DEECO Inc.
3404 Lake Woodard Road
Raleigh, NC 27604
(919) 250-0285 (ph); (919) 250-1835 (Fax) www.deeco.com

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Hydrogen Cyanide, Hydrogen Fluoride and Diatomic Chlorine from a Portland Cement Plant

Buzzi Unicem USA, Inc.
Stockertown PA Facility
Stockertown, PA

AUTHOR: Scott Steinsberger, Ph.D.

TEST DATES: December 19-20, 2023

FIELD TEAM: Dustin Carpenter, Jeremy Rothenberg, and Scott Steinsberger

PREPARED FOR: Buzzi Unicem USA, Inc.
Stockertown PA Facility
501 Center Avenue
Stockertown, PA 18083

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1. INTRODUCTION

The United States Environmental Protection Agency (US EPA) has directed the portland cement industry (SIC 3241) to conduct emissions testing as part of the US EPA Risk and Technology Review (RTR). This document provides the emission test results and supporting quality assurance/quality control (QA/QC) measures used to produce standardized data having known precision and accuracy. Collection of accurate, representative, and standardized data for facilities with low emissions is necessary especially in view of MACT standard setting procedures.

The Stockertown facility operates two dry-process, rotary kilns (Kiln 1 and Kiln 3). Kiln 1 is a Gepol Kiln and Kiln 3 has Preheater/Precalciner (PH/PC). The Kiln 1 and Kiln 3 exhausts are combined into a Common Stack. From the standpoint of emissions generation and release, the Stockertown kilns essentially operate as one. The intention was to conduct testing with both Kiln 1 and Kiln 3 in operation. However, Kiln 1 has been temporarily idle due to market conditions and the testing was conducted with only Kiln 3 in operation. This testing condition was confirmed to be acceptable by Brian Storey of the EPA on a conference call on October 11th, 2023.

The Stockertown facility kiln has a Selective Non-Catalytic Reduction (SNCR) system for NO_x control, a Dry Sorbent Injection (DSI) system for acid gas control, and a bag house for Particulate Matter (PM) removal. The SNCR and DSI systems will be used under normal operating conditions.

A more detailed description of the processes is provided in Section 2 of the RTR Sampling and Analytical Protocol reproduced in Appendix

The Buzzi retained DEECO Inc. (DEECO) to conduct emission tests for hydrogen cyanide (HCN), hydrogen fluoride (HF), and diatomic chlorine (Cl_2). All sampling runs were be one hour long. Concurrent measurements to determine volumetric flow rate were made.

A summary of the test results is shown in Table 1.1.

TABLE 1.1 SUMMARY OF HYDROGEN CYANIDE, HYDROGEN FLUORIDE, AND DIATOMIC CHLORINE EMISSIONS; BUZZI UNICEM USA, INC., STOCKERTOWN PA FACILITY; DECEMBER 19-20, 2023

Test Parameters	Main Stack Raw Mill On	Main Stack Raw Mill Off
Hydrogen Cyanide (FTIR)		
parts-per-million, dry basis corrected to 7% O_2	1.5	2.0
pounds-per-hour	0.50	0.65
pounds-per-ton of clinker	0.007	0.008
Hydrogen Fluoride (FTIR)		
parts-per-million, dry basis corrected to 7% O_2	<0.077	<0.054
pounds-per-hour	<0.020	<0.013
pounds-per-ton of clinker	<0.0003	<0.0002
Hydrogen Fluoride (Method 26A)		
parts-per-million, dry basis corrected to 7% O_2	<0.497	<0.397
pounds-per-hour	<0.128	<0.098
pounds-per-ton of clinker	<0.0017	<0.0013
Diatomic Chlorine (Method 26A)		
parts-per-million, dry basis corrected to 7% O_2	<0.110	<0.082
pounds-per-hour	<0.100	<0.072
pounds-per-ton of clinker	<0.0013	<0.0009

The sampling and analytical procedures followed are summarized in Table 1.2 and discussed in detail in Section 3.

Testing was performed on the main stack under two conditions, Raw Mill On and Raw Mill Off. Three Raw Mill On runs were conducted on December 19, 2023 and three Raw Mill Off runs were conducted on December 20, 2023.

Sampling was conducted by personnel from DEECO, Inc. of Raleigh, North Carolina. All questions regarding sampling and analytical data should be directed to Dr. Scott Steinsberger of DEECO at (800) 733-3261. The field sampling was completed by Dustin Carpenter, Jeremy Rothenberg, and Scott Steinsberger of DEECO.

The remainder of this document summarizes the results, procedures and quality control measures followed for this program. Section 2 contains tabulated air emission results for each parameter of interest. Section 3 summarizes the air emission sampling and analytical procedures performed by DEECO, with a brief description and/or reference to the applicable methodologies. Section 4 discusses the basic quality control elements in place for this program to assure the collection of representative, accurate air emission data.

The appendices provided in this document contain all of the necessary information to verify the reported results. Included as Appendices are: Appendix A - Emission Summary Tables; Appendix B - Field Data and CEM/FTIR Data; Appendix C - Ion Chromatography Analytical Report Data; Appendix D - Plant Process Data; Appendix E - Calibration Documents; Appendix F - Test Participants; Appendix G - RTR Sampling and Analytical Protocol

TABLE 1.2 SUMMARY OF SAMPLING AND ANALYTICAL PROTOCOLS FOR BUZZI UNICEM USA, INC., STOCKERTOWN PA FACILITY

Location and Frequency	Test Parameter	Sampling Method	Sampling Procedure	Analysis Method	Analysis Procedure
Kiln 1 and 3Main Stack	Volumetric Flow Rate and cyclonic check	EPA Methods 1 and 2	Velocity and temperature traverses	EPA Methods 1 and 2	Manometer for differential pressure and thermocouple for temperature
	Oxygen and Carbon Dioxide and Stratification Check	EPA Method 3A	Continuous; extractive sample	EPA Method 3A	Paramagnetic for O_2 and NDIR for CO_2
	Moisture	EPA Method 4	Condensation	EPA Method 4	Gravimetric
	Hydrogen Fluoride and Diatomic Chlorine (Cl_2)	EPA Method 26A	Isokinetic integrated sample	EPA Method 26A	Ion chromatography
	Hydrogen Fluoride and Hydrogen Cyanide	EPA Method 320	Continuous; extractive sample	EPA Method 320	Fourier Transform Infrared (FTIR) Spectroscopy

2. SUMMARY OF RESULTS

Emissions sampling was conducted at Buzzi's Stockertown PA facility. Sampling was conducted for stack gas flow rate (EPA Methods 1 and 2), stack gas oxygen and carbon dioxide (EPA Method 3A), stack gas moisture (EPA Method 4), stack gas hydrogen fluoride and diatomic chlorine (EPA Method 26A) and stack gas hydrogen cyanide and hydrogen fluoride (EPA Method 320).

Testing was conducted on the main stack under two conditions; Raw Mill On and Raw Mill Off and the results are summarized in Tables 2.1 and 2.2, respectively.

TABLE 2.1 BUZZI UNICEM USA, INC., STOCKERTOWN PA FACILITY; KILNS 1 AND 3 MAIN STACK HYDROGEN CYANIDE, HYDROGEN FLUORIDE, AND DIATOMIC CHLORINE EMISSIONS; RAW MILL ON; DECEMBER 19, 2023

Test Parameter	Main Stack Raw Mill On Run 1	Main Stack Raw Mill On Run 2	Main Stack Raw Mill On Run 3	Main Stack Raw Mill On Average
Time	10:02-11:12	11:34-12:43	12:59-14:09	December 19, 2023
Flow Rate (dscfm)	190,500	188,600	191,850	190,317
Oxygen	14.9%	14.8%	14.9%	14.9%
Carbon Dioxide	10.4%	10.4%	10.4%	10.4%
Moisture	4.4%	4.4%	4.5%	4.4%
Hydrogen Cyanide (FTIR)				
ppm_{dry} at 7% O_2	1.5	1.5	1.4	1.5
pounds-per-hour	0.51	0.51	0.49	0.50
pounds-per-ton of clinker	0.007	0.007	0.006	0.007
Hydrogen Fluoride (FTIR)				
ppm_{dry} at 7% O_2	<0.078	<0.076	<0.078	<0.077
pounds-per-hour	<0.020	<0.020	<0.020	<0.020
pounds-per-ton of clinker	<0.0003	<0.0003	<0.0003	<0.0003
Hydrogen Fluoride (Method 26A)				
ppm_{dry} at 7% O_2	<0.475	<0.502	<0.513	<0.497
pounds-per-hour	<0.122	<0.130	<0.133	<0.128
pounds-per-ton of clinker	<0.0016	<0.0017	<0.0017	<0.0017
Diatomic Chlorine (Method 26A)				
ppm_{dry} at 7% O_2	<0.115	<0.106	<0.110	<0.110
pounds-per-hour	<0.104	<0.097	<0.101	<0.100
pounds-per-ton of clinker	<0.0014	<0.0013	<0.0013	<0.0013

TABLE 2.2 BUZZI UNICEM USA, INC., STOCKERTOWN PA FACILITY; KILNS 1 AND 3 MAIN STACK HYDROGEN CYANIDE, HYDROGEN FLUORIDE, AND DIATOMIC CHLORINE EMISSIONS; RAW MILL OFF; DECEMBER 20, 2023

Test Parameter	Main Stack Raw Mill Off Run 1	Main Stack Raw Mill Off Run 2	Main Stack Raw Mill Off Run 3	Main Stack Raw Mill Off Average
Time	08:33-09:43	10:00-11:09	11:25-1235	December 20, 2023
Flow Rate (dscfm)	129,300	126,300	122,700	126,100
Oxygen	12.1%	12.1%	12.2%	12.1%
Carbon Dioxide	14.9%	15.1%	14.9%	15.0%
Moisture	5.9%	5.9%	5.5%	5.8%
Hydrogen Cyanide (FTIR)				
ppm_{dry} at 7% O_2	1.9	2.0	2.0	2.0
pounds-per-hour	0.65	0.67	0.64	0.65
pounds-per-ton of clinker	0.008	0.009	0.008	0.008
Hydrogen Fluoride (FTIR)				
ppm_{dry} at 7% O_2	<0.054	<0.054	<0.054	<0.054
pounds-per-hour	<0.014	<0.013	<0.013	<0.013
pounds-per-ton of clinker	<0.0002	<0.0002	<0.0002	<0.0002
Hydrogen Fluoride (Method 26A)				
ppm_{dry} at 7% O_2	<0.398	<0.386	<0.407	<0.397
pounds-per-hour	<0.102	<0.096	<0.098	<0.098
pounds-per-ton of clinker	<0.0013	<0.0013	<0.0013	<0.0013
Diatomic Chlorine (Method 26A)				
ppm_{dry} at 7% O_2	<0.080	<0.082	<0.083	<0.082
pounds-per-hour	<0.072	<0.073	<0.070	<0.072
pounds-per-ton of clinker	<0.0009	<0.0009	<0.0009	<0.0009

3. SAMPLING AND ANALYTICAL PROCEDURES

Table 1.2 presents a summary of the overall sampling and analytical protocols used for the test program for the main stack at Buzzi's Stockertown PA facility. All sampling and analytical methods employed for this test program were performed in accordance with the procedures outlined in the Reference Test Methods contained in the Code of Federal Regulations, Title 40, Part 60, Appendix A (40 CFR 60, Appendix A) and 40 CFR 63, Appendix A.

3.1 Sampling Point Determination - EPA Method 1

The measurement site for the Kiln 1 and 3 Main stack is located in a vertically-oriented round duct. The duct has an inside diameter of 131". The nearest upstream disturbance is a duct breaching (from the ID fan) located about 121 feet (~11 diameters) from the sampling ports. The nearest downstream disturbance is the stack outlet at about 94 feet (~8.5 diameters) from the sampling ports. This sampling location meets the minimum requirements specified by EPA Method 1. Four (4) test ports are located at equidistant positions (every 90°) around the duct. The number and location of the sampling or traverse points were determined according to the procedures outlined in EPA Method 1. The traverse point locations are provided in Appendix B. All points were at least 1.0 inches from the stack wall, per Method 1.

The sampling location met the minimum specifications for selection of a measurement site as outlined in EPA Method 1. Cyclonic flow checks, as described in EPA Method 1 Section 2.4, using the Type-S pitot null procedure and angle measurements at the stack test location were conducted.

A twelve (12) point sampling traverse were made using 3 points in each of 4 sampling ports at the main stack. Each traverse was made at each sampling location using a type-S pitot tube in accordance with EPA Methods 2 procedures. The traverse point locations are provided in Appendix B. Gas temperatures were measured using calibrated Type K thermocouples and digital readout devices. All measurements were performed in accordance with the procedures in EPA Methods 2, and 26A.

A schematic of the main stack is provided in Figure 3-1.

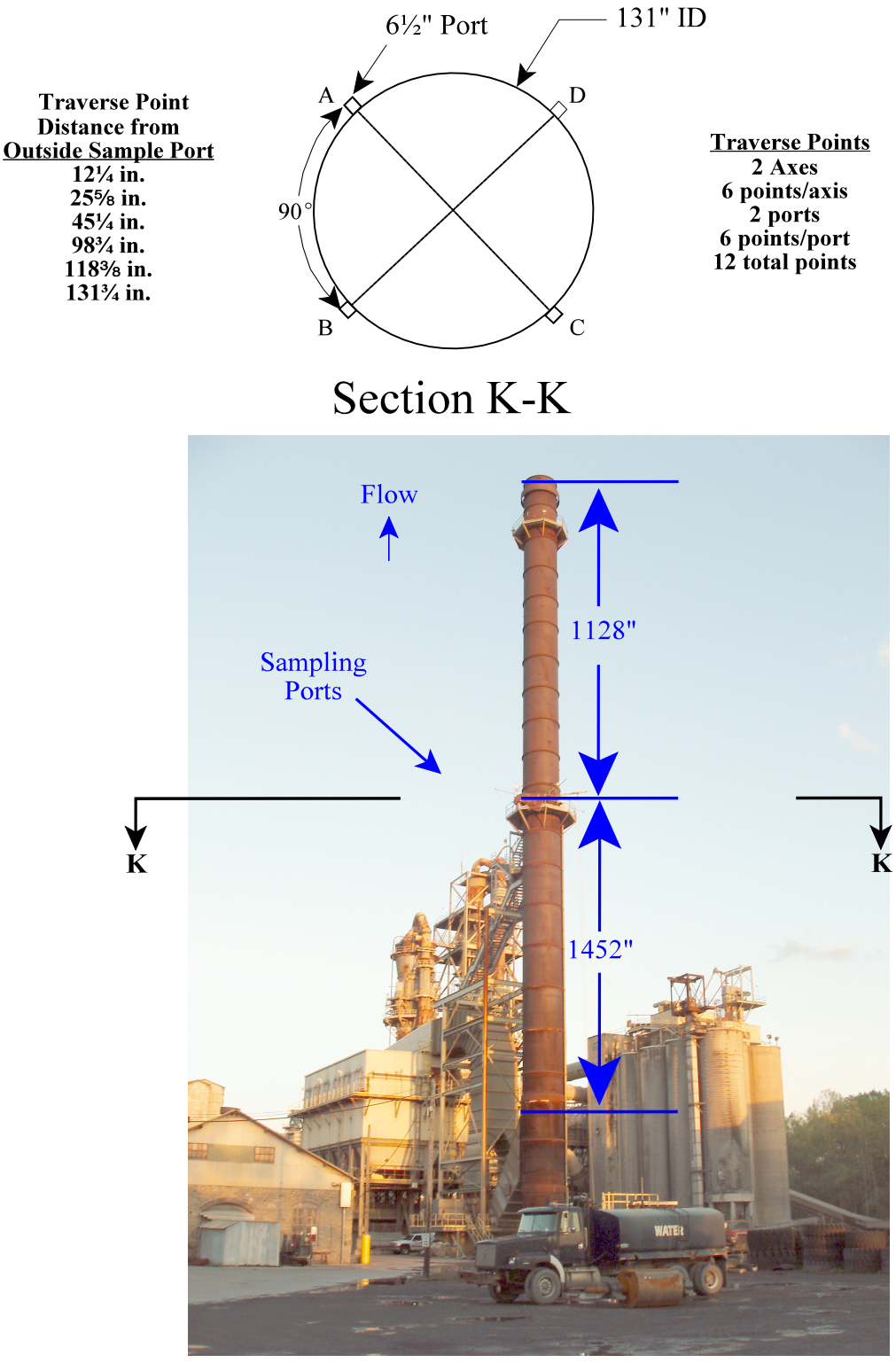


Figure 3.1 Schematic of the Kiln 1 and 3 Main Stack Sampling Location

3.2 Flue Gas Velocity and Volumetric Flow Rate - EPA Method 2

The flue gas velocity and volumetric flow rate were determined according to the procedures outlined in EPA Method 2. Velocity measurements were using type S pitot tubes conforming to the calibration specifications outlined in EPA Method 2, Section 10.1. Each Type-S pitot tube, calibrated according to these standards, had an assigned coefficient. Differential pressures were measured with fluid manometers. Effluent gas temperatures were measured with chromel-alumel thermocouples equipped with digital readouts.

3.3 Outlet Flue Gas Composition - EPA Method 3A

Outlet flue gas analysis for oxygen (O_2) and carbon dioxide (CO_2) concentrations, and the calculation of percent excess air and flue gas dry molecular weight was performed in accordance with EPA Method 3A.

To evaluate the sampling location and points for FTIR and O_2 sampling, a three-point O_2 concentration stratification test on a line passing through the centroidal area at (for stacks is greater than 2.4 meters) at 0.4, 1.2 and 2.0 meters from the stack or duct wall. The procedures in Section 8.1.2 of Method 7E were followed, but oxygen will be used as parameter as allowed by fourth sentence in Section 8.1.2. The plant O_2 CEMS was used as a control. A criteria of <5% variation from combined mean for each point was used as indication of non-stratification to allow single point sampling at the point closest to the mean.

Per EPA Method 3A for determining molecular weight, continuous extractive sampling will be obtain using the Method 320 sampling system described in Section 3.6.

A portion of the hot , wet gas sample was sent through a condensing system to remove the stack moisture. A portion of the moisture-free gas sample was sent to an O_2/CO_2 analyzer.

Calibration procedures were be performed in accordance with EPA methodology. Analyzers were calibrated before and after each test and a calibration check between each test run.

The pretest calibrations consisted of the following steps:

- Internal (direct) calibration of each analyzer to adjust calibration and check linearity.
- External (through the entire sampling system) calibration to check the system bias on zero and span gases.

The post test calibration consisted of an external system bias calibration check.

The analyzer calibrated using a certified zero and span (mid or high range) gas. Zero and span gases were directed to each analyzer through the appropriate plumbing, the calibration gas flow rates were adjusted to the correct flow rate and the analyzer was adjusted with the appropriate span pot.

After the analyzer was properly adjusted the linearity was checked using a low and high range

calibration gas. The maximum allowable limit for linearity is 2% of the analyzer range and all analyzers were shown to be linear within these limits before proceding..

The external calibration bias check were performed by placing the CEM system in sampling mode and injecting a zero and span gas into the sample line at the probe exit. This check showed if there is any sampling system related bias, and also checks the integrity of the sample line.

3.3.1 Calibration Gases

DEECO useed EPA Protocol and/or ±2% NIST Traceable gases for calibration as required by the various reference methods employed in this test program. Calibration gases were selected from previous experience with similar sources and/or from information obtained from the facility engineer prior to sampling. In some cases if the gases that are selected are out of the optimum range of operation then no significant impact of data quality is expected due to the linear nature of the analyzers that were used.

No audit gases from a federal or a state agency were provided.

3.3.2 Sampling Procedures

At the completion of the pretest calibration routine, the CEM system was ready for operation. No further adjustments of sample flow rates, analyzer zero or span adjustments, or other critical CEM operating parameters were made until testing and post test calibration were complete.

Each sampling run was one hour. At the completion for each test run, calibration gases were used to check between test runs. A zero and the upscale calibration gas closest to the actual emission concentrations were used for the pretest and post test calibrations.

3.4 Flue Gas Moisture Content - EPA Method 4

The flue gas moisture content was determined in conjunction with the EPA Method 26A trains according to the sampling and analytical procedures outlined in EPA Method 4. (**NOTE:** In order to maintain isokinetic sampling, the sampling rate used may have been required to temporarily exceed the EPA Method 4-specified maximum sampling rate of 0.75 CFM, based on observed stack gas pitot readings.) The impingers were connected in series and contained reagents as described below. The impingers were contained in an ice bath in order to assure condensation of the moisture in the flue gas stream. Any moisture that is not condensed in the impingers was captured in the silica gel, therefore all moisture was weighed and entered into moisture content calculations.

3.5 Hydrogen Fluoride and Diatomic Chlorine - EPA Method 26A

Sampling and analytical procedures were those outlined in EPA Method 26A to determine primarily diatomic chlorine (Cl_2) emissions and hydrogen fluoride (HF) emissions at main stack outlet sampling locations. Duplicate simultaneous trains (a.k.a "paired trains") for each test run were used to determine precision.

Sample was collected through a heated glass probe, followed by a heated Teflon filter, where stack gas HF and Cl_2 were collected in a series of chilled impingers. The sampling train impingers contained 100 ml of 0.1N sulfuric acid in the first and second, an empty third impinger, 100 ml of 0.1N NaOH in the fourth and fifth and 200 grams of silica gel in the last impinger

Sampling was conducted isokinetically (±10%) with readings of flue gas parameters recorded at traverse points selected according to EPA Method 1. Leak-checks on the Method 26A sampling train were performed before and after each sampling run and optionally for any port change. The sampling train leak-checks and leakage rate (where applicable) were documented on the field test data sheet for each respective run. All leak checks were acceptable.

The glass button hook nozzle and probe liner was constructed of borosilicate glass. The filter holder will be constructed of borosilicate glass with a Teflon frit filter support and a sealing gasket. A PTFE-bonded glass fiber filter was used. The probe and filter housing were heated to above 248 °F and not exceed an upper boundary of 273 °F. Probe liners and filter holders were cleaned thoroughly prior to testing.

The Method 26A trains was operated isokinetically for a minimum of 60 minutes and collected a minimum of 1 dry, standard cubic meter (DSCM). Pretest preparations, preliminary determinations, and leak check procedures were those outlined in EPA Method 5.

After completion of sampling the train was leak checked and transferred to the sample recovery trailer. All leak checks were acceptable. The impingers were weighed to determine moisture gain in accordance with EPA Method 4.

Sample recovery involved quantitative recovery of the sulfuric acid impinger contents and the NaOH impinger contents into separate tare-weighed, precleaned polyethylene sample containers.

The nozzle, probe, filter and filter housing were not recovered.

The contents of sulfuric acid impingers, including the contents if any of the empty (2^{nd} knockout or third) impinger were quantitatively transferred to the tare-weighed, precleaned polyethylene sample container, followed by three rinses with deionized (DI) water of the impingers and all connecting glassware (including the connecting glassware to the first impinger) placed in the same H_2SO_4 container. The container was labeled and weighed to determine the final sample volume.

The contents NaOH impingers were quantitatively transferred to a second tare-weighed, precleaned polyethylene sample container, followed by three rinses with DI water of the impingers and all connecting glassware placed in the same NaOH container. The container was labeled and weighed to determine the final sample volume.

Sample recovery from each train included:

1. Container No. 1 - Contents of H_2SO_4 impingers and knockout impinger and, and DI rinse of impingers and connecting glassware; and
2. Container No. 2 - Contents NaOH impingers, and DI rinse of impingers and connecting glassware.

Additional quality control consisted of collecting and analyzing a field blank train for every three test runs. The blank train was assembled from a used train, leak checked and sat for a period equal to the sampling time (i.e, 1-hr). The blank train data was to be used to determine the method detection limit for the test program target analytes (ie. The lowest number that could be detected), and compared to stack emissions.

Reagent blanks of 0.1 N H_2SO_4, 0.1N NaOH, and DI water were collected and archived for later analysis should there be any issues with the field blank train samples

The H_2SO_4 impinger solutions were analyzed using ion chromatography techniques for fluoride ions (F^-) (EPA SW-9057). Duplicate analyses performed on the samples and field blanks. Precision was demonstrated by duplicate injection of each sample, the results of each individual analysis being within 5% of their mean to be acceptable.

The NaOH impinger solutions was treated with sodium thiosulfate to ensure complete conversion of hypochlorous acid (HClO) to chloride ions (Cl^-). The resulting solution was analyzed using ion chromatography techniques for chloride ions (EPA SW-9057). Duplicate analyses was performed on the samples and field blanks. Precision was demonstrated by duplicate injection of each sample, the results of each individual analysis being within 5% of their mean to be acceptable

All EPA Method 26A HF/Cl_2 samples were analyzed by Element One of Wilmington NC. Refer to Section 1, Figure 1.1 of the RTR Sampling and Analytical Protocol for contact information.

For this test program, the relative deviation (RD) was to be calculated as described in EPA Method 30B between the Cl_2 concentrations measured with the paired trains. A criteria of a less than 10% relative deviation or 0.2 ppm absolute difference was required.

The absolute differences between the Cl_2 concentrations measured with the paired trains is summarized in Table 3.1. For each paired run, Cl_2 concentrations met the 0.2 ppm absolute difference criteria.

TABLE 3.1 PAIRED METHOD 26A SAMPLING TRAIN DIATOMIC CHLORINE CONCENTRATION COMPARISON RESULTS FOR THE KILN 1 AND 3 MAIN STACK; DECEMBER 19 AND 20, 2023

Run	Time	Train A Diatomic Chlorine Concentration (ppm,dry)	Train B Diatomic Chlorine Concentration (ppm,dry)	Absolute Difference (ppm,dry)
December 19, 2023; Kiln 1 and 3 Main Stack; Raw Mill On				
Run 1	10:02-11:12	<0.052	<0.047	0.005
Run 2	11:34-12:43	<0.048	<0.045	0.003
Run 3	12:59-14:09	<0.049	<0.045	0.004
December 20, 2023; Kiln 1 and 3 Main Stack; Raw Mill Off				
Run 1	08:33-09:43	<0.051	<0.050	0.001
Run 2	10:00-11:09	<0.054	<0.050	0.004
Run 3	11:25-12:35	<0.052	<0.052	0.000

3.6 Hydrogen Cyanide and Hydrogen Fluoride - EPA Method 320

EPA Method 320 was performed to determine emissions of concentrations of HCN and HF. Three, 1-hour sampling runs were conducted under each representative process and control system operating conditions.

The gas sample was extracted from the stack through a glass-lined probe and filter heated to 375° F. For external calibration checks and analyte spikes, the gases were introduced in front of the heated filter. Any excess calibration gas was diverted through the sample probes into the source. Outflow of gas from the heated filter enclosure was transported through a Teflon sample line heated to 375° F. For these sources approximately 300' of sample line was required. The heated sample line was connected directly to the FTIR sample cell. Using heat-traced Teflon tubing the exit of the FTIR cell was connected to a sample pump with a heated stainless steel pump head. The pump discharge was directed to a proprietary chiller-type gas conditioner to remove moisture prior to delivery sample gas to the O_2/CO_2 monitor.

The distribution of the gas sample to the monitors was accomplished using a panel equipped with valves and rotometers. The gas sample was then divided and directed to the O_2/CO_2 analyzer.

FTIR sample cell was maintained at 191°C and connected to a MKS Instruments Multigas 2030 Fourier Transform Infrared Spectrometer and Detector.

The FTIR spectrometer measured vapor phase organic or inorganic compounds which absorb energy in the mid-infrared spectral region, about 400 to 4000 cm^{-1} (25 to 2.5 μm). Continuous measurement were made by matching sample absorbance bands with bands in reference spectra, and comparing sample band intensities with reference band intensities.

The principle limitation to FTIR spectroscopy are the presence of interfering compounds that also absorb energy in the mid-infrared spectral region. In a cement kiln stack gas matrix, water vapor (H_2O) and carbon dioxide (CO_2) are the primary interferents that must be incorporated into the identification and quantitation method.

The FTIR software performs the computation for a single compound by subtracting all the other compounds (interferants and target) from the absorbance spectra and quantifies the single compound based on the remain absorbance. The FTIR software provides a Standard Error Calculation (SEC) value that is an indication of how well the identification and quantitation has been performed. A high SEC indicates that other interferants have not been accounted for in the analysis method, and a low SEC is indicative of greater confidence measurement.

The instrument is operated with a resolution of 0.5 cm^{-1} with 4x zero filling. Beer-Norton Medium apodization is used with amplitude phase correction.

For this RTR test program, following specific QA/QC activities for EPA Method 320 were performed and are summarized in Table 3.2

3.6.1 Laboratory QA/QC Activities Before Field Test Program

Before field testing occurs, the following QA/QC activities were conducted;

1) Seven consecutive samples of dry nitrogen through the sampling system was acquired and used to calculate the standard deviation for each of the test program target analytes multiplied by a factor of 3. These data were considered representative of detection limits (DL) for this test program and were below the 0.5 ppm required DL for both HCN and HF;

2) From these seven dry nitrogen samples, the results for the Signal-to-Noise Ratio (SNR) @ 2500 cm^{-1} was >2500, at 64 scans and the results for single beam intensity @ 2500 cm^{-1} was >0.9; and

3) The HCN calibration gases was analyzed directly and the FTIR responses agreed with tag value within 5%

3.6.2 QA/QCActivities During Field Test Program

During the field test program, following QA/QC activities were be performed and criterium met;

1) On each test day prior to any testing, an instrument background was collected using dry nitrogen directed to the gas cell. The background was collected with at least 128 scans;
2) The probe, filter, sample line and all sample system components in contact with effluent were be maintained at or above 375ºF or 191ºC (consistent with FTIR calibration temperature) to avoid any possible "cold spots;"
3) A system zero with all sampling system components at operating temperature was performed by injecting nitrogen at the sample probe and through sample filter and entire measurement system. After zero equilibration was been achieved, all measurement components will be quantified for at least 128 scans;
4) The sample probe was position at effluent measurement point and sampling was continue until equilibration of the measurement system has been achieved. At this point, the effluent concentrations was quantified with two consecutive 64-scan samples as the initial native concentration for the dynamic spike;
5) Analyte spiking was conducted for HCN before the first test run, and after each successive test run for a minimum of 4 spikes per test condition. These results will be used to determine accuracy and are summarized in Table 3.3;
6) The spike gas injections was maintained at 10% or less of total sample volume. The spike gas concentration and flow rate was be selected to approximately double the native effluent concentration. Spike recovery results were within ±20% of the expected value. An SF_6 tracer was used to calculate the exact spike gas dilution ratio of 10% or less;
7) After the dynamic spike, nitrogen was sent through the sampling system until all traces of spike gas are removed and lines are proven below DL for target analytes;

TABLE 3.2 FTIR PRETEST AND FIELD TEST QA/QC SUMMARY

Spectrum	HCN	SF6	HF	SNR 2500	sBeam @2500
Seven consecutive samples of dry nitrogen for detection limit					
SPC__000837.LAB	-0.051		-0.002	6223.51	1.42
SPC__000838.LAB	-0.032		-0.000	5809.30	1.42
SPC__000839.LAB	0.046		-0.017	3759.60	1.42
SPC__000840.LAB	-0.011		0.016	4373.66	1.42
SPC__000841.LAB	0.080		0.002	5347.95	1.42
SPC__000842.LAB	0.059		-0.012	5012.46	1.42
SPC__000843.LAB	-0.029		-0.006	4706.13	1.42
Standard Deviation X 3	**0.156**		**0.032**		
Averages				**5033.23**	**1.42**
HCN Standard (CC768222; 49.9 ppm HCN/5.0 ppm SF6)					
SPC__155614.LAB	48.14	4.79			
SPC__155615.LAB	48.31	4.76			
Averages	**48.23**	**4.78**			
Residuals for Post HCN analyte spike native scans					
SPC_155662.LAB					
Concentration	0.72		0.00		
MDC3	0.11		0.20		
MDC3%	NA		NA		
SPC_155663LAB					
Concentration	0.68		-0.01		
MDC3	0.11		0.21		
MDC3%	NA		NA		
Final SNR @ 2500 cm^{-1} and single beam intensity @ 2500 cm^{-1}					
SPC__156299.LAB				3014.2	1.26

8) The nitrogen purge was discontinued and the sampling system was allowed to equilibrate with stack gas before starting a test run. The first two consecutive 64-scan samples of a sample run was used for the final native concentration. Residual results for HCN and HF were verified to be less than 0.2-0.3 ppm for data acceptance, or less than 5% of the measured value, whichever was least restrictive.

9) The final SNR @ 2500 cm^{-1}, at 64 scans, and the results for single beam intensity @ 2500 cm^{-1} were verified to met the >2500 and >0.9 criterium; respectively.

TABLE 3.3 ETHYLENE CALIBRATION TRANSFER STANDARD (CTS) AND HYDROGEN CYANIDE ANALYTE SPIKING TEST RESULTS FOR THE KILN MAIN STACK; DECEMBER 19-20, 2023

Run	Time	Average Native Hydrogen Cyanide Concentration (ppm,wet)	Spike plus Average Hydrogen Cyanide Native Concentration (ppm,wet)	Hydrogen Cyanide Spike Recovery	CTS Error
December 19, 2023; Main Stack Raw Mill On					
Pre Run 1	08:08-08:26	0.59	1.68	101.7%	-3.6%
Post Run 1	11:03-11:18	0.65	1.50	88.6%	
Post Run 2	12:31-12:51	0.55	1.59	101.1%	
Post Run 3	14:00-14:27	0.52	1.59	92.8%	-2.9%
December 20, 2023; Main Stack Raw Mill Off					
Pre Run 1	08:02-08:16	1.08	3.72	92.5%	-3.3%
Post Run 1	09:31-09:46	1.30	3.65	86.0%	
Post Run 2	10.56-11:12	1.35	4.15	95.0%	
Post Run 3	12:23-12:43	1.19	4.02	102.4%	-3.3%

4. QA/QC PROCEDURES AND RESULTS

The objective of a quality assurance/quality control (QA/QC) program is to assure that the precision and accuracy of all environmental data generated by DEECO for clients are commensurate with data quality objectives (DQO's). DQO's are based on a common understanding of the intended end use(s) of the data, the measurement process, and the availability of resources. Once DQO's are established, formally or informally, QC protocol can be defined for the measurements.

In this project, the final data user will be Buzzi Unicem. The data quality objectives in this project are to generate scientifically sound data to be used for compliance purposes.

4.1 Sampling Equipment

All of the sampling equipment used was calibrated according to the procedures outlined in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, EPA-600/4-77-027b.

4.1.1 Manual Sampling Equipment Calibrations

For sampling Methods 1, 2, and 4 the procedures and equipment used to measure stack gas velocity and temperature measurements and the metering system used to maintain constant rate sampling conditions and to determine the sample gas volume were subjected to pretest and posttest calibrations and/or inspections as required by the appropriate EPA methods.

Barometer - Barometric pressure values were obtained from a calibrated barometer, verified by phone call to a local airport, and corrected for elevation to sample port level (0.01 inches Hg per 10 ft. elevation).

Pitot Tubes - Each pitot tube used in sampling meets the design specifications for type-S pitot tubes in EPA Method 2. Therefore, a maximum value baseline coefficient (C_p) of 0.84 is assigned to each pitot tube. Calibration by the manufacturer for pitot face-opening alignment included measuring the external tubing diameter (dimension D_t), the base-to-opening plane distance (dimensions P_a and P_b), and the face opening misalignment angles, with all terms as described in EPA Method 2. Pitot tubes were visually inspected for structural integrity at the completion of each test. Inspection sheets for pitot tubes are included in Appendix E.

Calibration Meter and Metering System - The secondary reference meter equipment arrangement for calibration is shown in Figure 5.7 of EPA Method 5. The prescribed procedures were followed. A wet test meter with a 1 ft^3/rev capacity and $\pm$ 1 percent accuracy is used as the primary calibrant. The dry gas meter's pump is run for a minimum of 5 minutes at a flow rate of 0.35 cfm to condition the interior surface of the wet test meter. Leak checks are performed and if satisfactory, triplicate runs at each of no less than five different flow rates are done. A calibration curve is prepared and the meter is recalibrated after 200 hours of operation or annually, whichever comes first.

The calibration set-up for the dry gas metering system using the secondary reference meter in lieu of the wet test meter is given in Figure 5.5 of EPA Method 5. A leak check of the metering system before calibration was performed as shown in Figure 5.4 of EPA Method 5. The metering systems's pump is operated for 5 minutes at an orifice manometer setting of 0.5 inches H_20 to heat up the pump and system to stabilize the meter inlet and outlet temperatures. Values for the orifice setting (delta H), wet test meter volume (V_w), corresponding dry test meter volume (V_d), dry test meter inlet and outlet gas temperatures (t_{di} and t_{dn}), and time are recorded for the initial calibration. Then the ratio of the wet test meter to the dry test meter (gamma) and the orifice pressure differential that equates to 0.75 cfm at standard conditions (delta H@) are calculated.

A post-test meter calibration was made on the dry gas meter used during the test to check its accuracy against the pre-test calibration. This was performed following EPA Method 5, Section 16.3 or a post-test calibration check was made using the average orifice setting obtained during each test run and setting the vacuum at the maximum value obtained during each test run. These test runs were made against DEECO's secondary reference dry gas meter which was calibrated against a wet test meter. The calibration data sheets for the dry gas meters are included in Appendix E.

Thermocouples and Digital Indicators - Thermocouples were calibrated by comparing them against an ASTM-3F mercury-in-glass thermometer at approximately 32°F (ice water), ambient temperature, and at approximately 220°F. Each thermocouple was calibrated against temperature ranges to which it is typically exposed during test conditions, and they agreed within 1.5 percent (expressed in °R) of the reference thermometer throughout the entire calibration range. Also, thermocouples were checked at ambient temperature at the test site to verify calibration. The calibration data sheets for the thermocouples are included in Appendix E.

Pretest and Posttest Leak Checks of Sampling Trains - Each Method 4 sampling train was subjected to pretest leak checks and posttest leak checks. For all sampling runs the posttest leak checks were acceptable (less than 4% of the sampling rate at the highest vacuum recorded during the test run).

4.2 Analytical QA/QC Results

Analytical measurements of precision and accuracy were made on stack gas samples, and are summarized in a separate report.

Appendix A

Emission Summary Tables

Company: **Buzzi Unicem; Stockertown PA**
Source: **Kilns 1 and 3 Main Stack; Raw Mill On**
Job ID: **23-3317**
Train Type: **M26A**

	1A 12/19/23 1002-1112	1B 12/19/23 1002-1112	2A 12/19/23 1134-1243	2B 12/19/23 1134-1243	3A 12/19/23 1259-1409	3B 12/19/23 1259-1409	Average
Initial Meter Volume, ft^3	726.606	931.085	771.623	977.115	816.374	23.260	
Final Meter Volume, ft^3	771.411	976.971	816.169	1023.049	861.315	71.047	
Intra-Port Leak Check Volume, ft^3	0.000	0.000	0.000	0.000	0.000	0.000	
Total Sample Volume, cf	**44.805**	**45.886**	**44.546**	**45.934**	**44.941**	**47.787**	**45.650**
DGM Calibration Factor	1.006	0.988	1.006	0.988	1.006	0.988	0.997
Average DGM Temp, F	62.8	59.7	62.8	61.9	63.3	62.3	62.1
Average DGM delta H, "H2O	1.78	1.62	1.76	1.59	1.81	1.64	1.70
Barometric Pressure, "Hg	29.20	29.20	29.20	29.20	29.20	29.20	29.20
Corrected Sample Vol,dscf	**44.608**	**45.116**	**44.348**	**44.970**	**44.704**	**46.754**	**45.083**
Corrected Sample Vol,dscm	**1.263**	**1.278**	**1.256**	**1.273**	**1.266**	**1.324**	**1.277**
Oxygen, %	14.9	14.9	14.8	14.8	14.9	14.9	14.9
Carbon Dioxide, %	10.4	10.4	10.4	10.4	10.4	10.4	10.4
Nitrogen, %	74.7	74.7	74.8	74.8	74.7	74.7	74.7
Stack Gas Excess Air, %	309.1	309.1	299.2	299.2	309.1	309.1	305.8
Total Moisture Catch Weight, grams	43.8	43.6	41.8	46.4	41.8	49.5	45.9
Stack Gas Moisture, %	**4.4**	**4.4**	**4.2**	**4.6**	**4.2**	**4.7**	**4.4**
Stack Gas Dry Molecular Weight, lb/lbmole	30.26	30.26	30.26	30.26	30.26	30.26	30.26
Stack Gas Wet Molecular Weight, lb/lbmole	29.72	29.72	29.74	29.69	29.75	29.68	29.72
Average Stack Temp, F	264.2	264.2	261.7	261.7	261.3	261.3	262.4
Stack Static (Gauge) Pressure, "H2O	-0.65	-0.65	-0.65	-0.65	-0.65	-0.65	-0.65
Stack Gas Actual Pressure, "Hg	29.15	29.15	29.15	29.15	29.15	29.15	29.15
Average Sqrt delta P	0.752	0.752	0.743	0.743	0.756	0.756	0.750
Pitot Tube Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Stack Gas Velocity, ft/second	**49.96**	**49.96**	**49.26**	**49.30**	**50.10**	**50.16**	**49.79**
Nozzle Inside Diameter, inches	0.260	0.260	0.260	0.260	0.260	0.260	
Total Sample Time, min	60	60	60	60	60	60	60
Isokinetic Rate, %	**99.1**	**100.2**	**99.4**	**101.1**	**98.5**	**103.4**	**100.3**
Stack Dimensions	131 in. ID	131 in. ID	131 in. ID	131 in. ID	131 in. ID	131 in. ID	
Stack Area, sq ft	93.60	93.60	93.60	93.60	93.60	93.60	93.60
Stack Gas Flow Rate, acfm	**280,600**	**280,600**	**276,600**	**276,900**	**281,400**	**281,700**	**279,633**
Stack Gas Flow Rate, acmm	7,946	7,946	7,832	7,841	7,968	7,977	7,918
Stack Gas Flow Rate, dscfm	**190,500**	**190,500**	**188,900**	**188,300**	**192,200**	**191,500**	**190,317**
Stack Gas Flow Rate, dscmm	5,394	5,394	5,349	5,332	5,443	5,423	5,389

Company: Buzzi Unicem; Stockertown PA
Source: Kilns 1 and 3 Main Stack; Raw Mill On
Job ID: 23-3317
Train Type: M26A

"ND()" denotes values below detection limits
Note: Average EXCLUDES Non-detect runs' results

		1A 12/19/23 1002-1112	1B 12/19/23 1002-1112	2A 12/19/23 1134-1243	2B 12/19/23 1134-1243	3A 12/19/23 1259-1409	3B 12/19/23 1259-1409	Average
Hydrogen Fluoride	Catch Wt, mg	ND(0.223)	ND(0.21)	ND(0.227)	ND(0.236)	ND(0.23)	)(0.247)	ID(0.229)
	Conc., mg/dscm	ND(0.177)	ND(0.164)	ND(0.181)	ND(0.185)	ND(0.182)	)(0.187)	ID(0.179)
	Conc., mg/dscm @7% O2	ND(0.409)	ND(0.381)	ND(0.412)	ND(0.422)	ND(0.421)	)(0.432)	ID(0.413)
	Conc., mg/dscm @12% CO2	ND(0.204)	ND(0.190)	ND(0.209)	ND(0.214)	ND(0.210)	)(0.215)	ID(0.207)
	Conc., ppmvd	ND(0.212)	ND(0.198)	ND(0.217)	ND(0.223)	ND(0.218)	)(0.224)	ID(0.215)
	Conc., ppmvd @7% O2	ND(0.492)	ND(0.458)	ND(0.495)	ND(0.508)	ND(0.506)	)(0.520)	ID(0.496)
	Conc., ppmvd @12% CO2	ND(0.245)	ND(0.228)	ND(0.251)	ND(0.257)	ND(0.252)	)(0.259)	ID(0.249)
	Emission Rate, lb/hr	ND(0.126)	ND(0.117)	ND(0.128)	ND(0.131)	ND(0.131)	)(0.134)	ID(0.128)
	Clinker Rates (tph and lbs/ton)	76.82	ND(0.0016)	76.85	ND(0.0017)	76.88	ND(0.0017)	ID(0.0017)
Chlorine	Catch Wt, mg	ND(0.193)	ND(0.177)	ND(0.176)	ND(0.17)	ND(0.184)	)(0.177)	ID(0.180)
	Conc., mg/dscm	ND(0.153)	ND(0.138)	ND(0.140)	ND(0.134)	ND(0.145)	)(0.134)	ID(0.141)
	Conc., mg/dscm @7% O2	ND(0.354)	ND(0.321)	ND(0.319)	ND(0.304)	ND(0.337)	)(0.310)	ID(0.324)
	Conc., mg/dscm @12% CO2	ND(0.176)	ND(0.160)	ND(0.162)	ND(0.154)	ND(0.168)	)(0.154)	ID(0.162)
	Conc., ppmvd	ND(0.052)	ND(0.047)	ND(0.048)	ND(0.045)	ND(0.049)	)(0.045)	ID(0.048)
	Absolute Difference, ppmvd (<0.2 required)		0.005		0.002		0.004	
	Conc., ppmvd @7% O2	ND(0.120)	ND(0.109)	ND(0.108)	ND(0.103)	ND(0.114)	)(0.105)	ID(0.110)
	Conc., ppmvd @12% CO2	ND(0.060)	ND(0.054)	ND(0.055)	ND(0.052)	ND(0.057)	)(0.052)	ID(0.055)
	Emission Rate, lb/hr	ND(0.109)	ND(0.099)	ND(0.099)	ND(0.094)	ND(0.105)	)(0.096)	ID(0.100)
	Clinker Rates (tph and lbs/ton)	76.82	ND(0.0014)	76.85	ND(0.0013)	76.88	ND(0.0013)	ID(0.0013)

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
MIII On Run 1

Spectrum	Date	Time	HCN PCA 191c R1 191c		HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C	H2O% (40) 191C	CO2% (40) 191C span
SPC__155753.LAB	12/19/23	10:02:42.884	0.623		-0.081	-0.003	0.161	4.114	10.469
SPC__155754.LAB	12/19/23	10:03:46.972	0.729		-0.078	-0.002	0.270	4.156	10.640
SPC__155755.LAB	12/19/23	10:04:50.687	0.656		-0.071	-0.000	0.201	4.170	10.549
SPC__155756.LAB	12/19/23	10:05:54.662	0.572		-0.074	-0.002	0.177	4.094	10.344
SPC__155757.LAB	12/19/23	10:06:58.526	0.453		-0.074	-0.001	0.235	4.050	10.391
SPC__155758.LAB	12/19/23	10:08:02.428	0.745		-0.085	-0.001	0.231	4.099	10.583
SPC__155759.LAB	12/19/23	10:09:06.376	0.536		-0.074	-0.001	0.197	4.140	10.529
SPC__155760.LAB	12/19/23	10:10:10.375	0.754		-0.075	-0.003	0.199	4.132	10.498
SPC__155761.LAB	12/19/23	10:11:14.217	0.666		-0.078	-0.000	0.220	4.160	10.453
SPC__155762.LAB	12/19/23	10:12:17.991	0.647		-0.059	-0.001	0.234	4.210	10.470
SPC__155763.LAB	12/19/23	10:13:21.960	0.582		-0.075	-0.001	0.167	4.174	10.487
SPC__155764.LAB	12/19/23	10:14:25.793	0.643		-0.084	-0.004	0.227	4.165	10.622
SPC__155765.LAB	12/19/23	10:15:29.696	0.628		-0.068	-0.001	0.190	4.091	10.588
SPC__155766.LAB	12/19/23	10:16:33.599	0.660		-0.075	-0.001	0.199	4.107	10.630
SPC__155767.LAB	12/19/23	10:17:37.622	0.496		-0.073	-0.001	0.249	4.147	10.412
SPC__155768.LAB	12/19/23	10:18:41.580	0.536		-0.072	-0.000	0.243	4.198	10.410
SPC__155769.LAB	12/19/23	10:19:45.665	0.464		-0.076	-0.003	0.220	4.262	10.771
SPC__155770.LAB	12/19/23	10:20:49.239	0.610		-0.082	-0.003	0.251	4.261	10.875
SPC__155771.LAB	12/19/23	10:21:53.282	0.421		-0.076	0.001	0.239	4.151	10.524
SPC__155772.LAB	12/19/23	10:22:57.003	0.512		-0.064	0.001	0.208	4.141	10.521
SPC__155773.LAB	12/19/23	10:24:00.940	0.629		-0.075	-0.004	0.181	4.152	10.649
SPC__155774.LAB	12/19/23	10:25:04.840	0.629		-0.066	0.001	0.248	4.143	10.526
SPC__155775.LAB	12/19/23	10:26:08.739	0.670		-0.078	-0.002	0.216	4.090	10.387
SPC__155776.LAB	12/19/23	10:27:12.643	0.531		-0.068	-0.002	0.238	4.092	10.417
SPC__155777.LAB	12/19/23	10:28:16.614	0.723		-0.075	-0.002	0.238	4.091	10.482
SPC__155778.LAB	12/19/23	10:29:20.414	0.519		-0.066	-0.002	0.250	4.084	10.524
SPC__155779.LAB	12/19/23	10:30:24.310	0.579		-0.064	-0.001	0.197	4.103	10.675
SPC__155780.LAB	12/19/23	10:31:28.209	0.589		-0.063	0.001	0.225	4.058	10.603
SPC__155781.LAB	12/19/23	10:32:32.294	0.539		-0.080	0.001	0.222	4.036	10.354
SPC__155782.LAB	12/19/23	10:33:36.007	0.605		-0.077	-0.002	0.189	4.166	10.608
SPC__155783.LAB	12/19/23	10:34:39.907	0.767		-0.028	-0.003	0.252	4.217	10.797
SPC__155784.LAB	12/19/23	10:35:43.813	0.564		-0.020	-0.002	0.227	4.197	10.728
SPC__155785.LAB	12/19/23	10:36:47.709	0.952		-0.039	-0.003	0.189	4.260	10.692
SPC__155786.LAB	12/19/23	10:37:51.610	0.655		-0.062	-0.001	0.202	4.202	10.514
SPC__155787.LAB	12/19/23	10:38:55.547	0.426		-0.071	-0.001	0.242	4.140	10.435
SPC__155788.LAB	12/19/23	10:39:59.450	0.647		-0.064	-0.000	0.171	4.155	10.633
SPC__155789.LAB	12/19/23	10:41:03.396	0.613		-0.079	-0.003	0.272	4.094	10.575
SPC__155790.LAB	12/19/23	10:42:07.214	0.721		-0.062	-0.002	0.247	4.162	10.489
SPC__155791.LAB	12/19/23	10:43:11.423	0.594		-0.080	-0.002	0.263	4.197	10.416
SPC__155792.LAB	12/19/23	10:44:15.009	0.596		-0.066	-0.002	0.219	4.101	10.245
SPC__155793.LAB	12/19/23	10:45:18.916	0.721		-0.079	-0.004	0.154	4.120	10.541
SPC__155794.LAB	12/19/23	10:46:22.939	0.453		-0.069	-0.003	0.242	4.191	10.484
SPC__155795.LAB	12/19/23	10:47:26.712	0.442		-0.073	-0.002	0.263	4.262	10.639
SPC__155796.LAB	12/19/23	10:48:30.618	0.646		-0.086	-0.002	0.218	4.181	10.494
SPC__155797.LAB	12/19/23	10:49:34.515	0.823		-0.072	-0.002	0.215	4.193	10.519
SPC__155798.LAB	12/19/23	10:50:38.414	0.557		-0.083	-0.002	0.240	4.243	10.546
SPC__155799.LAB	12/19/23	10:51:42.389	0.641		-0.084	-0.002	0.221	4.249	10.295
SPC__155800.LAB	12/19/23	10:52:46.220	0.662		-0.068	-0.004	0.288	4.293	10.468
SPC__155801.LAB	12/19/23	10:53:50.153	0.726		-0.083	-0.003	0.197	4.312	10.473
SPC__155802.LAB	12/19/23	10:54:54.019	0.445		-0.104	-0.001	0.189	4.311	10.749
SPC__155803.LAB	12/19/23	10:55:57.914	0.657		-0.102	-0.004	0.222	4.253	10.568
SPC__155804.LAB	12/19/23	10:57:01.813	0.564		-0.085	-0.003	0.223	4.277	10.639
SPC__155805.LAB	12/19/23	10:58:05.717	0.797		-0.075	-0.004	0.270	4.233	10.664
SPC__155806.LAB	12/19/23	10:59:09.611	0.631		-0.069	-0.003	0.221	4.199	10.744
SPC__155807.LAB	12/19/23	11:00:13.509	0.709		-0.089	-0.000	0.247	4.182	10.587
SPC__155808.LAB	12/19/23	11:01:17.595	0.556		-0.081	-0.002	0.199	4.272	10.535
SPC__155809.LAB	12/19/23	11:02:21.309	0.183		-0.071	-0.003	0.227	4.312	10.613
Mill On Run 1		**(actual)**	**0.609**	**<**	**0.032**	**-0.002**	**0.222**	**4.173**	**10.545**
Oxygen	**14.9%**	**(ppm,dry @7% O2)**	**1.475**	**<**	**0.078**	**-0.004**	**0.537**	**4.4**	**M26A Moisture**
DSCFM	**190,500**	**(lbs/hr)**	**0.510**	**<**	**0.020**	**-0.008**	**0.193**		
Clinker (tons/hr)	**76.82**	**(lbs/ton clinker)**	**0.007**	**<**	**0.0003**				

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill On Run 2

Spectrum	Date	Time	HCN PCA 191c R1 191c		HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C	H2O% (40) 191C	CO2% (40) 191C span
SPC__155838.LAB	12/19/23	11:34:15.805	0.668		-0.080	-0.002	0.204	4.205	10.570
SPC__155839.LAB	12/19/23	11:35:19.809	0.688		-0.080	-0.002	0.232	4.125	10.402
SPC__155840.LAB	12/19/23	11:36:23.609	0.512		-0.093	-0.001	0.249	4.108	10.339
SPC__155841.LAB	12/19/23	11:37:27.504	0.608		-0.083	-0.001	0.231	4.175	10.455
SPC__155842.LAB	12/19/23	11:38:31.403	0.683		-0.041	-0.002	0.270	4.151	10.528
SPC__155843.LAB	12/19/23	11:39:35.308	0.486		-0.079	-0.003	0.222	4.124	10.431
SPC__155844.LAB	12/19/23	11:40:39.201	0.480		-0.074	-0.004	0.264	4.071	10.281
SPC__155845.LAB	12/19/23	11:41:43.099	0.867		-0.077	0.001	0.277	4.097	10.734
SPC__155846.LAB	12/19/23	11:42:47.339	0.550		-0.081	-0.002	0.213	4.045	10.462
SPC__155847.LAB	12/19/23	11:43:50.905	0.344		-0.088	-0.000	0.226	4.060	10.553
SPC__155848.LAB	12/19/23	11:44:54.795	0.371		-0.090	-0.000	0.209	4.034	10.604
SPC__155849.LAB	12/19/23	11:45:58.736	0.506		-0.113	-0.002	0.256	4.098	10.686
SPC__155850.LAB	12/19/23	11:47:02.634	0.733		-0.073	-0.004	0.259	4.159	10.744
SPC__155851.LAB	12/19/23	11:48:06.579	0.842		-0.079	-0.002	0.272	4.196	10.544
SPC__155852.LAB	12/19/23	11:49:10.478	0.617		-0.069	-0.002	0.350	4.241	10.653
SPC__155853.LAB	12/19/23	11:50:14.296	0.852		-0.065	-0.003	0.264	4.225	10.790
SPC__155854.LAB	12/19/23	11:51:18.193	0.350		-0.092	0.001	0.231	4.021	10.330
SPC__155855.LAB	12/19/23	11:52:22.095	0.667		-0.088	-0.001	0.266	4.043	10.674
SPC__155856.LAB	12/19/23	11:53:26.329	0.633		-0.093	-0.003	0.293	4.093	10.544
SPC__155857.LAB	12/19/23	11:54:29.970	0.362		-0.064	-0.002	0.225	4.178	10.849
SPC__155858.LAB	12/19/23	11:55:33.832	0.558		-0.072	-0.002	0.183	4.092	10.435
SPC__155859.LAB	12/19/23	11:56:37.690	0.576		-0.095	-0.002	0.213	4.110	10.549
SPC__155860.LAB	12/19/23	11:57:41.588	0.581		-0.096	-0.003	0.244	4.123	10.579
SPC__155861.LAB	12/19/23	11:58:45.592	0.595		-0.071	-0.000	0.216	4.119	10.503
SPC__155862.LAB	12/19/23	11:59:49.508	0.702		-0.087	-0.003	0.178	4.159	10.663
SPC__155863.LAB	12/19/23	12:00:53.285	0.692		-0.077	-0.001	0.292	4.136	10.559
SPC__155864.LAB	12/19/23	12:01:57.192	0.828		-0.111	-0.003	0.232	4.136	10.575
SPC__155865.LAB	12/19/23	12:03:01.086	0.604		-0.076	-0.000	0.211	4.163	10.342
SPC__155866.LAB	12/19/23	12:04:05.057	0.688		-0.084	-0.003	0.236	4.193	10.558
SPC__155867.LAB	12/19/23	12:05:08.926	0.561		-0.086	-0.003	0.241	4.191	10.543
SPC__155868.LAB	12/19/23	12:06:12.821	0.578		-0.096	-0.002	0.234	4.198	10.479
SPC__155869.LAB	12/19/23	12:07:16.719	0.471		-0.084	-0.001	0.225	4.237	10.467
SPC__155870.LAB	12/19/23	12:08:20.666	0.366		-0.075	0.001	0.181	4.301	10.661
SPC__155871.LAB	12/19/23	12:09:24.520	0.560		-0.095	-0.004	0.229	4.248	10.714
SPC__155872.LAB	12/19/23	12:10:28.724	0.697		-0.052	-0.003	0.211	4.173	10.648
SPC__155873.LAB	12/19/23	12:11:32.320	0.791		-0.091	-0.002	0.248	4.097	10.637
SPC__155874.LAB	12/19/23	12:12:36.435	0.864		-0.091	-0.001	0.163	4.110	10.714
SPC__155875.LAB	12/19/23	12:13:40.074	0.579		-0.086	-0.002	0.157	4.173	10.747
SPC__155876.LAB	12/19/23	12:14:44.080	0.782		-0.055	-0.001	0.225	4.111	10.934
SPC__155877.LAB	12/19/23	12:15:48.166	0.537		-0.085	0.001	0.289	4.047	10.391
SPC__155878.LAB	12/19/23	12:16:51.771	0.608		-0.084	-0.001	0.253	4.128	10.703
SPC__155879.LAB	12/19/23	12:17:55.672	0.455		-0.068	-0.001	0.285	4.048	10.485
SPC__155880.LAB	12/19/23	12:18:59.567	0.746		-0.075	-0.004	0.203	4.064	10.853
SPC__155881.LAB	12/19/23	12:20:03.466	0.559		-0.092	-0.002	0.260	4.127	10.617
SPC__155882.LAB	12/19/23	12:21:07.370	0.724		-0.081	-0.000	0.235	4.145	10.356
SPC__155883.LAB	12/19/23	12:22:11.264	0.631		-0.064	-0.001	0.274	4.273	10.594
SPC__155884.LAB	12/19/23	12:23:15.201	0.626		-0.095	0.002	0.241	4.151	10.160
SPC__155885.LAB	12/19/23	12:24:19.104	0.628		-0.089	-0.001	0.226	4.151	10.207
SPC__155886.LAB	12/19/23	12:25:23.001	0.845		-0.071	-0.000	0.343	4.250	10.623
SPC__155887.LAB	12/19/23	12:26:27.176	0.620		-0.077	-0.001	0.282	4.203	10.488
SPC__155888.LAB	12/19/23	12:27:30.762	0.541		-0.093	-0.001	0.264	4.117	9.972
SPC__155889.LAB	12/19/23	12:28:34.996	0.925		-0.079	-0.000	0.245	4.130	10.319
SPC__155890.LAB	12/19/23	12:29:38.642	0.568		-0.045	-0.001	0.265	4.188	10.443
SPC__155891.LAB	12/19/23	12:30:42.459	0.534		-0.063	0.001	0.169	4.228	10.414
SPC__155892.LAB	12/19/23	12:31:46.354	0.525		-0.049	-0.002	0.251	4.182	10.410
SPC__155893.LAB	12/19/23	12:32:50.251	0.433		-0.049	-0.002	0.165	4.142	10.471
SPC__155894.LAB	12/19/23	12:33:54.192	0.410		-0.045	-0.002	0.278	4.104	10.242
Mill On Run 2		**(actual)**	**0.611**	**<**	**0.032**	**-0.002**	**0.240**	**4.144**	**10.530**
Oxygen	**14.8%**	**(ppm,dry @7% O2)**	**1.456**	**<**	**0.076**	**-0.004**	**0.571**	**4.4**	**M26A Moisture**
DSCFM	**188,600**	**(lbs/hr)**	**0.507**	**<**	**0.020**	**-0.007**	**0.207**		
Clinker (tons/hr)	**76.85**	**(lbs/ton clinker)**	**0.007**	**<**	**0.0003**				

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill On Run 3

Spectrum	Date	Time	HCN PCA 191c R1 191c		HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C	H2O% (40) 191C	CO2% (40) 191C span
SPC__155917.LAB	12/19/23	12:59:33.742	0.437		-0.060	-0.001	0.242	3.936	10.147
SPC__155918.LAB	12/19/23	13:00:37.717	0.563		-0.057	0.002	0.199	3.987	10.467
SPC__155919.LAB	12/19/23	13:01:41.498	0.617		-0.036	-0.003	0.239	4.000	10.483
SPC__155920.LAB	12/19/23	13:02:45.502	0.730		-0.059	-0.000	0.210	4.085	10.460
SPC__155921.LAB	12/19/23	13:03:49.296	0.577		-0.063	-0.003	0.195	4.123	10.476
SPC__155922.LAB	12/19/23	13:04:53.195	0.679		-0.055	-0.001	0.184	4.221	10.384
SPC__155923.LAB	12/19/23	13:05:57.098	0.536		-0.063	-0.001	0.291	4.290	10.370
SPC__155924.LAB	12/19/23	13:07:00.992	0.560		-0.053	-0.001	0.215	4.285	10.401
SPC__155925.LAB	12/19/23	13:08:04.891	0.280		-0.057	-0.002	0.219	4.284	10.464
SPC__155926.LAB	12/19/23	13:09:08.862	0.630		-0.096	-0.001	0.335	4.204	10.166
SPC__155927.LAB	12/19/23	13:10:12.690	0.307		-0.051	-0.003	0.238	4.197	10.470
SPC__155928.LAB	12/19/23	13:11:16.624	0.729		-0.046	0.000	0.233	4.103	10.268
SPC__155929.LAB	12/19/23	13:12:20.526	0.552		-0.088	-0.000	0.220	3.997	10.494
SPC__155930.LAB	12/19/23	13:13:24.420	0.876		-0.043	-0.002	0.188	4.022	10.618
SPC__155931.LAB	12/19/23	13:14:28.280	0.514		-0.083	-0.003	0.245	4.078	10.543
SPC__155932.LAB	12/19/23	13:15:32.182	0.558		-0.069	-0.003	0.267	4.146	10.683
SPC__155933.LAB	12/19/23	13:16:36.076	0.459		-0.049	-0.001	0.244	4.203	10.549
SPC__155934.LAB	12/19/23	13:17:39.973	0.582		-0.042	-0.003	0.205	4.153	10.402
SPC__155935.LAB	12/19/23	13:18:43.878	0.903		-0.048	-0.001	0.194	4.144	10.539
SPC__155936.LAB	12/19/23	13:19:47.860	0.735		-0.067	-0.003	0.275	4.264	10.696
SPC__155937.LAB	12/19/23	13:20:51.738	0.585		-0.095	-0.003	0.241	4.224	10.828
SPC__155938.LAB	12/19/23	13:21:55.605	0.459		-0.086	-0.001	0.246	4.115	10.445
SPC__155939.LAB	12/19/23	13:22:59.800	0.731		-0.073	-0.001	0.274	4.183	10.693
SPC__155940.LAB	12/19/23	13:24:03.448	0.623		-0.103	-0.003	0.184	4.217	10.562
SPC__155941.LAB	12/19/23	13:25:07.260	0.632		-0.066	-0.002	0.211	4.121	10.357
SPC__155942.LAB	12/19/23	13:26:11.335	0.598		-0.088	-0.001	0.217	4.186	10.956
SPC__155943.LAB	12/19/23	13:27:15.054	0.766		-0.077	-0.002	0.221	4.142	10.403
SPC__155944.LAB	12/19/23	13:28:18.956	0.418		-0.088	-0.002	0.234	4.250	10.690
SPC__155945.LAB	12/19/23	13:29:22.859	0.388		-0.093	-0.002	0.245	4.219	10.431
SPC__155946.LAB	12/19/23	13:30:26.808	0.721		-0.091	-0.001	0.266	4.131	10.632
SPC__155947.LAB	12/19/23	13:31:30.650	0.714		-0.088	0.000	0.223	4.138	10.472
SPC__155948.LAB	12/19/23	13:32:34.636	0.791		-0.090	-0.001	0.210	4.185	10.537
SPC__155949.LAB	12/19/23	13:33:38.441	0.769		-0.088	-0.003	0.291	4.326	10.663
SPC__155950.LAB	12/19/23	13:34:42.381	0.133		-0.095	-0.002	0.163	4.217	10.433
SPC__155951.LAB	12/19/23	13:35:46.278	0.208		-0.044	-0.000	0.188	4.281	10.648
SPC__155952.LAB	12/19/23	13:36:50.176	0.460		-0.052	-0.002	0.198	4.230	10.442
SPC__155953.LAB	12/19/23	13:37:54.038	0.749		-0.051	-0.004	0.230	4.186	10.309
SPC__155954.LAB	12/19/23	13:38:57.932	0.472		-0.055	-0.001	0.223	4.265	10.458
SPC__155955.LAB	12/19/23	13:40:01.830	0.411		-0.077	-0.000	0.212	4.281	10.436
SPC__155956.LAB	12/19/23	13:41:06.068	0.511		-0.080	-0.002	0.193	4.270	10.452
SPC__155957.LAB	12/19/23	13:42:09.625	0.514		-0.081	-0.001	0.265	4.339	10.719
SPC__155958.LAB	12/19/23	13:43:13.703	0.492		-0.083	-0.000	0.242	4.316	10.430
SPC__155959.LAB	12/19/23	13:44:17.525	0.547		-0.070	-0.003	0.214	4.211	10.176
SPC__155960.LAB	12/19/23	13:45:21.659	0.651		-0.096	-0.001	0.217	4.106	10.392
SPC__155961.LAB	12/19/23	13:46:25.257	0.523		-0.074	-0.000	0.225	3.973	10.234
SPC__155962.LAB	12/19/23	13:47:29.156	0.532		-0.042	-0.001	0.231	3.942	10.324
SPC__155963.LAB	12/19/23	13:48:33.108	0.727		-0.084	-0.001	0.216	3.947	10.166
SPC__155964.LAB	12/19/23	13:49:36.951	0.593		-0.088	-0.001	0.175	3.884	10.366
SPC__155965.LAB	12/19/23	13:50:40.815	0.915		-0.086	-0.002	0.258	3.901	10.549
SPC__155966.LAB	12/19/23	13:51:45.056	0.585		-0.056	-0.002	0.230	3.934	10.497
SPC__155967.LAB	12/19/23	13:52:48.606	0.598		-0.038	-0.000	0.211	3.985	10.512
SPC__155968.LAB	12/19/23	13:53:52.509	0.605		-0.079	-0.000	0.198	3.869	10.369
SPC__155969.LAB	12/19/23	13:54:56.403	0.386		-0.071	-0.001	0.293	3.926	10.560
SPC__155970.LAB	12/19/23	13:56:00.339	0.676		-0.097	-0.003	0.162	4.049	10.822
SPC__155971.LAB	12/19/23	13:57:04.239	0.710		-0.099	-0.005	0.271	3.988	10.758
SPC__155972.LAB	12/19/23	13:58:08.466	0.775		-0.077	-0.002	0.153	3.897	10.263
SPC__155973.LAB	12/19/23	13:59:12.030	0.482		-0.087	-0.001	0.203	3.875	10.369
Mill On Run 3		**(actual)**	**0.584**	**<**	**0.032**	**-0.001**	**0.226**	**4.123**	**10.481**
Oxygen	**14.9%**	**(ppm,dry @7% O2)**	**1.417**	**<**	**0.078**	**-0.004**	**0.548**	**4.6**	**M26A Moisture**
DSCFM	**191,850**	**(lbs/hr)**	**0.494**	**<**	**0.020**	**-0.007**	**0.198**		
Clinker (tons/hr)	**76.88**	**(lbs/ton clinker)**	**0.006**	**<**	**0.0003**				

Company: **Buzzi Unicem; Stockertown PA**
Source: **Kilns 1 and 3 Main Stack; Raw Mill Off**
Job ID: **23-3317**
Train Type: **M26A**

	4A 12/20/23 833-943	4B 12/20/23 833-943	5A 12/20/23 1000-1109	5B 12/20/23 1000-1109	6A 12/20/23 1125-1235	6B 12/20/23 1125-1235	Average
Initial Meter Volume, ft^3	861.555	71.372	905.000	115.455	948.186	159.140	
Final Meter Volume, ft^3	904.884	115.305	948.005	158.955	990.570	202.950	
Intra-Port Leak Check Volume, ft^3	0.000	0.000	0.000	0.000	0.000	0.000	
Total Sample Volume, cf	**43.329**	**43.933**	**43.005**	**43.500**	**42.384**	**43.810**	**43.327**
DGM Calibration Factor	1.006	0.988	1.006	0.988	1.006	0.988	0.997
Average DGM Temp, F	70.6	72.1	79.3	84.4	89.5	88.0	80.7
Average DGM delta H, "H2O	1.75	1.57	1.68	1.48	1.55	1.40	1.57
Barometric Pressure, "Hg	29.70	29.70	29.70	29.70	29.70	29.70	29.70
Corrected Sample Vol,dscf	**43.226**	**42.904**	**42.203**	**41.512**	**40.808**	**41.525**	**42.030**
Corrected Sample Vol,dscm	**1.224**	**1.215**	**1.195**	**1.175**	**1.156**	**1.176**	**1.190**
Oxygen, %	12.1	12.1	12.1	12.1	12.2	12.2	12.1
Carbon Dioxide, %	14.9	14.9	15.1	15.1	14.9	14.9	15.0
Nitrogen, %	73.0	73.0	72.8	72.8	72.9	72.9	72.9
Stack Gas Excess Air, %	168.7	168.7	170.0	170.0	173.2	173.2	170.6
Total Moisture Catch Weight, grams	56.3	57.7	56.5	55.3	51.6	50.3	52.4
Stack Gas Moisture, %	**5.8**	**6.0**	**5.9**	**5.9**	**5.6**	**5.4**	**5.8**
Stack Gas Dry Molecular Weight, lb/lbmole	30.87	30.87	30.90	30.90	30.87	30.87	30.88
Stack Gas Wet Molecular Weight, lb/lbmole	30.12	30.10	30.14	30.14	30.15	30.18	30.14
Average Stack Temp, F	364.3	364.3	363.3	363.3	363.7	363.7	363.8
Stack Static (Gauge) Pressure, "H2O	-0.60	-0.60	-0.60	-0.60	-0.60	-0.60	-0.60
Stack Gas Actual Pressure, "Hg	29.66	29.66	29.66	29.66	29.66	29.66	29.66
Average Sqrt delta P	0.552	0.552	0.539	0.539	0.522	0.522	0.538
Pitot Tube Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Stack Gas Velocity, ft/second	**38.53**	**38.54**	**37.59**	**37.59**	**36.40**	**36.39**	**37.51**
Nozzle Inside Diameter, inches	0.310	0.312	0.310	0.312	0.310	0.312	
Total Sample Time, min	60	60	60	60	60	60	60
Isokinetic Rate, %	**99.5**	**97.6**	**99.5**	**96.6**	**99.1**	**99.4**	**98.6**
Stack Dimensions	131 in. ID	131 in. ID	131 in. ID	131 in. ID	131 in. ID	131 in. ID	
Stack Area, sq ft	93.60	93.60	93.60	93.60	93.60	93.60	93.60
Stack Gas Flow Rate, acfm	**216,400**	**216,400**	**211,100**	**211,100**	**204,400**	**204,400**	**210,633**
Stack Gas Flow Rate, acmm	6,128	6,128	5,978	5,978	5,788	5,788	5,965
Stack Gas Flow Rate, dscfm	**129,400**	**129,200**	**126,300**	**126,300**	**122,600**	**122,800**	**126,100**
Stack Gas Flow Rate, dscmm	3,664	3,659	3,576	3,576	3,472	3,477	3,571

Company: Buzzi Unicem; Stockertown PA
Source: Kilns 1 and 3 Main Stack; Raw Mill Off
Job ID: 23-3317
Train Type: M26A

"ND()" denotes values below detection limits
Note: Average EXCLUDES Non-detect runs' results

		4A 12/20/23 833-943	4B 12/20/23 833-943	5A 12/20/23 1000-1109	5B 12/20/23 1000-1109	6A 12/20/23 1125-1235	6B 12/20/23 1125-1235	Average
Hydrogen Fluoride	Catch Wt, mg	ND(0.255)	ND(0.256)	ND(0.235)	ND(0.247)	ND(0.238)	)(0.256)	ID(0.248)
	Conc., mg/dscm	ND(0.208)	ND(0.211)	ND(0.197)	ND(0.210)	ND(0.206)	)(0.218)	ID(0.208)
	Conc., mg/dscm @7% O2	ND(0.329)	ND(0.333)	ND(0.311)	ND(0.332)	ND(0.329)	)(0.348)	ID(0.330)
	Conc., mg/dscm @12% CO2	ND(0.168)	ND(0.170)	ND(0.156)	ND(0.167)	ND(0.166)	)(0.175)	ID(0.167)
	Conc., ppmvd	ND(0.250)	ND(0.253)	ND(0.236)	ND(0.253)	ND(0.248)	)(0.262)	ID(0.250)
	Conc., ppmvd @7% O2	ND(0.396)	ND(0.400)	ND(0.373)	ND(0.399)	ND(0.396)	)(0.418)	ID(0.397)
	Conc., ppmvd @12% CO2	ND(0.202)	ND(0.204)	ND(0.188)	ND(0.201)	ND(0.199)	)(0.211)	ID(0.201)
	Emission Rate, lb/hr	ND(0.101)	ND(0.102)	ND(0.093)	ND(0.099)	ND(0.095)	)(0.100)	ID(0.098)
	Clinker Rates (tph and lbs/ton)	76.86	ND(0.0013)	76.87	ND(0.0013)	76.79	ND(0.0013)	ID(0.0013)
Chlorine	Catch Wt, mg	ND(0.184)	ND(0.179)	ND(0.189)	ND(0.174)	ND(0.177)	)(0.18)	ID(0.181)
	Conc., mg/dscm	ND(0.150)	ND(0.147)	ND(0.158)	ND(0.148)	ND(0.153)	)(0.153)	ID(0.152)
	Conc., mg/dscm @7% O2	ND(0.237)	ND(0.233)	ND(0.250)	ND(0.234)	ND(0.245)	)(0.245)	ID(0.241)
	Conc., mg/dscm @12% CO2	ND(0.121)	ND(0.119)	ND(0.126)	ND(0.118)	ND(0.123)	)(0.123)	ID(0.122)
	Conc., ppmvd	ND(0.051)	ND(0.050)	ND(0.054)	ND(0.050)	ND(0.052)	)(0.052)	ID(0.051)
	Absolute Difference, ppmvd (<0.2 required)		0.001		0.003		0.000	
	Conc., ppmvd @7% O2	ND(0.081)	ND(0.079)	ND(0.085)	ND(0.079)	ND(0.083)	)(0.083)	ID(0.082)
	Conc., ppmvd @12% CO2	ND(0.041)	ND(0.040)	ND(0.043)	ND(0.040)	ND(0.042)	)(0.042)	ID(0.041)
	Emission Rate, lb/hr	ND(0.073)	ND(0.071)	ND(0.075)	ND(0.070)	ND(0.070)	)(0.070)	ID(0.072)
	Clinker Rates (tph and lbs/ton)	76.86	ND(0.0009)	76.87	ND(0.0009)	76.79	ND(0.0009)	ID(0.0009)

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill Off Run 1

Spectrum	Date	Time	HCN PCA 191c R1 191c		HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C	H2O% (40) 191C	CO2% (40) 191C span
SPC__156074.LAB	12/20/23	08:34:09.603	1.122		-0.001	-0.004	0.243	5.765	14.551
SPC__156075.LAB	12/20/23	08:35:13.611	0.925		-0.009	-0.004	0.126	5.671	14.265
SPC__156076.LAB	12/20/23	08:36:17.471	1.164		-0.024	-0.005	0.185	5.673	14.318
SPC__156077.LAB	12/20/23	08:37:21.312	1.147		-0.013	-0.004	0.199	5.796	14.461
SPC__156078.LAB	12/20/23	08:38:25.323	1.251		-0.001	-0.005	0.219	5.794	14.612
SPC__156079.LAB	12/20/23	08:39:29.367	1.267		-0.002	-0.005	0.171	5.778	14.576
SPC__156080.LAB	12/20/23	08:40:33.114	1.147		-0.006	0.000	0.197	5.828	14.492
SPC__156081.LAB	12/20/23	08:41:36.927	0.952		-0.002	-0.002	0.264	5.862	14.678
SPC__156082.LAB	12/20/23	08:42:40.864	1.097		-0.006	-0.001	0.225	5.918	14.789
SPC__156083.LAB	12/20/23	08:43:44.768	1.287		0.004	-0.006	0.256	5.965	14.656
SPC__156084.LAB	12/20/23	08:44:48.667	1.055		-0.015	-0.006	0.214	5.879	14.909
SPC__156085.LAB	12/20/23	08:45:52.535	0.863		-0.016	-0.006	0.255	5.946	15.166
SPC__156086.LAB	12/20/23	08:46:56.530	1.316		-0.023	-0.004	0.278	5.981	15.150
SPC__156087.LAB	12/20/23	08:48:00.347	1.225		-0.031	-0.005	0.273	5.776	14.789
SPC__156088.LAB	12/20/23	08:49:04.371	1.147		-0.005	-0.001	0.178	5.819	14.756
SPC__156089.LAB	12/20/23	08:50:08.330	0.995		-0.010	-0.005	0.224	5.755	14.718
SPC__156090.LAB	12/20/23	08:51:12.055	1.094		-0.021	-0.004	0.188	5.807	14.731
SPC__156091.LAB	12/20/23	08:52:16.135	0.988		-0.014	-0.005	0.222	5.651	14.369
SPC__156092.LAB	12/20/23	08:53:19.857	0.997		0.005	-0.004	0.273	5.655	14.307
SPC__156093.LAB	12/20/23	08:54:23.868	1.165		-0.029	-0.005	0.297	5.726	14.420
SPC__156094.LAB	12/20/23	08:55:27.845	1.047		-0.031	-0.003	0.248	5.758	14.395
SPC__156095.LAB	12/20/23	08:56:31.567	0.989		-0.025	-0.005	0.223	5.718	14.459
SPC__156096.LAB	12/20/23	08:57:35.482	1.099		-0.011	-0.004	0.265	5.842	14.662
SPC__156097.LAB	12/20/23	08:58:39.376	1.084		-0.042	-0.004	0.222	5.771	14.432
SPC__156098.LAB	12/20/23	08:59:43.277	1.205		-0.016	-0.003	0.262	5.803	14.422
SPC__156099.LAB	12/20/23	09:00:47.185	1.106		-0.028	-0.005	0.275	5.902	14.581
SPC__156100.LAB	12/20/23	09:01:51.083	1.206		-0.018	-0.003	0.237	5.809	14.491
SPC__156101.LAB	12/20/23	09:02:55.021	0.965		-0.043	-0.003	0.238	5.800	14.490
SPC__156102.LAB	12/20/23	09:03:58.960	1.111		-0.036	-0.004	0.168	5.801	14.500
SPC__156103.LAB	12/20/23	09:05:02.886	1.328		-0.036	-0.001	0.207	5.755	14.324
SPC__156104.LAB	12/20/23	09:06:07.023	1.235		-0.033	-0.002	0.243	5.752	14.447
SPC__156105.LAB	12/20/23	09:07:10.669	0.978		-0.041	-0.004	0.171	5.729	14.461
SPC__156106.LAB	12/20/23	09:08:14.534	1.176		-0.032	-0.005	0.247	5.758	14.604
SPC__156107.LAB	12/20/23	09:09:18.757	1.113		-0.024	-0.006	0.187	5.723	14.494
SPC__156108.LAB	12/20/23	09:10:22.337	1.045		-0.029	-0.003	0.254	5.814	14.681
SPC__156109.LAB	12/20/23	09:11:26.205	1.036		-0.037	-0.003	0.257	5.751	14.535
SPC__156110.LAB	12/20/23	09:12:30.289	1.190		-0.037	-0.003	0.259	5.801	14.554
SPC__156111.LAB	12/20/23	09:13:34.016	1.075		-0.026	-0.005	0.225	5.795	14.479
SPC__156112.LAB	12/20/23	09:14:37.914	0.898		-0.040	-0.002	0.248	5.774	14.428
SPC__156113.LAB	12/20/23	09:15:41.922	1.222		-0.041	-0.005	0.216	5.827	14.678
SPC__156114.LAB	12/20/23	09:16:45.906	1.088		-0.039	-0.004	0.240	5.885	14.623
SPC__156115.LAB	12/20/23	09:17:49.801	0.974		-0.026	-0.003	0.260	5.776	14.387
SPC__156116.LAB	12/20/23	09:18:53.522	0.954		-0.031	-0.005	0.159	5.698	14.275
SPC__156117.LAB	12/20/23	09:19:57.430	1.211		-0.063	-0.004	0.210	5.761	14.435
SPC__156118.LAB	12/20/23	09:21:01.454	1.006		-0.045	-0.002	0.268	5.748	14.444
SPC__156119.LAB	12/20/23	09:22:05.229	1.433		-0.052	-0.004	0.223	5.685	14.352
SPC__156120.LAB	12/20/23	09:23:09.136	1.278		-0.048	-0.002	0.270	5.691	14.414
SPC__156121.LAB	12/20/23	09:24:13.032	1.157		-0.055	-0.003	0.177	5.644	14.420
SPC__156122.LAB	12/20/23	09:25:17.116	1.153		-0.049	-0.004	0.235	5.558	14.103
SPC__156123.LAB	12/20/23	09:26:20.840	1.343		-0.054	-0.005	0.195	5.715	14.611
SPC__156124.LAB	12/20/23	09:27:24.736	0.960		-0.045	-0.006	0.270	5.821	14.707
SPC__156125.LAB	12/20/23	09:28:28.638	1.304		-0.048	-0.002	0.298	5.775	14.364
SPC__156126.LAB	12/20/23	09:29:32.616	1.159		-0.045	-0.002	0.238	5.785	14.725
SPC__156127.LAB	12/20/23	09:30:36.443	1.238		-0.046	-0.004	0.220	5.809	14.802
SPC__156128.LAB	12/20/23	09:31:40.348	1.234		-0.051	-0.005	0.292	5.817	14.816
SPC__156129.LAB	12/20/23	09:32:44.326	1.078		-0.052	-0.005	0.239	5.752	14.439
Mill Off Run 1		**(actual)**	**1.123**	**<**	**0.032**	**-0.004**	**0.231**	**5.779**	**14.549**
Oxygen	**12.1%**	**(ppm,dry @7% O2)**	**1.885**	**<**	**0.054**	**-0.006**	**0.388**	**5.9**	**M26A Moisture**
DSCFM	**129,300**	**(lbs/hr)**	**0.649**	**<**	**0.014**	**-0.012**	**0.139**		
Clinker (tons/hr)	**76.86**	**(lbs/ton clinker)**	**0.008**	**<**	**0.0002**				

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill Off Run 2

Spectrum	Date	Time	HCN PCA 191c R1 191c		HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C	H2O% (40) 191C	CO2% (40) 191C span
SPC__156154.LAB	12/20/23	10:00:33.711	0.875		-0.035	-0.004	0.246	5.726	14.207
SPC__156155.LAB	12/20/23	10:01:37.578	1.322		-0.060	-0.006	0.242	5.811	14.441
SPC__156156.LAB	12/20/23	10:02:41.655	1.188		-0.046	-0.002	0.253	5.815	14.447
SPC__156157.LAB	12/20/23	10:03:45.375	0.910		-0.053	-0.003	0.176	5.778	14.350
SPC__156158.LAB	12/20/23	10:04:49.383	1.395		-0.044	-0.005	0.173	5.780	14.204
SPC__156159.LAB	12/20/23	10:05:53.216	1.054		-0.049	-0.005	0.234	5.875	14.487
SPC__156160.LAB	12/20/23	10:06:57.080	1.177		-0.042	-0.004	0.216	5.887	14.802
SPC__156161.LAB	12/20/23	10:08:00.987	1.094		-0.050	-0.001	0.262	5.765	14.428
SPC__156162.LAB	12/20/23	10:09:04.884	1.387		-0.052	-0.005	0.227	5.758	14.567
SPC__156163.LAB	12/20/23	10:10:08.894	1.233		-0.044	-0.001	0.262	5.744	14.573
SPC__156164.LAB	12/20/23	10:11:12.696	1.292		-0.047	-0.002	0.241	5.667	14.367
SPC__156165.LAB	12/20/23	10:12:16.594	1.119		-0.041	-0.005	0.281	5.691	14.612
SPC__156166.LAB	12/20/23	10:13:20.496	1.111		-0.044	-0.004	0.235	5.645	14.599
SPC__156167.LAB	12/20/23	10:14:24.511	1.155		-0.044	-0.004	0.294	5.648	14.622
SPC__156168.LAB	12/20/23	10:15:28.425	1.361		-0.074	-0.004	0.325	5.819	14.828
SPC__156169.LAB	12/20/23	10:16:32.202	1.138		-0.057	-0.006	0.236	5.812	14.839
SPC__156170.LAB	12/20/23	10:17:36.127	1.082		-0.058	-0.002	0.254	5.746	14.472
SPC__156171.LAB	12/20/23	10:18:40.006	1.099		-0.047	-0.001	0.275	5.744	14.511
SPC__156172.LAB	12/20/23	10:19:44.014	1.035		-0.057	-0.005	0.323	5.878	14.834
SPC__156173.LAB	12/20/23	10:20:47.914	1.328		-0.060	-0.004	0.252	5.877	14.761
SPC__156174.LAB	12/20/23	10:21:51.837	1.194		-0.058	-0.002	0.203	5.862	14.773
SPC__156175.LAB	12/20/23	10:22:55.668	1.074		-0.036	-0.001	0.250	5.737	14.529
SPC__156176.LAB	12/20/23	10:23:59.518	1.332		-0.052	-0.003	0.192	5.826	14.759
SPC__156177.LAB	12/20/23	10:25:03.415	1.238		-0.050	-0.002	0.254	5.765	14.546
SPC__156178.LAB	12/20/23	10:26:07.318	1.143		-0.056	-0.004	0.260	5.770	14.706
SPC__156179.LAB	12/20/23	10:27:11.327	1.032		-0.037	-0.003	0.217	5.827	14.883
SPC__156180.LAB	12/20/23	10:28:15.302	1.290		-0.048	-0.004	0.320	5.910	14.971
SPC__156181.LAB	12/20/23	10:29:19.023	1.195		-0.055	-0.003	0.265	5.852	14.928
SPC__156182.LAB	12/20/23	10:30:22.928	1.227		-0.044	-0.005	0.267	5.865	14.918
SPC__156183.LAB	12/20/23	10:31:26.824	1.221		-0.054	-0.005	0.279	6.093	15.149
SPC__156184.LAB	12/20/23	10:32:30.725	1.171		-0.054	-0.005	0.261	6.005	15.084
SPC__156185.LAB	12/20/23	10:33:34.631	1.346		-0.040	-0.006	0.285	5.921	14.869
SPC__156186.LAB	12/20/23	10:34:38.566	1.235		-0.049	-0.003	0.202	5.829	14.519
SPC__156187.LAB	12/20/23	10:35:42.470	1.164		-0.046	-0.002	0.234	5.805	14.674
SPC__156188.LAB	12/20/23	10:36:46.437	1.065		-0.059	-0.001	0.195	5.787	14.525
SPC__156189.LAB	12/20/23	10:37:50.271	1.138		-0.057	-0.001	0.194	5.749	14.240
SPC__156190.LAB	12/20/23	10:38:54.133	1.054		-0.055	-0.005	0.185	5.687	13.978
SPC__156191.LAB	12/20/23	10:39:58.038	1.178		-0.061	-0.001	0.212	5.658	14.290
SPC__156192.LAB	12/20/23	10:41:01.934	1.206		-0.061	-0.003	0.275	5.811	15.229
SPC__156193.LAB	12/20/23	10:42:05.834	1.243		-0.051	-0.003	0.157	5.574	14.492
SPC__156194.LAB	12/20/23	10:43:09.892	1.135		-0.058	-0.003	0.230	5.683	14.591
SPC__156195.LAB	12/20/23	10:44:13.886	1.044		-0.052	-0.003	0.248	5.766	14.778
SPC__156196.LAB	12/20/23	10:45:17.717	1.065		-0.052	-0.006	0.182	5.834	14.840
SPC__156197.LAB	12/20/23	10:46:21.545	1.113		-0.069	-0.004	0.268	5.965	14.997
SPC__156198.LAB	12/20/23	10:47:25.586	1.210		-0.066	-0.005	0.260	5.926	14.947
SPC__156199.LAB	12/20/23	10:48:29.236	1.568		-0.063	-0.002	0.293	5.974	14.938
SPC__156200.LAB	12/20/23	10:49:33.499	1.395		-0.039	-0.004	0.305	5.940	14.758
SPC__156201.LAB	12/20/23	10:50:37.077	1.235		-0.058	-0.001	0.267	5.985	14.900
SPC__156202.LAB	12/20/23	10:51:40.938	1.240		-0.062	-0.006	0.236	5.983	15.029
SPC__156203.LAB	12/20/23	10:52:45.171	1.470		-0.063	-0.003	0.264	6.032	15.045
SPC__156204.LAB	12/20/23	10:53:49.071	1.111		-0.072	-0.003	0.228	5.895	14.853
SPC__156205.LAB	12/20/23	10:54:52.681	1.218		-0.057	-0.006	0.198	5.795	14.646
SPC__156206.LAB	12/20/23	10:55:56.545	1.268		-0.056	-0.004	0.251	5.922	15.088
SPC__156207.LAB	12/20/23	10:57:00.481	1.255		-0.066	-0.002	0.240	5.734	14.606
SPC__156208.LAB	12/20/23	10:58:04.381	1.060		-0.071	-0.004	0.218	5.814	14.883
SPC__156209.LAB	12/20/23	10:59:08.277	1.151		-0.060	-0.003	0.240	5.746	14.859
SPC__156210.LAB	12/20/23	11:00:12.142	1.029		-0.065	-0.003	0.263	5.810	14.977
Mill Off Run 2		**(actual)**	**1.187**	**<**	**0.032**	**-0.003**	**0.244**	**5.818**	**14.697**
Oxygen	**12.1%**	**(ppm,dry @7% O2)**	**1.993**	**<**	**0.054**	**-0.006**	**0.409**	**5.9**	**M26A Moisture**
DSCFM	**126,300**	**(lbs/hr)**	**0.671**	**<**	**0.013**	**-0.011**	**0.143**		
Clinker (tons/hr)	**76.87**	**(lbs/ton clinker)**	**0.009**	**<**	**0.0002**				

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill Off Run 3 HCN Analyte Spike

Spectrum	Date	Time	HCN PCA 191c R1 191c		HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C	H2O% (40) 191C	CO2% (40) 191C span
SPC__156233.LAB	12/20/23	11:25:32.757	1.356		-0.061	-0.005	0.277	5.931	14.712
SPC__156234.LAB	12/20/23	11:26:36.657	1.155		-0.056	-0.003	0.286	5.848	14.697
SPC__156235.LAB	12/20/23	11:27:40.664	1.003		-0.067	-0.004	0.242	5.787	14.790
SPC__156236.LAB	12/20/23	11:28:44.633	1.095		-0.067	-0.004	0.309	5.791	14.610
SPC__156237.LAB	12/20/23	11:29:48.431	1.281		-0.057	-0.004	0.259	5.771	14.569
SPC__156238.LAB	12/20/23	11:30:52.359	1.105		-0.065	-0.001	0.245	5.789	14.417
SPC__156239.LAB	12/20/23	11:31:56.150	1.267		-0.070	-0.004	0.281	5.732	14.409
SPC__156240.LAB	12/20/23	11:33:00.049	1.257		-0.060	-0.004	0.230	5.735	14.513
SPC__156241.LAB	12/20/23	11:34:03.954	1.157		-0.057	-0.001	0.215	5.658	14.204
SPC__156242.LAB	12/20/23	11:35:07.941	1.332		-0.067	-0.004	0.231	5.710	14.351
SPC__156243.LAB	12/20/23	11:36:11.746	1.091		-0.075	-0.002	0.172	5.692	13.970
SPC__156244.LAB	12/20/23	11:37:15.745	1.221		-0.052	-0.002	0.237	5.829	14.462
SPC__156245.LAB	12/20/23	11:38:19.545	1.265		-0.056	-0.006	0.271	5.783	14.505
SPC__156246.LAB	12/20/23	11:39:23.440	1.120		-0.072	-0.001	0.254	5.565	13.926
SPC__156247.LAB	12/20/23	11:40:27.370	0.953		-0.081	0.001	0.216	5.094	12.821
SPC__156248.LAB	12/20/23	11:41:31.274	1.199		-0.075	0.000	0.306	5.172	13.535
SPC__156249.LAB	12/20/23	11:42:35.472	1.136		-0.084	-0.002	0.250	5.069	13.813
SPC__156250.LAB	12/20/23	11:43:39.404	1.131		-0.078	-0.001	0.240	4.662	11.388
SPC__156251.LAB	12/20/23	11:44:42.973	1.194		-0.096	-0.003	0.169	4.679	11.733
SPC__156252.LAB	12/20/23	11:45:47.021	0.980		-0.062	-0.001	0.215	5.073	14.083
SPC__156253.LAB	12/20/23	11:46:51.072	1.004		-0.065	-0.002	0.199	5.153	14.888
SPC__156254.LAB	12/20/23	11:47:54.678	1.207		-0.068	-0.004	0.223	5.314	15.368
SPC__156255.LAB	12/20/23	11:48:58.576	1.186		-0.082	-0.001	0.205	5.695	15.811
SPC__156256.LAB	12/20/23	11:50:02.471	0.982		-0.047	-0.002	0.294	5.804	15.270
SPC__156257.LAB	12/20/23	11:51:06.375	1.014		-0.073	-0.003	0.287	5.874	14.774
SPC__156258.LAB	12/20/23	11:52:10.234	1.112		-0.051	-0.005	0.288	6.019	15.008
SPC__156259.LAB	12/20/23	11:53:14.320	1.483		-0.076	-0.004	0.252	5.957	14.771
SPC__156260.LAB	12/20/23	11:54:18.033	1.237		-0.061	-0.004	0.294	5.952	15.077
SPC__156261.LAB	12/20/23	11:55:22.113	0.994		-0.059	-0.001	0.244	5.967	14.995
SPC__156262.LAB	12/20/23	11:56:25.835	1.297		-0.061	-0.004	0.208	6.117	14.967
SPC__156263.LAB	12/20/23	11:57:29.729	1.288		-0.071	-0.003	0.157	6.234	15.281
SPC__156264.LAB	12/20/23	11:58:33.628	1.205		-0.078	-0.003	0.147	6.142	15.063
SPC__156265.LAB	12/20/23	11:59:37.531	1.204		-0.066	-0.005	0.323	6.090	15.246
SPC__156266.LAB	12/20/23	12:00:41.607	1.300		-0.097	-0.005	0.261	6.136	15.432
SPC__156267.LAB	12/20/23	12:01:45.349	1.282		-0.087	-0.003	0.171	6.137	15.376
SPC__156268.LAB	12/20/23	12:02:49.329	1.269		-0.082	-0.003	0.193	6.212	15.538
SPC__156269.LAB	12/20/23	12:03:53.120	1.061		-0.065	-0.005	0.186	5.997	15.114
SPC__156270.LAB	12/20/23	12:04:57.126	1.079		-0.072	-0.005	0.188	5.993	15.068
SPC__156271.LAB	12/20/23	12:06:00.922	1.076		-0.059	-0.005	0.223	5.951	15.067
SPC__156272.LAB	12/20/23	12:07:04.998	1.151		-0.058	-0.001	0.255	5.859	14.753
SPC__156273.LAB	12/20/23	12:08:08.717	1.193		-0.050	-0.005	0.288	5.797	14.552
SPC__156274.LAB	12/20/23	12:09:12.620	1.214		-0.065	-0.004	0.274	5.802	14.716
SPC__156275.LAB	12/20/23	12:10:16.514	0.921		-0.054	-0.005	0.233	5.941	14.937
SPC__156276.LAB	12/20/23	12:11:20.541	1.179		-0.058	-0.001	0.280	5.821	14.552
SPC__156277.LAB	12/20/23	12:12:24.317	1.334		-0.044	-0.002	0.306	5.865	14.766
SPC__156278.LAB	12/20/23	12:13:28.338	1.069		-0.064	-0.003	0.216	5.772	14.537
SPC__156279.LAB	12/20/23	12:14:32.108	0.973		-0.071	-0.004	0.261	5.872	14.799
SPC__156280.LAB	12/20/23	12:15:36.191	1.211		-0.059	-0.003	0.290	6.065	15.098
SPC__156281.LAB	12/20/23	12:16:39.901	1.305		-0.075	-0.004	0.282	6.004	15.045
SPC__156282.LAB	12/20/23	12:17:43.799	1.212		-0.062	-0.003	0.209	5.943	14.845
SPC__156283.LAB	12/20/23	12:18:47.702	1.016		-0.057	-0.004	0.176	5.864	14.730
SPC__156284.LAB	12/20/23	12:19:51.595	1.454		-0.051	-0.007	0.284	5.901	14.739
SPC__156285.LAB	12/20/23	12:20:55.493	1.045		-0.051	-0.002	0.237	5.947	14.880
SPC__156286.LAB	12/20/23	12:21:59.396	0.992		-0.052	-0.003	0.233	5.959	15.146
SPC__156287.LAB	12/20/23	12:23:03.289	1.288		-0.043	-0.003	0.294	5.751	14.692
SPC__156288.LAB	12/20/23	12:24:07.184	1.059		-0.067	-0.003	0.289	5.753	14.653
SPC__156289.LAB	12/20/23	12:25:11.086	1.076		-0.050	-0.002	0.319	5.784	14.890
Mill Off Run 3		**(actual)**	**1.163**	**<**	**0.032**	**-0.003**	**0.245**	**5.769**	**14.631**
Oxygen	**12.2%**	**(ppm,dry @7% O2)**	**1.966**	**<**	**0.054**	**-0.005**	**0.415**	**5.5**	**M26A Moisture**
DSCFM	**122,700**	**(lbs/hr)**	**0.635**	**<**	**0.013**	**-0.009**	**0.139**		
Clinker (tons/hr)	**76.79**	**(lbs/ton clinker)**	**0.008**	**<**	**0.0002**				

Appendix B

Field Data
and
CEM/FTIR Data

EPA Method 1
Traverse Point Location for Circular Ducts

Plant	Buzzi Unicem
City	Stockertown
State	PA
Location	Inline Kiln/Raw Mill System Stack
Stack ID (inches)	131
Nipple Length	6.5

Nearest Upstream Disturbance (Bend, ID FAN, etc)

Distance (inches): 1452 Type of Disturbance: Stack Breaching

Nearest Downstream Disturbance (Bend, or Stack Outlet)

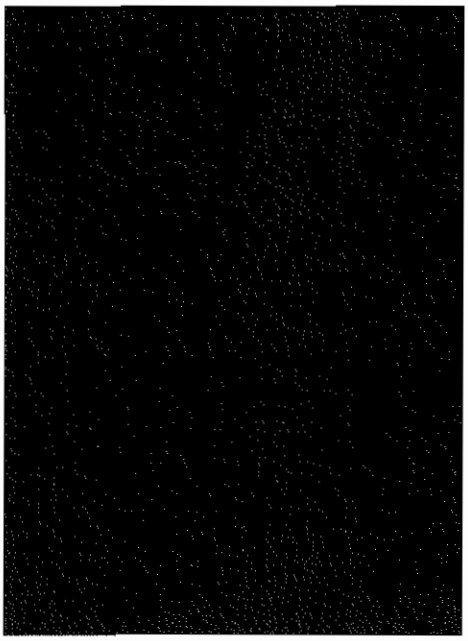
Distance (inches): 1128 Type of Disturbance: Stack Outlet

Sampler: WGD Date: 04/13/05

(Mark with an "x")

Particulate Traverse? [x] Yes [ ] No

Number of Traverse Points Required: 6



Traverse Point Number	Fraction of Stack Internal Diam.	Stack ID (Inches)	Diameter Frac. x Stack ID	Nipple Length (Inches)	Traverse Point Distance from outside Nipple
1	0.044	131	5.76	6.5	12 1/4 in.
2	0.146	131	19.13	6.5	25 5/8 in.
3	0.296	131	38.78	6.5	45 1/4 in.
4	0.704	131	92.22	6.5	98 3/4 in.
5	0.854	131	111.87	6.5	118 3/8 in.
6	0.956	131	125.24	6.5	131 3/4 in.

Cyclonic Flow Check Data Sheet

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Stockton, CA	12/12/23	Unit 1 & 2 Main Stack	Cyclonic Flow Check	

OPERATOR	Barometric Pressure (Pb (In. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (deg. F)	STACK ID (In.)	PITOT Cp	DGM BOX No.	DGM delta H@	DGM CAL FACTOR (gamma)		PROBE ID NO
DC/BB	29.2	-0.69	70	130	0.84	14574	NA	NA		573

EPA Method 2 Data

Run Time (24 hr)	Traverse Port Point ID	Pitot Delta P READING " H2O	STACK TEMP deg F	Absolute Angle at null (0) Delta P READING " H2O
0800	A 1	0.70	264	5
	2	0.65	264	5
	3	0.60	265	5
	B 1	0.60	263	10
	2	0.55	264	5
	3	0.50	265	5
	C 1	0.60	264	8
	2	0.5	265	4
	3	0.5	264	4
	D 1	0.6	265	10
	2	0.6	265	5
	3	0.7	265	4
Pitot Leak Check		✓		
Averages				

Average of Absolute Angle Readings must be < 20 degrees

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/10/23	Main Stack	M26A	ST 1 4

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
DGC	29.2	-1.65	40	NA	132 131	0.85	6' glass	.260 .261 .240	.260

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
8	MS-14	1.76	1.000	5A	5A	[illegible]	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 10 "Hg	15	10	317

PITOT LEAK CHECK ----> ☒ PASSED ☐ FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	1002	726.606	.7	2.2	259	263	59	259	60	5
2	5		730.74	.63	2.0	259	264	60	260	60	5
3	10		734.66	.60	1.9	260	265	60	261	60	5
	15	1017	738.431	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

B-1	15	1020	738.431	.55	1.7	260	265	62	259	61	5
2	20		741.99	.52	1.6	260	265	63	257	57	5
3	25		745.55	.47	1.5	259	264	63	252	55	5
	30	1035	748.945	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

C-1	30	1039	748.945	.57	1.8	260	266	63	262	57	5
2	35		752.66	.52	1.6	260	265	64	260	53	5
3	40		756.27	.5	1.6	261	265	64	260	51	5
	45	1054	759.867	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

D-1	45	1057	759.867	.60	1.9	260	263	65	260	53	5
2	50		763.72	.57	1.8	255	263	65	260	50	5
3	55		767.56	.57	1.8	260	262	66	260	51	5
	60	1112	771.411	End of Port							

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE. TEMP.	AVE. TEMP.
60 Min.					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12/19/23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12/19/23
Run No. ST ON -M26A- 1A Recovered by SCS
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		769.3	777.1	617.9	749.8	748.0	1175.1	g
Initial weight		763.4	758.0	613.3	746.0	746.6	966.1	g
Net weight		5.9	19.1	4.6	3.8	1.4	9.0	g

Description of impinger water Clear ✓ 40 % spent
BMW Sil gel color
Total moisture = 43.8 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. ST -M26A-H2SO4- 1A
Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. ST -M26A-NaOH- 1A
Liquid level marked/sealed ✓

Samples stored and locked _____
Remarks _____

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/ 19 /23	Main Stack	M26A	ST 1B

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
S. Schnabel	29.30	-0.65	40	NA	131 ~~132~~	0.85	6' glass	.261 .260 .260	.260

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
9	M5-17	1.60	0.954	5A	5A	CRM	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 10 "Hg	15	10	2.88

PITOT LEAK CHECK ----> [X] PASSED [ ] FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	1002	931.065	.70	2.0	247	263	57	259	65	6
2	5		935.42	.63	1.8	245	264	59	260	55	6
3	10		939.35	.60	1.7	237	265	60	261	56	6
	15	1017	943.31	End of Port							

INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT) INITIAL ____ FINAL ____ LEAK RATE: ____ CU.FT @ ____ INCHES Hg ____ CU.FT @ ____ INCHES Hg

B-1	15	1020	943.31	.55	1.6	236	265	61	259	56	5 SR
2	20		947.15	.52	1.5	243	265	62	257	55	5
3	25		950.78	.47	1.4	238	264	63	252	55	5
	30	1035	954.251	End of Port							

INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT) INITIAL ____ FINAL ____ LEAK RATE: ____ CU.FT @ ____ INCHES Hg ____ CU.FT @ ____ INCHES Hg

C-1	30	1039	954.251	.57	1.6	247	266	62	262	58	5
2	35		958.08	.52	1.5	246	265	61	265	55	5
3	40		961.71	.50	1.4	247	265	61	265	53	5
	45	1054	965.343	End of Port							

INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT) INITIAL ____ FINAL ____ LEAK RATE: ____ CU.FT @ ____ INCHES Hg ____ CU.FT @ ____ INCHES Hg

D-1	45	1057	965.343	.60	1.7	243	263	57	260	57	6
2	50		969.21	.57	1.6	246	263	56	260	55	6
3	55		973.08	.57	1.6	245	262	57	260	55	6
	60	1112	976.941	End of Port							

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE. TEMP.	AVE. TEMP.
60 Min.					

✓

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12/19/23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12/19/23
Run No. ST 6N -M26A- 1B Recovered by SH
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight	X	760.1	790.9	624.3	753.5	749.2	991.1	g
Initial weight	X	752.3	773.3	618.4	751.1	749.4	981.0	g
Net weight	X	7.8	17.6	5.9	2.4	-0.2	10.1	g

Description of impinger water Clear 50 % spent
B/W Sil gel color
Total moisture = 43.6 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. ST -M26A-H2SO4- 1B
Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. ST -M26A-NaOH- 1B
Liquid level marked/sealed ✓

Samples stored and locked _____
Remarks _____

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/19/23	Main Kiln Stack	M26A	ST 2 A

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
DOC	29.2	40 ⇔	-0.65	NA	131 ~~132~~	0.85	6' glass	.260 .260 .261	.260

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
2	DGM-14	1.76	1.006	5A	5A	CEM	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 10 "Hg	15	10	2.17

PITOT LEAK CHECK ----> ☒ PASSED ☐ FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	1134	771.623	.71	2.3	260	262	60	262	62	7
2	5		775.74	.65	2.1	261	260	61	264	59	7
3	10		779.77	.60	1.9	260	260	61	260	55	7
	15	1149	783.643	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

B-1	15	1152	783.643	.55	1.7	262	263	63	263	56	7
2	20		787.33	.55	1.7	260	260	63	261	56	7
3	25		790.94	.47	1.5	263	262	64	261	53	7
	30	1207	794.433	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

C-1	30	1210	794.433	.57	1.9	259	262	63	260	50	7
2	35		798.13	.51	1.6	255	262	63	255	51	7
3	40		801.88	.50	1.6	250	262	63	257	51	7
	45	1225	805.413	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

D-1	45	1225	805.413	.53	1.7	260	262	64	258	53	7
2	50		809.35	.55	1.7	260	264	64	259	54	7
3	55		812.66	.46	1.5	259	261	64	259	55	7
	60	1243	816.109	End of Port							

TOTAL TIME		DGM VOLUME	AVE SQRT delta P	AVE delta H		AVE. TEMP.	AVE. TEMP.
60 Min.							

✓

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12/19/23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12/19/23
Run No. ST 0N -M26A- 2A Recovered by SCS
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		776.1	764.6	673.5	744.6	753.7	1028.6	g
Initial weight		761.2	752.6	670.4	741.9	752.8	1020.4	g
Net weight		14.9	12.0	3.1	2.7	0.9	8.2	g

Description of impinger water clear 80 % spent
B/W Sil gel color
Total moisture = 41.8 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. ST -M26A-H2SO4- 2A Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. ST -M26A-NaOH- 2A Liquid level marked/sealed ✓

Samples stored and locked _____
Remarks _____

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/19/23		M26A	ST 25

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
J. Rothrock	29.28	-0.15	40	NA	(3) ~~132~~	0.85	6' glass	.261 .260	.260

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
5	95-17	1.60	0.968	5A	5A	CEM	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 10 "Hg	15	10	2.88

PITOT LEAK CHECK ----> [X] PASSED [ ] FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	1134	977.115	.71	2.0	250	262	58	262	59	6
2	5		980.74	.65	1.9	250	260	59	264	55	6
3	10		985.38	.60	1.7	247	260	61	266	47	6
	15	1149	989.198	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

B-1	15	1152	989.198	.55	1.6	253	263	61	263	48	6
2	20		992.91	.55	1.6	242	260	61	261	47	6
3	25		996.61	.47	1.4	246	262	62	261	47	6
	30	1207	1000.336	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

C-1	30	1210	1000.336	.57	1.6	247	262	63	260	47	6
2	35		1004.31	.51	1.5	239	262	63	255	45	6
3	40		1008.11	.50	1.4	240	262	64	257	45	6
	45	1225	1011.856	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

D-1	45	1228	1011.856	.53	1.5	237	262	64	258	44	6
2	50		1015.54	.56	1.6	240	264	64	259	42	6
3	55		1019.31	.46	1.3	241	261	63	259	42	6
	60	1243	1023.049	End of Port							

TOTAL TIME		DGM VOLUME	AVE SQRT delta P	AVE delta H		AVE. TEMP.	AVE. TEMP.
60 Min.							

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12/19/23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12/19/23
Run No. ST -M26A-2B Recovered by GCS
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight	X	777.9	771.9	652.0	757.5	745.3	969.8	g
Initial weight	X	762.4	759.3	648.2	754.7	744.2	959.2	g
Net weight	X	15.5	12.6	3.8	2.8	1.1	10.6	g

Description of impinger water clear 10 % spent
BL/W Sil gel color
Total moisture = 46.4 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. ST -M26A-H2SO4- 2B Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. ST -M26A-NaOH- 2B Liquid level marked/sealed ✓

Samples stored and locked _____
Remarks _____

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/19/23		M26A	ST 3A

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
DGC	29.2	-.05	40	NA	13	0.85	6' glass	.260 .261 .260	.260

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
5	M5141	1.710	1.006	5A	5A	CEM	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 10 "Hg	15	10	3.17

PITOT LEAK CHECK ----> [] PASSED [] FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	1259	816.374	.72	2.3	262	261	60	259	60	6
2	5		820.64	.69	2.1	260	262	60	260	60	6
3	10		824.88	.62	2.0	262	261	61	263	59	6
	15	1314	828.583	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

B-1	15	1314	828.583	.57	1.8	257	261	63	250	60	6
2	20		832.34	.58	1.8	257	260	63	252	58	6
3	25		836.19	.50	1.6	257	260	65	255	58	6
	30	1333	839.731	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

C-1	30	1336	839.731	.55	1.7	259	261	63	261	55	6
2	35		843.52	.52	1.6	260	261	64	260	54	6
3	40		846.82	.46	1.5	255	257	65	265	56	6
	45	1351	850.125	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

D-1	45	1354	850.125	.60	1.9	259	265	65	261	57	6
2	50		853.96	.58	1.8	260	265	65	260	58	6
3	55		857.82	.52	1.6	257	261	65	260	60	6
	60	1409	861.315	End of Port							

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE. TEMP.	AVE. TEMP.
60 Min.					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA**
Sample Location Kiln 1 and 3 Main Stack
Run No. ST ON -M26A- 3A
Filter Number(s) Not Applicable

Sample Date 12/19/23
Recovery Date 12/19/23
Recovered by SCG

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		763.1	766.4	616.0	747.6	757.5	940.2	g
Initial weight		744.6	754.9	614.2	745.7	756.6	933.0	g
Net weight		18.5	11.5	1.8	1.9	0.9	7.2	g

Description of impinger water clear 30 % spent
B/W Sil gel color
Total moisture = 41.8 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. ST -M26A-H2SO4- 3A
Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. ST -M26A-NaOH- 3A
Liquid level marked/sealed ✓

Samples stored and locked _____
Remarks _____

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	2/10/23	Main Stack	M26A	ST 3B

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
J. Rothenberg	29.20	-0.65	40	NA	131 ~~132~~	0.85	6' glass	.261 .260 .260	.260

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
5	MS-17	1.60	0.982	5A	5A	QEM	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 10 "Hg	15	10	2.88

PITOT LEAK CHECK ----> ☒ PASSED ☐ FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	1259	23.260	.72	2.1	243	261	59	259	49	6
2	5		27.54	.67	1.9	240	262	60	260	47	6
3	10		31.20	.62	1.5	240	261	60	263	46	6
	15	1314	36.016	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

B-1	15	1318	36.016	.57	1.6	246	261	62	250	46	5
2	20		39.91	.58	1.7	246	260	62	252	46	5
3	25		43.85	.50	1.4	242	260	63	255	45	5
	30	1333	47.776	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

C-1	30	1336	47.776	.55	1.6	235	261	63	261	45	5
2	35		51.88	.52	1.5	242	261	64	260	45	5
3	40		55.61	.46	1.3	243	257	64	265	45	5
	45	1351	59.482	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

D-1	45	1354	59.482	.60	1.7	239	265	64	261	43	5
2	50		63.44	.58	1.7	240	265	64	260	43	5
3	55		67.31	.52	1.5	240	261	63	260	42	5
	60	1409	71.047	End of Port							

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE. TEMP.	AVE. TEMP.
60 Min.					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12/19/23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12/19/23
Run No. ST 01 -M26A- 3B Recovered by SG
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight	X	777.8	767.9	622.0	751.9	749.0	999.1	g
Initial weight	X	753.5	756.1	619.1	750.2	748.3	991.0	g
Net weight	X	24.3	11.8	2.9	1.7	0.7	8.1	g

Description of impinger water clear 60 % spent
13/LW Sil gel color
Total moisture = 49.5 grams

RECOVERED SAMPLE

H_2SO_4 Impingers contents and water rinse
container no. **ST -M26A-H2SO4-** 313 Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. **ST -M26A-NaOH-** 313 Liquid level marked/sealed ✓

Samples stored and locked
Remarks

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12/19/**23**
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12/20/**23**
Run No. ST ON **-M26A-** FB Recovered by SC
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight	X	764.5	756.1	671.2	745.7	751.4	1028.0	g
Initial weight	X	764.7	756.4	671.3	745.8	751.4	1028.5	g
Net weight	X							g

Description of impinger water _____ _____ % spent
_____ _____ Sil gel color
Total moisture = _____ grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. **ST -M26A-H2SO4-** ON FB
Liquid level marked/sealed _____

NaOH Impingers contents and water rinse
container no. **ST -M26A-NaOH-** ON FB
Liquid level marked/sealed _____

Samples stored and locked _____
Remarks From train 2A

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/20/23	Main	M26A	ST 4A

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
DOC	29.7	-.6	30	NA	~~132~~ 131	0.85	6' glass	.310 .311	.310

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
6	M5-14	1.76	1.004	5A	5A	CEM	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 15 "Hg	12	15	5.7

PITOT LEAK CHECK ----> [] PASSED [] FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	833	861.555	.37	2.1	260	306	67	263	65	5
2	5		865.54	.33	1.9	260	308	68	260	64	5
3	10		869.35	.33	1.9	258	300	68	255	61	5
	15	848	873.131	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

B-1	15	851	873.131	.33	1.9	261	306	70	260	55	5
2	20		876.89	.30	1.7	259	307	71	260	52	5
3	25		880.43	.27	1.5	255	307	71	260	50	5
	30	906	883.775	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

C-1	30	910	883.775	.30	1.7	261	305	70	255	51	5
2	35		887.37	.30	1.7	257	305	71	258	48	5
3	40		890.88	.25	1.4	255	303	72	256	49	5
	45	925	894.145	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

D-1	45	928	894.145	.31	1.8	255	304	73	260	52	5
2	50		897.78	.29	1.7	250	360	73	262	50	5
3	55		901.35	.29	1.7	249	301	73	257	50	5
	60	943	904.884	End of Port							

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE. TEMP.	AVE. TEMP.
60 Min.					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12/ 20 /23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12/ 20 /23
Run No. ST C068 -M26A- 4A Recovered by SCS
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		784.0	776.1	617.3	762.0	748.7	947.8	g
Initial weight		751.9	764.2	615.9	759.6	747.9	940.1	g
Net weight		32.1	11.9	1.4	2.4	0.8	7.7	g

Description of impinger water clear 45 % spent
13/W Sil gel color
Total moisture = 56.3 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. ST -M26A-H2SO4- 4A Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. ST -M26A-NaOH- 4A Liquid level marked/sealed ✓

Samples stored and locked
Remarks white coating on 1st Impinger inlet stem removed to with DI rinse

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/ 20 /23		M26A	ST 413

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
J. Rothenberg	29.70	-0.60	30	NA	~~432~~ 431	0.85	6' glass	.312 .311 .313	.312

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
6	M5-17	1.60	0.988	5A	5A	CP,M	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 10 "Hg	12	15	5.1

PITOT LEAK CHECK ----> [X] PASSED [ ] FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	833	71.372	.37	~~1.9~~ 1.9	231	366	69	263	42	7
2	5		75.52	.33	1.7	237	368	69	260	43	7
3	10		79.32	.33	1.7	237	360	70	255	45	7
	15	848	83.059	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL ____ FINAL ____ LEAK RATE: ____ CU.FT @ ____ INCHES Hg ____ CU.FT @ ____ INCHES Hg

B-1	15	851	83.059	.33	1.7	246	366	72	260	44	7
2	20		86.91	.30	1.5	250	367	72	260	42	6
3	25		90.45	.27	1.4	251	367	73	260	41	6
	30	906	94.025	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL ____ FINAL ____ LEAK RATE: ____ CU.FT @ ____ INCHES Hg ____ CU.FT @ ____ INCHES Hg

C-1	30	910	94.025	.30	1.5	247	365	73	255	42	6
2	35		97.73	.30	1.5	247	365	73	258	43	6
3	40		101.24	.25	1.3	250	363	73	256	45	6
	45	925	104.778	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL ____ FINAL ____ LEAK RATE: ____ CU.FT @ ____ INCHES Hg ____ CU.FT @ ____ INCHES Hg

D-1	45	928	104.778	.31	1.6	251	364	74	260	46	6
2	50		108.25	.29	1.5	250	360	74	262	46	6
3	55		111.81	.24	1.5	250	361	73	257	48	6
	60	943	115.305	End of Port							

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE. TEMP.	AVE. TEMP.
60 Min.					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12/ 20/23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12/ 20/23
Run No. ST 044 -M26A- 4B Recovered by GCS
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight	X	787.5	770.6	650.8	743.1	763.1	977.9	g
Initial weight	X	754.3	759.6	648.4	741.3	762.1	969.6	g
Net weight	X	33.2	11.0	2.4	1.8	1.0	8.3	g

Description of impinger water clear 50 % spent
BLU Sil gel color
Total moisture = 57.7 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. ST -M26A-H2SO4- 4B
Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. ST -M26A-NaOH- 4B
Liquid level marked/sealed ✓

Samples stored and locked
Remarks white coating impinger 1 inlet stem

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/20/23	Main kiln stack	M26A	ST 5A

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
DOC	29.7	-.6	30	NA	~~132~~ 131	0.85	6' glass	.316 .310 .311	.310

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
6	MS-14	1.76	1.006	5A	5A	CFR	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 10 "Hg	12	15	5.7

PITOT LEAK CHECK ----> [] PASSED [] FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	1000	905.0	.40	2.3	260	363	70	255	60	5
2	5		909.23	.29	1.7	260	363	70	258	60	5
3	10		912.90	.29	1.7	258	360	71	259	58	5
	15	1015	916.486	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

B-1	15	1018	916.486	.31	1.8	250	363	79	258	60	5
2	20		420.22	.27	1.5	256	363	81	260	57	5
3	25		923.57	.24	1.4	258	363	80	261	53	5
	30	1033	926.855	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

C-1	30	1036	926.855	.30	1.7	260	365	82	267	56	5
2	35		930.47	.30	1.7	260	362	82	267	50	5
3	40		934.06	.22	1.3	258	360	82	267	50	5
	45	1051	937.246	End of Port							

INTRA-PORT LEAK CHECK?
DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

D-1	45	1054	937.246	.32	1.8	259	366	83	259	55	5
2	50		941.19	.30	1.7	260	367	85	260	56	5
3	55		944.56	.26	1.5	260	364	86	260	55	5
	60	1109	946.005	End of Port							

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE. TEMP.	AVE. TEMP.
60 Min.	448.005				

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA**
Sample Location Kiln 1 and 3 Main Stack
Run No. ST Off -M26A- 5A
Filter Number(s) Not Applicable

Sample Date 12/20/23
Recovery Date 12/20/23
Recovered by SCS

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight	X	802.4	769.5	670.0	761.1	769.[illegible]	933.5	g
Initial weight		770.2	759.3	667.8	759.2	768.6	923.9	g
Net weight								g

Description of impinger water Clear 80 % spent
B/G Sil gel color
Total moisture = 56.5 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. ST -M26A-H2SO4- 5A
Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. ST -M26A-NaOH- 5A
Liquid level marked/sealed ✓

Samples stored and locked
Remarks White material on 1st Imp. Stem

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/20/23		M26A	ST 5B

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
J. Bothner Jr	29.70	-0.60	40	NA	~~132~~ 157	0.85	6' glass	.311, .312, .313	.312

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
6	M5-17	1.66	0.988	5A	5A	CFM	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 10 "Hg	17	15	5.1

PITOT LEAK CHECK ----> [X] PASSED [ ] FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	1000	115.455	.40	2.0	226	363	81	255	51	~~5~~ 6
2	5		119.62	.29	1.5	235	363	81	258	55	5
3	10		123.27	.29	1.5	236	360	80	259	56	5
	15	1015	126.958	End of Port							
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL ____/____ FINAL		LEAK RATE: ____/____ CU.FT @ ____/____ INCHES Hg CU.FT @ ____/____ INCHES Hg							
B-1	15	1018	126.958	.31	1.6	249	363	83	258	54	5
2	20		130.67	.27	1.4	250	363	85	260	52	5
3	25		134.28	.24	1.2	250	363	85	261	53	5
	30	1033	137.552	End of Port							
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL ____/____ FINAL		LEAK RATE: ____/____ CU.FT @ ____/____ INCHES Hg CU.FT @ ____/____ INCHES Hg							
C-1	30	1036	137.552	.30	1.5	250	365	86	267	55	5
2	35		141.13	.30	1.5	251	362	87	267	54	5
3	40		144.71	.22	1.1	251	360	87	267	54	5
	45	1051	147.862	End of Port							
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL ____/____ FINAL		LEAK RATE: ____/____ CU.FT @ ____/____ INCHES Hg CU.FT @ ____/____ INCHES Hg							
D-1	45	1054	147.862	.32	1.6	251	366	86	259	54	5
2	50		151.57	.30	1.5	251	367	86	260	57	5
3	55		155.31	.26	1.3	249	364	86	260	60	5
	60	1109	158.955	End of Port							

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE. TEMP.	AVE. TEMP.
60 Min.					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 7/20/23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 7/20/23
Run No. ST oft -M26A- 5B Recovered by SG
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight	X	788.2	774.4	620.6	745.3	754.4	1007.7	g
Initial weight	X	756.0	763.4	618.9	744.3	753.9	998.8	g
Net weight	X							g

Description of impinger water clear 60 % spent
B/W Sil gel color
Total moisture = 55.3 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. ST -M26A-H2SO4- 5B Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. ST -M26A-NaOH- 5B Liquid level marked/sealed ✓

Samples stored and locked
Remarks white material on Imp. 1 Inlet Stem

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/20/23	Main Kiln Stack	M26A	ST 6A

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
DGC	29.7	-.16		NA	~~432~~ 313	0.85	6' glass	.310 .311 310	.310

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
6	M5-14	1.76	1.0006	5A	5A	CFM	.001 CU. FT @ 10 "Hg	.011 CU. FT @ 10 "Hg	12	15	5.7

PITOT LEAK CHECK ----> [] PASSED [] FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	1125	948.186	.37	2.1	260	364	88	261	65	5
2	5		952.12	.30	1.7	261	366	88	261	60	5
3	10		955.76	.23	1.3	258	366	88	260	58	5
	15	1140	959.435	End of Port							

INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

B-1	15	1143	959.435	.30	1.7	259	364	89	255	55	5
2	20		963.33	.27	1.5	260	363	90	250	50	5
3	25		966.59	.25	1.4	260	363	91	252	50	5
	30	~~1205~~	~~966.~~	End of Port							

INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT) INITIAL 1158 969.908 FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

C-1	30	1202	969.908	.30	1.7	263	363	90	260	52	5
2	35		973.61	.25	1.4	260	359	90	260	50	5
3	40		976.96	.25	1.4	255	360	90	257	50	5
	45	1217	980.295	End of Port							

INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT) INITIAL _____ FINAL _____ LEAK RATE: _____ CU.FT @ _____ INCHES Hg _____ CU.FT @ _____ INCHES Hg

D-1	45	1220	980.295	.30	1.7	260	367	91	261	55	5
2	50		983.98	.23	1.3	260	365	90	260	57	5
3	55		987.21	.24	1.4	260	364	89	260	59	5
	60	1235	990.570	End of Port							

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE. TEMP.	AVE. TEMP.
60 Min.					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12 20 23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12/21 20 23
Run No. ST -M26A- 6A Recovered by G S
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight	X	788.8	763.1	672.4	747.0	751.9	962.7	g
Initial weight	X	757.7	753.1	670.0	745.0	757.1	937.2	g
Net weight	X							g

Description of impinger water clear 15 % spent
B/W Sil gel color
Total moisture = 51.6 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. ST -M26A-H2SO4- 6A Liquid level marked/sealed _____

NaOH Impingers contents and water rinse
container no. ST -M26A-NaOH- 6A Liquid level marked/sealed _____

Samples stored and locked _____
Remarks White material on Imp 1 Inlet stem

METHOD 26A FIELD DATA SHEET

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Buzzi Unicem; Stockertown PA	12/20/23		M26A	ST 1 of B

OPERATOR	AMBIENT PRESS (In. Hg)	STATIC PRESSURE (in. Water)	AMBIENT TEMP (deg. F)	FILTER NUMBERS	STACK ID (In.)	PITOT Cp	PROBE LENGTH AND LINER TYPE	NOZZLE NUMBER	NOZZLE DIAMETER
J. Rothenberg	29.76	-0.60	40	NA	~~.432~~ /31	0.85	6' glass	.311 .312 .313	.312

ASSUMED MOISTURE (%)	DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	O2 CONTENT %	CO2 CONTENT %	K FACTOR
6	MS-17	1.60	0.988	5A	5A	CEM	.001 CU. FT @ 10 "Hg	.001 CU. FT @ 10 "Hg	12	15	5.1

PITOT LEAK CHECK ----> [X] PASSED [ ] FAILED

TRAVERSE PORT/ /POINT NO.	ELAPSED TEST TIME (MIN)	CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	delta P VELOCITY HEAD (In. H2O)	delta H ORIFICE (In. H2O)	PROBE TEMP (deg. F)	STACK TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	FILTER OVEN TEMP (deg. F)	Sil Gel EXIT TEMP (deg. F)	SAMPLE TRAIN VAC (in. Hg)
A-1	0	1125	159.140	.37	1.9	238	364	85	261	57	5
2	5		163.18	.30	1.5	247	364	85	261	55	4
3	10		166.91	.23	1.2	247	366	86	260	54	4
	15	1149	170.622	End of Port							
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL ____ FINAL ____		LEAK RATE: ____ CU.FT @ ____ INCHES Hg ____ CU.FT @ ____ INCHES Hg							
B-1	15	1153	170.622	.30	1.5	242	364	87	255	53	5
2	20		174.40	.27	1.4	247	363	88	250	52	5
3	25		177.81	.25	1.3	247	363	88	257	52	5
	30	1158	181.211	End of Port							
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL ____ FINAL ____		LEAK RATE: ____ CU.FT @ ____ INCHES Hg ____ CU.FT @ ____ INCHES Hg							
C-1	30	1202	181.211	.30	1.5	254	363	88	260	56	5
2	35		184.91	.25	1.3	250	359	88	260	56	5
3	40		188.61	.25	1.3	251	360	89	257	55	5
	45	1217	191.953	End of Port							
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL ____ FINAL ____		LEAK RATE: ____ CU.FT @ ____ INCHES Hg ____ CU.FT @ ____ INCHES Hg							
D-1	45	1220	191.953	.30	1.5	251	367	90	261	55	5
2	50		195.61	.23	1.2	253	365	90	260	55	5
3	55		199.35	.24	1.2	253	364	91	260	57	5
	60	1235	202.950	End of Port							

TOTAL TIME	DGM VOLUME	AVE SQRT delta P	AVE delta H	AVE. TEMP.	AVE. TEMP.
60 Min.					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12 20 /23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12 26 /23
Run No. ST **-M26A-** GB Recovered by SC
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight	X	803.2	796.5	600.4	760.0	771.6	955.5	g
Initial weight		773.4	786.8	598.6	759.7	770.4	948.0	g
Net weight		29.8	9.7	1.8	0.3	1.2	7.5	g

Description of impinger water Clear 60 % spent
B/W Sil gel color
Total moisture = 50.3 grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. **ST -M26A-H2SO4-** Liquid level marked/sealed ✓

NaOH Impingers contents and water rinse
container no. **ST -M26A-NaOH-** Liquid level marked/sealed ✓

Samples stored and locked
Remarks black material on Imp 1 inlet stem

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant **Buzzi Unicem; Stockertown PA** Sample Date 12/20/23
Sample Location Kiln 1 and 3 Main Stack Recovery Date 12/20/23
Run No. ST Off -M26A- FB Recovered by SCS
Filter Number(s) Not Applicable

MOISTURE

Impingers	1 50 ml 0.1N H_2SO_4 (knockout)	2 100 ml 0.1N H_2SO_4 (tipped)	3 100 ml 0.1N H_2SO_4 (tipped)	4 Optional Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		749.3	763.5	612.5	751.3	752.6	947.4	g
Initial weight	X	749.6	763.4	612.6	751.1	752.4	947.4	g
Net weight								g

Description of impinger water _____ 40 % spent
_____ B/W Sil gel color
Total moisture = _____ grams

RECOVERED SAMPLE

H_2SO_4 Impingers and knockout contents and water rinse
container no. **ST -M26A-H2SO4-** Off FB Liquid level marked/sealed _____

NaOH Impingers contents and water rinse
container no. **ST -M26A-NaOH-** Off FB Liquid level marked/sealed _____

Samples stored and locked _____
Remarks Train 4A used

Client: Buzzi Unicem Stockertown
Test Location: Kiln 1 and 3 Stack
Date: Dec 19, 2023 Start Time: 10:02:06
Run number 1
One Minute Averages

	O2 %,dry	CO2 %,dry
10:03:04 AM	14.9	10.2
10:04:04 AM	14.8	10.4
10:05:04 AM	14.8	10.3
10:06:04 AM	14.9	10.1
10:07:04 AM	14.9	10.1
10:08:04 AM	14.9	10.2
10:09:04 AM	14.8	10.4
10:10:04 AM	14.9	10.1
10:11:04 AM	14.8	10.3
10:12:04 AM	14.9	10.2
10:13:04 AM	14.9	10.2
10:14:04 AM	14.8	10.3
10:15:04 AM	14.8	10.4
10:16:04 AM	14.8	10.3
10:17:04 AM	14.8	10.4
10:18:04 AM	14.9	10.2
10:19:04 AM	15.0	10.2
10:20:04 AM	14.7	10.5
10:21:04 AM	14.6	10.7
10:22:04 AM	14.8	10.3
10:23:04 AM	14.8	10.3
10:24:04 AM	14.8	10.3
10:25:04 AM	14.8	10.4
10:26:04 AM	14.9	10.2
10:27:04 AM	14.9	10.2
10:28:04 AM	15.0	10.1
10:29:04 AM	15.0	10.2
10:30:04 AM	14.9	10.4
10:31:04 AM	14.8	10.4
10:32:04 AM	14.9	10.3
10:33:04 AM	15.0	10.1
10:34:04 AM	14.8	10.4
10:35:04 AM	14.7	10.6
10:36:04 AM	14.7	10.5
10:37:04 AM	14.7	10.5
10:38:04 AM	14.7	10.4
10:39:04 AM	15.0	10.1
10:40:04 AM	14.9	10.4
10:41:04 AM	14.9	10.4
10:42:04 AM	14.9	10.2
10:43:04 AM	14.9	10.3
10:44:04 AM	15.1	10.0
10:45:04 AM	15.0	10.1
10:46:04 AM	14.9	10.3
10:47:04 AM	14.9	10.3
10:48:04 AM	14.8	10.4
10:49:04 AM	14.9	10.2
10:50:04 AM	14.9	10.3
10:51:04 AM	14.9	10.3
10:52:04 AM	15.0	10.0
10:53:04 AM	14.9	10.3
10:54:04 AM	14.9	10.2
10:55:04 AM	14.8	10.5
10:56:04 AM	14.7	10.4
10:57:04 AM	14.8	10.4
10:58:04 AM	14.9	10.3
10:59:04 AM	14.7	10.6
11:00:04 AM	14.8	10.5
11:01:04 AM	14.9	10.2
11:02:04 AM	14.8	10.5
Run Avgs	14.8	10.3
Cal Gas	12.1	10.1
Initial Zero	0.1	0.2
Final Zero	0.1	0.2
Initial cal.	12.0	10.0
Final Cal.	12.1	10.0
Corrected Average	14.9	10.4

Client: Buzzi Unicem Stockertown
Test Location: Kiln 1 and 3 Stack
Date: Dec 19 23 Start Time: 11:34:14
Run number 2
One Minute Averages

	O2 %,dry	CO2 %,dry
11:35:12 AM	14.8	10.4
11:36:12 AM	15.0	10.1
11:37:12 AM	15.0	10.2
11:38:12 AM	14.9	10.3
11:39:12 AM	14.9	10.3
11:40:12 AM	15.0	10.1
11:41:12 AM	15.0	10.1
11:42:12 AM	14.8	10.5
11:43:12 AM	14.9	10.2
11:44:12 AM	14.9	10.3
11:45:12 AM	14.8	10.4
11:46:12 AM	14.8	10.4
11:47:12 AM	14.7	10.6
11:48:12 AM	14.8	10.4
11:49:12 AM	14.9	10.3
11:50:12 AM	14.5	10.8
11:51:12 AM	15.0	10.1
11:52:12 AM	15.0	10.3
11:53:12 AM	14.9	10.4
11:54:12 AM	14.9	10.4
11:55:12 AM	14.7	10.5
11:56:12 AM	14.9	10.2
11:57:12 AM	14.9	10.3
11:58:12 AM	14.8	10.3
11:59:12 AM	14.9	10.3
12:00:12 PM	14.8	10.4
12:01:12 PM	14.9	10.3
12:02:12 PM	14.9	10.4
12:03:12 PM	15.0	10.1
12:04:12 PM	14.9	10.3
12:05:12 PM	14.9	10.3
12:06:12 PM	14.9	10.3
12:07:12 PM	14.9	10.3
12:08:12 PM	14.9	10.3
12:09:12 PM	14.8	10.5
12:10:12 PM	14.8	10.5
12:11:12 PM	14.8	10.4
12:12:12 PM	14.8	10.4
12:13:12 PM	14.8	10.5
12:14:12 PM	14.7	10.5
12:15:12 PM	14.6	10.7
12:16:12 PM	15.0	10.1
12:17:12 PM	14.9	10.5
12:18:12 PM	15.0	10.2
12:19:12 PM	14.7	10.7
12:20:12 PM	14.9	10.4
12:21:12 PM	14.9	10.2
12:22:12 PM	14.8	10.4
12:23:12 PM	15.1	10.0
12:24:12 PM	15.2	10.0
12:25:12 PM	15.2	10.0
12:26:12 PM	14.8	10.6
12:27:12 PM	15.2	9.9
12:28:12 PM	15.3	9.8
12:29:12 PM	15.1	10.2
12:30:12 PM	15.1	10.2
12:31:12 PM	15.0	10.1
12:32:12 PM	15.0	10.2
12:33:12 PM	14.9	10.2
12:34:12 PM	15.1	10.0
Run Avgs	14.9	10.3
Cal Gas	12.1	10.1
Initial Zero	0.1	0.2
Final Zero	0.2	0.2
Initial cal.	12.1	10.0
Final Cal.	12.3	10.0
Corrected Average	14.8	10.4

Client: Buzzi Unicem Stockertown
Test Location: Kiln 1 and 3 Stack
Date: Dec 19 23 Start Time: 12:59:04
Run number 3
One Minute Averages

	O2 %,dry	CO2 %,dry
1:00:02 PM	15.3	9.9
1:01:02 PM	15.1	10.2
1:02:02 PM	15.1	10.2
1:03:02 PM	15.0	10.3
1:04:02 PM	15.1	10.2
1:05:02 PM	15.0	10.2
1:06:02 PM	15.1	10.1
1:07:02 PM	15.1	10.1
1:08:02 PM	15.0	10.3
1:09:02 PM	15.1	10.0
1:10:02 PM	15.2	9.9
1:11:02 PM	15.0	10.3
1:12:02 PM	15.2	10.0
1:13:02 PM	15.0	10.3
1:14:02 PM	15.0	10.4
1:15:02 PM	15.1	10.3
1:16:02 PM	14.9	10.5
1:17:02 PM	15.0	10.3
1:18:02 PM	15.1	10.2
1:19:02 PM	15.0	10.3
1:20:02 PM	14.9	10.4
1:21:02 PM	14.7	10.7
1:22:02 PM	15.1	10.2
1:23:02 PM	15.0	10.4
1:24:02 PM	14.9	10.5
1:25:02 PM	15.1	10.1
1:26:02 PM	14.8	10.5
1:27:02 PM	14.8	10.5
1:28:02 PM	15.1	10.1
1:29:02 PM	14.8	10.6
1:30:02 PM	15.1	10.1
1:31:02 PM	14.8	10.5
1:32:02 PM	15.0	10.2
1:33:02 PM	15.0	10.3
1:34:02 PM	14.9	10.5
1:35:02 PM	15.1	10.2
1:36:02 PM	14.9	10.4
1:37:02 PM	15.0	10.2
1:38:02 PM	15.0	10.1
1:39:02 PM	15.0	10.2
1:40:02 PM	15.0	10.2
1:41:02 PM	15.0	10.2
1:42:02 PM	14.9	10.4
1:43:02 PM	14.8	10.4
1:44:02 PM	15.1	10.1
1:45:02 PM	15.2	10.0
1:46:02 PM	15.1	10.2
1:47:02 PM	15.2	9.9
1:48:02 PM	15.1	10.1
1:49:02 PM	15.2	9.9
1:50:02 PM	15.1	10.1
1:51:02 PM	15.0	10.3
1:52:02 PM	15.0	10.2
1:53:02 PM	14.9	10.3
1:54:02 PM	15.1	10.1
1:55:02 PM	15.1	10.2
1:56:02 PM	14.8	10.5
1:57:02 PM	14.6	10.7
1:58:02 PM	15.0	10.2
1:59:02 PM	15.2	10.1
Run Avgs	15.0	10.3
Cal Gas	12.1	10.1
Initial Zero	0.2	0.2
Final Zero	0.2	0.2
Initial cal.	12.3	10.0
Final Cal.	12.2	10.0
Corrected Average	14.9	10.4

Buzzi Unicem; Stockertown PA Main Stack: Raw Mill On December 19, 2023 Operator GH

					Run No. 1		10:02-11:02			Run No. 2		11:34-12:34			Run No. 3		12:59-13:59		
Cylinder ID	Gas Type	Value	Internal Response	Cal Error	Pre Run Bias	Percent Bias	Post Run Bias	Percent Bias	Percent Drift	Pre Run Bias	Percent Bias	Post Run Bias	Percent Bias	Percent Drift	Pre Run Bias	Percent Bias	Post Run Bias	Percent Bias	Percent Drift
	O2 Zero	Zero N2	0.0%	0.00%	0.1%	0.46%	0.1%	0.46%	0.00%	0.1%	0.46%	0.2%	0.91%	0.46%	0.2%	0.91%	0.2%	0.91%	0.00%
EB0070764	O2 Mid	12.1%	12.0%	-0.37%	12.0%	0.00%	12.1%	0.46%	0.46%	12.1%	0.46%	12.3%	1.37%	0.91%	12.3%	1.37%	12.2%	0.91%	-0.46%
ALM056015	O2 Span	21.9%	21.9%	0.00%															
	CO2 Zero	Zero N2	0.0%	0.00%	0.2%	1.10%	0.2%	1.10%	0.00%	0.2%	1.10%	0.2%	1.10%	0.00%	0.2%	1.10%	0.2%	1.10%	0.00%
EB0070764	CO2 Mid	10.1%	10.0%	-0.77%	10.0%	0.00%	10.0%	0.00%	0.00%	10.0%	0.00%	10.0%	0.00%	0.00%	10.0%	0.00%	10.1%	0.55%	0.55%
ALM056015	CO2 Span	18.2%	18.2%	0.17%															

Client: Buzzi Unicem Stockertown
Test Location: Kiln 1 and 3 Stack
Date: Dec 20 23 Start Time: 08:33:06
Run number 1
One Minute Averages

	O2 %,dry	CO2 %,dry
8:34:04 AM	12.0	14.8
8:35:04 AM	12.2	14.6
8:36:04 AM	12.4	14.3
8:37:04 AM	12.2	14.5
8:38:04 AM	12.1	14.6
8:39:04 AM	12.0	14.7
8:40:04 AM	12.0	14.7
8:41:04 AM	12.1	14.6
8:42:04 AM	12.0	14.8
8:43:04 AM	11.8	14.9
8:44:04 AM	12.0	14.8
8:45:04 AM	11.9	15.0
8:46:04 AM	11.7	15.3
8:47:04 AM	11.6	15.3
8:48:04 AM	11.7	15.2
8:49:04 AM	12.0	14.8
8:50:04 AM	12.0	14.9
8:51:04 AM	12.0	14.9
8:52:04 AM	12.1	14.6
8:53:04 AM	12.3	14.5
8:54:04 AM	12.4	14.4
8:55:04 AM	12.3	14.6
8:56:04 AM	12.2	14.5
8:57:04 AM	12.1	14.6
8:58:04 AM	11.9	14.8
8:59:04 AM	12.1	14.5
9:00:04 AM	12.1	14.6
9:01:04 AM	12.0	14.7
9:02:04 AM	12.1	14.6
9:03:04 AM	12.1	14.7
9:04:04 AM	12.1	14.6
9:05:04 AM	12.2	14.5
9:06:04 AM	12.3	14.5
9:07:04 AM	12.2	14.6
9:08:04 AM	12.1	14.7
9:09:04 AM	12.2	14.6
9:10:04 AM	12.1	14.7
9:11:04 AM	11.9	14.8
9:12:04 AM	12.1	14.7
9:13:04 AM	12.1	14.7
9:14:04 AM	12.1	14.6
9:15:04 AM	12.1	14.5
9:16:04 AM	12.0	14.8
9:17:04 AM	12.0	14.8
9:18:04 AM	12.2	14.6
9:19:04 AM	12.3	14.4
9:20:04 AM	12.3	14.5
9:21:04 AM	12.3	14.5
9:22:04 AM	12.3	14.5
9:23:04 AM	12.2	14.6
9:24:04 AM	12.4	14.3
9:25:04 AM	12.3	14.5
9:26:04 AM	12.5	14.3
9:27:04 AM	12.1	14.9
9:28:04 AM	12.0	14.8
9:29:04 AM	12.2	14.5
9:30:04 AM	11.9	14.9
9:31:04 AM	11.9	14.9
9:32:04 AM	11.8	15.0
9:33:04 AM	12.2	14.6
Run Avgs	12.1	14.7
Cal Gas	12.1	10.1
Initial Zero	0.2	0.2
Final Zero	0.2	0.2
Initial cal.	12.1	10.0
Final Cal.	12.1	10.0
Corrected Average	12.1	14.9

Client: Buzzi Unicem Stockertown
Test Location: Kiln 1 and 3 Stack
Date: Dec 20 23 Start Time: 10:00:04
Run number 2
One Minute Averages

	O2 %,dry	CO2 %,dry
10:01:02	12.4	14.3
10:02:02	12.2	14.6
10:03:02	12.1	14.6
10:04:02	12.2	14.5
10:05:02	12.4	14.2
10:06:02	12.3	14.5
10:07:02	12.0	14.9
10:08:02	12.0	14.8
10:09:02	12.3	14.5
10:10:02	12.1	14.7
10:11:02	12.2	14.6
10:12:02	12.3	14.5
10:13:02	12.1	14.8
10:14:02	12.1	14.7
10:15:02	12.2	14.7
10:16:02	11.8	15.1
10:17:02	11.8	14.9
10:18:02	12.2	14.6
10:19:02	12.2	14.6
10:20:02	12.0	15.0
10:21:02	12.0	14.9
10:22:02	11.9	15.0
10:23:02	12.2	14.6
10:24:02	12.1	14.9
10:25:02	12.3	14.7
10:26:02	12.2	14.8
10:27:02	12.1	14.9
10:28:02	11.9	15.1
10:29:02	11.8	15.2
10:30:02	12.0	14.9
10:31:02	11.8	15.2
10:32:02	11.6	15.3
10:33:02	11.6	15.3
10:34:02	11.9	15.0
10:35:02	12.2	14.6
10:36:02	12.1	14.8
10:37:02	12.2	14.6
10:38:02	12.4	14.4
10:39:02	12.7	14.0
10:40:02	12.6	14.1
10:41:02	12.0	15.3
10:42:02	12.2	14.8
10:43:02	12.4	14.6
10:44:02	12.3	14.7
10:45:02	12.0	14.9
10:46:02	11.8	15.1
10:47:02	11.7	15.2
10:48:02	11.8	15.1
10:49:02	11.7	15.1
10:50:02	11.9	14.9
10:51:02	11.8	15.1
10:52:02	11.8	15.1
10:53:02	11.8	15.2
10:54:02	11.8	15.1
10:55:02	12.1	14.7
10:56:02	11.9	15.2
10:57:02	12.1	14.8
10:58:02	12.1	14.9
10:59:02	12.1	15.0
11:00:02	12.1	15.0
Run Avgs	12.1	14.8
Cal Gas	12.1	10.1
Initial Zero	0.2	0.2
Final Zero	0.2	0.2
Initial cal.	12.1	10.0
Final Cal.	12.1	10.0
Corrected Average	12.1	15.1

Client: Buzzi Unicem Stockertown
Test Location: Kiln 1 and 3 Stack
Date: Dec 20 23 Start Time: 11:25:06
Run number 3
One Minute Averages

	O2 %,dry	CO2 %,dry
11:26:04 AM	11.9	14.8
11:27:04 AM	12.1	14.8
11:28:04 AM	12.0	14.9
11:29:04 AM	12.2	14.7
11:30:04 AM	12.3	14.7
11:31:04 AM	12.3	14.6
11:32:04 AM	12.5	14.4
11:33:04 AM	12.3	14.7
11:34:04 AM	12.5	14.3
11:35:04 AM	12.5	14.4
11:36:04 AM	12.6	14.2
11:37:04 AM	12.6	14.2
11:38:04 AM	12.3	14.6
11:39:04 AM	12.3	14.7
11:40:04 AM	13.0	13.5
11:41:04 AM	13.4	12.8
11:42:04 AM	13.2	13.6
11:43:04 AM	13.2	13.8
11:44:04 AM	14.7	11.2
11:45:04 AM	14.5	11.4
11:46:04 AM	13.4	13.6
11:47:04 AM	12.4	14.9
11:48:04 AM	12.1	15.4
11:49:04 AM	11.9	15.6
11:50:04 AM	11.9	15.6
11:51:04 AM	12.1	14.9
11:52:04 AM	12.0	15.1
11:53:04 AM	12.1	15.0
11:54:04 AM	12.1	15.1
11:55:04 AM	12.0	15.1
11:56:04 AM	11.9	15.1
11:57:04 AM	11.9	15.1
11:58:04 AM	11.6	15.4
11:59:04 AM	11.8	15.2
12:00:04 PM	11.7	15.4
12:01:04 PM	11.6	15.6
12:02:04 PM	11.6	15.5
12:03:04 PM	11.4	15.8
12:04:04 PM	11.8	15.2
12:05:04 PM	11.8	15.3
12:06:04 PM	11.9	15.2
12:07:04 PM	12.0	15.1
12:08:04 PM	12.3	14.7
12:09:04 PM	12.4	14.6
12:10:04 PM	12.1	15.1
12:11:04 PM	12.2	14.9
12:12:04 PM	12.3	14.7
12:13:04 PM	12.2	14.8
12:14:04 PM	12.3	14.6
12:15:04 PM	12.1	14.9
12:16:04 PM	11.8	15.2
12:17:04 PM	11.8	15.2
12:18:04 PM	11.9	14.9
12:19:04 PM	12.1	14.8
12:20:04 PM	12.1	14.9
12:21:04 PM	12.2	14.9
12:22:04 PM	11.9	15.2
12:23:04 PM	12.2	14.8
12:24:04 PM	12.2	14.9
12:25:04 PM	12.4	14.5
Run Avgs	12.3	14.7
Cal Gas	12.1	10.1
Initial Zero	0.2	0.2
Final Zero	0.3	0.2
Initial cal.	12.1	10.0
Final Cal.	12.2	10.0
Corrected Average	12.2	14.9

Buzzi Unicem; Stockertown PA Main Stack: Raw Mill Off December 20, 2023 Operator JCS

Cylinder ID	Gas Type	Value	Internal Response	Cal Error	Run No. 1 08:33-09:33 Pre Run Bias	Percent Bias	Post Run Bias	Percent Bias	Percent Drift	Run No. 2 10:00-11:00 Pre Run Bias	Percent Bias	Post Run Bias	Percent Bias	Percent Drift	Run No. 3 11:25-12:25 Pre Run Bias	Percent Bias	Post Run Bias	Percent Bias	Percent Drift
	O2 Zero	Zero N2	0.0%	0.00%	0.2%	0.91%	0.2%	0.91%	0.00%	0.2%	0.91%	0.2%	0.91%	0.00%	0.2%	0.91%	0.3%	1.37%	0.46%
EB0070764	O2 Mid	12.1%	12.1%	0.09%	12.1%	0.00%	12.1%	0.00%	0.00%	12.1%	0.00%	12.1%	0.00%	0.00%	12.1%	0.00%	12.2%	0.46%	0.46%
ALM056015	O2 Span	21.9%	21.9%	0.00%															
	CO2 Zero	Zero N2	0.0%	0.00%	0.2%	1.10%	0.2%	1.10%	0.00%	0.2%	1.10%	0.2%	1.10%	0.00%	0.2%	1.10%	0.2%	1.10%	0.00%
EB0070764	CO2 Mid	10.1%	10.1%	-0.22%	10.0%	-0.55%	10.0%	-0.55%	0.00%	10.0%	-0.55%	10.0%	-0.55%	0.00%	10.0%	-0.55%	10.0%	-0.55%	0.00%
ALM056015	CO2 Span	18.2%	18.2%	0.17%															

Buzzi
Stockertown PA
Kiln 1 and 3 Main Stack; Mill On
HCN Analyte Spikes

	Date	**12/19/23**	**12/19/23**	**12/19/23**	**12/19/23**
	Time	**08:08-08:26**	**11:03-11:18**	**12:31-12:51**	**14:00-14:27**
		Main Pre 1	**Main Post 1**	**Main Post 2**	**Main Post 3**
		HCN	**HCN**	**HCN**	**HCN**
Cs	Spike Direct, ppm	48.22	48.22	48.22	48.22
	SF6 Tracer Direct, ppm	4.78	4.78	4.78	4.78
SF6	Diluted SF6 Tracer, ppm	0.107	0.098	0.106	0.120
	Diluted SF6 Tracer, ppm	0.108	0.094	0.101	0.111
	Average Diluted SF6 Tracer, ppm	0.108	0.096	0.104	0.116
DF	Dilution Ratio	44.44	49.76	46.15	41.36
	Total, ppm	1.677	1.558	1.589	1.659
	Total, ppm	1.684	1.436	1.594	1.526
Ct	Average Total, ppm	1.681	1.497	1.592	1.593
	Pre Spike Native , ppm	0.525	0.634	0.534	0.632
	Pre Spike Native , ppm	0.434	0.658	0.525	0.617
	Post Spike Native , ppm	0.722	0.575	0.560	0.463
	Post Spike Native , ppm	0.681	0.739	0.570	0.379
Cn	Average Native , ppm	0.591	0.652	0.547	0.523
	Spike Recovery	**101.7%**	**88.6%**	**101.1%**	**92.8%**
	CTS Direct (CC426155)				
	Ethylene Expected (ppm)	75.47			75.48
	Ethylene Measured (ppm)	72.76			73.26
	CTS Error	**-3.6%**			**-2.9%**

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack; Mill On
Pre Run 1 HCN Analyte Spike

Spectrum	Date	Time	HCN PCA 191c R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC__155644.LAB	12/19/23	08:06:01.629	0.429	0.072	-0.000
SPC__155645.LAB	12/19/23	08:07:05.536	0.565	0.058	-0.002
SPC__155646.LAB	12/19/23	08:08:09.435	0.525	0.023	-0.005
SPC__155647.LAB	12/19/23	08:09:13.336	0.434	0.030	-0.003
SPC__155648.LAB	12/19/23	08:10:17.424	0.379	0.020	-0.001
SPC__155649.LAB	12/19/23	08:11:21.140	0.199	-0.007	-0.003
SPC__155650.LAB	12/19/23	08:12:25.222	0.356	0.004	-0.001
SPC__155651.LAB	12/19/23	08:13:28.950	0.608	-0.012	-0.003
SPC__155652.LAB	12/19/23	08:14:33.030	0.757	-0.014	0.006
SPC__155653.LAB	12/19/23	08:15:36.750	1.582	0.005	0.113
SPC__155654.LAB	12/19/23	08:16:40.658	1.677	-0.003	0.107
SPC__155655.LAB	12/19/23	08:17:44.558	1.684	-0.002	0.108
SPC__155656.LAB	12/19/23	08:18:48.459	3.768	0.029	0.298
SPC__155657.LAB	12/19/23	08:19:52.372	0.653	-0.033	-0.004
SPC__155658.LAB	12/19/23	08:20:56.365	0.675	-0.042	-0.004
SPC__155659.LAB	12/19/23	08:22:00.205	-0.156	-0.039	-0.006
SPC__155660.LAB	12/19/23	08:23:04.071	0.413	-0.008	-0.002
SPC__155661.LAB	12/19/23	08:24:08.070	0.883	-0.018	-0.003
SPC__155662.LAB	12/19/23	08:25:11.954	0.722	0.004	-0.003
SPC__155663.LAB	12/19/23	08:26:15.806	0.681	-0.006	-0.003
SPC__155664.LAB	12/19/23	08:27:19.710	0.647	-0.010	-0.000
SPC__155665.LAB	12/19/23	08:28:23.611	0.469	-0.020	-0.001

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Post Run 1 HCN Analyte Spike

Spectrum	Date	Time	HCN PCA 191c R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC__155809.LAB	12/19/23	11:02:21.309	0.183	-0.071	-0.003
SPC__155810.LAB	12/19/23	11:03:25.208	0.634	-0.076	0.002
SPC__155811.LAB	12/19/23	11:04:29.113	0.658	-0.083	-0.001
SPC__155812.LAB	12/19/23	11:05:33.008	1.273	-0.096	0.087
SPC__155813.LAB	12/19/23	11:06:36.949	1.454	-0.072	0.107
SPC__155814.LAB	12/19/23	11:07:40.812	1.558	-0.050	0.098
SPC__155815.LAB	12/19/23	11:08:44.807	1.436	-0.029	0.094
SPC__155816.LAB	12/19/23	11:09:48.714	3.355	-0.066	0.260
SPC__155817.LAB	12/19/23	11:10:52.505	0.370	-0.042	0.001
SPC__155818.LAB	12/19/23	11:11:56.400	0.299	-0.029	0.001
SPC__155819.LAB	12/19/23	11:13:00.300	0.334	-0.004	0.001
SPC__155820.LAB	12/19/23	11:14:04.232	-0.046	-0.026	-0.009
SPC__155821.LAB	12/19/23	11:15:08.145	0.594	-0.072	-0.006
SPC__155822.LAB	12/19/23	11:16:12.044	0.653	-0.083	0.001
SPC__155823.LAB	12/19/23	11:17:15.940	0.575	-0.091	-0.001
SPC__155824.LAB	12/19/23	11:18:19.983	0.739	-0.086	-0.003

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Post Run 2 HCN Analyte Spike

Spectrum	Date	Time	HCN PCA 191c R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC__155890.LAB	12/19/23	12:29:38.642	0.568	-0.045	-0.001
SPC__155891.LAB	12/19/23	12:30:42.459	0.534	-0.063	0.001
SPC__155892.LAB	12/19/23	12:31:46.354	0.525	-0.049	-0.002
SPC__155893.LAB	12/19/23	12:32:50.251	0.433	-0.049	-0.002
SPC__155894.LAB	12/19/23	12:33:54.192	0.410	-0.045	-0.002
SPC__155895.LAB	12/19/23	12:34:58.088	0.498	-0.043	-0.003
SPC__155896.LAB	12/19/23	12:36:01.988	0.855	-0.041	-0.002
SPC__155897.LAB	12/19/23	12:37:05.853	0.524	-0.044	-0.000
SPC__155898.LAB	12/19/23	12:38:09.851	0.868	-0.065	0.055
SPC__155899.LAB	12/19/23	12:39:13.646	1.589	-0.069	0.106
SPC__155900.LAB	12/19/23	12:40:17.887	1.594	-0.068	0.101
SPC__155901.LAB	12/19/23	12:41:21.444	3.246	-0.062	0.259
SPC__155902.LAB	12/19/23	12:42:25.343	0.408	-0.068	0.001
SPC__155903.LAB	12/19/23	12:43:29.240	0.430	-0.044	-0.001
SPC__155904.LAB	12/19/23	12:44:33.132	-0.071	-0.013	-0.004
SPC__155905.LAB	12/19/23	12:45:37.031	0.066	-0.016	-0.007
SPC__155906.LAB	12/19/23	12:46:40.939	0.211	-0.044	-0.004
SPC__155907.LAB	12/19/23	12:47:44.833	0.454	-0.078	-0.003
SPC__155908.LAB	12/19/23	12:48:48.835	0.519	-0.098	-0.001
SPC__155909.LAB	12/19/23	12:49:53.001	0.560	-0.087	-0.002
SPC__155910.LAB	12/19/23	12:50:56.524	0.570	-0.073	-0.002
SPC__155911.LAB	12/19/23	12:52:00.603	0.552	-0.081	-0.001

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Post Run 3 HCN Analyte Spike and CTS

Spectrum	Date	Time	HCN PCA 191c R1 191c	HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C
SPC__155974.LAB	12/19/23	14:00:15.959	0.632	-0.097	-0.002	0.274
SPC__155975.LAB	12/19/23	14:01:19.827	0.617	-0.078	-0.003	0.302
SPC__155976.LAB	12/19/23	14:02:23.682	0.645	-0.090	-0.002	0.249
SPC__155977.LAB	12/19/23	14:03:27.586	0.469	-0.079	-0.000	0.239
SPC__155978.LAB	12/19/23	14:04:31.481	1.040	-0.045	0.061	0.215
SPC__155979.LAB	12/19/23	14:05:35.670	1.659	-0.085	0.120	0.192
SPC__155980.LAB	12/19/23	14:06:39.281	1.526	-0.090	0.111	0.176
SPC__155981.LAB	12/19/23	14:07:43.174	1.318	-0.082	0.104	0.136
SPC__155982.LAB	12/19/23	14:08:47.146	1.965	-0.081	0.168	0.214
SPC__155983.LAB	12/19/23	14:09:51.013	2.305	-0.043	0.158	0.124
SPC__155984.LAB	12/19/23	14:10:54.898	0.281	-0.025	0.000	0.090
SPC__155985.LAB	12/19/23	14:11:58.795	0.442	-0.031	-0.007	-0.008
SPC__155986.LAB	12/19/23	14:13:02.670	0.066	-0.069	-0.003	0.142
SPC__155987.LAB	12/19/23	14:14:06.599	0.653	-0.094	-0.000	0.245
SPC__155988.LAB	12/19/23	14:15:10.792	0.781	-0.102	-0.005	0.247
SPC__155989.LAB	12/19/23	14:16:14.358	0.463	-0.075	0.000	0.243
SPC__155990.LAB	12/19/23	14:17:18.246	0.379	-0.059	-0.004	0.057
SPC__155991.LAB	12/19/23	14:18:22.276	0.559	-0.010	-0.001	0.047
SPC__155992.LAB	12/19/23	14:19:26.043	-0.022	-0.011	-0.000	-0.010
SPC__155993.LAB	12/19/23	14:20:30.194	0.263	-0.023	0.001	0.087
SPC__155994.LAB	12/19/23	14:21:33.828	0.330	-0.007	0.002	0.036
SPC__155995.LAB	12/19/23	14:22:37.781	-0.090	-0.000	-0.011	63.873
SPC__155996.LAB	12/19/23	14:23:41.622	-0.073	-0.010	-0.013	72.800
SPC__155997.LAB	12/19/23	14:24:45.700	0.048	-0.014	-0.013	72.949
SPC__155998.LAB	12/19/23	14:25:49.425	0.139	-0.007	-0.013	73.175
SPC__155999.LAB	12/19/23	14:26:53.315	0.190	-0.010	-0.012	73.335
SPC__156000.LAB	12/19/23	14:27:57.320	0.124	-0.026	-0.013	68.995

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack; Mill On
CTS and HCN Spike Direct

Spectrum	Date	Time	HCN PCA 191c R1 191c	HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C
SPC__155602BKG.LAB	12/19/23	07:14:13.044	0.000	0.000	0.000	0.000
SPC__155603.LAB	12/19/23	07:15:22.833	-0.006	-0.000	-0.002	-0.014
SPC__155604BKG.LAB	12/19/23	07:17:45.097	0.000	0.000	0.000	0.000
SPC__155605.LAB	12/19/23	07:18:54.993	-0.423	-0.022	0.001	0.005
SPC__155606.LAB	12/19/23	07:19:58.889	-0.128	-0.003	-0.020	47.609
SPC__155607.LAB	12/19/23	07:21:02.787	0.134	-0.000	-0.013	72.753
SPC__155608.LAB	12/19/23	07:22:06.692	0.163	-0.012	-0.013	73.017
SPC__155609.LAB	12/19/23	07:23:10.589	0.084	-0.007	-0.013	72.782
SPC__155610.LAB	12/19/23	07:24:14.490	0.297	-0.012	-0.014	72.526
Ethylene CTS (CC426155)						**72.775**
SPC__155611.LAB	12/19/23	07:25:18.419	0.167	0.004	-0.010	68.131
SPC__155612.LAB	12/19/23	07:26:22.337	0.063	0.012	-0.009	62.466
SPC__155613.LAB	12/19/23	07:27:26.221	33.872	0.029	3.450	13.787
SPC__155614.LAB	12/19/23	07:28:30.119	48.142	-0.003	4.792	-0.438
SPC__155615.LAB	12/19/23	07:29:34.020	48.307	-0.007	4.762	-0.606
HCN Analyte Spike (CC768222)			**48.225**		**4.777**	

Buzzi
Stockertown PA
Kiln 1 and 3 Main Stack; Mill Off
HCN Analyte Spikes

	Date	**12/20/23**	**12/20/23**	**12/20/23**	**12/20/23**
	Time	**08:02-08:16**	**09:31-09:46**	**10:56-11:12**	**12:23-12:43**
		Main Pre 1	**Main Post 1**	**Main Post 2**	**Main Post 3**
		HCN	**HCN**	**HCN**	**HCN**
Cs	Spike Direct, ppm	48.61	48.61	48.61	48.61
	SF6 Tracer Direct, ppm	4.80	4.80	4.80	4.80
SF6	Diluted SF6 Tracer, ppm	0.299	0.262	0.304	0.290
	Diluted SF6 Tracer, ppm	0.279	0.296	0.294	0.268
	Average Diluted SF6 Tracer, ppm	0.289	0.279	0.299	0.279
DF	Dilution Ratio	16.60	17.19	16.04	17.19
	Total, ppm	3.794	3.562	4.089	4.031
	Total, ppm	3.653	3.746	4.207	4.002
Ct	Average Total, ppm	3.724	3.654	4.148	4.017
	Pre Spike Native , ppm	1.183	1.238	1.268	1.288
	Pre Spike Native , ppm	1.042	1.234	1.255	1.059
	Post Spike Native , ppm	1.066	1.393	1.317	1.144
	Post Spike Native , ppm	1.023	1.329	1.378	1.268
Cn	Average Native , ppm	1.079	1.299	1.354	1.190
	Spike Recovery	**92.5%**	**86.0%**	**95.0%**	**102.4%**
	CTS Direct (CC426155)				
	Ethylene Expected (ppm)	75.47			75.47
	Ethylene Measured (ppm)	73.00			72.96
	CTS Error	**-3.3%**			**-3.3%**

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill Off Pre Run 1 HCN Analyte Spike

Spectrum	Date	Time	HCN PCA 191c R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC__156044.LAB	12/20/23	08:01:20.634	1.042	0.130	-0.005
SPC__156045.LAB	12/20/23	08:02:24.540	1.183	0.130	-0.004
SPC__156046.LAB	12/20/23	08:03:28.398	1.042	0.140	-0.004
SPC__156047.LAB	12/20/23	08:04:32.342	1.162	0.121	-0.005
SPC__156048.LAB	12/20/23	08:05:36.251	0.950	0.120	-0.003
SPC__156049.LAB	12/20/23	08:06:40.072	3.076	0.089	0.208
SPC__156050.LAB	12/20/23	08:07:44.016	3.794	0.081	0.299
SPC__156051.LAB	12/20/23	08:08:48.070	3.653	0.060	0.279
SPC__156052.LAB	12/20/23	08:09:51.770	3.138	0.043	0.251
SPC__156053.LAB	12/20/23	08:10:55.762	0.165	-0.012	-0.007
SPC__156054.LAB	12/20/23	08:11:59.586	-0.105	-0.006	-0.010
SPC__156055.LAB	12/20/23	08:13:03.498	0.794	0.082	-0.014
SPC__156056.LAB	12/20/23	08:14:07.488	1.135	0.072	-0.003
SPC__156057.LAB	12/20/23	08:15:11.670	1.066	0.048	-0.006
SPC__156058.LAB	12/20/23	08:16:15.312	1.023	0.046	-0.007
SPC__156059.LAB	12/20/23	08:17:19.117	1.153	0.031	-0.005

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill Off Post Run 1 HCN Analyte Spike

Spectrum	Date	Time	HCN PCA 191c R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC__156126.LAB	12/20/23	09:29:32.616	1.159	-0.045	-0.002
SPC__156127.LAB	12/20/23	09:30:36.443	1.238	-0.046	-0.004
SPC__156128.LAB	12/20/23	09:31:40.348	1.234	-0.051	-0.005
SPC__156129.LAB	12/20/23	09:32:44.326	1.078	-0.052	-0.005
SPC__156130.LAB	12/20/23	09:33:48.183	1.160	-0.046	-0.001
SPC__156131.LAB	12/20/23	09:34:52.090	3.562	-0.057	0.262
SPC__156132.LAB	12/20/23	09:35:55.958	3.746	-0.051	0.296
SPC__156133.LAB	12/20/23	09:36:59.895	3.641	-0.048	0.277
SPC__156134.LAB	12/20/23	09:38:03.817	2.878	-0.013	0.211
SPC__156135.LAB	12/20/23	09:39:07.680	-0.154	-0.007	-0.013
SPC__156136.LAB	12/20/23	09:40:11.919	-0.028	0.004	-0.005
SPC__156137.LAB	12/20/23	09:41:15.500	1.018	-0.026	-0.008
SPC__156138.LAB	12/20/23	09:42:19.695	0.978	-0.016	-0.005
SPC__156139.LAB	12/20/23	09:43:23.263	1.393	-0.058	-0.003
SPC__156140.LAB	12/20/23	09:45:39.060	1.329	-0.055	-0.005
SPC__156141.LAB	12/20/23	09:46:42.957	1.142	-0.021	-0.004

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill Off Post Run 2 HCN Analyte Spike

Spectrum	Date	Time	HCN PCA 191c R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC__156205.LAB	12/20/23	10:54:52.681	1.218	-0.057	-0.006
SPC__156206.LAB	12/20/23	10:55:56.545	1.268	-0.056	-0.004
SPC__156207.LAB	12/20/23	10:57:00.481	1.255	-0.066	-0.002
SPC__156208.LAB	12/20/23	10:58:04.381	1.060	-0.071	-0.004
SPC__156209.LAB	12/20/23	10:59:08.277	1.151	-0.060	-0.003
SPC__156210.LAB	12/20/23	11:00:12.142	1.029	-0.065	-0.003
SPC__156211.LAB	12/20/23	11:01:16.128	1.251	-0.047	-0.005
SPC__156212.LAB	12/20/23	11:02:19.947	1.396	-0.066	0.016
SPC__156213.LAB	12/20/23	11:03:23.843	4.089	-0.069	0.304
SPC__156214.LAB	12/20/23	11:04:27.743	4.207	-0.048	0.294
SPC__156215.LAB	12/20/23	11:05:31.632	3.020	-0.017	0.236
SPC__156216.LAB	12/20/23	11:06:35.527	0.197	-0.020	-0.006
SPC__156217.LAB	12/20/23	11:07:39.426	0.035	-0.014	-0.006
SPC__156218.LAB	12/20/23	11:08:43.345	1.220	-0.058	-0.009
SPC__156219.LAB	12/20/23	11:09:47.367	1.317	-0.057	-0.004
SPC__156220.LAB	12/20/23	11:10:51.248	1.378	-0.077	-0.005
SPC__156221.LAB	12/20/23	11:11:55.044	1.354	-0.058	-0.002

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill Off Post Run 3 HCN Analyte Spike

Spectrum	Date	Time	HCN PCA 191c R1 191c	HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C
SPC__156286.LAB	12/20/23	12:21:59.396	0.992	-0.052	-0.003	0.233
SPC__156287.LAB	12/20/23	12:23:03.289	1.288	-0.043	-0.003	0.294
SPC__156288.LAB	12/20/23	12:24:07.184	1.059	-0.067	-0.003	0.289
SPC__156289.LAB	12/20/23	12:25:11.086	1.076	-0.050	-0.002	0.319
SPC__156290.LAB	12/20/23	12:26:14.979	1.156	-0.042	-0.002	0.293
SPC__156291.LAB	12/20/23	12:27:18.878	2.648	-0.073	0.168	0.189
SPC__156292.LAB	12/20/23	12:28:22.884	4.031	-0.064	0.290	0.226
SPC__156293.LAB	12/20/23	12:29:26.799	4.002	-0.066	0.268	0.249
SPC__156294.LAB	12/20/23	12:30:30.557	2.592	-0.007	0.207	0.181
SPC__156295.LAB	12/20/23	12:31:34.459	0.120	-0.016	-0.008	0.038
SPC__156296.LAB	12/20/23	12:32:38.351	0.069	-0.024	-0.009	0.047
SPC__156297.LAB	12/20/23	12:33:42.283	0.334	0.002	-0.008	0.266
SPC__156298.LAB	12/20/23	12:34:46.521	1.029	-0.051	-0.004	0.336
SPC__156299.LAB	12/20/23	12:35:50.096	1.144	-0.062	-0.006	0.502
SPC__156300.LAB	12/20/23	12:36:53.994	1.268	-0.055	-0.006	0.344
SPC__156301.LAB	12/20/23	12:37:58.212	0.160	-0.024	-0.009	0.107
SPC__156302.LAB	12/20/23	12:39:01.776	0.143	0.000	-0.000	0.066
SPC__156303.LAB	12/20/23	12:40:05.720	0.053	-0.010	-0.001	-0.022
SPC__156304.LAB	12/20/23	12:41:09.534	-0.045	-0.020	-0.022	39.253
SPC__156305.LAB	12/20/23	12:42:13.424	-0.042	-0.015	-0.014	72.922
SPC__156306.LAB	12/20/23	12:43:17.321	-0.164	0.010	-0.013	72.994
SPC__156307.LAB	12/20/23	12:44:21.322	-0.074	-0.004	-0.016	72.870

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill Off CTS and HCN Analyte Spike

Spectrum	Date	Time	HCN PCA 191c R1 191c	HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C
SPC__156001BKG.LAB	12/20/23	07:03:44.687	0.000	0.000	0.000	0.000
SPC__156002.LAB	12/20/23	07:04:54.584	0.212	0.009	-0.002	-0.028
SPC__156003BKG.LAB	12/20/23	07:07:24.861	0.000	0.000	0.000	0.000
SPC__156004.LAB	12/20/23	07:08:34.748	-0.025	-0.011	0.001	-0.001
SPC__156005.LAB	12/20/23	07:09:38.650	-0.107	-0.006	0.002	-0.000
SPC__156006BKG.LAB	12/20/23	07:11:58.103	0.000	0.000	0.000	0.000
SPC__156007.LAB	12/20/23	07:13:07.819	0.085	-0.006	-0.000	-0.044
SPC__156008.LAB	12/20/23	07:14:11.842	0.059	-0.019	-0.001	-0.034
SPC__156009BKG.LAB	12/20/23	07:17:06.538	0.000	0.000	0.000	0.000
SPC__156010.LAB	12/20/23	07:18:16.340	0.032	0.004	-0.002	0.008
SPC__156011.LAB	12/20/23	07:19:20.354	-0.079	-0.002	-0.000	-0.028
SPC__156012BKG.LAB	12/20/23	07:22:16.585	0.000	0.000	0.000	0.000
SPC__156013.LAB	12/20/23	07:23:26.431	0.088	-0.008	-0.000	-0.064
SPC__156014.LAB	12/20/23	07:24:30.274	-0.103	-0.001	0.001	-0.020
SPC__156015.LAB	12/20/23	07:25:34.363	0.013	-0.000	0.000	-0.024
SPC__156016.LAB	12/20/23	07:26:38.263	-0.033	-0.007	0.001	-0.044
SPC__156017.LAB	12/20/23	07:27:42.170	-0.022	-0.006	-0.001	-0.023
SPC__156018.LAB	12/20/23	07:28:45.904	-0.026	0.014	0.002	-0.037
SPC__156019BKG.LAB	12/20/23	07:31:14.252	0.000	0.000	0.000	0.000
SPC__156020.LAB	12/20/23	07:32:24.260	-0.071	0.003	0.002	0.001
SPC__156021.LAB	12/20/23	07:33:28.161	-0.060	0.007	0.001	-0.042
SPC__156022.LAB	12/20/23	07:34:31.886	-0.023	0.022	-0.018	35.457
SPC__156023.LAB	12/20/23	07:35:35.901	0.123	0.004	-0.011	73.051
SPC__156024.LAB	12/20/23	07:36:39.831	-0.018	0.016	-0.007	72.954
Ethylene CTS (CC426155)						**73.002**
SPC__156025.LAB	12/20/23	07:37:43.609	22.472	0.003	2.111	35.906
SPC__156026.LAB	12/20/23	07:38:47.522	48.312	0.004	4.802	-0.471
SPC__156027.LAB	12/20/23	07:39:51.423	48.486	0.014	4.788	-0.468
SPC__156028.LAB	12/20/23	07:40:55.404	48.642	0.017	4.807	-0.463
SPC__156029.LAB	12/20/23	07:41:59.424	48.701	0.011	4.797	-0.484
HCN Analyte Spike (CC768222)			**48.610**		**4.797**	

Appendix C

Ion Chromatography Analytical Report Data

Deeco, Inc.

3404 Lake Woodard Drive
Raleigh, NC 27604

Project No: 23-3323
Buzzi Unicem

Hydrogen Fluoride & Chlorine

EPA Method 26A Analysis

Analytical Report
41822

el1

Element One, Inc.
6319-D Carolina Beach Rd., Wilmington, NC 28412
910-793-0128 FAX: 910-792-6853 e1lab@e1lab.com

The following data for Analytical Report 41822
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:

Linda Ann Webb, M.S. Analytical Chemist
January 12, 2024

Report Reviewed and Finalized by:

Ken Smith, Laboratory Director
January 12, 2024

SUMMARY OF RESULTS

Summary of Analysis

Summary of Method 26A Analysis

Element	ST-M26A-R1A e41822-1 Total mg	ST-M26A-R2A e41822-2 Total mg	ST-M26A-R3A e41822-3 Total mg
HF	< 0.223	< 0.227	< 0.230
Cl_2	< 0.193	< 0.176	< 0.184

Element	ST-M26A-R4A e41822-4 Total mg	ST-M26A-R5A e41822-5 Total mg	ST-M26A-R6A e41822-6 Total mg
HF	< 0.255	< 0.235	< 0.238
Cl_2	< 0.184	< 0.189	< 0.177

Element	ST-M26A-R1B e41822-7 Total mg	ST-M26A-R2B e41822-8 Total mg	ST-M26A-R3B e41822-9 Total mg
HF	< 0.210	< 0.236	< 0.247
Cl_2	< 0.177	< 0.170	< 0.177

Element	ST-M26A-R4B e41822-10 Total mg	ST-M26A-R5B e41822-11 Total mg	ST-M26A-R6B e41822-12 Total mg
HF	< 0.256	< 0.247	< 0.256
Cl_2	< 0.179	< 0.174	< 0.180

Element	ST-M26A-FBON e41822-13 Total mg	ST-M26A-FBOFF e41822-14 Total mg
HF	< 0.224	< 0.227
Cl_2	< 0.185	< 0.184

ANALYTICAL NARRATIVE

Element One Analytical Narrative

Client:	Deeco, Inc.	Element One #:	41822
Client ID:	23-3323 Buzzi Unicem	Analyst:	LAW
Method:	M26A	Dates Received:	01.03.24
Analytes:	HF, Cl_2	Dates Analyzed:	01.10-12.24

Summary of Analysis

The samples were prepared and analyzed according to Method 26A protocol. The samples were analyzed for fluoride and chloride on Metrohm 861/788 and 881/858 chromatograph systems respectively.

Detection Limits

The Metrohm reporting limit was 0.1 µg/mL for fluoride and chloride.

Analysis QA/QC

Duplicate analyses relative percent difference (RPD), spike recovery and second source verification data are summarized in the Quality Control section. All QA/QC data was within the criteria of the method.

Additional Comments

The reported results have not been corrected for any blank values or spike recovery values. Due to the sample matrix, it was necessary to analyze all samples at a minimum five-fold dilution to reduce interferences and to preserve the anion column. The reported results relate only to the items tested or calibrated.

QUALITY CONTROL SUMMARY

Summary of Quality Control Data

Summary of Method 26A Duplicate Analysis RPD

(Method 26A QC limits: <5% for RPD)

Element	ST-M26A-R1A RPD	ST-M26A-R2A RPD	ST-M26A-R3A RPD
HF	NA	NA	NA
Cl_2	NA	NA	NA

Element	ST-M26A-R4A RPD	ST-M26A-R5A RPD	ST-M26A-R6A RPD
HF	NA	NA	NA
Cl_2	NA	NA	NA

Element	ST-M26A-R1B RPD	ST-M26A-R2B RPD	ST-M26A-R3B RPD
HF	NA	NA	NA
Cl_2	NA	NA	NA

Element	ST-M26A-R4B RPD	ST-M26A-R5B RPD	ST-M26A-R6B RPD
HF	NA	NA	NA
Cl_2	NA	NA	NA

Element	ST-M26A-FBON RPD	ST-M26A-FBOFF RPD
HF	NA	NA
Cl_2	NA	NA

Summary of Quality Control Data

Summary of Method 26A Spike Recoveries

(Method 26A QC limits: 90-110% for Spike Recoveries)

Element	ST-M26A-R3A Recovery	ST-M26A-R3B Recovery
HF	110%	106%
Cl_2	105%	106%

Second Source Calibration Verification

*(*Laboratory QC limits: 90-110%)*

Element	DL 0.1mg/L Recovery	*QC 5.0mg/L Recovery
HF	109%	107%
Cl_2	103%	101%

SAMPLE CUSTODY

DEECO, In

41822

3404 Lake Woodard Dr.
Raleigh, NC 27604
919-250-0285

Date:	12/22/23
Lab:	Element One
Train:	EPA Method 26A

Plant Name: Buzzi Unicem Plant Location: Stockertown PA Project Name: 23-3323

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
R Dewees	1-3-24	Lisa Barton	1.3.24	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments

Field Sample No.	Date	Composite or Grab	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
ST-1A-H_2SO_4	12/19/23	Comp.	Fluoride ion as Hydrogen Fluoride	EPA Method 26A	0.1N H_2SO_4 and DI Rinses	Final Volume 424.2 mL	Element One
ST-1A-NaOH	12/19/23	Comp.	Chloride ion as Chlorine (Cl_2)	EPA Method 26A	0.1N NaOH and DI Rinses	Final Volume 386.7 mL **Sodium thiosulfate NOT ADDED!**	Element One
ST-1B-H_2SO_4	12/19/23	Comp.	Fluoride ion as Hydrogen Fluoride	EPA Method 26A	0.1N H_2SO_4 and DI Rinses	Final Volume 399.4 mL	Element One
ST-1B-NaOH	12/19/23	Comp.	Chloride ion as Chlorine (Cl_2)	EPA Method 26A	0.1N NaOH and DI Rinses	Final Volume 354.3 mL **Sodium thiosulfate NOT ADDED!**	Element One
ST-2A-H_2SO_4	12/19/23	Comp.	Fluoride ion as Hydrogen Fluoride	EPA Method 26A	0.1N H_2SO_4 and DI Rinses	Final Volume 431.3 mL	Element One
ST-2A-NaOH	12/19/23	Comp.	Chloride ion as Chlorine (Cl_2)	EPA Method 26A	0.1N NaOH and DI Rinses	Final Volume 352.1 mL **Sodium thiosulfate NOT ADDED!**	Element One
ST-2B-H_2SO_4	12/19/23	Comp.	Fluoride ion as Hydrogen Fluoride	EPA Method 26A	0.1N H_2SO_4 and DI Rinses	Final Volume 447.8 mL	Element One
ST-2B-NaOH	12/19/23	Comp.	Chloride ion as Chlorine (Cl_2)	EPA Method 26A	0.1N NaOH and DI Rinses	Final Volume 340.9 mL **Sodium thiosulfate NOT ADDED!**	Element One

Samples received in good condition in ENV. Express containers. No empty containers.

DEECO, In

3404 Lake Woodard Dr.
Raleigh, NC 27604
919-250-0285

41822

Date:	12/22/23
Lab:	Element One
Train:	EPA Method 26A

Plant Name: Buzzi Unicem Plant Location: Stockertown PA Project Name: 23-3323

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
B. DeWeese	1-3-24	Lisa Burton	1.3.24	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments

Field Sample No.	Date	Composite or Grab	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
ST-3A-H_2SO_4	12/19/23	Comp.	Fluoride ion as Hydrogen Fluoride	EPA Method 26A	0.1N H_2SO_4 and DI Rinses	Final Volume 436.2 mL	Element One
ST-3A-NaOH	12/19/23	Comp.	Chloride ion as Chlorine (Cl_2)	EPA Method 26A	0.1N NaOH and DI Rinses	Final Volume 368.8 mL **Sodium thiosulfate NOT ADDED!**	Element One
ST-3B-H_2SO_4	12/19/23	Comp.	Fluoride ion as Hydrogen Fluoride	EPA Method 26A	0.1N H_2SO_4 and DI Rinses	Final Volume 470.2 mL	Element One
ST-3B-NaOH	12/19/23	Comp.	Chloride ion as Chlorine (Cl_2)	EPA Method 26A	0.1N NaOH and DI Rinses	Final Volume 353.2mL **Sodium thiosulfate NOT ADDED!**	Element One
ST-4A-H_2SO_4	12/20/23	Comp.	Fluoride ion as Hydrogen Fluoride	EPA Method 26A	0.1N H_2SO_4 and DI Rinses	Final Volume 484.9 mL	Element One
ST-4A-NaOH	12/20/23	Comp.	Chloride ion as Chlorine (Cl_2)	EPA Method 26A	0.1N NaOH and DI Rinses	Final Volume 367.8 mL **Sodium thiosulfate NOT ADDED!**	Element One
ST-4B-H_2SO_4	12/20/23	Comp.	Fluoride ion as Hydrogen Fluoride	EPA Method 26A	0.1N H_2SO_4 and DI Rinses	Final Volume 485.8 mL	Element One
ST-4B-NaOH	12/20/23	Comp.	Chloride ion as Chlorine (Cl_2)	EPA Method 26A	0.1N NaOH and DI Rinses	Final Volume 358.8 mL **Sodium thiosulfate NOT ADDED!**	Element One

DEECO, In

41822

3404 Lake Woodard Dr.
Raleigh, NC 27604
919-250-0285

Date:	12/22/23
Lab:	Element One
Train:	EPA Method 26A

Plant Name: Buzzi Unicem Plant Location: Stockertown PA Project Name: 23-3323

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
B. Dewar	1-3-24	Rea Smith	1.3.24	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments

Field Sample No.	Date	Composite or Grab	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
ST-FBON-H_2SO_4	12/20/23	Comp.	Fluoride ion as Hydrogen Fluoride	EPA Method 26A	0.1N H_2SO_4 and DI Rinses	Final Volume 426.5 mL	Element One
ST-FBON-NaOH	12/20/23	Comp.	Chloride ion as Chlorine (Cl_2)	EPA Method 26A	0.1N NaOH and DI Rinses	Final Volume 369.8 mL **Sodium thiosulfate NOT ADDED!**	Element One
ST-FBOFF-H_2SO_4	12/20/23	Comp.	Fluoride ion as Hydrogen Fluoride	EPA Method 26A	0.1N H_2SO_4 and DI Rinses	Final Volume 431.5 mL	Element One
ST-FBOFF-NaOH	12/20/23	Comp.	Chloride ion as Chlorine (Cl_2)	EPA Method 26A	0.1N NaOH and DI Rinses	Final Volume 368.1 mL **Sodium thiosulfate NOT ADDED!**	Element One

ANALYTICAL DATA

Analytical Calculations

HF -

$$\textbf{Total HX (mg)} = \frac{[\textbf{X Results (µg/mL)*Dilution*Beginning Vol (mL)}]}{\textbf{1000}} \textbf{*Correction Factor}$$

Where-

X Results= Raw sample concentration (ppm) — *IC Data Sheet*

Dilution= $\frac{\text{Diluted Volume}}{\text{Aliquot}}$ —*IC Run Sheet*

Beginning Volume--*Sample Submission*

1.053= Correction factor for hydrogen fluoride

Cl_2 -

$$\textbf{Total } X_2 \textbf{ (mg)} = \frac{\textbf{X Results (µg/mL)*Dilution*Beginning Volume (mL)}}{\textbf{1000}}$$

Where-

X Results= Raw sample concentration (ppm)—*Cl_2 IC Data Sheet*

Dilution= $\frac{\text{Diluted Volume}}{\text{Aliquot}}$ —*IC Run Sheet*

Beginning Volume--*Sample Submission*

Analytical Calculations

Spike Recovery-

$$\textbf{Spike (\%)} = \frac{\textbf{(Spiked Result (µg/mL) – Sample Result (µg/mL))}}{\textbf{Spike Amount (µg/mL)}} \textbf{ X100}$$

Where-

Spike Result = Raw sample concentration (ppm)--*IC-Data Sheet*

Sample Result = Raw sample concentration (ppm)--*IC-Data Sheet*

Spike Amount—*IC-Data Sheet*

Duplicate Analysis RPD-

$$\textbf{RPD (\%)} = \frac{\textbf{(Duplicate Result (µg/mL) - Sample Result (µg/mL))}}{\textbf{Average (µg/mL)}} \textbf{ X100}$$

Where-

Sample Result and Duplicate Results=Raw sample concentration (ppm)--*IC-Data Sheet*

Average= $\frac{\textit{(Duplicate + Sample Results)}}{2}$

elementOne **AIR TESTING SAMPLE SUBMISSION FORM** **Lab ID 41822**

Out of Hold 01.16-17.24

Analysis Due Date 01.13.24
QA/QC/Report Due Date 01.15.24

Client:	Deeco, Inc.
Project No	23-3323

Date Rec	01.03.24
Time Rec	1100

Volume Marked	Volume Loss	FH pH < 2	BH pH > 8	Ref. Method:
Y (N)	Y (N) ?	(Y) N	Y (N)	26A

Sample Identification

1	ST-M26A-R1A	7	ST-M26A-R1B	13	ST-M26A-FBON
2	ST-M26A-R2A	8	ST-M26A-R2B	14	ST-M26A-FBOFF
3	ST-M26A-R3A	9	ST-M26A-R3B		
	ST-M26A-R3A Spike		ST-M26A-R3B Spike		
4	ST-M26A-R4A	10	ST-M26A-R4B		
5	ST-M26A-R5A	11	ST-M26A-R5B		
6	ST-M26A-R6A	12	ST-M26A-R6B		

Analyses Requested		
	Samples 1-14	HF
	Samples 1-14	Cl_2

Runs/FB

	FH Impinger 1 (or Combined Imp)		FH Impinger 2		FH Impinger 3		BH Impinger 4 (or Combined Imp)		BH Impinger 5	
Lab ID	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml
1	424.2						386.7			
2	481.3						352.1			
3.S	486.2						368.3			
4	494.9						347.4			
5	496.3						377.2			
6	451.9						354.1			
7	399.4						354.3			
8	447.4						340.9			
9.S	470.2						353.2			
10	495.8						358.8			
11	468.7						345.3			
12	495.6						359.7			
13	426.5						369.8			
14	431.5						368.1			

Lab Communications

Volumes on COC at bottles
NaOH impinger pH = 12

Rec Runs/FB: H2SO4; NaOH; No RB received---01.03.24 LLB

SS Page 1 of 1
SS by LLB
1/3/2024 3:45:41 PM

Imp 1, 2, &3 Prep By / Date MMG LAW 01.10.24
Imp 4 & 5 Prep By / Date MMG LAW 01.10.24
Labeled By/Date LLB 1.3.24
ID Verification By/Date MMG 1.3.24

Metrohm 861/788 Ion Chromatograph System

elementOne **M26A-HF IC Data Sheet** **Lab ID #: 41822**

Client: Deeco
Date: 01.12.24
Analyst: LAW
Detection Limit, (µg/ml): 0.10

Column: IonPac AS14A
Eluent: 8.0 mM Na_2CO_3/ 1.0 mM $NaHCO_3$
Flow Rate: 1.0 mL/min.
F⁻ to HF factor: 1.053

Sample ID	F⁻ µg/ml	Dilution	Final Vol, ml	HF, Total mg	Spike, µg/ml	% Recovery/ RPD	File Name	Date Time
LRB	0.000	1	10	< 0.001			_2024-01-11_	1/11/2024 15:30
LRB	0.000	1	10	< 0.001		NA	_2024-01-11_	1/11/2024 15:49
LRB SPK	5.236	1	10	0.055	5.00	105%	_2024-01-11_	1/11/2024 16:07
LRB SPK	5.294	1	10	0.056	5.00	106%	_2024-01-11_	1/11/2024 16:26
41822-1	0.000	5	424.2	< 0.223			_2024-01-11_	1/11/2024 16:45
41822-1 DUP	0.000	5	424.2	< 0.223		NA	_2024-01-11_	1/11/2024 17:03
41822-2	0.000	5	431.3	< 0.227			_2024-01-11_	1/11/2024 17:22
41822-2 DUP	0.000	5	431.3	< 0.227		NA	_2024-01-11_	1/11/2024 17:41
41822-3	0.000	5	436.2	< 0.23			_2024-01-11_	1/11/2024 19:52
41822-3 DUP	0.000	5	436.2	< 0.23		NA	_2024-01-11_	1/11/2024 20:11
41822-3 SPK	5.486	5	436.2	12.6	5.00	110%	_2024-01-11_	1/11/2024 20:30
41822-3 SPK DUP	5.447	5	436.2	12.5	5.00	109%	_2024-01-11_	1/11/2024 20:48
41822-4	0.000	5	484.9	< 0.255			_2024-01-11_	1/11/2024 18:00
41822-4 DUP	0.000	5	484.9	< 0.255		NA	_2024-01-11_	1/11/2024 18:18
41822-5	0.000	5	446.3	< 0.235			_2024-01-11_	1/11/2024 21:07
41822-5 DUP	0.000	5	446.3	< 0.235		NA	_2024-01-11_	1/11/2024 21:26
41822-6	0.000	5	451.9	< 0.238			_2024-01-11_	1/11/2024 21:45
41822-6 DUP	0.000	5	451.9	< 0.238		NA	_2024-01-11_	1/11/2024 22:03
41822-7	0.000	5	399.4	< 0.21			_2024-01-11_	1/11/2024 22:22
41822-7 DUP	0.000	5	399.4	< 0.21		NA	_2024-01-11_	1/11/2024 22:41
41822-8	0.000	5	447.8	< 0.236			_2024-01-12_	1/12/2024 0:14
41822-8 DUP	0.000	5	447.8	< 0.236		NA	_2024-01-12_	1/12/2024 0:33
41822-9	0.000	5	470.2	< 0.247			_2024-01-12_	1/12/2024 0:52
41822-9 DUP	0.000	5	470.2	< 0.247		NA	_2024-01-12_	1/12/2024 1:11
41822-9 SPK	5.243	5	470.2	13.0	5.00	105%	_2024-01-12_	1/12/2024 1:29
41822-9 SPK DUP	5.331	5	470.2	13.2	5.00	107%	_2024-01-12_	1/12/2024 1:48
41822-10	0.071	5	485.8	< 0.256			_2024-01-12_	1/12/2024 2:07
41822-10 DUP	0.000	5	485.8	< 0.256		NA	_2024-01-12_	1/12/2024 2:26
41822-11	0.000	5	468.7	< 0.247			_2024-01-12_	1/12/2024 2:44
41822-11 DUP	0.000	5	468.7	< 0.247		NA	_2024-01-12_	1/12/2024 3:03
41822-12	0.000	5	485.6	< 0.256			_2024-01-12_	1/12/2024 4:37
41822-12 DUP	0.000	5	485.6	< 0.256		NA	_2024-01-12_	1/12/2024 4:55
41822-13 FB ON	0.000	5	426.5	< 0.224			_2024-01-12_	1/12/2024 5:14
41822-13 FB ON DUP	0.000	5	426.5	< 0.224		NA	_2024-01-12_	1/12/2024 5:33
41822-14 FB OFF	0.000	5	431.5	< 0.227			_2024-01-12_	1/12/2024 5:52
41822-14 FB OFF DUP	0.000	5	431.5	< 0.227		NA	_2024-01-12_	1/12/2024 6:10

HF Data 1 of 2

elementOne
e 41822-HF

Metrohm 861/788 Ion Chromatograph System

elementOne **M26A-HF IC Data Sheet** **Lab ID #: 41822**

Client: Deeco
Date: 01.12.24
Analyst: LAW
Detection Limit, (µg/ml): 0.10

Column: IonPac AS14A
Eluent: 8.0 mM Na_2CO_3/ 1.0 mM $NaHCO_3$
Flow Rate: 1.0 mL/min.
F⁻ to HF factor: 1.053

Standards	F⁻ µg/ml	Dilution	QC, µg/ml	% Relative Error	% Recovery	File Name	Date Time
0	0.000					_2024-01-11_	1/11/2024 11:45
0.1	0.099			-1.0%	99%	_2024-01-11_	1/11/2024 12:04
1	1.024			2.4%	102%	_2024-01-11_	1/11/2024 12:22
3	2.943			-1.9%	98%	_2024-01-11_	1/11/2024 12:41
5	5.039			0.8%	101%	_2024-01-11_	1/11/2024 13:00
10	9.995			-0.1%	100%	_2024-01-11_	1/11/2024 13:19
0.1	0.099			-1.0%	99%	_2024-01-12_	1/12/2024 9:18
1	1.049			4.9%	105%	_2024-01-12_	1/12/2024 9:36
3	3.178			5.9%	106%	_2024-01-12_	1/12/2024 9:55
5	5.393			7.9%	108%	_2024-01-12_	1/12/2024 10:14
10	10.597			6.0%	106%	_2024-01-12_	1/12/2024 10:33
Correlation-	0.9998						
QC	5.337		5.00		107%	_2024-01-11_	1/11/2024 13:37
QC	5.347		5.00		107%	_2024-01-11_	1/11/2024 13:56
QC	5.443		5.00		109%	_2024-01-11_	1/11/2024 18:37
QC	5.374		5.00		107%	_2024-01-11_	1/11/2024 18:56
QC	5.488		5.00		110%	_2024-01-11_	1/11/2024 22:59
QC	5.412		5.00		108%	_2024-01-11_	1/11/2024 23:18
QC	5.221		5.00		104%	_2024-01-12_	1/12/2024 3:22
QC	5.446		5.00		109%	_2024-01-12_	1/12/2024 3:40
QC	5.456		5.00		109%	_2024-01-12_	1/12/2024 8:21
QC	5.188		5.00		104%	_2024-01-12_	1/12/2024 10:51
DL	0.109		0.10		109%	_2024-01-11_	1/11/2024 14:52
DL	0.108		0.10		108%	_2024-01-11_	1/11/2024 15:11
DL	0.110		0.10		110%	_2024-01-12_	1/12/2024 8:40
DL	0.110		0.10		110%	_2024-01-12_	1/12/2024 11:10
BLK	0.000					_2024-01-11_	1/11/2024 14:15
BLK	0.000					_2024-01-11_	1/11/2024 14:34
BLK	0.000					_2024-01-11_	1/11/2024 19:15
BLK	0.000					_2024-01-11_	1/11/2024 19:33
BLK	0.000					_2024-01-11_	1/11/2024 23:37
BLK	0.000					_2024-01-11_	1/11/2024 23:56
BLK	0.000					_2024-01-12_	1/12/2024 4:18
BLK	0.000					_2024-01-12_	1/12/2024 8:59
BLK	0.000					_2024-01-12_	1/12/2024 11:29

HF Data 2 of 2

elementOne
e 41822-HF

elementOne **IC Sample Sheet/Digestion Worksheet** **Lab ID #:** 41822

Date: 011024 Column: IonPac AS14A Instrument: 861 1788
Analyst: LMW Conc. Eluent: 8.0 mM Na_2CO_3/ 1.0mM $NaHCO_3$ Lot# IC 11.99.3
Batch name: 011024-41822 10mL Conc. Eluent Diluted to FV=1L with filtered UPDI
Regenerant: 100 mM H_3PO_4 Lot # IC11.111.2
Flow Rate: 1.0 mL/min. Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
1	0.0			QC	Manf	R²	
2	0.1		F⁻	BBC10574	Sigma Aldrich	.99998	
3	1.0						
4	3.0						
5	5.0						
6	10.0						
7	QC						
8	QC						
9	BLK						
10	BLK						
11	DL						
12	DL						
13	LRB						
14	LRB						
15	LRBf						
16	LRBf						
17	41822-1	Deeco	HF		—	5X	
18	-1d	↓	↓		—	↓	
19	-2				—		
20	-2d				—		
21	-4				—		
22	-4d	↓	↓		—	↓	
23	QC						
24	QC						
25	BLK						

Manual integrations noted by M
Curve IC Lot # IC11.112.1 Comments: pg 1 of 3
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: IC ME Solution 2303019-250 IC NO2 Solution 2308942-250 HPS pg 1 of
QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SO_4 Std. to 10mL sample; lot #'s listed above.
QC: Spike 20 uL from 1000 ug/mL NO_2, NO_3, and PO_4 Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date: 011224 Time: 1230 By: LMW QC Review- Date: ✓ Time: _____ By: _____

elementOne **IC Sample Sheet/Digestion Worksheet** **Lab ID #:** 41822

Date: 011024 Column: IonPac AS14A Instrument: 861/788
Analyst: LMO Conc. Eluent: 8.0 mM Na_2CO_3/ 1.0mM $NaHCO_3$ Lot# 1011.993
Batch name: 011024-41822 10mL Conc. Eluent Diluted to FV=1L with filtered UPDI
Regenerant: 100 mM H_3PO_4 Lot # 1011.111.2
Flow Rate: 1.0 mL/min. Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
26	BLK						
27	41822-3	Deeco	HF		—	5X	
28	-3d	↓	↓		—	↓	
29	-3+				5.456		
30	-3+d				5.447		
31	-5				—		
32	-5d				—		
33	-6				—		
34	-6d				—		
35	-7				—		
36	-7d	↓	↓		—	↓	
37	QC						
38	QC						
39	BLK						
40	BLK						
41	41822-8	Deeco	HF		—	5X	
42	-8d	↓	↓		—	↓	
43	-9				—		
44	-9d				—		
45	-9+			5.243	~~5.337~~	MO 01.12	
46	-9+d				5.331		
47	-10				—		
48	-10d				—		
49	-11				—		
50	-11d	↓	↓		—	↓	

Manual integrations noted by M
Curve IC Lot #_____ Comments: pg 2 of 3
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: IC ME Solution _____ IC NO2 Solution ~~pg 2 of~~
QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SO_4 Std. to 10mL sample; lot #'s listed above.
QC: Spike 20 uL from 1000 ug/mL NO_2, NO_3, and PO_4 Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date:_____ Time:_____ By:_____ QC Review- Date:_____ Time:_____ By:_____

elementOne **IC Sample Sheet/Digestion Worksheet** **Lab ID #:** 41822

Date: 01.10.24 Column: IonPac AS14A Instrument: 361 1488
Analyst: CW Conc. Eluent: 8.0 mM Na_2CO_3/ 1.0mM $NaHCO_3$ Lot# IC11.091.3
Batch name: 011024-41822 10mL Conc. Eluent Diluted to FV=1L with filtered UPDI
Regenerant: 100 mM H_3PO_4 Lot # IC11.111.2
Flow Rate: 1.0 mL/min. Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
S1	QC						
S2	QC						
S3	BLK						
S4	BLK						
S5	41822-12	Deeco	HF		—	5X	
S6	-12d	↓	↓		—	↓	
S7	-13FBON				—		
S8	-13FBON d				—		
S9	-14FBOFF				—		
L10	-14FBOFF d	↓			—	↓	
L11	41834-11QC			E 366.2	~~(0.484)~~ (0.484)	20X	HF TV=71.7
L12	41834-11QC d		↓	367.4	(0.540)	↓	HF TV=11.1
L13	QC						
L14	DL						
L15	BLK						
L16	0.1						
L17	1.0						
L18	3.0						
L19	5.0						
20	10.0						
21	QC						
22	DL						
23	BLK						

Manual integrations noted by M
Curve IC Lot #_____ Comments: pg 30 of 3
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** _____ **IC NO2 Solution** ~~pg 3 of~~
QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SO_4 Std. to 10mL sample; lot #'s listied above.
QC: Spike 20 uL from 1000 ug/mL NO_2, NO_3, and PO_4 Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date:_____ Time:_____ By:_____ QC Review- Date:_____ Time:_____ By:_____

Metrohm 881/858 Ion Chromatograph System

elementOne

M26A-Cl_2 IC Data Sheet

Lab ID #: 41822

Client: Deeco
Date: 01.12.24
Analyst: LAW
Detection Limit, (µg/ml): 0.10

Column: IonPac AS14A
Eluent: 8.0 mM Na_2CO_3/ 1.0 mM $NaHCO_3$
Flow Rate: 1.0 mL/min.

Sample ID	Cl^- µg/ml	Dilution	Final Vol, ml	Cl_2, Total mg	Spike, µg/ml	% RPD/ Recovery	File Name	Date Time
LRB	0.00	1	10	< 0.001			749a1733:18cf389dea8:-748f	1/10/2024 22:03
LRB	0.041	1	10	< 0.001		NA	749a1733:18cf389dea8:-748d	1/10/2024 22:26
LRB SPK	5.13	1	10	0.051	5.00	102%	749a1733:18cf389dea8:-7a44	1/10/2024 22:50
LRB SPK	5.53	1	10	0.055	5.00	110%	749a1733:18cf389dea8:-7a42	1/10/2024 23:13
41822-1	0.091	5	386.7	< 0.193			749a1733:18cf389dea8:-7a40	1/10/2024 23:37
41822-1 DUP	0.091	5	386.7	< 0.193		NA	749a1733:18cf389dea8:-7a3e	1/11/2024 0:00
41822-2	0.069	5	352.1	< 0.176			749a1733:18cf389dea8:-7a2c	1/11/2024 3:31
41822-2 DUP	0.058	5	352.1	< 0.176		NA	749a1733:18cf389dea8:-7a2a	1/11/2024 3:55
41822-3	0.088	5	368.8	< 0.184			749a1733:18cf389dea8:-7a3c	1/11/2024 0:24
41822-3 DUP	0.067	5	368.8	< 0.184		NA	749a1733:18cf389dea8:-7a3a	1/11/2024 0:47
41822-3 SPK	5.37	5	368.8	9.91	5.00	106%	749a1733:18cf389dea8:-7a38	1/11/2024 1:11
41822-3 SPK DUP	5.26	5	368.8	9.70	5.00	104%	749a1733:18cf389dea8:-7a36	1/11/2024 1:34
41822-4	0.090	5	367.8	< 0.184			749a1733:18cf389dea8:-7a28	1/11/2024 4:18
41822-4 DUP	0.099	5	367.8	< 0.184		NA	749a1733:18cf389dea8:-7a26	1/11/2024 4:42
41822-5	0.064	5	377.2	< 0.189			749a1733:18cf389dea8:-7a24	1/11/2024 5:05
41822-5 DUP	0.083	5	377.2	< 0.189		NA	749a1733:18cf389dea8:-7a22	1/11/2024 5:29
41822-6	0.078	5	354.1	< 0.177			749a1733:18cf389dea8:-7a20	1/11/2024 5:52
41822-6 DUP	0.076	5	354.1	< 0.177		NA	749a1733:18cf389dea8:-7a1e	1/11/2024 6:16
41822-7	0.085	5	354.3	< 0.177			749a1733:18cf389dea8:-7a1c	1/11/2024 6:39
41822-7 DUP	0.090	5	354.3	< 0.177		NA	749a1733:18cf389dea8:-7a1a	1/11/2024 7:03
41822-8	0.065	5	340.9	< 0.17			749a1733:18cf389dea8:-78db	1/11/2024 9:00
41822-8 DUP	0.087	5	340.9	< 0.17		NA	749a1733:18cf389dea8:-78d9	1/11/2024 9:24
41822-9	0.068	5	353.2	< 0.177			749a1733:18cf389dea8:-78d7	1/11/2024 9:47
41822-9 DUP	0.031	5	353.2	< 0.177		NA	749a1733:18cf389dea8:-78d5	1/11/2024 10:11
41822-9 SPK	5.33	5	353.2	9.41	5.00	105%	749a1733:18cf389dea8:-78d3	1/11/2024 10:34
41822-9 SPK DUP	5.33	5	353.2	9.41	5.00	106%	749a1733:18cf389dea8:-78d1	1/11/2024 10:58
41822-10	0.076	5	358.8	< 0.179			749a1733:18cf389dea8:-78cf	1/11/2024 11:21
41822-10 DUP	0.083	5	358.8	< 0.179		NA	749a1733:18cf389dea8:-78cd	1/11/2024 11:45
41822-11	0.077	5	348.3	< 0.174			749a1733:18cf389dea8:-78cb	1/11/2024 12:08
41822-11 DUP	0.087	5	348.3	< 0.174		NA	749a1733:18cf389dea8:-78c9	1/11/2024 12:32
41822-12	0.068	5	359.7	< 0.18			749a1733:18cf389dea8:-74da	1/11/2024 14:29
41822-12 DUP	0.088	5	359.7	< 0.18		NA	749a1733:18cf389dea8:-74d8	1/11/2024 14:53
41822-13 FB ON	0.035	5	369.8	< 0.185			749a1733:18cf389dea8:-74d6	1/11/2024 15:16
41822-13 FB ON DUP	0.035	5	369.8	< 0.185		NA	749a1733:18cf389dea8:-74d4	1/11/2024 15:40
41822-14 FB OFF	0.056	5	368.1	< 0.184			749a1733:18cf389dea8:-74d2	1/11/2024 16:03
41822-14 FB OFF DUP	0.059	5	368.1	< 0.184		NA	749a1733:18cf389dea8:-74d0	1/11/2024 16:27

Metrohm 881/858 Ion Chromatograph System

elementOne

M26A-Cl_2 IC Data Sheet

Lab ID #: 41822

Client: Deeco
Date: 01.12.24
Analyst: LAW
Detection Limit, (µg/ml): 0.10

Column: IonPac AS14A
Eluent: 8.0 mM Na_2CO_3/ 1.0 mM $NaHCO_3$
Flow Rate: 1.0 mL/min.

Standards	Cl^- µg/ml	Dilution	QC µg/ml	%Relative Error	% Recovery	File Name	Date Time
0.0	0.00					749a1733:18cf389dea8:-749b	1/10/2024 17:21
0.1	0.102			2.0%	102%	749a1733:18cf389dea8:-7499	1/10/2024 17:44
1.0	0.971			-2.9%	97%	749a1733:18cf389dea8:-7497	1/10/2024 18:08
3.0	2.99			-0.2%	100%	749a1733:18cf389dea8:-7495	1/10/2024 18:31
5.0	5.05			1.1%	101%	749a1733:18cf389dea8:-7493	1/10/2024 18:55
10.0	9.98			-0.2%	100%	749a1733:18cf389dea8:-7491	1/10/2024 19:18
0.1	0.105			5.0%	105%	749a1733:18cf389dea8:-74c4	1/11/2024 18:48
1.0	1.04			4.4%	104%	749a1733:18cf389dea8:-74c2	1/11/2024 19:11
3.0	3.17			5.8%	106%	749a1733:18cf389dea8:-74c0	1/11/2024 19:35
5.0	5.26			5.2%	105%	749a1733:18cf389dea8:-74be	1/11/2024 19:58
10.0	10.6			5.8%	106%	749a1733:18cf389dea8:-74bc	1/11/2024 20:22
Correlation-	0.999966						
QC	5.03		5.00		101%	749a1733:18cf389dea8:-7a54	1/10/2024 19:42
QC	4.94		5.00		99%	749a1733:18cf389dea8:-7a52	1/10/2024 20:05
QC	5.35		5.00		107%	749a1733:18cf389dea8:-7a34	1/11/2024 1:58
QC	5.38		5.00		108%	749a1733:18cf389dea8:-7a32	1/11/2024 2:21
QC	5.33		5.00		107%	749a1733:18cf389dea8:-7a18	1/11/2024 7:26
QC	5.35		5.00		107%	749a1733:18cf389dea8:-7a16	1/11/2024 7:50
QC	5.38		5.00		108%	749a1733:18cf389dea8:-74e2	1/11/2024 12:55
QC	5.29		5.00		106%	749a1733:18cf389dea8:-74e0	1/11/2024 13:19
QC	5.38		5.00		108%	749a1733:18cf389dea8:-74ca	1/11/2024 17:37
QC	5.34		5.00		107%	749a1733:18cf389dea8:-74ba	1/11/2024 20:45
DL	0.103		0.10		103%	749a1733:18cf389dea8:-7a4c	1/10/2024 21:16
DL	0.104		0.10		104%	749a1733:18cf389dea8:-7a4a	1/10/24 21:39
DL	0.105		0.10		105%	749a1733:18cf389dea8:-74c8	1/11/2024 18:01
DL	0.092		0.10		92%	2331bcbc:18ccab694ba:-783f	1/3/2024 16:24
BLK	0.041					749a1733:18cf389dea8:-7a50	1/10/2024 20:29
BLK	0.026					749a1733:18cf389dea8:-7a30	1/11/2024 2:45
BLK	0.030					749a1733:18cf389dea8:-7a2e	1/11/2024 3:08
BLK	0.043					749a1733:18cf389dea8:-7a14	1/11/2024 8:13
BLK	0.022					749a1733:18cf389dea8:-7a12	1/11/2024 8:37
BLK	0.020					749a1733:18cf389dea8:-74de	1/11/2024 13:42
BLK	0.043					749a1733:18cf389dea8:-74dc	1/11/2024 14:06
BLK	0.011					749a1733:18cf389dea8:-74c6	1/11/2024 18:24
BLK	0.009					749a1733:18cf389dea8:-74b6	1/11/2024 21:32

Cl_2-Data 2 of 2

elementOne
e 41822-Cl_2

elementOne **IC Sample Sheet/Digestion Worksheet** **Lab ID #:** 41822

Date: 010824
Analyst: LW

Column: IonPac AS14A
Conc. Eluent: 8.0 mM Na_2CO_3/ 1.0mM $NaHCO_3$

Instrument: 8811858
Lot# IC11-99-3

Batch name: 010924-41822

10mL Conc. Eluent Diluted to FV=1L with filtered UPDI
Regenerant: 100mM H_3PO_4
Flow Rate: 1.0 mL/min.

Lot # IC11-108-3
Method: 26A NaOH

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
1	DD			QC	mgf	22	
2	G1		Cl-	43085S9	RICCA	[illegible]	.999966
3	1D						
4	3D						
5	5D						
6	10D						
7	QC						
8	QC						
9	BLK						
10	BLK						
11	DL						
12	DL						
13	LRB						
14	LCB						
15	LRBt						
16	LRBt						
17	41822-1	Deeco	Cl_2		→	5X	
18	-1D	↓	↓		—	↓	
19	-3				—		
20	-3D				—		
21	-3t				5374		
22	-3tD				5,258		
23	QC						
24	QC						
25	BLK						

Manual integra

Curve IC Lot # IC-11-111-3 Sodium Thiosulfate Lot # IC11-73-4 Comments: pg 1 of 3

Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** 2303029-250 HPI

QC: Spike 50 uL from 1000 ug/mL Br Std. to 10mL sample; lot #'s listied above.

Submitted for QC- Date: 01.1224 Time: 16:00 By: LW QC Review- Date: 1 Time: _____ By: _____

elementOne **IC Sample Sheet/Digestion Worksheet** **Lab ID #:** 41822

Date: 01.09.24
Analyst: LMW

Column: IonPac AS14A
Conc. Eluent: 8.0 mM Na_2CO_3/ 1.0mM $NaHCO_3$

Instrument: 881 1858
Lot# 1C11-99-3

10mL Conc. Eluent Diluted to FV=1L with filtered UPDI

Batch name: 010924-41822

Regenerant: 100mM H_3PO_4
Flow Rate: 1.0 mL/min.

Lot # 1911-08-3
Method: 26A NaOH

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
26	BLK						
27	41822-2	Deeco	Cl2		—	5X	
28	-2D	↓	↓		—	↓	
29	-4				—		
30	-4D				—		
31	-5				—		
32	-5D				—		
33	-6				—		
34	-6D				—		
35	-7				—		
36	-7D	↓	↓		—	↓	
37	CC						
38	CC						
39	BLK						
40	BLK						
41	41822-8	Deeco	Cl2		—	5X	
42	-8D	↓	↓		—	↓	
43	-9				—		
44	-9D				—		
45	-9+				5.329		
46	-9+D				5.329		
47	-10				—		
48	-10D				—		
49	-11				—		
50	-11D	↓	↓		—	↓	

Manual integra
Curve IC Lot #_____ Sodium Thiosulfate Lot #_____ Comments: pg 2 of 3
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** _____
QC: Spike 50 uL from 1000 ug/mL Br Std. to 10mL sample; lot #'s listied above.
Submitted for QC- Date:_____ Time:_____ By:_____ QC Review- Date:_____ Time:_____ By:_____

elementOne **IC Sample Sheet/Digestion Worksheet** **Lab ID #:** 41822

Date: 01.09.24 Column: IonPac AS14A Instrument: 881/858
Analyst: LMJ Conc. Eluent: 8.0 mM Na_2CO_3/ 1.0mM $NaHCO_3$ Lot# 1C11-99-3
10mL Conc. Eluent Diluted to FV=1L with filtered UPDI
Batch name: 010924-41822 Regenerant: 100mM H_3PO_4 Lot # 1C11-108-3
Flow Rate: 1.0 mL/min. Method: 26A NaOH

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
51	GC						
52	GC						
53	BLK						
54	BLK						
55	41822-12	Deeco	Cl_2		—	5X	
56	-12D	↓	↓		—	↓	
57	-13 FB ON				—		
58	-13 FB ON				—		
59	-14 FB OFF						
60	-14 FB OFF D	↓				↓	
61	41822-7 -GC			wrong GC standard		10X	TV=78.0
62	-7_GC		↓	standard HCl, HF		↓	
63	GC						
64	DL						
65	BLK						
66	0.1						
67	1.0						
68	3.0						
69	5.0						
70	10.0						
71	GC						
72	DL						
73	BLK						
74	LCS						
75	LCSD						

Manual integrations noted by M
Curve IC Lot #_____ Sodium Thiosulfate Lot #_____ Comments: pg 3 of 3
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** _____
QC: Spike 50 uL from 1000 ug/mL Br Std. to 10mL sample; lot #'s listied above.
Submitted for QC- Date:_____ Time:_____ By:_____ QC Review- Date:_____ Time:_____ By:_____

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Appendix D

Plant Process Data

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
Start Run 1	
12/19/2023 10:02	76.69
12/19/2023 10:03	76.37
12/19/2023 10:04	76.88
12/19/2023 10:05	77.52
12/19/2023 10:06	77.71
12/19/2023 10:07	76.75
12/19/2023 10:08	77.13
12/19/2023 10:09	76.43
12/19/2023 10:10	76.31
12/19/2023 10:11	76.69
12/19/2023 10:12	76.62
12/19/2023 10:13	77.32
12/19/2023 10:14	77.26
12/19/2023 10:15	76.05
12/19/2023 10:16	76.31
12/19/2023 10:17	76.18
12/19/2023 10:18	77.07
12/19/2023 10:19	76.94
12/19/2023 10:20	76.37
12/19/2023 10:21	76.75
12/19/2023 10:22	77.90
12/19/2023 10:23	76.37
12/19/2023 10:24	76.69
12/19/2023 10:25	76.18
12/19/2023 10:26	77.07
12/19/2023 10:27	76.94
12/19/2023 10:28	76.75
12/19/2023 10:29	77.96
12/19/2023 10:30	76.50
12/19/2023 10:31	76.56
12/19/2023 10:32	76.31
12/19/2023 10:33	76.62
12/19/2023 10:34	77.13
12/19/2023 10:35	76.62
12/19/2023 10:36	76.82
12/19/2023 10:37	77.32
12/19/2023 10:38	76.37
12/19/2023 10:39	77.13
12/19/2023 10:40	76.94
12/19/2023 10:41	76.31

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
12/19/2023 10:42	77.26
12/19/2023 10:43	76.56
12/19/2023 10:44	77.20
12/19/2023 10:45	76.56
12/19/2023 10:46	76.88
12/19/2023 10:47	76.82
12/19/2023 10:48	76.69
12/19/2023 10:49	76.82
12/19/2023 10:50	77.52
12/19/2023 10:51	76.50
12/19/2023 10:52	76.94
12/19/2023 10:53	77.01
12/19/2023 10:54	76.88
12/19/2023 10:55	77.07
12/19/2023 10:56	76.50
12/19/2023 10:57	76.75
12/19/2023 10:58	76.62
12/19/2023 10:59	76.62
12/19/2023 11:00	77.39
12/19/2023 11:01	76.62
12/19/2023 11:02	76.24
12/19/2023 11:03	76.75
12/19/2023 11:04	76.69
12/19/2023 11:05	77.32
12/19/2023 11:06	77.07
12/19/2023 11:07	77.71
12/19/2023 11:08	76.11
12/19/2023 11:09	76.75
12/19/2023 11:10	76.88
12/19/2023 11:11	76.56
Run 1 Average	**76.82**
12/19/2023 11:12	76.94
12/19/2023 11:13	77.07
12/19/2023 11:14	77.58
12/19/2023 11:15	77.13
12/19/2023 11:16	77.20
12/19/2023 11:17	76.62
12/19/2023 11:18	77.01
12/19/2023 11:19	77.52
12/19/2023 11:20	76.31
12/19/2023 11:21	77.07

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
12/19/2023 11:22	77.32
12/19/2023 11:23	77.20
12/19/2023 11:24	77.45
12/19/2023 11:25	76.31
12/19/2023 11:26	76.31
12/19/2023 11:27	77.07
12/19/2023 11:28	76.69
12/19/2023 11:29	77.20
12/19/2023 11:30	78.03
12/19/2023 11:31	77.26
12/19/2023 11:32	76.05
12/19/2023 11:33	76.69
Start Run 2	
12/19/2023 11:34	76.43
12/19/2023 11:35	77.01
12/19/2023 11:36	77.45
12/19/2023 11:37	76.75
12/19/2023 11:38	77.39
12/19/2023 11:39	77.13
12/19/2023 11:40	76.37
12/19/2023 11:41	76.31
12/19/2023 11:42	76.75
12/19/2023 11:43	76.56
12/19/2023 11:44	76.82
12/19/2023 11:45	77.32
12/19/2023 11:46	75.61
12/19/2023 11:47	76.50
12/19/2023 11:48	76.82
12/19/2023 11:49	76.31
12/19/2023 11:50	76.69
12/19/2023 11:51	77.39
12/19/2023 11:52	76.82
12/19/2023 11:53	76.43
12/19/2023 11:54	76.88
12/19/2023 11:55	76.31
12/19/2023 11:56	76.94
12/19/2023 11:57	76.75
12/19/2023 11:58	77.45
12/19/2023 11:59	77.13
12/19/2023 12:00	76.24
12/19/2023 12:01	77.07

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
12/19/2023 12:02	76.69
12/19/2023 12:03	76.18
12/19/2023 12:04	76.88
12/19/2023 12:05	77.58
12/19/2023 12:06	77.32
12/19/2023 12:07	76.11
12/19/2023 12:08	76.69
12/19/2023 12:09	76.69
12/19/2023 12:10	77.01
12/19/2023 12:11	76.82
12/19/2023 12:12	77.58
12/19/2023 12:13	76.75
12/19/2023 12:14	76.31
12/19/2023 12:15	76.88
12/19/2023 12:16	76.56
12/19/2023 12:17	77.32
12/19/2023 12:18	77.52
12/19/2023 12:19	76.43
12/19/2023 12:20	76.18
12/19/2023 12:21	76.94
12/19/2023 12:22	76.94
12/19/2023 12:23	76.50
12/19/2023 12:24	77.45
12/19/2023 12:25	76.05
12/19/2023 12:26	76.31
12/19/2023 12:27	76.56
12/19/2023 12:28	77.20
12/19/2023 12:29	76.94
12/19/2023 12:30	76.82
12/19/2023 12:31	77.64
12/19/2023 12:32	76.24
12/19/2023 12:33	76.56
12/19/2023 12:34	76.18
12/19/2023 12:35	77.01
12/19/2023 12:36	76.88
12/19/2023 12:37	76.88
12/19/2023 12:38	77.58
12/19/2023 12:39	76.24
12/19/2023 12:40	77.32
12/19/2023 12:41	77.07
12/19/2023 12:42	76.94

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
Run 2 Average	**76.85**
12/19/2023 12:43	77.07
12/19/2023 12:44	76.62
12/19/2023 12:45	77.01
12/19/2023 12:46	77.32
12/19/2023 12:47	76.43
12/19/2023 12:48	76.56
12/19/2023 12:49	76.43
12/19/2023 12:50	77.20
12/19/2023 12:51	76.75
12/19/2023 12:52	76.56
12/19/2023 12:53	77.96
12/19/2023 12:54	76.82
12/19/2023 12:55	77.20
12/19/2023 12:56	76.56
12/19/2023 12:57	76.82
12/19/2023 12:58	77.52
Start Run 3	
12/19/2023 12:59	76.69
12/19/2023 13:00	77.01
12/19/2023 13:01	77.20
12/19/2023 13:02	77.01
12/19/2023 13:03	76.82
12/19/2023 13:04	76.56
12/19/2023 13:05	76.94
12/19/2023 13:06	77.26
12/19/2023 13:07	76.82
12/19/2023 13:08	77.13
12/19/2023 13:09	77.32
12/19/2023 13:10	76.18
12/19/2023 13:11	76.69
12/19/2023 13:12	76.88
12/19/2023 13:13	76.43
12/19/2023 13:14	76.37
12/19/2023 13:15	76.88
12/19/2023 13:16	76.62
12/19/2023 13:17	76.43
12/19/2023 13:18	77.58
12/19/2023 13:19	77.39
12/19/2023 13:20	76.11
12/19/2023 13:21	77.13

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
12/19/2023 13:22	76.43
12/19/2023 13:23	77.01
12/19/2023 13:24	76.82
12/19/2023 13:25	77.32
12/19/2023 13:26	76.24
12/19/2023 13:27	76.18
12/19/2023 13:28	77.07
12/19/2023 13:29	77.32
12/19/2023 13:30	77.13
12/19/2023 13:31	77.26
12/19/2023 13:32	76.56
12/19/2023 13:33	76.37
12/19/2023 13:34	77.45
12/19/2023 13:35	77.26
12/19/2023 13:36	77.96
12/19/2023 13:37	76.24
12/19/2023 13:38	76.43
12/19/2023 13:39	77.07
12/19/2023 13:40	76.50
12/19/2023 13:41	76.37
12/19/2023 13:42	76.75
12/19/2023 13:43	76.94
12/19/2023 13:44	77.32
12/19/2023 13:45	77.45
12/19/2023 13:46	76.62
12/19/2023 13:47	76.37
12/19/2023 13:48	76.82
12/19/2023 13:49	77.32
12/19/2023 13:50	77.96
12/19/2023 13:51	77.32
12/19/2023 13:52	76.50
12/19/2023 13:53	76.18
12/19/2023 13:54	76.88
12/19/2023 13:55	76.62
12/19/2023 13:56	77.07
12/19/2023 13:57	77.13
12/19/2023 13:58	77.71
12/19/2023 13:59	76.56
12/19/2023 14:00	76.69
12/19/2023 14:01	76.69
12/19/2023 14:02	77.26

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
12/19/2023 14:03	76.75
12/19/2023 14:04	77.01
12/19/2023 14:05	77.45
12/19/2023 14:06	76.69
12/19/2023 14:07	76.31
12/19/2023 14:08	76.82
Run 3 Average	**76.88**

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
Start Run 1	
12/20/2023 08:33	77.39
12/20/2023 08:34	76.05
12/20/2023 08:35	76.31
12/20/2023 08:36	76.43
12/20/2023 08:37	76.94
12/20/2023 08:38	77.32
12/20/2023 08:39	77.52
12/20/2023 08:40	76.94
12/20/2023 08:41	76.62
12/20/2023 08:42	76.31
12/20/2023 08:43	76.56
12/20/2023 08:44	77.45
12/20/2023 08:45	76.05
12/20/2023 08:46	77.32
12/20/2023 08:47	77.71
12/20/2023 08:48	76.69
12/20/2023 08:49	76.37
12/20/2023 08:50	77.20
12/20/2023 08:51	76.82
12/20/2023 08:52	76.94
12/20/2023 08:53	76.82
12/20/2023 08:54	76.94
12/20/2023 08:55	77.13
12/20/2023 08:56	76.37
12/20/2023 08:57	76.75
12/20/2023 08:58	77.20
12/20/2023 08:59	77.26
12/20/2023 09:00	76.69
12/20/2023 09:01	76.94
12/20/2023 09:02	76.82
12/20/2023 09:03	77.32
12/20/2023 09:04	76.37
12/20/2023 09:05	76.50
12/20/2023 09:06	76.56
12/20/2023 09:07	76.88
12/20/2023 09:08	77.64
12/20/2023 09:09	76.11
12/20/2023 09:10	76.82
12/20/2023 09:11	76.56
12/20/2023 09:12	76.94
12/20/2023 09:13	77.20

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
12/20/2023 09:14	77.20
12/20/2023 09:15	77.52
12/20/2023 09:16	76.31
12/20/2023 09:17	76.94
12/20/2023 09:18	76.56
12/20/2023 09:19	77.39
12/20/2023 09:20	76.69
12/20/2023 09:21	76.50
12/20/2023 09:22	77.26
12/20/2023 09:23	76.69
12/20/2023 09:24	77.45
12/20/2023 09:25	77.07
12/20/2023 09:26	76.43
12/20/2023 09:27	76.75
12/20/2023 09:28	77.39
12/20/2023 09:29	76.56
12/20/2023 09:30	76.69
12/20/2023 09:31	77.32
12/20/2023 09:32	77.45
12/20/2023 09:33	77.64
12/20/2023 09:34	76.18
12/20/2023 09:35	76.31
12/20/2023 09:36	76.18
12/20/2023 09:37	76.75
12/20/2023 09:38	77.71
12/20/2023 09:39	77.45
12/20/2023 09:40	76.31
12/20/2023 09:41	76.43
12/20/2023 09:42	76.56
Run 1 Average	**76.86**
12/20/2023 09:43	76.75
12/20/2023 09:44	77.07
12/20/2023 09:45	76.43
12/20/2023 09:46	77.58
12/20/2023 09:47	77.58
12/20/2023 09:48	77.01
12/20/2023 09:49	76.56
12/20/2023 09:50	76.24
12/20/2023 09:51	76.75
12/20/2023 09:52	77.45
12/20/2023 09:53	76.05
12/20/2023 09:54	77.58

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
12/20/2023 09:55	76.24
12/20/2023 09:56	76.43
12/20/2023 09:57	77.64
12/20/2023 09:58	77.13
12/20/2023 09:59	77.01
Start Run 2	
12/20/2023 10:00	76.82
12/20/2023 10:01	77.58
12/20/2023 10:02	76.43
12/20/2023 10:03	77.20
12/20/2023 10:04	77.58
12/20/2023 10:05	76.94
12/20/2023 10:06	76.31
12/20/2023 10:07	76.50
12/20/2023 10:08	77.01
12/20/2023 10:09	76.56
12/20/2023 10:10	77.58
12/20/2023 10:11	76.62
12/20/2023 10:12	76.18
12/20/2023 10:13	77.26
12/20/2023 10:14	76.88
12/20/2023 10:15	76.88
12/20/2023 10:16	77.13
12/20/2023 10:17	76.88
12/20/2023 10:18	76.50
12/20/2023 10:19	77.39
12/20/2023 10:20	76.37
12/20/2023 10:21	77.52
12/20/2023 10:22	76.37
12/20/2023 10:23	77.26
12/20/2023 10:24	76.11
12/20/2023 10:25	77.45
12/20/2023 10:26	77.64
12/20/2023 10:27	76.37
12/20/2023 10:28	76.94
12/20/2023 10:29	77.39
12/20/2023 10:30	77.26
12/20/2023 10:31	76.37
12/20/2023 10:32	76.56
12/20/2023 10:33	77.58
12/20/2023 10:34	76.82
12/20/2023 10:35	76.88

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
12/20/2023 10:36	76.69
12/20/2023 10:37	76.69
12/20/2023 10:38	77.64
12/20/2023 10:39	76.56
12/20/2023 10:40	76.82
12/20/2023 10:41	77.20
12/20/2023 10:42	76.88
12/20/2023 10:43	76.82
12/20/2023 10:44	76.69
12/20/2023 10:45	76.94
12/20/2023 10:46	76.82
12/20/2023 10:47	76.82
12/20/2023 10:48	76.94
12/20/2023 10:49	77.01
12/20/2023 10:50	77.07
12/20/2023 10:51	76.11
12/20/2023 10:52	76.43
12/20/2023 10:53	77.01
12/20/2023 10:54	77.32
12/20/2023 10:55	76.82
12/20/2023 10:56	77.07
12/20/2023 10:57	76.11
12/20/2023 10:58	76.37
12/20/2023 10:59	76.75
12/20/2023 11:00	77.07
12/20/2023 11:01	76.43
12/20/2023 11:02	77.26
12/20/2023 11:03	76.56
12/20/2023 11:04	76.31
12/20/2023 11:05	77.32
12/20/2023 11:06	77.01
12/20/2023 11:07	76.88
12/20/2023 11:08	76.50
Run 2 Average	**76.87**
12/20/2023 11:09	76.56
12/20/2023 11:10	77.32
12/20/2023 11:11	78.22
12/20/2023 11:12	76.31
12/20/2023 11:13	75.99
12/20/2023 11:14	76.56
12/20/2023 11:15	76.69
12/20/2023 11:16	77.20

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
12/20/2023 11:17	76.82
12/20/2023 11:18	76.94
12/20/2023 11:19	76.88
12/20/2023 11:20	76.69
12/20/2023 11:21	77.26
12/20/2023 11:22	76.88
12/20/2023 11:23	77.26
12/20/2023 11:24	76.24
Start Run 3	
12/20/2023 11:25	76.24
12/20/2023 11:26	76.56
12/20/2023 11:27	77.13
12/20/2023 11:28	76.82
12/20/2023 11:29	76.62
12/20/2023 11:30	75.99
12/20/2023 11:31	77.07
12/20/2023 11:32	75.99
12/20/2023 11:33	77.45
12/20/2023 11:34	76.88
12/20/2023 11:35	76.50
12/20/2023 11:36	76.24
12/20/2023 11:37	76.62
12/20/2023 11:38	77.01
12/20/2023 11:39	77.13
12/20/2023 11:40	76.82
12/20/2023 11:41	76.82
12/20/2023 11:42	76.56
12/20/2023 11:43	76.31
12/20/2023 11:44	76.37
12/20/2023 11:45	76.82
12/20/2023 11:46	77.96
12/20/2023 11:47	75.86
12/20/2023 11:48	76.62
12/20/2023 11:49	76.62
12/20/2023 11:50	77.39
12/20/2023 11:51	76.88
12/20/2023 11:52	76.94
12/20/2023 11:53	77.20
12/20/2023 11:54	77.64
12/20/2023 11:55	75.99
12/20/2023 11:56	76.69
12/20/2023 11:57	77.01

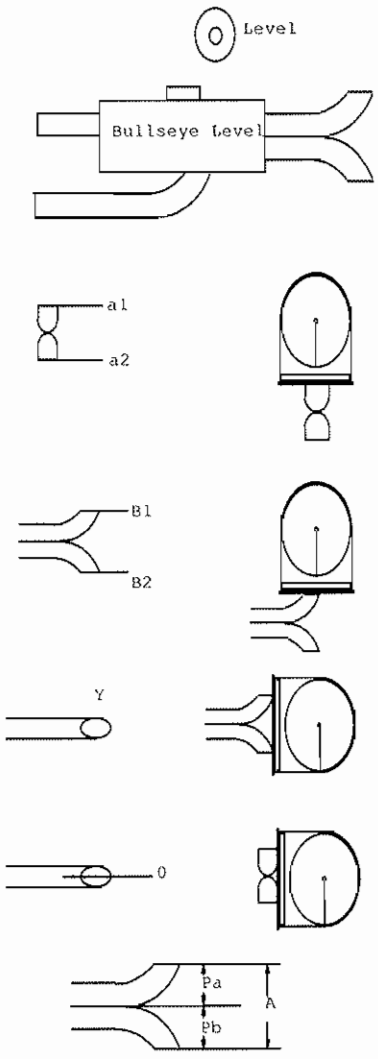
Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: K3 Clinker (TNHR) Expression Value
12/20/2023 11:58	76.69
12/20/2023 11:59	76.88
12/20/2023 12:00	76.18
12/20/2023 12:01	77.26
12/20/2023 12:02	76.88
12/20/2023 12:03	76.75
12/20/2023 12:04	77.77
12/20/2023 12:05	77.07
12/20/2023 12:06	76.56
12/20/2023 12:07	77.01
12/20/2023 12:08	76.94
12/20/2023 12:09	76.94
12/20/2023 12:10	77.13
12/20/2023 12:11	77.07
12/20/2023 12:12	76.50
12/20/2023 12:13	75.99
12/20/2023 12:14	77.20
12/20/2023 12:15	76.94
12/20/2023 12:16	77.71
12/20/2023 12:17	76.75
12/20/2023 12:18	76.18
12/20/2023 12:19	77.32
12/20/2023 12:20	76.94
12/20/2023 12:21	77.32
12/20/2023 12:22	76.31
12/20/2023 12:23	75.99
12/20/2023 12:24	76.94
12/20/2023 12:25	76.37
12/20/2023 12:26	76.82
12/20/2023 12:27	77.26
12/20/2023 12:28	76.31
12/20/2023 12:29	77.07
12/20/2023 12:30	76.82
12/20/2023 12:31	77.13
12/20/2023 12:32	76.69
12/20/2023 12:33	76.56
12/20/2023 12:34	76.62
Run 3 Average	**76.79**

Appendix E

Calibration Documents

Probe or Pitot No:	5A

Pitot Tube Inspection Sheet



Date	01/03/23
Tube Assembly Level?	Yes
Ports Damaged?	No
-10 deg < a1 < +10 deg	2
-10 deg < a2 < +10 deg	1
-5 deg < B1 < +5 deg	1
-5 deg < B2 < +5 deg	1
Y (gamma)	1
0 (theta)	1
A (alpha)	0.951
Z = A (sin y) < 0.125"?	yes
W = A (sin 0) < 0.031"?	yes
Pa =	0.475
Pb =	0.476
Tube Diameter (Dt) =	0.376
Pa = Pb +- 0.063"?	yes
(1.05 x Dt)?	0.3948
(1.50 x Dt)?	0.564
(1.05 x Dt)< P < (1.50 x Dt)?	yes
Eligible for Default Pitot Calibration Factor (Cp = 0.84)?	**Yes**

Thermocouple Calibration

Type of Reference Thermometer?	Mercury	Date	01/03/23
Barometeric Pressure?	29.52	Ambient Temperature?	68

Source	Reference Temp, F	Thermocouple Temp, F	Absolute Temp Difference
cold air	37	38	-0.20%
medium air	215	215	0.00%
hot air	325	325	0.00%

Windtunnel Calibration

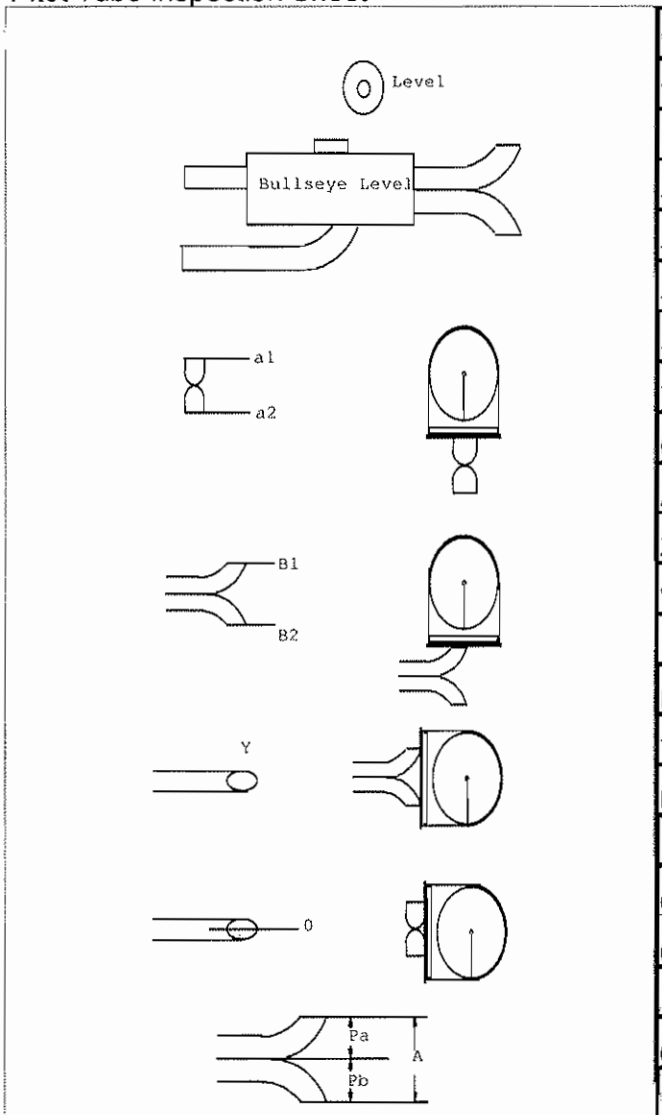
Pitot Reading	Reference (0.99)	5A S-Type Pitot	Cp
ΔP_1	0.31	0.44	0.84
ΔP_2	0.31	0.43	0.85
ΔP_3	0.31	0.43	0.85
		Average Pitot Tube Calibration Factor--->	**0.85**

Thermocouple Calibration Check (EPA ALT-011 Procedure), performed on 1/3/23

Source	Ref. Temp. F	Thermocouple Temp. F	± 2 deg F?
Ambient	68	66.9	Yes

Probe or Pitot No:	5B

Pitot Tube Inspection Sheet



Date	01/03/23
Tube Assembly Level?	Yes
Ports Damaged?	No
-10 deg < a1 < +10 deg	1
-10 deg < a2 < +10 deg	2
-5 deg < B1 < +5 deg	1
-5 deg < B2 < +5 deg	2
Y (gamma)	1
0 (theta)	1
A (alpha)	0.94
Z = A (sin y) < 0.125"?	yes
W = A (sin 0) < 0.031"?	yes
Pa =	0.47
Pb =	0.47
Tube Diameter (Dt) =	0.376
Pa = Pb +- 0.063"?	yes
(1.05 x Dt)?	0.3948
(1.50 x Dt)?	0.564
(1.05 x Dt)< P < (1.50 x Dt)?	yes
Eligible for Default Pitot Calibration Factor (Cp = 0.84)?	**Yes**

Thermocouple Calibration

Type of Reference Thermometer?	Mercury	Date	01/03/23
Barometeric Pressure?	29.52	Ambient Temperature?	69.9

Source	Reference Temp, F	Thermocouple Temp, F	Absolute Temp Difference
cold air	37	38	-0.20%
medium air	215	215	0.00%
hot air	325	324	0.13%

Windtunnel Calibration

Pitot Reading	Reference (0.99)	5B S-Type Pitot	Cp
ΔP_1	0.31	0.44	0.84
ΔP_2	0.31	0.43	0.85
ΔP_3	0.31	0.44	0.84
		Average Pitot Tube Calibration Factor--->	**0.84**

Thermocouple Calibration Check (EPA ALT-011 Procedure), performed on 1/3/23

Source	Ref. Temp. F	Thermocouple Temp. F	± 2 deg F?
Ambient	69.9	69.4	Yes

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

Quality - Service - Reliability

ENVIRONMENTAL SUPPLY COMPANY

1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
4) Record data and information in the GREEN cells, YELLOW cells are calculated.

DATE: 12/14/23 | METER SERIAL #: m5-14 | BAROMETRIC PRESSURE (in Hg): INITIAL 30.65, FINAL 30.65, AVG (P_{bar}) 30.65

METER PART #: m5-14 | CRITICAL ORIFICE SET SERIAL #: 14315

IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT^3) INITIAL	DGM READINGS (FT^3) FINAL	NET (V_m)	TEMPERATURES °F AMBIENT	DGM INLET INITIAL	DGM INLET FINAL	DGM OUTLET INITIAL	DGM OUTLET FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH ($in H_2O$)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	Y VARIATION (%)	$\Delta H_@$
12	1	0.3283				0.000						0							
	2					0.000						0							
	3					0.000						0							
																AVG =			
15	1	0.4094	18	682.809	688.152	5.343	48	57	60	56	57	57.5	10.00	0.91	5.5977	5.5690	0.995		1.73
	2	0.4094	18	688.152	693.503	5.351	48	59	65	57	59	60	10.00	0.91	5.5791	5.5690	0.998		1.72
	3	0.4094	18			0.000						0							
																AVG =	0.997	-0.99	
19	1	0.5047	18	693.697	700.279	6.582	48	64	70	59	62	63.75	10.00	1.5	6.8231	6.8654	1.006		1.86
	2	0.5047	18	700.279	706.896	6.617	48	69	74	62	64	67.25	10.00	1.5	6.8138	6.8654	1.008		1.84
	3	0.5047	18			0.000						0							
																AVG =	1.007	0.04	
23	1	0.6426	18	707.321	715.739	8.418	44	72	77	65	67	70.25	10.00	2.3	8.6358	8.7759	1.016		1.72
	2	0.6426	18	715.739	724.192	8.453	44	75	78	67	69	72.25	10.00	2.3	8.6391	8.7759	1.016		1.72
	3	0.6426	18			0.000						0							
																AVG =	1.016	0.95	
32	1	0.8587				0.000						0							
	2					0.000						0							
	3					0.000						0							
																AVG =			

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
The following equations are used to calculate the standard volumes of air passed through the DGM, Vm (std), and the critical orifice, Vcr (std), and the DGM calibration factor, Y. These equations are automatically calculated in the

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = 1.006

AVERAGE $\Delta H_@$ = 1.76

(1) $$Vm_{(std)} = K_1 * Vm * \frac{Pbar + (\Delta H / 13.6)}{Tm}$$

= Net volume of gas sample passed through DGM, corrected to standard conditions

K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)

T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

(2) $$Vcr_{(std)} = K' * \frac{Pbar * \Theta}{\sqrt{Tamb}}$$

= Volume of gas sample passed through the critical orifice, corrected to standard conditions

T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

K' = Average K' factor from Critical Orifice Calibration

(3) $$Y = \frac{Vcr_{(std)}}{Vm_{(std)}}$$

= DGM calibration factor

Potentiometer Check, °F (per manufacturer procedure): 0 @ 0 F; 497 @ 500 F; 1000 @ 1000 F

Avg Absolute Difference = 0.1%

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

ENVIRONMENTAL SUPPLY COMPANY
Quality - Service - Reliability

1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
4) Record data and information in the GREEN cells, YELLOW cells are calculated.

				INITIAL	FINAL	AVG (P_{bar})
DATE:	12/07/23	METER SERIAL #:	M5-17	BAROMETRIC PRESSURE (in Hg):	30.12	30.13	30.125
METER PART #:	M5-17	CRITICAL ORIFICE SET SERIAL #:	1431S				

IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT^3) INITIAL	DGM READINGS (FT^3) FINAL	NET (V_m)	TEMPERATURES °F AMBIENT	DGM INLET INITIAL	DGM INLET FINAL	DGM OUTLET INITIAL	DGM OUTLET FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH (in H_2O)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	Y VARIATION (%)	$\Delta H_@$
12	1	0.3283				0.000						0							
	2					0.000						0							
	3					0.000						0							
																AVG =			
15	1	0.4094	18	859.095	864.468	5.373	53	61	62	61	61	61.25	10.00	0.81	5.4918	5.4469	0.992		1.57
	2	0.4094	18	869.782	875.174	5.392	53	66	70	63	64	65.75	10.00	0.81	5.4640	5.4469	0.997		1.56
	3					0.000						0							
																AVG =	0.994	-0.39	
19	1	0.5047	18	875.363	882.018	6.655	52	69	72	64	65	67.5	10.00	1.3	6.7295	6.7214	0.999		1.64
	2	0.5047	18	923.558	930.302	6.744	48	76	76	69	69	72.5	10.00	1.3	6.7554	6.7478	0.999		1.61
	3					0.000						0							
																AVG =	0.999	0.06	
23	1	0.6426	18	906.282	914.812	8.530	52	76	78	66	69	72.25	10.00	2.1	8.5651	8.5578	0.999		1.62
	2	0.6426	18	914.812	923.341	8.529	48	75	78	68	69	72.5	10.00	2.1	8.5601	8.5915	1.004		1.61
	3					0.000						0							
																AVG =	1.001	0.32	
32	1	0.8587				0.000						0							
	2					0.000						0							
	3					0.000						0							
																AVG =			

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
The following equations are used to calculate the standard volumes of air passed through the DGM, Vm (std), and the critical orifice, Vcr (std), and the DGM calibration factor, Y. These equations are automatically calculated in the

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = 0.998

AVERAGE $\Delta H_@$ = 1.60

(1) $$Vm_{(std)} = K_1 * Vm * \frac{Pbar + (\Delta H / 13.6)}{Tm}$$

= Net volume of gas sample passed through DGM, corrected to standard conditions
K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)
T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

(2) $$Vcr_{(std)} = K' * \frac{Pbar * \Theta}{\sqrt{Tamb}}$$

= Volume of gas sample passed through the critical orifice, corrected to standard conditions
T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)
K' = Average K' factor from Critical Orifice Calibration

(3) $$Y = \frac{Vcr_{(std)}}{Vm_{(std)}}$$

= DGM calibration factor

Potentiometer Check, °F (per manufacturer procedure)		
	0	@ 0 F
	497	@ 500 F
	998	@ 1000 F

Avg Absolute Difference = 0.1%

Company: **Buzzi Unicem; Stockertown PA**
Source: **Kilns 1 and 3 Main Stack; Raw Mill Off**
Job ID: **23-3317**
Train Type: **M26A**

Alt-009 Alternate Post Test Calibration Data	M5-14 4A 12/20/23 833-943	M5-17 4B 12/20/23 833-943	M5-14 5A 12/20/23 1000-1109	M5-17 5B 12/20/23 1000-1109	M5-14 6A 12/20/23 1125-1235	M5-17 6B 12/20/23 1125-1235	M5-14 Average	M5-17 Average
Vm	43.329	43.933	43.005	43.5	42.384	43.81		
Tm	530.6	532.1	539.3	544.4	549.5	548		
Pb	29.7	29.7	29.7	29.7	29.7	29.7		
Havg	1.75	1.57	1.68	1.48	1.55	1.4		
H@	1.76	1.6	1.76	1.6	1.76	1.6		
Md	30.868	30.868	30.9	30.9	30.872	30.872		
(Havg)^0.5	1.32109636	1.25016276	1.29099502	1.21128378	1.2418716	1.18062183		
Run Time, Min	60	60	60	60	60	60		
Meter Gamma	1.006	0.988	1.006	0.988	1.006	0.988	1.006	0.988
Calculated Gamma (Yqa)	1.007	0.987	0.999	0.977	0.985	0.949	0.997	0.971
% difference from Actual Y	0.08%	0.09%	0.70%	1.15%	2.11%	3.96%	0.96%	1.73%

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
630 United Drive
Durham, NC 27713
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Part Number:	E04NI77E15A3796	Reference Number:	122-402389886-1
Cylinder Number:	EB0070764	Cylinder Volume:	151.0 CF
Laboratory:	124 - Durham (SAP) - NC	Cylinder Pressure:	2015 PSIG
PGVP Number:	B22022	Valve Outlet:	590
Gas Code:	CO,CO2,O2,BALN	Certification Date:	Mar 23, 2022

Expiration Date: Mar 23, 2030

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.

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 MONOXIDE	65.00 PPM	62.51 PPM	G1	+/- 0.6% NIST Traceable	03/23/2022
CARBON DIOXIDE	10.00 %	10.14 %	G1	+/- 0.6% NIST Traceable	03/23/2022
OXYGEN	12.00 %	12.08 %	G1	+/- 0.4% NIST Traceable	03/23/2022
NITROGEN	Balance				

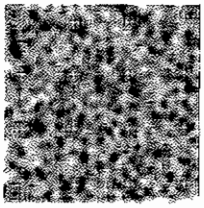
CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	09010213	KAL004779	98.48 PPM CARBON MONOXIDE/NITROGEN	+/- 0.5%	Oct 16, 2024
NTRM	19060402	6162642Y	11.105 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Dec 04, 2025
NTRM	10010616	K014963	9.967 % OXYGEN/NITROGEN	+/- 0.3%	Apr 19, 2022

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VA-5001 CO2 BF89GV17	Nondispersive Infrared (NDIR)	Mar 01, 2022
Horiba VIA510 CO 1G46EA07	Nondispersive Infrared (NDIR)	Mar 09, 2022
Siemens Oxymat 61 M3299 O2	Paramagnetic	Mar 01, 2022

Triad Data Available Upon Request



Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
630 United Drive
Durham, NC 27713
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Part Number:	E04NI59E15A38X3	Reference Number:	122-402389885-1A
Cylinder Number:	ALM-056015	Cylinder Volume:	143.7 CF
Laboratory:	124 - Durham (SAP) - NC	Cylinder Pressure:	2016 PSIG
PGVP Number:	B22022	Valve Outlet:	590
Gas Code:	CO,CO2,O2,BALN	Certification Date:	Mar 28, 2022

Expiration Date: Mar 28, 2030

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.

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 MONOXIDE	120.0 PPM	116.5 PPM	G1	+/- 0.3% NIST Traceable	03/28/2022
CARBON DIOXIDE	18.00 %	18.17 %	G1	+/- 0.7% NIST Traceable	03/28/2022
OXYGEN	22.00 %	21.90 %	G1	+/- 0.5% NIST Traceable	03/28/2022
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13010207	KAL003102	246.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.2%	Oct 16, 2024
NTRM	12061508	CC354696	19.87 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 11, 2024
NTRM	08010220	K013155	23.20 % OXYGEN/NITROGEN	+/- 0.4%	Jun 01, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VA-5001 CO2 BF89GV17	Nondispersive Infrared (NDIR)	Mar 01, 2022
Horiba VIA510 CO RS2EGL6K	Nondispersive Infrared (NDIR)	Mar 01, 2022
Siemens Oxymat 61 M3299 O2	Paramagnetic	Mar 01, 2022

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
630 United Drive
Durham, NC 27713
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: CERTIFIED STANDARD-SPEC

Part Number:	X02NI99C15A54F5	Reference Number:	122-402705571-1
Cylinder Number:	CC426155	Cylinder Volume:	144.0 CF
Laboratory:	124 - Durham (SAP) - NC	Cylinder Pressure:	2015 PSIG
Analysis Date:	Mar 28, 2023	Valve Outlet:	350
Lot Number:	122-402705571-1		

Expiration Date: Mar 28, 2031

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	75.00 PPM	75.47 PPM	+/- 2%
NITROGEN	Balance		

Approved for Release

Airgas
an Air Liquide company

CERTIFICATE OF ACCURACY: *GMACS-c Calibration Standard*

'SAY LABORATORY

CUSTOMER INFORMATION

IRGAS SPECIALTY GASES
Exploratory Products Group
6141 Easton Road
Plumsteadville, PA 18949

Work Order #: 160-402845897-1
Sales Order #: 1123601913
PO #: 7100179560

Customer: DEECO Inc.
Address 1: 3404 Lake Woodard Road
Address 2:
City / State / Zip: Raleigh, NC 27604

PRODUCT INFORMATION

COMPOSITION	CONCENTRATION	UNCERTAINTY (Abs)	UNCERTAINTY (Rel)
Hydrogen Cyanide	49.9 PPM	2.3 PPM	4.6 %
Sulfur Hexafluoride	5.0 PPM	0.07 PPM	1.3 %
Nitrogen	Balance		

CYLINDER #: CC768222
CYLINDER TYPE: 150A Aluminum
CGA: 350 SS
CYLINDER PRESSURE: 2000 psig

AIRGAS PART #: X03NI99C15AC0W8
CERTIFICATION DATE: 7-Sep-2023
EXPIRATION DATE: 7-Mar-2024
MIXTURE DEW POINT: N/A

CERTIFICATION DATA

BLENDING PROCESS: GravStat™ Gravimetry

COMPONENT	CONCENTRATION	UNCERTAINTY (Abs)	UNCERTAINTY (Rel)
Hydrogen Cyanide	50.02 PPM	0.9 PPM	1.8 %
lfur Hexafluoride	5.02 PPM	0.07 PPM	1.3 %

CONFIRMING ANALYSIS: FTIR Spectroscopy
INSTRUMENT / MODEL: CAI Model 700 FTIR

COMPONENT	CONCENTRATION	UNCERTAINTY (Abs)	UNCERTAINTY (Rel)
Hydrogen Cyanide	49.8 PPM	2.1 PPM	4.2 %

REFERENCE STANDARD: GMPS-c 50 PPM Hydrogen Cyanide
CYLINDER NUMBER: CC768196
EXPIRATION DATE: 2/29/2024

COMPONENT	CONCENTRATION	UNCERTAINTY (Abs)	UNCERTAINTY (Rel)
Hydrogen Cyanide	48.9 PPM	1.7 PPM	3.4 %

CALIBRATION CURVE DATA	Curve Order	Correlation	Slope (X2)	Slope (X)	Intercept
Point-to-Point Matching Std	Linear / Direct Ratio	N/A	N/A	N/A	N/A

INTERLOCK STATISTICS

	CONCENTRATION	UNCERTAINTY (Abs)	UNCERTAINTY (Rel)
BLEND RESULT:	50.02 PPM	0.9 PPM	1.8 %
ANALYSIS RESULT:	49.8 PPM	2.1 PPM	4.2 %
INTERLOCK RESULT:	49.9 PPM	2.3 PPM	4.6 %

COMMENTS / SPECIAL INSTRUCTIONS

A GMACS-c ("Candidate GMACS") is made and certified according to the EPA GMACS Procedure (Alt-114) found at: https://cfpub.epa.gov

2. Do not use this standard if pressure is less than 200 psig.
3. Do not use or store this product at or below the stated dew point.

APPROVED BY: _____ BOB GRASMEDER

Client: Buzzi Unicem Stockertown
Test Location: Kiln 1 and 3 Stack
Date: Dec 19, 2023 Start Time: 10:02:06
Run number Stratification Check
One Minute Averages

	Reference O2 %,dry	Plant O2 %,dry
10:03:04 AM	14.9	16.4
10:04:04 AM	14.8	16.4
10:05:04 AM	14.8	16.4
10:06:04 AM	14.9	16.4
10:07:04 AM	14.9	16.4
Point A	14.9	16.4
10:08:04 AM	14.9	16.5
10:09:04 AM	14.8	16.4
10:10:04 AM	14.9	16.3
10:11:04 AM	14.8	16.4
10:12:04 AM	14.9	16.4
Point B	14.9	16.4
10:13:04 AM	14.9	16.3
10:14:04 AM	14.8	16.4
10:15:04 AM	14.8	16.3
10:16:04 AM	14.8	16.2
10:17:04 AM	14.8	16.3
Point C	14.8	16.3

Buzzi Unicem Stockertown PA Kiln 1 and 3 Stack Date/Time	Kiln: O2 Raw (PCT) Raw Value
12/19/2023 10:02	16.44
12/19/2023 10:03	16.40
12/19/2023 10:04	16.40
12/19/2023 10:05	16.36
12/19/2023 10:06	16.40
12/19/2023 10:07	16.46
12/19/2023 10:08	16.38
12/19/2023 10:09	16.27
12/19/2023 10:10	16.40
12/19/2023 10:11	16.36
12/19/2023 10:12	16.33
12/19/2023 10:13	16.40
12/19/2023 10:14	16.29
12/19/2023 10:15	16.23
12/19/2023 10:16	16.27
12/19/2023 10:17	16.29

Analysis Validation Report

Sample Filename: F:\Stockertown\Stockertown December 2023\December 19\SPC__155662.LAB

Filename for noise: F:\Midlothian on Rental\November 14\SPC__000837.LAB
Interferences Filenames: C:\Midlothian on Rental\November 15\SPC__001463.LAB
C:\Midlothian on Rental\November 15\SPC__001464.LAB
C:\Midlothian on Rental\November 15\SPC__001465.LAB
C:\Midlothian on Rental\November 15\SPC__001466.LAB
C:\Midlothian on Rental\November 15\SPC__001467.LAB
C:\Midlothian on Rental\November 15\SPC__001468.LAB
C:\Midlothian on Rental\November 15\SPC__001469.LAB
C:\Midlothian on Rental\November 15\SPC__001470.LAB

Recipe path: C:\OLT\recipes\Cement Testing R3.MGRCP

Gas calibration Name	Conc	MDC3	MDC2	MDC1	MAU	FMU*R	OCU	~ DL	~ CL	~ Bias	Sigma	Range	Span	Comment
ST HCN (200) PCA 191C 191C	0.72	0.11	-	0.31	0.37	0.13	0.37	-	0.01	-	-	0-200	-	Good
HF PPM (10) 191C	0	0.2	0.05	0.04	0.07	0.37	0.37	0.07	0.17	0.02	0.02	0-10	-	Close to DL
SF6 (10) 191C	0	0.02	-	0	0	0.02	0.02	-	0.01	-	-	0-10	-	Close to DL
ETHYLENE (100,3000) 191C	0.3	0.99	0.33	0.17	0.29	1.72	1.72	1.08	1.08	0.75	0.11	0-3000	-	Close to DL
H2O% (40) 191C	4.24	0.07	-	0.01	0.02	0.15	0.15	-	0.08	-	-	0-40	-	Good
CO2% (40) 191C	9.77	0.11	-	0.01	0.02	0.15	0.15	-	0.2	-	-	0-40	-	Good
HCL PPM (100) 191C	0.16	0.55	0.05	0.15	0.28	1.01	1.01	0.06	0.42	0.01	0.02	0-100	-	Close to DL
SO2 (1000) 191C	256.9	1.45	0.37	0.14	0.27	2.76	2.76	0.79	5.2	0.42	0.12	0-1000	-	Good
NO (350,3000) 191C	114.97	2.78	0.22	0.26	0.35	3.82	3.82	0.45	2.34	0.23	0.07	0-3000	-	Good
NH3 (300) 191C (1OF2)	4.83	0.73	0.03	0.12	0.2	1.24	1.24	0.15	0.49	0.11	0.01	0-300	-	Good
CO (500) 191C (1OF2)	192.1	4.67	-	0.2	0.43	9.46	9.46	-	3.84	-	-	0-500	-	Good
CO% (1) 191C (2OF2)	0.02	0	0	0	0	0	0	0	0	0	0	0-1	-	Good
FORMALDEHYDE (70) 191C	0.39	0.56	0.28	0.2	0.24	0.68	0.68	0.33	0.37	0.04	0.09	0-70	-	Close to DL
ACETALDEHYDE (1000) 191C	3.71	2.03	0.23	0.35	0.38	2.21	2.21	0.59	1.57	0.35	0.08	0-1000	-	Check it!
CH4 (250) 191C (1OF2)	1.86	1.12	0.05	0.26	0.7	2.96	2.96	0.06	0.81	0.01	0.02	0-250	-	Check it!
PROPANE (100) 191C	-0.48	0.67	0.42	0.12	0.14	0.79	0.79	0.72	0.72	0.3	0.14	0-100	-	Close to DL
HBR (100) 180C	-0.22	3.79	0.17	0.68	1.39	7.7	7.7	0.19	3.13	0.02	0.06	0-100	-	Close to DL
NO2 (150) 191C (1OF2)	0.27	0.23	0.04	0.02	0.03	0.24	0.24	0.05	0.2	0.01	0.01	0-150	-	Close to DL
NO2 (2000) 191C (2OF2)	-0.59	5.62	2.03	0.88	1.12	7.16	7.16	3.81	4.76	1.78	0.68	0-2000	-	Close to DL
N2O (100,200,300) 191C	0.99	0.12	0.05	0.04	0.05	0.13	0.13	0.07	0.08	0.02	0.02	0-300	-	Good
NH3 (3000) 191C (2OF2)	5.54	4.93	0.35	1.19	2.25	9.3	9.3	0.44	3.8	0.09	0.12	0-3000	-	Check it!
CH4 (3000) 191C (2OF2)	2.89	7.32	0.34	1.1	1.81	12.06	12.06	0.61	6.18	0.27	0.11	0-3000	-	Close to DL
ACETYLENE (1000) 191C	0.15	1.84	0.15	0.31	0.37	2.24	2.24	0.21	1.55	0.06	0.05	0-1000	-	Close to DL
PROPYLENE (200,1000) 191C	0.57	2.5	0.19	0.43	0.5	2.92	2.92	0.49	2.07	0.3	0.06	0-1000	-	Close to DL
COS (100) 150C	0.16	0.12	0.02	0.02	0.02	0.17	0.17	0.02	0.1	0	0.01	0-100	-	Check it!
ETHANE (500) 191C	0.18	1.01	0.32	0.2	0.22	1.13	1.13	0.54	0.82	0.22	0.11	0-500	-	Close to DL
H2SO4 (50) 150C	0.1	0.13	0.04	0.05	0.05	0.14	0.14	0.29	0.29	0.25	0.01	0-50	-	Close to DL
MEOH (10) 191C	-0.2	0.38	0.14	0.14	0.16	0.44	0.44	0.17	0.25	0.03	0.05	0-10	-	Close to DL
SO3 (150) 191C	-4.36	0.32	0.7	0.03	0.04	0.35	0.35	1.14	1.14	0.44	0.23	0-150	-	Close to DL

Analysis Validation Report

Sample Filename: F:\Stockertown\Stockertown December 2023\December 19\SPC__155663.LAB

Filename for noise: F:\Midlothian on Rental\November 14\SPC__000837.LAB
Interferences Filenames: C:\Midlothian on Rental\November 15\SPC__001463.LAB
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C:\Midlothian on Rental\November 15\SPC__001466.LAB
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C:\Midlothian on Rental\November 15\SPC__001470.LAB

Recipe path: C:\OLT\recipes\Cement Testing R3.MGRCP

Gas calibration Name	Conc	MDC3	MDC2	MDC1	MAU	FMU*R	OCU	~ DL	~ CL	~ Bias	Sigma	Range	Span	Comment
ST HCN (200) PCA 191C 191C	0.68	0.11	-	0.31	0.37	0.13	0.37	-	0.01	-	-	0-200	-	Good
HF PPM (10) 191C	-0.01	0.21	0.05	0.04	0.07	0.38	0.38	0.07	0.18	0.02	0.02	0-10	-	Close to DL
SF6 (10) 191C	0	0.01	-	0	0	0.02	0.02	-	0.01	-	-	0-10	-	Close to DL
ETHYLENE (100,3000) 191C	0.28	1	0.33	0.17	0.29	1.74	1.74	1.08	1.08	0.75	0.11	0-3000	-	Close to DL
H2O% (40) 191C	4.22	0.07	-	0.01	0.02	0.15	0.15	-	0.08	-	-	0-40	-	Good
CO2% (40) 191C	9.8	0.11	-	0.01	0.02	0.15	0.15	-	0.2	-	-	0-40	-	Good
HCL PPM (100) 191C	0.15	0.54	0.05	0.15	0.28	0.98	0.98	0.06	0.41	0.01	0.02	0-100	-	Close to DL
SO2 (1000) 191C	254.01	1.45	0.37	0.14	0.27	2.76	2.76	0.79	5.14	0.42	0.12	0-1000	-	Good
NO (350,3000) 191C	110.98	2.75	0.22	0.26	0.35	3.76	3.76	0.45	2.26	0.23	0.07	0-3000	-	Good
NH3 (300) 191C (1OF2)	4.84	0.73	0.03	0.12	0.2	1.23	1.23	0.15	0.48	0.11	0.01	0-300	-	Good
CO (500) 191C (1OF2)	192.65	4.71	-	0.2	0.43	9.55	9.55	-	3.85	-	-	0-500	-	Good
CO% (1) 191C (2OF2)	0.02	0	0	0	0	0	0	0	0	0	0	0-1	-	Good
FORMALDEHYDE (70) 191C	0.3	0.55	0.28	0.2	0.24	0.66	0.66	0.33	0.35	0.04	0.09	0-70	-	Close to DL
ACETALDEHYDE (1000) 191C	3.78	2.01	0.23	0.35	0.38	2.19	2.19	0.59	1.55	0.35	0.08	0-1000	-	Check it!
CH4 (250) 191C (1OF2)	1.9	1.1	0.05	0.26	0.7	2.89	2.89	0.06	0.79	0.01	0.02	0-250	-	Check it!
PROPANE (100) 191C	-0.47	0.67	0.42	0.12	0.14	0.8	0.8	0.72	0.72	0.3	0.14	0-100	-	Close to DL
HBR (100) 180C	-0.24	3.7	0.17	0.68	1.39	7.52	7.52	0.19	3.04	0.02	0.06	0-100	-	Close to DL
NO2 (150) 191C (1OF2)	0.27	0.22	0.04	0.02	0.03	0.24	0.24	0.05	0.2	0.01	0.01	0-150	-	Close to DL
NO2 (2000) 191C (2OF2)	-0.63	5.55	2.03	0.88	1.12	7.08	7.08	3.81	4.69	1.78	0.68	0-2000	-	Close to DL
N2O (100,200,300) 191C	1.04	0.13	0.05	0.04	0.05	0.15	0.15	0.07	0.08	0.02	0.02	0-300	-	Good
NH3 (3000) 191C (2OF2)	6.03	5.08	0.35	1.19	2.25	9.58	9.58	0.44	3.93	0.09	0.12	0-3000	-	Check it!
CH4 (3000) 191C (2OF2)	2.9	7.26	0.34	1.1	1.81	11.96	11.96	0.61	6.12	0.27	0.11	0-3000	-	Close to DL
ACETYLENE (1000) 191C	0.1	1.86	0.15	0.31	0.37	2.26	2.26	0.21	1.57	0.06	0.05	0-1000	-	Close to DL
PROPYLENE (200,1000) 191C	0.69	2.51	0.19	0.43	0.5	2.94	2.94	0.49	2.08	0.3	0.06	0-1000	-	Close to DL
COS (100) 150C	0.16	0.12	0.02	0.02	0.02	0.17	0.17	0.02	0.1	0	0.01	0-100	-	Check it!
ETHANE (500) 191C	0.21	1.03	0.32	0.2	0.22	1.15	1.15	0.54	0.84	0.22	0.11	0-500	-	Close to DL
H2SO4 (50) 150C	0.08	0.13	0.04	0.05	0.05	0.14	0.14	0.29	0.29	0.25	0.01	0-50	-	Close to DL
MEOH (10) 191C	-0.14	0.41	0.14	0.14	0.16	0.48	0.48	0.17	0.28	0.03	0.05	0-10	-	Close to DL
SO3 (150) 191C	-4.16	0.31	0.7	0.03	0.04	0.34	0.34	1.14	1.14	0.44	0.23	0-150	-	Close to DL

Buzzi Unicem; Stockertown PA
Kilns 1 and 3 Stack
Mill Off Run 3 HCN Analyte Spike

Spectrum	Date	Time	SNR 2500	sBeam @ 2500
SPC__156299.LAB	12/20/23	12:35:50.096	3014.157959	1.255054

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Gas ID: ST HCN (200) PCA 191C 191c

LRF Path: C:\OLT\Methods R3\Cement-coal-EGU method 191C\ST HCN (200) PCA 191C 191c_18.lrf

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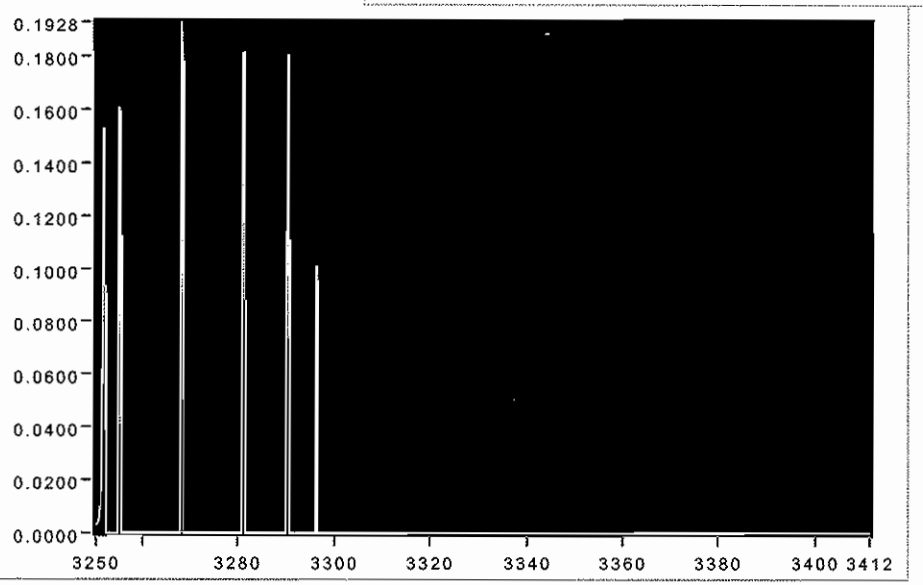
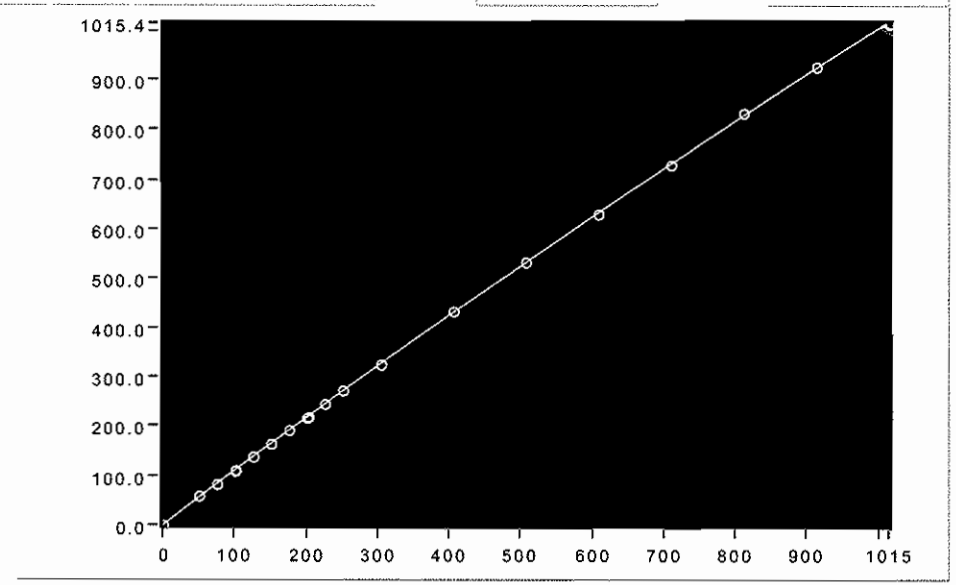
Hi Alarm: NaN

Span: Offset: [illegible]000

Mutations: FALSE





Cal Spectra	Temp (C)	Pres (atm)	Conc (ppm-m)	Actual	Calc'd
HCN (200) PCA 191C (9.86ppm, 5.11r	191.209	0.977	50.385	50.338	58.028
HCN (200) PCA 191C (14.79ppm, 5.11	191.194	0.977	75.577	75.505	81.748
HCN (200) PCA 191C (19.72ppm, 5.11	191.202	0.977	100.769	100.670	108.784
HCN (200) PCA 191C (19.87ppm, 5.11	191.196	0.978	101.536	101.566	110.134
HCN (200) PCA 191C (24.65ppm, 5.11	191.204	0.977	125.962	125.832	137.484
HCN (200) PCA 191C (29.58ppm, 5.11	191.209	0.977	151.154	150.999	163.367
HCN (200) PCA 191C (34.51ppm, 5.11	191.225	0.977	176.346	176.168	191.423
HCN (200) PCA 191C (39.44ppm, 5.11	191.217	0.977	201.538	201.349	215.933
HCN (200) PCA 191C (39.74ppm, 5.11	191.194	0.978	203.071	203.055	218.187
HCN (200) PCA 191C (44.37ppm, 5.11	191.203	0.977	226.731	226.500	244.687
HCN (200) PCA 191C (49.30ppm, 5.11	191.199	0.977	251.923	251.691	271.907
HCN (200) PCA 191C (59.61ppm, 5.11	191.221	0.978	304.607	304.577	324.286
HCN (200) PCA 191C (79.48ppm, 5.11	191.195	0.977	406.143	405.954	433.207
HCN (200) PCA 191C (99.35ppm, 5.11	191.258	0.977	507.679	507.181	533.828
HCN (200) PCA 191C (119.22ppm, 5.11	191.209	0.977	609.214	608.643	629.940
HCN (200) PCA 191C (139.09ppm, 5.11	191.246	0.977	710.750	709.953	729.858
HCN (200) PCA 191C (158.96ppm, 5.11	191.263	0.977	812.286	811.364	833.737
HCN (200) PCA 191C (178.83ppm, 5.11	191.221	0.977	913.821	913.339	926.574
HCN (200) PCA 191C (198.70ppm, 5.11	191.202	0.978	1015.357	1015.357	1015.357

Interpolation: Quadratic

Force Through Zero: ☒

Min % Residuals: ☐ Excl. Zero: ☐ Quant w/ Highest: ☐

Spectral Regions
Region 00 - 3250.25 to 3411.52 cm-1
Region 01 - 593.01 to 840.34 cm-1
Region 02 - 1295.95 to 1518.21 cm-1
Region 03 - 2496.93 to 2901.43 cm-1
Region 04 - 3172.38 to 3250.01 cm-1
Region 05 - 3881.35 to 4113.97 cm-1

Calibration Generated :22 AM 06/26/2012

Gas ID HF ppm (10) 191C

LRF Path C:\OLT\Methods R3\Cement-coal-EGU method 191C\HF ppm (10) 191C_12.lrf

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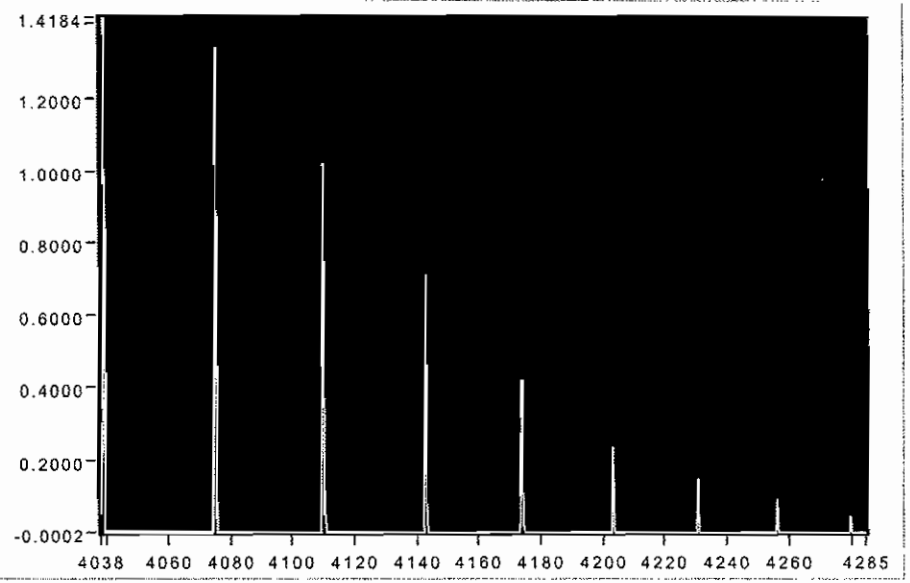
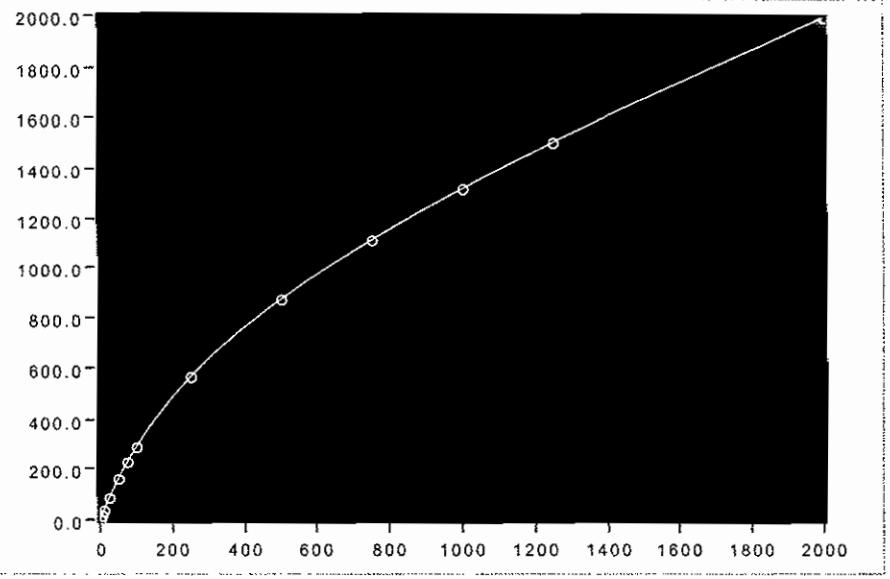
Hi Alarm NaN

Span Offse. 00000

Mutations FALSE





Cal Spectra	Temp (C)	Pres (atm)	Conc (ppm-m)	Actual	Calc'd
HF 96 MNB-fz 1ppm-m (1ppm, 1.000m,	191.000	1.000	1.000	1.000	3.620
HF 96 MNB-fz 5ppm-m (5ppm, 1.000m,	191.000	1.000	5.000	5.000	17.914
HF 96 MNB-fz 10ppm-m (10ppm, 1.000m	191.000	1.000	10.000	10.000	35.375
HF 96 MNB-fz 25ppm-m (25ppm, 1.000	191.000	1.000	25.000	25.000	85.208
HF 96 MNB-fz 50ppm-m (50ppm, 1.000	191.000	1.000	50.000	50.000	160.659
HF 96 MNB-fz 75ppm-m (75ppm, 1.000	191.000	1.000	75.000	75.000	228.048
HF 96 MNB-fz 100ppm-m (100ppm, 1.00	191.000	1.000	100.000	100.000	288.789
HF 96 MNB-fz 250ppm-m (250ppm, 1.0	191.000	1.000	250.000	250.000	565.147
HF 96 MNB-fz 500ppm-m (500ppm, 1.0	191.000	1.000	500.000	500.000	875.753
HF 96 MNB-fz 750ppm-m (750ppm, 1.0	191.000	1.000	750.000	750.000	1115.993
HF 96 MNB-fz 1000ppm-m (1000ppm, 1.	191.000	1.000	1000.000	1000.000	1322.828
HF 96 MNB-fz 1250ppm-m (1250ppm, 1	191.000	1.000	1250.000	1250.000	1509.378
HF 96 MNB-fz 2000ppm-m (2000ppm, 1	191.000	1.000	2000.000	2000.000	2000.000

Interpolation Spline

Force Through Zero ☒

Min % Residuals ☐ Excl. Zero ☐ Quant w/ Highest ☐

Spectral Regions
Region 00 - 4037.90 to 4284.87 cm-1
Region 01 - 3405.41 to 4037.84 cm-1
Region 02 - 4284.93 to 4363.63 cm-1

Calibration Generated	.2:50 AM 11/30/2012	Gas ID	Ethylene (100,3000) 191C	Lo Alarm	NaN	Span	Offse. J00000
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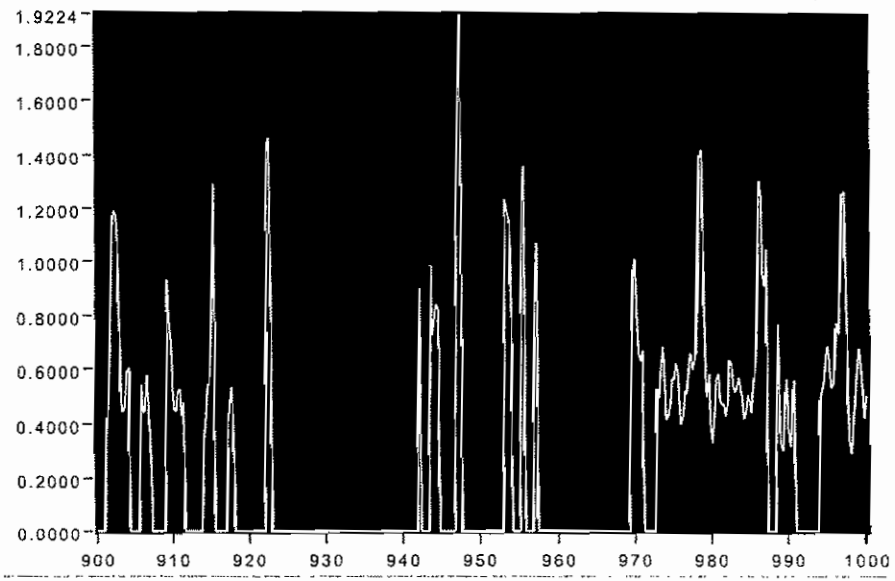

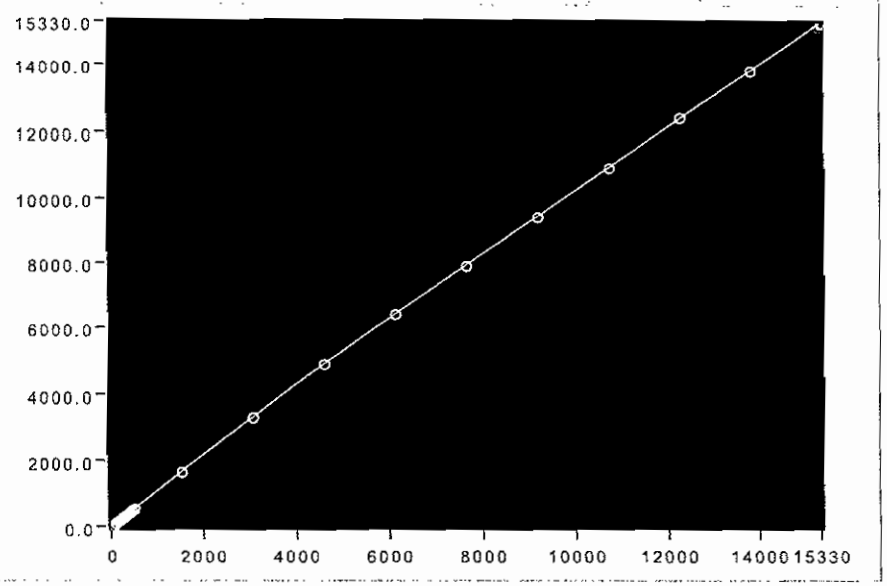

Cal Spectra	Temp (C)	Pres (atm)	Conc (ppm-m)	Actual	Calc'd
Ethylene (9.74ppm, 5.11m, 190C).lab	190.014	0.994	49.792	49.542	54.522
Ethylene (19.49ppm, 5.11m, 190C).lab	189.989	0.994	99.594	99.135	107.070
Ethylene (29.23ppm, 5.11m, 190C).lab	189.985	0.994	149.365	148.729	162.298
Ethylene (38.98ppm, 5.11m, 190C).lab	189.998	0.995	199.188	198.392	217.388
Ethylene (48.72ppm, 5.11m, 190C).lab	189.971	0.995	248.959	247.990	272.190
Ethylene (58.46ppm, 5.11m, 190C).lab	189.964	0.995	298.731	297.587	327.537
Ethylene (68.21ppm, 5.11m, 190C).lab	189.977	0.995	348.553	347.251	383.508
Ethylene (77.95ppm, 5.11m, 190C).lab	189.933	0.995	398.325	396.868	439.409
Ethylene (87.70ppm, 5.11m, 190C).lab	189.964	0.995	448.127	446.506	495.696
Ethylene (97.44ppm, 5.11m, 190C).lab	189.934	0.995	497.918	496.089	551.021
Ethylene (300.00ppm, 5.11m, 190C).la	189.942	0.997	1533.000	1531.357	1654.977
Ethylene (600.00ppm, 5.11m, 190C).la	189.991	0.998	3066.000	3063.066	3290.420
Ethylene (900.00ppm, 5.11m, 190C).la	189.934	0.998	4599.000	4597.015	4885.213
Ethylene (1200.00ppm, 5.11m, 190C).la	189.933	0.998	6132.000	6130.754	6446.341
Ethylene (1500.00ppm, 5.11m, 190C).la	189.960	0.998	7664.999	7658.046	7940.995
Ethylene (1800.00ppm, 5.11m, 190C).la	189.922	0.998	9197.999	9195.039	9445.204
Ethylene (2100.00ppm, 5.11m, 190C).la	189.971	0.998	10730.999	10728.462	10942.161
Ethylene (2400.00ppm, 5.11m, 190C).la	189.936	0.998	12263.999	12262.913	12444.229
Ethylene (2700.00ppm, 5.11m, 190C).la	189.914	0.998	13796.999	13797.629	13888.468

Interpolation Quartic Force Through Zero ☒

Min % Residuals ☒ Excl. Zero ☐ Quant w/ Highest ☐

Spectral Regions
Region 00 - 900.12 to 1000.16 cm-1
Region 01 - 615.91 to 899.88 cm-1
Region 02 - 1000.40 to 1211.33 cm-1
Region 03 - 1341.75 to 2117.96 cm-1
Region 04 - 2901.41 to 3286.87 cm-1

Calibration Generated 2:34 PM 07/09/2012

Gas ID SF6 (10) 191C

LRF Path C:\OLT\Methods R3\Cement-coal-EGU method 191C\SF6 (10) 191C_0.lrf

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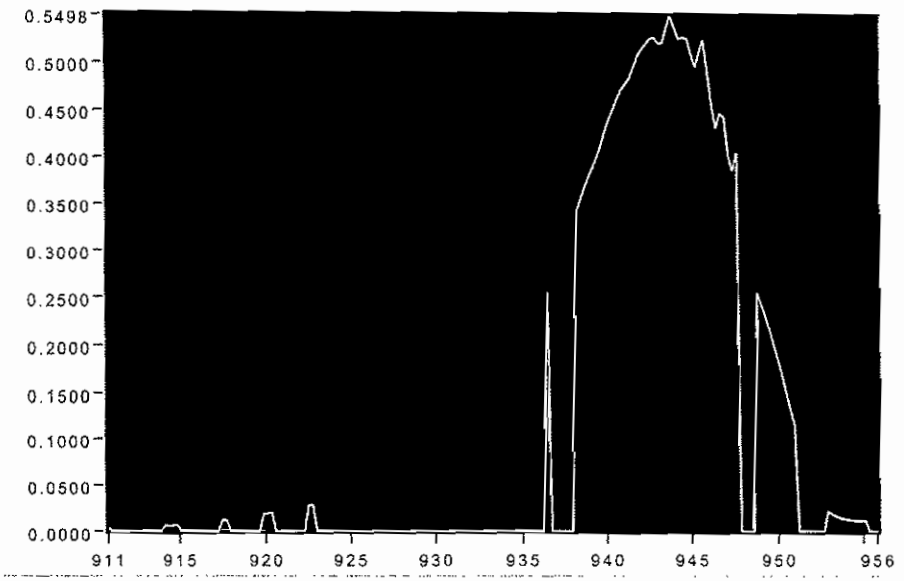
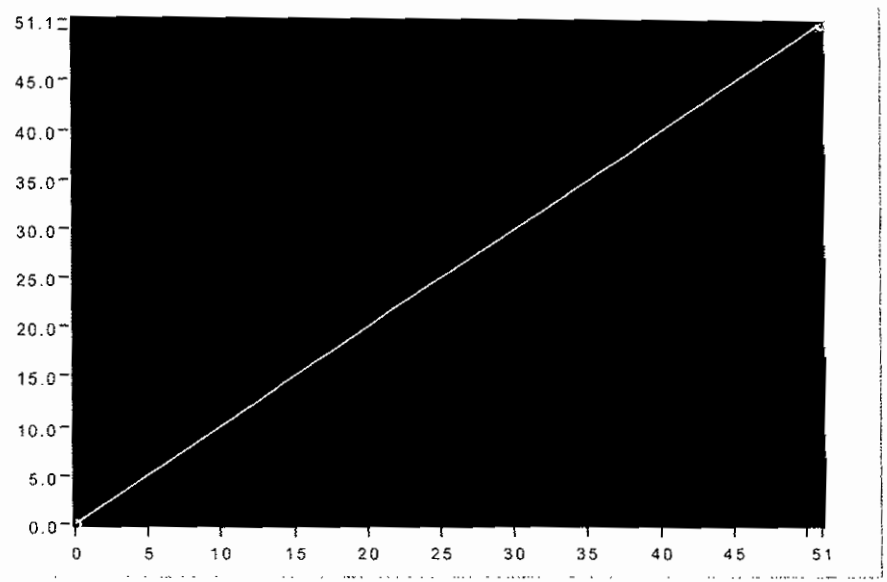
Hi Alarm NaN

Span Offset ,00000

Mutations FALSE





Cal Spectra	Temp (C)	Pres (atm)	Conc (ppm-m)	Actual	Calc'd
SF6 (10ppm, 5.11m, 191C) #1.LAB	191.504	1.008	51.100	51.100	51.100

Interpolation Linear

Force Through Zero ☒

Min % Residuals ☒ Excl. Zero ☐ Quant w/ Highest ☐

Spectral Regions
Region 00 - 910.73 to 955.81 cm-1
Region 01 - 902.05 to 910.49 cm-1
Region 02 - 956.05 to 1004.99 cm-1

Appendix F

Test Participants

Scott Steinsberger	Project Manager and FTIR Operator
Dustin Carpenter	Sampling Technician
Jeremy Rothenberg	Sampling Technician
Antonio Pineda	Buzzi Plant Contact

Appendix G

RTR Sampling and Analytical Protocol

DEECO Inc.
3404 Lake Woodard Road
Raleigh, NC 27604
(919) 250-0285 (ph); (919) 250-1835 (Fax) www.deeco.com

PROTOCOL TO PERFORM A SAMPLING AND ANALYTICAL TESTING PROGRAM AS PART OF THE US EPA RISK AND TECHNOLOGY REVIEW at Buzzi Unicem USA, Inc. Stockertown PA Facility 501 Center Avenue Stockertown, PA 18083

Submitted By:
DEECO, INC.
3404 Lake Woodard Road
Raleigh, NC 27604

October 11, 2023

Copy # 1

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1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

The United States Environmental Protection Agency (US EPA) has directed the portland cement industry (SIC 3241) to conduct emissions testing as part of the US EPA Risk and Technology Review (RTR). This document provides the overall test program approach and specifies minimum sample collection procedures, data quality objectives, and quality assurance/quality control measures to be used by the source testing firms selected by the cement companies performing tests. The test program is designed to be a comprehensive and robust test of each facility. The quality assurance and quality control (QA/QC) measures are designed to produce standardized data having known precision and accuracy. Collection of accurate, representative, and standardized data for facilities with low emissions is necessary especially in view of MACT standard setting procedures.

Cement kiln pyro-processing systems located throughout the US are included in the RTR request. Individual facilities have a wide range of kiln system configurations and air pollution control (APC) trains. Site-specific considerations will be required to capture emissions profiles for the target analytes that represent the extent of control or possible emissions increases from these controls.

1.2 PLANT NAME, ADDRESS, AND CONTACT

Buzzi Unicem USA, Inc.
Stockertown PA Facility
501 Center Avenue
Stockertown, PA 18083

Antonio Pineda
Office: 610-882-5038
Mobile: 610-704-3592
E-Mail Antonio.Pineda@buzziunicemusa.com

1.3 PROCESS OF INTEREST

The Stockertown facility operates two dry-process, rotary kilns (Kiln 1 and Kiln 3). Kiln 1 is a Gepol Kiln and Kiln 3 has Preheater/Precalciner (PH/PC). The Kiln 1 and Kiln 3 exhausts are combined into a Common Stack. From the standpoint of emissions generation and release, the Stockertown kilns essentially operate as one. The intention is to conduct testing with both Kiln 1 and Kiln 3 in operation. However, in the event that Kiln 1 is temporarily idle due to market conditions, the test will proceed with only Kiln 3 in operation. This testing condition was confirmed to be acceptable by Brian Storey of the EPA on a conference call on October 11th, 2023.

1.4 AIR POLLUTION CONTROL EQUIPMENT

The Stockertown facility kiln has a Selective Non-Catalytic Reduction (SNCR) system for NO_x control, a Dry Sorbent Injection (DSI) system for acid gas control, and a bag house for Particulate Matter (PM) removal. The SNCR and DSI systems will be used under normal operating conditions.

1.5 EMISSION POINTS AND SAMPLING LOCATIONS

The Common Stack will be the only location sampled for the RTR program. Details of this sampling location are provided in Section 4.

1.6 POLLUTANTS TO BE MEASURED

Emission testing will be conducted for hydrogen cyanide (HCN), hydrogen fluoride (HF), and diatomic chlorine (Cl_2). Concurrent measurements to determine volumetric flow rate will be made. The sampling and analytical procedures to be followed are discussed in detail in Section 5.

1.7 EXPECTED TEST DATES

The test is currently scheduled for the week of December 18, 2023. A detailed test schedule is provided in Table 3-1.

1.8 TEST PROGRAM ORGANIZATION

The test program organizational chart is presented in Figure 1.1.

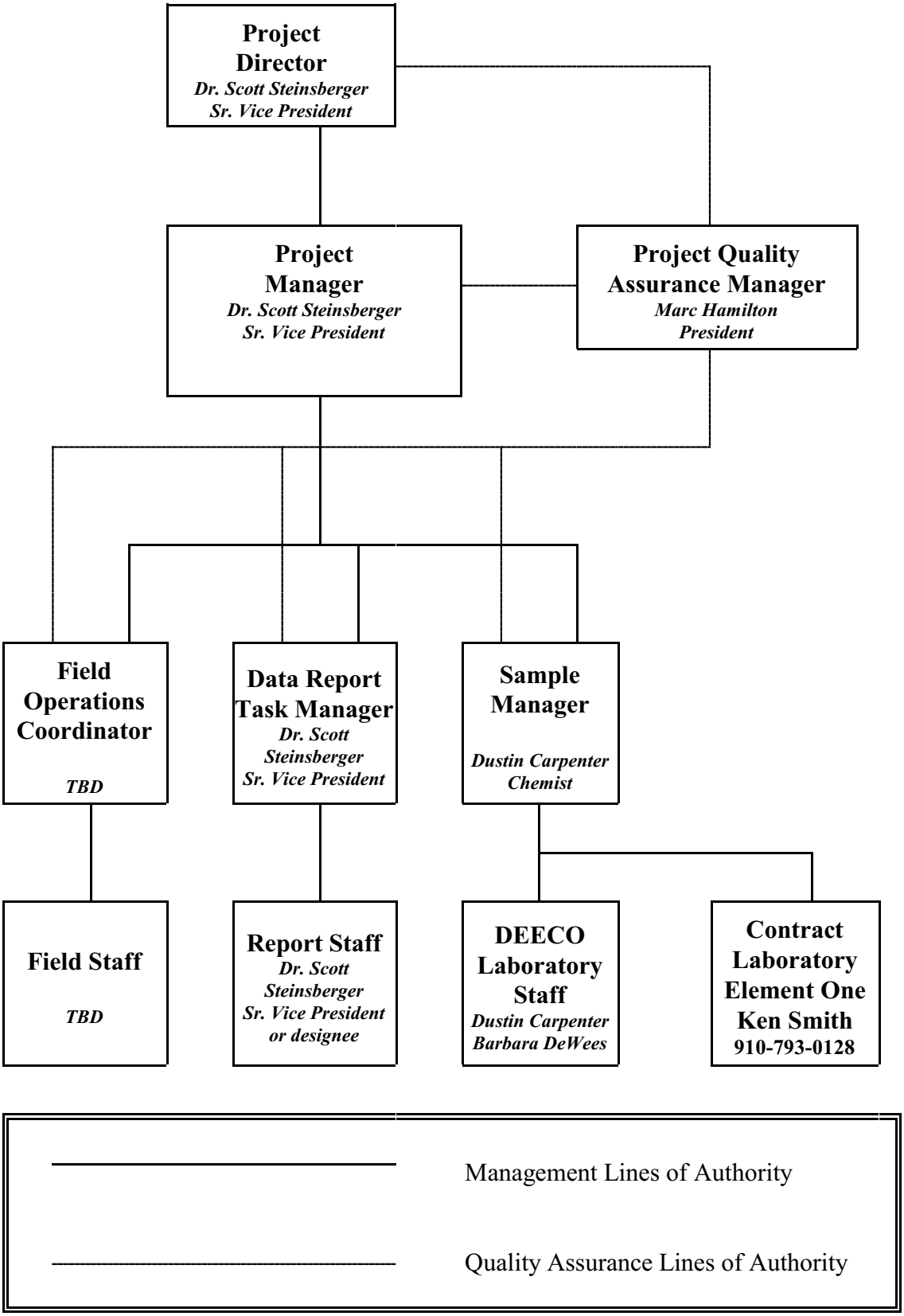

Figure 1.1 Organizational Chart

2.0 SOURCE DESCRIPTION

2.1 PROCESS DESCRIPTION

Buzzi Unicem'sStockertown plant operates two dry-process, rotary kilns (Kiln 1 and Kiln 3) to produce portland cement at their facility in Stockertown, PA.

Raw feed from the kiln feed silos provides a common feed source to both kilns, and coal/coke from the fuel storage bin provides a common fuel source. Kiln feed is introduced to the top of Kiln 1's vertical shaft and at the top of Kiln 3's preheater tower. Fuel is introduced at the burning zone or discharge end of the rotary kilns. Fuel is also introduced in to the vertical shaft of Kiln 1 and at the calciner burner located toward to bottom of the preheater tower of Kiln 3. All alternative fuels are introduced in the vertical shaft of Kiln 1 and the calciner burner of Kiln 3. Exhaust gases from the kilns are drafted into a common duct with an induced-draft fan and ultimately vent to a single baghouse. From the standpoint of emissions generation and release, the Stockertown kilns essentially operate as one.

The raw mill at the facility is an in-line mill (as defined in 40 CFR 63.1341) since a portion of the exhaust gases from the kiln system is used for processing raw materials in the mill. In the mill, raw materials are combined and ground. Kiln exhaust gas is used to dry the materials during grinding, which provides for greater fuel efficiency in the kiln system. Prepared kiln feed is stored in silos until fed to the kiln system.

2.2 CONTROL EQUIPMENT DESCRIPTION

Stack gases from the kiln systems are mainly composed of combustion products, carbon dioxide from calcination, excess air, and particulate matter. To remove the PM, exhaust gases from the kilns are routed through a fabric filter dust collector (i.e., the main baghouse). Once cleaned, the exhaust gases from the baghouse discharge to the atmosphere through a single exhaust stack.

A schematic of the Stockertown process, including control equipment is shown below in Figure 2.1.

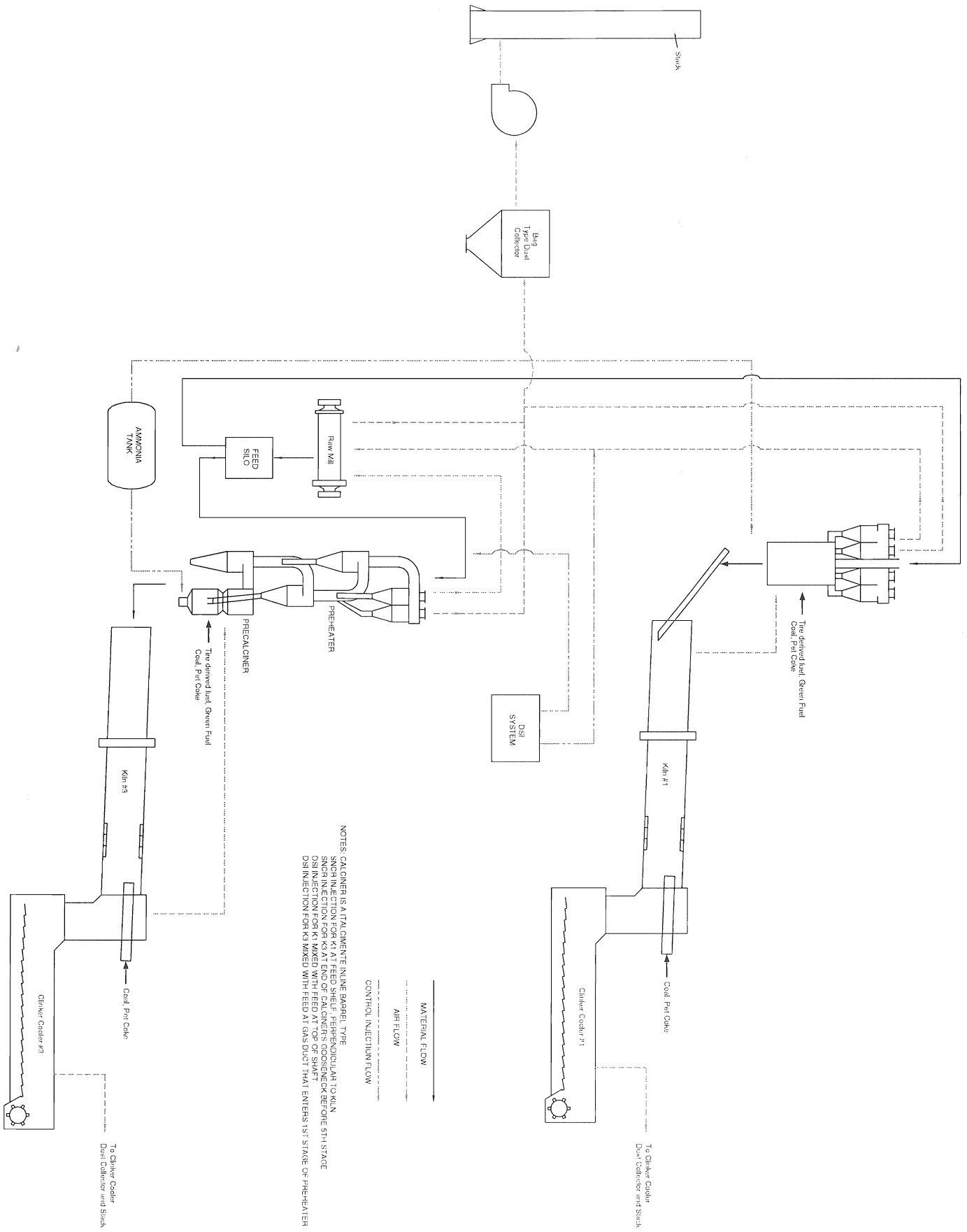

Figure 2.1 Stockertown Process Schematic

3.0 TEST PROGRAM

3.1 OBJECTIVES

An air emissions sampling and analytical program will be conducted on the Kilns 1 and 3 Common Stack at the Buzzi Unicem USA Inc. cement facility located in Stockertown, PA. All testing will be performed following accepted EPA methodology. The test program is to provide a standardized data set to the EPA and the cement industry so that reliable facility inter-comparisons of emissions can be made.

All testing will be performed in strict accordance with specifications stipulated in 40 CFR 60, Appendix A for flow rate following EPA Method 1, 2, 3A, and 4 and hydrogen fluoride (HF) and diatomic chlorine (Cl_2) following EPA Method 26A and in 40 CFR 63, Appendix A for hydrogen cyanide (HCN) and (HF) following EPA Method 320. All sampling runs will be one hour long.

The source emission test will be performed the week of January 1, 2024. Testing will be conducted under representative process and control system operating conditions. This facility has an inline raw mill and testing will be performed while operating in the "Mill On" and "Mill Off" conditions.

3.2 TEST MATRIX

Table 3-1 presents the sampling and analytical matrix and proposed test schedule.

TABLE 3-1 PROGRAM OUTLINE AND TENTATIVE TEST SCHEDULE FOR BUZZI UNICEM USA, INC , STOCKERTOWN, PA.

Sampling Location	No. of runs	Sample/Type Pollutant	Sampling Method	Sample Run Times (min)	Analytical Method	Analytical Laboratory
Day 1						
Stack	Arrive on-site and set up test equipment					
Day 2 (Raw Mill On or Off, depending on production)						
Stack	3	O_2/CO_2	EPA Method 3A	60	Paramagnetic (O2) NDIR (CO2)	DEECO
	3	HF and Cl_2	EPA Method 26A[1]	60	Ion Chromatograph	Element One
	3	HCN and HF	EPA Method 320	60	FTIR (Method 320)	DEECO
Day 3 (Raw Mill On or Off, depending on production)						
Stack	3	O_2/CO_2	EPA Method 3A	60	Paramagnetic (O2) NDIR (CO2)	DEECO
	3	HF and Cl_2	EPA Method 26A[1]	60	Ion Chromatograph	Element One
	3	HCN and HF	EPA Method 320	60	FTIR (Method 320)	DEECO
Day 4 Contingency Day/Demobilization						

[1] Stack gas flow rate and moisture measurement may be taken from concurrent Method 26A isokinetic sampling trains.

3.3 TEST COORDINATION

Mr. Antonio Pineda the Stockertown facility contact, will serve as the test coordinator and will be responsible for:

1. Scheduling the start of all testing
2. Principal contact with the agency officials concerning the tests
3. Principal contact with DEECO concerning the tests
4. Recording the process data during the testing
5. Providing copies of any field test data to the agency

If there is a temporary equipment malfunction in the middle of a test, radio contact will be made with the test crew in order to delay the test. When problems have been corrected, the test will continue from the point where it was delayed. If the malfunction or upset condition results in an extended test delay, then the affected test run(s) may be aborted and a new run(s) conducted when the malfunction has been corrected or process upset cleared. Any samples or field data from aborted runs may be discarded.

4.0 SAMPLING LOCATION DESCRIPTIONS

4.1 SAMPLING LOCATION DESCRIPTION

The measurement site for the Kiln 1 and 3 Systems common stack is located in a vertically-oriented round duct. The duct has an inside diameter of 131". The nearest upstream disturbance is a duct breaching (from the ID fan) located about 121 feet (~11 diameters) from the sampling ports. The nearest downstream disturbance is the stack outlet at about 94 feet (~8.5 diameters) from the sampling ports.

This sampling location meets the minimum specifications for selection of a measurement site as outlined in EPA Method 1. Four (4) test ports are located at equidistant positions (every 90°) around the duct. A schematic of the stack sampling location is shown in Figure 4.1. Cyclonic flow checks, as described in EPA Method 1 Section 2.4, using the Type-S pitot null procedure and angle measurements will be conducted at the Kiln 1 and 3 Systems stack test location.

For the Kiln 1 and 3 Systems stack, a total of 12 velocity/isokinetic traverse points will be used, with three points on each of the four ports. An S-type pitot tube is used in accordance with EPA Method 2 to measure the flue gas velocity. Gas temperatures are measured using calibrated Type K thermocouples and digital readout devices. These measurements are performed in accordance with the procedures in EPA Methods 2, 5, and 26A .

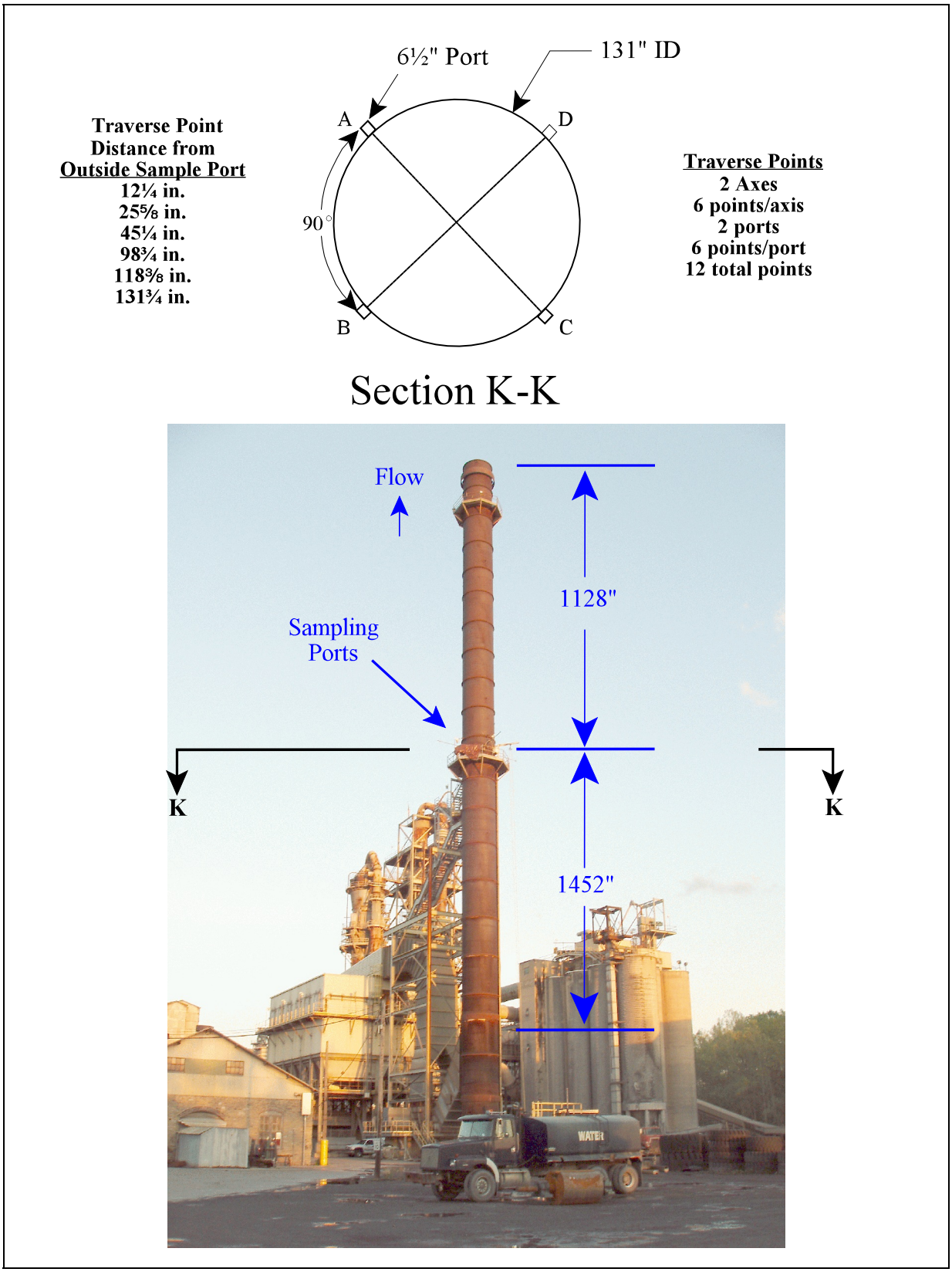

Figure 4.1 Schematic of Common Stack Sampling Location

5.0 SAMPLING AND ANALYTICAL PROCEDURES

This section contains a brief description of the sampling and analytical procedures for each method that will be employed during the test program. All equipment, procedures, and quality assurance measures necessary for completion of the test program will meet or exceed the specifications of the appropriate methods Any deviations from the methods to ensure quality representativeness of the results are also discussed.

5.1 TEST METHODS

The methods for the test program are described below, and apply to all process operating conditions (e.g. where there is an inline raw mill, testing will be performed while operating in the "Mill On" and "Mill Off" conditions). Table 3-1 outlines expected operating conditions for this test.

5.1.1 SAMPLING POINT DETERMINATION - EPA METHOD 1

The number and location of the sampling or traverse points will be determined according to the procedures outlined in EPA Method 1. The sample location will be inspected to insure EPA Method 1 criteria is met. All points will be at least 1.0 inches from the stack wall, per Method 1.

5.1.2 FLUE GAS VELOCITY AND VOLUMETRIC FLOW RATE - EPA METHOD 2

The flue gas velocity and volumetric flow rate will be determined according to the procedures outlined in EPA Method 2. Velocity measurements will be made using type S pitot tubes conforming to the calibration specifications outlined in EPA Method 2, Section 10.1. Each Type-S pitot tube, calibrated according to these standards, will have an assigned coefficient. Differential pressures will be measured with Magnehelic gauges of appropriate range or with fluid manometers. Effluent gas temperatures will be measured with chromel-alumel thermocouples equipped with digital readouts.

5.1.3 OUTLET FLUE GAS COMPOSITION - EPA METHOD 3A

Outlet flue gas analysis for oxygen (O_2) and carbon dioxide (CO_2) concentrations, and the calculation of percent excess air and flue gas dry molecular weight will be performed in accordance with EPA Method 3A.

To evaluate the sampling location and points for FTIR and O_2 sampling, a three-point O_2 concentration stratification test on a line passing through the centroidal area at 16.7, 50.0 and 83.3 percent of the measurement line (or for stacks is greater than 2.4 meters (7.8 ft) at 0.4, 1.2 and 2.0 meters from the stack or duct wall). The procedures in Section 8.1.2 of Method 7E will be followed, but oxygen will be used as parameter as allowed by fourth sentence in Section 8.1.2. The plant O_2 CEMS as a control. A criteria of <5% variation from combined mean for each point will be used as indication of non-stratification and allowing single point sampling at the point closest to the mean. Otherwise, sampling for equal periods at the three test points during test run will be conducted.

Per EPA Method 3A for determining molecular weight, integrated sampling will be obtain using the Method 320 sampling system described in Section 5.1.6.

A portion of the hot , wet gas sample will be sent through a condensing system to remove the

stack moisture, A portion of the moisture-free gas sample will be snt to a CAI Model 200 O_2 (or equivalent) analyzer measures using the paramagnetic technique. An oxygen molecule, because of its sp3 electron orbital distribution, has an unpaired electron and hence displays a magnetic orientation. Since other elements that display this magnetic phenomenon are not common gasses at normal temperatures, the paramagnetic measurement technique is virtually specific for oxygen. The sample gas flows through a detection cell located in a very strong magnetic field. The concentration of O_2 gas present induces a pressure differential in the detector cell. The amount of differential pressure is proportional to the concentration of O_2 gas present.

Calibration procedures will be performed in accordance with EPA methodology. Analyzers will be calibrated before and after each test and a calibration check between each test run.

The pretest calibrations will consist of the following steps:

- Internal (direct) calibration of each analyzer to adjust calibration and check linearity.
- External (through the entire sampling system) calibration to check the system bias on zero and span gases.

The post test calibration will consist of an external system bias calibration check.

The analyzer will be as calibrated using a certified zero and span (mid or high range) gas. Zero and span gases were directed to each analyzer through the appropriate plumbing, the calibration gas flow rates will be adjusted to the correct flow rate and the analyzer will be adjusted with the appropriate span pot.

After the analyzer is properly adjusted the linearity will be checked using a low and high range calibration gas. The maximum allowable limit for linearity is 2% of the analyzer range. All analyzers will be shown to be linear within these limits before proceding..

The external calibration bias check will be performed by placing the CEM system in sampling mode and injecting a zero and span gas into the sample line at the probe exit. This check shows if there is any sampling system related bias, and also checks the integrity of the sample line.

5.1.3.1 Calibration Gases-DEECO will use EPA Protocol and/or ±2% NIST Traceable gases for calibration as required by the various reference methods employed in this test program. Calibration gases will be selected from previous experience with similar sources and/or from information obtained from the facility engineer prior to sampling. In some cases if the gases that are selected are out of the optimum range of operation then no significant impact of data quality is expected due to the linear nature of the analyzers that were used.

Audit gases, if available from a federal or a state agency, will be analyzed.

5.1.3.2 Sampling Procedures-At the completion of the pretest calibration routine, the CEM system will be ready for operation. No further adjustments of sample flow rates, analyzer zero or span adjustments, or other critical CEM operating parameters will be made until testing and post test calibration were complete.

Each sampling run will be one hour. At the completion for each test run, calibration gases

will be used to check between test runs. A zero and the upscale calibration gas closest to the actual emission concentrations will be used for the pretest and post test calibrations.

5.1.4 FLUE GAS MOISTURE CONTENT - EPA METHOD 4

The flue gas moisture content will be determined in conjunction with the EPA Method 26A trains according to the sampling and analytical procedures outlined in EPA Method 4. (**NOTE:** In order to maintain isokinetic sampling, the sampling rate used may be required to temporarily exceed the EPA Method 4-specified maximum sampling rate of 0.75 CFM, based on observed stack gas pitot readings.) The impingers will be connected in series and will contain reagents as described below. The impingers will be contained in an ice bath in order to assure condensation of the moisture in the flue gas stream. Any moisture that is not condensed in the impingers is captured in the silica gel, therefore all moisture can be weighed and entered into moisture content calculations.

5.1.5 HYDROGEN FLUORIDE AND DIATOMIC CHLORINE - EPA METHOD 26A

Sampling and analytical procedures will be similar to those outlined in EPA Method 26A to determine primarily diatomic chlorine (Cl_2) emissions and hydrogen fluoride (HF) emissions at main stack outlet sampling locations. Duplicate simultaneous trains (a.k.a "paired trains") for each test run will be used to determine precision.

Sample is collected through a heated glass probe, followed by a heated quartz fiber filter, where stack gas HF and Cl_2 are collected in a series of chilled impingers. The sampling train impingers will contain 50 ml of 0.1N sulfuric acid in the first impinger (optional should high moisture warrant a modified short stem), 100 ml of 0.1N sulfuric acid in the second and third, a fourth empty impinger, 100 ml of 0.1N NaOH in the fifth and sixth and 200 grams of silica gel in the last impinger. (**NOTE**: For plants with scrubbers, the optional cyclone may be used since the gas stream may be saturated with moisture.)

Sampling will be conducted isokinetically (±10%) with readings of flue gas parameters recorded at traverse points selected according to EPA Method 1. Leak-checks on the Method 26A sampling train will be are performed before and after each sampling run and optionally for any port change. In the event that any portion of the train needed to be disassembled and reassembled (i.e., due to filter or resin changes), leak-checks are performed. The sampling train leak-checks and leakage rate (where applicable) are documented on the field test data sheet for each respective run. All leak checks will be acceptable.

The glass button hook nozzle and probe liner will be constructed of borosilicate glass or quartz. The filter holder will be constructed of borosilicate glass with a Teflon frit filter support and a sealing gasket. A heated quartz fiber filter, for sources above 210°C, or PTFE-bonded glass fiber filter will be used. The probe and filter housing will heated to above 248°F and not exceed an upper boundary of 273°F. Probe liners and filter holders will be cleaned thoroughly prior to testing.

The Method 26A trains will be operated isokinetically for a minimum of 60 minutes and collect a minimum of 1 dry, standard cubic meter (DSCM). Pretest preparations, preliminary determinations, and leak check procedures will be those outlined in EPA Method 5.

After completion of sampling the train will be leak checked and transferred to the sample recovery trailer. All leak checks will be acceptable. The impingers will be weighed to determine

moisture gain in accordance with EPA Method 4.

Sample recovery will involve quantitative recovery of the sulfuric acid impinger contents and the NaOH impinger contents into separate tare-weighed, precleaned polyethylene sample containers. The nozzle, probe, filter and filter housing will not be recovered.

The contents of sulfuric acid impingers, including the contents if any of the empty (2^{nd} knockout or fourth) impinger will be quantitatively transferred to the tare-weighed, precleaned polyethylene sample container, followed by three rinses with deionized (DI) water of the impingers and all connecting glassware (including the connecting glassware to the first impinger) placed in the same H_2SO_4 container. The container will be labeled and weighed to determine the final sample volume. The liquid level will be marked on the sample container.

The contents NaOH impingers will be quantitatively transferred to a second tare-weighed, precleaned polyethylene sample container, followed by three rinses with DI water of the impingers and all connecting glassware placed in the same NaOH container. The container will be labeled and weighed to determine the final sample volume. The liquid level will be marked on the sample container

Sample recovery from each train will include:

1. Container No. 1 - Contents 1^{st} knockout, H_2SO_4 impingers, and 2^{nd} knockout and, and DI rinse of impingers and connecting glassware; and
2. Container No. 2 - Contents NaOH impingers, and DI rinse of impingers and connecting glassware.

Additional quality control consists of collecting and analyzing a field blank train for every three test runs. The blank train is to be assembled from a used train, leak checked and sit for a period equal to the sampling time (i.e, 1-hr). The blank train data will be used to determine the method detection limit for the test program target analytes (ie. The lowest number that could be detected), and compared to stack emissions.

Reagent blanks of 0.1 N H_2SO_4, 0.1N NaOH, and DI water will be collected and archived for later analysis should there be any issues with the field blank train samples

The H_2SO_4 impinger solutions will be analyzed using ion chromatography techniques for fluoride ions (F^-) (EPA SW-9057). Duplicate analyses will be performed on the samples and a reagent blank. Precision will be demonstrated by duplicate injection of each sample, the results of each individual analysis must be within 5% of their mean to be acceptable. If the precision criteria is not met, analysis of the sample is repeated until consecutive injections meet the criteria.

The NaOH impinger solutions will be treated with sodium thiosulfate to ensure complete conversion of hypochlorous acid (HClO) to chloride ions (Cl^-). The resulting solution will be analyzed using ion chromatography techniques for chloride ions (EPA SW-9057). Duplicate analyses will be performed on the samples and a reagent blank. Precision will be demonstrated by duplicate injection of each sample, the results of each individual analysis must be within 5% of their mean to be acceptable. If the precision criteria is not met, analysis of the sample is repeated until consecutive injections meet the criteria.

All EPA Method 26A HF/Cl_2 samples will be analyzed by Element One of Wilmington NC. Refer to Section 1, Figure 1.1 for contact information.

The relative deviation (RD)will be calculated as described in EPA Method 30B between the Cl_2 concentrations measured with the paired trains.

5.1.6 HYDROGEN CYANIDE AND HYDROGEN FLUORIDE - EPA METHOD 320

EPA Method 320 will be performed to determine emissions of concentrations of HCN and HF. Three, 1-hour sampling runs will be conducted under representative process and control system operating conditions.

The gas sample will be extracted from the stack through a glass-lined probe and filter heated to 375° F. For external calibration checks and analyte spikes, the gases will be introduced in front of the heated filter. Any excess calibration gas will be diverted through the sample probes into the source. Outflow of gas from the heated filter enclosure was transported through a Teflon sample line heated to 375° F. For this source approximately 100' of sample line will be required. The heated sample line will be connected directly to the FTIR sample cell. Using heat-traced Teflon tubing the exit of the FTIR cell will be connected to a sample pump with a heated stainless steel pump head. The pump discharge will be directed to a proprietary chiller-type gas conditioner to remove moisture prior to delivery sample gas to the O_2/CO_2 monitors.

The distribution of the gas sample to the monitors will be accomplished using a panel equipped with valves and rotometers. The gas sample was then divided and directed to the analyzers.

FTIR sample cell will be maintained at 191°C and connected to a MKS Instruments Multigas 2030 Fourier Transform Infrared Spectrometer and Detector.

The FTIR spectrometer will measure vapor phase organic or inorganic compounds which absorb energy in the mid-infrared spectral region, about 400 to 4000 cm^{-1} (25 to 2.5 μm). Continuous measurement will be made by matching sample absorbance bands with bands in reference spectra, and comparing sample band intensities with reference band intensities.

The principle limitation to FTIR spectroscopy are the presence of interfering compounds that also absorb energy in the mid-infrared spectral region. In a cement kiln stack gas matrix, water vapor (H_2O) and carbon dioxide (CO_2) are the primary interferents that must be incorporated into the identification and quantitation method.

The FTIR software performs the computation for a single compound by subtracting all the other compounds (interferants and target) from the absorbance spectra and quantifies the single compound based on the remain absorbance. The FTIR software provides a Standard Error Calculation (SEC) value that is an indication of how well the identification and quantitation has been performed. A high SEC indicates that other interferants have not been accounted for in the analysis method, and a low SEC is indicative of greater confidence measurement.

The instrument is operated with a resolution of 0.5 cm^{-1} with 4x zero filling. Beer-Norton Medium apodization is used with amplitude phase correction.

For this RTR test program, following specific QA/QC activities for EPA Method 320 will be performed and criterium met.

5.1.6.1 Laboratory QA/QC Activities Before Field Test Program- Before field testing occurs, the following QA/QC activities will be conducted;

1) Seven consecutive samples of dry nitrogen through the sampling system will be acquired and used to calculate the standard deviation for each of the test program target analytes multiplied by a factor of 3. These data will be considered representative of detection limits for this test program and are to be compared to the 0.5 ppm required DL;

2) From these seven dry nitrogen samples, the results for the Signal-to-Noise Ratio (SNR) @ 2500 cm^{-1} should be >2500, at 64 scans and the results for single beam intensity @ 2500 cm^{-1} should be >0.9; and

3 Upon receipt of HCN calibration gases a direct analysis will be performed to verify FTIR response agrees with tag value within 5%. Analysis results will be reported to PCA to assess need for modified reference spectra and/or change to direct analysis criterion:

5.1.6.2 QA/QCActivities During Field Test Program- During the field test program, following QA/QC activities will be performed and criterium met;

1) On each test day prior to any testing , an instrument background will be collected using dry nitrogen directed to the gas cell. The background will be collected with at least 128 scans;
2) The probe, filter, sample line and all sample system components in contact with effluent will be maintained at or above 375ºF or 191ºC (consistent with FTIR calibration temperature) to avoid any possible "cold spots;"
3) Heated sample lines will be ≤100 feet wherever possible, and not longer than 200 feet, without prior approval for unusual test circumstances;
4) A system zero with all sampling system components at operating temperature will be performed by injecting nitrogen at the sample probe and through sample filter and entire measurement system. After zero equilibration has been achieved, all measurement components will be quantified for at least 128 scans;
5) Ambient air will be sampled until equilibration of the measurement system has been achieved and all measurement components will be quantify for at least 128 scans;
6) The sample probe will be position at effluent measurement point and sampling will continue until equilibration of the measurement system has been achieved. At this point, the effluent concentrations will be quantified with two consecutive 64-scan samples as the initial native concentration for the dynamic spike;
7) Analyte spiking will be conducted for HCN before the first test run, and after each successive test run for a minimum of 4 spikes per test condition. (Additional spikes would be required before and after corrective action for the sampling or analysis system and/or before and after removing the sampling system from the stack.) These results will determine accuracy;
8) The spike gas injections will be maintained at 10% or less of total sample volume. The spike gas concentration and flow rate will be selected to approximately double the native effluent concentration, or the spike will be conducted to add 3-4 ppm to native concentration, whichever results in greater spiked concentration. Spike recovery results will be within ±20% of the expected value or ±0.5 ppm, whichever is least restrictive. (Specific HCN gases will be manufactured for this test program in the range of 50-100 ppm to provide spikes in the 5-10 ppm range, or lower. An SF_6 or appropriate tracer will be used to calculate the exact spike gas dilution ratio of 10% or less;)
9) After the dynamic spike, nitrogen will be sent through the sampling system until all traces

of spike gas are removed and lines are proven below DL for target analytes;

10) The nitrogen purge will be discontinued and the sampling system will be allowed to equilibrate with stack gas before starting a test run. The first two consecutive 64-scan samples of a sample run will be used for the final native concentration. Residual results for HCN and HF will be verified to be less than 0.2-0.3 ppm for data acceptance, or less than 5% of the measured value, whichever is least restrictive. Calculate the standard deviation for each of the test program target analytes for seven consecutive sample spectra from Run 1, multiplied by a factor of 3. These data will be compared to the pre-test system nitrogen standard deviation results and also included in the facility test report;

11) The SNR @ 2500 cm^{-1}, at 64 scans, and the results for single beam intensity @ 2500 cm^{-1} will be verified to met the >2500 and >0.9 criterium; respectively. The analyte spiking for HCN and subsequent system nitrogen injection will be conducted after each test run. Continue sequence until at least three valid runs per test condition are completed.

6.0 QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

6.1 QA/QC PROCEDURES

The QA/QC procedures for this RTR test program are summarized in Table 6-1.

TABLE 6-1 QA/QC PROCEDURES AND REQUIREMENTS

Target Analyte	Test Method	Detection Limit	QA/QC
HCN	EPA Method 320	0.5 ppm	Increase scans if needed to achieve detection limits. Increasing to 400 from relative 64 (gives a 2.5 S/N advantage). HCN spiking before and after each run by adding 10% or less spike to approximately double the native effluent concentration, or conduct spike to add 3-4 ppm to native concentration, whichever results in greater spiked concentration. Spike recovery results shall be within ±20% of the expected value or ±0.5 ppm, whichever is least restrictive 5% pre-to-post run calibration transfer standard (CTS) requirement
HF		0.2-0.3 ppm	Rely on CTS (5%), HCN and tracer gas responses to validate HF FTIR data
Cl_2	EPA Method 26A	~ 0.07 mg/m^3 (~0.2 ppm)	Duplicate Simultaneous Trains; Collect minimum of 1 dscm for each sample train. Acceptance criteria for paired samples: 10% Relative Deviation or 0.2 ppm absolute difference, whichever is least restrictive. Insert dry impinger between acid and base impingers
Effluent Flow Rate	EPA Methods 1-4	Not Applicable	As per M26A isokinetic testing or separately by Methods 1-3. FTIR measurements for H_2O. **Wind Tunnel calibrated pitot tube having a Cp of 0.84 or less is required for all flow measurements**. Compare preliminary velocity traverse measurements and sample run flow rate measurements to installed certified flow rate monitor. Investigate and resolve differences greater than 10% of average flow rate.
O_2	EPA Method 3A	Not Applicable	Analyte concentrations corrected @ 7% O_2 Span is 10%, 15%, or 20% (for co-mingled stacks only) Acceptance criteria are 0.2% O_2 difference for analyzer calibration error, and 0.3% O_2 for system bias checks, and zero and upscale drift checks.

6.2 SAMPLE IDENTIFICATION AND CUSTODY

Sample custody procedures for this program are based on EPA recommended procedures. Since samples will be analyzed by one or more laboratories as well as in the field, the custody procedures emphasize careful documentation of sample collection and field analytical data and the use of chain of custody records for samples being transported. The procedures which will be used are discussed below.

The project manager will be responsible for ensuring that proper custody and documentation procedures are followed for the field sampling and field analytical efforts. He will be assisted in this effort by key sampling personnel involved in sampling recovery.

Samples will be collected, transported, and stored in clean containers which are constructed of materials inert to the analytical matrix such as glass jars. Only containers which allow air tight seals will be used. Amber glass jars will be employed when containers are needed to inhibit photochemical reactions.

All sampling data, including information regarding sampling times, locations, and any specific considerations associated with sample acquisition will be recorded on preformatted data sheets. All samples will be given unique, identifying alphanumeric sample codes which will serve to track samples from the field to the laboratory.

Samples will be stored for transport from the lab to the field to the lab in storage boxes constructed in a fashion which minimizes movement and thus prevents breakage of containers. For example, boxes used for transporting glass containers will have foam inserts with form-fitting cutouts. Sample transport boxes will be locked except when in use. Vans containing equipment and samples will be locked whenever they are left unattended.

A daily activity log will be maintained by the project supervisor. This will be an informal log used to record various types of information, such as minor problems which arise, sketches of sampling locations, names and phone numbers of plant contacts. daily activity summaries, etc.

This section provides information regarding the organization of the sampling and analytical program. The following details the key positions and their responsibilities. Once personnel have been assigned to these positions, their qualifications will be provided as an addendum.

The organization of the project team, including QA functions, is shown in the project organization chart (see Figure 1.1).

7.0 SAMPLE CUSTODY

Sample custody procedures for this program are based on EPA recommended procedures. Since samples will be analyzed by one or more laboratories as well as in the field, the custody procedures emphasize careful documentation of sample collection and field analytical data and the use of chain of custody records for samples being transported. The procedures which will be used are discussed below.

7.1 FIELD SAMPLING OPERATIONS

The project manager will be responsible for ensuring that proper custody and documentation procedures are followed for the field sampling and field analytical efforts. He will be assisted in this effort by key sampling personnel involved in sampling recovery.

Samples will be collected, transported, and stored in clean containers which are constructed of materials inert to the analytical matrix such as glass jars. Only containers which allow air tight seals will be used. Amber glass jars will be employed when containers are needed to inhibit photochemical reactions.

All sampling data, including information regarding sampling times, locations, and any specific considerations associated with sample acquisition will be recorded on preformatted data sheets. All samples will be given unique, identifying alphanumeric sample codes which will serve to track samples from the field to the laboratory.

Samples will be stored for transport from the lab to the field to the lab in storage boxes constructed in a fashion which minimizes movement and thus prevents breakage of containers. For example, boxes used for transporting glass containers will have foam inserts with form-fitting cutouts. Sample transport boxes will be locked except when in use. Vans containing equipment and samples will be locked whenever they are left unattended.

A daily activity log will be maintained by the project supervisor. This will be an informal log used to record various types of information, such as minor problems which arise, sketches of sampling locations, names and phone numbers of plant contacts. daily activity summaries, etc.

7.2 ANALYTICAL OPERATIONS

Analytical operations will be performed on-site in the laboratory as well as in the remote laboratories. Samples analyzed by outside laboratories are transported with a Change of Custody form. This form will list sample identifications, analytical parameters, sample matrices, anticipated date of results, and other relevant information necessary to ensure the appropriate analyses are performed and to document the progress of the samples.

8.0 INTERNAL QUALITY CONTROL CHECKS

Specific quality control (QC) procedures will be followed to ensure the continuous production of useful and valid data throughout the course of this test program. The QC checks and procedures described in this section represent an integral part of the overall sampling and analytical scheme. Strict adherence to prescribed procedures is quite often the most applicable QC check. A discussion of both the sampling and analytical QC checks that will be utilized during this program is presented below.

8.1 EQUIPMENT INSPECTION AND MAINTENANCE

Each item of field test equipment will be assigned a unique, permanent identification number. An effective preventative maintenance program is necessary to ensure data quality. Each item of equipment returning from the field will be inspected before it is returned to storage. During the course of these inspections, items are cleaned, repaired, reconditioned, and recalibrated where necessary.

Each item of equipment transported to the field for this test program will be inspected again before being packed to detect equipment problems which may originate during periods of storage. This minimizes lost time on the job site due to equipment failure.

Occasional equipment failure in the field is unavoidable despite the most rigorous inspection and maintenance procedures. For this reason, replacement equipment for all critical sampling train components will be transported to the job site.

8.2 EQUIPMENT CALIBRATION

New items for which calibration is required will be calibrated before initial field use. Equipment whose calibration status may change with use or time will be inspected in the field before testing begins and again upon return form each field use. When an item of equipment is found to be out of calibration, it will be repaired and recalibrated or retired from service. All equipment will be periodically recalibrated in full, regardless of the outcome of these regular inspections.

Calibrations will be conducted in a manner, and at a frequency, which meets or exceeds U.S. EPA specifications. The calibration procedures outlined in the EPA Methods will be followed. When these methods are inapplicable, methods such as those prescribed by the American Society for Testing Materials (ASTM) will be used.

Data obtained during calibrations will be recorded on standardized forms, which will be checked for completeness and accuracy by the quality assurance manager. Data reduction and subsequent calculations will be performed using computer facilities. Calculations will be checked at least twice for accuracy. Copies of calibration forms will be included in the test or projects reports.

Emissions sampling equipment requiring calibration includes pitot tubes, pressure gauges, thermometers, dry gas meters and barometers. The following sections elaborate on the calibration procedures to be followed for these items of equipment.

A: Pitot Tubes. All Type S pitot tubes used, whether separate or attached to a sampling

probe, will be constructed in-house or by a third-party vendor. Each new pitot will be calibrated in accordance with Section 10.1 of EPA Method 2. Each Type-S pitot tube, calibrated according to these standards, will have an assigned coefficient. This coefficient should not change as long as the pitot tube is not damaged.

Each pitot tube will be inspected visually upon return from the field. If a cursory inspection indicates damage or raises doubt that the pitot remains in accordance with the EPA geometry standards, the pitot tube will be refurbished as needed and recalibrated.

B: **Differential Pressure Gauge.** All meter consoles used are equipped with 10-inch water column (W.C.) inclined-vertical manometers. Fluid manometers do not require calibration other than leak checks. Manometers will be leak checked in the field prior to each test series, and again upon return from the field.

C: **Impinger Thermometer.** Prior to the start of testing, the thermometer used to monitor the temperature of the gas leaving the last impinger will be compared with a mercury-in-glass thermometer which meets ASTM E-1 No. 63F specifications. The impinger thermometer is adjusted if necessary until is agrees within 2°F of the reference thermometer. If the thermometer is not adjustable, it is labeled with a correction factor.

D: **Dry Gas Meter Thermometer.** The thermometer used to measure the temperature of the metered gas sample will be checked prior to each field trip against an ASTM mercury-in-glass thermometer. The dry gas meter thermometer is acceptable if the values agree within ± 5.4°F. Thermometers not meeting this requirements will be adjusted or labeled with a correction factor.

E: **Flue Gas Temperature Sensor.** All thermocouples employed for the measurement of flue gas temperature are calibrated upon receipt. Initial calibrations will be performed at three points (ice bath, boiling water, and hot oil). An ASTM mercury-in-glass thermometer will be used as a reference. The thermocouple is acceptable if the agreement is within 1.5 percent (absolute) at each of the three calibration points.

Before and after each field use, the reading from the flue gas thermocouple-potentiometer combination will be compared with an ASTM mercury-in-glass reference thermometer at ambient conditions. If the two agree within ± 1.5 percent (absolute), the thermocouple and potentiometer are considered to be in proper working order.

F: **Dry Gas Meter and Orifice.** Two procedures will be used to calibrate the dry gas meter and orifice simultaneously. The full calibration will be a complete laboratory procedure used to obtain the calibration factor of the dry gas meter. Full calibrations will be performed over a wide range of orifice settings. A simpler procedure, the post-test calibration, will be designed to check whether the calibration factor has changed.

A dry gas meter that is calibrated annually against a spirometer or a set of calibrated critical orifices will be used as a transfer standard. During the annual calibration,

triplicate calibration runs will be performed at seven flow rates ranging from 0.25 to 1.40 cfm.

G: **Dry Gas Meter.** Each metering system receives a full calibration at the time of purchase and a post-test calibration after each field use. If the calibration factor, γ, deviates by less than five percent from the initial value, the test data are acceptable. If γ deviates by more than 5 percent, the meter is recalibrated and the meter coefficient (initial or recalibrated) that yields the lowest sample volume for the test runs is used.

EPA Method 5 requires another full calibration anytime the post-test calibration check indicates that γ changed by more than 5 percent. Standard practice is to adjust and recalibrate the dry gas meter anytime γ is found to be outside the range of 0.96 to 1.04. Post-test calibrations will be performed after each field test series per EPA Method 5, section 16.3 procedures.

H: **Orifice.** An orifice calibration factor will be calculated for each flow setting during a full calibration. If the range of values does not vary by more than 0.20 in H_2O over a range of 0.4 to 4.0 in H_2O, the arithmetic average of the values obtained during the calibration is used.

I: **Barometer.** Each field barometer will be adjusted before each test series to agree within ± 0.1 inches of a reference aneroid barometer. The reference barometer will be checked against the station pressure value (corrected for elevation difference) reported by the National Weather Service.

8.3 SAMPLING QUALITY CONTROL PROCEDURES

The following pretest QC checks will be conducted:

- All sampling equipment will be thoroughly checked to ensure clean and operable components.
- Equipment will be inspected for possible damage from shipment.
- The oil manometer or Magnehelic gauge used to measure pressure across the Type S pitot tube will be leveled and zeroed.
- The number and location of the sampling traverse points will be checked before taking measurements.
- The temperature measurement system will be visually checked for damage and operability by measuring the ambient temperature prior to each traverse.

In addition to the general QC procedures listed above, QC procedures specific to each sampling method will also be incorporated into the sampling scheme. These methods and specific procedures are discussed below.

A: Sampling Train QC checks. The following QC procedures will be emphasized:

Prior to Start of Tests

- Keep all cleaned glassware and sample train components sealed until train assembly.
- Assemble the sampling trains in an environment free from uncontrolled dust.
- Visually inspect each sampling train for proper assembly.
- Perform pretest calculations to determine the proper sampling nozzle size.

Prior to Each Test Run

- Visually inspect the sampling nozzle.
- Visually inspect the Type S pitot tube.
- Leak check each leg of the Type S pitot tube.
- Leak check the entire sampling train.

During Each Test Run

- Readings of temperature and differential pressure will be taken at each transverse point.
- All sampling data and calculations will be recorded on preformatted data sheets.
- All calibration data forms will be reviewed for completeness and accuracy.
- Any unusual occurrences will be noted during each run on the appropriate data form.
- The project supervisor will review sampling data sheets daily during testing.
- Properly maintain the roll and pitch axis of the Type S pitot tube and the sampling nozzle.
- Leak check the train before and after any move from one sampling port to another during a run (at DEECO's option) or if a filter change takes place.
- Conduct additional leak checks if the sampling time exceeds 4 hours.
- Maintain the probe, filter, and impingers at the proper temperatures.
- Maintain ice in the ice bath at all times.
- Make proper readings of the dry gas meter, delta P and delta H, temperature, and pump vacuum during sampling at each traverse point.
- Maintain isokinetic sampling within ± 10% of 100%.

After Each Test Run

- Visually inspect the sampling nozzle.
- Visually inspect the Type S pitot tube.
- Leak check each leg of the Type S pitot tube.
- Leak check the entire sampling train.

B: QC for Volumetric air flow rate determinations

Flue Gas Velocity. Data required to determine the flue gas velocity will be collected using the methodology specified in EPA Method 2. Quality control procedures are as follows.

- Visually inspect the Type S pitot tube before and after sampling.
- Leak check both legs of the pitot tube before and after sampling.
- Check the number and location of the sampling traverse points before taking measurements.

Flue Gas Molecular Weight. In the event that that integrated bag samples are to be used for determination of flue gas molecular weight, EPA Method 3 will be the sampling technique specified. Quality control will focus on the following procedures:

- The sampling train will be leak checked before and after each run.
- A constant sampling rate will be used in withdrawing a sample.
- The sampling train will be purged prior to sample collection.
- The sampling port will be properly sealed to prevent air in-leakage.

Moisture Content. The moisture content of the gas stream will be determined using the technique specified in EPA Method 4. The following QC checks will be performed:

- The sampling train will be leak checked before and after each run.
- Ice will be maintained in the ice bath throughout each run to insure an exit temperature (after the silica gel impinger) of $\leq 67^{\circ}F$.

8.4 ANALYTICAL QUALITY CONTROL PROCEDURES

All analyses for this program will be performed using accepted laboratory procedures in accordance with the specified analytical protocols. Adherence to prescribed QC procedures will ensure data of consistent and measurable quality. Analytical QC will focus upon the use of control standards to provide a measure of analytical precision and accuracy. Also, specific acceptance criteria are defined for various analytical operations including calibrations, control standard analyses, drift checks, blanks, etc. The following general QC procedures will be incorporated into the analytical effort:

- The on-site project manager will review all analytical data and QC data on a daily basis for completeness and acceptability.
- Analytical QC data will be tabulated using the appropriate charts and forms on a daily basis
- Copies of the QC data tabulation will be submitted to the quality assurance manager following the completion of the test program.
- All hard copy raw data (i.e., chromatograms, computer printouts, etc.) will be maintained in organized files.

Specific analytical QC procedures for the Orsat analyzer (if used) are listed below.

- The analyzer will be leveled and the fluid levels zeroed prior to use.
- The analyzer will be leak checked prior to use.
- The analyzer will be thoroughly purged with sample prior to use.
- The analyzer will be checked by analyzing an ambient air sample.

EPA Method 26A Sample Analysis QC Checks are listed below.

- Calibration curve consisting of 4 calibration levels that bracket the expected sample range. Dilute samples as necessary to reach the calibration range;
- Duplicate analysis of calibration standards, before and after sample analysis, with duplicate injections being within 5% of their mean;
- Duplicate analysis of reagent blanks, quality control samples and field samples with duplicate injections being within 5% of their mean;
- Matrix spike samples may be prepared and analyzed. Matrix spike recoveries should be 90-110%
- A field blank will be carried through the procedure and analyzed with the field samples.
- An audit sample will be analyzed for if available from two or more independent, Approved Audit Sample Providers no less than 60 days prior to the test effort.

9.0 REPORTING AND DATA REDUCTION REQUIREMENTS

9.1 DATA REPORTING

The reporting units for HCN, HF, and Cl_2 will be in parts-per-million by volume, wet basis ($ppm_{v,d}$), parts-per-million by volume, dry corrected to 7% oxygen ($ppm_{v,d}@7\%O_2$), pounds-per-hour (lbs/hr), and pounds-per-ton of clinker (lbs/ton). Additional supporting data for CO_2, O_2, and H_2O concentrations and volumetric flow rates (actual cubic feet-per-minute, wet,standard cubic feet-per-minute, and dry,standard cubic feet-per-minute) will be reported. The clinker production, in short tons-per-hour (TPH) will be reported.

Any data that is not acceptable because of technical difficulties will be indicated, and an explanation of the technical problem will be given. All related QC and calibration data will be in the final report.

9.2 REPORT CONTENTS

Copies of the test report will be submitted after the test series has been completed. Results reported will include, but not be limited to emission rates and concentrations of gaseous pollutants, and process sample determinations, any liquid stream constituents determinations, and any other type of data requested. This report will also include a list of all personnel present during testing, summary results, descriptions of test procedures used, a description of the source and its operation during testing, test locations drawings, example calculations, raw field data, and equipment calibrations.

9.3 DATA REDUCTION

Care will be exercised to ensure hand recorded data is written accurately and legibly. Additionally, the use of prepared data recording forms, conveniently formatted, is an important aid to verify that all necessary data items are recorded. The collected field and laboratory data will be reviewed by the analyst and the Project Manager.

The Project Manager will reduce and validate all of the sampling and analytical data that is collected. The sampling data will include flow measurements, calibrations, etc. Each laboratory will reduce all analytical results prior to their submission to the Project Manager. The analytical data will be used to determine concentrations and emission rates of the compounds of interest.

Data reduction follows guidelines published in EPA Reference Methods, where applicable, and by guideline documents where EPA Reference Methods are not available. Validated computer programs will be used to calculate all reported values.

9.4 DATA VALIDATION

A second technical review of the data will be performed and documented by a qualified scientist other than the one who performed the actual analyses. The second reviewer will include evidence (e.g., check marks, recalculations, etc.) that show which data points were checked. Finally, the second reviewer will sign and date the cover page of the data packet or the record that was reviewed.

In-situ measurements will be validated by demonstrated acceptable post-test leak checks and calibration verifications according to the referenced method used.

Analysis data may be validated according to defined criteria by a secondary reviewer or by the analyst. At a minimum and if applicable, analysis data will be validated according to the following criteria (additional method-specific criteria or project requirements may apply):

- Sampling records complete and traceable
- All appropriate QC samples included with the analytical batch and reported with the sample results
- Routine tuning, calibration and inspection of analytical instrumentation documented and performed prior to analyses
- Initial and continuing calibration criteria met
- Method/reagent blanks confirm no background contamination
- Surrogate recoveries within criteria
- Qualitative sample results (e.g., retention times, mass spectra, isotopic ratios) consistent with standard data
- Sample data within the calibrated range of the instrument
- Chromatograms or other raw data consistent with computer-generated quantitation reports
- Accuracy of intermediate data manipulations, transcribed numbers and/or final reported results verified
- Reference standards, instrumentation, sample identification, analysts, methodology, and sequence of processing clearly identified and traceable in the project records
- Lost data or corrective actions documented (e.g., loss of sample, reanalysis, redilutions, additional cleanup steps, alternative calculations etc.)
- Data that does not meet the validation requirements flagged accordingly
- Data reported in the correct units (e.g., "ppm" should not be used without specifying volume or mass units; "ug/g" are preferred units for data reporting)

10.0 PLANT ENTRY AND SAFETY

10.1 SAFETY RESPONSIBILITIES

The Project Manager is responsible for ensuring compliance with plant entry, health, and safety requirements. The Facility Contact (refer to Section 1.2) as the authority to impose or waive facility restrictions. The Project Manager has the authority to negotiate with facility person any deviations from the facility restrictions.

10.2 SAFETY PROGRAM

DEECO has a comprehensive health and safety program that satisfies Federal OSHA and MSHA requirements. The basic elements include: (1) written policies and procedures, (2) routine training of employees and supervisors, (3) medical monitoring, (4) use of personal protection equipment, (5) hazard communication, (6) pre-mobilization meetings with Holcim personnel and DEECO test team personnel, and (7) routine surveillance of the on-going test work.

10.3 SAFETY REQUIREMENTS

All test personnel will adhere to the following standard safety and precautionary measures as follows:

1) Confine activities to test area only;
2) Wear hard hats at all times on-site, except inside sample recovery trailers and mobile CEM laboratory;
3) Wear protective shoes or boots in test area:
4) Wear protective glasses or goggles at the outlet test sites, and other areas as designated;
5) Have readily available first aid equipment and fire extinguishers.

Before or on the first day on-site, the Project Manager will fill out the Emergency Response Procedure form and provide copies to be posted at each test site.