Section 114 Information Collection Request Emissions Test Report

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GCC Rio Grande Inc.
Tijeras Plant
EPA Registry ID: 110000600831
Kiln Stack
11783 Highway 337
Tijeras, NM 87059
Report No. M234302

mostardi platt

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Emissions Test Report

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EPA Registry ID: 110000600831
11783 Highway 337
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Report Submittal Date:
December 20, 2023

Report No. M234302

Crown Point, IN | Mendota Heights, MN | Denver, CO | Henderson, NV

Corporate Headquarters
888 Industrial Drive
Elmhurst, Illinois 60126
630-993-2100

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1.0 INTRODUCTION

Mostardi Platt conducted an air emissions test program for GCC Rio Grande Inc. at the Tijeras Plant located in Tijeras, New Mexico. All testing was performed as described in the *Code of Federal Regulations*, Title 40, Part 60, Appendix A (40CFR60), Methods 1, 2, 3A, 4, 26A, and 40CFR63, Appendix A, (40CFR63) Method 320.

This test program was completed to satisfy the requirements of the United States Environmental Protection Agency (USEPA) Section 114 Information Collection Request for Portland Cement Manufacturing facilities.

The identification of individuals associated with the test program is summarized below:

Location	Address	Contact
Facility Representative	GCC Rio Grande, Inc. 11783 Highway 337 Tijeras, NM 87059	Samantha Kretz P: 505-286-6081 E: skretz@gcc.com
Testing Company Representative	Mostardi Platt 7715 Commercial Way Suite 155 Henderson, NV 89011	Rich Sollars P: (630) 993-2100 (phone) E: rsollars@mp-mail.com

2.0 TEST REQUIREMENTS

Testing was performed at the kiln stack. The following table presents a list of the parameters tested, the applicable methodologies utilized, and average test results:

Source	Parameter Tested	Test Results	Method/Regulation Citation
Kiln Stack	Hydrogen Fluoride (HF)	≤ 0.10 ppmvw	USEPA Method 320, 40CFR63, Appendix A
		≤ 0.30 ppmvd @7% O_2	
		≤ 0.06 lb/hr	
		≤ 0.0010 lb/ton clinker	
	HF[1]	≤ 0.13 ppmvd	Method 26A, 40CFR60, Appendix A
		≤ 0.38 ppmvd @7% O_2	
		≤ 0.07 lb/hr	
		≤ 0.0013 lb/ton clinker	
	Chlorine (Cl_2)[1]	≤ 0.04 ppmvd	USEPA Method 26A, 40CFR60, Appendix A
		≤ 0.12 ppmvd @7% O_2	
		≤ 0.08 lb/hr	
		≤ 0.0014 lb/ton clinker	
	Hydrogen Cyanide (HCN)	1.91 ppmvw	USEPA Method 320, 40CFR63, Appendix A
		5.78 ppmvd @7% O_2	
		1.48 lb/hr	
		0.0271 lb/ton clinker	
	Oxygen (O_2)	16.2 % (dry)	USEPA Method 3A, 40CFR60, Appendix A
	Carbon Dioxide (CO_2)	6.3 % (dry)	USEPA Method 320, 40CFR63, Appendix A
	Moisture (H_2O)	2.8 %	USEPA Method 320, 40CFR63, Appendix A
	Cyclonic Flow Determination	PASS	USEPA Method 1, 40CFR60, Appendix A, Section 11.4
	Three-point O_2 Stratification Determination	< 5 %	USEPA Method 3A, 40CFR60, Appendix A and Method 7E, Section 8.1.2

[1] HF and Cl_2 Method 26A results are reported as the average from Train A and Train B.

3.0 QA SPECIFICATIONS AND PROCESS DIAGRAM

Table 3-1 QA/QC Specifications

Parameter	Method	QA/QC Specification	Acceptance Criteria	Actual Result
HCN	320	Method Detection Limit	0.5 ppm	0.2 ppmvw
		SNR	>2500 at 64 scans	6266 (Run 1 Average)
		S Beam	>0.9	1.549 (Run 1 Average)
		Direct HCN Analysis	±5% of tag value	-3.1%
		Dynamic Spike Analysis	≤10% of total sample volume	8.4%
			Spike gas ~twice native concentration or 3-4 ppm addition to native concentration	+4.0 ppmvw
			≤±20% of expected value or ≤±0.5 ppm, whichever is less restrictive	+1.2 %
		Residuals	≤±0.3 ppm, or ≤±5% of measured value, whichever is less restrictive	0.4 ppmvw
Cl_2	26A	Detection Limit	300 µg	150 µg
		Paired Train Agreement	≤10% Relative Deviation or ≤0.2 ppm, whichever is less restrictive.	0.01 ppmvd

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed as described in the Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40CFR60), Methods 1, 2, 3A, 4, 26A, and 40CFR63, Appendix A, Method 320; and the latest revisions thereof. Where applicable, the *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume III, Stationary Source Specific Methods, United States Environmental Protection Agency (USEPA) 600/R-94/038c, September 1994 was used to supplement procedures in addition to the appended "Draft General Test Plan".

4.1 Method 1 Sample and Velocity Traverse Determination

Sample points for testing are determined using USEPA Test Method 1, 40CFR60, Appendix A. The characteristics of the measurement location is summarized below.

Sample Point Selection

Test Location	Stack Diameter	Port Length	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
Main Kiln	132 Inches	6.0 Inches	3.3 Diameters	9.2 Diameters	HF/Cl_2 (26A)	24
					O_2 (3A)	3 (stratification)
					$HCN/HF/CO_2$ (320/3A)	1

A cyclonic flow check was performed in accordance with Section 11.4, which demonstrated it meets the criteria of an average value of less than 20° and therefore is considered to be a suitable testing location for flow rate measurements.

4.2 Method 2 Volumetric Flow Rate Determination

The gas velocity and volumetric flowrate were determined using Method 2, 40CFR60, Appendix A, as an integrated part of the HF/Cl_2 sampling system.

Velocity pressures were determined by traversing the duct with wind tunnel calibrated S-type pitot tube. Temperatures were measured using K-type thermocouples with calibrated digital temperature indicators. The molecular weight and moisture content of the gases were also determined to permit the calculation of the volumetric flowrate.

4.3 Method 3A Oxygen (O_2) and Carbon Dioxide (CO_2) Determination

O_2 and CO_2 concentrations were determined in accordance with Method 3A, 40CFR60, Appendix A and Method 320, 40CRR63, Appendix A, respectively. A Servomex analyzer was used to determine O_2 concentrations while the MKS 2030 analyzer was used to determine CO_2 concentrations. The O_2 instrument has a paramagnetic detector and operates in a nominal range of 0-25%.

A list of calibration gases used and the results of all calibration and other required quality assurance checks are found in the appendix of this report. Copies of calibration gas certifications are also appended.

4.4 Method 26A Hydrogen Fluoride (HF) and Chlorine (Cl_2) Determination

HF and Cl_2 concentrations and emission rates were determined in accordance with Method 26A, 40CFR60, Appendix A. Paired sampling trains were used to collect the samples. A total of twelve (12) test points were sampled per run on the kiln stack. The sample was extracted isokinetically from the gas stream and passed through dilute sulfuric acid (0.1N H_2SO_4). HF was collected in the dilute acid. Cl_2 was collected in the dilute sodium hydroxide (0.1N NaOH) solution. The sample train consisted of a Teflon coated nozzle, a heated borosilicate glass probe liner, a Teflon® filter placed on the outlet of the glass probe liner, and six impingers. The first two impingers contained the 0.1N H_2SO_4, the third remained empty (and was recovered with the first two impingers), the fourth and fifth impingers contained the 0.1N NaOH, while the sixth impinger contained silica gel to absorb any remaining moisture. A de-ionized water rinse was performed on each set of impingers, and samples were stored in Nalgene sample containers for transport. The 0.1N H_2SO_4 impinger catch samples were analyzed for HF while the 0.1N NaOH impinger catch samples were analyzed for Cl_2. A method detection limit (MDL) of 150 µg was determined for both HF and Cl_2 using the “Definition and Procedure for the Determination of the Method Detection Limit, Revision 2”. All equipment used was calibrated in accordance with the specifications of the method. Calibration data is appended.

Hand recorded field data sheets were reviewed and scans are retained on the Mostardi Platt network. Copies of this data is available upon request.

4.5 Method 320 Speciated Flue Gas Concentration Determinations

The sampling procedures for HCN and HF were performed in accordance with USEPA Method 320, 40CFR63, Appendix A. Data was continuously recorded with a data logging system throughout sampling, with brief interruption to properly label reference spectra.

The average gas effluent concentrations were determined from the average gas concentration displayed by the MKS 2030 analyzer.

All sampling system components were heated to 375^{o}F +/- 25^{o}F, including: stainless steel sample probe, stainless steel calibration tee, in line glass fiber particulate filter, Teflon® sample line, heated head sample pump, and FTIR detector cell. The sample pump distributes the gas sample to the instrument at a steady sample flow rate (+/- 10%). All components of the sampling system are constructed of stainless steel, glass, or Teflon®.

FTIR technology works on the principle that most gases absorb infrared light. This is true for all compounds except for homonuclear diatomic molecules and noble gases such as: N_2, O_2, H_2, He, Ne, and Ar. Vibrations, stretches, bends, and rotations within the bonds of a molecule determine the infrared absorption distinctiveness. The absorption creates a “fingerprint" which is unique for each given compound. The quantity of infrared light absorbed is proportional to the gas concentration. Most compounds have absorbencies at different infrared frequencies, thus allowing the simultaneous analysis of multiple compounds at one time. The FTIR software compares each sample spectrum to a user-selected list of calibration references and concentration data is generated.

FTIR data was collected using an MKS MultiGas 2030 FTIR spectrometer. Data was generated at 0.5 cm^{-1}. Each Spectra was derived from the coaddition of 62-64 scans with a new data point generated approximately every minute. HCN analyte spiking assured the ability of the FTIR to quantify HCN in the presence of effluent gas. All analyte spikes were introduced using an instrument grade stainless steel rotameter. All QA/QC procedures were within the acceptance criteria allowance of the applicable methodology and the “General Test Plan.”

5.0 TEST RESULTS SUMMARIES

Client: GCC Rio Grande Inc.
Facility: Tijeras Plant
Test Location: Main Stack
Test Method: 26A Combined

Source Condition		**Normal**		**Normal**		**Normal**		
Date		**10/24/23**		**10/24/23**		**10/24/23**		
Start Time		**8:00**		**10:00**		**12:00**		
End Time		**9:20**		**11:11**		**13:10**		
		Run 1		**Run 2**		**Run 3**		**Average**
Stack Conditions								
Average Gas Velocity, ft/sec		62.325		62.631		61.152		62.036
Gas Volumetric Flow Rate, acfm		355,373		357,119		348,689		353,727
Gas Volumetric Flow Rate, dscfm		179,986		179,302		176,009		178,432
Gas Volumetric Flow Rate, scfm		185,601		185,368		181,849		184,272
Average %CO_2 by volume, dry basis		6.2		6.3		6.5		6.3
Average %O_2 by volume, dry basis		16.1		16.2		16.2		16.2
Clinker Production, ton/hr		53.5		53.5		57.6		54.9
Chloride (Cl2) Emissions								
ppm	≤	0.04	≤	0.04	≤	0.04	≤	0.04
ppm@7%O2	≤	0.12	≤	0.12	≤	0.12	≤	0.12
lb/hr	≤	0.08	≤	0.08	≤	0.08	≤	0.08
lb/ton of clinker	≤	0.0015	≤	0.0015	≤	0.0013	≤	0.0014
Hydrogen Fluoride (HF) Emissions								
ppm	≤	0.13	≤	0.13	≤	0.13	≤	0.13
ppm@7%O2	≤	0.38	≤	0.38	≤	0.38	≤	0.38
lb/hr	≤	0.07	≤	0.07	≤	0.07	≤	0.07
lb/ton of clinker	≤	0.0014	≤	0.0014	≤	0.0012	≤	0.0013

Client: GCC Rio Grande Inc.
Facility: Tijeras Plant
Test Location: Main Stack
Test Method: 5/26A

Source Condition	Normal	Normal	Normal	
Date	10/24/23	10/24/23	10/24/23	
Start Time	8:00	10:00	12:00	
End Time	9:20	11:11	13:10	
	Run 1A	Run 2A	Run 3A	Average
Stack Conditions				
Average Gas Temperature, °F	337.8	343.8	341.4	341.0
Flue Gas Moisture, percent by volume	3.1%	3.3%	3.0%	3.1%
Average Flue Pressure, in. Hg	23.64	23.64	23.64	23.64
Gas Sample Volume, dscf	49.875	50.403	49.143	49.807
Average Gas Velocity, ft/sec	60.514	61.667	59.909	60.697
Gas Volumetric Flow Rate, acfm	345,051	351,625	341,603	346,093
Gas Volumetric Flow Rate, dscfm	174,778	176,437	172,400	174,538
Gas Volumetric Flow Rate, scfm	180,423	182,488	177,803	180,238
Average %CO_2 by volume, dry basis	6.2	6.3	6.5	6.3
Average %O_2 by volume, dry basis	16.1	16.2	16.2	16.2
Isokinetic Variance	100.7	100.8	100.6	100.7
Clinker Production, ton/hr	53.5	53.5	57.6	54.9
Chloride (Cl2) Emissions				
ug of sample collected	≤ 150.00	≤ 150.00	≤ 150.00	≤ 150.00
ppm	≤ 0.04	≤ 0.04	≤ 0.04	≤ 0.04
Hydrogen Fluoride (HF) Emissions				
ug of sample collected	≤ 150.00	≤ 150.00	≤ 150.00	≤ 150.00
ppm	≤ 0.13	≤ 0.13	≤ 0.13	≤ 0.13

Client: GCC Rio Grande Inc.
Facility: Tijeras Plant
Test Location: Main Stack
Test Method: 26A

Source Condition		**Normal**		**Normal**		**Normal**		
Date		**10/24/23**		**10/24/23**		**10/24/23**		
Start Time		**8:00**		**10:00**		**12:00**		
End Time		**9:20**		**11:11**		**13:10**		
		Run 1B		**Run 2B**		**Run 3B**		**Average**
Stack Conditions								
Average Gas Temperature, °F		339.4		343.3		338.2		340.3
Flue Gas Moisture, percent by volume		2.9%		3.2%		3.4%		3.2%
Average Flue Pressure, in. Hg		23.63		23.63		23.63		23.63
Gas Sample Volume, dscf		50.924		50.220		49.605		50.250
Average Gas Velocity, ft/sec		64.135		63.594		62.395		63.375
Gas Volumetric Flow Rate, acfm		365,695		362,612		355,774		361,360
Gas Volumetric Flow Rate, dscfm		185,194		182,166		179,617		182,326
Gas Volumetric Flow Rate, scfm		190,778		188,248		185,894		188,307
Average %CO_2 by volume, dry basis		6.2		6.3		6.5		6.3
Average %O_2 by volume, dry basis		16.1		16.2		16.2		16.2
Isokinetic Variance		100.5		100.7		100.9		100.7
Clinker Production, ton/hr		53.5		53.5		57.6		54.9
Chloride (Cl2) Emissions								
ug of sample collected	≤	150.00	≤	150.00	≤	150.00	≤	150.00
ppm	≤	0.04	≤	0.04	≤	0.04	≤	0.04
Hydrogen Fluoride (HF) Emissions								
ug of sample collected	≤	150.00	≤	150.00	≤	150.00	≤	150.00
ppm	≤	0.13	≤	0.13	≤	0.13	≤	0.13

GCC Rio Grande, Inc. Tijeras Plant Main Stack Reference Method Test Data									
Test No.	**Date**	**Start Time**	**End Time**	**O2 % (dry)**	**Moisture %**	**HCN ppmvw**	**HCN ppmvd @ 7% O2**	**HF ppmvw**	**HF ppmvd @ 7% O2**
1	10/24/2023	8:00	8:59	16.1	2.9%	2.03	6.07	0.10	0.30
2	10/24/2023	10:00	10:59	16.2	2.7%	1.82	5.55	0.10	0.30
3	10/24/2023	12:00	12:59	16.2	2.7%	1.89	5.74	0.10	0.30
Average				**16.2**	**2.8%**	**1.91**	**5.78**	**0.10**	**0.30**

Test No.	**Date**	**Start Time**	**End Time**	**Volumetric Flow, SCFH**	**Clinker Production, ton/hr**	**HCN lb/hr**	**HCN lb/ton**	**HF lb/hr**	**HF lb/ton**
1	10/24/2023	8:00	8:59	11,136,060	53.5	1.58	0.0296	0.06	0.0011
2	10/24/2023	10:00	10:59	11,122,080	53.5	1.42	0.0266	0.06	0.0011
3	10/24/2023	12:00	12:59	10,910,940	57.6	1.45	0.0251	0.06	0.0010
Average				**11,056,360**	**54.9**	**1.48**	**0.0271**	**0.06**	**0.0010**

6.0 CERTIFICATION

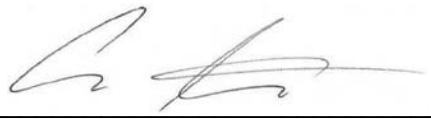
Mostardi Platt is pleased to have been of service to GCC Rio Grande Inc. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT

Project Manager

Richard J. Sollars II



Quality Assurance

Chet A. Gutwein

APPENDICES

Appendix A – Plant Operating Data

Tijeras PM RUN 1

Run	Clk Prod st/hr
10/24/2023 8:00	49.1
10/24/2023 8:01	48.3
10/24/2023 8:02	48.6
10/24/2023 8:03	50.4
10/24/2023 8:04	48.9
10/24/2023 8:05	49.6
10/24/2023 8:06	50.6
10/24/2023 8:07	51.5
10/24/2023 8:08	49.2
10/24/2023 8:09	50.3
10/24/2023 8:10	50.4
10/24/2023 8:11	50.2
10/24/2023 8:12	51
10/24/2023 8:13	51.8
10/24/2023 8:14	51.1
10/24/2023 8:15	51.4
10/24/2023 8:16	51.4
10/24/2023 8:17	50.7
10/24/2023 8:18	52.9
10/24/2023 8:19	50.9
10/24/2023 8:20	51
10/24/2023 8:21	51.4
10/24/2023 8:22	49.2
10/24/2023 8:23	49.1
10/24/2023 8:24	49.7
10/24/2023 8:25	50.5
10/24/2023 8:26	48.2
10/24/2023 8:27	49.7
10/24/2023 8:28	50.4
10/24/2023 8:29	49.5
10/24/2023 8:30	49.1
10/24/2023 8:31	49.9
10/24/2023 8:32	47.7
10/24/2023 8:33	51.1
10/24/2023 8:34	49.9
10/24/2023 8:35	48.9
10/24/2023 8:36	51.3
10/24/2023 8:37	50.3
10/24/2023 8:38	49.6
10/24/2023 8:39	52.7
10/24/2023 8:40	50.9
10/24/2023 8:41	51.7
10/24/2023 8:42	54.8
10/24/2023 8:43	56.2
10/24/2023 8:44	55
10/24/2023 8:45	58.2
10/24/2023 8:46	57.7
10/24/2023 8:47	56.3
10/24/2023 8:48	56.7
10/24/2023 8:49	58.8
10/24/2023 8:50	58
10/24/2023 8:51	59.4
10/24/2023 8:52	58.2
10/24/2023 8:53	57.9
10/24/2023 8:54	58.8
10/24/2023 8:55	59.3
10/24/2023 8:56	57.8
10/24/2023 8:57	58.1
10/24/2023 8:58	56.4
10/24/2023 8:59	57.3
10/24/2023 9:00	58
10/24/2023 9:01	56.8
10/24/2023 9:02	58
10/24/2023 9:03	57.9
10/24/2023 9:04	59.5
10/24/2023 9:05	57.3
10/24/2023 9:06	56.9
10/24/2023 9:07	58.5
10/24/2023 9:08	55.2
10/24/2023 9:09	57
10/24/2023 9:10	55.2
10/24/2023 9:11	56.4
10/24/2023 9:12	55.6
10/24/2023 9:13	54.3
10/24/2023 9:14	55.2
10/24/2023 9:15	55.9
10/24/2023 9:16	55.6
10/24/2023 9:17	55.4
10/24/2023 9:18	55.4
10/24/2023 9:19	56.2
10/24/2023 9:20	54.6
Average	53.5

Tijeras PM Run 2

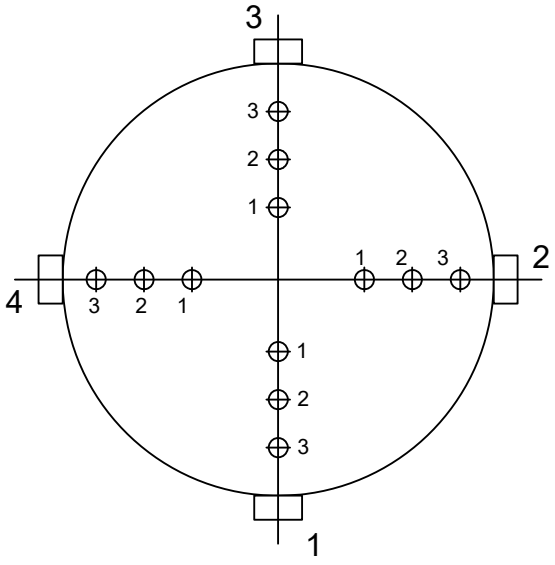
Run	Clk Prod st/hr
10/24/2023 8:00	49.1
10/24/2023 8:01	48.3
10/24/2023 8:02	48.6
10/24/2023 8:03	50.4
10/24/2023 8:04	48.9
10/24/2023 8:05	49.6
10/24/2023 8:06	50.6
10/24/2023 8:07	51.5
10/24/2023 8:08	49.2
10/24/2023 8:09	50.3
10/24/2023 8:10	50.4
10/24/2023 8:11	50.2
10/24/2023 8:12	51
10/24/2023 8:13	51.8
10/24/2023 8:14	51.1
10/24/2023 8:15	51.4
10/24/2023 8:16	51.4
10/24/2023 8:17	50.7
10/24/2023 8:18	52.9
10/24/2023 8:19	50.9
10/24/2023 8:20	51
10/24/2023 8:21	51.4
10/24/2023 8:22	49.2
10/24/2023 8:23	49.1
10/24/2023 8:24	49.7
10/24/2023 8:25	50.5
10/24/2023 8:26	48.2
10/24/2023 8:27	49.7
10/24/2023 8:28	50.4
10/24/2023 8:29	49.5
10/24/2023 8:30	49.1
10/24/2023 8:31	49.9
10/24/2023 8:32	47.7
10/24/2023 8:33	51.1
10/24/2023 8:34	49.9
10/24/2023 8:35	48.9
10/24/2023 8:36	51.3
10/24/2023 8:37	50.3
10/24/2023 8:38	49.6
10/24/2023 8:39	52.7
10/24/2023 8:40	50.9
10/24/2023 8:41	51.7
10/24/2023 8:42	54.8
10/24/2023 8:43	56.2
10/24/2023 8:44	55
10/24/2023 8:45	58.2
10/24/2023 8:46	57.7
10/24/2023 8:47	56.3
10/24/2023 8:48	56.7
10/24/2023 8:49	58.8
10/24/2023 8:50	58
10/24/2023 8:51	59.4
10/24/2023 8:52	58.2
10/24/2023 8:53	57.9
10/24/2023 8:54	58.8
10/24/2023 8:55	59.3
10/24/2023 8:56	57.8
10/24/2023 8:57	58.1
10/24/2023 8:58	56.4
10/24/2023 8:59	57.3
10/24/2023 9:00	58
10/24/2023 9:01	56.8
10/24/2023 9:02	58
10/24/2023 9:03	57.9
10/24/2023 9:04	59.5
10/24/2023 9:05	57.3
10/24/2023 9:06	56.9
10/24/2023 9:07	58.5
10/24/2023 9:08	55.2
10/24/2023 9:09	57
10/24/2023 9:10	55.2
10/24/2023 9:11	56.4
10/24/2023 9:12	55.6
10/24/2023 9:13	54.3
10/24/2023 9:14	55.2
10/24/2023 9:15	55.9
10/24/2023 9:16	55.6
10/24/2023 9:17	55.4
10/24/2023 9:18	55.4
10/24/2023 9:19	56.2
10/24/2023 9:20	54.6
Average	53.5

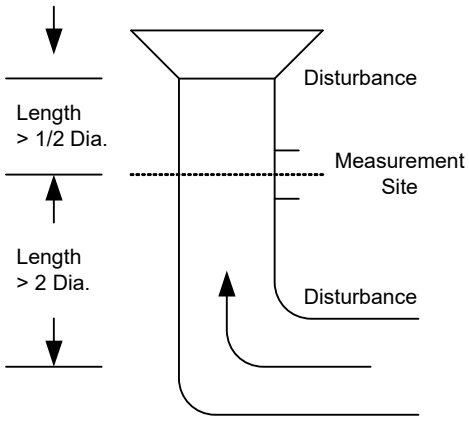
Tijeras PM Run 3

Run	Clk Prod st/hr
10/24/2023 12:00	50.2
10/24/2023 12:01	49.4
10/24/2023 12:02	52
10/24/2023 12:03	51.4
10/24/2023 12:04	50.6
10/24/2023 12:05	52.2
10/24/2023 12:06	52.2
10/24/2023 12:07	52.8
10/24/2023 12:08	54.6
10/24/2023 12:09	54.8
10/24/2023 12:10	52.4
10/24/2023 12:11	57.1
10/24/2023 12:12	56.3
10/24/2023 12:13	57.3
10/24/2023 12:14	59.5
10/24/2023 12:15	57.9
10/24/2023 12:16	57.5
10/24/2023 12:17	58.3
10/24/2023 12:18	58.8
10/24/2023 12:19	59
10/24/2023 12:20	59.2
10/24/2023 12:21	60
10/24/2023 12:22	59.5
10/24/2023 12:23	57.9
10/24/2023 12:24	56.9
10/24/2023 12:25	55.1
10/24/2023 12:26	58.2
10/24/2023 12:27	55.8
10/24/2023 12:28	54.1
10/24/2023 12:29	56.3
10/24/2023 12:30	54.2
10/24/2023 12:31	52.5
10/24/2023 12:32	53.9
10/24/2023 12:33	50.4
10/24/2023 12:34	51.8
10/24/2023 12:35	54
10/24/2023 12:36	52.9
10/24/2023 12:37	51.7
10/24/2023 12:38	54
10/24/2023 12:39	53.8
10/24/2023 12:40	55.4
10/24/2023 12:41	57.8
10/24/2023 12:42	60.3
10/24/2023 12:43	61.8
10/24/2023 12:44	63.2
10/24/2023 12:45	64
10/24/2023 12:46	70.9
10/24/2023 12:47	71.9
10/24/2023 12:48	73
10/24/2023 12:49	69.2
10/24/2023 12:50	69
10/24/2023 12:51	68.9
10/24/2023 12:52	64.6
10/24/2023 12:53	66.2
10/24/2023 12:54	69.9
10/24/2023 12:55	62.4
10/24/2023 12:56	59.2
10/24/2023 12:57	56.3
10/24/2023 12:58	53.2
10/24/2023 12:59	52.5
10/24/2023 13:00	53.5
10/24/2023 13:01	55
10/24/2023 13:02	54.9
10/24/2023 13:03	53.6
10/24/2023 13:04	57.2
10/24/2023 13:05	68.3
10/24/2023 13:06	64.3
10/24/2023 13:07	58.3
10/24/2023 13:08	53
10/24/2023 13:09	50.3
10/24/2023 13:10	53.7
Average	57.6

Appendix B – Test Section Diagrams

STRATIFICATION TEST FOR ROUND DUCTS

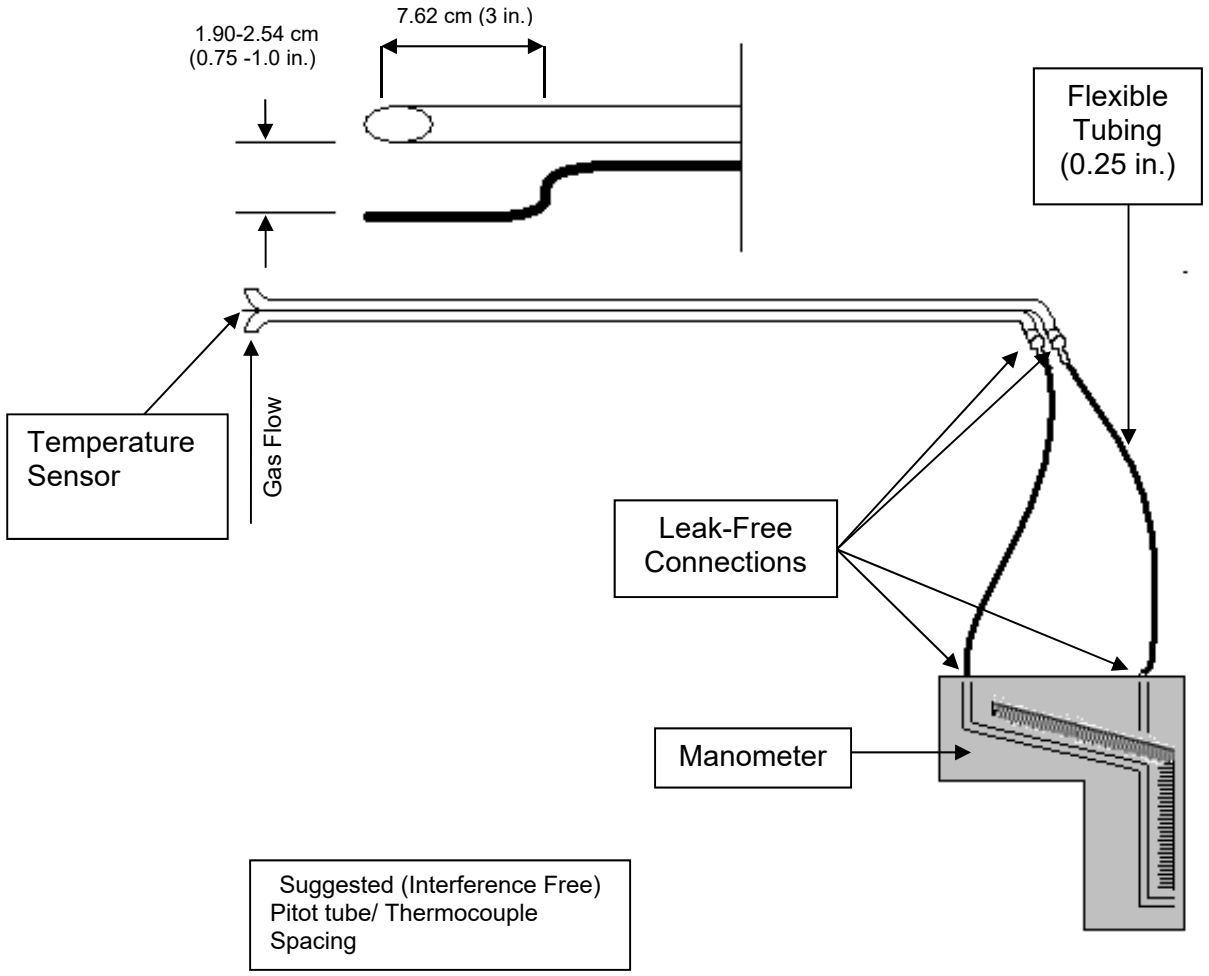




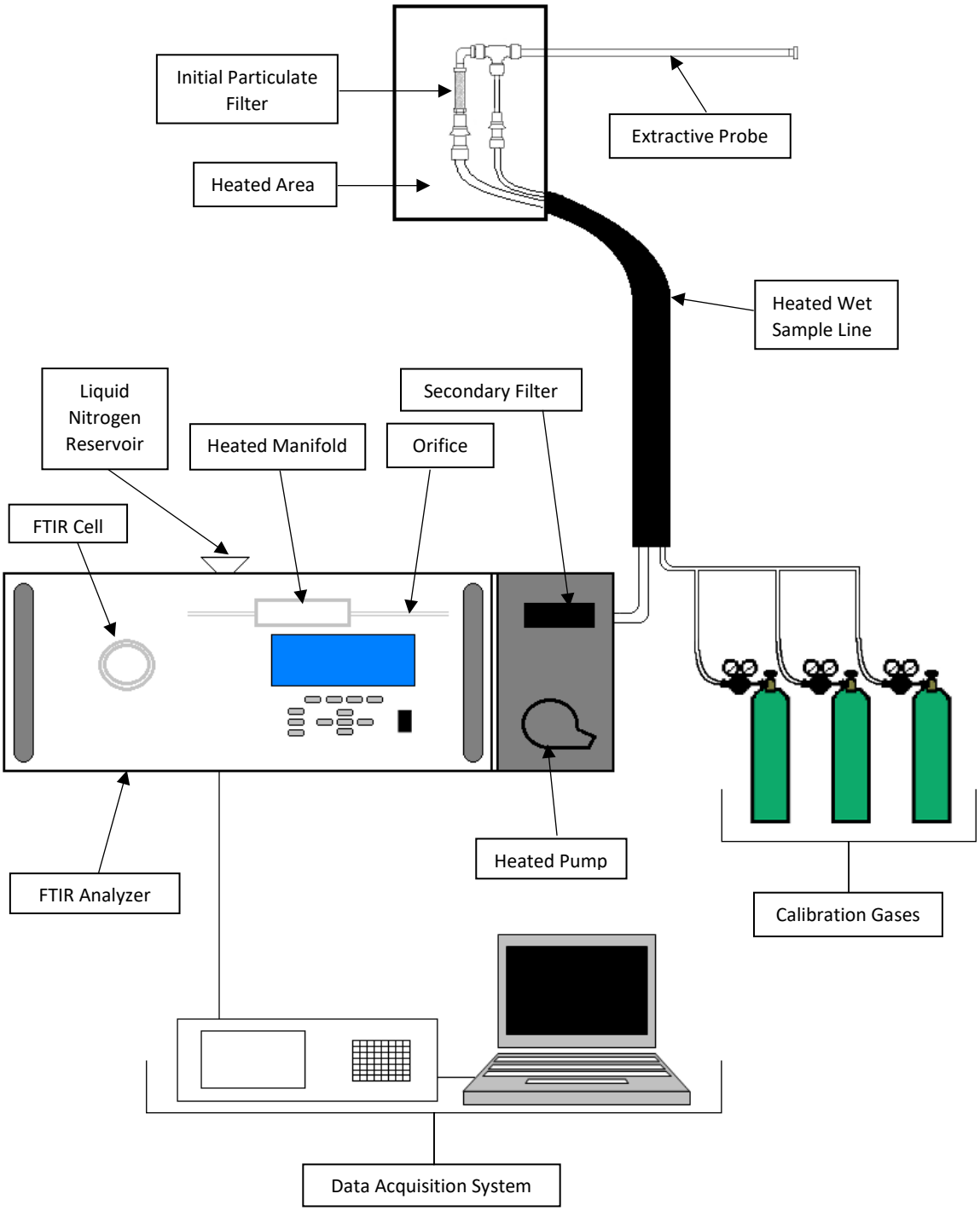
Project:	GCC Rio Grande Inc. Tijeras Plant
Test Location:	Main Kiln
Duct Diameter:	132 Inches
Duct Area:	95.03 Square Feet
No. Points Across Diameter:	6
No. of Ports:	2

Appendix C – Sample Train Diagrams

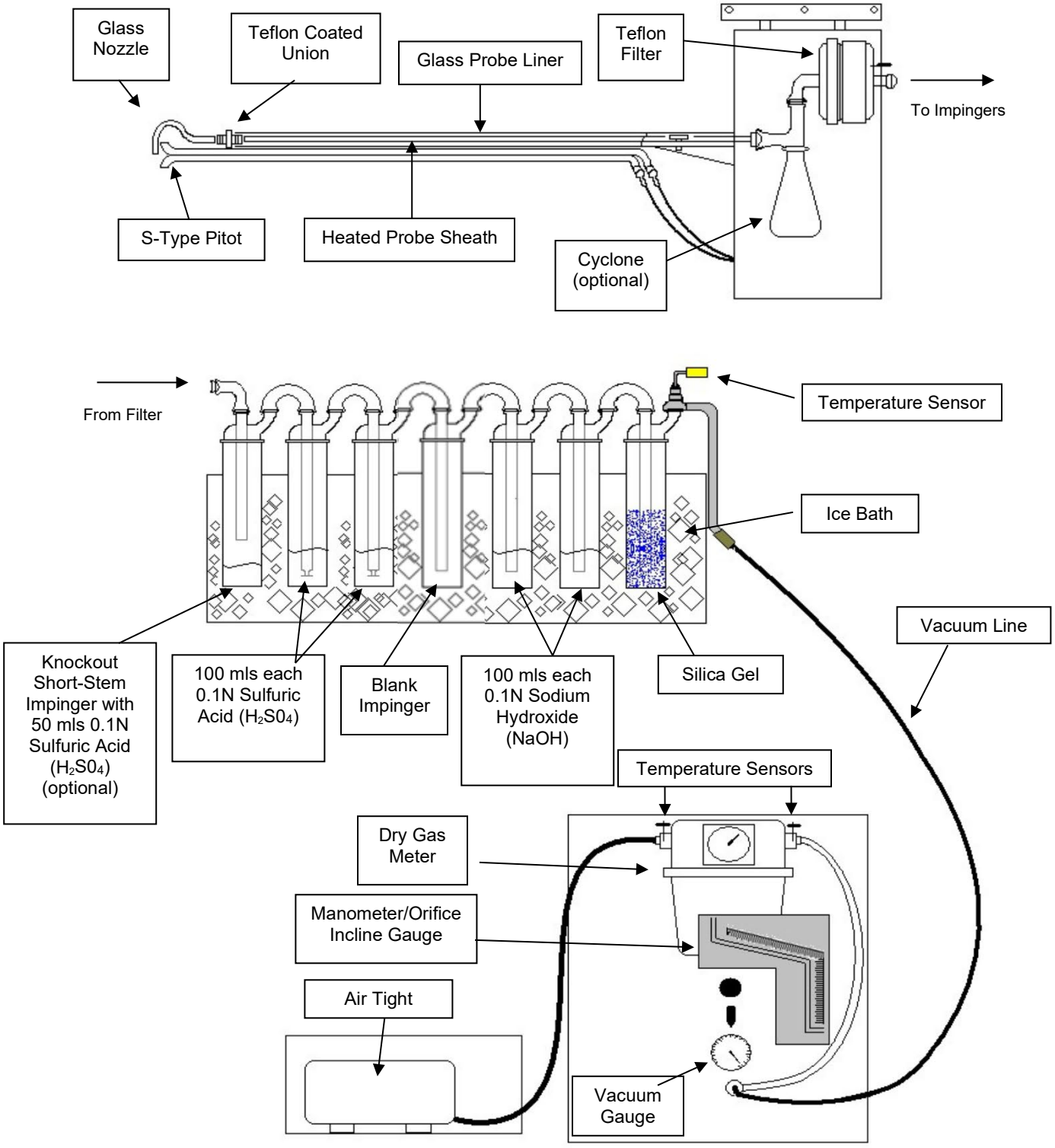
USEPA Method 2 – Type S Pitot Tube Manometer Assembly



USEPA Method 320 – Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared (FTIR) Spectroscopy Sample Train Diagram



USEPA Method 26A – HF and Cl_2 Sample Train Diagram



Appendix D – Calculation Nomenclature and Formulas

Client:	**GCC Rio Grande Inc.**
Facility:	**Tijeras Plant**
Test Location:	**Main Stack**
Run:	**1**
Date:	**10/24/2023**
Method:	**5/26A**
Source Condition:	**Normal**

Dry Molecular Weight

$$Md = 0.44 \times (\%CO_2) + 0.32 \times (\%O_2) + 0.28 \times \%N_2$$

$\%CO_2$ =	6.2	$\%O_2$ =	16.1	$\%N_2$ =	77.7

Md = 29.636

Wet Molecular Weight

$$Ms = Md \times (1-Bws) + (18.0 \times Bws)$$

Md =	29.636	Bws =	0.031

Ms = 29.272

Meter Volume at Standard Conditions

$$Vm(std) = 17.647 \times Y \times Vm \times \frac{(Pbar + DH/13.6)}{Tm}$$

Y =	0.994	Vm =	61.904	Pbar =	23.6
DH =	2.7	Tm =	59.1		

Vm(std) = 49.875

Volume of Water Vapor Condensed

$$Vw(std) = 0.0471 \times (\text{net } H_2O \text{ gain})$$

Net H_2O = 34.2

Vw(std) = 1.611

Moisture Content

$$Bws = \frac{Vw(std)}{Vw(std) + Vm(std)}$$

Vw(std) =	1.611	Vm(std) =	49.875

Bws = 0.031

Average Duct Velocity

$$Vs = 85.49 \times Cp \times \text{Sqrt DP (avg)} \times (Ts\ (avg) + 460/ (Ps \times Ms))^{1/2}$$

Cp =	0.820	Ts (avg) =	337.8	Sqrt DP (avg):	0.804
Ps =	23.64	Ms =	29.272		

Vs = 60.514

Volumetric Flow Rate (Actual Basis)

$$Q = Vs \times A \times 60$$

Vs =	60.514	A =	95.033

Q = 345,051

Client:	**GCC Rio Grande Inc.**
Facility:	**Tijeras Plant**
Test Location:	**Main Stack**
Run:	**1**
Date:	**10/24/2023**
Method:	**5/26A**
Source Condition:	**Normal**

Volumetric Flow Rate (Standard Basis)

$$Qstd = 17.647 \times Q \times \frac{Ps}{Ts(avg) + 460}$$

Q =	**345,051**	**Ps =**	**23.64**	**Ts (avg) =**	**337.8**

Qstd = 180,423

Volumetric Flow Rate (Standard Dry Basis)

$$Qstd(dry) = Qstd \times (1-Bws)$$

Qstd =	**180,423**	**Bws =**	**0.031**

Qstd(dry) = 174,778

Isokinetic Variation:

$$\%ISO = \frac{0.0945 \times (Ts + 460) \times Vm(std)}{Vs \times \theta \times An \times Ps \times (1-Bws)}$$

Ts =	**337.8**	**Vm(std) =**	**49.875**	**Vs =**	**60.514**
An =	**0.0004492**	**θ =**	**60**	**Ps =**	**23.64**
Bws =	**0.031**				

%ISO = 100.7

Chloride (Cl2) Concentration:

$$mg/m^3 = \frac{mg \text{ of Chloride (Cl2)}}{Vm(std) \times 0.02832\ m^3/ft^3}$$

mg=	**0.15**	**Vm(std) =**	**49.875**

mg/m^3= 0.11

Chloride (Cl2) Emission Rate:

$$\text{lb of Chloride (Cl2)} = \frac{\mu g \text{ of sample} \times 10^{-6}\ grams/\mu g}{453.6\ grams/lb}$$

$$\text{Emission Rate lb/hr} = \frac{\text{lb of Chloride (Cl2)}}{Vm(std)} \times dscfm \times 60\ min/hr$$

lb of Chloride (Cl2) =	**3.31E-10**	**dscfm =**	**174,778**

Emission Rate lb/hr = 0.0695

$$\text{Emission Rate lb/ton} = \frac{\text{lb/hr of Chloride (Cl2)}}{\text{clinker production ton/hr}}$$

lb/hr of Chloride (Cl2) =	**0.0695**	**clinker ton/hr =**	**53.5**

Emission Rate lb/ton = 0.0013

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Test Location: Main Stack
Date: 10/24/23

Sample Calculations

$$(16.25\ \% \ - \ 0.08\ \%) \ x \ \frac{\textbf{O2 \% (dry)}\ 12.03\ \%}{12.14\ \% \ - \ 0.08\ \%} = 16.13\ \%$$

$$C_{gas} = (C - C_o) \ x \frac{C_{ma}}{C_m - C_o}$$

where:
C_{gas} = Effluent gas concentration, dry basis, ppm or %
C = Average gas concentration indicated by gas analyzer, dry basis, ppm or %
C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm or %
C_m = Average of inititial and final system calibration bias check responses for the upscale calibration gas, ppm or %
C_{ma} = Actual concentration of the upscale calibration gas, ppm or %

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Test Location: Main Stack
Date: 10/24/23

FTIR Sample Calculations

Direct Recovery % of Calibration Transfer Standard

$$DR_{cts} = \frac{D_{cts}}{Cma} \times 100$$

Cma= 100.6 D_{cts} = 100.6

DR_{cts} = 100.0%

Recovery % with Calibration Transfer Standard System Purge

$$R_{cts} = \frac{Sys_{cts}}{D_{cts}} \times 100$$

Sys_{cts} = 101.0 D_{cts} = 100.6

R_{cts} = 100%

Direct Recovery % of Analyte Spike Gas

SF6			HCN		
$DR_{sf6} = \frac{D_{sf6}}{Cma} \times 100$			$DR_{asg} = \frac{D_{asg}}{Cma} \times 100$		
Cma= 5.0	D_{sf6} = 5.1		Cma= 49.6	D_{asg} = 48.0	
DR_{sf6} = 102%			DR_{asg} = 96.9%		

Dilution Factor for Analyte Spiking

$$DF = \frac{Spk_{sf6}}{D_{sf6}}$$

Spk_{sf6} = 0.424 D_{sf6} = 5.101

DF = 0.083

Recovery % for Analyte Spike With HCN

$$R_x = \frac{Spk_x}{(N_x \times (1-DF) + D_{asg} \times DF)}$$

Spk_x = 6.1 N_x = 2.0

DF = 0.083 D_{asg} = 48.0

R_x = 103.4 %

where:

DR_{cts} = Recovery % of the calibration transfer standard directly to the analyzer
Cma = certified concentration of calibration gas, ppm
D_{cts} = Concentration of the calibration transfer standard gas directly to the analyzer, ppm
R_{cts} = Recovery % of the calibration transfer standard through the sampling system
Sys_{cts} = Concentration of the calibration transfer standard gas through the system, ppm
DF = Dilution Factor of analyte spike gas
Spk_{sf6} = SF6 concentration in effluent during spiking
Spk_x = Analyte concentration in effluent during spiking
D_{asg} = Concentration of the analyte spike gas directly to the analyzer, ppm
D_{sf6} = Concentration of the SF6 directly to the analyzer, ppm
R_x = Recovery % of the analyte spike gas
N_x = Native effluent (HCN) concentration prior to analyte spike

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Moisture Calculations

$$V_{wc(std)} = \frac{(V_f - V_i)\rho_w R T_{std}}{P_{std} M_w} = 0.04707(V_f - V_i)$$

$$V_{wsg(std)} = \frac{(W_f - W_i)\rho_w R T_{std}}{P_{std} M_w} = 0.04715(W_f - W_i)$$

$$V_{m(std)} = 17.64\, V_m Y \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

Where:

B_{ws} = Water vapor in gas stream, proportion by volume
M_w = Molecular weight of water, 18.015 lb/lb-mole
P_{bar} = Barometric pressure at the testing site, in. Hg
P_{std} = Standard absolute pressure, 29.92 in. Hg
R = Ideal gas constant, 0.048137 (in. Hg)(ft^3)/(g-mole)(°R) = [21.8348(in. Hg)(ft^3)/(lb-mole)(°R)]/453.592 g-mole/lb-mole
T_m = Absolute average dry gas meter temperature, °R
T_{std} = Standard absolute temperature, 528 °R
V_f = Final volume of condenser water, ml
V_i = Initial volume of condenser water, ml
V_m = Dry gas volume measured by dry gas meter, dcf
$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, scf
$V_{wc(std)}$ = Volume of condensed water vapor, corrected to standard conditions, scf
$V_{wsg(std)}$ = Volume of water vapor collected in silica gel, corrected to standard conditions, scf
W_f = Final weight of silica gel, g
W_i = Initial weight of silica gel, g
Y = Dry gas meter calibration factor
ΔH = Average pressure exerted on dry gas meter outlet by gas sample bag, in. H_2O
ρ_w = Density of water, 0.9982 g/ml
13.6 = Specific gravity of mercury (Hg)
17.64 = T_{std}/P_{std}
0.04707 = ft^3/ml 0.04715 = ft^3/g

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Volumetric Flow Nomenclature

A =	Cross-sectional area of stack or duct, ft2
Bws =	Water vapor in gas stream, proportion by volume
Cp =	Pitot tube coefficient, dimensionless
Md =	Dry molecular weight of gas, lb/lb-mole
Ms =	Molecular weight of gas, wet basis, lb/lb-mole
Mw =	Molecular weight of water, 18.0 lb/lb-mole
Pbar =	Barometric pressure at testing site, in. Hg
Pg =	Static pressure of gas, in. Hg (in. H2O/13.6)
DH=	Static pressure of gas, in.H2O
Ps =	Absolute pressure of gas, in. Hg = Pbar + Pg
Pstd =	Standard absolute pressure, 29.92 in. Hg
Acfm =	Actual volumetric gas flow rate
Scfm=	Volumetric gas flow rate, corrected to standard conditions
Dscfm =	Standard volumetric flow rate, corrected to dry conditions
R =	Ideal gas constant, 21.85 in. Hg-ft3/°R-lb-mole
Ts =	Average stack gas temperature, °F
Tm =	Average dry gas meter temperature, oF
Tstd =	Standard absolute temperature, 528°R
vs =	Gas velocity, ft/sec
Vm(std)=	Volume of gas sampled, corrected to standard conditions, scf
Vw(std) =	Volume of water vapor in gas sample, corrected to standard conditions, scf
Vlc=	Volume of liquid collected
Y =	Dry gas meter calibration factor
Δp =	Velocity head of gas, in. H2O
K1 =	17.647 °R/in. Hg
%EA =	Percent excess air
%CO2 =	Percent carbon dioxide by volume, dry basis
%O2 =	Percent oxygen by volume, dry basis
%N2 =	Percent nitrogen by volume, dry basis
0.264 =	Ratio of O2 to N2 in air, v/v
0.28 =	Molecular weight of N2 or CO, divided by 100
0.32 =	Molecular weight of O2 divided by 100
0.44 =	Molecular weight of CO2 divided by 100
13.6 =	Specific gravity of mercury (Hg)

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Volumetric Air Flow Calculations

$$Vm\ (std) = 17.647 \times Vm \times \left[\frac{\left(P_{bar} + \left[\frac{DH}{13.6}\right]\right)}{(460 + Tm)}\right] \times Y$$

$$Vw\ (std) = 0.0471 \times Vlc$$

$$Bws = \left[\frac{Vw\ (std)}{Vw\ (std) + Vm\ (std)}\right]$$

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + [0.28 \times (100 - \%CO_2 - \%O_2)]$$

$$Ms = Md \times (1 - Bws) + (18 \times Bws)$$

$$Vs = \sqrt{\frac{(Ts + 460)}{Ms \times Ps}} \times \sqrt{DP} \times Cp \times 85.49$$

$$Acfm = Vs \times Area\ (of\ stack\ or\ duct) \times 60$$

$$Scfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)}\right]$$

$$Scfh = Scfm \times 60\frac{min}{hr}$$

$$Dscfm = Scfm \times (1 - Bws)$$

MOSTARDI PLATT

Isokinetic Calculation Formulas

1. $V_{w(std)} = V_{lc}\left(\frac{\rho_w}{M_w}\right)\left(\frac{RT_{std}}{P_{std}}\right) = K_2 V_{lc}$

2. $V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\right)\left(\frac{(P_{bar} + (\frac{\Delta H}{13.6}))}{P_{std}}\right) = K_1\, V_m\, Y \frac{(P_{bar} + (\frac{\Delta H}{13.6}))}{T_m}$

3. $B_{ws} = \frac{V_{w(std)}}{(V_{m(std)} + V_{w(std)})}$

4. $M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2)$

5. $M_s = M_d(1 - B_{ws}) + 18.0(B_{ws})$

6. $C_a = \frac{m_a}{V_a \rho_a}$

7. $W_a = C_a V_{aw} \rho_a$

8. $C_{acf} = 15.43 K_i\left(\frac{m_n P_s}{V_{w(std)} + V_{m(std)}\, T_s}\right)$

9. $C_S = (15.43\ \text{grains/gram})\,(m_n / V_{m(std)})$

10. $v_s = K_p C_p \sqrt{\frac{\Delta P\, T_s}{P_s M_s}}$

11. $Q_{acfm} = v_s A(60_{sec/min})$

12. $Q_{sd} = (3600_{sec/hr})(1 - B_{ws})\, v_s \left(\frac{T_{std} P_s}{T_s P_{std}}\right) A$

13. $E\,(\text{emission rate, lbs/hr}) = Q_{std}\left(C_s / 7000\ \text{grains/lb}\right)$

14. $IKV = \frac{T_s V_{m(std)} P_{std}}{T_{std} v_s \theta A_n P_s 60(1 - B_{ws})} = K_4 \frac{T_s V_{m(std)}}{P_s v_s A_n \theta (1 - B_{ws})}$

15. $\%EA = \left(\frac{\%O_2 - (0.5\,\%CO)}{0.264\,\%N_2 - (\%O_2 - 0.5\,\%CO)}\right) \times 100$

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Isokinetic Nomenclature

A = Cross-sectional area of stack or duct, square feet
A_n = Cross-sectional area of nozzle, square feet
B_{ws} = Water vapor in gas stream, by volume
C_a = Acetone blank residue concentration, g/g
C_{acf} = Concentration of particulate matter in gas stream at actual conditions, gr/acf
C_p = Pitot tube coefficient
C_s = Concentration of particulate matter in gas stream, dry basis, corrected to standard conditions, gr/dscf
IKV = Isokinetic sampling variance, must be 90.0 % ≤ IKV ≤ 110.0%
M_d = Dry molecular weight of gas, lb/lb-mole
M_s = Molecular weight of gas, wet basis, lb/lb-mole
M_w = Molecular weight of water, 18.0 lb/lb-mole
m_a = Mass of residue of acetone after evaporation, grams
P_{bar} = Barometric pressure at testing site, inches mercury
P_g = Static pressure of gas, inches mercury (inches water/13.6)
P_s = Absolute pressure of gas, inches mercury = $P_{bar} + P_g$
P_{std} = Standard absolute pressure, 29.92 inches mercury
Q_{acfm} = Actual volumetric gas flow rate, acfm
Q_{sd} = Dry volumetric gas flow rate corrected to standard conditions, dscfh
R = Ideal gas constant, 21.85 inches mercury cubic foot/°R-lb-mole
T_m = Dry gas meter temperature, °R
T_s = Gas temperature, °R
T_{std} = Absolute temperature, 528°R
V_a = Volume of acetone blank, ml
V_{aw} = Volume of acetone used in wash, ml
W_a = Weight of residue in acetone wash, grams
m_n = Total amount of particulate matter collected, grams
V_{1c} = Total volume of liquid collected in impingers and silica gel, ml
V_m = Volume of gas sample as measured by dry gas meter, dcf
$V_{m(std)}$ = Volume of gas sample measured by dry gas meter, corrected to standard conditions, dscf
v_s = Gas velocity, ft/sec
$V_{w(std)}$ = Volume of water vapor in gas sample, corrected to standard conditions, scf
Y = Dry gas meter calibration factor
ΔH = Average pressure differential across the orifice meter, inches water
Δp = Velocity head of gas, inches water
ρ_a = Density of acetone, 0.7855 g/ml (average)
ρ_w = Density of water, 0.002201 lb/ml
θ = Total sampling time, minutes
K_1 = 17.647 °R/in. Hg
K_2 = 0.04707 ft^3/ml
K_4 = 0.09450/100 = 0.000945
K_p = Pitot tube constant, $85.49 \frac{ft}{sec}\left[\frac{(lb/lb-mole)(in.\ Hg)}{(°R)(in.\ H_2O)}\right]^{1/2}$
%EA = Percent excess air
$\%CO_2$ = Percent carbon dioxide by volume, dry basis
$\%O_2$ = Percent oxygen by volume, dry basis
%CO = Percent carbon monoxide by volume, dry basis
$\%N_2$ = Percent nitrogen by volume, dry basis
0.264 = Ratio of O_2 to N_2 in air, v/v
28 = Molecular weight of N_2 or CO
32 = Molecular weight of O_2
44 = Molecular weight of CO_2
13.6 = Specific gravity of mercury (Hg)

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Calculations for Hydrogen Fluoride By Method 26 or 26A

Concentration

$$\frac{\text{lbs HF}}{\text{dscf}} = \frac{\mu\text{g HF in sample}}{4.536 \times 10^{8} \times \text{dscf}}$$

where:

$4.536 \times 10^{8} = \mu\text{g/lb}$

dscf = Volume of gas sampled

$$\mu g\text{/lb HF} = \mu\text{g F} \times \frac{20.008}{19.000}$$

Parts Per Million

$$\text{ppm HF} = \frac{\text{lbs HF}}{\text{dscf}} \div \frac{20.008}{385 \times 10^{6}}$$

where:

385 = Volume of 1 lb mole of gas at 68°F and 29.92 in. Hg

106 = Conversion of ppm v/v

Emission Rate

lbs HF /dscf × dscfm × 60 min/hr = lbs/hr HF

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Pollutant Concentration Correction 7% for Percent Oxygen

$$C_{adj} = C_d \frac{20.9 - 7\%}{20.9 - \%O_2}$$

where:

C_{adj} = Pollutant concentration corrected to percent O_2

20.9 - 7% = Percent O_2, the defined O_2 correction value, percent

20.9 = Percent O_2 in air

$\%O_2$ = Measured O_2 concentration dry basis, percent

C_d = Pollutant concentration measured, dry basis, ppm.

Appendix E- Laboratory Sample Analysis

Kiln Stack

Client:	GCC	Analysis Date:	11/13/2023
Facility:	Tijeras	Analysis Location:	Elmhurst
Test Location:	Kiln Stack	Analyst:	JMG
Project Number:	M234302		
Method:	26A		
Date Samples Received:	11/3/2023		

Train A

Sampling Date		10/24/2023	10/24/2023	10/24/2023	10/24/2023		
	UNITS	**M26A DI Blank**	**M26A H2SO4 Blank**	**M26A H2SO4-R1**	**M26A H2SO4-R1 Dup**	**RDL**	**MDL**
Sulfuric Acid Volume	ml	237	264	400	400		
Hydrofluoric Acid	ug	<150	<150	<150	<150	150	15

Sampling Date		10/24/2023	10/24/2023	10/23/2023			
	UNITS	**M26A- H2SO4 R2**	**M26A- H2SO4 R3**	**Train A Blank**		**RDL**	**MDL**
Sulfuric Acid Volume	ml	288	308	278			
Hydrofluoric Acid	ug	<150	<150	<150		150	15

Train B

Sampling Date		10/24/2023	10/24/2023	10/24/2023	10/24/2023		
	UNITS	**M26A DI Blank**	**M26A H2SO4 Blank**	**M26A H2SO4-R1**	**M26A H2SO4-R1 Dup**	**RDL**	**MDL**
Sulfuric Acid Volume	ml	237	264	329	329		
Hydrofluoric Acid	ug	<150	<150	<150	<150	150	15

Sampling Date		10/24/2023	10/24/2023	10/23/2023			
	UNITS	**M26A- H2SO4 R2**	**M26A- H2SO4 R3**	**Train B Blank**		**RDL**	**MDL**
Sulfuric Acid Volume	ml	288	308	278			
Hydrofluoric Acid	ug	<150	<150	<150		150	15

Client:	GCC	**Analysis Date:**	11/13/2023								
Facility:	Tijeras	**Analysis Location:**	Elmhurst								
Test Location:	Kiln Stack	**Analyst:**	JMG								
Project Number:	M234302										
Method:	26A										
Date Samples Received:	11/3/2023										

Standard ppm HF	**Area**	**Response Factor**	**Calculated Value**	**Slope of Regression Curve**
1	0.2148	0.2148	**0.96**	**0.2247**
2	0.4360	0.2180	**1.94**	
5	1.1313	0.2263	**5.03**	**Response Factor Ave**
8	1.8409	0.2301	**8.19**	**0.2247**
10	2.3426	0.2343	**10.42**	
Lot Number	Ricca 8209004			
	R^2	**0.9997**		

	Sample Date	**Sample ID**	**Sample Area**	**PPM F**	**PPM X Dilution Factor**	**Dilution Factor**	**Total ml**	**mg F in soln**	**mg HF in soln**	**mg HF in soln avg**	**ug HF in soln**
	10/24/2023	DI Reagent Blank	0.0031	0.0138	0.0138	1	237	0.0033	0.0034		
	10/24/2023	DI Reagent Blank	0.0037	0.0165	0.0165	1	237	0.0039	0.0041	**0.0038**	**3.776411187**
	10/24/2023	H2SO4 Reagent Blank	0.0088	0.0392	0.0392	1	264	0.0103	0.0109		
	10/24/2023	H2SO4 Reagent Blank	0.0111	0.0494	0.0494	1	264	0.0130	0.0137	**0.0123**	**12.31059432**
	10/24/2023	Test 1A H2SO4 Imp	0.0260	0.1157	0.1157	1	400	0.0463	0.0487		
	10/24/2023	Test 1A H2SO4 Imp	0.0295	0.1313	0.1313	1	400	0.0525	0.0553	**0.0520**	**52.02055619**
	10/24/2023	Test 1A H2SO4 Imp	0.0221	0.0983	0.0983	1	400	0.0393	0.0414		
	10/24/2023	Test 1A H2SO4 Imp	0.0259	0.1152	0.1152	1	400	0.0461	0.0486	**0.0450**	**44.9907513**
	10/24/2023	Test 2A H2SO4 Imp	0.0380	0.1691	0.1691	1	288	0.0487	0.0513		
	10/24/2023	Test 2A H2SO4 Imp	0.0315	0.1402	0.1402	1	288	0.0404	0.0425	**0.0469**	**46.90285823**
	10/24/2023	Test 3A H2SO4 Imp	0.0214	0.0952	0.0952	1	308	0.0293	0.0309		
	10/24/2023	Test 3A H2SO4 Imp	0.0284	0.1264	0.1264	1	308	0.0389	0.0410	**0.0359**	**35.94198645**
	10/23/2023	Train Blank A	0.0475	0.2114	0.2114	1	278	0.0588	0.0604		
	10/23/2023	Train Blank A	0.0522	0.2323	0.2323	1	278	0.0646	0.0664	**0.0634**	**63.40216074**
					Expected Value	**% Difference**					
		Run 1 H2SO4 Spike W/ 2ppm	0.2426	1.0795	1.0317						
Lot Number: Thermo 21-191JKS		Run 1 H2SO4 Spike W/ 2ppm	0.2319	1.0318	1.0317	2.32%					

CCV ppm Cl	**Area**	**PPM Cl**
1 ppm ICV	0.2385	1.0612
5 ppm CCV	1.1267	5.0133
5 ppm CCV	1.1357	5.0533
5 ppm CCV	1.1475	5.1058
5 ppm CCV		0.0000

Standard ppm Cl	**Area**	**Difference**
1	0.2166	0.42%
2	0.4542	2.00%
5	1.1676	1.55%
8	1.8907	1.32%
10	2.4469	2.13%

Client:	GCC	**Analysis Date:**	11/13/2023								
Facility:	Tijeras	**Analysis Location:**	Elmhurst								
Test Location:	Kiln Stack	**Analyst:**	JMG								
Project Number:	M234302										
Method:	26A										
Date Samples Received:	11/3/2023										
Standard ppm HF	**Area**	**Response Factor**	**Calculated Value**	**Slope of Regression Curve**							
1	0.2148	0.2148	**0.96**	**0.2247**							
2	0.4360	0.2180	**1.94**								
5	1.1313	0.2263	**5.03**	**Response Factor Ave**							
8	1.8409	0.2301	**8.19**	**0.2247**							
10	2.3426	0.2343	**10.42**								
Lot Number	Ricca 8209004										
	R²	**0.9997**									
	Sample Date	**Sample ID**	**Sample Area**	**PPM F**	**PPM X Dilution Factor**	**Dilution Factor**	**Total ml**	**mg F in soln**	**mg HF in soln**	**mg HF in soln avg**	**ug HF in soln**
	10/24/2023	DI Reagent Blank	0.0031	0.0138	0.0138	1	237	0.0033	0.0034		
	10/24/2023	DI Reagent Blank	0.0037	0.0165	0.0165	1	237	0.0039	0.0041	**0.0038**	**3.776411187**
	10/24/2023	H2SO4 Reagent Blank	0.0088	0.0392	0.0392	1	264	0.0103	0.0109		
	10/24/2023	H2SO4 Reagent Blank	0.0111	0.0494	0.0494	1	264	0.0130	0.0137	**0.0123**	**12.31059432**
	10/24/2023	Test 1B H2SO4 Imp	0.0420	0.1869	0.1869	1	329	0.0615	0.0648		
	10/24/2023	Test 1B H2SO4 Imp	0.0509	0.2265	0.2265	1	329	0.0745	0.0785	**0.0716**	**71.61988655**
	10/24/2023	Test 1B H2SO4 Imp	0.0458	0.2038	0.2038	1	329	0.0670	0.0706		
	10/24/2023	Test 1B H2SO4 Imp	0.0450	0.2002	0.2002	1	329	0.0659	0.0694	**0.0700**	**70.00092249**
	10/24/2023	Test 2B H2SO4 Imp	0.0052	0.0231	0.0231	1	364	0.0084	0.0089		
	10/24/2023	Test 2B H2SO4 Imp	0.0049	0.0218	0.0218	1	364	0.0079	0.0084	**0.0086**	**8.614791567**
	10/24/2023	Test 3B H2SO4 Imp	0.0443	0.1971	0.1971	1	290	0.0572	0.0602		
	10/24/2023	Test 3B H2SO4 Imp	0.0539	0.2398	0.2398	1	290	0.0696	0.0733	**0.0667**	**66.73159456**
	10/23/2023	Train Blank B	0.0475	0.2114	0.2114	1	278	0.0588	0.0619		
	10/23/2023	Train Blank B	0.0522	0.2323	0.2323	1	278	0.0646	0.0680	**0.0649**	**64.94743008**
CCV ppm F	**Area**	**PPM CI**									
1 ppm ICV	0.2385	1.0612									
5 ppm CCV	1.1267	5.0133									
5 ppm CCV	1.1357	5.0533									
5 ppm CCV	1.1475	5.1058									
5 ppm CCV	0	0.0000									
Standard ppm CI	**Area**	**Difference**									
1	0.2166	0.42%									
2	0.4542	2.00%									
5	1.1676	1.55%									
8	1.8907	1.32%									
10	2.4469	2.13%									

Kiln Stack

Client:	GCC	Analysis Date:	11/13/2023
Facility:	Tijeras	Analysis Location:	Elmhurst
Test Location:	Kiln Stack	Analyst:	JMG
Project Number:	M234302		
Method:	26A		
Date Samples Received:	11/3/2023		

Train A

Sampling Date		10/24/2023	10/24/2023	10/24/2023	10/24/2023		
	UNITS	**M26A DI Blank**	**M26A NaOH Blank**	**M26A NaOH-R1**	**M26A NaOH-R1 Dup**	**RDL**	**MDL**
Sodium Hydroxide Volume	ml	253	267	264	264		
Chlorine	ug	<150	<150	<150	<150	150	15

Sampling Date		10/24/2023	10/24/2023	10/23/2023			
	UNITS	**M26A- NaOH R2**	**M26A- NaOH R3**	**Train A Blank**		**RDL**	**MDL**
Sodium Hydroxide Volume	ml	276	253	267			
Chlorine	ug	<150	<150	<150		150	15

Train B

Sampling Date		10/24/2023	10/24/2023	10/24/2023	10/24/2023		
	UNITS	**M26A DI Blank**	**M26A NaOH Blank**	**M26A NaOH-R1**	**M26A NaOH-R1 Dup**	**RDL**	**MDL**
Sodium Hydroxide Volume	ml	253	267	304	304		
Chlorine	ug	<150	<150	<150	<150	150	15

Sampling Date		10/24/2023	10/24/2023	1/0/1900			
	UNITS	**M26A- NaOH R2**	**M26A- NaOH R3**	**Train B Blank**		**RDL**	**MDL**
Sodium Hydroxide Volume	ml	226	267	267			
Chlorine	ug	<150	<150	<150		150	15

Client:	GCC	**Analysis Date:**								
Facility:	Tijeras	**Analysis Location:**	Elmhurst Lab							
Test Location:	Kiln Stack	**Analyst:**	JMG							
Project Number:	M234302									
Method:	26A									
Date Samples Received:	11/3/2023									
Standard ppm Cl	**Area**	**Response Factor**	**Calculated Value**	**Slope of Regression Curve**						
1	0.1523	0.1523	**1.01**	**0.1513**						
2	0.2939	0.1470	**1.94**							
5	0.7660	0.1532	**5.06**	**Response Factor Ave**						
8	1.2141	0.1518	**8.03**	**0.1512**						
10	1.5201	0.1520	**10.05**							
Lot Number	Ricca 8209004									
	R^2	**0.9999**								
	Sample Date	**Sample ID**	**Sample Area**	**PPM Cl**	**PPM X Dilution Factor**	**Dilution Factor**	**Total ml**	**mg Cl in soln**	**ug Cl2 in soln**	**ug Cl2 in soln**
	10/24/2023	DI Reagent Blank	0.0010	0.0066	0.0066	1	253	0.0017		
	10/24/2023	DI Reagent Blank	0.0001	0.0007	0.0007	1	253	0.0002	**0.0009**	**0.919949415**
	10/24/2023	NaOH Reagent Blank	0.0200	0.1322	0.1322	1	267	0.0353		
	10/24/2023	NaOH Reagent Blank	0.0182	0.1203	0.1203	1	267	0.0321	**0.0337**	**33.71517089**
	10/24/2023	Test 1A NaOH Imp	0.0203	0.1342	0.1342	1	264	0.0354		
	10/24/2023	Test 1A NaOH Imp	0.0209	0.1382	0.1382	1	264	0.0365	**0.0360**	**35.95438661**
	10/24/2023	Test 1A NaOH Imp	0.0267	0.1765	0.1765	1	264	0.0466		
	10/24/2023	Test 1A NaOH Imp	0.0249	0.1646	0.1646	1	264	0.0435	**0.0450**	**45.03025119**
	10/24/2023	Test 2A NaOH Imp	0.0032	0.0212	0.0212	1	276	0.0058		
	10/24/2023	Test 2A NaOH Imp	0.0076	0.0502	0.0502	1	276	0.0139	**0.0099**	**9.853342491**
	10/24/2023	Test 3A NaOH Imp	0.0262	0.1732	0.1732	1	253	0.0438		
	10/24/2023	Test 3A NaOH Imp	0.0266	0.1759	0.1759	1	253	0.0445	**0.0442**	**44.1575719**
	10/24/2023	Train Blank	0.0200	0.1322	0.1322	1	267	0.0353		
	10/24/2023	Train Blank	0.0182	0.1203	0.1203	1	267	0.0321	**0.0337**	**33.71517089**
					Expected Value	**% Difference**				
		Run 1 H2SO4 Spike W/ 2ppm	0.1574	1.0406	1.0396					
		Run 1 H2SO4 Spike W/ 2ppm	0.1499	0.9910	1.0396	2.29%				
CCV ppm Cl	**Area**	**PPM Cl**								
5 ppm ICV	0.7339	4.8520								
5 ppm CCV	0.7823	5.1719								
5 ppm CCV	0.7941	5.2500								
5 ppm CCV		0.0000								
Standard ppm Cl	**Area**	**Difference**								
1	0.1575	1.65%								
2	0.2902	0.64%								
5	0.7781	0.78%								
8	1.2309	0.68%								
10	1.5781	1.84%								

Client:	GCC	**Analysis Date:**	1/0/1900							
Facility:	Tijeras	**Analysis Location:**	Elmhurst Lab							
Test Location:	Kiln Stack	**Analyst:**	JMG							
Project Number:	M234302									
Method:	26A									
Date Samples Received:	11/3/2023									
Standard ppm Cl	**Area**	**Response Factor**	**Calculated Value**	**Slope of Regression Curve**						
1	0.1523	0.1523	**1.01**	**0.1513**						
2	0.2939	0.1470	**1.94**							
5	0.7660	0.1532	**5.06**	**Response Factor Ave**						
8	1.2141	0.1518	**8.03**	**0.1512**						
10	1.5201	0.1520	**10.05**							
Lot Number	Ricca 8209004									
	R^2	**0.9999**								
	Sample Date	**Sample ID**	**Sample Area**	**PPM Cl**	**PPM X Dilution Factor**	**Dilution Factor**	**Total ml**	**mg Cl in soln**	**mg Cl2 in soln avg**	**ug Cl2 in soln**
	10/24/2023	DI Reagent Blank	0.0010	0.0066	0.0066	1	253	0.0017		
	10/24/2023	DI Reagent Blank	0.0001	0.0007	0.0007	1	253	0.0002	**0.0009**	**0.919949415**
	10/24/2023	NaOH Reagent Blank	0.0200	0.1322	0.1322	1	267	0.0353		
	10/24/2023	NaOH Reagent Blank	0.0182	0.1203	0.1203	1	267	0.0321	**0.0337**	**33.71517089**
	10/24/2023	Test 1B NaOH Imp	0.0086	0.0569	0.0569	1	304	0.0173		
	10/24/2023	Test 1B NaOH Imp	0.0081	0.0536	0.0536	1	304	0.0163	**0.0168**	**16.78188713**
	10/24/2023	Test 1B NaOH Imp	0.0084	0.0555	0.0555	1	304	0.0169		
	10/24/2023	Test 1B NaOH Imp	0.0088	0.0582	0.0582	1	304	0.0177	**0.0173**	**17.28433884**
	10/24/2023	Test 2B NaOH Imp	0.0368	0.2433	0.2433	1	226	0.0550		
	10/24/2023	Test 2B NaOH Imp	0.0353	0.2334	0.2334	1	226	0.0527	**0.0539**	**53.86348448**
	10/24/2023	Test 3B NaOH Imp	0.0135	0.0893	0.0893	1	267	0.0238		
	10/24/2023	Test 3B NaOH Imp	0.0160	0.1058	0.1058	1	267	0.0282	**0.0260**	**26.03658485**
	1/0/1900	Train B Train Blank	0.0200	0.1322	0.1322	1	267	0.0353		
	1/0/1900	Train B Train Blank	0.0182	0.1203	0.1203	1	267	0.0321	**0.0337**	**33.71517089**
CCV ppm Cl	**Area**	**PPM Cl**								
5 ppm ICV	0.7339	4.8520								
5 ppm CCV	0.7823	5.1719								
5 ppm CCV	0.7841	5.1838								
5 ppm CCV	0	0.0000								
Standard ppm Cl	**Area**	**Difference**								
1	0.1575	1.65%								
2	0.2902	0.64%								
5	0.7781	0.78%								
8	1.2309	0.68%								
10	1.5781	1.84%								

Appendix F - Reference Method Test Data

Client:	GCC Rio Grande Inc.		
Facility:	Tijeras Plant		
Test Location:	Main Stack		
Project #:	M234302		
Test Method:	5/26A		
Test Engineer:	KAW		
Test Technician:	RODS		
	Run 1A	**Run 2A**	**Run 3A**
Meter ID:	CM53	CM53	CM53
Pitot ID:	S8-031A	S8-031A	S8-031A
Filter ID:	11763	11747	11749
Filter Pre-Weight (grams):	0.26642	0.26870	0.26950
Nozzle Diameter (Inches):	0.287	0.287	0.287
Meter Calibration Date:	9/6/2023	9/6/2023	9/6/2023
Meter Calibration Factor (Y):	0.994	0.994	0.994
Meter Orifice Setting (Delta H):	1.775	1.775	1.775
Nozzle Kit ID Number and Material:	Glass	Glass	Glass
Pitot Tube Coefficient:		0.820	
Probe Length (Feet):		6.0	
Probe Liner Material:		Glass	
Sample Plane:		Horizontal	
Port Length (Inches):		6.50	
Port Size (Diameter, Inches):		4.00	
Port Type:		Flange	
Duct Shape:		Circular	
Diameter (Feet):		11	
Duct Area (Square Feet):		95.033	
Upstream Diameters:		3.3	
Downstream Diameters:		9.2	
Number of Ports Sampled:		4	
Number of Points per Port:		3	
Minutes per Point:		5.0	
Minutes per Reading:		5.0	
Total Number of Traverse Points:		12	
Test Length (Minutes):		60	
Train Type:		Anderson Box	
Source Condition:		Normal	
Diluent Model/Serial Number:		CAI 700 and MKS 2030	
Moisture Balance ID:		LV4	
# of Runs		3	

Run 1A - Method 5/26A

Client: GCC Rio Grande Inc. | **Date: 10/24/23**
Facility: Tijeras Plant | **Start Time: 8:00**
Test Location: Main Stack | **End Time: 9:20**
Source Condition: Normal

DRY GAS METER CONDITIONS			STACK CONDITIONS		
ΔH:	2.68	in. H_2O	Static Pressure	-0.10	in. H_2O
Meter Temperature, Tm:	59.1	°F	Flue Pressure (Ps):	23.64	in. Hg. abs.
Sqrt ΔP:	0.804	in. H_2O	Carbon Dioxide:	6.20	%
Stack Temperature, Ts:	337.8	°F	Oxygen:	16.10	%
Meter Volume, Vm:	61.904	ft^3	Nitrogen:	77.70	%
Meter Volume, Vmstd:	49.875	dscf	Gas Weight dry, Md:	29.636	lb/lb mole
Meter Volume, Vwstd:	1.611	wscf	Gas Weight wet, Ms:	29.272	lb/lb mole
Isokinetic Variance:	100.7	%I	Excess Air:	---	%
			Gas Velocity, Vs:	60.514	fps
Test Length:	60.00	in mins.	Volumetric Flow:	345,051	acfm
Nozzle Diameter:	0.287	in inches	Volumetric Flow:	174,778	dscfm
Barometric Pressure:	23.65	in Hg	Volumetric Flow:	180,423	scfm

MOISTURE DETERMINATION

Initial Impinger Content:	3430.9	ml	Silica Initial Wt.	834.6	grams
Final Impinger Content:	3453.7	ml	Silica Final Wt.	846.0	grams
Impinger Difference:	22.8	ml	Silica Difference:	11.4	grams
Total Water Gain:	34.2		Moisture, Bws:	0.031	

Port-Point No.	Clock Time	Velocity Head Δp in. H2O	Orifice ΔH in. H2O	Actual Meter Vol. ft^3	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Probe Temp °F	Filter Exit Temp °F	Impinger Exit Temp °F
1-1	8:00:00	0.64	2.65	838.571	336	58	58	251	258	55
1-2	8:05:00	0.64	2.67	843.650	330	58	58	253	252	57
1-3	8:10:00	0.62	2.57	848.670	335	58	58	257	260	60
	8:15:00			853.940						
2-1	8:20:00	0.64	2.65	853.940	336	58	58	270	260	55
2-2	8:25:00	0.64	2.65	859.090	336	58	58	265	256	58
2-3	8:30:00	0.65	2.70	864.150	335	58	58	267	264	58
	8:35:00			869.360						
3-1	8:45:00	0.69	2.87	869.360	335	59	59	266	263	55
3-2	8:50:00	0.68	2.80	874.730	341	59	59	271	260	57
3-3	8:55:00	0.59	2.44	879.940	340	60	60	258	260	60
	9:00:00			884.890						
4-1	9:05:00	0.69	2.86	884.890	340	61	61	257	260	58
4-2	9:10:00	0.67	2.76	890.210	344	61	61	260	261	61
4-3	9:15:00	0.61	2.51	895.290	345	61	61	270	260	61
	9:20:00			900.475						
Total	1:00:00			61.904		59.1	59.1			
Average			2.68		337.8	59.1				
Min			2.44		330.0	58.0				
Max			2.87		345.0	61.0				

Impinger Weight Sheet - Run 1A

Client:	**GCC Rio Grande Inc.**
Facility:	**Tijeras Plant**
Test Location:	**Main Stack**
Project #:	**M234302**
Date:	**10/24/2023**
Test Method:	**5/26A**
Weighed/Measured By:	**RODS**
Balance ID:	**LV4**

Scale Calibration Check Date: **10/24/2023**

Scale Calibration Check (see QS-6.05C for procedure)

must be within ± 0.5g of certified mass

Certified Weight, grams	Result, grams
250	250.0
500	500.0
750	750.0

IMPINGER CONTENTS	FINAL MLS / GRAMS	INITIAL MLS / GRAMS	GAIN MLS / GRAMS
0.1N H2SO4	738.0	738.8	-0.8
0.1N H2SO4	713.4	697.4	16.0
Empty	707.8	703.1	4.7
0.1N NaOH	610.4	607.9	2.5
0.1N NaOH	684.1	683.7	0.4
Silica Gel	846.0	834.6	11.4
	3,453.7	3,430.9	22.8
	Liquid Final	**Liquid Initial**	**Liquid Gain**
	846.0	834.6	11.4
	Silica Final	**Silica Initial**	**Silica Gain**

Run 2A - Method 5/26A

Client: GCC Rio Grande Inc. | **Date: 10/24/23**
Facility: Tijeras Plant | **Start Time: 10:00**
Test Location: Main Stack | **End Time: 11:11**
Source Condition: Normal

DRY GAS METER CONDITIONS			STACK CONDITIONS		
ΔH:	2.79	In. H_2O	Static Pressure	-0.10	in. H_2O
Meter Temperature, Tm:	67.8	°F	Flue Pressure (Ps):	23.64	in. Hg. abs.
Sqrt ΔP:	0.816	In. H_2O	Carbon Dioxide:	6.30	%
Stack Temperature, Ts:	343.8	°F	Oxygen:	16.20	%
Meter Volume, Vm:	63.593	ft^3	Nitrogen:	77.5	%
Meter Volume, Vmstd:	50.403	dscf	Gas Weight dry, Md:	29.656	lb/lb mole
Meter Volume, Vwstd:	1.729	wscf	Gas Weight wet, Ms:	29.270	lb/lb mole
Isokinetic Variance:	100.8	%I	Excess Air:	---	%
			Gas Velocity, Vs:	61.667	fps
Test Length:	60.00	in mins.	Volumetric Flow:	351,625	acfm
Nozzle Diameter:	0.287	in inches	Volumetric Flow:	176,437	dscfm
Barometric Pressure:	23.65	in Hg	Volumetric Flow:	182,488	scfm

MOISTURE DETERMINATION

Initial Impinger Content:	3517.9	ml	Silica Initial Wt.	796.8	grams
Final Impinger Content:	3540.7	ml	Silica Final Wt.	810.7	grams
Impinger Difference:	22.8	ml	Silica Difference:	13.9	grams
Total Water Gain:	36.7		Moisture, Bws:	0.033	

Port-Point No.	Clock Time	Velocity Head Δp in. H2O	Orifice ΔH in. H2O	Actual Meter Vol. ft^3	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Probe Temp °F	Filter Exit Temp °F	Impinger Exit Temp °F
1-1	10:00:00	0.72	3.01	900.680	340	66	66	260	257	55
1-2	10:05:00	0.67	2.80	906.240	345	68	68	261	260	55
1-3	10:10:00	0.61	2.55	911.580	345	68	68	261	262	57
	10:15:00			916.570						
2-1	10:18:00	0.69	2.88	916.570	345	68	68	258	260	56
2-2	10:23:00	0.68	2.84	921.780	346	68	68	262	261	58
2-3	10:28:00	0.59	2.46	927.180	346	68	68	264	258	59
	10:33:00			932.290						
3-1	10:36:00	0.70	2.92	932.290	345	68	68	254	260	56
3-2	10:41:00	0.65	2.72	937.690	344	69	69	257	256	58
3-3	10:46:00	0.67	2.80	943.150	346	69	69	258	257	60
	10:51:00			948.280						
4-1	10:56:00	0.71	2.97	948.280	342	67	67	258	256	60
4-2	11:01:00	0.68	2.85	953.690	341	67	67	259	257	61
4-3	11:06:00	0.63	2.65	959.100	340	68	68	259	257	62
	11:11:00			964.273						
Total	1:00:00			63.593		67.8	67.8			
Average			2.79		343.8	67.8				
Min			2.46		340.0	66.0				
Max			3.01		346.0	69.0				

Impinger Weight Sheet - Run 2A

Client:	**GCC Rio Grande Inc.**
Facility:	**Tijeras Plant**
Test Location:	**Main Stack**
Project #:	**M234302**
Date:	**10/24/2023**
Test Method:	**5/26A**
Weighed/Measured By:	**RODS**
Balance ID:	**LV4**

Scale Calibration Check Date: **10/24/2023**

Scale Calibration Check (see QS-6.05C for procedure)

must be within ± 0.5g of certified mass

Certified Weight, grams	Result, grams
250	250.0
500	500.0
750	750.0

IMPINGER CONTENTS	FINAL MLS / GRAMS	INITIAL MLS / GRAMS	GAIN MLS / GRAMS
0.1N H2SO4	789.7	783.4	6.3
0.1N H2SO4	718.5	704.2	14.3
Empty	663.9	661.2	2.7
0.1N NaOH	679.0	680.0	-1.0
0.1N NaOH	689.6	689.1	0.5
Silica Gel	810.7	796.8	13.9
	3,540.7	3,517.9	22.8
	Liquid Final	**Liquid Initial**	**Liquid Gain**
	810.7	796.8	13.9
	Silica Final	**Silica Initial**	**Silica Gain**

Run 3A - Method 5/26A

Client: GCC Rio Grande Inc. | **Date: 10/24/23**
Facility: Tijeras Plant | **Start Time: 12:00**
Test Location: Main Stack | **End Time: 13:10**
Source Condition: Normal

DRY GAS METER CONDITIONS			STACK CONDITIONS		
ΔH:	2.66	In. H_2O	Static Pressure	-0.10	in. H_2O
Meter Temperature, Tm:	69.3	°F	Flue Pressure (Ps):	23.64	in. Hg. abs.
Sqrt ΔP:	0.795	In. H_2O	Carbon Dioxide:	6.50	%
Stack Temperature, Ts:	341.4	°F	Oxygen:	16.20	%
Meter Volume, Vm:	62.203	ft^3	Nitrogen:	77.3	%
Meter Volume, Vmstd:	49.143	dscf	Gas Weight dry, Md:	29.688	lb/lb mole
Meter Volume, Vwstd:	1.540	wscf	Gas Weight wet, Ms:	29.333	lb/lb mole
Isokinetic Variance:	100.6	%I	Excess Air:	---	%
			Gas Velocity, Vs:	59.909	fps
Test Length:	60.00	in mins.	Volumetric Flow:	341,603	acfm
Nozzle Diameter:	0.287	in inches	Volumetric Flow:	172,400	dscfm
Barometric Pressure:	23.65	in Hg	Volumetric Flow:	177,803	scfm

MOISTURE DETERMINATION

Initial Impinger Content:	3380.2	ml	Silica Initial Wt.	846.0	grams
Final Impinger Content:	3402.9	ml	Silica Final Wt.	856.0	grams
Impinger Difference:	22.7	ml	Silica Difference:	10.0	grams
Total Water Gain:	32.7		Moisture, Bws:	0.030	

Port-Point No.	Clock Time	Velocity Head Δp in. H2O	Orifice ΔH in. H2O	Actual Meter Vol. ft^3	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Probe Temp °F	Filter Exit Temp °F	Impinger Exit Temp °F
1-1	12:00:00	0.68	2.84	964.942	341	66	66	255	260	55
1-2	12:05:00	0.64	2.69	970.300	341	68	68	267	260	56
1-3	12:10:00	0.59	2.47	975.480	342	68	68	263	256	58
	12:15:00			980.490						
2-1	12:18:00	0.70	2.93	980.490	344	69	69	256	260	58
2-2	12:23:00	0.68	2.85	985.960	344	69	69	256	260	59
2-3	12:28:00	0.55	2.30	991.300	345	69	69	256	261	61
	12:33:00			996.120						
3-1	12:36:00	0.71	2.99	996.120	342	70	70	259	259	62
3-2	12:41:00	0.65	2.73	1001.600	342	70	70	259	259	62
3-3	12:46:00	0.53	2.23	1006.790	343	70	70	260	259	62
	12:51:00			1011.630						
4-1	12:55:00	0.69	2.93	1011.630	337	71	71	257	259	62
4-2	13:00:00	0.62	2.63	1017.050	338	71	71	257	261	62
4-3	13:05:00	0.56	2.37	1022.310	338	71	71	257	260	62
	13:10:00			1027.145						
Total	1:00:00			62.203		69.3	69.3			
Average			2.66		341.4	69.3				
Min			2.23		337.0	66.0				
Max			2.99		345.0	71.0				

Impinger Weight Sheet - Run 3A

Client:	**GCC Rio Grande Inc.**
Facility:	**Tijeras Plant**
Test Location:	**Main Stack**
Project #:	**M234302**
Date:	**10/24/2023**
Test Method:	**5/26A**
Weighed/Measured By:	**RODS**
Balance ID:	**LV4**

Scale Calibration Check Date: **10/24/2023**

Scale Calibration Check (see QS-6.05C for procedure)

must be within ± 0.5g of certified mass

Certified Weight, grams	Result, grams
250	250.0
500	500.0
750	750.0

IMPINGER CONTENTS	FINAL MLS / GRAMS	INITIAL MLS / GRAMS	GAIN MLS / GRAMS
0.1N H2SO4	742.2	736.7	5.5
0.1N H2SO4	712.4	701.6	10.8
Empty	649.7	644.9	4.8
0.1N NaOH	609.4	609.9	-0.5
0.1N NaOH	689.2	687.1	2.1
Silica Gel	856.0	846.0	10.0
	3,402.9 Liquid Final	3,380.2 Liquid Initial	22.7 Liquid Gain
	856.0 Silica Final	846.0 Silica Initial	10.0 Silica Gain

Client:	GCC Rio Grande Inc.		
Facility:	Tijeras Plant		
Test Location:	Main Stack		
Project #:	M234302		
Test Method:	26A		
Test Engineer:	JLV		
Test Technician:	RODS		
	Run 1B	**Run 2B**	**Run 3B**
Temp ID:	CM46	CM46	CM46
Meter ID:	CM46	CM46	CM46
Pitot ID:	S8-032A	S8-032A	S8-032A
Nozzle Diameter (Inches):	0.282	0.282	0.282
Meter Calibration Date:	9/5/2023	9/5/2023	9/5/2023
Meter Calibration Factor (Y):	1.004	1.004	1.004
Meter Orifice Setting (Delta H):	1.744	1.744	1.744
Nozzle Kit ID Number and Material:	Glass	Glass	Glass
Pitot Tube Coefficient:	0.822		
Probe Length (Feet):	6.0		
Probe Liner Material:	Glass		
Sample Plane:	Horizontal		
Port Length (Inches):	6.50		
Port Size (Diameter, Inches):	4.00		
Port Type:	Flange		
Duct Shape:	Circular		
Diameter (Feet):	11		
Duct Area (Square Feet):	95.033		
Upstream Diameters:	3.3		
Downstream Diameters:	9.2		
Number of Ports Sampled:	4		
Number of Points per Port:	3		
Minutes per Point:	5.0		
Minutes per Reading:	5.0		
Total Number of Traverse Points:	12		
Test Length (Minutes):	60		
Train Type:	Anderson Box		
Source Condition:	Normal		
Diluent Model/Serial Number:	CAI 700 and MKS 2030		
Moisture Balance ID:	LV4		
# of Runs	3		

Run 1B - Method 26A

Client: GCC Rio Grande Inc. | **Date: 10/24/23**
Facility: Tijeras Plant | **Start Time: 8:00**
Test Location: Main Stack | **End Time: 9:20**
Source Condition: Normal

DRY GAS METER CONDITIONS			STACK CONDITIONS		
ΔH:	2.93	in. H_2O	Static Pressure	-0.10	in. H_2O
Meter Temperature, Tm:	59.4	°F	Flue Pressure (Ps):	23.63	in. Hg. abs.
Sqrt ΔP:	0.849	in. H_2O	Carbon Dioxide:	6.20	%
Stack Temperature, Ts:	339.4	°F	Oxygen:	16.10	%
Meter Volume, Vm:	62.581	ft^3	Nitrogen:	77.70	%
Meter Volume, Vmstd:	50.924	dscf	Gas Weight dry, Md:	29.636	lb/lb mole
Meter Volume, Vwstd:	1.535	wscf	Gas Weight wet, Ms:	29.295	lb/lb mole
Isokinetic Variance:	100.5	%I	Excess Air:	---	%
			Gas Velocity, Vs:	64.135	fps
Test Length:	60.00	in mins.	Volumetric Flow:	365,695	acfm
Nozzle Diameter:	0.282	in inches	Volumetric Flow:	185,194	dscfm
Barometric Pressure:	23.64	in Hg	Volumetric Flow:	190,778	scfm

MOISTURE DETERMINATION

Initial Impinger Content:	3666.6	ml	Silica Initial Wt.	878.3	grams
Final Impinger Content:	3686.5	ml	Silica Final Wt.	891.0	grams
Impinger Difference:	19.9	ml	Silica Difference:	12.7	grams
Total Water Gain:	32.6		Moisture, Bws:	0.029	

Port-Point No.	Clock Time	Velocity Head Δp in. H2O	Orifice ΔH in. H2O	Actual Meter Vol. ft^3	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Probe Temp °F	Filter Exit Temp °F	Impinger Exit Temp °F
1-1	8:00:00	0.70	2.76	87.321	336	58	58	260	260	56
1-2	8:05:00	0.75	3.50	92.460	336	58	58	260	260	56
1-3	8:10:00	0.73	3.00	97.770	336	58	58	260	260	56
	8:15:00			103.013						
2-1	8:20:00	0.74	2.80	103.013	334	59	59	259	259	56
2-2	8:25:00	0.75	3.50	108.308	338	59	59	251	261	56
2-3	8:30:00	0.71	3.00	113.627	339	59	59	260	260	56
	8:35:00			118.798						
3-1	8:45:00	0.75	2.80	118.798	341	60	60	260	259	53
3-2	8:50:00	0.71	2.90	124.118	341	60	60	260	262	52
3-3	8:55:00	0.65	2.80	129.367	341	60	60	264	258	52
	9:00:00			134.242						
4-1	9:05:00	0.75	2.50	134.242	344	60	60	264	260	55
4-2	9:10:00	0.73	2.80	139.555	344	61	61	263	262	56
4-3	9:15:00	0.69	2.80	144.780	343	61	61	260	260	57
	9:20:00			149.902						
Total	1:00:00			62.581		59.4	59.4			
Average			2.93		339.4	59.4				
Min			2.50		334.0	58.0				
Max			3.50		344.0	61.0				

Impinger Weight Sheet - Run 1B

Client:	**GCC Rio Grande Inc.**
Facility:	**Tijeras Plant**
Test Location:	**Main Stack**
Project #:	**M234302**
Date:	**10/24/2023**
Test Method:	**26A**
Weighed/Measured By:	**RODS**
Balance ID:	**LV4**

Scale Calibration Check Date: **10/24/2023**

Scale Calibration Check (see QS-6.05C for procedure)

must be within ± 0.5g of certified mass

Certified Weight, grams	Result, grams
250	249.9
500	500.1
750	750.0

IMPINGER CONTENTS	FINAL MLS / GRAMS	INITIAL MLS / GRAMS	GAIN MLS / GRAMS
0.1N H2SO4	743.9	756.2	-12.3
0.1N H2SO4	809.1	793.9	15.2
Empty	639.3	631.7	7.6
0.1N NaOH	756.8	750.7	6.1
0.1N NaOH	737.4	734.1	3.3
Silica Gel	891.0	878.3	12.7

3,686.5	3,666.6	19.9
Liquid Final	**Liquid Initial**	**Liquid Gain**
891.0	878.3	12.7
Silica Final	**Silica Initial**	**Silica Gain**

Run 2B - Method 26A

Client: GCC Rio Grande Inc. | **Date: 10/24/23**
Facility: Tijeras Plant | **Start Time: 10:00**
Test Location: Main Stack | **End Time: 11:11**
Source Condition: Normal

DRY GAS METER CONDITIONS			STACK CONDITIONS		
ΔH:	2.83	In. H_2O	Static Pressure	-0.10	in. H_2O
Meter Temperature, Tm:	70.4	°F	Flue Pressure (Ps):	23.63	in. Hg. abs.
Sqrt ΔP:	0.840	In. H_2O	Carbon Dioxide:	6.30	%
Stack Temperature, Ts:	343.3	°F	Oxygen:	16.20	%
Meter Volume, Vm:	63.042	ft^3	Nitrogen:	77.5	%
Meter Volume, Vmstd:	50.220	dscf	Gas Weight dry, Md:	29.656	lb/lb mole
Meter Volume, Vwstd:	1.677	wscf	Gas Weight wet, Ms:	29.279	lb/lb mole
Isokinetic Variance:	100.7	%I	Excess Air:	---	%
			Gas Velocity, Vs:	63.594	fps
Test Length:	60.00	in mins.	Volumetric Flow:	362,612	acfm
Nozzle Diameter:	0.282	in inches	Volumetric Flow:	182,166	dscfm
Barometric Pressure:	23.64	in Hg	Volumetric Flow:	188,248	scfm

MOISTURE DETERMINATION

Initial Impinger Content:	3478.2	ml	Silica Initial Wt.	862.8	grams
Final Impinger Content:	3496.6	ml	Silica Final Wt.	880.0	grams
Impinger Difference:	18.4	ml	Silica Difference:	17.2	grams

Total Water Gain: 35.6 Moisture, Bws: 0.032

Port-Point No.	Clock Time	Velocity Head Δp in. H2O	Orifice ΔH in. H2O	Actual Meter Vol. ft^3	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Probe Temp °F	Filter Exit Temp °F	Impinger Exit Temp °F
1-1	10:00:00	0.75	2.98	50.080	347	68	68	256	259	58
1-2	10:05:00	0.71	2.82	55.466	347	69	69	255	263	61
1-3	10:10:00	0.69	2.75	60.708	346	69	69	260	260	60
	10:15:00			65.878						
2-1	10:18:00	0.75	3.00	65.878	345	71	71	263	264	58
2-2	10:23:00	0.73	2.80	71.299	344	71	71	260	255	58
2-3	10:28:00	0.71	2.80	76.645	344	71	71	260	259	60
	10:33:00			81.918						
3-1	10:36:00	0.75	3.00	81.918	342	72	72	259	258	60
3-2	10:41:00	0.70	2.90	87.358	341	72	72	260	260	60
3-3	10:46:00	0.69	2.80	92.612	341	72	72	261	260	59
	10:51:00			97.831						
4-1	10:56:00	0.70	2.82	97.831	341	70	70	260	258	61
4-2	11:01:00	0.65	2.75	103.069	341	70	70	265	260	61
4-3	11:06:00	0.64	2.60	108.117	341	70	70	260	260	60
	11:11:00			113.122						
Total	1:00:00			63.042		70.4	70.4			
Average			2.83		343.3	70.4				
Min			2.60		341.0	68.0				
Max			3.00		347.0	72.0				

Impinger Weight Sheet - Run 2B

Client:	**GCC Rio Grande Inc.**
Facility:	**Tijeras Plant**
Test Location:	**Main Stack**
Project #:	**M234302**
Date:	**10/24/2023**
Test Method:	**26A**
Weighed/Measured By:	**RODS**
Balance ID:	**LV4**

Scale Calibration Check Date: **10/24/2023**

Scale Calibration Check (see QS-6.05C for procedure)

must be within ± 0.5g of certified mass

Certified Weight, grams	Result, grams
250	249.9
500	500.1
750	750.0

IMPINGER CONTENTS	FINAL MLS / GRAMS	INITIAL MLS / GRAMS	GAIN MLS / GRAMS
0.1N H2SO4	754.7	754.0	0.7
0.1N H2SO4	675.6	668.9	6.7
Empty	674.0	595.7	78.3
0.1N NaOH	676.8	687.5	-10.7
0.1N NaOH	715.5	772.1	-56.6
Silica Gel	880.0	862.8	17.2

3,496.6	3,478.2	18.4
Liquid Final	**Liquid Initial**	**Liquid Gain**
880.0	862.8	17.2
Silica Final	**Silica Initial**	**Silica Gain**

Run 3B - Method 26A

Client: GCC Rio Grande Inc. | **Date: 10/24/23**
Facility: Tijeras Plant | **Start Time: 12:00**
Test Location: Main Stack | **End Time: 13:10**
Source Condition: Normal

DRY GAS METER CONDITIONS			STACK CONDITIONS		
ΔH:	2.85	In. H_2O	Static Pressure	-0.10	in. H_2O
Meter Temperature, Tm:	72.4	°F	Flue Pressure (Ps):	23.63	in. Hg. abs.
Sqrt ΔP:	0.827	In. H_2O	Carbon Dioxide:	6.50	%
Stack Temperature, Ts:	338.2	°F	Oxygen:	16.20	%
Meter Volume, Vm:	62.501	ft^3	Nitrogen:	77.3	%
Meter Volume, Vmstd:	49.605	dscf	Gas Weight dry, Md:	29.688	lb/lb mole
Meter Volume, Vwstd:	1.733	wscf	Gas Weight wet, Ms:	29.293	lb/lb mole
Isokinetic Variance:	100.9	%I	Excess Air:	---	%
			Gas Velocity, Vs:	62.395	fps
Test Length:	60.00	in mins.	Volumetric Flow:	355,774	acfm
Nozzle Diameter:	0.282	in inches	Volumetric Flow:	179,617	dscfm
Barometric Pressure:	23.64	in Hg	Volumetric Flow:	185,894	scfm

MOISTURE DETERMINATION

Initial Impinger Content:	3660.5	ml	Silica Initial Wt.	891.0	grams
Final Impinger Content:	3685.3	ml	Silica Final Wt.	903.0	grams
Impinger Difference:	24.8	ml	Silica Difference:	12.0	grams
Total Water Gain:	36.8		Moisture, Bws:	0.034	

Port-Point No.	Clock Time	Velocity Head Δp in. H2O	Orifice ΔH in. H2O	Actual Meter Vol. ft^3	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Probe Temp °F	Filter Exit Temp °F	Impinger Exit Temp °F
1-1	12:00:00	0.75	2.80	13.485	340	70	70	257	260	53
1-2	12:05:00	0.69	3.00	18.910	340	70	70	263	260	54
1-3	12:10:00	0.70	2.72	24.116	339	70	70	258	260	53
	12:15:00			29.355						
2-1	12:18:00	0.73	2.91	29.355	337	72	72	265	262	54
2-2	12:23:00	0.70	2.80	34.738	337	73	73	258	258	56
2-3	12:28:00	0.69	2.76	40.020	337	73	73	258	260	55
	12:33:00			45.258						
3-1	12:36:00	0.69	2.80	45.258	337	73	73	261	261	56
3-2	12:41:00	0.65	2.90	50.510	337	73	73	260	260	56
3-3	12:46:00	0.67	3.00	55.589	337	73	73	261	261	56
	12:51:00			60.753						
4-1	12:55:00	0.65	2.85	60.753	339	74	74	265	260	57
4-2	13:00:00	0.63	2.72	65.846	339	74	74	261	260	57
4-3	13:05:00	0.66	2.98	70.858	339	74	74	261	258	57
	13:10:00			75.986						
Total	1:00:00			62.501		72.4	72.4			
Average			2.85		338.2	72.4				
Min			2.72		337.0	70.0				
Max			3.00		340.0	74.0				

Impinger Weight Sheet - Run 3B

Client:	**GCC Rio Grande Inc.**
Facility:	**Tijeras Plant**
Test Location:	**Main Stack**
Project #:	**M234302**
Date:	**10/24/2023**
Test Method:	**26A**
Weighed/Measured By:	**RODS**
Balance ID:	**LV4**

Scale Calibration Check Date: **10/24/2023**

Scale Calibration Check (see QS-6.05C for procedure)

must be within ± 0.5g of certified mass

Certified Weight, grams	Result, grams
250	249.9
500	500.1
750	750.0

IMPINGER CONTENTS	FINAL MLS / GRAMS	INITIAL MLS / GRAMS	GAIN MLS / GRAMS
0.1N H2SO4	767.2	760.9	6.3
0.1N H2SO4	798.6	787.0	11.6
Empty	637.8	633.5	4.3
0.1N NaOH	746.8	733.8	13.0
0.1N NaOH	734.9	745.3	-10.4
Silica Gel	903.0	891.0	12.0
	3,685.3	3,660.5	24.8
	Liquid Final	**Liquid Initial**	**Liquid Gain**
	903.0	891.0	12.0
	Silica Final	**Silica Initial**	**Silica Gain**

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Test Location: Main Stack
Date: 10/24/23

Run 1

		FTIR Data						Analyzer Data
Spectrum	Time	H2O %	CO2 % (wet)	HCN ppmvw	HF ppmvw	Cell Temp	Pressure	O2 % (dry)
RUN1_000250.LAB	8:00	2.89	5.87	1.99	0.10	190.74	0.80	16.33
RUN1_000251.LAB	8:01	2.89	5.92	1.94	0.10	190.76	0.80	16.31
RUN1_000252.LAB	8:02	2.86	5.80	1.90	0.10	190.91	0.80	16.35
RUN1_000253.LAB	8:03	2.87	5.78	1.91	0.10	190.88	0.80	16.36
RUN1_000254.LAB	8:04	2.85	5.75	1.94	0.10	190.71	0.80	16.33
RUN1_000255.LAB	8:05	2.84	5.73	1.92	0.10	190.68	0.80	16.42
RUN1_000256.LAB	8:06	2.83	5.76	1.97	0.10	190.76	0.80	16.36
RUN1_000257.LAB	8:07	2.86	5.84	1.96	0.10	190.78	0.80	16.36
RUN1_000258.LAB	8:08	2.83	5.83	1.92	0.10	190.69	0.80	16.35
RUN1_000259.LAB	8:09	2.89	5.97	2.01	0.10	190.62	0.80	16.35
RUN1_000260.LAB	8:10	2.85	5.95	1.97	0.10	190.74	0.80	16.22
RUN1_000261.LAB	8:11	2.84	5.85	1.95	0.10	190.80	0.80	16.36
RUN1_000262.LAB	8:12	2.89	5.93	2.02	0.10	190.74	0.80	16.37
RUN1_000263.LAB	8:13	2.91	6.01	2.14	0.10	190.66	0.80	16.28
RUN1_000264.LAB	8:14	2.92	5.99	2.08	0.10	190.74	0.80	16.22
RUN1_000265.LAB	8:15	2.93	5.97	2.09	0.10	190.89	0.80	16.30
RUN1_000266.LAB	8:16	2.92	5.97	2.09	0.10	190.81	0.80	16.27
RUN1_000267.LAB	8:17	2.90	5.89	2.03	0.10	190.68	0.80	16.32
RUN1_000268.LAB	8:18	2.90	5.96	2.06	0.10	190.69	0.80	16.34
RUN1_000269.LAB	8:19	2.88	5.92	2.00	0.10	190.74	0.80	16.31
RUN1_000270.LAB	8:20	2.89	6.04	2.10	0.10	190.75	0.80	16.35
RUN1_000271.LAB	8:21	2.87	6.06	2.03	0.10	190.69	0.80	16.27
RUN1_000272.LAB	8:22	2.86	6.09	2.11	0.10	190.72	0.80	16.26
RUN1_000273.LAB	8:23	2.83	5.96	2.03	0.10	190.84	0.80	16.28
RUN1_000274.LAB	8:24	2.84	6.01	1.96	0.10	190.81	0.80	16.29
RUN1_000275.LAB	8:25	2.85	5.97	2.02	0.10	190.69	0.80	16.31
RUN1_000276.LAB	8:26	2.88	6.05	1.96	0.10	190.65	0.80	16.29
RUN1_000277.LAB	8:27	2.85	6.00	2.00	0.10	190.79	0.80	16.27
RUN1_000278.LAB	8:28	2.86	5.92	1.88	0.10	190.84	0.80	16.27
RUN1_000279.LAB	8:29	2.90	6.05	2.05	0.10	190.75	0.80	16.30
RUN1_000280.LAB	8:30	2.89	5.96	1.99	0.10	190.66	0.80	16.28
RUN1_000281.LAB	8:31	2.87	5.92	1.93	0.10	190.74	0.80	16.20
RUN1_000282.LAB	8:32	2.86	5.92	1.94	0.10	190.84	0.80	16.29
RUN1_000283.LAB	8:33	2.85	5.92	1.90	0.10	190.83	0.80	16.28
RUN1_000284.LAB	8:34	2.84	5.86	1.88	0.10	191.01	0.80	16.32
RUN1_000285.LAB	8:35	2.86	5.94	1.93	0.10	191.19	0.80	16.31
RUN1_000286.LAB	8:36	2.87	6.11	1.97	0.10	191.26	0.80	16.37
RUN1_000287.LAB	8:37	2.85	6.08	1.99	0.10	191.24	0.80	16.27
RUN1_000288.LAB	8:38	2.86	6.13	1.87	0.10	191.04	0.80	16.23
RUN1_000289.LAB	8:39	2.87	6.22	2.01	0.10	190.82	0.80	16.25
RUN1_000290.LAB	8:40	2.82	6.05	1.92	0.10	190.73	0.80	16.19
RUN1_000291.LAB	8:41	2.85	6.13	1.88	0.10	190.74	0.80	16.17
RUN1_000292.LAB	8:42	2.85	6.29	2.07	0.10	190.83	0.80	16.27
RUN1_000293.LAB	8:43	2.82	6.20	1.97	0.10	190.74	0.80	16.23
RUN1_000294.LAB	8:44	2.82	6.22	1.95	0.10	190.59	0.80	16.11
RUN1_000295.LAB	8:45	2.80	6.24	1.97	0.10	190.62	0.80	16.12
RUN1_000296.LAB	8:46	2.80	6.25	2.05	0.10	190.73	0.80	16.14
RUN1_000297.LAB	8:47	2.77	6.16	1.86	0.10	190.72	0.80	16.14
RUN1_000298.LAB	8:48	2.80	6.20	1.93	0.10	190.66	0.80	16.10
RUN1_000299.LAB	8:49	2.81	6.25	1.99	0.10	190.65	0.80	16.16
RUN1_000300.LAB	8:50	2.82	6.25	2.01	0.10	190.78	0.80	16.17
RUN1_000301.LAB	8:51	2.85	6.37	2.11	0.10	190.79	0.80	16.11
RUN1_000302.LAB	8:52	2.84	6.31	2.05	0.10	190.73	0.80	16.08
RUN1_000303.LAB	8:53	2.87	6.42	2.23	0.10	190.64	0.80	16.08
RUN1_000304.LAB	8:54	2.85	6.28	2.20	0.10	190.74	0.80	16.08
RUN1_000305.LAB	8:55	2.89	6.33	2.36	0.10	190.82	0.80	16.09
RUN1_000306.LAB	8:56	2.88	6.29	2.39	0.10	190.76	0.80	16.08
RUN1_000307.LAB	8:57	2.90	6.37	2.34	0.10	190.69	0.80	16.12
RUN1_000308.LAB	8:58	2.93	6.47	2.42	0.10	190.73	0.80	16.06
RUN1_000309.LAB	8:59	2.94	6.49	2.38	0.10	190.83	0.80	16.11
Average		**2.86**	**6.06**	**2.03**	**0.10**	**190.78**	**0.80**	**16.25**

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Test Location: Main Stack
Date: 10/24/23

Run 2

		FTIR Data						Analyzer Data
Spectrum	Time	H2O %	CO2 % (wet)	HCN ppmvw	HF ppmvw	Cell Temp	Pressure	O2 % (dry)
RUN2_000439.LAB	10:00	2.67	6.3	2.03	0.10	190.6	0.80	16.11
RUN2_000440.LAB	10:01	2.62	6.2	1.97	0.10	190.7	0.80	16.22
RUN2_000441.LAB	10:02	2.62	6.2	1.96	0.10	190.7	0.80	16.19
RUN2_000442.LAB	10:03	2.67	6.4	2.20	0.10	190.6	0.80	16.05
RUN2_000443.LAB	10:04	2.59	6.2	1.99	0.10	190.6	0.80	16.23
RUN2_000444.LAB	10:05	2.55	6.0	1.72	0.10	190.6	0.80	16.37
RUN2_000445.LAB	10:06	2.59	6.1	1.85	0.10	190.5	0.80	16.25
RUN2_000446.LAB	10:07	2.58	6.1	1.82	0.10	190.4	0.80	16.30
RUN2_000447.LAB	10:08	2.61	6.1	1.93	0.10	190.6	0.80	16.23
RUN2_000448.LAB	10:09	2.59	6.0	1.88	0.10	190.6	0.80	16.26
RUN2_000449.LAB	10:10	2.58	5.9	1.81	0.10	190.5	0.80	16.35
RUN2_000450.LAB	10:11	2.58	6.0	1.78	0.10	190.6	0.80	16.29
RUN2_000451.LAB	10:12	2.59	6.0	1.79	0.10	190.7	0.80	16.34
RUN2_000452.LAB	10:13	2.60	6.0	1.90	0.10	190.7	0.80	16.27
RUN2_000453.LAB	10:14	2.62	6.1	1.84	0.10	190.5	0.80	16.32
RUN2_000454.LAB	10:15	2.61	6.2	1.86	0.10	190.6	0.80	16.19
RUN2_000455.LAB	10:16	2.62	6.2	1.88	0.10	190.7	0.80	16.24
RUN2_000456.LAB	10:17	2.64	6.3	1.90	0.10	190.7	0.80	16.24
RUN2_000457.LAB	10:18	2.64	6.3	1.84	0.10	190.6	0.80	16.18
RUN2_000458.LAB	10:19	2.62	6.2	1.78	0.10	190.7	0.80	16.23
RUN2_000459.LAB	10:20	2.63	6.1	1.73	0.10	190.7	0.80	16.27
RUN2_000460.LAB	10:21	2.63	6.1	1.81	0.10	190.6	0.80	16.23
RUN2_000461.LAB	10:22	2.61	6.0	1.77	0.10	190.6	0.80	16.25
RUN2_000462.LAB	10:23	2.64	6.1	1.79	0.10	190.7	0.80	16.28
RUN2_000463.LAB	10:24	2.64	6.1	1.76	0.10	190.7	0.80	16.24
RUN2_000464.LAB	10:25	2.67	6.2	1.78	0.10	190.6	0.80	16.24
RUN2_000465.LAB	10:26	2.66	6.1	1.76	0.10	190.7	0.80	16.17
RUN2_000466.LAB	10:27	2.70	6.2	1.79	0.10	190.7	0.80	16.26
RUN2_000467.LAB	10:28	2.67	6.1	1.68	0.10	190.7	0.80	16.18
RUN2_000468.LAB	10:29	2.72	6.2	1.89	0.10	190.6	0.80	16.23
RUN2_000469.LAB	10:30	2.71	6.2	1.86	0.10	190.7	0.80	16.18
RUN2_000470.LAB	10:31	2.67	6.1	1.74	0.10	190.8	0.80	16.19
RUN2_000471.LAB	10:32	2.68	6.1	1.78	0.10	190.7	0.80	16.29
RUN2_000472.LAB	10:33	2.68	6.1	1.78	0.10	190.6	0.80	16.28
RUN2_000473.LAB	10:34	2.67	6.0	1.80	0.10	190.8	0.80	16.24
RUN2_000474.LAB	10:35	2.69	6.2	1.83	0.10	190.7	0.80	16.42
RUN2_000475.LAB	10:36	2.67	6.2	1.86	0.10	190.6	0.80	16.28
RUN2_000476.LAB	10:37	2.67	6.2	1.80	0.10	190.7	0.80	16.26
RUN2_000477.LAB	10:38	2.67	6.2	1.78	0.10	190.8	0.80	16.28
RUN2_000478.LAB	10:39	2.68	6.2	1.85	0.10	190.8	0.80	16.26
RUN2_000479.LAB	10:40	2.69	6.2	1.82	0.10	190.7	0.80	16.27
RUN2_000480.LAB	10:41	2.68	6.1	1.77	0.10	190.7	0.80	16.25
RUN2_000481.LAB	10:42	2.67	6.0	1.74	0.10	190.8	0.80	16.30
RUN2_000482.LAB	10:43	2.72	6.1	1.77	0.10	190.7	0.80	16.27
RUN2_000483.LAB	10:44	2.72	6.1	1.81	0.10	190.6	0.80	16.33
RUN2_000484.LAB	10:45	2.76	6.2	1.88	0.10	190.7	0.80	16.25
RUN2_000485.LAB	10:46	2.73	6.1	1.79	0.10	190.8	0.80	16.28
RUN2_000486.LAB	10:47	2.75	6.1	1.77	0.10	190.7	0.80	16.23
RUN2_000487.LAB	10:48	2.74	6.1	1.73	0.10	190.6	0.80	16.31
RUN2_000488.LAB	10:49	2.77	6.2	1.79	0.10	190.8	0.80	16.29
RUN2_000489.LAB	10:50	2.79	6.3	1.76	0.10	190.8	0.80	16.31
RUN2_000490.LAB	10:51	2.82	6.4	1.90	0.10	190.7	0.80	16.25
RUN2_000491.LAB	10:52	2.80	6.3	1.81	0.10	190.7	0.80	16.20
RUN2_000492.LAB	10:53	2.82	6.4	1.75	0.10	190.8	0.80	16.12
RUN2_000493.LAB	10:54	2.82	6.4	1.79	0.10	190.7	0.80	16.17
RUN2_000494.LAB	10:55	2.80	6.3	1.76	0.10	190.6	0.80	16.16
RUN2_000495.LAB	10:56	2.80	6.1	1.80	0.10	190.7	0.80	16.14
RUN2_000496.LAB	10:57	2.80	6.2	1.77	0.10	190.8	0.80	16.14
RUN2_000497.LAB	10:58	2.79	6.1	1.73	0.10	190.7	0.80	16.20
RUN2_000498.LAB	10:59	2.76	6.1	1.76	0.10	190.6	0.80	16.26
Average		**2.68**	**6.15**	**1.82**	**0.10**	**190.67**	**0.80**	**16.24**

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Test Location: Main Stack
Date: 10/24/23

Run 3

		FTIR Data						Analyzer Data
Spectrum	Time	H2O %	CO2 % (wet)	HCN ppmvw	HF ppmvw	Cell Temp	Pressure	O2 % (dry)
RUN3_000624.LAB	12:00	2.72	6.3	1.80	0.10	190.8	0.80	16.22
RUN3_000625.LAB	12:01	2.72	6.3	1.65	0.10	190.8	0.80	16.21
RUN3_000626.LAB	12:02	2.71	6.2	1.85	0.10	190.7	0.80	16.23
RUN3_000627.LAB	12:03	2.71	6.2	1.74	0.10	190.7	0.80	16.31
RUN3_000628.LAB	12:04	2.67	6.0	1.78	0.10	190.8	0.80	16.34
RUN3_000629.LAB	12:05	2.69	6.2	1.78	0.10	190.7	0.80	16.31
RUN3_000630.LAB	12:06	2.70	6.2	1.83	0.10	190.6	0.80	16.25
RUN3_000631.LAB	12:07	2.70	6.1	1.79	0.10	190.7	0.80	16.32
RUN3_000632.LAB	12:08	2.70	6.2	1.86	0.10	190.8	0.80	16.22
RUN3_000633.LAB	12:09	2.71	6.2	1.88	0.10	190.7	0.80	16.30
RUN3_000634.LAB	12:10	2.74	6.2	1.87	0.10	190.6	0.80	16.22
RUN3_000635.LAB	12:11	2.70	6.0	1.87	0.10	190.7	0.80	16.23
RUN3_000636.LAB	12:12	2.73	6.1	1.85	0.10	190.7	0.80	16.36
RUN3_000637.LAB	12:13	2.69	6.0	1.78	0.10	190.7	0.80	16.23
RUN3_000638.LAB	12:14	2.68	6.1	1.80	0.10	190.6	0.80	16.33
RUN3_000639.LAB	12:15	2.69	6.1	1.86	0.10	190.7	0.80	16.32
RUN3_000640.LAB	12:16	2.71	6.1	1.86	0.10	190.7	0.80	16.29
RUN3_000641.LAB	12:17	2.72	6.1	1.80	0.10	190.6	0.80	16.25
RUN3_000642.LAB	12:18	2.72	6.2	1.80	0.10	190.6	0.80	16.29
RUN3_000643.LAB	12:19	2.73	6.2	1.82	0.10	190.7	0.80	16.26
RUN3_000644.LAB	12:20	2.72	6.2	1.82	0.10	190.7	0.80	16.23
RUN3_000645.LAB	12:21	2.72	6.2	1.89	0.10	190.6	0.80	16.27
RUN3_000646.LAB	12:22	2.73	6.2	1.84	0.10	190.6	0.80	16.28
RUN3_000647.LAB	12:23	2.72	6.2	1.84	0.10	190.7	0.80	16.25
RUN3_000648.LAB	12:24	2.73	6.3	1.87	0.10	190.7	0.80	16.29
RUN3_000649.LAB	12:25	2.71	6.2	1.88	0.10	190.6	0.80	16.29
RUN3_000650.LAB	12:26	2.73	6.3	1.85	0.10	190.6	0.80	16.23
RUN3_000651.LAB	12:27	2.74	6.3	1.91	0.10	190.7	0.80	16.30
RUN3_000652.LAB	12:28	2.79	6.4	1.94	0.10	190.7	0.80	16.24
RUN3_000653.LAB	12:29	2.75	6.3	1.91	0.10	190.5	0.80	16.17
RUN3_000654.LAB	12:30	2.74	6.3	1.88	0.10	190.6	0.80	16.15
RUN3_000655.LAB	12:31	2.73	6.4	1.96	0.10	190.7	0.80	16.24
RUN3_000656.LAB	12:32	2.75	6.5	1.97	0.10	190.7	0.80	16.21
RUN3_000657.LAB	12:33	2.70	6.3	1.88	0.10	190.5	0.80	16.20
RUN3_000658.LAB	12:34	2.75	6.4	2.00	0.10	190.7	0.80	16.19
RUN3_000659.LAB	12:35	2.73	6.3	1.89	0.10	190.7	0.80	16.19
RUN3_000660.LAB	12:36	2.77	6.4	2.00	0.10	190.7	0.80	16.19
RUN3_000661.LAB	12:37	2.77	6.4	1.98	0.10	190.6	0.80	16.22
RUN3_000662.LAB	12:38	2.77	6.3	1.92	0.10	190.7	0.80	16.13
RUN3_000663.LAB	12:39	2.74	6.3	1.83	0.10	190.7	0.80	16.16
RUN3_000664.LAB	12:40	2.74	6.3	1.85	0.10	190.7	0.80	16.17
RUN3_000665.LAB	12:41	2.80	6.4	1.93	0.10	190.7	0.80	16.23
RUN3_000666.LAB	12:42	2.80	6.4	2.01	0.10	190.8	0.80	16.23
RUN3_000667.LAB	12:43	2.80	6.4	1.89	0.10	190.8	0.80	16.12
RUN3_000668.LAB	12:44	2.78	6.3	1.86	0.10	190.6	0.80	16.11
RUN3_000669.LAB	12:45	2.76	6.3	1.91	0.10	190.6	0.80	16.10
RUN3_000670.LAB	12:46	2.79	6.4	1.98	0.10	190.7	0.80	16.15
RUN3_000671.LAB	12:47	2.77	6.3	1.91	0.10	190.7	0.80	16.18
RUN3_000672.LAB	12:48	2.75	6.3	1.94	0.10	190.6	0.80	16.15
RUN3_000673.LAB	12:49	2.77	6.6	2.06	0.10	190.6	0.80	16.13
RUN3_000674.LAB	12:50	2.77	6.6	2.07	0.10	190.7	0.80	16.21
RUN3_000675.LAB	12:51	2.76	6.6	1.97	0.10	190.7	0.80	16.13
RUN3_000676.LAB	12:52	2.75	6.6	2.00	0.10	190.6	0.80	16.09
RUN3_000677.LAB	12:53	2.75	6.6	1.97	0.10	190.7	0.80	16.16
RUN3_000678.LAB	12:54	2.68	6.3	1.90	0.10	190.7	0.80	16.12
RUN3_000679.LAB	12:55	2.67	6.3	1.96	0.10	190.7	0.80	16.12
RUN3_000680.LAB	12:56	2.68	6.4	1.92	0.10	190.6	0.80	16.19
RUN3_000681.LAB	12:57	2.72	6.5	1.94	0.10	190.7	0.80	16.26
RUN3_000682.LAB	12:58	2.74	6.6	1.99	0.10	190.8	0.80	16.23
RUN3_000683.LAB	12:59	2.78	6.7	2.06	0.10	190.7	0.80	16.18
Average		**2.73**	**6.30**	**1.89**	**0.10**	**190.68**	**0.80**	**16.22**

Method 1 and 2 Cyclonic Flow Check Data

Project Number	M234302	**Source Condition:**	Normal
Client:	GCC Rio Grande Inc.	**Run No.:**	1
Facility:	Tijeras Plant	**Date:**	9/26/2023
Location:	Main Stack	**Start Time:**	14:07
Pitot ID:	S8-031A	**End Time:**	14:22
Pitot Coefficient:	0.820	**RM Testers:**	NJC
Probe Length:	6	**Port Length:**	6.50

Port	Point	DP (in. H_2O)	Sqrt. DP	Temp (^oF)	Yaw (o)		Velocity (V)	Port	Point	DP (in. H_2O)	Sqrt. DP	Temp (^oF)	Yaw (o)		Velocity (V)
A	1	0.70	0.8367	341.0	2.0	2.0	63.11	C	1	0.75	0.8660	343.0	5.0	5.0	65.40
A	2	0.75	0.8660	341.0	2.0	2.0	65.32	C	2	0.71	0.8426	344.0	3.0	3.0	63.67
A	3	0.73	0.8544	341.0	2.0	2.0	64.44	C	3	0.66	0.8124	344.0	3.0	3.0	61.39
B	1	0.74	0.8602	341.0	3.0	3.0	64.88	D	1	0.74	0.8602	344.0	2.0	2.0	65.00
B	2	0.74	0.8602	342.0	1.0	1.0	64.92	D	2	0.73	0.8544	344.0	1.0	1.0	64.56
B	3	0.70	0.8367	342.0	1.0	1.0	63.14	D	3	0.63	0.7937	344.0	1.0	1.0	59.98

Average Yaw Angle 2.2 °

Stratification Test Results Summary
GCC Rio Grande, Inc.
Tijeras Plant
Main Stack
October 24, 2023

Number of Ports Sampled:	1
Number of Points per Port:	3
Total Number of Traverse Points:	3

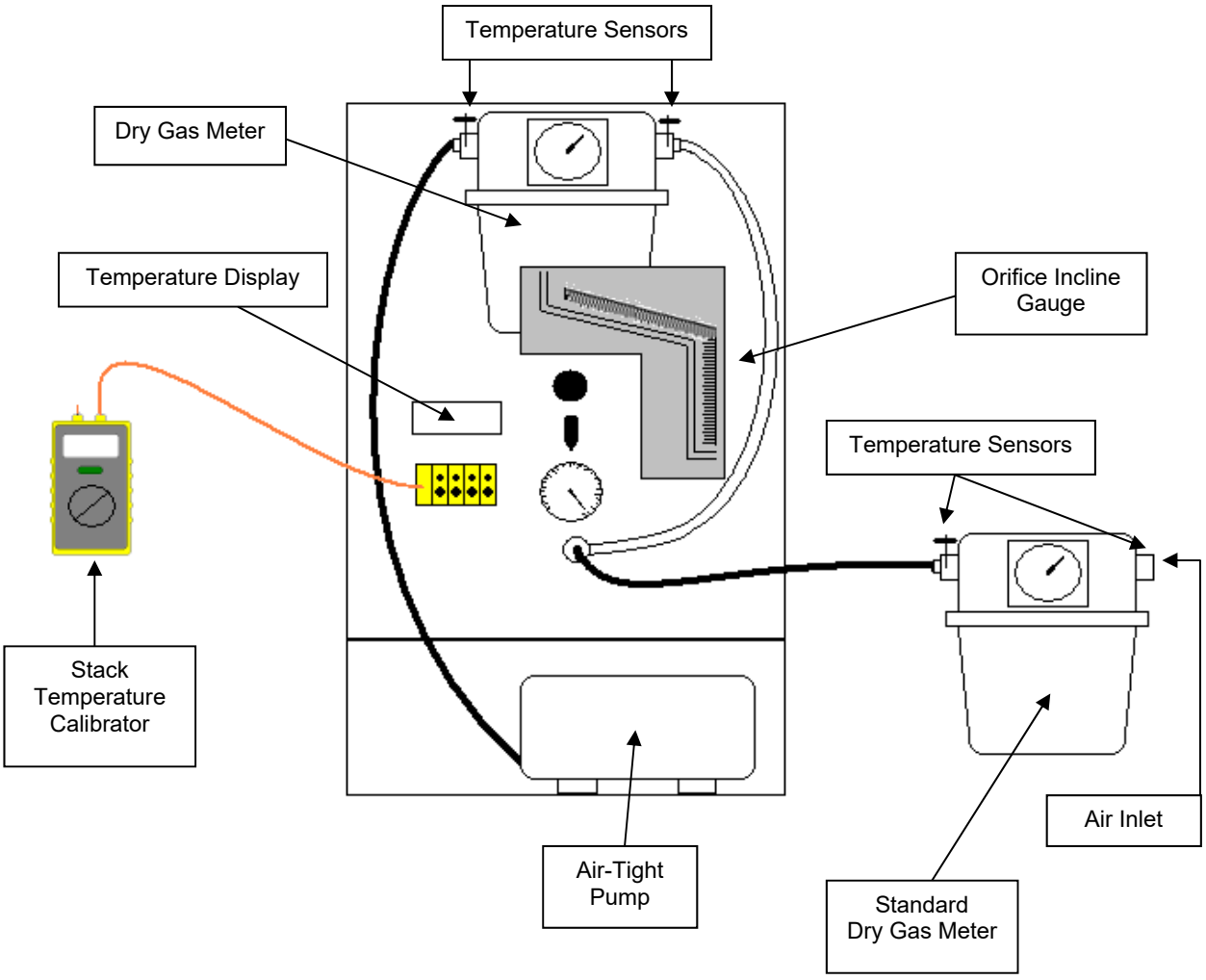
Port No.	Point No.	Time	O_2%	Actual % Difference O_2%	Mean Difference O_2%
1	1	7:51	16.21	0.37	0.06
	2	7:55	16.26	0.06	0.01
	3	7:59	16.34	0.43	0.07
Average			**16.27**		

One point traverse (<5% difference)
Three point traverse (0.4, 1.2, and 2.0 meters), <10% difference
Twelve point traverse (Method 1 points) >10% difference

One point traverse (<0.3% mean difference)
Three point traverse (0.4, 1.2, and 2.0 meters), < 0.5% mean difference for O_2
Twelve point traverse (Method 1 points) >0.5% mean difference for O_2

Appendix G - Calibration Data

Dry Gas Meter/Control Module Calibration Diagram



Dry Gas Meter Calibration Data

Dry Gas Meter No.	*CM46*	*Date:*	*September 5, 2023*
Standard Meter No.	*25125408*	*Calibrated By:*	*DV*
Standard Meter (Y)	*0.99800*	*Barometric Pressure:*	*28.09*

Run Number		Orifice Setting in H_2O Chg (H)	Standard Meter Gas Volume vr	Dry Gas Meter Gas Volume vd	Standard Meter Temp. F° tr	Dry Gas Meter Inlet Temp. F° tdi	Dry Gas Meter Outlet Temp. F° tdo	Dry Gas Meter Avg. Temp. F° td	Time Min	Time Sec	Y	Chg (H)
Final			*109.822*	*84.911*	*80*	*79*	*79*					
Initial			*104.567*	*79.639*	*79*	*77*	*77*					
Difference	*1*	*0.20*	*5.255*	*5.272*	*80*	*78*	*78*	*78*	*19*	*36*	*0.991*	*1.714*
Final			*115.015*	*90.033*	*81*	*80*	*80*					
Initial			*109.822*	*84.911*	*80*	*79*	*79*					
Difference	*2*	*0.50*	*5.193*	*5.122*	*81*	*80*	*80*	*80*	*12*	*26*	*1.009*	*1.767*
Final			*120.336*	*95.378*	*81*	*81*	*81*					
Initial			*115.015*	*90.033*	*81*	*80*	*80*					
Difference	*3*	*0.70*	*5.321*	*5.345*	*81*	*81*	*81*	*81*	*10*	*39*	*0.991*	*1.729*
Final			*125.421*	*100.386*	*82*	*82*	*82*					
Initial			*120.336*	*95.378*	*81*	*81*	*81*					
Difference	*4*	*0.90*	*5.085*	*5.008*	*82*	*82*	*82*	*82*	*8*	*59*	*1.011*	*1.732*
Final			*133.350*	*108.110*	*82*	*83*	*83*					
Initial			*128.200*	*103.044*	*82*	*83*	*83*					
Difference	*5*	*1.20*	*5.150*	*5.066*	*82*	*83*	*83*	*83*	*7*	*51*	*1.013*	*1.717*
Final			*140.985*	*115.640*	*82*	*84*	*84*					
Initial			*133.350*	*108.110*	*82*	*83*	*83*					
Difference	*6*	*2.00*	*7.635*	*7.530*	*82*	*84*	*84*	*84*	*9*	*15*	*1.009*	*1.807*
								Average			***1.004***	***1.744***

Stack Temperature Sensor Calibration

Meter Box # : CM46 *Name :* DV

Ambient Temperature : 80.7 °F *Date :* September 5, 2023

Calibrator Model # : CL940A

Serial # : 526

Date Of Certification : December 28, 2022

Primary Standards Directly Traceable National Institute of Standards and Technology (NIST)

Reference Source Temperature (°F)	***Test Thermometer Temperature (°F)***	***Temperature Difference %***
0	*0*	0.0
250	*251*	0.1
600	*601*	0.1
1200	*1205*	0.3

$$\frac{(\text{Ref. Temp., }^{o}\text{F} + 460) - (\text{Test Therm. Temp., }^{o}\text{F} + 460)}{\text{Ref. Temp., }^{o}\text{F} + 460} * 100 <= 1.5\ \%$$

Dry Gas Meter Calibration Data

Dry Gas Meter No.	*CM46*	*Date:*	*November 28, 2023*
Standard Meter No.	*18654530*	*Calibrated By:*	*DV*
Standard Meter (Y)	*0.99730*	*Barometric Pressure:*	*28.43*

Run Number		Orifice Setting in H_2O Chg (H)	Standard Meter Gas Volume vr	Dry Gas Meter Gas Volume vd	Standard Meter Temp. F^o tr	Dry Gas Meter Inlet Temp. F^o tdi	Dry Gas Meter Outlet Temp. F^o tdo	Dry Gas Meter Avg. Temp. F^o td	Time Min	Time Sec	Y	Chg (H)
Final			*75.159*	*116.171*	*60*	*60*	*60*					
Initial			*70.135*	*111.072*	*60*	*61*	*61*					
Difference	*1*	*0.20*	*5.024*	*5.099*	*60*	*61*	*61*	*61*	*19*	*50*	*0.983*	*1.824*
Final			*70.135*	*111.072*	*60*	*61*	*61*					
Initial			*65.060*	*105.910*	*59*	*61*	*61*					
Difference	*2*	*0.50*	*5.075*	*5.162*	*60*	*61*	*61*	*61*	*12*	*45*	*0.982*	*1.842*
Final			*65.060*	*105.910*	*59*	*61*	*61*					
Initial			*59.951*	*100.905*	*59*	*59*	*59*					
Difference	*3*	*0.70*	*5.109*	*5.005*	*59*	*60*	*60*	*60*	*10*	*30*	*1.018*	*1.725*
Final			*59.951*	*100.905*	*59*	*59*	*59*					
Initial			*54.850*	*95.840*	*59*	*58*	*58*					
Difference	*4*	*0.90*	*5.101*	*5.065*	*59*	*59*	*59*	*59*	*9*	*32*	*1.001*	*1.840*
Final			*54.850*	*95.840*	*59*	*58*	*58*					
Initial			*49.775*	*90.794*	*58*	*58*	*58*					
Difference	*5*	*1.20*	*5.075*	*5.046*	*59*	*58*	*58*	*58*	*8*	*15*	*0.999*	*1.854*
Final			*49.775*	*90.794*	*58*	*58*	*58*					
Initial			*44.425*	*85.585*	*58*	*57*	*57*					
Difference	*6*	*2.00*	*5.350*	*5.209*	*58*	*58*	*58*	*58*	*6*	*48*	*1.018*	*1.887*

Average	***1.000***	***1.829***

Stack Temperature Sensor Calibration

Meter Box # : CM46 *Name :* DV

Ambient Temperature : 58.7 °F *Date :* November 28, 2023

Calibrator Model # : CL940A

Serial # : 526

Date Of Certification : December 28, 2022

Primary Standards Directly Traceable National Institute of Standards and Technology (NIST)

Reference Source Temperature (°F)	***Test Thermometer Temperature (°F)***	***Temperature Difference %***
0	*1*	0.2
250	*252*	0.3
600	*602*	0.2
1200	*1205*	0.3

$$\frac{\text{(Ref. Temp., °F + 460) - (Test Therm. Temp., °F + 460)}}{\text{Ref. Temp., °F + 460}} * 100 <= 1.5\ \%$$

Dry Gas Meter Calibration Data

Dry Gas Meter No.	*CM53*	*Date:*	*September 6, 2023*
Standard Meter No.	*18654530*	*Calibrated By:*	*DV*
Standard Meter (Y)	*0.99730*	*Barometric Pressure:*	*28.12*

Run Number		Orifice Setting in H_2O Chg (H)	Standard Meter Gas Volume vr	Dry Gas Meter Gas Volume vd	Standard Meter Temp. F° tr	Dry Gas Meter Inlet Temp. F° tdi	Dry Gas Meter Outlet Temp. F° tdo	Dry Gas Meter Avg. Temp. F° td	Time Min	Time Sec	Y	Chg (H)
Final			*108.455*	*58.760*	*81*	*82*	*82*					
Initial			*103.434*	*53.667*	*80*	*81*	*81*					
Difference	*1*	*0.20*	*5.021*	*5.093*	*81*	*82*	*82*	*82*	*18*	*35*	*0.985*	*1.683*
Final			*103.434*	*53.667*	*80*	*81*	*81*					
Initial			*98.353*	*48.581*	*80*	*80*	*80*					
Difference	*2*	*0.50*	*5.081*	*5.086*	*80*	*81*	*81*	*81*	*12*	*12*	*0.996*	*1.771*
Final			*98.353*	*48.581*	*80*	*80*	*80*					
Initial			*93.335*	*43.543*	*79*	*79*	*79*					
Difference	*3*	*0.70*	*5.018*	*5.038*	*80*	*80*	*80*	*80*	*10*	*15*	*0.992*	*1.795*
Final			*93.335*	*43.543*	*79*	*79*	*79*					
Initial			*88.268*	*38.486*	*79*	*78*	*78*					
Difference	*4*	*0.90*	*5.067*	*5.057*	*79*	*79*	*79*	*79*	*9*	*10*	*0.996*	*1.810*
Final			*88.268*	*38.486*	*79*	*78*	*78*					
Initial			*83.006*	*33.210*	*79*	*77*	*77*					
Difference	*5*	*1.20*	*5.262*	*5.276*	*79*	*78*	*78*	*78*	*8*	*12*	*0.989*	*1.794*
Final			*83.006*	*33.210*	*79*	*77*	*77*					
Initial			*76.885*	*27.189*	*78*	*77*	*77*					
Difference	*6*	*2.00*	*6.121*	*6.021*	*79*	*77*	*77*	*77*	*7*	*24*	*1.006*	*1.798*
								Average			***0.994***	***1.775***

Stack Temperature Sensor Calibration

Meter Box # : CM53 *Name :* DV

Ambient Temperature : 80.1 °F *Date :* September 6, 2023

Calibrator Model # : CL940A

Serial # : 526

Date Of Certification : December 28, 2022

Primary Standards Directly Traceable Nationa 108.5 58.76

103.4 53.667

Reference Source Temperature (° F)	***Test Thermometer Temperature (° F)***	***Temperature Difference %***
0	*1*	0.2
250	*252*	0.3
600	*601*	0.1
1200	*1205*	0.3

$$\frac{(\text{Ref. Temp., }^{o}\text{F} + 460) - (\text{Test Therm. Temp., }^{o}\text{F} + 460)}{\text{Ref. Temp., }^{o}\text{F} + 460} * 100 <= 1.5\ \%$$

Dry Gas Meter Calibration Data

Dry Gas Meter No.	*CM53*	*Date:*	*October 26, 2023*
Standard Meter No.	*18654530*	*Calibrated By:*	*ER*
Standard Meter (Y)	*0.99730*	*Barometric Pressure:*	*28.05*

Run Number		Orifice Setting in H_2O Chg (H)	Standard Meter Gas Volume vr	Dry Gas Meter Gas Volume vd	Standard Meter Temp. F^o tr	Dry Gas Meter Inlet Temp. F^o tdi	Dry Gas Meter Outlet Temp. F^o tdo	Dry Gas Meter Avg. Temp. F^o td	Time Min	Time Sec	Y	Chg (H)
Final			*10.800*	*37.210*	*71*	*71*	*71*					
Initial			*5.798*	*32.147*	*71*	*71*	*71*					
Difference	*1*	*0.20*	*5.002*	*5.063*	*71*	*71*	*71*	*71*	*18*	*35*	*0.985*	*1.674*
Final			*15.810*	*42.298*	*73*	*73*	*73*					
Initial			*10.800*	*37.210*	*71*	*71*	*71*					
Difference	*2*	*0.50*	*5.010*	*5.088*	*72*	*72*	*72*	*72*	*12*	*10*	*0.981*	*1.791*
Final			*20.871*	*47.430*	*72*	*73*	*73*					
Initial			*15.810*	*42.298*	*73*	*73*	*72*					
Difference	*3*	*0.70*	*5.061*	*5.132*	*73*	*73*	*73*	*73*	*10*	*19*	*0.982*	*1.768*
Final			*25.915*	*52.558*	*72*	*73*	*73*					
Initial			*20.871*	*47.430*	*72*	*73*	*73*					
Difference	*4*	*0.90*	*5.044*	*5.128*	*72*	*73*	*73*	*73*	*9*	*0*	*0.980*	*1.737*
Final			*30.935*	*57.662*	*72*	*74*	*74*					
Initial			*25.915*	*52.558*	*72*	*73*	*73*					
Difference	*5*	*1.20*	*5.020*	*5.104*	*72*	*74*	*74*	*74*	*8*	*15*	*0.981*	*1.963*
Final			*5.798*	*32.147*	*71*	*71*	*71*					
Initial			*0.792*	*27.133*	*71*	*71*	*71*					
Difference	*6*	*2.00*	*5.006*	*5.014*	*71*	*71*	*71*	*71*	*6*	*20*	*0.991*	*1.941*

Average	***0.983***	***1.812***

Stack Temperature Sensor Calibration			
Temperature ID :	100769	Name :	ER
Ambient Temperature, ^{o}F :	72.2	Date :	10/25/2023

Temperature Calibrator			
Model # :	CL23A	Certification Date:	May 1,2023
Serial # :	T-285668	Expiration Date:	May 2,2024

Primary Standards Directly Traceable National Institute of Standards and Technology (NIST)

Reference Source Temperature (^{o}F)	Test Thermometer Temperature (^{o}F)	Temperature Difference %
0	0	0.0
250	251	0.1
600	601	0.1
1200	1205	0.3

$$\frac{(\text{Ref. Temp., }^{o}\text{F} + 460) - (\text{Test Therm. Temp., }^{o}\text{F} + 460)}{\text{Ref. Temp., }^{o}\text{F} + 460} * 100 <= 1.5\ \%$$

Airflow Sciences Corporation
Probe Calibration for Method 2

Wind Tunnel Facility: Airflow Sciences Corporation
Wind Tunnel Location: Livonia, MI
Probe Type: S-Type Pitot
Probe ID: S8-031-A
Probe Calibration Date: 07/10/17
Test Point Location: center
Ambient Temperature (°F): 77.8
Barometric Pressure ("Hg): 29.23

Repitition	Nominal Low Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (°F)	DP ("H_2O)	Yaw Angle (°)	
1	60	0.81	77.8	1.18	0	0.82
2	60	0.80	77.8	1.18	0	0.82
3	60	0.81	77.8	1.18	0	0.82
					Average ($C_{p(avg-low)}$)	0.82

Repitition	Nominal High Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (°F)	DP ("H_2O)	Yaw Angle (deg)	
1	90	1.81	77.8	2.63	0	0.82
2	90	1.81	77.8	2.62	0	0.82
3	90	1.81	77.8	2.63	0	0.82
					Average ($C_{p(avg-high)}$)	0.82

$$\% \text{ Difference} = \frac{C_{p(avg-low)} - C_{p(avg-high)}}{C_{p(avg-low)}} \times 100\% = \textbf{-0.49\%}$$ Pass

Note: (1) The percent difference between the low and high velocity setting C_p values shall be within +/- 3 %.
(2) If calibrating a 3-D probe for this method, the pitch angle setting must be 0°.

C_p = 0.820

Airflow Sciences Corporation

Probe Calibration for Method 2

Wind Tunnel Facility:	Airflow Sciences Corporation
Wind Tunnel Location:	Livonia, MI
Probe Type:	S-Type Pitot
Probe ID:	S8-031-B
Probe Calibration Date:	07/10/17
Test Point Location:	center
Ambient Temperature (°F):	77.5
Barometric Pressure ("Hg):	29.23

Repitition	Nominal Low Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (°F)	DP ("H_2O)	Yaw Angle (°)	
1	60	0.81	77.5	1.19	0	0.82
2	60	0.81	77.5	1.19	0	0.82
3	60	0.81	77.5	1.19	0	0.82
					Average ($C_{p(avg-low)}$)	0.82

Repitition	Nominal High Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (°F)	DP ("H_2O)	Yaw Angle (deg)	
1	90	1.81	77.5	2.65	0	0.82
2	90	1.81	77.5	2.64	0	0.82
3	90	1.81	77.5	2.64	0	0.82
					Average ($C_{p(avg-high)}$)	0.82

$$\% \text{ Difference} = \frac{C_{p(avg-low)} - C_{p(avg-high)}}{C_{p(avg-low)}} \times 100\% = \textbf{-0.55\%}$$ Pass

Note: (1) The percent difference between the low and high velocity setting C_p values shall be within +/- 3 %.
(2) If calibrating a 3-D probe for this method, the pitch angle setting must be 0°.

C_p = 0.818

Airflow Sciences Corporation

Probe Calibration for Method 2

Data Collection and Analysis

Date:	6/8/2017
Temperature (°F):	72.2
Pressure ("Hg):	29.33
Personnel:	wgj
Probe:	S8-031-A

Wind Tunnel Target DP [I.W.C]	Wind Tunnel Actual DP [I.W.C]	S-Probe DP [I.W.C.]	C_p	$C_{p(avg)}$	C_p-$C_{p(avg)}$	σ max	
0.81	0.81	1.19	0.818	0.818	0.000	0.001	Pass
0.81	0.81	1.19	0.818		0.000		
0.81	0.81	1.19	0.817		-0.001		
1.81	1.82	2.63	0.823	0.822	0.001	0.001	Pass
1.81	1.82	2.64	0.822		0.000		
1.81	1.81	2.64	0.820		-0.001		

Airflow Sciences Corporation

Probe Calibration for Method 2

Data Collection and Analysis

Date:	6/8/2017
Temperature (°F):	72.0
Pressure ("Hg):	29.33
Personnel:	wgj
Probe:	S8-031-B

Wind Tunnel Target DP [I.W.C]	Wind Tunnel Actual DP [I.W.C]	S-Probe DP [I.W.C.]	C_p	$C_{p(avg)}$	C_p-$C_{p(avg)}$	σ max	
0.81	0.81	1.19	0.817	0.816	0.000	0.001	Pass
0.81	0.81	1.19	0.817		0.000		
0.81	0.81	1.19	0.816		-0.001		
1.81	1.82	2.65	0.820	0.820	0.000	0.000	Pass
1.81	1.82	2.65	0.820		0.000		
1.81	1.82	2.64	0.820		0.000		

Airflow Sciences Corporation

Probe Calibration for Method 2

Wind Tunnel Facility:	Airflow Sciences Corporation
Wind Tunnel Location:	Livonia, MI
Probe Type:	S-Type Pitot
Probe ID:	S8-031-A
Probe Calibration Date:	06/08/17
Test Point Location:	center
Ambient Temperature (°F):	72.2
Barometric Pressure ("Hg):	29.33

Repitition	Nominal Low Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (°F)	DP ("H_2O)	Yaw Angle (°)	
1	60	0.81	72.2	1.19	0	0.82
2	60	0.81	72.2	1.19	0	0.82
3	60	0.81	72.2	1.19	0	0.82
					Average ($C_{p(avg-low)}$)	0.82

Repitition	Nominal High Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (°F)	DP ("H_2O)	Yaw Angle (deg)	
1	90	1.82	72.2	2.63	0	0.82
2	90	1.82	72.2	2.64	0	0.82
3	90	1.81	72.2	2.64	0	0.82
					Average ($C_{p(avg-high)}$)	0.82

$$\% \text{ Difference} = \frac{C_{p(avg-low)} - C_{p(avg-high)}}{C_{p(avg-low)}} \times 100\% = \textbf{-0.51\%}$$ Pass

Note: (1) The percent difference between the low and high velocity setting C_p values shall be within +/- 3 %.
(2) If calibrating a 3-D probe for this method, the pitch angle setting must be 0°.

C_p = 0.820

Airflow Sciences Corporation

Probe Calibration for Method 2

Wind Tunnel Facility:	Airflow Sciences Corporation
Wind Tunnel Location:	Livonia, MI
Probe Type:	S-Type Pitot
Probe ID:	S8-031-B
Probe Calibration Date:	06/08/17
Test Point Location:	center
Ambient Temperature (°F):	72.0
Barometric Pressure ("Hg):	29.33

Repitition	Nominal Low Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (°F)	DP ("H_2O)	Yaw Angle (°)	
1	60	0.81	72.0	1.19	0	0.82
2	60	0.81	72.0	1.19	0	0.82
3	60	0.81	72.0	1.19	0	0.82
					Average ($C_{p(avg-low)}$)	0.82

Repitition	Nominal High Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (°F)	DP ("H_2O)	Yaw Angle (deg)	
1	90	1.82	72.0	2.65	0	0.82
2	90	1.82	72.0	2.65	0	0.82
3	90	1.82	72.0	2.64	0	0.82
					Average ($C_{p(avg-high)}$)	0.82

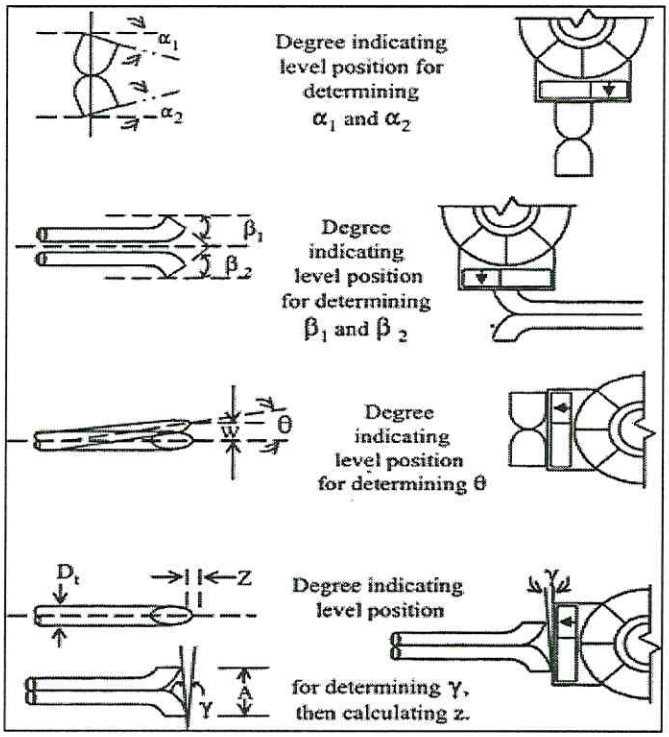
$$\% \text{ Difference} = \frac{C_{p(avg-low)} - C_{p(avg-high)}}{C_{p(avg-low)}} \times 100\% = \textbf{-0.45\%}$$ Pass

Note: (1) The percent difference between the low and high velocity setting C_p values shall be within +/- 3 %.
(2) If calibrating a 3-D probe for this method, the pitch angle setting must be 0°.

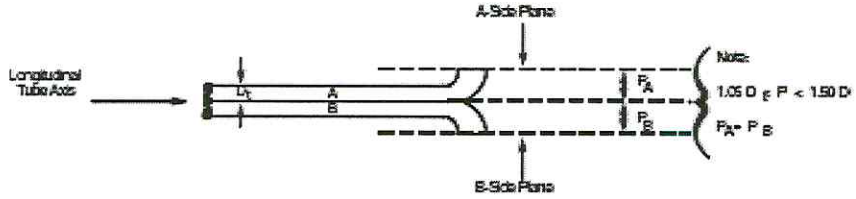
C_p = 0.818

Airflow Sciences Corporation

Probe Inspection for Method 2



α_1	0.8 (°)	Pass
α_2	0.3 (°)	Pass
β_1	0.3 (°)	Pass
β_2	1.1 (°)	Pass
D_t	0.375 (")	Pass
P_a	0.459 (")	Pass
P_b	0.459 (")	Pass
z	<0.02 (")	Pass
w	0.005 (")	Pass



Certification

I certify that Type S probe ID **S8-031** meets or exceeds all specifications, criteria, and applicable design features.

Certified by: Craig Rood Date: 6/8/2017

Airflow Sciences Corporation

Probe Calibration for Method 2

Data Collection and Analysis

Date:	8/31/2017
Temperature (^{o}F):	73.7
Pressure ("Hg):	29.43
Personnel:	wgj
Probe:	S8-032-A

Wind Tunnel Target DP [I.W.C]	Wind Tunnel Actual DP [I.W.C]	S-Probe DP [I.W.C.]	C_p	$C_{p(avg)}$	C_p-$C_{p(avg)}$	σ max	
0.81	0.81	1.18	0.820	0.821	0.000	0.000	Pass
0.81	0.81	1.18	0.821		0.000		
0.81	0.81	1.18	0.821		0.000		
1.81	1.82	2.62	0.825	0.824	0.000	0.000	Pass
1.81	1.82	2.63	0.824		0.000		
1.81	1.82	2.63	0.824		0.000		

Airflow Sciences Corporation

Probe Calibration for Method 2

Data Collection and Analysis

Date:	8/31/2017
Temperature (^{o}F):	74.5
Pressure ("Hg):	29.43
Personnel:	wgj
Probe:	S8-032-B

Wind Tunnel Target DP [I.W.C]	Wind Tunnel Actual DP [I.W.C]	S-Probe DP [I.W.C.]	C_p	$C_{p(avg)}$	C_p-$C_{p(avg)}$	σ max	
0.81	0.81	1.19	0.819	0.819	0.000	0.000	Pass
0.81	0.81	1.19	0.819		0.000		
0.81	0.81	1.19	0.820		0.000		
1.81	1.81	2.63	0.823	0.823	0.000	0.000	Pass
1.81	1.82	2.63	0.823		0.000		
1.81	1.82	2.63	0.823		0.000		

Airflow Sciences Corporation

Probe Calibration for Method 2

Wind Tunnel Facility:	Airflow Sciences Corporation
Wind Tunnel Location:	Livonia, MI
Probe Type:	S-Type Pitot
Probe ID:	S8-032-A
Probe Calibration Date:	08/31/17
Test Point Location:	center
Ambient Temperature (^oF):	73.7
Barometric Pressure ("Hg):	29.43

Repitition	Nominal Low Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (^oF)	DP ("H_2O)	Yaw Angle (^{o})	
1	60	0.81	73.7	1.18	0	0.82
2	60	0.81	73.7	1.18	0	0.82
3	60	0.81	73.7	1.18	0	0.82
					Average ($C_{p(avg-low)}$)	0.82

Repitition	Nominal High Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (^oF)	DP ("H_2O)	Yaw Angle (deg)	
1	90	1.82	73.7	2.62	0	0.82
2	90	1.82	73.7	2.63	0	0.82
3	90	1.82	73.7	2.63	0	0.82
					Average ($C_{p(avg-high)}$)	0.82

$$\% \text{ Difference} = \frac{C_{p(avg-low)} - C_{p(avg-high)}}{C_{p(avg-low)}} \times 100\% = \textbf{-0.46\%}$$ **Pass**

Note: (1) The percent difference between the low and high velocity setting C_p values shall be within +/- 3 %.
(2) If calibrating a 3-D probe for this method, the pitch angle setting must be 0^o.

C_p = 0.822

Airflow Sciences Corporation

Probe Calibration for Method 2

Wind Tunnel Facility:	Airflow Sciences Corporation
Wind Tunnel Location:	Livonia, MI
Probe Type:	S-Type Pitot
Probe ID:	S8-032-B
Probe Calibration Date:	08/31/17
Test Point Location:	center
Ambient Temperature (^oF):	74.5
Barometric Pressure ("Hg):	29.43

Repitition	Nominal Low Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (^oF)	DP ("H_2O)	Yaw Angle (^{o})	
1	60	0.81	74.5	1.19	0	0.82
2	60	0.81	74.5	1.19	0	0.82
3	60	0.81	74.5	1.19	0	0.82
					Average ($C_{p(avg-low)}$)	0.82

Repitition	Nominal High Velocity Setting (ft/s)	Calibration Pitot		Tested Probe		Calculated C_p
		DP_{std} ("H_2O)	Temperature (^oF)	DP ("H_2O)	Yaw Angle (deg)	
1	90	1.81	74.5	2.63	0	0.82
2	90	1.82	74.5	2.63	0	0.82
3	90	1.82	74.5	2.63	0	0.82
					Average ($C_{p(avg-high)}$)	0.82

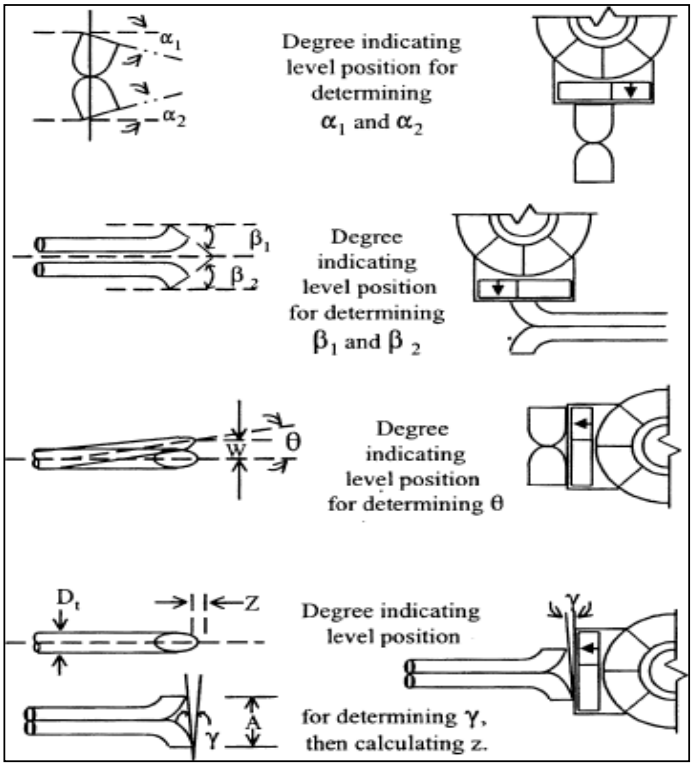
$$\% \text{ Difference} = \frac{C_{p(avg-low)} - C_{p(avg-high)}}{C_{p(avg-low)}} \times 100\% = \textbf{-0.43\%}$$ **Pass**

Note: (1) The percent difference between the low and high velocity setting C_p values shall be within +/- 3 %.
(2) If calibrating a 3-D probe for this method, the pitch angle setting must be 0^o.

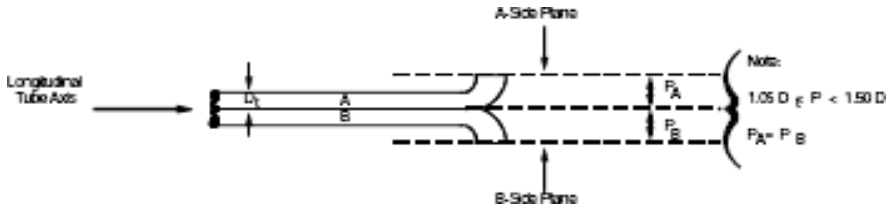
C_p = 0.821

Airflow Sciences Corporation

Probe Inspection for Method 2



α_1	1.1 (°)	Pass
α_2	1.8 (°)	Pass
β_1	1.0 (°)	Pass
β_2	1.5 (°)	Pass
D_t	0.375 (")	Pass
P_a	0.481 (")	Pass
P_b	0.481 (")	Pass
z	<0.02 (")	Pass
w	0.008 (")	Pass



Certification

I certify that Type S probe ID **S8-032** meets or exceeds all specifications, criteria, and applicable design features.

Certified by: wgj Date: 8/31/2017

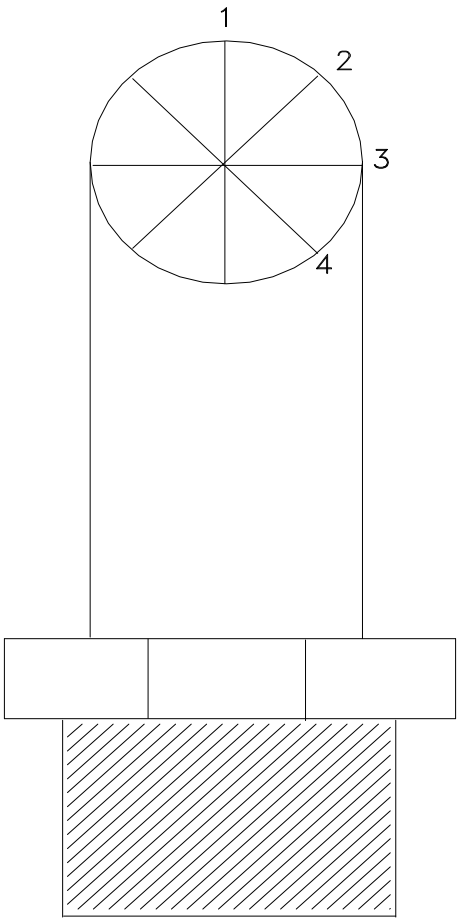
Nozzle Calibration

Date: 4/25/2023

Nozzle ID No.: 909

Analyst: WAP

Material/Type: Glass



0.282	1
0.282	2
0.281	3
0.281	4

Valid Data

Average
0.282

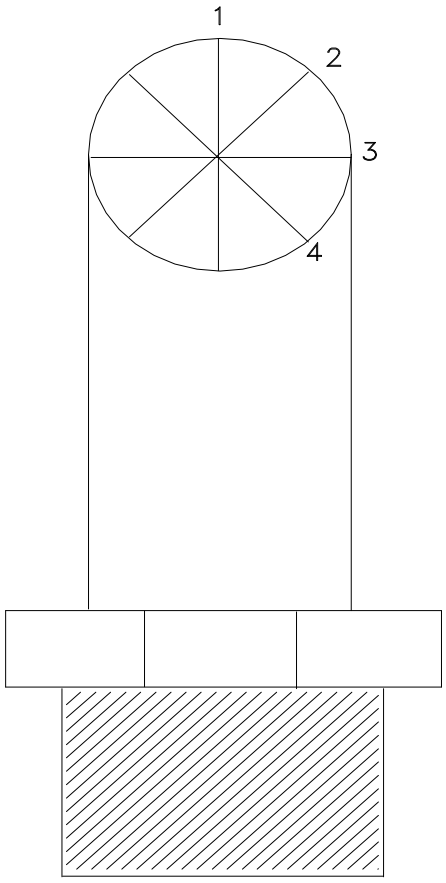
Nozzle Calibration

Date: 4/25/2023

Nozzle ID No.: 267

Analyst: WAP

Material/Type: Glass



0.287	1
0.287	2
0.287	3
0.287	4

Average
0.287

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Test Location: Main Stack
Date: 10/24/2023
Operator: R. Sollars
Operating Condition Normal

Sample System:	FTIR				
Probe Length:	8.0	**ft**			
Probe Type:	FTIR				
Sample Plane:	Vertical				
Port Length:	6.5	**in.**			
Port Size (diameter):	4	**in.**			
Port Type:	Flange				
Duct Shape:	Circular				
Diameter:	11	**ft**			
Duct Area:	95.03	**Sq. Ft.**			
Upstream Diameters:	3.30		Minimum Upstream Distance	5.5	Feet
Downstream Diameters:	9.20		Minimum Downstream Distance	22.0	Feet
Number of Ports Sampled:	1		Ideal Upstream Distance	22.0	Feet
Number of Points per Port:	3		Ideal Downstream Distance	88.0	Feet
Total Number of Traverse Points:	3				

Calibration Gases

Type	Setting	Cylinder ID	Cylinder Value	Analyzer Response	Difference, % of Span	Expiration Date	Mid cylinder % of high cylinder	Final Bottle Pressure, PSI
O2 % (dry)	Zero	Zero Nitrogen	0.0	0.02	-0.09%	N/A		1500
	Mid	CC326608	12.03	12.19	-0.71%	7/19/2031	53.68%	1500
	High	CC420519	22.41	22.35	0.27%	7/15/2029		1000

Type	Compound	Cylinder ID	Cylinder Value	Expiration Date	Final Bottle Pressure, PSI
Zero Gas	Nitrogen	Zero Nitrogen	0.0	N/A	1500
Calibration Transfer Standard	Ethylene	ALM007995	100.6	6/1/2026	1100
Analyte Spike Gas	HCN	CC768241	49.55	3/11/2024	1900
	SF6		5.001		

Response Time Data

Type	RM Analyzer Make/Model	RM Analyzer s/n	Analyzer Span	RM Gas Span
O2 % (dry)	CAI 700	221018	25	22.41
HF ppmvw	MKS 2030	110161896	10	N/A
HCN ppmvw	MKS 2030	110161896	100	N/A

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Test Location: Main Stack
Date: 10/24/23
Project #: M234302

Linearity Cal/Pre 1 Cal

Time	O2 % (dry)	
6:59	0.03	
7:00	0.02	**iz**
7:01	3.25	
7:02	0.06	
7:03	0.01	
7:04	0.37	
7:05	6.11	
7:06	17.44	
7:07	22.33	
7:08	22.35	**ih**
7:09	20.56	
7:10	13.85	
7:11	12.18	
7:12	12.19	**im**
7:13	18.28	
7:14	21.11	
7:15	20.86	
7:16	20.99	
7:17	2.52	
7:18	0.10	
7:19	0.09	**z**
7:20	10.55	
7:21	12.19	
7:22	12.20	**m**

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Test Location: Main Stack
Date: 10/24/23

Post 1/Pre 2			Post 2/Pre 3		
Time	**O2 % (dry)**		**Time**	**O2 % (dry)**	
9:43	0.11		11:41	14.87	
9:44	6.80		11:42	0.17	
9:45	12.06		11:43	0.10	
9:46	12.08	**m**	11:44	11.52	
9:47	11.01		11:45	12.06	
9:48	0.11		11:46	12.07	**m**
9:49	0.08		11:47	7.45	
9:50	0.08		11:48	0.11	
9:51	0.07	**z**	11:49	0.09	
			11:50	0.08	**z**

Post 3		
Time	**O2 % (dry)**	
13:44	16.41	
13:45	3.88	
13:46	0.12	
13:47	5.80	
13:48	12.06	
13:49	12.07	
13:50	12.08	**m**
13:51	12.08	
13:52	4.85	
13:53	0.10	
13:54	0.09	**z**

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Diluent: O2 %

Test Location: Main Stack
Date: 10/24/23
Operator: R. Sollars
O2 % Correction: 7

O2 % (dry) Correction Data

Run #	Cma	Precal	Postcal	Pre zero	Post zero	Co	Cm	C	Cgas	Span Bias	Span Drift	Zero Bias	Zero Drift
1	12.03	12.20	12.08	0.09	0.07	0.08	12.14	16.25	16.1	0.49	-0.54	-0.22	-0.09
2	12.03	12.08	12.07	0.07	0.08	0.08	12.08	16.24	16.2	0.54	-0.04	-0.27	0.04
3	12.03	12.07	12.08	0.08	0.09	0.09	12.08	16.22	16.2	0.49	0.04	-0.31	0.04

Concentration of Cal Gas C = Average value of test Co=Average Pre and Post Zero
verage Pre and Post Span Cgas = Corrected gas value of test

Calibration Corrected and Calculated Data

Run #	Run Date	Start Time	End Time	Moisture %	O2 % (dry)	CO2 % (wet)	CO2 % (dry)	HCN ppmvw	HCN ppmvd @ 7% O2	HF ppmvw	HF ppmvd @ 7% O2
1	10/24/23	8:00	8:59	2.86%	16.13	6.06	6.24	2.03	6.07	0.10	0.30
2	10/24/23	10:00	10:59	2.68%	16.21	6.15	6.32	1.82	5.55	0.10	0.30
3	10/24/23	12:00	12:59	2.73%	16.19	6.30	6.48	1.89	5.74	0.10	0.30

Appendix H - FTIR QA/QC

Method 320 FTIR Detector Multi-Gas Determination QA/QC

FTIR data was collected using an MKS MultiGas 2030 FTIR spectrometer.

The FTIR was equipped with a temperature-controlled, 5.11 meter multi-pass gas cell maintained at 191°C. Gas flows and sampling system pressures were monitored using a rotameter and pressure transducer. All data was collected at 0.5 cm^{-1} resolution. Each spectrum was derived from the coaddition of 64 scans, with a new data point generated approximately every one minute. Analyzer data for each run is presented in the Reference Method Test Data appendix.

SAMPLING SYSTEM PARAMETERS				
MKS Serial #	**Sampling Line**	**Probe Assembly**	**Particulate Filter Media**	**Operating Temperatures**
110161896	100' 3/8" dia., heated Teflon	Heated 12', 3/8" dia. SS	0.01µ heated borosilicate glass fiber	191°C

QA/QC procedures followed US EPA Method 320 guidelines. See below for QA/QC procedure details and list of calibration gas standards. All calibration gases were introduced to the analyzer and the sampling system using an instrument grade stainless steel rotameter. All QA/QC procedures were within the acceptance criteria allowance of the applicable EPA methodology. Detailed FTIR QA/QC data follow the narrative portion of this appendix.

FTIR QA/QC Procedures						
QA/QC Specification	**Purpose**	**Calibration Gas Analyte**	**Delivery**	**Frequency**	**Acceptance Criteria**	**Result**
M320: Zero	Verify that the FTIR is free of contaminants & zero the FTIR	Nitrogen (zero)	Direct to FTIR	pre/post test	< MDL or Noise	**Pass**
M320: Calibration Transfer Standard (CTS) Direct	Verify FTIR stability, confirm optical path length	Ethylene	Direct to FTIR	pretest	+/- 5% cert. value	**Pass**
M320: Analyte Direct	Verify FTIR calibration	HCN, SF_6	Direct to FTIR	Pretest	+/- 5% cert. value	**Pass**
M320: CTS Response	Verify system stability, recovery, response time	Ethylene	Sampling System	Daily, pre/post test	+/- 5% of Direct Measurement	**Pass**
M320: Zero Response	Verify system is free of contaminants, system bias	Nitrogen (zero)	Sampling System	pretest	Bias correct data	**Pass**
M320: Analyte Spike	Verify system ability to deliver and quantify analyte of interest in the presence of other effluent gases	HCN, SF_6	Dynamic Addition to Sampling System, 1:10 effluent	Throughout testing – daily	+/- 20% theoretical recovery	**Pass**

Note: The determined concentrations from direct analyses were used in all system/spike recovery calculations.

CALIBRATION GAS STANDARDS				
Components	**Concentration (ppm)**	**Vendor**	**Cylinder #**	**Standard Type**
Ethylene	100.6	Airgas	ALM007995	Primary +/- 1%
HCN/SF_6	49.55/5.001	Airgas	CC768241	Certified Standard-Spec +/- 5%
Nitrogen	Zero Gas	Airgas	Zero Nitrogen	UHP Grade

Analyte Spiking

HCN spiking was performed prior to testing to verify the ability of the sampling system to quantitatively deliver a sample containing HCN from the base of the probe to the FTIR. Analyte spiking assures the ability of the FTIR sampling system to recover acid gases in the presence of effluent gas.

As part of the spiking procedure, samples were measured to determine native HCN concentrations to be used in the spike recovery calculations. The analyte spiking gases contained a low concentration of sulfur hexafluoride (SF_6). The determined SF_6 concentration in the spiked sample was used to calculate the dilution factor of the spike and thus used to calculate the concentration of the spiked HCN. The spike target dilution ratio was 1:10 or less.

The following equation illustrates the percent recovery calculation.

$$DF = \frac{SF6(spk)}{SF6(direct)}$$ (Sec. 9.2.3 (3) USEPA Method 320)

$$CS = DF * Spike(dir) + Unspike(1 - DF)$$ (Sec. 9.2.3 (4) USEPA Method 320)

DF = Dilution factor of the spike gas
$SF_{6(dir)}$ = SF_6 concentration measured directly in undiluted spike gas
$SF_{6(spk)}$ = Diluted SF_6 concentration measured in a spiked sample
$Spike_{dir}$ = Concentration of the analyte in the spike standard measure by the FTIR directly
CS = Expected concentration of the spiked samples
Unspike = Native concentration of analytes in unspiked samples

Post Collection Data Validation

As part of the data validation procedure, reference spectra are manually fit to that of the sample spectra and a concentration is determined. The reference spectra are scaled to match the peak amplitude of the sample, thus providing a scale factor. The scale factor multiplied by the reference spectra concentration is used to determine the concentration value for the sample spectra. Sample pressure and temperature corrections are then applied to compute the final sample concentration. The manually calculated results are then compared with the software-generated results. The data is then validated if the two concentrations are within ± 20% agreement. If there is a difference greater than ± 20% the spectra are reviewed for possible spectra interferences or any other possible causes leading to incorrectly quantified data.

Detection Limit

The detection limit of each analyte was calculated following Annex A2 of ASTM D6348-12 procedure using spectra that contained similar amounts of moisture.

FTIR DETECTION LIMITS			
Analyte	**Detection Limit (ppmv wet)**	**Detection Limit (%v)**	**Detection Limit (%v wet)**
Hydrogen Cyanide	0.2	—	—
Hydrogen Fluoride	0.1		
Water	—	**0.1**	**N/A**
Carbon Dioxide	—	**N/A**	**0.1**

Copies of gas cylinder certifications are appended. All concentration data were recorded on a wet, volume basis. HCN spiking was performed prior to testing to confirm the measurement system's ability to deliver and quantify HCN. The sample and data collection followed the procedures outlined in Methods 320.

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Operating Condition: Normal

Test Location: Main Stack
Date: 10/24/2023
Operator: R. Sollars
FTIR s/n: 110161896

System Leak Check: 0.0 mL/min

Nitrogen (Zero) Direct to FTIR

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet
N2_DIR_000002.LAB	10/24/23	6:49:57	0.0	0.0	0.0	190.5	0.80	0.4	0.1	0.002
N2_DIR_000003BKG.LAB	10/24/23	6:52:09	0.0	0.0	0.0	190.4	0.80	0.0	0.0	0.000
N2_DIR_000004.LAB	10/24/23	6:52:23	0.0	0.0	0.0	190.3	0.80	0.1	-0.1	-0.006
N2_DIR_000005.LAB	10/24/23	6:52:31	0.0	0.0	0.0	190.3	0.80	0.3	-0.1	-0.001
N2_DIR_000006.LAB	10/24/23	6:52:39	0.0	0.0	0.0	190.3	0.80	0.1	0.1	-0.015
N2_DIR_000007.LAB	10/24/23	6:52:47	0.0	0.0	0.0	190.3	0.80	0.2	0.0	-0.012
N2_DIR_000008.LAB	10/24/23	6:52:55	0.0	0.0	0.0	190.3	0.80	0.2	-0.1	-0.014
N2_DIR_000009.LAB	10/24/23	6:53:02	0.0	0.0	0.0	190.3	0.80	0.3	-0.1	0.008
N2_DIR_000010.LAB	10/24/23	6:53:10	0.0	0.0	0.0	190.3	0.80	0.2	0.0	0.010

Calibration Transfer Standard (CTS), Direct to FTIR

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Recovery % Ethylene
CTS_DIR_000026.LAB	10/24/23	6:56:20	0.0	0.0	0.0	190.5	0.80	100.6	-0.1	-0.035	**100.0%**
CTS_DIR_000027.LAB	10/24/23	6:56:28	0.0	0.0	0.0	190.5	0.80	100.5	0.0	-0.030	**99.9%**
CTS_DIR_000028.LAB	10/24/23	6:56:36	0.0	0.0	0.0	190.5	0.80	100.7	-0.1	-0.031	**100.1%**
CTS_DIR_000029.LAB	10/24/23	6:56:44	0.0	0.0	0.0	190.5	0.80	100.6	-0.1	-0.031	**100.0%**
CTS_DIR_000030.LAB	10/24/23	6:56:52	0.0	0.0	0.0	190.6	0.80	100.5	-0.1	-0.025	**99.9%**
CTS_DIR_000031.LAB	10/24/23	6:57:00	0.0	0.0	-0.1	190.6	0.80	100.7	-0.1	-0.030	**100.1%**
CTS_DIR_000032.LAB	10/24/23	6:57:08	0.0	0.0	0.0	190.6	0.80	100.6	-0.2	-0.027	**100.0%**
CTS_DIR_000033.LAB	10/24/23	6:57:15	0.0	0.0	0.0	190.6	0.80	100.5	-0.1	-0.028	**99.9%**
	Average							**100.6**			**100.0%**

Analyte Spike Gas (HCN) Direct to FTIR

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Recovery % HCN
HCN_DIR_000043.LAB	10/24/23	7:00:16	0.0	0.0	0.0	190.5	0.80	-0.2	47.9	5.062	**96.7%**
HCN_DIR_000044.LAB	10/24/23	7:00:24	0.0	0.0	0.0	190.4	0.80	0.1	48.0	5.089	**96.9%**
HCN_DIR_000045.LAB	10/24/23	7:00:32	0.0	0.0	0.0	190.4	0.80	0.0	48.0	5.109	**97.0%**
HCN_DIR_000046.LAB	10/24/23	7:00:40	0.0	0.0	0.0	190.4	0.80	-0.2	48.0	5.111	**96.9%**
HCN_DIR_000047.LAB	10/24/23	7:00:48	0.0	0.0	0.0	190.3	0.80	0.0	47.9	5.107	**96.7%**
HCN_DIR_000048.LAB	10/24/23	7:00:56	0.0	0.0	0.0	190.3	0.80	-0.1	48.0	5.105	**96.9%**
HCN_DIR_000049.LAB	10/24/23	7:01:04	0.0	0.0	0.0	190.4	0.80	0.2	48.1	5.110	**97.1%**
HCN_DIR_000050.LAB	10/24/23	7:01:11	0.0	0.0	0.0	190.3	0.80	0.1	48.2	5.112	**97.3%**
	Average								**48.0**	**5.101**	**96.9%**

CTS, System Purge

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Recovery % Ethylene
CTS_RT_000093.LAB	10/24/23	7:18:32	0.0	0.0	0.0	190.8	0.80	100.9	0.0	-0.034	**100.3%**
CTS_RT_000094.LAB	10/24/23	7:18:39	0.0	0.0	0.0	190.8	0.80	101.0	0.0	-0.035	**100.4%**
CTS_RT_000095.LAB	10/24/23	7:18:48	0.0	0.0	0.0	190.8	0.80	101.0	0.0	-0.032	**100.4%**
CTS_RT_000096.LAB	10/24/23	7:18:55	0.0	0.0	0.0	190.8	0.80	100.9	0.0	-0.035	**100.3%**
CTS_RT_000097.LAB	10/24/23	7:19:03	0.0	0.0	0.0	190.7	0.80	101.3	0.0	-0.033	**100.7%**
CTS_RT_000098.LAB	10/24/23	7:19:11	0.0	0.0	0.0	190.7	0.80	101.2	-0.1	-0.021	**100.6%**
CTS_RT_000099.LAB	10/24/23	7:19:19	0.0	0.0	0.0	190.7	0.80	100.8	-0.1	-0.031	**100.2%**
CTS_RT_000100.LAB	10/24/23	7:19:27	0.0	0.0	0.0	190.7	0.80	101.2	0.0	-0.035	**100.5%**

Response Time Test

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Response Time (sec)
CTS_RT_000080.LAB	10/24/23	7:16:49	1.1	0.0	0.0	190.7	0.80	0.0	-0.1	-0.006	-
CTS_RT_000081.LAB	10/24/23	7:16:57	0.6	0.4	0.0	190.7	0.80	52.8	-0.1	-0.032	**15.892**
CTS_RT_000082.LAB	10/24/23	7:17:05	0.1	0.0	0.0	190.7	0.80	100.1	-0.2	-0.024	**23.892**
CTS_RT_000083.LAB	10/24/23	7:17:13	0.1	0.0	0.0	190.7	0.80	100.6	-0.2	-0.037	
CTS_RT_000084.LAB	10/24/23	7:17:21	0.0	0.0	0.0	190.7	0.80	100.7	-0.1	-0.035	
CTS_RT_000085.LAB	10/24/23	7:17:29	0.0	0.0	0.0	190.8	0.80	100.8	0.1	-0.014	
CTS_RT_000086.LAB	10/24/23	7:17:37	0.0	0.0	0.0	190.8	0.80	100.9	-0.1	-0.025	
CTS_RT_000087.LAB	10/24/23	7:17:44	0.0	0.0	0.0	190.8	0.80	101.1	-0.1	-0.025	
CTS_RT_000088.LAB	10/24/23	7:17:52	0.0	0.0	0.0	190.8	0.80	101.1	-0.1	-0.030	

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Operating Condition: Normal

Test Location: Main Stack
Date: 10/24/2023
Operator: R. Sollars
FTIR s/n: 110161896

Pre 1 Native Effluent Prior to Analyte Spike

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet
AMBIENT_STACK_000169.LAB	10/24/23	7:31:50	6.8	5.7	-0.1	190.8	0.80	0.6	2.1	-0.017
AMBIENT_STACK_000170.LAB	10/24/23	7:31:58	6.6	5.8	-0.1	190.8	0.80	0.8	2.1	-0.001
AMBIENT_STACK_000171.LAB	10/24/23	7:32:06	6.6	5.7	-0.1	190.8	0.80	0.7	1.9	-0.004
									2.0	**-0.007**

Pre 1 Effluent Spike Using Analyte

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Dilution Factor	Recovery % HCN
PRE1_SPK_000179.LAB	10/24/23	7:34:56	4.8	5.0	-0.1	190.6	0.80	0.3	6.1	0.424	**0.083**	**103.4%**
PRE1_SPK_000180.LAB	10/24/23	7:35:04	4.7	5.1	-0.1	190.6	0.80	0.5	5.9	0.429	**0.084**	**100.1%**
PRE1_SPK_000181.LAB	10/24/23	7:35:12	4.6	5.1	-0.1	190.7	0.80	0.6	6.1	0.424	**0.083**	**104.0%**
PRE1_SPK_000182.LAB	10/24/23	7:35:19	4.6	5.1	-0.1	190.6	0.80	0.6	6.1	0.423	**0.083**	**104.7%**
PRE1_SPK_000183.LAB	10/24/23	7:35:27	4.6	5.1	-0.1	190.7	0.80	0.5	6.0	0.430	**0.084**	**101.8%**
PRE1_SPK_000184.LAB	10/24/23	7:35:35	4.6	5.1	-0.1	190.7	0.80	0.7	5.8	0.439	**0.086**	**97.3%**
PRE1_SPK_000185.LAB	10/24/23	7:35:43	4.5	5.1	-0.1	190.7	0.80	0.5	5.9	0.433	**0.085**	**99.8%**
PRE1_SPK_000186.LAB	10/24/23	7:35:51	4.5	5.1	-0.1	190.7	0.80	0.6	5.8	0.429	**0.084**	**98.7%**

Native Effluent Prior to Analyte Spike

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet
RUN1_000333.LAB	10/24/23	9:27:43	2.8	6.3	-0.1	190.7	0.80	0.7	1.9	-0.004
RUN1_000334.LAB	10/24/23	9:28:45	2.8	6.4	-0.1	190.9	0.80	0.7	2.0	-0.005
RUN1_000335.LAB	10/24/23	9:29:48	2.9	6.4	-0.1	190.9	0.80	0.7	2.3	-0.005
									2.1	**-0.005**

Effluent Spike Using Analyte

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Dilution Factor	Recovery % HCN
POST1_SPK_000340.LAB	10/24/23	9:32:36	2.5	5.6	0.0	190.8	0.80	0.5	5.5	0.374	**0.073**	**101.2%**
POST1_SPK_000341.LAB	10/24/23	9:32:44	2.6	5.7	-0.1	190.8	0.80	0.6	5.6	0.371	**0.073**	**103.2%**
POST1_SPK_000342.LAB	10/24/23	9:32:52	2.6	5.8	-0.1	190.8	0.80	0.5	5.6	0.367	**0.072**	**104.0%**
POST1_SPK_000343.LAB	10/24/23	9:33:00	2.6	5.8	-0.1	190.8	0.80	0.6	5.7	0.373	**0.073**	**104.8%**
POST1_SPK_000344.LAB	10/24/23	9:33:08	2.6	5.8	-0.1	190.8	0.80	0.6	5.7	0.367	**0.072**	**105.5%**
POST1_SPK_000345.LAB	10/24/23	9:33:15	2.6	5.8	-0.1	190.8	0.80	0.6	5.5	0.366	**0.072**	**102.8%**
POST1_SPK_000346.LAB	10/24/23	9:33:23	2.6	5.8	0.0	190.8	0.80	0.6	5.7	0.365	**0.072**	**107.5%**
POST1_SPK_000347.LAB	10/24/23	9:33:32	2.6	5.8	-0.1	190.8	0.80	0.6	5.6	0.381	**0.075**	**102.7%**

CTS, System Purge

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Recovery % Ethylene
POST1_CTS_000393.LAB	10/24/23	9:42:54	0.0	0.0	0.0	190.7	0.80	100.8	0.0	-0.023	**100.2%**
POST1_CTS_000394.LAB	10/24/23	9:43:01	0.0	0.0	0.0	190.7	0.80	100.8	0.0	-0.031	**100.2%**
POST1_CTS_000395.LAB	10/24/23	9:43:09	0.0	0.0	0.0	190.7	0.80	100.4	0.0	-0.018	**99.8%**
POST1_CTS_000396.LAB	10/24/23	9:43:17	0.0	0.0	0.0	190.7	0.80	100.5	-0.1	-0.028	**99.9%**
POST1_CTS_000397.LAB	10/24/23	9:43:25	0.0	0.0	0.1	190.7	0.80	100.6	0.1	-0.027	**100.0%**
POST1_CTS_000398.LAB	10/24/23	9:43:33	0.0	0.0	0.0	190.7	0.80	100.7	0.0	-0.019	**100.1%**
POST1_CTS_000399.LAB	10/24/23	9:43:40	0.0	0.0	0.0	190.6	0.80	100.9	0.1	-0.030	**100.3%**
POST1_CTS_000400.LAB	10/24/23	9:43:48	0.0	0.0	0.0	190.6	0.80	101.3	-0.1	-0.025	**100.7%**

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Operating Condition: Normal

Test Location: Main Stack
Date: 10/24/2023
Operator: R. Sollars
FTIR s/n: 110161896

Native Effluent Prior to Analyte Spike

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet
RUN2_000523.LAB	10/24/23	11:28:27	2.8	6.2	-0.1	190.7	0.80	0.6	1.8	0.000
RUN2_000524.LAB	10/24/23	11:29:30	2.8	6.2	-0.1	190.8	0.80	0.6	1.7	0.001
RUN2_000525.LAB	10/24/23	11:30:33	2.8	6.2	-0.1	190.7	0.80	0.7	1.8	0.000
									1.8	**0.000**

Effluent Spike Using Analyte

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Dilution Factor	Recovery % HCN
POST2_SPK_000537.LAB	10/24/23	11:33:45	2.5	5.5	0.0	190.6	0.80	0.7	4.7	0.321	**0.063**	**99.4%**
POST2_SPK_000538.LAB	10/24/23	11:33:53	2.5	5.4	-0.1	190.7	0.80	0.5	4.9	0.330	**0.065**	**101.5%**
POST2_SPK_000539.LAB	10/24/23	11:34:00	2.5	5.4	-0.1	190.6	0.80	0.6	4.4	0.323	**0.063**	**94.1%**
POST2_SPK_000540.LAB	10/24/23	11:34:08	2.5	5.6	-0.1	190.5	0.80	0.3	4.9	0.323	**0.063**	**103.6%**
POST2_SPK_000541.LAB	10/24/23	11:34:16	2.5	5.6	-0.1	190.6	0.80	0.5	5.1	0.325	**0.064**	**107.1%**
POST2_SPK_000542.LAB	10/24/23	11:34:24	2.5	5.5	-0.1	190.5	0.80	0.6	5.0	0.334	**0.065**	**102.6%**
POST2_SPK_000543.LAB	10/24/23	11:34:32	2.5	5.4	-0.1	190.6	0.80	0.7	5.0	0.328	**0.064**	**105.5%**
POST2_SPK_000544.LAB	10/24/23	11:34:40	2.5	5.4	-0.1	190.5	0.80	0.5	4.7	0.324	**0.064**	**99.9%**

CTS, System Purge

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Recovery % Ethylene
POST2_CTS_000582.LAB	10/24/23	11:42:27	0.0	0.0	0.0	190.6	0.80	100.5	-0.1	-0.032	**99.9%**
POST2_CTS_000583.LAB	10/24/23	11:42:35	0.0	0.0	0.1	190.7	0.80	100.6	0.0	-0.015	**100.0%**
POST2_CTS_000584.LAB	10/24/23	11:42:43	0.0	0.0	0.0	190.5	0.80	100.8	0.0	-0.028	**100.2%**
POST2_CTS_000585.LAB	10/24/23	11:42:50	0.0	0.0	0.0	190.6	0.80	100.6	0.1	-0.041	**100.0%**
POST2_CTS_000586.LAB	10/24/23	11:42:59	0.0	0.0	0.0	190.6	0.80	100.8	0.1	-0.031	**100.2%**
POST2_CTS_000587.LAB	10/24/23	11:43:06	0.0	0.0	0.0	190.5	0.80	100.5	0.1	-0.025	**99.9%**
POST2_CTS_000588.LAB	10/24/23	11:43:14	0.0	0.0	0.1	190.5	0.80	100.5	0.2	-0.027	**99.9%**
POST2_CTS_000589.LAB	10/24/23	11:43:22	0.0	0.0	0.1	190.5	0.80	100.5	-0.1	-0.028	**99.9%**

Native Effluent Prior to Analyte Spike

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet
RUN3_000707.LAB	10/24/23	13:27:37	2.6	5.5	-0.1	190.7	0.80	0.6	1.7	0.001
RUN3_000708.LAB	10/24/23	13:28:40	2.7	5.6	-0.1	190.6	0.80	0.5	1.9	0.004
RUN3_000709.LAB	10/24/23	13:29:43	2.6	5.6	-0.1	190.7	0.80	0.5	1.8	0.000
									1.8	**0.002**

Effluent Spike Using Analyte

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Dilution Factor	Recovery % HCN
POST3_SOK_000741.LAB	10/24/23	13:35:31	2.4	4.9	-0.1	190.6	0.80	0.2	5.3	0.408	**0.080**	**95.7%**
POST3_SOK_000742.LAB	10/24/23	13:35:39	2.3	4.9	-0.1	190.7	0.80	0.4	5.3	0.412	**0.081**	**96.5%**
POST3_SOK_000743.LAB	10/24/23	13:35:47	2.4	4.8	0.0	190.7	0.80	0.2	5.4	0.408	**0.080**	**98.3%**
POST3_SOK_000744.LAB	10/24/23	13:35:55	2.4	4.9	0.0	190.7	0.80	0.7	5.1	0.409	**0.080**	**92.3%**
POST3_SOK_000745.LAB	10/24/23	13:36:03	2.4	4.9	0.0	190.7	0.80	0.4	5.4	0.404	**0.079**	**98.8%**
POST3_SOK_000746.LAB	10/24/23	13:36:11	2.4	5.0	-0.1	190.7	0.80	0.2	5.4	0.405	**0.079**	**98.1%**
POST3_SOK_000747.LAB	10/24/23	13:36:18	2.4	5.0	0.0	190.7	0.80	0.3	5.4	0.399	**0.078**	**99.2%**
POST3_SOK_000748.LAB	10/24/23	13:36:26	2.4	5.0	0.0	190.8	0.80	0.4	5.1	0.399	**0.078**	**94.9%**

CTS, System Purge

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Recovery % Ethylene
POST3_CTS_000778.LAB	10/24/23	13:45:49	0.0	0.0	0.0	190.7	0.80	100.3	0.0	-0.037	**99.7%**
POST3_CTS_000779.LAB	10/24/23	13:45:57	0.0	0.0	0.1	190.7	0.80	100.3	0.1	-0.016	**99.7%**
POST3_CTS_000780.LAB	10/24/23	13:46:05	0.0	0.0	0.0	190.7	0.80	100.2	0.0	-0.029	**99.6%**
POST3_CTS_000781.LAB	10/24/23	13:46:12	0.0	0.0	0.1	190.7	0.80	100.4	0.0	-0.034	**99.8%**
POST3_CTS_000782.LAB	10/24/23	13:46:20	0.0	0.0	0.0	190.7	0.80	100.6	0.2	-0.022	**100.0%**
POST3_CTS_000783.LAB	10/24/23	13:46:28	0.0	0.0	0.0	190.7	0.80	100.5	0.1	-0.024	**99.9%**
POST3_CTS_000784.LAB	10/24/23	13:46:36	0.0	0.0	0.1	190.7	0.80	100.6	0.2	-0.022	**100.0%**
POST3_CTS_000785.LAB	10/24/23	13:46:44	0.0	0.0	0.0	190.7	0.80	100.3	0.1	-0.025	**99.7%**

Client: GCC Rio Grande, Inc.
Facility: Tijeras Plant
Project #: M234302
Operating Condition: Normal

Test Location: Main Stack
Date: 10/24/2023
Operator: R. Sollars
FTIR s/n: 110161896

Post Test CTS, Direct Purge

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet	Recovery % Ethylene
CTS_DIR_001020.LAB	10/24/23	17:07:22	0.0	0.0	0.0	190.7	0.80	100.5	-0.1	-0.033	**99.9%**
CTS_DIR_001021.LAB	10/24/23	17:07:30	0.0	0.0	0.0	190.7	0.80	100.6	0.0	-0.031	**100.0%**
CTS_DIR_001022.LAB	10/24/23	17:07:38	0.0	0.0	0.1	190.7	0.80	100.6	0.1	-0.027	**100.0%**
CTS_DIR_001023.LAB	10/24/23	17:07:46	0.0	0.0	0.0	190.7	0.80	100.5	0.1	-0.024	**99.9%**
CTS_DIR_001024.LAB	10/24/23	17:07:53	0.0	0.0	0.0	190.7	0.80	100.5	0.0	-0.023	**99.9%**
CTS_DIR_001025.LAB	10/24/23	17:08:01	0.0	0.0	0.0	190.7	0.80	100.4	0.0	-0.024	**99.8%**
CTS_DIR_001026.LAB	10/24/23	17:08:09	0.0	0.0	0.0	190.7	0.80	100.4	0.0	-0.021	**99.8%**
CTS_DIR_001027.LAB	10/24/23	17:08:17	0.0	0.0	0.0	190.8	0.80	100.4	0.1	-0.028	**99.7%**
	Average							**100.5**			

Post Test N2, Direct Purge

Spectrum	Date	Time	H2O% %v	CO2 %v wet	HF ppmv wet	FTIR Gas Cell Temperature deg C	FTIR Gas Cell Pressure atm	Ethylene ppmv wet	HCN ppmv wet	SF6 ppmv wet
N2_DIR_001029.LAB	10/24/23	17:11:28	0.0	0.0	0.0	190.5	0.80	0.1	-0.2	0.005
N2_DIR_001030.LAB	10/24/23	17:13:33	0.0	0.0	0.0	190.5	0.80	0.1	-0.2	0.005
N2_DIR_001031.LAB	10/24/23	17:15:39	0.0	0.0	0.0	190.5	0.80	0.1	-0.1	0.004

Time	DL summary - zero gas		Time	DL summary - in stack	
	HF ppm (10) 191C	HCN (100) 191C		HF ppm (10) 191C	HCN (100) 191C
6:52:39 AM	-0.02	0.09	7:52:25 AM	-0.09	1.99
6:52:47 AM	-0.01	-0.02	7:53:28 AM	-0.08	1.95
6:52:55 AM	-0.01	-0.08	7:54:30 AM	-0.09	1.94
6:53:02 AM	0.00	-0.05	7:55:34 AM	-0.09	2.00
6:53:10 AM	-0.03	0.02	7:56:36 AM	-0.08	1.97
6:53:18 AM	-0.02	-0.16	7:57:39 AM	-0.09	1.98
6:53:26 AM	0.02	0.03	7:58:42 AM	-0.08	2.09
Standard Deviation	**0.01**	**0.08**	**Standard Deviation**	**0.01**	**0.05**
3x = DL	**0.04**	**0.23**	**3x = DL**	**0.02**	**0.14**

Appendix I - Gas Cylinder Certifications

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Part Number:	E03NI78E15A1066	Reference Number:	153-402794083-1
Cylinder Number:	CC326608	Cylinder Volume:	151.1 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72023	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Jul 19, 2023

Expiration Date: Jul 19, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	10.00 %	9.893 %	G1	+/- 0.9% NIST Traceable	07/19/2023
OXYGEN	12.00 %	12.03 %	G1	+/- 0.8% NIST Traceable	07/19/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060405	CC411744	7.489 % CARBON DIOXIDE/NITROGEN	0.6%	May 14, 2025
NTRM	98051010	SG9161286BAL	12.05 % OXYGEN/NITROGEN	0.7%	Dec 14, 2023

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA-510 SV4MEUTJ CO2	CO2 NDIR (Dixon)	Jun 28, 2023
Horiba MPA-510 W603MM58 O2	O2 Paramagnetic (DIXON)	Jun 29, 2023

Triad Data Available Upon Request

Signature on file
Approved for Release

Airgas Specialty Gases
Airgas USA LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Part Number:	E03NI59E15A3452	Reference Number:	153-402157382-1
Cylinder Number:	CC420519	Cylinder Volume:	159.0 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72021	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Jul 15, 2021

Expiration Date: Jul 15, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	19.00 %	18.99 %	G1	+/- 0.6% NIST Traceable	07/15/2021
OXYGEN	22.00 %	22.41 %	G1	+/- 0.3% NIST Traceable	07/15/2021
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060802	CC415397	24.04 % CARBON DIOXIDE/NITROGEN	0.6%	Dec 11, 2025
NTRM	12062008	CC367433	22.883 % OXYGEN/NITROGEN	0.2%	May 14, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA-510 SV4MEUTJ CO2	CO2 NDIR (Dixon)	Jun 17, 2021
Horiba MPA-510 W603MM58 O2	O2 Paramagnetic (Mason)	Jul 12, 2021

Triad Data Available Upon Request

Signature on file
Approved for Release

Airgas Specialty Gases
Airgas USA LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: CERTIFIED STANDARD-SPEC

Part Number:	X02NI99C15A1268	Reference Number:	153-402757278-1
Cylinder Number:	ALM007995	Cylinder Volume:	144.0 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
Analysis Date:	Jun 01, 2023	Valve Outlet:	350
Lot Number:	153-402757278-1		

Expiration Date: Jun 01, 2026

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

ANALYTICAL RESULTS

Component	Req Conc	Actual Concentration (Mole %)	Analytical Uncertainty
ETHYLENE	100.0 PPM	100.6 PPM	+/- 2%
NITROGEN	Balance		

Signature on file
Approved for Release

Airgas Specialty Gases
Airgas USA LLC
6141 Easton Road
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: CERTIFIED STANDARD-SPEC

Customer:	MOSTARDI PLATT		
Part Number:	X03NI99C15AC0W8	Reference Number:	160-402841635-1
Cylinder Number:	CC768241	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
Analysis Date:	Sep 11, 2023	Valve Outlet:	350SS
Lot Number:	160-402841635-1		

Expiration Date: Mar 11, 2024

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

ANALYTICAL RESULTS

Component	Req Conc	Actual Concentration (Mole %)	Analytical Uncertainty
SULFUR HEXAFLUORIDE	5.000 PPM	5.001 PPM	+/- 1.3%
HYDROGEN CYANIDE	50.00 PPM	49.55 PPM	+/- 5%
NITROGEN	Balance		

Signature on file
Approved for Release

END OF THE REPORT