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

**Hagerstown Facility
1260 Security Road
Hagerstown, MD 21742**

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TEST DATES: March 13 and 15, 2024

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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 process tested at the Hagerstown facility is a pyro-processing system, equipped with preheater and 5-Stage, low-NO_x inline calciner, along with an inline raw mill producing portland cement at a rate of approximately 850,000 tons-per-year (TPY).

The air pollution control equipment at the Hagerstown facility consists of three control devices. A selective noncatalytic reduction (SNCR) post combustion emissions control technology for reducing NO_x by injecting ammonia into the kiln at a properly determined location. A dry sorbent injection system utilizing lime is used to control acid gas emissions. Exhaust from the raw mill, coal mill, alkali bypass, and kiln are directed through respective fabric filters for particulate removal, and directed into a common duct before exhausting out a common stack.

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

The Holcim retained DEECO Inc. (DEECO) to conduct emission tests for hydrogen cyanide (HCN), hydrogen fluoride (HF), and diatomic chlorine (Cl₂). All sampling runs were 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; HOLCIM INC., HAGERSTOWN, MD FACILITY; MARCH 13 AND 15, 2024

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 pounds-per-hour pounds-per-ton of clinker	1.8 0.72 0.007	2.1 0.78 0.008
Hydrogen Fluoride (FTIR) parts-per-million, dry basis corrected to 7% O ₂ pounds-per-hour pounds-per-ton of clinker	<0.012 <0.035 <0.0003	<0.055 <0.015 <0.0002
Hydrogen Fluoride (Method 26A) parts-per-million, dry basis corrected to 7% O ₂ pounds-per-hour pounds-per-ton of clinker	<0.35 <0.103 <0.0009	<0.39 <0.107 <0.0010
Diatomic Chlorine (Method 26A) parts-per-million, dry basis corrected to 7% O ₂ pounds-per-hour pounds-per-ton of clinker	<0.092 <0.096 <0.0009	<0.120 <0.117 <0.0011

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, both Raw Mill On and both Raw Mill Off. The two Raw Mill On runs were conducted on March 13, 2024 before the raw mill went down during the third run. The three Raw Mill Off runs were conducted on March 13, 2024. The final Raw Mill On was conducted on March 15, 2024

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, Gage meyer, Michael Powell, 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 HOLCIM INC., HAGERSTOWN MD FACILITY

Location and Frequency	Test Parameter	Sampling Method	Sampling Procedure	Analysis Method	Analysis Procedure
Kiln Main 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 Holcim's Hagerstown MD 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 performed on the main stack under two conditions, both Raw Mill On and both Raw Mill Off. The two Raw Mill On runs were conducted on March 13, 2024 before the raw mill went down during the third run. The three Raw Mill Off runs were conducted on March 13, 2024. The final Raw Mill On was conducted on March 15, 2024. The Raw Mill On and Raw Mill Off results are summarized in Tables 2.1 and 2.2, respectively.

**TABLE 2.1 HOLCIM INC., HAGERSTOWN MD FACILITY; KILN MAIN STACK
HYDROGEN CYANIDE, HYDROGEN FLUORIDE, AND DIATOMIC
CHLORINE EMISSIONS; RAW MILL ON; MARCH 13 AND 15, 2024**

Test Parameter	Main Stack Raw Mill On Run 1	Main Stack Raw Mill On Run 2	Main Stack Raw Mill On Run 4	Main Stack Raw Mill On Average
Time	10:00-11:06	11:25-12:31	12:20-13:26	March 13-15, 2024
Flow Rate (dscfm)	181,400	178,500	167,750	175,900
Oxygen	14.0%	13.2%	13.2%	13.5%
Carbon Dioxide	12.6%	14.1%	14.1%	13.6%
Moisture	9.4%	9.7%	9.0%	9.4%
Hydrogen Cyanide (FTIR)				
ppm _{dry} at 7% O ₂	1.2	1.2	3.1	1.8
pounds-per-hour	0.46	0.50	1.19	0.72
pounds-per-ton of clinker	0.005	0.005	0.012	0.007
Hydrogen Fluoride (FTIR)				
ppm _{dry} at 7% O ₂	0.19	0.14	<0.03	<0.12
pounds-per-hour	0.054	0.043	<0.009	<0.035
pounds-per-ton of clinker	0.0005	0.0004	<0.0001	<0.0003
Hydrogen Fluoride (Method 26A)				
ppm _{dry} at 7% O ₂	<0.370	<0.324	<0.358	<0.351
pounds-per-hour	<0.104	<0.100	<0.104	<0.103
pounds-per-ton of clinker	<0.0009	<0.0009	<0.0009	<0.0009
Diatomic Chlorine (Method 26A)				
ppm _{dry} at 7% O ₂	<0.083	<0.093	<0.100	<0.092
pounds-per-hour	<0.083	<0.102	<0.103	<0.096
pounds-per-ton of clinker	<0.0007	<0.0009	<0.0009	<0.0009

**TABLE 2.2 HOLCIM INC., HAGERSTOWN MD FACILITY; KILN MAIN STACK
HYDROGEN CYANIDE, HYDROGEN FLUORIDE, AND DIATOMIC
CHLORINE EMISSIONS; RAW MILL OFF; MARCH 13, 2024**

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	14:20-15:26	15:43-16:49	17:20-18:26	March 13, 2024
Flow Rate (dscfm)	195,550	189,350	191,350	195,080
Oxygen	14.1%	14.4%	14.9%	14.5%
Carbon Dioxide	12.4%	11.9%	11.0%	11.8%
Moisture	8.5%	8.7%	7.7%	8.3%
Hydrogen Cyanide (FTIR)				
ppm _{dry} at 7% O ₂	1.8	2.1	2.4	2.1
pounds-per-hour	0.72	0.79	0.83	0.78
pounds-per-ton of clinker	0.007	0.008	0.008	0.008
Hydrogen Fluoride (FTIR)				
ppm _{dry} at 7% O ₂	<0.036	0.062	0.066	<0.055
pounds-per-hour	<0.011	0.017	0.017	<0.015
pounds-per-ton of clinker	<0.0001	0.0002	0.0002	<0.0002
Hydrogen Fluoride (Method 26A)				
ppm _{dry} at 7% O ₂	<0.365	<0.394	<0.406	<0.388
pounds-per-hour	<0.110	<0.109	<0.105	<0.107
pounds-per-ton of clinker	<0.0010	<0.0010	<0.0009	<0.0010
Diatomic Chlorine (Method 26A)				
ppm _{dry} at 7% O ₂	<0.096	0.129	0.135	<0.120
pounds-per-hour	<0.101	0.126	0.123	<0.117
pounds-per-ton of clinker	<0.0009	0.0011	0.0011	<0.0011

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 Holcim's Hagerstown, MD 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 Main Stack is a vertically oriented circular duct with a measured inside diameter of about 126 inches. Four equidistant sampling ports are located at about 184 feet (~17.5 diameters) above the duct breaching, and about 51 feet (~4.9 diameters) below the stack outlet.

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.

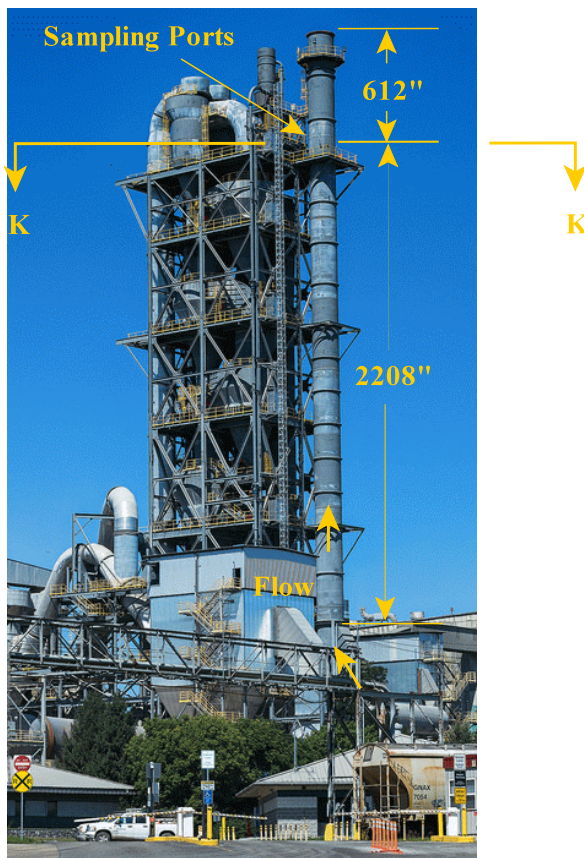
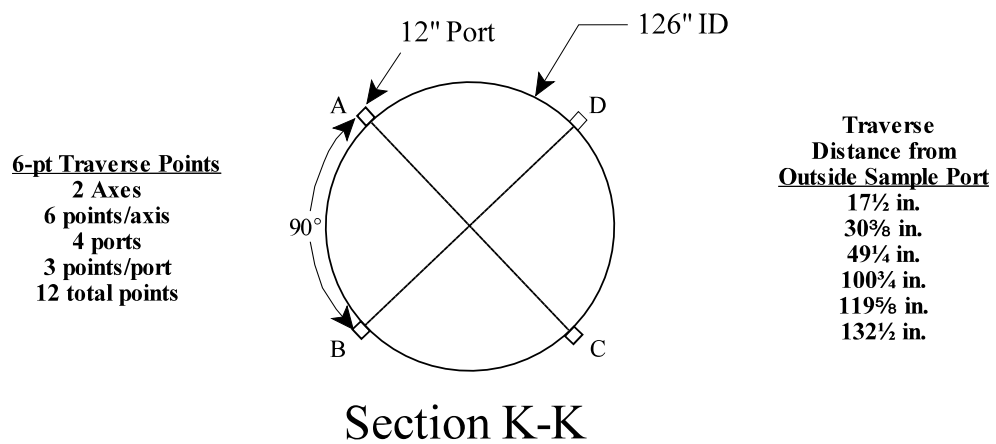


Figure 3.1 Schematic of the Main Stack Sampling Location

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 (O₂) and carbon dioxide (CO₂) 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 O₂ sampling, a three-point O₂ 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 O₂ 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 O₂/CO₂ 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 proceeding..

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 used EPA Protocol and/or $\pm 2\%$ 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 ($\pm 10\%$) 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-weighted, 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 (2nd knockout or third) impinger were quantitatively transferred to the tare-weighted, 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-weighted, 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 (i.e., the lowest number that could be detected), and compared to stack emissions.

Reagent blanks of 0.1 N H_2SO_4 , 0.1 N 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 were 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 were 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 MAIN STACK; MARCH 13 AND 15, 2024

Run	Time	Train A Diatomic Chlorine Concentration (ppm,dry)	Train B Diatomic Chlorine Concentration (ppm,dry)	Absolute Difference (ppm,dry)
March 13, 2024; Main Stack; Raw Mill On				
Run 1	10:00-11:06	<0.041	<0.041	0.000
Run 2	11:25-12:31	<0.043	0.060	0.017
March 13, 2024; Main Stack; Raw Mill Off				
Run 1	14:20-15:26	<0.038	0.056	0.018
Run 2	15:43-16:49	0.082	0.038	0.044
Run 3	17:20-18:26	0.057	0.059	0.002
March 15, 2024; Main Stack; Raw Mill On				
Run 4	12:20-13:26	<0.045	0.066	0.022

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 O₂/CO₂ 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 O₂/CO₂ 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 (H₂O) and carbon dioxide (CO₂) 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/QC Activities 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 375°F or 191°C (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 $\pm 20\%$ 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__157232.LAB	-0.070		0.012	3392.51	1.17
SPC__157233.LAB	0.026		0.004	3673.29	1.17
SPC__157234.LAB	-0.059		0.008	3315.68	1.17
SPC__157235.LAB	-0.015		0.011	3273.98	1.17
SPC__157236.LAB	-0.009		0.005	4401.05	1.17
SPC__157237.LAB	0.087		-0.004	3727.15	1.17
SPC__157238.LAB	-0.071		0.007	4182.04	1.17
Standard Deviation X 3	0.174		0.016		
Averages				3709.39	1.17
HCN Standard (CC768222; 49.9 ppm HCN/5.0 ppm SF6)					
SPC__001760.LAB	48.64	4.95			
SPC__001761.LAB	48.76	4.95			
SPC__001762.LAB	48.81	4.95			
SPC__001763.LAB	49.04	4.95			
Averages	48.81	4.95			
Residuals for Post HCN analyte spike native scans					
SPC_001828.LAB					
Concentration	0.72		0.10		
MDC3	0.18		0.30		
MDC3%	NA		NA		
SPC_001829LAB					
Concentration	0.71	0.14			
MDC3	0.20	0.29			
MDC3%	NA	NA			
Final SNR @ 2500 cm ⁻¹ and single beam intensity @ 2500 cm ⁻¹					
SPC__002628.LAB				3116.8	1.15

- 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; MARCH 13 AND 15, 2024

Run	Time	Average Native Hydrogen Cyanide Concentration (ppm,wet)	Spike plus Average Hydrogen Cyanide Native Concentration (ppm,wet)	Hydrogen Cyanide Spike Recovery	CTS Error
March 13, 2024; Main Stack Raw Mill On					
Pre Run 1	09:32-09:56	0.57	3.55	90.1%	-0.7%
Post Run 1	10:57-11:23	0.57	3.56	93.0%	
Post Run 2	12:26-12:51	0.53	3.54	92.1%	
March 13, 2024; Main Stack Raw Mill Off					
Pre Run 1	13:49-14:16	0.61	3.50	90.0%	
Post Run 1	15:20-15:41	0.80	3.72	95.2%	
Post Run 2	16:41-17:11	0.69	3.54	94.4%	
Post Run 3	18:18-18:44	0.78	3.62	90.8%	0.9%
March 15, 2024; Main Stack Raw Mill On					
Pre Run 4	10:29-10:59	0.43	3.42	84.2%	0.2%
Post Run 4	13:16-13:57	1.69	5.17	93.8%	-0.9%

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 Holcim. 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 ft³/rev capacity and ± 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 system's pump is operated for 5 minutes at an orifice manometer setting of 0.5 inches H₂O to heat up the pump and system to stabilize the meter inlet and outlet temperatures. Values for the orifice setting (ΔH), 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_{do}), and time are recorded for the initial calibration. Then the ratio of the wet test meter to the dry test meter (γ) 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: Holcim; Hagerstown MD
Source: Main Stack; Raw Mill On
Job ID: 24-3331
Train Type: EPA Method 26A

	1A	1B	2A	2B	7A	7B	
	03/13/24	03/13/24	03/13/24	03/13/24	03/15/24	03/15/24	
	1000-1106	1000-1106	1125-1231	1125-1231	1220-1326	1220-1326	Average
Initial Meter Volume, ft ³	265.907	6.672	316.912	55.106	573.823	315.805	
Final Meter Volume, ft ³	316.578	54.981	367.402	104.689	618.941	361.733	
Intra-Port Volume and/or Leak Check Correction, ft ³	0.000	0.000	0.000	0.000	0.000	0.000	
Total Sample Volume, cf	50.671	48.309	50.490	49.583	45.118	45.928	48.350
DGM Calibration Factor	0.967	0.987	0.967	0.987	0.967	0.987	0.977
Average DGM Temp, F	82.3	89.3	93.7	95.5	90.3	93.8	90.8
Average DGM delta H, "H ₂ O	2.21	1.83	2.15	1.83	1.84	1.56	1.90
Barometric Pressure, "Hg	29.29	29.29	29.29	29.29	29.29	29.29	29.29
Corrected Sample Vol, dscf	46.932	45.045	45.795	45.717	41.143	42.448	44.513
Corrected Sample Vol, dscm	1.329	1.276	1.297	1.295	1.165	1.202	1.261
Sample Volume (at Stack Conditions), acf	66.436	63.694	65.451	66.508	57.775	59.476	63.223
Sample Volume (at Stack Conditions), acm	1.881	1.804	1.853	1.883	1.636	1.684	1.790
Oxygen, %	14.0	14.0	13.2	13.2	13.2	13.2	13.5
Carbon Dioxide, %	12.6	12.6	14.1	14.1	14.1	14.1	13.6
Nitrogen, %	73.4	73.4	72.7	72.7	72.7	72.7	72.9
Stack Gas Excess Air, %	260.3	260.3	220.3	220.3	220.3	220.3	233.6
Total Moisture Catch Weight, grams	104.8	99.1	94.3	114.1	87.4	88.1	96.5
Stack Gas Moisture, %	9.5	9.4	8.9	10.5	9.1	8.9	9.4
Stack Gas Dry Molecular Weight, lb/lbmole	30.58	30.58	30.78	30.78	30.78	30.78	30.71
Stack Gas Wet Molecular Weight, lb/lbmole	29.38	29.39	29.65	29.44	29.62	29.65	29.52
Average Stack Temp, F	201.5	201.5	212.3	212.3	199.1	199.1	204.3
Stack Static (Gauge) Pressure, "H ₂ O	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39
Stack Gas Actual Pressure, "Hg	29.26	29.26	29.26	29.26	29.26	29.26	29.26
Average Sqrt delta P *	0.775	0.775	0.773	0.773	0.715	0.715	0.754
Pitot Tube Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Stack Gas Velocity, ft/second	49.40	49.39	49.45	49.62	45.31	45.29	48.08
Nozzle Inside Diameter, inches	0.261	0.261	0.261	0.261	0.261	0.261	
Total Sample Time, min	60	60	60	60	60	60	60
Isokinetic Rate, %	100.6	96.5	99.0	100.3	95.4	98.2	98.3
Stack Dimensions	126 in. ID	126 in. ID	126 in. ID	126 in. ID	126 in. ID	126 in. ID	
Stack Area, sq ft	86.59	86.59	86.59	86.59	86.59	86.59	86.59
Actual Stack Gas Flow Rate, acfm	256,700	256,600	256,900	257,800	235,400	235,300	249,800
Actual Stack Gas Flow Rate, acmm	7,269	7,266	7,275	7,300	6,666	6,663	7,073
Stack Gas Flow Rate, dscfm	181,300	181,500	179,800	177,200	167,600	167,900	175,900
Stack Gas Flow Rate, dscmm	5,134	5,140	5,091	5,018	4,746	4,754	4,981

Company: Holcim; Hagerstown MD
Source: Main Stack; Raw Mill On
Job ID: 24-3331
Train Type: EPA Method 26A

NOTE: Average INCLUDES Non-detect runs' results

"ND()" denotes values below detection limits

		1A		1B		2A		2B		7A		7B											
		03/13/24		03/13/24		03/13/24		03/13/24		15-Mar-24		15-Mar-24											
		1000-1106		1000-1106		1125-1231		1125-1231		1220-1326		1220-1326		Average									
Hydrogen Fluoride	Catch Wt, mg	ND(	0.203	)	ND(	0.197	)	ND(	0.184	)	ND(	0.203	)	ND(	0.195	)	ND(	0.195	)	ND(	0.196	)	
	Conc., mg/dscm	ND(	0.153	)	ND(	0.154	)	ND(	0.142	)	ND(	0.157	)	ND(	0.167	)	ND(	0.162	)	ND(	0.156	)	
	Conc., mg/dscm @ 7% O2	ND(	0.308	)	ND(	0.311	)	ND(	0.256	)	ND(	0.283	)	ND(	0.302	)	ND(	0.293	)	ND(	0.292	)	
	Conc., mg/dscm @ 12% CO2	ND(	0.145	)	ND(	0.147	)	ND(	0.121	)	ND(	0.133	)	ND(	0.142	)	ND(	0.138	)	ND(	0.138	)	
	Conc., ppmvd	ND(	0.184	)	ND(	0.186	)	ND(	0.171	)	ND(	0.188	)	ND(	0.201	)	ND(	0.195	)	ND(	0.187	)	
	Conc., ppmvd @ 7% O2	ND(	0.370	)	ND(	0.374	)	ND(	0.308	)	ND(	0.340	)	ND(	0.363	)	ND(	0.352	)	ND(	0.351	)	
	Conc., ppmvd @ 12% CO2	ND(	0.175	)	ND(	0.177	)	ND(	0.145	)	ND(	0.160	)	ND(	0.171	)	ND(	0.166	)	ND(	0.166	)	
	Emission Rate, lb/hr	ND(	0.104	)	ND(	0.105	)	ND(	0.096	)	ND(	0.104	)	ND(	0.105	)	ND(	0.102	)	ND(	0.103	)	
Clinker Rates (mtph and lbs/ton)		100.60		ND(		0.0009	)	100.60		ND(		0.0009	)	100.00		ND(		0.0009	)	ND(		0.0009	)
Chlorine	Catch Wt, mg	ND(	0.163	)	ND(	0.153	)	ND(	0.165	)		0.229	ND(	0.153	)		0.235		<	0.183			
	Conc., mg/dscm	ND(	0.123	)	ND(	0.120	)	ND(	0.127	)		0.177	ND(	0.131	)		0.196		<	0.146			
	Conc., mg/dscm @ 7% O2	ND(	0.247	)	ND(	0.242	)	ND(	0.230	)		0.319	ND(	0.237	)		0.353		<	0.271			
	Conc., mg/dscm @ 12% CO2	ND(	0.117	)	ND(	0.114	)	ND(	0.108	)		0.150	ND(	0.112	)		0.166		<	0.128			
	Conc., ppmvd	ND(	0.042	)	ND(	0.041	)	ND(	0.043	)		0.060	ND(	0.045	)		0.066		<	0.049			
	Absolute Difference, ppmvd (<0.2 required)				0.00						0.02				0.02								
	Conc., ppmvd @ 7% O2	ND(	0.084	)	ND(	0.082	)	ND(	0.078	)		0.108	ND(	0.080	)		0.120		<	0.092			
	Conc., ppmvd @ 12% CO2	ND(	0.040	)	ND(	0.039	)	ND(	0.037	)		0.051	ND(	0.038	)		0.056		<	0.043			
	Emission Rate, lb/hr	ND(	0.083	)	ND(	0.082	)	ND(	0.086	)		0.117	ND(	0.082	)		0.123		<	0.096			
	Clinker Rates (mtph and lbs/ton)		100.60		ND(		0.0007	)	100.60		ND(		0.0009	)	100.00		ND(		0.0009	)	<		0.0009

Spectrum	Date	Time	PCA 191C	R1 191c	HF ppm (10)	191C	SF6 (10)	191C	Ethylene (100,3000)	191C	H2O% (40)	191C	CO2% (40)	191C	11.073
SPC_1840.LAB	03/13/24	10:01:12.449	0.497		0.103		-0.001		1.013		9.149		11.219		11.073
SPC_1841.LAB	03/13/24	10:02:15.021	0.527		0.147		-0.008		0.878		9.202		11.219		11.219
SPC_1842.LAB	03/13/24	10:03:17.515	0.548		0.108		-0.005		0.902		9.347		11.112		11.112
SPC_1843.LAB	03/13/24	10:04:20.420	0.284		0.110		-0.003		0.867		9.314		10.976		10.976
SPC_1844.LAB	03/13/24	10:05:22.636	0.587		0.101		-0.002		0.844		9.309		11.113		11.113
SPC_1845.LAB	03/13/24	10:06:25.204	0.448		0.091		-0.005		0.828		9.254		11.173		11.173
SPC_1846.LAB	03/13/24	10:07:27.713	0.434		0.087		-0.002		0.873		9.302		11.247		11.247
SPC_1847.LAB	03/13/24	10:08:30.250	0.462		0.093		-0.004		0.819		9.318		11.235		11.235
SPC_1848.LAB	03/13/24	10:09:32.785	0.455		0.106		-0.003		0.805		9.379		11.211		11.211
SPC_1849.LAB	03/13/24	10:10:35.273	0.260		0.088		-0.004		0.898		9.397		11.335		11.335
SPC_1850.LAB	03/13/24	10:11:37.845	0.301		0.045		-0.003		0.892		9.404		11.240		11.240
SPC_1851.LAB	03/13/24	10:12:40.381	0.632		0.078		-0.002		0.808		9.475		11.231		11.231
SPC_1852.LAB	03/13/24	10:13:42.973	0.522		0.065		-0.004		0.900		9.409		11.271		11.271
SPC_1853.LAB	03/13/24	10:14:45.457	0.834		0.109		-0.002		0.912		9.390		11.184		11.184
SPC_1854.LAB	03/13/24	10:15:47.952	0.646		0.087		-0.003		0.821		9.432		11.189		11.189
SPC_1855.LAB	03/13/24	10:16:50.551	0.607		0.088		-0.002		0.915		9.455		11.141		11.141
SPC_1856.LAB	03/13/24	10:17:53.363	0.585		0.122		-0.002		0.870		9.422		11.227		11.227
SPC_1857.LAB	03/13/24	10:18:55.876	0.479		0.079		-0.003		0.904		9.504		11.162		11.162
SPC_1858.LAB	03/13/24	10:19:58.185	0.539		0.072		-0.003		0.818		9.485		11.020		11.020
SPC_1859.LAB	03/13/24	10:21:00.628	0.620		0.114		-0.002		0.973		9.458		11.218		11.218
SPC_1860.LAB	03/13/24	10:22:03.313	0.429		0.123		-0.004		0.977		9.445		11.133		11.133
SPC_1861.LAB	03/13/24	10:23:06.021	0.277		0.105		-0.005		0.904		9.471		11.090		11.090
SPC_1862.LAB	03/13/24	10:24:08.392	0.267		0.032		-0.003		0.921		9.530		11.008		11.008
SPC_1863.LAB	03/13/24	10:25:10.783	0.618		0.105		-0.004		0.978		9.510		11.180		11.180
SPC_1864.LAB	03/13/24	10:26:13.324	0.727		0.093		-0.001		0.965		9.480		11.077		11.077
SPC_1865.LAB	03/13/24	10:27:16.193	0.656		0.054		-0.005		0.934		9.492		11.076		11.076
SPC_1866.LAB	03/13/24	10:28:18.401	0.777		0.073		0.002		1.004		9.482		11.017		11.0

Holcim, Hagerstown MD
Kiln Main Stack, Raw Mill On

Run 2		Date	Time	HCN 9 (200)	PCA 191C R1	191c HF	ppm (10)	191C SF6 (10)	191C Ethylene (100,3000)	191C H2O% (40)	191C CO2% (40)	191C
Spectrum		03/13/24	11:28:54.089	0.743			0.044	-0.001	1.144	10.099	12.038	
SPC_1923.LAB		03/13/24	11:29:56.411	0.680			0.041	0.001	1.049	10.039	12.191	
SPC_1924.LAB		03/13/24	11:30:58.854	0.710			0.083	-0.002	1.047	10.029	12.030	
SPC_1925.LAB		03/13/24	11:32:01.385	0.602			0.085	0.002	1.102	10.022	11.881	
SPC_1927.LAB		03/13/24	11:33:04.224	0.531			0.073	-0.002	1.045	9.972	11.952	
SPC_1928.LAB		03/13/24	11:34:06.516	0.526			0.009	-0.004	1.070	10.033	12.113	
SPC_1929.LAB		03/13/24	11:35:09.049	0.717			0.034	-0.002	1.150	10.056	12.121	
SPC_1930.LAB		03/13/24	11:36:11.568	0.408			0.069	-0.001	1.146	10.146	11.971	
SPC_1931.LAB		03/13/24	11:37:14.181	0.440			0.057	-0.002	1.058	10.166	12.241	
SPC_1932.LAB		03/13/24	11:38:16.639	0.658			0.043	0.001	1.149	10.267	12.151	
SPC_1933.LAB		03/13/24	11:39:19.146	0.851			0.047	-0.003	1.164	10.307	12.169	
SPC_1934.LAB		03/13/24	11:40:21.675	0.635			0.056	-0.001	1.114	10.191	12.161	
SPC_1935.LAB		03/13/24	11:41:24.243	0.717			0.081	-0.004	1.124	10.220	12.351	
SPC_1936.LAB		03/13/24	11:42:26.743	0.406			0.089	-0.003	1.169	10.319	12.184	
SPC_1937.LAB		03/13/24	11:43:29.313	0.583			0.062	-0.002	1.130	10.410	12.123	
SPC_1938.LAB		03/13/24	11:44:31.807	0.422			0.054	-0.003	1.105	10.375	12.179	
SPC_1939.LAB		03/13/24	11:45:34.379	0.436			0.058	-0.003	1.200	10.326	12.010	
SPC_1940.LAB		03/13/24	11:46:36.877	0.938			-0.004	-0.001	1.149	10.185	11.939	
SPC_1941.LAB		03/13/24	11:47:39.452	0.762			0.006	-0.004	1.168	10.223	12.055	
SPC_1942.LAB		03/13/24	11:48:42.037	0.606			0.053	-0.002	1.097	10.215	12.303	
SPC_1943.LAB		03/13/24	11:49:44.522	0.852			0.062	-0.004	1.106	10.248	12.080	
SPC_1944.LAB		03/13/24	11:50:47.016	0.833			0.075	-0.006	1.095	10.274	11.997	
SPC_1945.LAB		03/13/24	11:51:49.556	0.637			0.029	-0.003	1.127	10.214	11.981	
SPC_1946.LAB		03/13/24	11:52:52.086	0.729			0.031	-0.008	1.124	10.241	12.088	
SPC_1947.LAB		03/13/24	11:53:54.683	0.845			0.055	-0.003	1.126	10.267	11.959	
SPC_1948.LAB		03/13/24	11:54:57.161	0.877			0.061	-0.004	1.138	10.103	12.331	
SPC_1949.LAB		03/13/24	11:55:59.805	0.551			0.044	-0.005	1.108	10.971	11.895	
SPC_1950.LAB		03/13/24	11:57:02.269	0.967			0.043	-0.005	1.147	10.357	11.748	
SPC_1951.LAB		03/13/24	11:58:04.769	0.777			0.087	0.000	1.122	10.206	12.158	
SPC_1952.LAB		03/13/24	11:59:07.338	0.556			-0.001	-0.005	1.188	10.118	11.918	
SPC_1953.LAB		03/13/24	12:00:09.913	0.480			0.033	-0.004	1.221	10.291	11.806	
SPC_1954.LAB		03/13/24	12:01:12.375	0.577			0.073	-0.005	1.150	10.722	11.901	
SPC_1955.LAB		03/13/24	12:02:14.946	0.610			0.009	-0.006	1.122	10.594	11.890	
SPC_1956.LAB		03/13/24	12:03:17.542	0.544			0.034	-0.008	1.085	10.725	12.042	
SPC_1958.LAB		03/13/24	12:05:22.549	0.421			0.138	-0.006	1.237	10.790	11.932	
SPC_1959.LAB		03/13/24	12:06:25.043	0.457			0.142	-0.003	1.123	10.780	12.122	
SPC_1960.LAB		03/13/24	12:07:27.613	0.654			0.119	-0.009	1.251	10.844	11.961	
SPC_1961.LAB		03/13/24	12:08:30.112	0.442			0.112	-0.005	1.056	10.726	11.951	
SPC_1962.LAB		03/13/24	12:09:32.708	0.427			0.142	-0.010	1.067	10.758	12.015	
SPC_1963.LAB		03/13/24	12:10:35.187	0.493			0.133	-0.007	1.103	10.762	11.950	
SPC_1964.LAB		03/13/24	12:11:37.758	0.184			0.142	-0.003	1.132	10.759	11.847	
SPC_1965.LAB		03/13/24	12:12:40.251	0.432			0.133	-0.006	1.148	10.873	11.884	
SPC_1966.LAB		03/13/24	12:13:42.823	0.459			0.080	-0.005	1.062	10.795	11.967	
SPC_1967.LAB		03/13/24	12:14:45.322	0.654			0.036	-0.003	1.063	10.702	11.692	
SPC_1968.LAB		03/13/24	12:15:47.897	0.668			0.059	-0.006	1.125	10.797	11.911	
SPC_1969.LAB		03/13/24	12:16:50.476	0.610			0.139	-0.004	1.151	10.773	11.980	
SPC_1970.LAB		03/13/24	12:17:52.926	0.393			0.150	-0.010	1.177	10.812	12.050	
SPC_1971.LAB		03/13/24	12:18:55.461	0.569			0.101	-0.010	1.257	10.771	11.728	
SPC_1972.LAB		03/13/24	12:19:58.033	0.502			0.007	-0.006	1.185	10.748	11.965	
SPC_1973.LAB		03/13/24	12:21:00.532	0.696			0.045	-0.006	1.061	10.781	12.061	
SPC_1974.LAB		03/13/24	12:22:03.107	0.468			0.149	-0.008	1.093	10.777	12.209	
SPC_1975.LAB		03/13/24	12:23:05.685	0.360			0.127	-0.003	1.092	10.828	12.223	
SPC_1976.LAB		03/13/24	12:24:08.176	0.889			0.128	-0.006	1.197	10.784	12.002	
SPC_1977.LAB		03/13/24	12:25:10.669	0.632			0.038	-0.002	1.142	10.665	12.172	
SPC_1978.LAB		03/13/24	12:26:13.245	0.447			-0.002	-0.003	1.076	10.684	12.120	
SPC_1979.LAB		03/13/24	12:27:15.736	0.501			0.106	-0.009	1.133	10.801	11.905	
SPC_1980.LAB		03/13/24	12:28:18.309	0.599			0.069	-0.004	1.130	10.438	12.034	
Mill On Run 2			(actual)									
Oxygen		13.2%	(ppm,dry @7% O2)	1.198			0.139					
DSCFM		178.500	(lbs/hr)	0.499			0.043					
Clinker (tons/hr)		100.6	(lbs/ton clinker)	0.005			0.0004					
				9.7		M26A Moisture						

Holcim, Hagerstown MD
Kiln Main Stack; Raw Mill On
Run 4

Spectrum	Date	Time	HCN 9 (200)	PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C	H2O% (40) 191C	CO2% (40) 191C
SPC_2536.LAB	03/15/24	12:20:33.599	1.446		-0.025	-0.003	2.488	9.289	11.960
SPC_2537.LAB	03/15/24	12:21:36.202	1.791		-0.036	0.006	2.612	9.207	12.024
SPC_2538.LAB	03/15/24	12:22:38.769	1.266		-0.029	0.001	2.598	9.166	12.257
SPC_2539.LAB	03/15/24	12:23:41.310	1.541		-0.034	-0.001	2.650	9.198	12.226
SPC_2540.LAB	03/15/24	12:24:43.918	1.457		-0.003	-0.002	2.582	9.177	12.185
SPC_2541.LAB	03/15/24	12:25:46.345	1.316		0.003	0.000	2.591	9.149	12.202
SPC_2542.LAB	03/15/24	12:26:48.833	1.272		-0.023	-0.000	2.614	9.236	12.399
SPC_2543.LAB	03/15/24	12:27:51.382	1.321		-0.025	-0.002	2.613	9.399	12.308
SPC_2544.LAB	03/15/24	12:28:53.968	1.487		-0.017	0.000	2.557	9.107	12.339
SPC_2545.LAB	03/15/24	12:29:56.447	1.441		-0.042	-0.001	2.731	9.027	12.326
SPC_2546.LAB	03/15/24	12:30:58.986	1.713		-0.009	-0.000	2.798	9.048	12.308
SPC_2547.LAB	03/15/24	12:32:01.533	1.771		-0.008	0.002	2.920	9.047	12.178
SPC_2548.LAB	03/15/24	12:33:04.375	1.670		-0.008	0.000	3.083	9.021	12.302
SPC_2549.LAB	03/15/24	12:34:06.656	1.539		-0.041	-0.002	3.106	9.048	12.510
SPC_2550.LAB	03/15/24	12:35:09.202	1.638		-0.030	-0.000	2.986	9.059	12.234
SPC_2551.LAB	03/15/24	12:36:11.788	1.578		-0.026	-0.002	2.981	9.059	12.115
SPC_2552.LAB	03/15/24	12:37:14.252	1.689		-0.040	-0.003	2.866	9.046	12.195
SPC_2553.LAB	03/15/24	12:38:16.789	1.449		-0.029	-0.005	2.910	9.082	12.299
SPC_2554.LAB	03/15/24	12:39:19.353	1.435		-0.004	-0.001	2.981	9.060	12.265
SPC_2555.LAB	03/15/24	12:40:21.843	1.379		-0.031	-0.000	2.977	9.042	12.140
SPC_2556.LAB	03/15/24	12:41:24.387	1.259		-0.047	0.000	2.957	9.041	12.430
SPC_2557.LAB	03/15/24	12:42:26.964	1.720		-0.041	-0.000	2.988	9.093	12.324
SPC_2558.LAB	03/15/24	12:43:29.519	1.309		-0.011	0.002	2.848	9.169	12.206
SPC_2559.LAB	03/15/24	12:44:32.072	1.358		-0.061	0.002	2.842	9.383	12.094
SPC_2560.LAB	03/15/24	12:45:34.568	1.263		-0.023	0.001	2.925	9.258	12.486
SPC_2561.LAB	03/15/24	12:46:37.108	1.625		-0.010	-0.001	2.742	9.237	12.397
SPC_2562.LAB	03/15/24	12:47:39.620	1.462		-0.002	0.001	2.743	9.271	12.255
SPC_2563.LAB	03/15/24	12:48:42.511	1.384		-0.023	-0.003	2.881	9.177	12.336
SPC_2564.LAB	03/15/24	12:49:44.707	1.483		-0.054	-0.003	2.806	9.174	12.533
SPC_2565.LAB	03/15/24	12:50:47.294	1.533		-0.010	0.000	2.855	9.116	12.115
SPC_2566.LAB	03/15/24	12:51:49.795	1.595		-0.037	-0.000	3.026	9.126	12.202
SPC_2567.LAB	03/15/24	12:52:52.393	1.045		-0.048	0.001	3.004	9.203	12.390
SPC_2568.LAB	03/15/24	12:53:54.863	1.741		-0.036	-0.004	3.064	9.285	12.235
SPC_2569.LAB	03/15/24	12:54:57.417	1.544		-0.003	-0.001	3.232	9.219	12.342
SPC_2570.LAB	03/15/24	12:55:59.993	1.508		-0.019	0.000	3.064	9.091	12.316
SPC_2571.LAB	03/15/24	12:57:02.493	1.574		-0.054	-0.002	3.284	9.149	12.451
SPC_2572.LAB	03/15/24	12:58:05.075	1.538		-0.021	0.003	3.199	9.195	12.322
SPC_2573.LAB	03/15/24	12:59:07.571	1.537		-0.023	0.002	3.125	9.094	12.204
SPC_2574.LAB	03/15/24	13:00:10.153	1.361		-0.047	-0.002	3.059	9.100	12.255
SPC_2575.LAB	03/15/24	13:01:12.656	1.275		-0.050	0.001	3.122	9.182	12.466
SPC_2576.LAB	03/15/24	13:02:15.233	1.478		-0.025	0.001	3.060	9.166	12.361
SPC_2577.LAB	03/15/24	13:03:17.866	1.624		-0.030	-0.002	2.987	9.102	12.219
SPC_2578.LAB	03/15/24	13:04:20.611	1.377		-0.032	-0.004	3.059	9.118	12.431
SPC_2579.LAB	03/15/24	13:05:22.848	1.529		-0.048	-0.006	3.127	9.130	12.338
SPC_2580.LAB	03/15/24	13:06:25.442	1.476		-0.007	-0.001	3.054	9.228	12.320
SPC_2581.LAB	03/15/24	13:07:27.891	1.630		-0.030	0.000	3.122	9.172	12.278
SPC_2582.LAB	03/15/24	13:08:30.759	1.466		-0.043	0.001	3.272	9.227	12.511
SPC_2583.LAB	03/15/24	13:09:32.966	1.792		-0.052	0.001	3.165	9.273	12.255
SPC_2584.LAB	03/15/24	13:10:35.512	1.593		-0.034	0.001	3.321	9.268	12.176
SPC_2585.LAB	03/15/24	13:11:38.047	1.675		-0.069	-0.001	3.295	9.129	12.415
SPC_2586.LAB	03/15/24	13:12:40.697	1.752		-0.022	-0.002	3.245	9.259	12.181
SPC_2587.LAB	03/15/24	13:13:43.132	1.825		-0.043	-0.001	3.360	9.353	12.139
SPC_2588.LAB	03/15/24	13:14:45.747	1.635		-0.014	-0.000	3.233	9.393	12.119
SPC_2589.LAB	03/15/24	13:15:48.205	1.739		-0.027	-0.000	3.409	9.387	12.265
SPC_2590.LAB	03/15/24	13:16:50.771	1.843		-0.026	0.002	3.242	9.365	12.066
SPC_2591.LAB	03/15/24	13:17:53.404	1.754		-0.036	-0.003	3.264	9.288	12.041
SPC_2592.LAB	03/15/24	13:18:55.976	1.590		-0.046	-0.002	3.271	9.339	12.123
SPC_2593.LAB	03/15/24	13:19:58.400	2.182		-0.062	-0.002	3.401	9.393	12.246
Mill On Run 4		(actual)	1.539		0.016	-0.001	2.990	9.183	12.269
Oxygen	13.2%	(ppm,dry @7% O2)	3.053		0.032			9.0	M26A Moisture
DSCFM	167.750	(lbs/hr)	1.194		0.009				
Clinker (tons/hr)	100.0	(lbs/ton clinker)	0.012		0.0001				

Company: Holcim; Hagerstown MD
Source: Main Stack; Raw Mill Off
Job ID: 24-3331
Train Type: EPA Method 26A

	4A	4B	5A	5B	6A	6B	
	03/13/24	03/13/24	03/13/24	03/13/24	03/13/24	03/13/24	
	1420-1526	1420-1526	1543-1649	1543-1649	1720-1826	1720-1826	Average
Initial Meter Volume, ft ³	417.899	153.906	473.092	209.629	523.527	264.061	
Final Meter Volume, ft ³	471.758	209.492	523.364	263.935	573.044	315.264	
Intra-Port Volume and/or Leak Check Correction, ft ³	0.000	0.000	0.000	0.000	0.000	0.000	
Total Sample Volume, cf	53.859	55.586	50.272	54.306	49.517	51.203	52.457
DGM Calibration Factor	0.967	0.987	0.967	0.987	0.967	0.987	0.977
Average DGM Temp, F	102.3	98.8	105.4	100.5	62.0	101.3	95.1
Average DGM delta H, "H ₂ O	2.53	2.16	2.40	2.04	2.35	2.00	2.25
Barometric Pressure, "Hg	29.29	29.29	29.29	29.29	29.29	29.29	29.29
Corrected Sample Vol, dscf	48.149	50.991	44.681	49.651	47.663	46.743	47.980
Corrected Sample Vol, dscm	1.363	1.444	1.265	1.406	1.350	1.324	1.359
Sample Volume (at Stack Conditions), acf	68.518	72.880	64.595	71.623	66.918	65.982	68.419
Sample Volume (at Stack Conditions), acm	1.940	2.064	1.829	2.028	1.895	1.868	1.937
Oxygen, %	14.1	14.1	14.4	14.4	14.9	14.9	14.5
Carbon Dioxide, %	12.4	12.4	11.9	11.9	11.0	11.0	11.8
Nitrogen, %	73.5	73.5	73.7	73.7	74.1	74.1	73.8
Stack Gas Excess Air, %	265.8	265.8	284.8	284.8	319.6	319.6	290.1
Total Moisture Catch Weight, grams	92.7	102.7	91.5	99.2	80.2	85.1	88.2
Stack Gas Moisture, %	8.3	8.7	8.8	8.6	7.4	7.9	8.3
Stack Gas Dry Molecular Weight, lb/lbmole	30.55	30.55	30.48	30.48	30.36	30.36	30.46
Stack Gas Wet Molecular Weight, lb/lbmole	29.51	29.46	29.38	29.41	29.44	29.38	29.43
Average Stack Temp, F	213.8	213.8	220.8	220.8	211.3	211.3	215.3
Stack Static (Gauge) Pressure, "H ₂ O	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35
Stack Gas Actual Pressure, "Hg	29.26	29.26	29.26	29.26	29.26	29.26	29.26
Average Sqrt delta P *	0.836	0.836	0.814	0.814	0.808	0.808	0.819
Pitot Tube Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Stack Gas Velocity, ft/second	53.66	53.71	52.64	52.61	51.83	51.88	52.72
Nozzle Inside Diameter, inches	0.261	0.261	0.261	0.261	0.261	0.261	
Total Sample Time, min	60	60	60	60	60	60	60
Isokinetic Rate, %	95.5	101.5	91.8	101.8	96.6	95.1	97.1
Stack Dimensions	126 in. ID	126 in. ID	126 in. ID	126 in. ID	126 in. ID	126 in. ID	
Stack Area, sq ft	86.59	86.59	86.59	86.59	86.59	86.59	86.59
Actual Stack Gas Flow Rate, acfm	278,800	279,000	273,500	273,300	269,300	269,500	273,900
Actual Stack Gas Flow Rate, acmm	7,895	7,900	7,745	7,739	7,626	7,631	7,756
Stack Gas Flow Rate, dscfm	195,900	195,200	189,200	189,500	191,800	190,900	192,100
Stack Gas Flow Rate, dscmm	5,547	5,527	5,358	5,366	5,431	5,406	5,439

Company: Holcim; Hagerstown MD
Source: Main Stack; Raw Mill Off
Job ID: 24-3331
Train Type: EPA Method 26A

NOTE: Average INCLUDES Non-detect runs' results

"ND()" denotes values below detection limits

	4A		4B		5A		5B		6A		6B		Average
	03/13/24 1420-1526		03/13/24 1420-1526		03/13/24 1543-1649		03/13/24 1543-1649		03/13/24 1720-1826		03/13/24 1720-1826		
Hydrogen Fluoride	Catch Wt, mg	ND(0.208)	ND(0.211)	ND(0.203)	ND(0.205)	ND(0.195)	ND(0.195)	ND(0.195)	ND(0.195)	ND(0.195)	ND(0.195)	ND(0.203)	
	Conc., mg/dscm	ND(0.153)	ND(0.146)	ND(0.160)	ND(0.146)	ND(0.144)	ND(0.146)	ND(0.144)	ND(0.147)	ND(0.147)	ND(0.147)	ND(0.149)	
	Conc., mg/dscm @ 7% O2	ND(0.312)	ND(0.299)	ND(0.343)	ND(0.312)	ND(0.335)	ND(0.312)	ND(0.335)	ND(0.341)	ND(0.341)	ND(0.341)	ND(0.324)	
	Conc., mg/dscm @ 12% CO2	ND(0.148)	ND(0.141)	ND(0.162)	ND(0.147)	ND(0.158)	ND(0.147)	ND(0.158)	ND(0.161)	ND(0.161)	ND(0.161)	ND(0.153)	
	Conc., ppmvd	ND(0.183)	ND(0.176)	ND(0.193)	ND(0.175)	ND(0.174)	ND(0.175)	ND(0.174)	ND(0.177)	ND(0.177)	ND(0.177)	ND(0.180)	
	Conc., ppmvd @ 7% O2	ND(0.375)	ND(0.359)	ND(0.413)	ND(0.375)	ND(0.402)	ND(0.375)	ND(0.402)	ND(0.410)	ND(0.410)	ND(0.410)	ND(0.389)	
	Conc., ppmvd @ 12% CO2	ND(0.178)	ND(0.170)	ND(0.195)	ND(0.177)	ND(0.189)	ND(0.177)	ND(0.189)	ND(0.193)	ND(0.193)	ND(0.193)	ND(0.184)	
	Emission Rate, lb/hr	ND(0.112)	ND(0.107)	ND(0.114)	ND(0.103)	ND(0.104)	ND(0.103)	ND(0.104)	ND(0.105)	ND(0.105)	ND(0.105)	ND(0.108)	
	Clinker Rates (mtph and lbs/ton)	100.60	ND(0.0010)	100.60	ND(0.0010)	100.60	ND(0.0010)	100.60	100.60	100.60	0.0009	ND(0.0010)	
Chlorine	Catch Wt, mg	ND(0.153)	ND(0.238)	ND(0.306)	ND(0.159)	ND(0.228)	ND(0.159)	ND(0.228)	ND(0.230)	ND(0.230)	ND(0.230)	< 0.219	
	Conc., mg/dscm	ND(0.112)	ND(0.165)	ND(0.242)	ND(0.113)	ND(0.169)	ND(0.113)	ND(0.169)	ND(0.174)	ND(0.174)	ND(0.174)	< 0.162	
	Conc., mg/dscm @ 7% O2	ND(0.229)	ND(0.337)	ND(0.517)	ND(0.242)	ND(0.391)	ND(0.242)	ND(0.391)	ND(0.402)	ND(0.402)	ND(0.402)	< 0.353	
	Conc., mg/dscm @ 12% CO2	ND(0.109)	ND(0.160)	ND(0.244)	ND(0.114)	ND(0.184)	ND(0.114)	ND(0.184)	ND(0.190)	ND(0.190)	ND(0.190)	< 0.167	
	Conc., ppmvd	ND(0.038)	ND(0.056)	ND(0.082)	ND(0.038)	ND(0.057)	ND(0.038)	ND(0.057)	ND(0.059)	ND(0.059)	ND(0.059)	< 0.055	
	Absolute Difference, ppmvd (<0.2 required)	ND(0.078)	ND(0.114)	ND(0.175)	ND(0.082)	ND(0.133)	ND(0.082)	ND(0.133)	ND(0.137)	ND(0.137)	ND(0.137)	< 0.120	
	Conc., ppmvd @ 7% O2	ND(0.037)	ND(0.054)	ND(0.083)	ND(0.039)	ND(0.063)	ND(0.039)	ND(0.063)	ND(0.064)	ND(0.064)	ND(0.064)	< 0.057	
	Conc., ppmvd @ 12% CO2	ND(0.082)	ND(0.121)	ND(0.171)	ND(0.080)	ND(0.121)	ND(0.080)	ND(0.121)	ND(0.124)	ND(0.124)	ND(0.124)	< 0.117	
	Clinker Rates (mtph and lbs/ton)	100.60	ND(0.0009)	100.60	ND(0.0011)	100.60	ND(0.0011)	100.60	ND(0.0011)	ND(0.0011)	< 0.0011	< 0.0011	

Holcim, Hagerstown MD
Kiln Main Stack; Raw Mill Off
Run 1

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 19° HF	ppm (10) 191SF6 (10) 191C	Ethylene (100,3000) 191C	H2O% (40) 191C	CO2% (40) 191C
SPC_2084.LAB	03/13/24	14:20:34.829	0.562	-0.013	0.892	8.680	9.869
SPC_2085.LAB	03/13/24	14:21:37.327	0.657	0.012	0.983	8.797	9.812
SPC_2086.LAB	03/13/24	14:22:39.935	0.712	0.018	0.898	8.882	9.894
SPC_2087.LAB	03/13/24	14:23:42.387	0.651	-0.023	0.984	9.099	9.856
SPC_2088.LAB	03/13/24	14:24:44.956	0.504	0.026	1.025	8.757	9.885
SPC_2089.LAB	03/13/24	14:25:47.454	0.766	-0.011	1.005	9.245	10.477
SPC_2090.LAB	03/13/24	14:26:49.993	0.468	-0.001	0.990	9.545	11.004
SPC_2091.LAB	03/13/24	14:27:52.591	0.626	-0.000	1.003	9.475	11.148
SPC_2092.LAB	03/13/24	14:28:55.094	0.629	-0.010	0.969	9.564	11.090
SPC_2093.LAB	03/13/24	14:29:57.589	0.786	-0.017	1.001	9.287	11.013
SPC_2094.LAB	03/13/24	14:31:00.160	0.713	-0.025	1.047	9.309	11.065
SPC_2095.LAB	03/13/24	14:32:02.656	0.542	-0.012	0.969	9.282	10.984
SPC_2096.LAB	03/13/24	14:33:05.284	0.826	-0.031	0.997	9.235	10.942
SPC_2097.LAB	03/13/24	14:34:07.728	0.854	-0.011	1.045	9.309	11.049
SPC_2098.LAB	03/13/24	14:35:10.297	0.716	0.019	1.119	9.333	11.043
SPC_2099.LAB	03/13/24	14:36:12.869	0.880	-0.020	1.021	9.401	10.952
SPC_2100.LAB	03/13/24	14:37:15.330	1.081	0.008	1.038	9.369	10.920
SPC_2101.LAB	03/13/24	14:38:17.902	0.979	-0.015	1.097	9.453	11.099
SPC_2102.LAB	03/13/24	14:39:20.443	0.650	0.018	1.000	9.418	11.002
SPC_2103.LAB	03/13/24	14:40:22.988	0.902	-0.003	1.025	9.439	10.934
SPC_2104.LAB	03/13/24	14:41:25.461	0.836	-0.009	1.043	9.555	11.088
SPC_2105.LAB	03/13/24	14:42:27.995	0.638	-0.048	1.016	9.485	11.023
SPC_2106.LAB	03/13/24	14:43:30.535	0.925	-0.003	1.016	9.562	11.078
SPC_2107.LAB	03/13/24	14:44:33.064	0.596	-0.049	1.016	9.617	11.020
SPC_2108.LAB	03/13/24	14:45:35.638	0.909	0.050	1.025	9.553	11.147
SPC_2109.LAB	03/13/24	14:46:38.138	0.665	0.002	1.115	9.559	10.934
SPC_2110.LAB	03/13/24	14:47:40.667	1.040	0.026	1.138	9.584	11.005
SPC_2111.LAB	03/13/24	14:48:43.202	1.003	-0.030	1.010	9.664	11.206
SPC_2112.LAB	03/13/24	14:49:45.741	1.006	0.013	1.000	9.541	11.256
SPC_2113.LAB	03/13/24	14:50:48.348	0.576	0.039	0.959	9.614	11.289
SPC_2114.LAB	03/13/24	14:51:50.898	0.821	0.026	0.994	9.629	11.129
SPC_2115.LAB	03/13/24	14:52:53.345	0.948	-0.005	1.165	9.647	11.163
SPC_2116.LAB	03/13/24	14:53:55.979	1.067	0.011	1.063	9.583	11.185
SPC_2117.LAB	03/13/24	14:54:58.410	0.603	0.044	1.020	9.557	10.950
SPC_2118.LAB	03/13/24	14:56:00.948	0.752	0.036	1.047	9.527	10.970
SPC_2119.LAB	03/13/24	14:57:03.478	0.959	0.027	1.003	9.499	11.066
SPC_2120.LAB	03/13/24	14:58:06.012	0.721	0.005	1.053	9.422	11.103
SPC_2121.LAB	03/13/24	14:59:08.550	0.686	-0.007	0.956	9.397	11.221
SPC_2122.LAB	03/13/24	15:00:11.225	0.936	0.018	1.141	9.272	11.026
SPC_2123.LAB	03/13/24	15:01:13.724	1.037	0.042	1.024	9.297	11.220
SPC_2124.LAB	03/13/24	15:02:16.230	0.596	0.008	1.034	9.317	11.028
SPC_2125.LAB	03/13/24	15:03:19.015	0.821	0.022	0.999	9.386	11.161
SPC_2126.LAB	03/13/24	15:04:21.213	0.779	0.052	1.009	9.319	11.001
SPC_2127.LAB	03/13/24	15:05:23.751	0.763	-0.006	1.063	9.429	11.019
SPC_2128.LAB	03/13/24	15:06:26.320	0.826	0.066	1.060	9.420	11.023
SPC_2129.LAB	03/13/24	15:07:28.892	0.916	0.035	1.028	9.436	11.067
SPC_2130.LAB	03/13/24	15:08:31.350	1.004	0.040	1.025	9.367	11.200
SPC_2131.LAB	03/13/24	15:09:33.878	0.722	0.039	1.017	9.295	11.000
SPC_2132.LAB	03/13/24	15:10:36.414	0.692	0.026	1.125	9.340	11.094
SPC_2133.LAB	03/13/24	15:11:38.983	0.941	0.044	0.981	9.363	11.216
SPC_2134.LAB	03/13/24	15:12:41.480	0.963	-0.015	0.9363	9.363	11.228
SPC_2135.LAB	03/13/24	15:13:44.072	0.859	0.061	1.016	9.311	11.112
SPC_2136.LAB	03/13/24	15:14:46.550	0.746	0.020	1.100	9.352	11.189
SPC_2137.LAB	03/13/24	15:15:49.078	0.959	0.030	1.060	9.337	11.244
SPC_2138.LAB	03/13/24	15:16:51.611	0.570	0.012	1.030	9.355	11.098
SPC_2139.LAB	03/13/24	15:17:54.237	0.846	0.047	1.040	9.308	10.969
SPC_2140.LAB	03/13/24	15:18:56.677	1.215	0.018	1.025	9.328	10.925
SPC_2141.LAB	03/13/24	15:19:59.210	0.792	0.007	1.095	9.335	11.235
Mill Off Run 1		(actual)	0.797	0.016	1.028	9.376	10.964
Oxygen	14.1%	(ppm,dry @7% O2)	1.780	0.036		8.5	M26A Moisture
DSCFM	195.550	(lbs/hr)	0.717	0.011			
Clinker (tons/hr)	100.6	(lbs/ton clinker)	0.007	0.0001			

Run 2		Date	Time	HCN 9 (200) PCA 191C R1 :HF ppm (10) 191SF6 (10) 191C	Ethylene (100,3000) 191C	H2O % (40) 191C	CO2% (40) 191C
Spectrum							
SPC__2162 LAB		03/13/24	15:42:26.151	1.144	1.121	9.210	11.215
SPC__2163 LAB		03/13/24	15:43:28.649	0.952	-0.006	9.140	11.131
SPC__2164 LAB		03/13/24	15:44:31.189	0.989	-0.002	9.198	10.995
SPC__2165 LAB		03/13/24	15:45:33.722	1.165	0.000	9.188	11.013
SPC__2166 LAB		03/13/24	15:46:36.291	0.691	-0.003	9.169	11.001
SPC__2167 LAB		03/13/24	15:47:38.877	0.913	-0.004	9.261	11.024
SPC__2168 LAB		03/13/24	15:48:41.661	0.909	0.000	9.158	11.047
SPC__2169 LAB		03/13/24	15:49:43.852	1.110	-0.004	9.231	11.245
SPC__2170 LAB		03/13/24	15:50:46.464	1.263	-0.003	9.235	11.143
SPC__2171 LAB		03/13/24	15:51:48.925	0.979	-0.001	9.217	11.050
SPC__2172 LAB		03/13/24	15:52:51.474	1.178	0.001	9.186	10.883
SPC__2173 LAB		03/13/24	15:53:53.986	0.679	-0.002	9.210	10.985
SPC__2174 LAB		03/13/24	15:54:56.612	0.845	-0.003	9.240	11.076
SPC__2175 LAB		03/13/24	15:55:59.076	0.972	0.000	9.202	10.979
SPC__2176 LAB		03/13/24	15:57:01.590	1.342	-0.002	9.182	11.094
SPC__2177 LAB		03/13/24	15:58:04.126	1.119	0.001	9.249	10.955
SPC__2178 LAB		03/13/24	15:59:06.733	0.750	0.002	9.151	10.827
SPC__2179 LAB		03/13/24	16:00:09.184	1.187	0.001	9.241	10.787
SPC__2180 LAB		03/13/24	16:01:12.029	1.215	-0.004	9.187	11.013
SPC__2181 LAB		03/13/24	16:02:14.360	0.977	-0.002	9.264	10.811
SPC__2182 LAB		03/13/24	16:03:16.870	0.992	-0.001	9.195	10.727
SPC__2183 LAB		03/13/24	16:04:19.413	0.843	-0.003	9.238	10.855
SPC__2184 LAB		03/13/24	16:05:21.912	0.993	0.001	9.157	10.905
SPC__2185 LAB		03/13/24	16:06:24.466	0.755	-0.002	9.189	10.731
SPC__2186 LAB		03/13/24	16:07:26.986	1.049	-0.001	9.207	10.827
SPC__2187 LAB		03/13/24	16:08:29.487	1.054	-0.005	9.153	10.993
SPC__2188 LAB		03/13/24	16:09:32.041	1.044	-0.000	9.268	10.830
SPC__2189 LAB		03/13/24	16:10:34.539	0.933	0.001	9.184	10.745
SPC__2190 LAB		03/13/24	16:11:37.098	0.831	-0.002	9.184	10.776
SPC__2191 LAB		03/13/24	16:12:39.596	1.112	-0.001	9.204	10.911
SPC__2192 LAB		03/13/24	16:13:42.141	0.850	-0.002	9.170	10.723
SPC__2193 LAB		03/13/24	16:14:44.709	0.862	-0.001	9.151	10.641
SPC__2194 LAB		03/13/24	16:15:47.281	1.063	0.000	9.113	10.703
SPC__2195 LAB		03/13/24	16:16:49.776	0.943	-0.001	9.133	10.733
SPC__2196 LAB		03/13/24	16:17:52.271	1.060	-0.001	9.125	10.635
SPC__2197 LAB		03/13/24	16:18:54.845	0.915	-0.003	9.119	10.644
SPC__2198 LAB		03/13/24	16:19:57.435	0.928	-0.003	9.148	10.783
SPC__2199 LAB		03/13/24	16:20:59.915	0.832	-0.012	9.170	10.776
SPC__2200 LAB		03/13/24	16:22:02.699	0.976	-0.000	8.849	10.444
SPC__2201 LAB		03/13/24	16:23:05.029	0.799	-0.001	8.639	10.177
SPC__2202 LAB		03/13/24	16:24:07.518	0.499	-0.003	8.738	10.238
SPC__2203 LAB		03/13/24	16:25:10.011	1.130	-0.001	8.821	10.174
SPC__2204 LAB		03/13/24	16:26:12.592	0.648	0.001	8.696	10.181
SPC__2205 LAB		03/13/24	16:27:15.088	0.964	-0.003	8.629	10.276
SPC__2206 LAB		03/13/24	16:28:17.606	0.887	0.001	8.603	10.198
SPC__2207 LAB		03/13/24	16:29:20.154	0.738	-0.005	8.624	10.204
SPC__2208 LAB		03/13/24	16:30:22.777	0.901	-0.000	8.694	10.140
SPC__2209 LAB		03/13/24	16:31:25.219	0.824	0.001	8.698	10.409
SPC__2210 LAB		03/13/24	16:32:27.759	0.837	0.003	8.686	10.409
SPC__2211 LAB		03/13/24	16:33:30.288	0.572	-0.001	8.697	10.292
SPC__2212 LAB		03/13/24	16:34:32.901	0.789	-0.001	8.737	10.243
SPC__2213 LAB		03/13/24	16:35:35.363	0.649	-0.026	8.687	10.261
SPC__2214 LAB		03/13/24	16:36:37.893	0.768	-0.019	8.675	10.132
SPC__2215 LAB		03/13/24	16:37:40.506	0.736	0.015	8.842	10.288
SPC__2216 LAB		03/13/24	16:38:43.031	0.699	-0.005	8.932	10.332
SPC__2217 LAB		03/13/24	16:39:45.579	0.789	-0.001	8.954	10.307
SPC__2218 LAB		03/13/24	16:40:48.033	0.683	0.013	8.867	10.093
SPC__2219 LAB		03/13/24	16:41:50.571	0.538	-0.007	8.843	10.022
SPC__2220 LAB		03/13/24	16:42:53.390	0.952	0.016	8.774	10.255
Mill Off Run 2			(actual)	0.910	1.063	9.029	10.656
Oxygen			14.4% (ppm dry @ 7% O2)	2.131			
DSCFM			189,350 (lbs/hr)	0.794			
Clinker (tons/hr)			100.6 (lbs/ton clinker)	0.008			
				8.7	M26A Moisture		

Holcim, Hagerstown MD
Kiln Main Stack: Raw Mill Off
Run 3

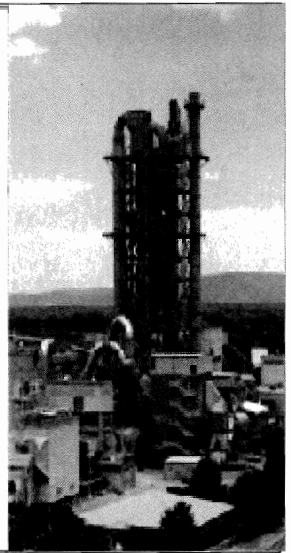
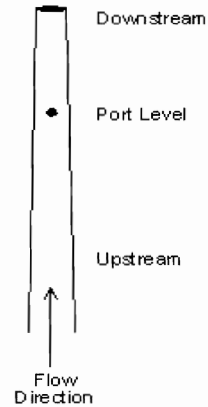
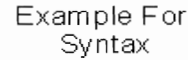
Spectrum	Date	Time	HCN 9 (200) PCA 191C R1	HF ppm (10) 19 SF6 (10) 191C	Ethylene (100.3000) 191C	H2O% (40) 191C	CO2% (40) 191C
SPC_2255 LAB	03/13/24	17:20:55.249	1.202	-0.032	1.072	8.239	10.161
SPC_2256 LAB	03/13/24	17:21:57.976	0.597	-0.010	1.101	8.299	9.949
SPC_2257 LAB	03/13/24	17:23:00.225	0.786	-0.013	0.929	8.420	9.858
SPC_2258 LAB	03/13/24	17:24:03.054	1.218	-0.007	1.011	8.527	9.983
SPC_2259 LAB	03/13/24	17:25:05.668	0.996	-0.013	0.990	8.565	9.843
SPC_2260 LAB	03/13/24	17:26:07.829	0.574	-0.022	1.067	8.569	9.805
SPC_2261 LAB	03/13/24	17:27:10.379	1.142	-0.041	1.073	8.549	9.838
SPC_2262 LAB	03/13/24	17:28:12.984	1.003	0.021	0.948	8.581	10.038
SPC_2263 LAB	03/13/24	17:29:15.518	0.508	-0.053	1.008	8.610	9.816
SPC_2264 LAB	03/13/24	17:30:18.032	0.971	-0.008	1.120	8.595	9.747
SPC_2265 LAB	03/13/24	17:31:20.593	0.967	-0.001	1.002	8.627	9.916
SPC_2266 LAB	03/13/24	17:32:23.087	0.843	0.009	1.080	8.558	9.810
SPC_2267 LAB	03/13/24	17:33:25.588	0.709	0.022	0.955	8.528	9.705
SPC_2268 LAB	03/13/24	17:34:28.158	0.971	0.007	1.002	8.499	9.770
SPC_2269 LAB	03/13/24	17:35:30.653	0.890	0.011	1.053	8.526	9.861
SPC_2270 LAB	03/13/24	17:36:33.193	1.116	-0.003	1.036	8.440	9.804
SPC_2271 LAB	03/13/24	17:37:35.811	0.824	-0.022	0.977	8.446	9.713
SPC_2272 LAB	03/13/24	17:38:38.261	1.079	-0.025	1.083	8.323	9.827
SPC_2273 LAB	03/13/24	17:39:40.854	1.085	0.023	1.103	8.161	9.977
SPC_2274 LAB	03/13/24	17:40:43.333	0.680	0.021	1.028	8.196	9.890
SPC_2275 LAB	03/13/24	17:41:45.868	0.858	0.014	1.056	8.215	9.812
SPC_2276 LAB	03/13/24	17:42:48.409	1.070	0.043	1.023	8.277	9.946
SPC_2277 LAB	03/13/24	17:43:51.068	0.833	0.013	0.972	8.291	9.853
SPC_2278 LAB	03/13/24	17:44:53.517	0.836	0.022	1.003	8.322	9.873
SPC_2279 LAB	03/13/24	17:45:56.097	1.053	0.049	1.058	8.262	9.771
SPC_2280 LAB	03/13/24	17:46:58.588	1.048	0.003	1.002	8.227	9.965
SPC_2281 LAB	03/13/24	17:48:01.083	0.903	0.020	1.052	8.179	9.775
SPC_2282 LAB	03/13/24	17:49:03.703	0.594	0.067	1.026	8.209	9.807
SPC_2283 LAB	03/13/24	17:50:06.260	0.792	0.047	1.004	8.195	9.770
SPC_2284 LAB	03/13/24	17:51:08.750	0.818	0.059	0.966	8.218	9.895
SPC_2285 LAB	03/13/24	17:52:11.263	1.091	0.022	1.125	8.223	9.842
SPC_2286 LAB	03/13/24	17:53:13.762	1.036	0.014	1.050	8.226	10.023
SPC_2287 LAB	03/13/24	17:54:16.438	1.223	0.067	1.015	8.265	10.018
SPC_2288 LAB	03/13/24	17:55:18.878	0.870	0.018	1.054	8.342	9.932
SPC_2289 LAB	03/13/24	17:56:21.480	0.621	0.052	0.930	8.271	9.867
SPC_2290 LAB	03/13/24	17:57:23.971	1.042	0.041	1.091	8.220	9.810
SPC_2291 LAB	03/13/24	17:58:26.447	0.956	0.033	0.962	8.402	9.888
SPC_2292 LAB	03/13/24	17:59:28.979	1.102	0.086	1.085	8.374	9.787
SPC_2293 LAB	03/13/24	18:00:31.587	0.738	0.023	1.044	8.260	9.857
SPC_2294 LAB	03/13/24	18:01:34.095	1.094	0.044	1.089	8.262	9.848
SPC_2295 LAB	03/13/24	18:02:36.587	1.165	0.003	0.989	8.256	9.934
SPC_2296 LAB	03/13/24	18:03:39.124	1.187	0.021	1.171	8.278	9.789
SPC_2297 LAB	03/13/24	18:04:41.771	0.950	0.028	1.034	8.220	9.862
SPC_2298 LAB	03/13/24	18:05:44.195	0.908	0.049	1.035	8.203	9.824
SPC_2299 LAB	03/13/24	18:06:46.772	1.094	0.071	1.086	8.210	9.862
SPC_2300 LAB	03/13/24	18:07:49.273	1.255	0.051	1.131	8.236	9.939
SPC_2301 LAB	03/13/24	18:08:51.945	1.015	0.027	1.094	8.250	9.866
SPC_2302 LAB	03/13/24	18:09:54.341	0.960	0.053	1.095	8.238	10.098
SPC_2303 LAB	03/13/24	18:10:56.970	1.024	0.030	1.044	8.227	9.826
SPC_2304 LAB	03/13/24	18:11:59.412	0.938	0.083	1.063	8.186	9.720
SPC_2305 LAB	03/13/24	18:13:01.946	0.994	0.068	1.085	8.316	9.921
SPC_2306 LAB	03/13/24	18:14:04.772	1.026	0.083	1.013	8.289	9.913
SPC_2307 LAB	03/13/24	18:15:07.018	0.865	0.045	0.948	8.392	9.826
SPC_2308 LAB	03/13/24	18:16:09.632	1.107	0.014	1.091	8.288	9.777
SPC_2309 LAB	03/13/24	18:17:12.126	1.201	0.094	1.049	8.252	9.940
SPC_2310 LAB	03/13/24	18:18:15.545	1.015	0.060	1.085	8.311	9.798
SPC_2311 LAB	03/13/24	18:19:17.161	0.868	0.022	1.079	8.332	9.843
Mill Off Run 3		(actual)	0.953	0.026	1.039	8.333	9.866
Oxygen	14.9%	(ppm,dry @7% O2)	2.390	0.066			
DSCFM	191.350	(lbs/hr)	0.831	0.017		7.7	M26A Moisture
Clinker (tons/hr)	100.6	(lbs/ton clinker)	0.008	0.0002			

Appendix B

**Field Data
and
CEM/FTIR Data**

Traverse Point Location for Circular Ducts

Plant	Holcim Hagerstown		
City	Hagerstown	State	MD
Location	Main Kiln Stack		
Stack ID (inches)	126		
Nipple Length	12		
Nearest Upstream Disturbance (Bend, ID FAN, etc)			
Distance (inches)	2208	Type of Disturbance	Duct
Nearest Downstream Disturbance (Bend, or Stack Outlet)			
Distance (inches)	612	Type of Disturbance	Stack Outlet
Sampler	JHM	Date	7/28/16



Stack Schematic (Draw by hand after printing)

(Mark with an "x")

Particulate Traverse?

Yes

x

No

Number of Traverse Points Required

6

[illegible]

Cyclonic Flow Check Data Sheet

PLANT AND CITY			DATE	SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER	
Hole in Placerville (MO)			3/13/24	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
GOV/MP	29.29	0.39	70	126	0.84	25	NA	NA		5B

EPA Method 2 Data

[illegible]

Average of Absolute Angle Readings must be < 20 degrees

METHOD 26A FIELD DATA SHEET

PAGE 1 of 1

PLANT AND CITY		DATE		SAMPLING LOCATION		SAMPLE TYPE		RUN NUMBER	
Holcim: Hoegh's Town MU		3 / 13 / 24		Main S' Leck		Method 26A		1 - ON OFF -M26A-1A	
OPERATOR		AMBIENT PRESS (in. Hg)		STATIC PRESSURE (in. Water)		AMBIENT TEMP (deg. F)		PROBE LENGTH AND LINER TYPE	
George M. Ward		19.19		-39		~70		5 ft 6 in ss	
ASSUMED MOISTURE (%)		DGM H@		DGM CAL FACTOR (Y)		STACK THERM NO.		STACK PITOT NO.	
9%		1.95		0.957		5 A		6 A	
				PITOT LEAK CHECK		delta P		delta H	
				PASS		VELOCITY HEAD (in. H2O)		ORIFICE (in. H2O)	
						.71		2.6	
						.60		2.28	
						.5		1.8	
						End of Port		End of Port	
TRAVERSE ELAPSED PORT/POINT NO.		CLOCK TIME (24-HR)		DGM READING Vm (cu. ft.)		delta P		delta H	
A-1		10:00		265.904		.71		2.6	
2		5		270.31		.60		2.28	
3		10		274.54		.5		1.8	
15		10:15		279.411		End of Port		End of Port	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		INCHES Hg	
DGM VOLUME (CU. FT) <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">CU. FT @ CU. FT @</td> <td colspan="2">INCHES Hg</td>						CU. FT @ CU. FT @		INCHES Hg	
B-1		15		10:17		279.411		.71	
2		20		283.62		283.62		.63	
3		25		288.98		288.98		.52	
30		10:37		292.424		292.424		.52	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		INCHES Hg	
DGM VOLUME (CU. FT) <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">CU. FT @ CU. FT @</td> <td colspan="2">INCHES Hg</td>						CU. FT @ CU. FT @		INCHES Hg	
C-1		30		10:34		292.424		.69	
2		35		297.53		297.53		.58	
3		40		300.76		300.76		.50	
45		10:49		304.415		304.415		.50	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		INCHES Hg	
DGM VOLUME (CU. FT) <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">CU. FT @ CU. FT @</td> <td colspan="2">INCHES Hg</td>						CU. FT @ CU. FT @		INCHES Hg	
D-1		45		10:51		304.415		.70	
2		50		308.59		308.59		.61	
3		55		313.01		313.01		.49	
60		11:06		316.578		316.578		.49	
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		316.578		2.6		2.6		87	
				2.3		2.3		88	
				1.8		1.8		89	
				End of Port		End of Port		89	
				258		258		153	
				255		255		155	
				257		257		153	
				End of Port		End of Port		153	
				200		200		51	
				200		200		55	
				199		199		55	
				254		254		56	
				252		252		53	
				253		253		55	
				254		254		56	
				252		252		57	
				253		253		52	
				253		253		52	
				252		252		60	
				254		254		60	
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				254		254		60	
				252		252		60	

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Holcim Hagerstown
 Sample Location Main Street
 Run No. 1A -M26A-MILL ON
 Filter Number(s) Not Applicable

Sample Date 3/13/24
 Recovery Date 3/13/24
 Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		768.1	811.3	631.5	745.5	757.4	918.2	g
Initial weight		756.9	774.3	609.1	733.1	750.9	902.9	g
Net weight		11.2	37.0	22.4	12.4	6.5	15.3	g

Description of impinger water Clear 20 % spent
Blue Sil gel color
 Total moisture = 104.8 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4- 1A

Liquid level
 marked/sealed ✓

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH 1A

Liquid level
 marked/sealed ✓

Samples stored and locked _____
 Remarks _____

METHOD 26A FIELD DATA SHEET

PAGE 1 of 1 13

PLANT AND CITY		DATE		SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER		
Holcim; Hagerstown, MD		03/13/24		Main Stack			Method 26A		- ON OFF -M26A-1B		
OPERATOR		AMBIENT PRESS (In. Hg)		STATIC PRESSURE (In. Water)		AMBIENT TEMP (deg. F)		PITOT Cp		PROBE LENGTH AND LINER TYPE	
MTP		29.24		-3.9		70		-87.55		5 ft Glass	
ASSUMED MOISTURE (%)		DGM H@		DGM CAL FACTOR (Y)		STACK THERM NO.		LEAK CHECK (INITIAL)		LEAK CHECK (FINAL)	
9		1.65		.987		50		0.001 CU. FT @ 10 "Hg		0.001 CU. FT @ 10 "Hg	
PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK	
TRAVERSE 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)	
A-1		0 1000		6.672		.71		2.16		250	
2		5		11.06		.60		1.9		249	
3		10		15.11		.50		1.5		252	
15		1015		17.231		End of Port		End of Port		End of Port	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		1017		19.231		.71		2.16		255	
B-1		15		23.14		.63		2.19		254	
2		20		27.36		.52		1.6		253	
3		30		31.075		End of Port		End of Port		End of Port	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		1034		31.075		.69		2.1		249	
C-1		30		36.81		.58		1.8		250	
2		35		39.58		.50		1.5		252	
3		45		43.075		End of Port		End of Port		End of Port	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		1049		43.075		.70		2.1		253	
D-1		45		47.17		.61		1.9		256	
2		50		51.27		.49		1.5		255	
3		60		54.991		End of Port		End of Port		End of Port	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50		54.991		End of Port		End of Port		End of Port	
3		60		54.991		End of Port		End of Port		End of Port	
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
60 Min.		1106		54.991		.70		2.1		253	
D-1		45		51.27		.49		1.5		255	
2		50									

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Holcim Hagerstown
 Sample Location Main Stack
 Run No. 1B -M26A-Mill ON
 Filter Number(s) Not Applicable

Sample Date 3/15/24
 Recovery Date 3/15/24
 Recovered by PC

796.0 MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		<u>768.6</u>	<u>767.9</u>	<u>679.7</u>	<u>743.1</u>	<u>753.9</u>	<u>899.7</u>	g
Initial weight		<u>744.1</u>	<u>705.0</u>	<u>661.1</u>	<u>731.3</u>	<u>748.7</u>	<u>883.7</u>	g
Net weight		<u>16.5</u>	<u>31.0</u>	<u>18.6</u>	<u>11.8</u>	<u>5.2</u>	<u>16.0</u>	g

Description of impinger water clear 18.6 20 % spent
Blue Sil gel color
 Total moisture = 99.1 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4- 1B

Liquid level
 marked/sealed ✓

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH 1B

Liquid level
 marked/sealed ✓

Samples stored and locked _____
 Remarks _____

METHOD 26A FIELD DATA SHEET

PAGE 1 of 1

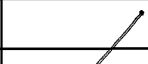
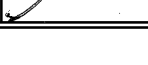
PLANT AND CITY		DATE		SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER		
Holicim: Hagerstown, MD		3 / 13 / 24		Main Stack			Method 26A		- ON OFF - M26A- 43		
OPERATOR		AMBIENT PRESS (in. Hg)		STATIC PRESSURE (in. Water)		AMBIENT TEMP (deg. F)		PITOT Cp		PROBE LENGTH AND LINER TYPE	
George Mayfield		19.18		- .39		~ 70		.85		5 ft Glass	
ASSUMED MOISTURE (%)		DGM H@		DGM CAL FACTOR (Y)		STACK THERM NO.		LEAK CHECK (INITIAL)		O2 CONTENT %	
9%		1.95		0.96		5A		.001 CU. FT @ 12 "Hg		12.6	
K FACTOR		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		LEAK CHECK (FINAL)		CO2 CONTENT %	
3.59		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		.001 CU. FT @ 12 "Hg		10.8	
TRAVERSE ELAPSED TEST TIME (MIN)		CLOCK TIME (24-HR)		DGM READING Vm (cu. ft.)		VELOCITY HEAD (in. H2O)		delta H ORIFICE (in. H2O)		PROBE TEMP (deg. F)	
A-1		0 11:15		36.912		.68		1.4		257	
2		5		321.72		.59		2.1		259	
3		10		325.79		.49		1.8		261	
15		11:40		329.124		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		11:41		329.224		.69		2.4	
B-1		20		333.65		.57		2.1		252	
3		25		337.91		.53		1.9		258	
30		11:51		342.424		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		11:59		342.424		.70		2.5	
C-1		35		347.36		.59		2.2		255	
3		40		351.07		.51		1.8		253	
45		12:14		355.101		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52		1.9		255	
60		12:31		367.402		End of Port		delta P		DGM IN / OUT TEMP (deg. F)	
INTRA-PORT LEAK CHECK?		INITIAL		FINAL		LEAK RATE:		CU. FT @ CU. FT @		INCHES Hg INCHES Hg	
DGM VOLUME (CU. FT)		15		12:16		355.101		.72		2.5	
D-1		50		359.84		.61		2.2		256	
3		55		363.25		.52					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Holston Hagerstown
 Sample Location Main Street
 Run No. 2A -M26A-M11 ON
 Filter Number(s) Not Applicable

Sample Date 3 / 13 / 24
 Recovery Date 3 / 13 / 24
 Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		744.5	188.2	681.4	768.4	707.7	988.2	g
Initial weight		728.2	702.0	669.8	749.8	761.4	972.9	g
Net weight		16.3	26.2	11.6	18.6	6.3	15.3	g

Description of impinger water Clear 30 % spent
Blue Sil gel color
 Total moisture = 94.3 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4- 2A

Liquid level ✓
 marked/sealed ✓

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH- 2A

Liquid level ✓
 marked/sealed ✓

Samples stored and locked _____

Remarks _____

PAGE 1 of 1

PLANT AND CITY			DATE		SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER		
Holcim: <u>Wageningen</u>			<u>3/13/24</u>		<u>Main Stack</u>			Method 26A		<u>- ON OFF -M26A-62</u>		
OPERATOR			AMBIENT PRESS (In. Hg)		STATIC PRESSURE (In. Water)		AMBIENT TEMP (deg. F)		PITOT Cp		PROBE LENGTH AND LINER TYPE	
<u>MT</u>			<u>29.29</u>		<u>- .39</u>		<u>70</u>		<u>120"</u>		<u>48</u>	
ASSUMED DGM MOISTURE BOX No. (%)			DGM H@		DGM CAL FACTOR (Y)		STACK THERM NO.		STACK PITOT NO.		K FACTOR	
<u>9</u>			<u>165</u>		<u>0.997</u>		<u>50</u>		<u>50</u>		<u>3.04</u>	
TRAVERSE ELAPSED PORT/POINT 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)	
<u>A-1</u>			<u>0 1125</u>		<u>55.106</u>		<u>.68</u>		<u>2.1</u>		<u>255</u>	
<u>2</u>			<u>5</u>		<u>59.82</u>		<u>.59</u>		<u>1.8</u>		<u>255</u>	
<u>3</u>			<u>10</u>		<u>64.73</u>		<u>.49</u>		<u>1.5</u>		<u>254</u>	
<u>15</u>			<u>1140</u>		<u>67.421</u>		<u>End of Port</u>		<u>End of Port</u>		<u>End of Port</u>	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)			INITIAL FINAL		LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg		INCHES Hg INCHES Hg		INCHES Hg INCHES Hg	
<u>B-1</u>			<u>15 1142</u>		<u>67.421</u>		<u>.69</u>		<u>2.1</u>		<u>255</u>	
<u>2</u>			<u>20</u>		<u>72.11</u>		<u>.57</u>		<u>1.7</u>		<u>254</u>	
<u>3</u>			<u>25</u>		<u>75.92</u>		<u>.53</u>		<u>1.6</u>		<u>250</u>	
<u>30</u>			<u>1157</u>		<u>79.784</u>		<u>End of Port</u>		<u>End of Port</u>		<u>End of Port</u>	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)			INITIAL FINAL		LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg		INCHES Hg INCHES Hg		INCHES Hg INCHES Hg	
<u>C-1</u>			<u>30 1159</u>		<u>79.784</u>		<u>.70</u>		<u>2.1</u>		<u>255</u>	
<u>2</u>			<u>35</u>		<u>82.49</u>		<u>.59</u>		<u>1.8</u>		<u>254</u>	
<u>3</u>			<u>40</u>		<u>89.94</u>		<u>.51</u>		<u>1.6</u>		<u>251</u>	
<u>45</u>			<u>1214</u>		<u>93.76</u>		<u>End of Port</u>		<u>End of Port</u>		<u>End of Port</u>	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)			INITIAL FINAL		LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg		INCHES Hg INCHES Hg		INCHES Hg INCHES Hg	
<u>D-1</u>			<u>45 1216</u>		<u>93.76</u>		<u>.72</u>		<u>2.2</u>		<u>255</u>	
<u>2</u>			<u>50</u>		<u>96.93</u>		<u>.61</u>		<u>1.4</u>		<u>256</u>	
<u>3</u>			<u>55</u>		<u>100.22</u>		<u>.52</u>		<u>1.6</u>		<u>252</u>	
<u>60</u>			<u>1231</u>		<u>104.689</u>		<u>End of Port</u>		<u>End of Port</u>		<u>End of Port</u>	
TOTAL TIME 60 Min.					DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Holcim Hagerstown
 Sample Location Main Stack
 Run No. 23 -M26A-M.M. on
 Filter Number(s) Not Applicable

Sample Date 3/13/24
 Recovery Date 3/13/24
 Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		764.2	799.5	671.1	772.2	700.9	958.1	g
Initial weight		734.8	767.3	663.0	762.9	699.6	943.8	g
Net weight		49.4	32.2	8.1	14.3	0.8	14.3	g

Description of impinger water Clear 9.3 °C 30 % spent
Dark Sil gel color
 Total moisture = 114.1 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4- 23

Liquid level
 marked/sealed ✓

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH - 23

Liquid level
 marked/sealed ✓

Samples stored and locked _____

Remarks _____

METHOD 26A FIELD DATA SHEET

PAGE 1 of 1

PLANT AND CITY		DATE		SAMPLING LOCATION		SAMPLE TYPE		RUN NUMBER	
Holicim; <i>Highway 101</i>		3 / 13 / 24		<i>Main Stack</i>		Method 26A		4 - ON (OFF) - M26A- 4A	
OPERATOR		AMBIENT PRESS (In. Hg)		AMBIENT TEMP (deg. F)		PITOT Cp		PROBE LENGTH AND LINER TYPE	
<i>Craig Mayes</i>		21.51		~90		<i>80005</i>		NUMBER DIAMETER	
		- 35						.260 .262	
								.261	
ASSUMED DGM BOX No.		DGM H@		DGM CAL FACTOR (Y)		LEAK CHECK (INITIAL)		LEAK CHECK (FINAL)	
948		1.95		.967		- .001 CU. FT @ 10 "Hg		- .001 CU. FT @ 10 "Hg	
25				PITOT LEAK CHECK		PASSED		CO2 CONTENT %	
				delta P		delta H ORIFICE (In. H2O)		O2 CONTENT %	
TRAVEL ELAPSED TEST TIME (MIN)		CLOCK TIME (24-HR)		DGM READING Vm (cu. ft.)		PROBE TEMP (deg. F)		FILTER OVEN TEMP (deg. F)	
A-1 0		14:20		417.899		245 255		255	
2 5				424.12		258		253	
3 10				424.77		253		252	
15		14:35		432.442		End of Port			
INTRA-PORT LEAK CHECK?		INITIAL FINAL		LEAK RATE: CU. FT @ CU. FT @		INCHES Hg INCHES Hg			
DGM VOLUME (CU. FT)		15 14:37		432.442		.92 3.3 246		215 101 250	
B-1 15		20		436.08		.69 2.5 248		215 102 252	
2 20				440.34		.58 2.1 250		210 103 253	
3 25				445.789		End of Port			
30 14:52		INITIAL FINAL		LEAK RATE: CU. FT @ CU. FT @		INCHES Hg INCHES Hg			
INTRA-PORT LEAK CHECK?		30 14:54		445.789		.79 2.8 249		215 102 255	
DGM VOLUME (CU. FT)		35		450.11		.71 2.5 252		215 103 250	
C-1 30		40		455.32		.53 1.9 254		215 103 248	
2 35				458.766		End of Port			
3 40		45		15:09		INITIAL FINAL		LEAK RATE: CU. FT @ CU. FT @	
INTRA-PORT LEAK CHECK?		45 15:11		458.766		.82 2.9 256		218 104 260	
DGM VOLUME (CU. FT)		50		463.42		.71 2.5 255		214 104 262	
D-1 45		55		468.06		.55 2.0 258		217 105 258	
2 50				471.758		End of Port			
3 55		60		15:26		INITIAL FINAL		LEAK RATE: CU. FT @ CU. FT @	
INTRA-PORT LEAK CHECK?		60 15:26		471.758		.82 2.9 256		218 104 260	
DGM VOLUME (CU. FT)		55		468.06		.55 2.0 258		217 105 258	
TOTAL TIME		60 Min.		DGM VOLUME		AVE. SQRT delta P		AVE. TEMP.	
60 Min.				471.758					
				DGM VOLUME		AVE. TEMP.		AVE. TEMP.	
				471.758					
				DGM VOLUME		AVE. TEMP.		AVE. TEMP.	
				471.758					
				DGM VOLUME		AVE. TEMP.		AVE. TEMP.	
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				DGM VOLUME		AVE. TEMP.		AVE. TEMP.	
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				DGM VOLUME		AVE. TEMP.		AVE. TEMP.	
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				DGM VOLUME		AVE. TEMP.		AVE. TEMP.	
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				DGM VOLUME		AVE. TEMP.		AVE. TEMP.	
				471.758					
				DGM VOLUME		AVE. TEMP.		AVE. TEMP.</	

Law

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Holcim Hagerstown
Sample Location Main Street
Run No. 4A -M26A- Mill off
Filter Number(s) Not Applicable

Sample Date 3/13/24
Recovery Date 3/13/24
Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		795.2	797.1	620.4	746.2	744.1	878.4	g
Initial weight		755.4	767.9	610.1	746.4	743.2	865.5	g
Net weight		39.8	29.2	10.3	-0.4	0.9	12.9	g

Description of impinger water clear 50 % spent
blue Sil gel color
Total moisture = 92.7 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
container no. -M26A-H2SO4-4A

Liquid level
marked/sealed ☒

NaOH Impingers contents and water rinse
container no. -M26A-NaOH-4A

Liquid level
marked/sealed ☒

Samples stored and locked _____

Remarks _____

* Law Mill went down during
M. 11 on P3 →

METHOD 26A FIELD DATA SHEET

PAGE 1 of 1

PLANT AND CITY		DATE	SAMPLING LOCATION		SAMPLE TYPE		RUN NUMBER		
Holcim: <u>Marysville</u>		<u>3/13/24</u>	<u>Main Stack</u>		Method 26A		<u>- ON OFF -M26A-413</u>		
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	
MTP		<u>29.29</u>	<u>1.35</u>	<u>170</u>	<u>NA</u>	<u>12.6"</u>	<u>965</u>	<u>5 ft 6135</u>	
DGM BOX No.		DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	ORSAT NO.	LEAK CHECK (INITIAL)	LEAK CHECK (FINAL)	
4		<u>1.65</u>	<u>1.87</u>	<u>502</u>	<u>502</u>	<u>CEM</u>	<u>0.001 CU. FT @ 1.0 "Hg</u>	<u>10.001 CU. FT @ 1.0 "Hg</u>	
PITOT LEAK CHECK		PASSED							
TRAVERSE ELAPSED TEST TIME (MIN)		CLOCK TIME (24-HR)	DGM READING Vm (cu. ft.)	VELOCITY HEAD (in. H2O)	delta P	delta H ORIFICE (in. H2O)	PROBE TEMP (deg. F)	DGM IN / OUT TEMP (deg. F)	
A-1		<u>0</u>	<u>1430</u>	<u>1.0</u>	<u>3.0</u>	<u>254</u>	<u>211</u>	<u>95</u>	
2		<u>5</u>	<u>159.30</u>	<u>.65</u>	<u>2.0</u>	<u>254</u>	<u>209</u>	<u>96</u>	
3		<u>10</u>	<u>163.52</u>	<u>.52</u>	<u>1.6</u>	<u>255</u>	<u>209</u>	<u>97</u>	
15		<u>1435</u>	<u>167.761</u>	End of Port					
INTRA-PORT LEAK CHECK?									
DGM VOLUME (CU. FT)		INITIAL FINAL	LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg				
B-1		<u>15</u>	<u>167.761</u>	<u>7.0</u>	<u>2.8</u>	<u>250</u>	<u>215</u>	<u>97</u>	
2		<u>20</u>	<u>173.02</u>	<u>.69</u>	<u>2.1</u>	<u>256</u>	<u>215</u>	<u>98</u>	
3		<u>25</u>	<u>177.24</u>	<u>.58</u>	<u>1.8</u>	<u>258</u>	<u>210</u>	<u>98</u>	
30		<u>182.705</u>	End of Port						
INTRA-PORT LEAK CHECK?									
DGM VOLUME (CU. FT)		INITIAL FINAL	LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg				
C-1		<u>30</u>	<u>182.705</u>	<u>.79</u>	<u>2.4</u>	<u>250</u>	<u>215</u>	<u>100</u>	
2		<u>35</u>	<u>187.21</u>	<u>.71</u>	<u>2.2</u>	<u>247</u>	<u>215</u>	<u>100</u>	
3		<u>40</u>	<u>191.93</u>	<u>.53</u>	<u>1.6</u>	<u>255</u>	<u>215</u>	<u>100</u>	
45		<u>195.903</u>	End of Port						
INTRA-PORT LEAK CHECK?									
DGM VOLUME (CU. FT)		INITIAL FINAL	LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg				
D-1		<u>45</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	
2		<u>50</u>	<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	
3		<u>55</u>	<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	
60		<u>209.492</u>	End of Port						
TOTAL TIME									
60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>	<u>1.7</u>	<u>255</u>	<u>212.80</u>	<u>102</u>	<u>258</u>
60		<u>1516</u>	<u>209.492</u>	End of Port					
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
60 Min.									
45		<u>1511</u>	<u>195.903</u>	<u>.82</u>	<u>2.5</u>	<u>258</u>	<u>218</u>	<u>101</u>	<u>260</u>
50			<u>200.59</u>	<u>.71</u>	<u>2.2</u>	<u>260</u>	<u>217.24</u>	<u>101</u>	<u>262</u>
55			<u>204.99</u>	<u>.55</u>					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Hokim Hagerstown
 Sample Location Main Stack
 Run No. 43 -M26A- off
 Filter Number(s) Not Applicable

Sample Date 3 / 13 / 24
 Recovery Date 3 / 13 / 24
 Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		825.0	777.6	666.3	747.6	758.8	911.7	g
Initial weight		762.7	759.6	661.4	744.7	756.2	899.7	g
Net weight		62.3	18.6	4.9	2.9	2.6	12.0	g

Description of impinger water Clear 30 % spent
Blue Sil gel color
 Total moisture = 102.7 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4- 43

Liquid level
 marked/sealed -

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH 43

Liquid level
 marked/sealed ✓

Samples stored and locked _____

Remarks _____

METHOD 26A FIELD DATA SHEET

PAGE 1 of 1

PLANT AND CITY		DATE		SAMPLING LOCATION		SAMPLE TYPE		RUN NUMBER	
Holcim: <u>Waco, Texas</u>		<u>3 / 13 / 24</u>		<u>Method 26A</u>		<u>Method 26A</u>		<u>5A</u>	
OPERATOR		AMBIENT PRESS (in. Hg)		STATIC PRESSURE (in. Water)		AMBIENT TEMP (deg. F)		PROBE LENGTH AND LINER TYPE	
<u>Gregory Maynard</u>		<u>29.87</u>		<u>1.35</u>		<u>77.0</u>		<u>5 ft 6 lines</u>	
ASSUMED MOISTURE (%)		DGM H@		DGM CAL FACTOR (Y)		STACK THERM NO.		STACK PITOT NO.	
<u>9</u>		<u>1.95</u>		<u>0.969</u>		<u>5A</u>		<u>8A</u>	
TRAVERSE ELAPSED TEST TIME (MIN)		CLOCK TIME (24-HR)		DGM READING Vm (cu. ft.)		VELOCITY HEAD (in. H2O)		delta H ORIFICE (in. H2O)	
<u>0</u>		<u>1543</u>		<u>473.092</u>		<u>.75</u>		<u>2.7</u>	
<u>5</u>		<u></u>		<u>477.83</u>		<u>.67</u>		<u>2.4</u>	
<u>10</u>		<u></u>		<u>482.14</u>		<u>.52</u>		<u>1.9</u>	
<u>15</u>		<u>1558</u>		<u>486.167</u>		<u>End of Port</u>		<u>End of Port</u>	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL FINAL		LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg		SAMPLE TRAIN VAC (in. Hg)	
<u>B-1</u>		<u>15</u>		<u>486.167</u>		<u>.8</u>		<u>2.9</u>	
<u>2</u>		<u>20</u>		<u>490.71</u>		<u>.68</u>		<u>2.4</u>	
<u>3</u>		<u>25</u>		<u>495.07</u>		<u>.51</u>		<u>1.8</u>	
<u>30</u>		<u>1615</u>		<u>498.855</u>		<u>End of Port</u>		<u>End of Port</u>	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL FINAL		LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg		SAMPLE TRAIN VAC (in. Hg)	
<u>C-1</u>		<u>30</u>		<u>498.855</u>		<u>.79</u>		<u>2.8</u>	
<u>2</u>		<u>35</u>		<u>503.47</u>		<u>.65</u>		<u>2.3</u>	
<u>3</u>		<u>40</u>		<u>507.68</u>		<u>.52</u>		<u>1.9</u>	
<u>45</u>		<u></u>		<u>511.654</u>		<u>End of Port</u>		<u>End of Port</u>	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL FINAL		LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg		SAMPLE TRAIN VAC (in. Hg)	
<u>D-1</u>		<u>45</u>		<u>511.654</u>		<u>.85</u>		<u>3.1</u>	
<u>2</u>		<u>50</u>		<u>515.55</u>		<u>.72</u>		<u>2.6</u>	
<u>3</u>		<u>55</u>		<u>519.62</u>		<u>.55</u>		<u>1.0</u>	
<u>60</u>		<u>1649</u>		<u>523.364</u>		<u>End of Port</u>		<u>End of Port</u>	
TOTAL TIME		DGM VOLUME		AVE SQRT delta P		AVE delta H		AVE. TEMP.	
<u>60 Min.</u>		<u>523.364</u>		<u>523.364</u>		<u>523.364</u>		<u>523.364</u>	

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Holcim Hayes town
 Sample Location Main Stack
 Run No. SA -M26A-M.I. OFF
 Filter Number(s) Not Applicable

Sample Date 3 / 13 / 24
 Recovery Date 3 / 13 / 24
 Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		791.2	777.8	671.0	732.2	783.7	949.9	g
Initial weight		736.4	761.3	667.6	731.9	782.9	984.2	g
Net weight		54.8	116.5	3.4	0.3	0.8	15.7	g

Description of impinger water Clear 40 % spent
Blue Sil gel color
 Total moisture = 91.5 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4- 5 A

Liquid level
 marked/sealed ☒

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH - 5 A

Liquid level
 marked/sealed ☒

Samples stored and locked _____
 Remarks _____

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Holcim Hagerstown
 Sample Location Main Stack
 Run No. 5B -M26A-08f
 Filter Number(s) Not Applicable

Sample Date 3 / 13 / 24
 Recovery Date 3 / 13 / 24
 Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		785.6	793.4	667.1	706.4	704.4	925.4	g
Initial weight		728.2	773.8	663.1	706.1	704.1	908.0	g
Net weight		57.4	19.6	4.0	.5	.3	17.4	g

Description of impinger water Clear 40 % spent
Blue Sil gel color
 Total moisture = 99.2 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4-5B

Liquid level
 marked/sealed -

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH-5B

Liquid level
 marked/sealed ✓

Samples stored and locked _____
 Remarks _____

PAGE 1 of 1

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EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Holcim Hagerstown
 Sample Location Main Street
 Run No. 10A -M26A- mill Off
 Filter Number(s) Not Applicable

Sample Date 3 / 13 /24
 Recovery Date 3 / 13 /24
 Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight	/	740.9	740.6	623.1	740.5	755.6	1003.3	g
Initial weight	/	744.9	762.9	619.1	739.0	755.3	989.8	g
Net weight	/	36.0	17.9	4.0	1.5	.3	14.5	g

Description of impinger water Clear 20 % spent
Blue Sil gel color
 Total moisture = 80.2 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4- 6A

Liquid level
 marked/sealed -

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH 6A

Liquid level
 marked/sealed ✓

Samples stored and locked _____
 Remarks _____

METHOD 26A FIELD DATA SHEET

PAGE 1 of 1

PLANT AND CITY		DATE		SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER		
Holtcim; Houston		3/13/24		Method 26A			Method 26A		- ON DEF - M26A-613		
OPERATOR		AMBIENT PRESS (in. Hg)		STATIC PRESSURE (in. Water)		AMBIENT TEMP (deg. F)		PITOT FILTER NUMBERS		STACK ID (in.)	
MTP		29.29		2.33		27.0		111		170"	
ASSUMED MOISTURE (%)		DGM H@		DGM CAL FACTOR (Y)		STACK THERM NO.		STACK PITOT NO.		ORSAT NO.	
9		1.05		.957		5.0		5.0		CEM	
PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK	
PASS		PASS		PASS		PASS		PASS		PASS	
TRAVERSE 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)	
A-1 0		17.20		264.061		.79		2.4		249	
2 5				268.97		.63		1.9		253	
3 10				273.44		.50		1.7		253	
15		15.35		277.21		End of Port		End of Port		End of Port	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE:		CU.FT @ CU.FT @		INCHES Hg INCHES Hg	
B-1 15		17.37		277.21		.78		2.4		252	
2 20				280.52		.65		2.0		253	
3 25				284.99		.54		1.6		255	
30		17.52		289.579		End of Port		End of Port		End of Port	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE:		CU.FT @ CU.FT @		INCHES Hg INCHES Hg	
C-1 30		17.54		289.579		.77		2.3		256	
2 35				294.29		.67		2.0		255	
3 40				298.65		.56		1.7		257	
45		18.1		302.625		End of Port		End of Port		End of Port	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE:		CU.FT @ CU.FT @		INCHES Hg INCHES Hg	
D-1 45		18.13		302.625		.79		2.4		251	
2 50				306.24		.67		2.0		253	
3 55				310.51		.53		1.0		252	
60		18.28		315.264		End of Port		End of Port		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.		AVE. TEMP.	
1826		315.264		1.0		182.6		182.6		182.6	
PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK	
PASS		PASS		PASS		PASS		PASS		PASS	
TRAVERSE 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)	
A-1 0		17.20		264.061		.79		2.4		249	
2 5				268.97		.63		1.9		253	
3 10				273.44		.50		1.7		253	
15		15.35		277.21		End of Port		End of Port		End of Port	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE:		CU.FT @ CU.FT @		INCHES Hg INCHES Hg	
B-1 15		17.37		277.21		.78		2.4		252	
2 20				280.52		.65		2.0		253	
3 25				284.99		.54		1.6		255	
30		17.52		289.579		End of Port		End of Port		End of Port	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE:		CU.FT @ CU.FT @		INCHES Hg INCHES Hg	
C-1 30		17.54		289.579		.77		2.3		256	
2 35				294.29		.67		2.0		255	
3 40				298.65		.56		1.7		257	
45		18.1		302.625		End of Port		End of Port		End of Port	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE:		CU.FT @ CU.FT @		INCHES Hg INCHES Hg	
D-1 45		18.13		302.625		.79		2.4		251	
2 50				306.24		.67		2.0		253	
3 55				310.51		.53		1.0		252	
60		18.28		315.264		End of Port		End of Port		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.		AVE. TEMP.	
1826		315.264		1.0		182.6		182.6		182.6	

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Wolcim Hagistown
 Sample Location Main stack
 Run No. 603 -M26A- M.II off
 Filter Number(s) Not Applicable

Sample Date 3 / 13 /24
 Recovery Date 3 / 13 /24
 Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		787.8	769.9	651.7	747.4	772.4	947.7	g
Initial weight		749.0	753.5	647.1	757.2	772.3	924.4	g
Net weight		38.8	16.4	4.6	1.9	.1	23.3	g

Description of impinger water clear 745.5 40 % spent
BMC Sil gel color
 Total moisture = 85.1 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4- 603

Liquid level
 marked/sealed —

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH 603

Liquid level
 marked/sealed ✓

Samples stored and locked _____
 Remarks _____

METHOD 26A FIELD DATA SHEET

PAGE 1 of 1

PLANT AND CITY		DATE		SAMPLING LOCATION		SAMPLE TYPE		RUN NUMBER	
Holicim: <i>Harcourt, WV</i>		<i>3 / 15 / 24</i>		<i>Millain & Shell</i>		Method 26A		<i>- ON OFF -M26A- 7A</i>	
OPERATOR		AMBIENT PRESS (in. Hg)		STATIC PRESSURE (in. Water)		AMBIENT TEMP (deg. F)		PROBE LENGTH AND LINER TYPE	
<i>Steve Wayer</i>		<i>29.12</i>		<i>-33</i>		<i>~50</i>		<i>126" 1" 61/8" 5/8" 61/32"</i>	
ASSUMED MOISTURE (%)		DGM BOX No.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	delta P	VELOCITY HEAD (in. H2O)	DGM READING Vm (cu. ft.)
<i>9%</i>		<i>M5-25</i>	<i>1.95</i>	<i>0.967</i>	<i>5A</i>	<i>5A</i>	<i>5A</i>	<i>5A</i>	<i>5A</i>
PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK		PITOT LEAK CHECK	
<i>15</i>		<i>12:35</i>		<i>585.153</i>		<i>585.153</i>		<i>585.153</i>	
TRAVERSE PORT/POINT NO.		CLOCK TIME (24-HR)	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)
A-1		0	12:20	573.823	59	2.1	2.1	252	200
2		5		577.89	52	1.9	1.9	251	199
3		10		581.55	41	1.5	1.5	256	199
15		15	12:35	585.153	End of Port				
INTRA-PORT LEAK CHECK?		DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE: INCHES Hg	
B-1		15	12:37	585.153	61	2.2	2.2	250	199
2		20		588.82	54	1.93	1.93	250	199
3		25		592.73	43	1.5	1.5	254	199
30		30	12:52	596.174	End of Port				
INTRA-PORT LEAK CHECK?		DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE: INCHES Hg	
C-1		30	12:54	596.174	60	2.2	2.2	249	199
2		35		600.15	51	1.8	1.8	251	198
3		40		604.08	41	1.5	1.5	258	199
45		45	13:09	607.548	End of Port				
INTRA-PORT LEAK CHECK?		DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE: INCHES Hg	
D-1		45	13:11	607.548	62	2.2	2.2	251	200
2		50		611.41	53	1.9	1.9	255	200
3		55		615.54	40	1.4	1.4	255	200
60		60	13:26	618.911	End of Port				
TOTAL TIME		60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.	
				618.911				AVE. TEMP.	
SAMPLE		TRAIN VAC (in. Hg)		SIL GEL EXIT TEMP (deg. F)		FILTER OVEN TEMP (deg. F)		CO2 CONTENT %	
K FACTOR		10.8		12.6		12.6		3.59	
NUMBER		260.262		260.262		260.262		260.262	
DIAMETER		.261		.261		.261		.261	

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Volcim Hagerstown
 Sample Location Main Stack
 Run No. 7A -M26A-M/H ON
 Filter Number(s) Not Applicable

Sample Date 3/15/24
 Recovery Date 3/15/24
 Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		793.9	794.0	612.1	743.9	745.2	894.6	g
Initial weight		739.1	781.8	610.4	741.8	744.6	878.4	g
Net weight		54.8	12.2	1.5	2.1	0.6	16.2	g

Description of impinger water Cool 40 % spent
Blue Sil gel color
 Total moisture = 87.4 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4-7A

Liquid level
 marked/sealed ✓

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH 7A

Liquid level
 marked/sealed ✓

Samples stored and locked _____
 Remarks _____

METHOD 26A FIELD DATA SHEET

PAGE 1 of 1

PLANT AND CITY		DATE		SAMPLING LOCATION		SAMPLE TYPE		RUN NUMBER	
Holcim:		3 / 15 / 24		Main Stack		Method 26A		- ON/OFF - M26A-713	
OPERATOR		AMBIENT PRESS (in. Hg)		AMBIENT TEMP (deg. F)		STACK ID (in.)		PROBE LENGTH AND LINER TYPE	
MTP		29.12		70		120"		95	
DGM BOX No.		DGM H@		DGM CAL FACTOR (Y)		STACK PITOT NO.		LEAK CHECK (INITIAL)	
45-15		1.05		0.97		5.1		0.001	
ASSUMED MOISTURE (%)		DGM H@		DGM CAL FACTOR (Y)		STACK PITOT NO.		LEAK CHECK (INITIAL)	
9		1.05		0.97		5.1		0.001	
TRAVERSE ELAPSED TEST TIME (MIN)		CLOCK TIME (24-HR)		DGM READING Vm (cu. ft.)		delta P VELOCITY HEAD (in. H2O)		delta H ORIFICE (in. H2O)	
A-1		0		12.20		315.805		1.8	
2		5		319.94		319.94		1.6	
3		10		324.01		324.01		1.2	
15		12.35		327.567		327.567		End of Port	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg	
B-1		15		12.37		327.567		.61	
2		20		12.37		327.567		.54	
3		25		12.37		327.567		.43	
30		12.37		327.567		327.567		End of Port	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg	
C-1		30		12.37		327.567		.60	
2		35		12.37		327.567		.51	
3		40		12.37		327.567		.41	
45		12.37		327.567		327.567		End of Port	
INTRA-PORT LEAK CHECK? DGM VOLUME (CU. FT)		INITIAL		FINAL		LEAK RATE: CU.FT @ CU.FT @		INCHES Hg INCHES Hg	
D-1		45		12.37		327.567		.62	
2		50		12.37		327.567		.53	
3		55		12.37		327.567		.40	
60		12.37		327.567		327.567		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
D-1		45		13.11		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.301		350.301		End of Port	
TOTAL TIME 60 Min.		DGM VOLUME		AVE SQRT delta P		AVE. TEMP.		AVE. TEMP.	
45		13.11		350.301		350.301		.62	
2		50		13.11		350.301		.53	
3		55		13.11		350.301		.40	
60		13.11		350.30					

EPA METHOD 26A RECOVERY AND INTEGRITY DATA SHEET

Plant Holcim Hagerstown
 Sample Location Main Stack
 Run No. 7B -M26A- mill ON
 Filter Number(s) Not Applicable

Sample Date 3 / 15 / 24
 Recovery Date 3 / 15 / 24
 Recovered by DC

MOISTURE

Impingers	1 50 ml 0.1N H ₂ SO ₄ (optional knockout)	2 100 ml 0.1N H ₂ SO ₄ (tipped)	3 100 ml 0.1N H ₂ SO ₄ (tipped)	4 Empty Knockout (untipped)	5 100 ml 0.1N NaOH (untipped)	6 100 ml 0.1N NaOH (untipped)	Silica gel (untipped)	
Final weight		801.8	778.3	663.7	757.2	736.0	926.9	g
Initial weight		745.7	764.8	661.5	756.1	736.0	911.7	g
Net weight		56.1	13.5	2.2	1.1	0.0	15.2	g

Description of impinger water clear 60 % spent
blue Sil gel color
 Total moisture = 88.1 grams

RECOVERED SAMPLE

H₂SO₄ Impingers and knockout contents and water rinse
 container no. -M26A-H2SO4- 7B

Liquid level
 marked/sealed

NaOH Impingers contents and water rinse
 container no. -M26A-NaOH 7B

Liquid level
 marked/sealed

Samples stored and locked _____
 Remarks _____

Client: Holcim Hagerstpn
 Test Location: Main Stack Mill On
 Date: Mar 13 24 Start Time: 10:00:02
 Run number 1
 One Minute Averages

	O2 %,dry	CO2 %,dry
10:01:00 AM	14.2	12.3
10:02:00 AM	14.2	12.5
10:03:00 AM	14.2	12.4
10:04:00 AM	14.3	12.2
10:05:00 AM	14.3	12.3
10:06:00 AM	14.3	12.4
10:07:00 AM	14.2	12.4
10:08:00 AM	14.1	12.6
10:09:00 AM	14.1	12.4
10:10:00 AM	14.1	12.6
10:11:00 AM	14.2	12.5
10:12:00 AM	14.1	12.5
10:13:00 AM	14.1	12.5
10:14:00 AM	14.2	12.5
10:15:00 AM	14.2	12.4
10:16:00 AM	14.2	12.4
10:17:00 AM	14.1	12.4
10:18:00 AM	14.1	12.6
10:19:00 AM	14.2	12.4
10:20:00 AM	14.3	12.2
10:21:00 AM	14.2	12.5
10:22:00 AM	14.2	12.4
10:23:00 AM	14.3	12.3
10:24:00 AM	14.3	12.3
10:25:00 AM	14.3	12.5
10:26:00 AM	14.3	12.4
10:27:00 AM	14.3	12.3
10:28:00 AM	14.3	12.3
10:29:00 AM	14.3	12.3
10:30:00 AM	14.3	12.4
10:31:00 AM	14.3	12.3
10:32:00 AM	14.3	12.4
10:33:00 AM	14.2	12.6
10:34:00 AM	14.3	12.5
10:35:00 AM	14.2	12.4
10:36:00 AM	14.2	12.6
10:37:00 AM	14.3	12.6
10:38:00 AM	14.4	12.3
10:39:00 AM	14.3	12.6
10:40:00 AM	14.3	12.4
10:41:00 AM	14.3	12.6
10:42:00 AM	14.3	12.5
10:43:00 AM	14.4	12.4
10:44:00 AM	14.4	12.5
10:45:00 AM	14.3	12.5
10:46:00 AM	14.6	12.1
10:47:00 AM	14.6	12.1
10:48:00 AM	14.6	12.2
10:49:00 AM	14.7	11.9
10:50:00 AM	14.7	11.8
10:51:00 AM	14.8	11.7
10:52:00 AM	14.7	12.0
10:53:00 AM	14.7	12.0
10:54:00 AM	14.7	11.9
10:55:00 AM	14.8	11.8
10:56:00 AM	14.8	11.9
10:57:00 AM	14.7	11.9
10:58:00 AM	14.7	11.9
10:59:00 AM	14.6	12.1
11:00:00 AM	14.6	12.0
Run Avgs	14.4	12.3
Cal Gas	12.1	10.2
Initial Zero	0.3	0.1
Final Zero	0.4	0.1
Initial cal.	12.4	10.0
Final Cal.	12.5	10.0
Corrected Average	14.0	12.6

Client: Holcim Hagerstpn
 Test Location: Main Stack Mill On
 Date: Mar 13 24 Start Time: 11:27:40
 Run number 2
 One Minute Averages

	O2 %,dry	CO2 %,dry
11:28:38 AM	13.7	13.7
11:29:38 AM	13.7	13.8
11:30:38 AM	13.6	13.7
11:31:38 AM	13.7	13.5
11:32:38 AM	13.8	13.5
11:33:38 AM	13.7	13.7
11:34:38 AM	13.6	13.7
11:35:38 AM	13.7	13.6
11:36:38 AM	13.6	13.8
11:37:38 AM	13.6	14.0
11:38:38 AM	13.6	13.8
11:39:38 AM	13.6	13.8
11:40:38 AM	13.6	14.0
11:41:38 AM	13.6	13.9
11:42:38 AM	13.6	13.8
11:43:38 AM	13.6	13.8
11:44:38 AM	13.6	13.9
11:45:38 AM	13.7	13.6
11:46:38 AM	13.8	13.6
11:47:38 AM	13.7	13.7
11:48:38 AM	13.7	13.9
11:49:38 AM	13.6	13.7
11:50:38 AM	13.8	13.6
11:51:38 AM	13.7	13.6
11:52:38 AM	13.6	13.9
11:53:38 AM	13.6	13.7
11:54:38 AM	13.6	13.5
11:55:38 AM	13.4	13.9
11:56:38 AM	13.4	13.8
11:57:38 AM	13.8	13.4
11:58:38 AM	13.9	13.2
11:59:38 AM	13.7	13.8
12:00:38 PM	13.8	13.5
12:01:38 PM	13.8	13.4
12:02:38 PM	13.8	13.5
12:03:38 PM	13.8	13.5
12:04:38 PM	13.8	13.5
12:05:38 PM	13.7	13.6
12:06:38 PM	13.7	13.7
12:07:38 PM	13.7	13.8
12:08:38 PM	13.7	13.6
12:09:38 PM	13.7	13.7
12:10:38 PM	13.7	13.6
12:11:38 PM	13.8	13.6
12:12:38 PM	13.8	13.5
12:13:38 PM	13.8	13.6
12:14:38 PM	13.9	13.6
12:15:38 PM	13.9	13.3
12:16:38 PM	13.8	13.5
12:17:38 PM	13.7	13.6
12:18:38 PM	13.7	13.8
12:19:38 PM	13.9	13.3
12:20:38 PM	13.9	13.4
12:21:38 PM	13.7	13.7
12:22:38 PM	13.6	13.9
12:23:38 PM	13.4	13.9
12:24:38 PM	13.5	13.7
12:25:38 PM	13.8	13.7
12:26:38 PM	13.7	13.8
12:27:38 PM	13.7	13.7
Run Avgs	13.7	13.7
Cal Gas	12.1	10.2
Initial Zero	0.4	0.1
Final Zero	0.5	0.3
Initial cal.	12.5	10.0
Final Cal.	12.6	9.9
Corrected Average	13.2	14.1

Client: Holcim Hagerstpn
 Test Location: Main Stack Mill On
 Date: Mar 13 24 Start Time: 12:50:34
 Run number 3
 One Minute Averages

	O2 %,dry	CO2 %,dry
12:51:32 PM	13.4	14.1
12:52:32 PM	13.3	14.2
12:53:32 PM	13.4	14.0
12:54:32 PM	13.3	14.1
12:55:32 PM	13.7	13.8
12:56:32 PM	13.8	13.7
12:57:32 PM	13.8	13.6
12:58:32 PM	13.7	13.7
12:59:32 PM	13.7	13.6
1:00:32 PM	13.7	13.7
1:01:32 PM	13.7	13.6
1:02:32 PM	13.7	13.7
1:03:32 PM	13.7	13.6
1:04:32 PM	13.6	13.7
1:05:32 PM	13.7	13.7
1:06:32 PM	13.7	13.6
1:07:32 PM	13.7	13.8
1:08:32 PM	13.7	13.8
1:09:32 PM	13.6	13.7
1:10:32 PM	13.7	13.7
1:11:32 PM	13.7	13.7
1:12:32 PM	13.7	13.6
1:13:32 PM	13.7	13.7
1:14:32 PM	13.7	13.7
1:15:32 PM	13.7	13.8
1:16:32 PM	13.7	13.6
1:17:32 PM	13.8	13.6
1:18:32 PM	13.8	13.7
1:19:32 PM	13.8	13.6
1:20:32 PM	13.5	14.0
1:21:32 PM	14.1	13.1
1:22:32 PM	13.2	14.6
1:23:32 PM	13.6	13.9
1:24:32 PM	13.7	13.7
1:25:32 PM	13.6	13.9
1:26:32 PM	13.6	13.9
1:27:32 PM	13.8	13.6
1:28:32 PM	13.7	13.6
1:29:32 PM	13.8	13.5
1:30:32 PM	13.7	13.7
1:31:32 PM	13.7	13.6
1:32:32 PM	13.7	13.8
1:33:32 PM	13.7	13.8
1:34:32 PM	13.6	13.9
1:35:32 PM	13.6	13.8
1:36:32 PM	13.7	13.4
1:37:32 PM	14.0	13.1
1:38:32 PM	14.1	12.8
1:39:32 PM	14.1	12.8
1:40:32 PM	14.3	12.5
1:41:32 PM	14.2	12.8
1:42:32 PM	14.2	12.7
1:43:32 PM	14.4	12.3
1:44:32 PM	14.4	12.3
1:45:32 PM	14.4	12.5
1:46:32 PM	14.4	12.3
1:47:32 PM	14.2	12.5
1:48:32 PM	14.2	12.7
1:49:32 PM	14.4	12.3
1:50:32 PM	14.5	12.1
Run Avgs	13.8	13.5
Cal Gas	12.1	10.2
Initial Zero	0.5	0.3
Final Zero	0.4	0.2
Initial cal.	12.6	9.9
Final Cal.	12.5	10.1
Corrected Average	13.4	13.8

Client: Holcim Hagerstpn
 Test Location: Main Stack Mill On
 Date: Mar 15 24 Start Time: 12:20:04
 Run number 7
 One Minute Averages

	O2 %,dry	CO2 %,dry
12:21:02 PM	13.4	13.3
12:22:02 PM	13.5	13.5
12:23:02 PM	13.3	13.7
12:24:02 PM	13.3	13.6
12:25:02 PM	13.3	13.5
12:26:02 PM	13.4	13.6
12:27:02 PM	13.2	13.8
12:28:02 PM	13.2	13.8
12:29:02 PM	13.2	13.7
12:30:02 PM	13.3	13.7
12:31:02 PM	13.3	13.6
12:32:02 PM	13.4	13.5
12:33:02 PM	13.4	13.6
12:34:02 PM	13.2	14.0
12:35:02 PM	13.2	13.6
12:36:02 PM	13.4	13.4
12:37:02 PM	13.5	13.5
12:38:02 PM	13.3	13.7
12:39:02 PM	13.3	13.6
12:40:02 PM	13.3	13.5
12:41:02 PM	13.3	13.7
12:42:02 PM	13.1	13.8
12:43:02 PM	13.2	13.7
12:44:02 PM	13.3	13.4
12:45:02 PM	13.3	13.7
12:46:02 PM	13.1	13.8
12:47:02 PM	13.2	13.8
12:48:02 PM	13.2	13.6
12:49:02 PM	13.2	14.0
12:50:02 PM	13.2	13.7
12:51:02 PM	13.3	13.5
12:52:02 PM	13.3	13.7
12:53:02 PM	13.3	13.8
12:54:02 PM	13.2	13.7
12:55:02 PM	13.3	13.7
12:56:02 PM	13.3	13.7
12:57:02 PM	13.1	13.8
12:58:02 PM	13.2	13.7
12:59:02 PM	13.2	13.6
1:00:02 PM	13.3	13.6
1:01:02 PM	13.1	13.9
1:02:02 PM	13.2	13.7
1:03:02 PM	13.3	13.6
1:04:02 PM	13.3	13.8
1:05:02 PM	13.2	13.7
1:06:02 PM	13.2	13.7
1:07:02 PM	13.3	13.6
1:08:02 PM	13.2	13.9
1:09:02 PM	13.1	13.7
1:10:02 PM	13.2	13.5
1:11:02 PM	13.3	13.7
1:12:02 PM	13.2	13.7
1:13:02 PM	13.3	13.5
1:14:02 PM	13.3	13.4
1:15:02 PM	13.3	13.6
1:16:02 PM	13.2	13.7
1:17:02 PM	13.3	13.5
1:18:02 PM	13.4	13.4
1:19:02 PM	13.4	13.6
1:20:02 PM	13.3	13.6
Run Avgs	13.3	13.6
Cal Gas	12.1	10.2
Initial Zero	0.4	0.0
Final Zero	0.4	0.1
Initial cal.	12.2	9.9
Final Cal.	12.2	9.8
Corrected Average	13.2	14.1

Client: Holcim Hagerstpn
 Test Location: Main Stack Mill On *ff*
 Date: Mar 13 24 Start Time: 14:20:04
 Run number 4
 One Minute Averages

	O2 %,dry	CO2 %,dry
2:21:02 PM	15.3	10.7
2:22:02 PM	15.3	10.7
2:23:02 PM	15.2	11.0
2:24:02 PM	15.2	10.9
2:25:02 PM	15.2	10.9
2:26:02 PM	14.5	12.0
2:27:02 PM	14.4	12.3
2:28:02 PM	14.3	12.3
2:29:02 PM	14.4	12.3
2:30:02 PM	14.5	12.3
2:31:02 PM	14.4	12.2
2:32:02 PM	14.5	12.1
2:33:02 PM	14.5	12.1
2:34:02 PM	14.5	12.2
2:35:02 PM	14.4	12.2
2:36:02 PM	14.4	12.1
2:37:02 PM	14.5	12.1
2:38:02 PM	14.4	12.2
2:39:02 PM	14.5	12.2
2:40:02 PM	14.5	12.0
2:41:02 PM	14.4	12.3
2:42:02 PM	14.4	12.2
2:43:02 PM	14.4	12.2
2:44:02 PM	14.4	12.2
2:45:02 PM	14.4	12.3
2:46:02 PM	14.4	12.3
2:47:02 PM	14.4	12.1
2:48:02 PM	14.4	12.3
2:49:02 PM	14.3	12.5
2:50:02 PM	14.3	12.4
2:51:02 PM	14.2	12.5
2:52:02 PM	14.3	12.4
2:53:02 PM	14.3	12.4
2:54:02 PM	14.3	12.3
2:55:02 PM	14.4	12.1
2:56:02 PM	14.5	12.1
2:57:02 PM	14.4	12.3
2:58:02 PM	14.4	12.3
2:59:02 PM	14.2	12.4
3:00:02 PM	14.4	12.2
3:01:02 PM	14.4	12.4
3:02:02 PM	14.4	12.2
3:03:02 PM	14.3	12.3
3:04:02 PM	14.6	12.1
3:05:02 PM	14.5	12.2
3:06:02 PM	14.4	12.2
3:07:02 PM	14.4	12.2
3:08:02 PM	14.4	12.4
3:09:02 PM	14.4	12.2
3:10:02 PM	14.5	12.2
3:11:02 PM	14.4	12.4
3:12:02 PM	14.4	12.4
3:13:02 PM	14.4	12.3
3:14:02 PM	14.4	12.3
3:15:02 PM	14.4	12.4
3:16:02 PM	14.3	12.4
3:17:02 PM	14.4	12.2
3:18:02 PM	14.5	12.0
3:19:02 PM	14.5	12.1
3:20:02 PM	14.4	12.3
Run Avgs	14.5	12.1
Cal Gas	12.1	10.2
Initial Zero	0.3	0.1
Final Zero	0.5	0.3
Initial cal.	12.4	10.0
Final Cal.	12.5	10.1
Corrected Average	14.1	12.4

Client: Holcim Hagerstown
 Test Location: Main Stack Mill Off
 Date: Mar 13 24 Start Time: 15:43:04
 Run number 5
 One Minute Averages

	O2 %,dry	CO2 %,dry
3:44:02 PM	14.5	12.2
3:45:02 PM	14.5	12.2
3:46:02 PM	14.5	12.2
3:47:02 PM	14.5	12.1
3:48:02 PM	14.5	12.1
3:49:02 PM	14.4	12.3
3:50:02 PM	14.3	12.5
3:51:02 PM	14.4	12.2
3:52:02 PM	14.5	12.2
3:53:02 PM	14.7	12.0
3:54:02 PM	14.6	12.1
3:55:02 PM	14.6	12.2
3:56:02 PM	14.6	12.1
3:57:02 PM	14.6	12.3
3:58:02 PM	14.6	12.0
3:59:02 PM	14.6	11.9
4:00:02 PM	14.6	11.9
4:01:02 PM	14.6	12.2
4:02:02 PM	14.7	11.9
4:03:02 PM	14.7	11.8
4:04:02 PM	14.8	11.9
4:05:02 PM	14.7	12.0
4:06:02 PM	14.7	11.9
4:07:02 PM	14.8	11.8
4:08:02 PM	14.6	12.0
4:09:02 PM	14.6	12.1
4:10:02 PM	14.8	11.8
4:11:02 PM	14.8	11.8
4:12:02 PM	14.7	12.0
4:13:02 PM	14.7	11.9
4:14:02 PM	14.8	11.7
4:15:02 PM	14.8	11.6
4:16:02 PM	14.8	11.8
4:17:02 PM	14.8	11.7
4:18:02 PM	14.8	11.8
4:19:02 PM	14.8	11.7
4:20:02 PM	14.7	11.9
4:21:02 PM	14.7	11.9
4:22:02 PM	15.0	11.3
4:23:02 PM	15.0	11.2
4:24:02 PM	15.1	11.2
4:25:02 PM	15.1	11.2
4:26:02 PM	15.1	11.2
4:27:02 PM	15.1	11.2
4:28:02 PM	15.1	11.2
4:29:02 PM	15.1	11.1
4:30:02 PM	15.1	11.1
4:31:02 PM	15.1	11.3
4:32:02 PM	15.0	11.4
4:33:02 PM	15.0	11.3
4:34:02 PM	15.0	11.3
4:35:02 PM	15.1	11.2
4:36:02 PM	15.1	11.1
4:37:02 PM	15.1	11.2
4:38:02 PM	15.0	11.4
4:39:02 PM	14.9	11.4
4:40:02 PM	15.0	11.4
4:41:02 PM	15.1	11.0
4:42:02 PM	15.2	11.0
4:43:02 PM	15.1	11.2
Run Avgs	14.8	11.7
Cal Gas	12.1	10.2
Initial Zero	0.5	0.3
Final Zero	0.6	0.2
Initial cal.	12.5	10.1
Final Cal.	12.6	10.0
Corrected Average	14.4	11.9

Client: Holcim Hagerstpn
 Test Location: Main Stack Mill *Off*
 Date: Mar 13 24 Start Time: 17:20:04
 Run number 6
 One Minute Averages

	O2 %,dry	CO2 %,dry
5:21:02 PM	15.3	11.0
5:22:02 PM	15.4	10.8
5:23:02 PM	15.4	10.8
5:24:02 PM	15.4	10.9
5:25:02 PM	15.4	10.7
5:26:02 PM	15.4	10.7
5:27:02 PM	15.4	10.7
5:28:02 PM	15.4	11.0
5:29:02 PM	15.4	10.7
5:30:02 PM	15.5	10.7
5:31:02 PM	15.4	10.7
5:32:02 PM	15.4	10.8
5:33:02 PM	15.5	10.6
5:34:02 PM	15.6	10.6
5:35:02 PM	15.5	10.7
5:36:02 PM	15.5	10.7
5:37:02 PM	15.5	10.7
5:38:02 PM	15.5	10.6
5:39:02 PM	15.4	10.8
5:40:02 PM	15.4	10.8
5:41:02 PM	15.4	10.7
5:42:02 PM	15.4	10.7
5:43:02 PM	15.4	10.8
5:44:02 PM	15.5	10.7
5:45:02 PM	15.5	10.6
5:46:02 PM	15.5	10.7
5:47:02 PM	15.4	10.8
5:48:02 PM	15.5	10.6
5:49:02 PM	15.4	10.6
5:50:02 PM	15.5	10.6
5:51:02 PM	15.3	10.8
5:52:02 PM	15.4	10.7
5:53:02 PM	15.3	10.9
5:54:02 PM	15.3	10.9
5:55:02 PM	15.3	10.9
5:56:02 PM	15.4	10.7
5:57:02 PM	15.4	10.7
5:58:02 PM	15.5	10.8
5:59:02 PM	15.5	10.7
6:00:02 PM	15.5	10.7
6:01:02 PM	15.4	10.7
6:02:02 PM	15.4	10.8
6:03:02 PM	15.4	10.7
6:04:02 PM	15.4	10.7
6:05:02 PM	15.5	10.7
6:06:02 PM	15.5	10.7
6:07:02 PM	15.4	10.9
6:08:02 PM	15.4	10.7
6:09:02 PM	15.4	10.8
6:10:02 PM	15.3	10.9
6:11:02 PM	15.5	10.7
6:12:02 PM	15.5	10.6
6:13:02 PM	15.5	10.8
6:14:02 PM	15.4	10.7
6:15:02 PM	15.4	10.7
6:16:02 PM	15.5	10.6
6:17:02 PM	15.5	10.8
6:18:02 PM	15.5	10.6
6:19:02 PM	15.4	10.7
6:20:02 PM	15.5	10.7
Run Avgs	15.4	10.7
Cal Gas	12.1	10.2
Initial Zero	0.6	0.2
Final Zero	0.5	0.2
Initial cal.	12.6	10.0
Final Cal.	12.6	10.0
Corrected Average	14.9	11.0

Holcim Hagerstown MD Kiln Main Stack; Raw Mill On and Off HCN Analyte Spikes									
Date	Time	@13:20 Lost							
		Mill On	Mill On	Mill On	Raw Mill	Mill Off	Mill Off	Mill Off	
	03/13/24	03/13/24	03/13/24	03/13/24	03/13/24	03/13/24	03/13/24	03/13/24	
	09:32-09:56	10:57-11:23	12:26-12:51	13:49-14:16	15:20-15:41	16:41-17:11	18:18-18:44		
	Pre 1	Post 1	Post 2	Post 3	Post 4	Post 5	Post 6		
	HCN	HCN	HCN	HCN	HCN	HCN	HCN		
Cs	CC768222	48.81	48.81	48.81	48.81	48.81	48.81		
	Spike Direct, ppm	4.95	4.95	4.95	4.95	4.95	4.95		
	SF6 Tracer Direct, ppm								
SF6	Diluted SF6 Tracer, ppm	0.346	0.338	0.339	0.328	0.319	0.314	0.329	
	Diluted SF6 Tracer, ppm	0.333	0.321	0.333	0.334	0.314	0.307	0.318	
	Average Diluted SF6 Tracer, ppm	0.340	0.330	0.336	0.331	0.317	0.311	0.324	
DF	Dilution Ratio	14.58	15.02	14.73	14.95	15.64	15.94	15.30	
	Total, ppm	3.686	3.610	3.494	3.352	3.783	3.635	3.708	
	Total, ppm	3.405	3.502	3.588	3.655	3.664	3.444	3.540	
Ct	Average Total, ppm	3.546	3.556	3.541	3.504	3.724	3.540	3.624	
	Pre Spike Native , ppm	0.612	0.555	0.632	0.747	0.792	0.683	1.015	
	Pre Spike Native , ppm	0.691	0.553	0.447	0.647	0.647	0.538	0.868	
	Post Spike Native , ppm	0.564	0.628	0.500	0.514	0.887	0.783	0.639	
	Post Spike Native , ppm	0.411	0.549	0.520	0.515	0.883	0.768	0.586	
Cn	Average Native , ppm	0.570	0.571	0.525	0.606	0.802	0.693	0.777	
	Spike Recovery	90.1%	93.0%	92.1%	90.0%	95.2%	94.4%	90.8%	
	CTS Direct (CC426155)								
	Ethylene Expected (ppm)	75.47						75.47	
	Ethylene Measured (ppm)	74.93						76.14	
	CTS Error	-0.7%						0.9%	

Holcim, Hagerstown MD
 Kiln Main Stack; Raw Mill On
 Pre Run 1 HCN Analyte Spike

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC__1819.LAB	03/13/24	09:30:56.600	0.276	0.251	1.172
SPC__1820.LAB	03/13/24	09:31:59.019	0.612	0.212	0.036
SPC__1821.LAB	03/13/24	09:33:01.622	0.691	0.214	0.001
SPC__1822.LAB	03/13/24	09:34:04.091	0.968	0.223	0.249
SPC__1823.LAB	03/13/24	09:35:06.661	3.624	0.209	0.355
SPC__1824.LAB	03/13/24	09:36:09.249	3.686	0.159	0.346
SPC__1825.LAB	03/13/24	09:37:11.725	3.405	0.184	0.333
SPC__1826.LAB	03/13/24	09:38:14.223	2.799	0.137	0.264
SPC__1827.LAB	03/13/24	09:39:16.853	0.902	0.164	-0.001
SPC__1828.LAB	03/13/24	09:40:19.584	0.720	0.129	-0.002
SPC__1829.LAB	03/13/24	09:41:21.902	0.709	0.176	0.004
SPC__1830.LAB	03/13/24	09:50:47.200	1.015	0.102	0.086
SPC__1831.LAB	03/13/24	09:51:49.615	0.240	0.017	-0.004
SPC__1832.LAB	03/13/24	09:52:52.199	0.259	0.192	-0.005
SPC__1833.LAB	03/13/24	09:53:54.695	1.026	0.167	-0.005
SPC__1834.LAB	03/13/24	09:54:57.234	0.564	0.141	-0.002
SPC__1835.LAB	03/13/24	09:55:59.803	0.411	0.178	-0.002
SPC__1836.LAB	03/13/24	09:57:02.300	0.638	0.099	0.002

Holcim, Hagerstown MD
 Kiln Main Stack; Raw Mill On
 Post Run 1 HCN Analyte Spike

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC__1893.LAB	03/13/24	10:56:26.882	0.738	0.052	-0.003
SPC__1894.LAB	03/13/24	10:57:29.422	0.555	0.056	-0.002
SPC__1895.LAB	03/13/24	10:58:31.950	0.553	0.044	0.000
SPC__1896.LAB	03/13/24	10:59:34.775	0.683	0.054	-0.001
SPC__1897.LAB	03/13/24	11:00:37.026	0.549	0.045	-0.002
SPC__1898.LAB	03/13/24	11:01:39.558	1.877	0.060	0.103
SPC__1899.LAB	03/13/24	11:02:42.096	3.610	0.054	0.338
SPC__1900.LAB	03/13/24	11:03:44.633	3.502	0.065	0.321
SPC__1901.LAB	03/13/24	11:04:47.162	2.841	0.081	0.466
SPC__1902.LAB	03/13/24	11:05:49.739	0.554	0.025	0.934
SPC__1903.LAB	03/13/24	11:06:52.236	0.583	0.062	0.934
SPC__1904.LAB	03/13/24	11:07:54.774	0.498	0.059	0.931
SPC__1905.LAB	03/13/24	11:08:57.342	0.322	0.075	0.925
SPC__1906.LAB	03/13/24	11:09:59.921	0.535	0.129	0.930
SPC__1907.LAB	03/13/24	11:11:02.411	0.446	0.094	0.925
SPC__1908.LAB	03/13/24	11:12:04.902	0.678	0.083	0.924
SPC__1909.LAB	03/13/24	11:13:07.478	0.533	0.066	1.100
SPC__1910.LAB	03/13/24	11:14:10.093	0.747	0.055	0.345
SPC__1911.LAB	03/13/24	11:15:12.504	0.289	0.033	0.191
SPC__1912.LAB	03/13/24	11:16:15.102	0.193	-0.013	-0.003
SPC__1913.LAB	03/13/24	11:17:17.576	0.286	0.002	-0.001
SPC__1914.LAB	03/13/24	11:18:20.159	0.262	0.080	-0.004
SPC__1915.LAB	03/13/24	11:20:33.843	0.404	0.066	-0.001
SPC__1916.LAB	03/13/24	11:21:36.036	0.628	0.128	-0.001
SPC__1917.LAB	03/13/24	11:22:38.577	0.549	0.028	-0.001
SPC__1918.LAB	03/13/24	11:23:41.159	0.757	0.065	-0.006

Holcim, Hagerstown MD
 Kiln Main Stack; Raw Mill On
 Post Run 2 HCN Analyte Spike

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC_1977.LAB	03/13/24	12:25:10.669	0.889	0.128	-0.006
SPC_1978.LAB	03/13/24	12:26:13.245	0.632	0.038	-0.002
SPC_1979.LAB	03/13/24	12:27:15.736	0.447	-0.002	-0.003
SPC_1980.LAB	03/13/24	12:28:18.309	0.501	0.106	-0.009
SPC_1981.LAB	03/13/24	12:29:20.807	2.557	0.035	0.165
SPC_1982.LAB	03/13/24	12:30:23.377	3.494	0.079	0.339
SPC_1983.LAB	03/13/24	12:31:25.870	3.588	0.033	0.333
SPC_1984.LAB	03/13/24	12:32:28.409	3.186	0.037	0.357
SPC_1985.LAB	03/13/24	12:33:30.978	0.715	0.026	0.921
SPC_1986.LAB	03/13/24	12:34:33.471	0.782	0.074	0.929
SPC_1987.LAB	03/13/24	12:35:36.042	0.319	0.054	0.938
SPC_1988.LAB	03/13/24	12:36:38.539	0.646	0.065	0.936
SPC_1989.LAB	03/13/24	12:37:41.114	0.463	0.093	0.933
SPC_1990.LAB	03/13/24	12:38:43.612	0.769	0.050	0.934
SPC_1991.LAB	03/13/24	12:39:46.182	0.560	0.039	0.933
SPC_1992.LAB	03/13/24	12:40:48.676	0.878	0.046	0.970
SPC_1993.LAB	03/13/24	12:41:51.281	0.002	0.182	0.230
SPC_1994.LAB	03/13/24	12:42:53.770	0.239	0.001	0.000
SPC_1995.LAB	03/13/24	12:44:58.842	0.434	-0.061	-0.007
SPC_1996.LAB	03/13/24	12:46:01.349	0.418	0.139	-0.002
SPC_1997.LAB	03/13/24	12:47:03.876	0.495	0.055	0.000
SPC_1998.LAB	03/13/24	12:48:06.748	0.694	0.007	-0.000
SPC_1999.LAB	03/13/24	12:49:09.030	0.641	0.093	0.000
SPC_2000.LAB	03/13/24	12:50:11.815	0.500	0.031	-0.002
SPC_2001.LAB	03/13/24	12:51:14.117	0.520	0.027	-0.003
SPC_2002.LAB	03/13/24	12:52:16.591	0.596	0.116	-0.003

Holcim, Hagerstown MD
 Kiln Main Stack; Raw Mill On
 Post Run 3 HCN Analyte Spike

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC_2055.LAB	03/13/24	13:47:30.817	0.803	0.030	-0.002
SPC_2056.LAB	03/13/24	13:48:33.387	0.747	0.001	-0.003
SPC_2057.LAB	03/13/24	13:49:35.970	0.647	0.023	-0.005
SPC_2058.LAB	03/13/24	13:50:38.562	0.863	0.020	-0.005
SPC_2059.LAB	03/13/24	13:51:40.955	0.631	0.026	0.000
SPC_2060.LAB	03/13/24	13:52:43.582	3.220	0.018	0.249
SPC_2061.LAB	03/13/24	13:53:46.016	3.531	0.010	0.334
SPC_2062.LAB	03/13/24	13:54:48.555	3.352	-0.022	0.328
SPC_2063.LAB	03/13/24	13:55:51.124	3.655	0.021	0.334
SPC_2064.LAB	03/13/24	13:56:53.619	0.876	0.016	0.817
SPC_2065.LAB	03/13/24	13:57:56.189	0.696	0.017	0.907
SPC_2066.LAB	03/13/24	13:58:58.685	0.647	0.037	0.912
SPC_2067.LAB	03/13/24	14:00:01.506	0.687	0.049	0.911
SPC_2068.LAB	03/13/24	14:01:03.757	0.524	0.037	0.906
SPC_2069.LAB	03/13/24	14:02:06.325	0.613	0.077	0.909
SPC_2070.LAB	03/13/24	14:03:08.886	0.543	-0.009	0.907
SPC_2071.LAB	03/13/24	14:04:11.361	0.619	0.046	0.909
SPC_2072.LAB	03/13/24	14:05:13.884	0.556	0.028	0.910
SPC_2073.LAB	03/13/24	14:06:16.417	0.609	0.025	0.909
SPC_2074.LAB	03/13/24	14:07:19.038	0.551	0.001	0.914
SPC_2075.LAB	03/13/24	14:08:21.485	0.393	0.037	0.710
SPC_2076.LAB	03/13/24	14:09:24.181	0.383	0.077	0.216
SPC_2077.LAB	03/13/24	14:10:26.550	0.164	-0.022	-0.004
SPC_2078.LAB	03/13/24	14:11:29.118	0.257	-0.014	-0.007
SPC_2079.LAB	03/13/24	14:15:22.181	0.514	-0.004	-0.003
SPC_2080.LAB	03/13/24	14:16:24.655	0.515	0.017	-0.001
SPC_2081.LAB	03/13/24	14:17:27.201	0.317	-0.003	-0.002

Holcim, Hagerstown MD
 Kiln Main Stack; Raw Mill Off
 Post Run 4 HCN Analyte Spike

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC__2139.LAB	03/13/24	15:17:54.237	0.846	0.047	-0.001
SPC__2140.LAB	03/13/24	15:18:56.677	1.215	0.018	-0.003
SPC__2141.LAB	03/13/24	15:19:59.210	0.792	0.007	-0.004
SPC__2142.LAB	03/13/24	15:21:01.778	0.647	0.026	-0.002
SPC__2143.LAB	03/13/24	15:22:04.275	0.916	0.020	-0.001
SPC__2144.LAB	03/13/24	15:23:06.807	2.203	0.028	0.076
SPC__2145.LAB	03/13/24	15:24:09.379	3.739	0.022	0.331
SPC__2146.LAB	03/13/24	15:25:11.874	3.783	0.008	0.319
SPC__2147.LAB	03/13/24	15:26:14.448	3.664	0.008	0.314
SPC__2148.LAB	03/13/24	15:27:17.027	1.135	0.007	0.869
SPC__2149.LAB	03/13/24	15:28:19.553	0.676	0.026	0.942
SPC__2150.LAB	03/13/24	15:29:22.049	0.492	-0.006	0.940
SPC__2151.LAB	03/13/24	15:30:24.546	0.574	0.053	0.942
SPC__2152.LAB	03/13/24	15:31:27.077	0.621	0.012	0.941
SPC__2153.LAB	03/13/24	15:32:29.606	0.677	0.002	0.938
SPC__2154.LAB	03/13/24	15:33:32.202	0.663	0.039	0.933
SPC__2155.LAB	03/13/24	15:34:34.714	0.611	0.082	0.932
SPC__2156.LAB	03/13/24	15:35:37.284	0.483	0.030	0.815
SPC__2157.LAB	03/13/24	15:36:39.730	0.639	0.151	0.200
SPC__2158.LAB	03/13/24	15:37:42.307	0.336	-0.006	-0.004
SPC__2159.LAB	03/13/24	15:38:44.807	0.432	0.150	0.001
SPC__2160.LAB	03/13/24	15:39:47.384	0.887	0.051	-0.002
SPC__2161.LAB	03/13/24	15:40:49.874	0.883	0.019	-0.002
SPC__2162.LAB	03/13/24	15:42:26.151	1.144	0.045	-0.006
SPC__2163.LAB	03/13/24	15:43:28.649	0.952	0.018	-0.002

Holcim, Hagerstown MD
 Kiln Main Stack; Raw Mill Off
 Post Run 5 HCN Analyte Spike

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC_2217.LAB	03/13/24	16:39:45.579	0.789	0.024	-0.001
SPC_2218.LAB	03/13/24	16:40:48.033	0.683	0.013	0.002
SPC_2219.LAB	03/13/24	16:41:50.571	0.538	-0.007	-0.004
SPC_2220.LAB	03/13/24	16:42:53.390	0.952	0.016	0.002
SPC_2221.LAB	03/13/24	16:43:55.637	1.068	0.019	0.005
SPC_2222.LAB	03/13/24	16:44:58.178	3.095	-0.002	0.244
SPC_2223.LAB	03/13/24	16:46:00.789	3.539	0.011	0.330
SPC_2224.LAB	03/13/24	16:47:03.301	3.635	-0.003	0.314
SPC_2225.LAB	03/13/24	16:48:05.816	3.444	-0.006	0.307
SPC_2226.LAB	03/13/24	16:49:08.313	2.623	-0.009	0.610
SPC_2227.LAB	03/13/24	16:50:11.182	0.827	-0.014	0.975
SPC_2228.LAB	03/13/24	16:51:13.387	0.687	0.115	0.978
SPC_2229.LAB	03/13/24	16:52:16.253	0.801	0.049	0.980
SPC_2230.LAB	03/13/24	16:53:18.453	0.570	0.145	0.981
SPC_2231.LAB	03/13/24	16:54:21.031	0.896	0.070	0.979
SPC_2232.LAB	03/13/24	16:55:23.524	0.639	0.091	0.975
SPC_2233.LAB	03/13/24	16:56:26.099	0.594	0.102	0.981
SPC_2234.LAB	03/13/24	16:57:28.631	0.877	0.086	0.982
SPC_2235.LAB	03/13/24	16:58:31.207	0.424	0.095	0.979
SPC_2236.LAB	03/13/24	16:59:33.706	0.570	-0.042	0.980
SPC_2237.LAB	03/13/24	17:00:36.206	0.761	0.021	0.982
SPC_2238.LAB	03/13/24	17:01:38.737	1.035	0.002	0.349
SPC_2239.LAB	03/13/24	17:02:41.312	0.609	-0.000	0.003
SPC_2240.LAB	03/13/24	17:03:43.813	0.673	-0.043	0.002
SPC_2241.LAB	03/13/24	17:04:46.443	0.328	-0.013	0.189
SPC_2242.LAB	03/13/24	17:05:48.863	0.426	-0.006	-0.001
SPC_2243.LAB	03/13/24	17:06:51.410	0.364	-0.012	-0.011
SPC_2244.LAB	03/13/24	17:07:54.067	0.171	0.012	-0.006
SPC_2245.LAB	03/13/24	17:08:56.485	0.767	0.017	-0.002
SPC_2246.LAB	03/13/24	17:09:59.064	0.783	-0.013	-0.003
SPC_2247.LAB	03/13/24	17:11:01.556	0.768	-0.004	-0.001
SPC_2248.LAB	03/13/24	17:12:04.130	0.940	-0.003	-0.004

Holcim, Hagerstown MD
 Kiln Main Stack; Raw Mill Off
 Post Run 6 HCN Analyte Spike

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C
SPC_2308.LAB	03/13/24	18:16:09.632	1.107	0.014	0.001	1.105
SPC_2309.LAB	03/13/24	18:17:12.126	1.201	0.094	-0.003	1.068
SPC_2310.LAB	03/13/24	18:18:15.545	1.015	0.060	0.002	1.099
SPC_2311.LAB	03/13/24	18:19:17.161	0.868	0.022	0.000	1.096
SPC_2312.LAB	03/13/24	18:20:19.792	1.004	0.033	-0.000	1.064
SPC_2313.LAB	03/13/24	18:21:22.345	1.977	0.083	0.050	1.069
SPC_2314.LAB	03/13/24	18:22:24.768	3.708	0.092	0.329	0.940
SPC_2315.LAB	03/13/24	18:23:27.309	3.540	0.085	0.318	0.930
SPC_2316.LAB	03/13/24	18:24:29.840	3.292	0.044	0.291	0.950
SPC_2317.LAB	03/13/24	18:25:32.417	2.061	0.013	0.800	0.822
SPC_2318.LAB	03/13/24	18:26:35.057	0.848	0.149	0.949	0.776
SPC_2319.LAB	03/13/24	18:27:37.527	0.791	0.173	0.947	0.810
SPC_2320.LAB	03/13/24	18:28:39.981	0.756	0.205	0.948	0.712
SPC_2321.LAB	03/13/24	18:29:42.554	0.676	0.055	0.943	0.807
SPC_2322.LAB	03/13/24	18:30:45.055	0.806	0.086	0.944	0.737
SPC_2323.LAB	03/13/24	18:31:47.591	0.965	0.157	0.941	0.742
SPC_2324.LAB	03/13/24	18:32:50.203	0.417	0.162	0.944	0.774
SPC_2325.LAB	03/13/24	18:33:52.690	0.454	-0.013	0.011	-0.062
SPC_2326.LAB	03/13/24	18:34:55.192	0.524	-0.015	-0.008	0.081
SPC_2327.LAB	03/13/24	18:35:57.741	0.260	0.110	-0.003	0.310
SPC_2328.LAB	03/13/24	18:37:00.358	0.486	0.071	0.001	1.026
SPC_2329.LAB	03/13/24	18:38:02.807	0.639	0.084	0.003	1.041
SPC_2330.LAB	03/13/24	18:39:05.348	0.586	0.111	-0.004	1.009
SPC_2331.LAB	03/13/24	18:40:07.907	0.321	0.054	-0.009	58.871
SPC_2332.LAB	03/13/24	18:41:10.402	0.124	-0.024	-0.011	76.550
SPC_2333.LAB	03/13/24	18:42:12.997	0.286	-0.022	-0.013	76.537
SPC_2334.LAB	03/13/24	18:43:15.599	0.214	-0.026	-0.009	76.434
SPC_2335.LAB	03/13/24	18:44:18.115	0.231	-0.021	-0.014	75.836
SPC_2336.LAB	03/13/24	18:45:20.554	0.383	-0.014	-0.012	73.920

Holcim, Hagerstown MD

Kiln Main Stack

CTS and HCN Analyte Spike Direct

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C
SPC__1752.LAB	03/13/24	08:10:42.742	-0.060	0.044	-0.018	60.150
SPC__1753.LAB	03/13/24	08:11:45.269	-0.070	-0.014	-0.012	75.090
SPC__1754.LAB	03/13/24	08:12:47.843	-0.036	-0.031	-0.014	74.761
Ethylene CTS (CC426155) Average						74.926
SPC__1755.LAB	03/13/24	08:13:50.341	2.193	-0.027	0.250	71.049
SPC__1756.LAB	03/13/24	08:14:52.909	14.031	0.005	1.512	51.416
SPC__1757.LAB	03/13/24	08:15:55.442	14.804	0.030	1.671	48.594
SPC__1758.LAB	03/13/24	08:16:58.031	14.114	-0.011	1.676	48.993
SPC__1759.LAB	03/13/24	08:18:00.638	38.281	-0.014	3.980	13.140
SPC__1760.LAB	03/13/24	08:19:03.050	48.644	-0.017	4.949	-0.558
SPC__1761.LAB	03/13/24	08:20:05.537	48.756	-0.013	4.951	-0.521
SPC__1762.LAB	03/13/24	08:21:08.064	48.814	-0.033	4.950	-0.578
SPC__1763.LAB	03/13/24	08:22:10.675	49.044	-0.006	4.951	-0.562
HCN Analyte Spike (CC768222) Averages			48.814		4.950	

**Holcim
Hagerstown MD
Kiln Main Stack; Raw Mill On
HCN Analyte Spikes**

	Date Time	MIII On 03/15/24 10:29-10:59	MIII On 03/15/24 13:16-13:57
		Pre 4 HCN	Post 4 HCN
Cs	CC768222		
	Spike Direct, ppm	48.08	48.08
	SF6 Tracer Direct, ppm	4.95	4.95
SF6	Diluted SF6 Tracer, ppm	0.375	0.402
	Diluted SF6 Tracer, ppm	0.366	0.391
	Average Diluted SF6 Tracer, ppm	0.371	0.397
DF	Dilution Ratio	13.36	12.48
Ct	Total, ppm	3.462	5.314
	Total, ppm	3.386	5.025
	Average Total, ppm	3.424	5.170
Cn	Pre Spike Native , ppm	0.000	1.843
	Pre Spike Native , ppm	0.600	1.754
	Post Spike Native , ppm	0.545	1.642
	Post Spike Native , ppm	0.561	1.528
	Average Native , ppm	0.427	1.692
	Spike Recovery	84.2%	93.8%
	CTS Direct (CC426155)		
	Ethylene Expected (ppm)	75.47	75.47
	Ethylene Measured (ppm)	75.61	74.82
	CTS Error	0.2%	-0.9%

Holcim, Hagerstown MD
 Kiln Main Stack; Raw Mill On
 Pre Run 4 HCN Analyte Spike

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C
SPC_2429.LAB	03/15/24	10:28:04.207	0.181	0.310	0.000
SPC_2430.LAB	03/15/24	10:29:06.713	-0.128	0.242	-0.001
SPC_2431.LAB	03/15/24	10:30:09.214	0.600	0.236	0.049
SPC_2432.LAB	03/15/24	10:31:12.087	3.227	0.187	0.384
SPC_2433.LAB	03/15/24	10:32:14.296	3.462	0.216	0.375
SPC_2434.LAB	03/15/24	10:33:16.908	3.386	0.195	0.366
SPC_2435.LAB	03/15/24	10:34:19.369	3.094	0.188	0.358
SPC_2436.LAB	03/15/24	10:35:21.913	3.305	0.132	0.442
SPC_2437.LAB	03/15/24	10:36:24.446	0.096	0.137	1.386
SPC_2438.LAB	03/15/24	10:37:27.025	-0.080	0.152	1.393
SPC_2439.LAB	03/15/24	10:38:29.530	0.002	0.217	1.245
SPC_2440.LAB	03/15/24	10:39:32.105	-0.059	0.181	1.064
SPC_2441.LAB	03/15/24	10:40:34.602	0.060	0.161	1.062
SPC_2442.LAB	03/15/24	10:41:37.153	0.121	0.137	1.060
SPC_2443.LAB	03/15/24	10:42:39.682	0.291	0.118	1.068
SPC_2444.LAB	03/15/24	10:43:42.517	-0.130	0.152	1.068
SPC_2445.LAB	03/15/24	10:44:44.765	0.068	0.171	1.069
SPC_2446.LAB	03/15/24	10:45:47.293	-0.008	0.130	0.368
SPC_2447.LAB	03/15/24	10:46:49.901	-0.042	0.036	-0.002
SPC_2448.LAB	03/15/24	10:47:52.435	-0.105	0.164	0.002
SPC_2449.LAB	03/15/24	10:48:54.920	-0.041	0.156	-0.001
SPC_2450.LAB	03/15/24	10:49:57.587	-0.070	0.085	0.000
SPC_2451.LAB	03/15/24	10:51:00.009	-0.038	0.065	0.002
SPC_2452.LAB	03/15/24	10:52:02.602	0.311	0.063	-0.001
SPC_2453.LAB	03/15/24	10:53:05.091	0.155	0.094	-0.000
SPC_2454.LAB	03/15/24	10:54:07.633	0.060	0.112	0.002
SPC_2455.LAB	03/15/24	10:55:10.179	0.142	0.042	-0.001
SPC_2456.LAB	03/15/24	10:56:12.787	0.911	0.077	0.000
SPC_2457.LAB	03/15/24	10:57:15.359	0.418	0.070	0.001
SPC_2458.LAB	03/15/24	10:58:17.841	0.545	-0.002	-0.000
SPC_2459.LAB	03/15/24	10:59:20.345	0.561	0.045	-0.001
SPC_2460.LAB	03/15/24	11:00:22.888	0.525	0.048	-0.001

Holcim, Hagerstown MD

Kiln Main Stack; Raw Mill On

Post Run 4 HCN Analyte Spike

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C
SPC_2589.LAB	03/15/24	13:15:48.205	1.739	-0.027	-0.000	3.431
SPC_2590.LAB	03/15/24	13:16:50.771	1.843	-0.026	0.002	3.269
SPC_2591.LAB	03/15/24	13:17:53.404	1.754	-0.036	-0.003	3.286
SPC_2592.LAB	03/15/24	13:18:55.976	1.590	-0.046	-0.002	3.296
SPC_2593.LAB	03/15/24	13:19:58.400	2.182	-0.062	-0.002	3.426
SPC_2594.LAB	03/15/24	13:21:01.013	1.679	-0.020	0.009	3.201
SPC_2595.LAB	03/15/24	13:22:49.856	5.314	-0.039	0.402	3.044
SPC_2596.LAB	03/15/24	13:23:52.395	5.025	-0.022	0.391	2.938
SPC_2597.LAB	03/15/24	13:24:54.940	4.458	-0.037	0.534	2.968
SPC_2598.LAB	03/15/24	13:25:57.514	1.852	-0.032	1.076	2.861
SPC_2599.LAB	03/15/24	13:27:00.108	1.682	-0.011	1.077	2.843
SPC_2600.LAB	03/15/24	13:28:02.847	1.545	-0.030	1.083	2.770
SPC_2601.LAB	03/15/24	13:29:05.091	1.542	-0.045	1.077	2.765
SPC_2602.LAB	03/15/24	13:30:07.630	1.673	-0.001	1.080	2.674
SPC_2603.LAB	03/15/24	13:31:10.206	1.587	-0.030	1.092	2.784
SPC_2604.LAB	03/15/24	13:32:12.710	1.610	-0.050	1.082	2.702
SPC_2605.LAB	03/15/24	13:33:15.311	1.637	-0.029	1.082	2.615
SPC_2606.LAB	03/15/24	13:34:17.794	1.656	-0.031	0.245	3.144
SPC_2607.LAB	03/15/24	13:35:20.400	0.881	0.042	0.214	1.797
SPC_2608.LAB	03/15/24	13:36:22.986	-0.043	0.022	-0.000	0.083
SPC_2609.LAB	03/15/24	13:37:25.405	0.110	-0.023	-0.002	0.169
SPC_2610.LAB	03/15/24	13:38:27.997	0.582	0.122	-0.002	1.422
SPC_2611.LAB	03/15/24	13:39:30.782	1.642	-0.027	-0.003	3.186
SPC_2612.LAB	03/15/24	13:40:33.088	1.528	-0.065	-0.004	3.114
SPC_2613.LAB	03/15/24	13:41:35.557	1.501	-0.020	-0.001	3.029
SPC_2614.LAB	03/15/24	13:42:38.085	-0.028	0.016	0.000	0.055
SPC_2615.LAB	03/15/24	13:43:40.793	0.017	-0.016	0.001	0.024
SPC_2616.LAB	03/15/24	13:44:43.209	-0.024	-0.021	0.000	-0.074
SPC_2617.LAB	03/15/24	13:45:45.787	0.089	0.007	-0.001	-0.020
SPC_2618.LAB	03/15/24	13:46:48.284	-0.038	0.006	0.002	0.067
SPC_2619.LAB	03/15/24	13:47:50.874	0.045	0.038	-0.000	0.040
SPC_2620.LAB	03/15/24	13:48:53.418	0.537	-0.004	0.184	0.038
SPC_2621.LAB	03/15/24	13:49:55.905	1.432	0.001	0.280	0.024
SPC_2622.LAB	03/15/24	13:50:58.408	0.166	0.007	0.018	0.032
SPC_2623.LAB	03/15/24	13:52:00.990	0.170	-0.001	0.009	0.025
SPC_2624.LAB	03/15/24	13:53:03.494	0.149	-0.002	0.006	0.046
SPC_2625.LAB	03/15/24	13:54:06.113	0.017	0.022	-0.016	28.207
SPC_2626.LAB	03/15/24	13:55:08.568	0.097	-0.017	-0.011	74.533
SPC_2627.LAB	03/15/24	13:56:11.204	-0.119	-0.003	-0.012	74.679
SPC_2628.LAB	03/15/24	13:57:13.687	-0.043	-0.009	-0.015	74.968
SPC_2629.LAB	03/15/24	13:58:16.188	0.123	-0.034	-0.016	35.298

Holcim, Hagerstown MD
 Kiln Main Stack; Raw Mill On
 CTS and HCN Direct

Spectrum	Date	Time	HCN 9 (200) PCA 191C R1 191c	HF ppm (10) 191C	SF6 (10) 191C	Ethylene (100,3000) 191C
SPC_2337.LAB	03/15/24	08:00:26.858	-0.103	-0.036	-0.004	-0.123
SPC_2338BKG.LAB	03/15/24	08:02:48.410	0.000	0.000	0.000	0.000
SPC_2339.LAB	03/15/24	08:03:56.774	-0.194	-0.016	0.001	-0.104
SPC_2340.LAB	03/15/24	08:04:59.317	-0.100	-0.005	0.004	-0.025
SPC_2341BKG.LAB	03/15/24	08:07:28.824	0.000	0.000	0.000	0.000
SPC_2342BKG.LAB	03/15/24	08:09:41.397	0.000	0.000	0.000	0.000
SPC_2343.LAB	03/15/24	08:10:49.804	0.075	0.014	0.003	0.029
SPC_2344.LAB	03/15/24	08:11:52.166	0.012	0.012	-0.012	64.852
SPC_2345.LAB	03/15/24	08:12:57.058	0.017	-0.004	-0.011	75.603
SPC_2346.LAB	03/15/24	08:13:57.250	0.034	-0.006	-0.010	75.606
Ethylene CTS (CC426155) Average						75.605
SPC_2347.LAB	03/15/24	08:14:59.782	16.280	0.018	1.655	44.462
SPC_2348.LAB	03/15/24	08:16:02.360	47.481	0.020	4.947	-0.530
SPC_2349.LAB	03/15/24	08:17:04.921	47.916	-0.027	4.944	-0.568
SPC_2350.LAB	03/15/24	08:18:07.394	48.251	0.023	4.955	-0.545
HCN Analyte Spike (CC768222) Averages			48.083		4.950	

Appendix C

Ion Chromatography Analytical Report Data

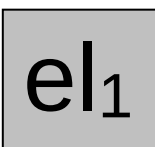
Deeco, Inc.
3404 Lake Woodard Drive
Raleigh, NC 27604

Project No: 24-3331
Holcim Hagerstown

Hydrogen Fluoride & Chlorine

EPA Method 26A Analysis

Analytical Report
42190



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 42190
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
March 22, 2024

Report Reviewed and Finalized by:



Ken Smith, Laboratory Director
March 22, 2024

SUMMARY OF RESULTS

Summary of Analysis

Summary of Method 26A Analysis

	Main Stack Mill On- M26A-R1A e42190-1	Main Stack Mill On- M26A-R2A e42190-2	Main Stack Mill On- M26A-R7A e42190-3
Element	Total mg	Total mg	Total mg
HF	< 0.203	< 0.184	< 0.195
Cl ₂	< 0.163	< 0.165	< 0.153

	Main Stack Mill Off- M26A-R4A e42190-4	Main Stack Mill Off- M26A-R5A e42190-5	Main Stack Mill Off- M26A-R6A e42190-6
Element	Total mg	Total mg	Total mg
HF	< 0.208	< 0.203	< 0.195
Cl ₂	<0.153	0.306	0.228

	Main Stack Mill On- M26A-R1B e42190-7	Main Stack Mill On- M26A-R2B e42190-8	Main Stack Mill On- M26A-R7B e42190-9
Element	Total mg	Total mg	Total mg
HF	< 0.197	< 0.203	< 0.195
Cl ₂	< 0.153	0.229	0.235

	Main Stack Mill Off- M26A-R4B e42190-10	Main Stack Mill Off- M26A-R5B e42190-11	Main Stack Mill Off- M26A-R6B e42190-12
Element	Total mg	Total mg	Total mg
HF	< 0.211	< 0.205	< 0.195
Cl ₂	0.238	0.159	0.230

	Main Stack Mill On- M26A-FB e42190-13	Main Stack Mill Off- M26A-FB e42190-14
Element	Total mg	Total mg
HF	< 0.163	< 0.171
Cl ₂	< 0.160	< 0.155

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ANALYTICAL NARRATIVE

Element One Analytical Narrative

Client:	Deeco, Inc.	Element One #:	42190
Client ID:	23-3309 Holcim Hagerstown	Analyst:	LAW
Method:	M26A	Dates Received:	03.18.24
Analytes:	HF, Cl ₂	Dates Analyzed:	03.19-21.24

Summary of Analysis

The samples were prepared and analyzed according to Method 26A protocol. The samples were analyzed for fluoride and chloride on Metrohm 930/858 and 881/858 ion 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)

	Main Stack Mill On- M26A-R1A	Main Stack Mill On- M26A-R2A	Main Stack Mill On- M26A-R7A
Element	RPD	RPD	RPD
HF	NA	NA	NA
Cl ₂	NA	NA	NA

	Main Stack Mill Off- M26A-R4A	Main Stack Mill Off- M26A-R5A	Main Stack Mill Off- M26A-R6A
Element	RPD	RPD	RPD
HF	NA	NA	NA
Cl ₂	NA	3.5%	4.0%

	Main Stack Mill On- M26A-R1B	Main Stack Mill On- M26A-R2B	Main Stack Mill On- M26A-R7B
Element	RPD	RPD	RPD
HF	NA	NA	NA
Cl ₂	NA	3.4%	3.8%

	Main Stack Mill Off- M26A-R4B	Main Stack Mill Off- M26A-R5B	Main Stack Mill Off- M26A-R6B
Element	RPD	RPD	RPD
HF	NA	NA	NA
Cl ₂	0.0%	1.0%	2.1%

	Main Stack Mill On- M26A-FB	Main Stack Mill Off- M26A-FB
Element	RPD	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	Main Stack Mill On- M26A-R7A Recovery	Main Stack Mill Off- M26A-R6A Recovery
HF	93%	94%
Cl ₂	101%	103%

Element	Main Stack Mill On- M26A-R7B Recovery	Main Stack Mill Off- M26A-R6B Recovery
HF	94%	95%
Cl ₂	103%	106%

Second Source Calibration Verification

(*Laboratory QC limits: 90-110%)

Element	DL 0.1mg/L Recovery	*QC 5.0mg/L Recovery
HF	108%	102%
Cl ₂	101%	95%

SAMPLE CUSTODY

DEECO, Inc 3404 Lake Woodard Dr. Raleigh, NC 27604 919-250-0285				Date: 03/13/24 Lab: ElementOne Train: EPA-Method 26A		42190	
Plant Name: Holcim Relinquished by: (Signature) <i>[Signature]</i> Relinquished by: (Signature)		Plant Location: Hagerstown Received by: (Signature) <i>[Signature]</i> Received by: (Signature)		Project Name: 24-3331 Comments			
Date/Time: 3/18/24 Date/Time		Date/Time: 3-18-24 Date/Time		Comments			
Date/Time Relinquished by: (Signature)		Date/Time Relinquished by: (Signature)		Comments			
Date/Time Relinquished by: (Signature)		Date/Time Relinquished by: (Signature)		Comments			
Date/Time Relinquished by: (Signature)		Date/Time Relinquished by: (Signature)		Comments			
Field Sample No.	Date	Composite or Grab	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
Main Stack-M26A-H2SO4-1A-Mill On	03/13/24	Composite	HF Cl2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH-1A-Mill On	03/13/24	Composite	HF Cl2	EPA Method 26A	NaOH Imp/Rinse		ElementOne
Main Stack-M26A-H2SO4-1B-Mill On	03/13/24	Composite	HF Cl2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH-1B-Mill On	03/13/24	Composite	HF Cl2	EPA Method 26A	NaOH Imp/Rinse		ElementOne
Main Stack-M26A-H2SO4-2A-Mill On	03/13/24	Composite	HF Cl2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH-2A-Mill On	03/13/24	Composite	HF Cl2	EPA Method 26A	NaOH Imp/Rinse		ElementOne
Main Stack-M26A-H2SO4-2B-Mill On	03/13/24	Composite	HF Cl2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH-2B-Mill On	03/13/24	Composite	HF Cl2	EPA Method 26A	NaOH Imp/Rinse		ElementOne

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

elementOne

DEECO, Inc 3404 Lake Woodard Dr. Raleigh, NC 27604 919-250-0285				42190 Date: 03/13/24 Lab: ElementOne Train: EPA Method 26A	
Plant Name: Holcim		Plant Location: Hagerstown		Project Name: 24-3331	
Relinquished by: (Signature) <i>[Signature]</i>	Date/Time 3/11/24	Received by: (Signature) <i>[Signature]</i>	Date/Time 3/18/24	Comments	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments	
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
Main Stack-M26A-H2SO4-4A-Mill Off	03/13/24	Composite	HF Cl2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH-4A-Mill Off	03/13/24	Composite	HF Cl2	EPA Method 26A	NaOH Imp/Rinse		ElementOne
Main Stack-M26A-H2SO4-4B-Mill Off	03/13/24	Composite	HF Cl2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH-4B-Mill Off	03/13/24	Composite	HF Cl2	EPA Method 26A	NaOH Imp/Rinse		ElementOne
Main Stack-M26A-H2SO4-5A-Mill Off	03/13/24	Composite	HF Cl2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH-5A-Mill Off	03/13/24	Composite	HF Cl2	EPA Method 26A	NaOH Imp/Rinse		ElementOne
Main Stack-M26A-H2SO4-5B-Mill Off	03/13/24	Composite	HF Cl2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH-5B-Mill Off	03/13/24	Composite	HF Cl2	EPA Method 26A	NaOH Imp/Rinse		ElementOne

DEECO, Inc 3404 Lake Woodard Dr. Raleigh, NC 27604 919-250-0285				42190 Date: 03/13/24 Lab: ElementOne Train: EPA Method 26A			
Plant Name: Holcim		Plant Location: Hagerstown		Project Name: 24-3331			
Relinquished by: (Signature) <i>[Signature]</i>	Date/Time 3/14/24	Received by: (Signature) <i>[Signature]</i>	Date/Time 3/18/24	Comments			
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Comments			
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
Main Stack-M26A-H2SO4-6A-Mill Off	03/13/24	Composite	HF C/2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH-6A-Mill Off	03/13/24	Composite	HF C/2	EPA Method 26A	NaOH Imp/Rinse		ElementOne
Main Stack-M26A-H2SO4-6B-Mill Off	03/13/24	Composite	HF C/2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH-6B-Mill Off	03/13/24	Composite	HF C/2	EPA Method 26A	NaOH Imp/Rinse		ElementOne
Main Stack-M26A-H2SO4- 6B -Mill Off FG	03/13/24	Composite	HF C/2	EPA Method 26A	All H2SO4 Imps + Rinse		ElementOne
Main Stack-M26A-NaOH- 6B -Mill Off FG	03/13/24	Composite	HF C/2	EPA Method 26A	NaOH Imp/Rinse		ElementOne

ANALYTICAL DATA

Analytical Calculations

HF -

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

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

Cl₂ -

$$\text{Total X}_2 \text{ (mg)} = \frac{\text{X Results } (\mu\text{g/mL}) * \text{Dilution} * \text{Beginning Volume (mL)}}{1000}$$

Where-

X Results= Raw sample concentration (ppm)—*Cl₂ IC Data Sheet*

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

Beginning Volume--*Sample Submission*

Analytical Calculations

Spike Recovery-

$$\text{Spike (\%)} = \frac{(\text{Spiked Result } (\mu\text{g/mL}) - \text{Sample Result } (\mu\text{g/mL}))}{\text{Spike Amount } (\mu\text{g/mL})} \times 100$$

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-

$$\text{RPD (\%)} = \frac{(\text{Duplicate Result } (\mu\text{g/mL}) - \text{Sample Result } (\mu\text{g/mL}))}{\text{Average } (\mu\text{g/mL})} \times 100$$

Where-

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

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

elementOne

AIR TESTING SAMPLE SUBMISSION FORM

Lab ID 42190

Analysis Due Date 03.25.24

QA/QC/Report Due Date 03.27.24

Client: Deeco, Inc.
Project No 24-3331

Date Rec 03.18.24
Time Rec 1200

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

Sample Identification

1	Main Stack Mill On-M26A-R1A	7	Main Stack Mill On-M26A-R1B	13	Main Stack Mill On-M26A-FB
2	Main Stack Mill On-M26A-R2A	8	Main Stack Mill On-M26A-R2B	14	Main Stack Mill Off-M26A-FB
3	Main Stack Mill On-M26A-R7A	9	Main Stack Mill On-M26A-R7B		
	Main Stack Mill On-M26A-R7A Spike		Main Stack Mill On-M26A-R7B Spike		
4	Main Stack Mill Off-M26A-R4A	10	Main Stack Mill Off-M26A-R4B		
5	Main Stack Mill Off-M26A-R5A	11	Main Stack Mill Off-M26A-R5B		
6	Main Stack Mill Off-M26A-R6A	12	Main Stack Mill Off-M26A-R6B		
	Main Stack Mill Off-M26A-R6A Spike		Main Stack Mill Off-M26A-R6B Spike		
Analyses Requested		Samples 1-14	HF		
		Samples 1-14	Cl ₂		

Runs/FB

Lab ID	FH Impinger 1 (or Combined Imp)		FH Impinger 2		FH Impinger 3		BH Impinger 4 (or Combined Imp)		BH Impinger 5	
	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml
1	385						325			
2	350						330			
3.S	370						305			
4	395						305			
5	385						305			
6.S	370						305			
7	375						305			
8	385						315			
9.S	370						300			
10	400						315			
11	390						310			
12.S	370						315			
13	310						320			
14	325						310			

Lab Communications

Rec Runs/FB: H2SO4; NaOH; No RB received---03.18.24 LLB

SS Page 1 of 1
SS by LLB
3/18/2024 4:48:24 PM

Imp 1, 2, & 3 Prep By / Date LAW 03.19.24
Imp 4 & 5 Prep By / Date LAW 03.26.24
Labeled By / Date KLK 3.18.24
ID Verification By / Date LAW 03.19.24
BV & pH LAW 03.19.24

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42190 Deeco M26A Report Packet
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M26A-HF IC Data Sheet

Lab ID #: 42190

Client: Deeco

Column: IonPac AS22

Date: 03.21.24

Eluent: 4.5 mM Na₂CO₃/ 1.4 mM NaHCO₃

Analyst: LAW

Flow Rate: 1.2 mL/min.

Detection Limit, (µg/ml): 0.10

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			-1b88ffd8:18e56fe9e:	3/19/2024 16:36
LRB	0.000	1	10	< 0.001		NA	-1b88ffd8:18e56fe9e:	3/19/2024 16:53
LRB SPK	5.057	1	10	0.053	5.00	101%	-1b88ffd8:18e56fe9e:	3/19/2024 17:10
LRB SPK	5.103	1	10	0.054	5.00	102%	-1b88ffd8:18e56fe9e:	3/19/2024 17:28
42190-1	0.091	5	385	< 0.203			-1b88ffd8:18e56fe9e:	3/19/2024 17:45
42190-1 DUP	0.031	5	385	< 0.203		NA	-1b88ffd8:18e56fe9e:	3/19/2024 18:03
42190-2	0.025	5	350	< 0.184			-1b88ffd8:18e56fe9e:	3/19/2024 20:40
42190-2 DUP	0.020	5	350	< 0.184		NA	-1b88ffd8:18e56fe9e:	3/19/2024 20:58
42190-3	0.025	5	370	< 0.195			-1b88ffd8:18e56fe9e:	3/19/2024 18:20
42190-3 DUP	0.037	5	370	< 0.195		NA	-1b88ffd8:18e56fe9e:	3/19/2024 18:38
42190-3 SPK	4.621	5	370	9.00	5.00	92%	-1b88ffd8:18e56fe9e:	3/19/2024 18:55
42190-3 SPK DUP	4.666	5	370	9.09	5.00	93%	-1b88ffd8:18e56fe9e:	3/19/2024 19:13
42190-4	0.029	5	395	< 0.208			-1b88ffd8:18e56fe9e:	3/19/2024 21:15
42190-4 DUP	0.027	5	395	< 0.208		NA	-1b88ffd8:18e56fe9e:	3/19/2024 21:32
42190-5	0.040	5	385	< 0.203			-1b88ffd8:18e56fe9e:	3/19/2024 21:50
42190-5 DUP	0.023	5	385	< 0.203		NA	-1b88ffd8:18e56fe9e:	3/19/2024 22:07
42190-6	0.015	5	370	< 0.195			-1b88ffd8:18e56fe9e:	3/19/2024 22:25
42190-6 DUP	0.010	5	370	< 0.195		NA	-1b88ffd8:18e56fe9e:	3/19/2024 22:42
42190-6 SPK	4.641	5	370	9.04	5.00	93%	-1b88ffd8:18e56fe9e:	3/19/2024 23:00
42190-6 SPK DUP	4.682	5	370	9.12	5.00	94%	-1b88ffd8:18e56fe9e:	3/19/2024 23:17
42190-7	0.024	5	375	< 0.197			-1b88ffd8:18e56fe9e:	3/20/2024 0:45
42190-7 DUP	0.025	5	375	< 0.197		NA	-1b88ffd8:18e56fe9e:	3/20/2024 1:02
42190-8	0.022	5	385	< 0.203			-1b88ffd8:18e56fe9e:	3/20/2024 1:20
42190-8 DUP	0.056	5	385	< 0.203		NA	-1b88ffd8:18e56fe9e:	3/20/2024 1:37
42190-9	0.046	5	370	< 0.195			-1b88ffd8:18e56fe9e:	3/20/2024 1:55
42190-9 DUP	0.014	5	370	< 0.195		NA	-1b88ffd8:18e56fe9e:	3/20/2024 2:12
42190-9 SPK	4.664	5	370	9.08	5.00	93%	-1b88ffd8:18e56fe9e:	3/20/2024 2:29
42190-9 SPK DUP	4.698	5	370	9.15	5.00	94%	-1b88ffd8:18e56fe9e:	3/20/2024 2:47
42190-10	0.036	5	400	< 0.211			-1b88ffd8:18e56fe9e:	3/20/2024 3:04
42190-10 DUP	0.016	5	400	< 0.211		NA	-1b88ffd8:18e56fe9e:	3/20/2024 3:22
42190-11	0.036	5	390	< 0.205			-1b88ffd8:18e56fe9e:	3/20/2024 4:49
42190-11 DUP	0.010	5	390	< 0.205		NA	-1b88ffd8:18e56fe9e:	3/20/2024 5:07
42190-12	0.032	5	370	< 0.195			-1b88ffd8:18e56fe9e:	3/20/2024 5:24
42190-12 DUP	0.025	5	370	< 0.195		NA	-1b88ffd8:18e56fe9e:	3/20/2024 5:42
42190-12 SPK	4.757	5	370	9.26	5.00	95%	-1b88ffd8:18e56fe9e:	3/20/2024 5:59
42190-12 SPK DUP	4.736	5	370	9.22	5.00	95%	-1b88ffd8:18e56fe9e:	3/20/2024 6:17
42190-13 FB	0.010	5	310	< 0.163			-1b88ffd8:18e56fe9e:	3/20/2024 6:34
42190-13 FB DUP	0.001	5	310	< 0.163		NA	-1b88ffd8:18e56fe9e:	3/20/2024 6:51
42190-14 FB	0.005	5	325	< 0.171			-1b88ffd8:18e56fe9e:	3/20/2024 7:09
42190-14 FB DUP	0.002	5	325	< 0.171		NA	-1b88ffd8:18e56fe9e:	3/20/2024 7:26

HF Data 1 of 2

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M26A-HF IC Data Sheet

Lab ID #: 42190

Client: Deeco

Column: IonPac AS22

Date: 03.21.24

Eluent: 4.5 mM Na₂CO₃/ 1.4 mM NaHCO₃

Analyst: LAW

Flow Rate: 1.2 mL/min.

Detection Limit, (µg/ml): 0.10

F⁻ to HF factor: 1.053

Standards	F ⁻ µg/ml	Dilution	QC, µg/ml	% Relative Error	% Recovery	File Name	Date Time
0.0	0.000					-1b88ffd8:18e56fe9e:	3/19/2024 13:06
0.1	0.102			2.0%	102%	-1b88ffd8:18e56fe9e:	3/19/2024 13:23
1.0	0.964			-3.6%	96%	-1b88ffd8:18e56fe9e:	3/19/2024 13:41
3.0	3.037			1.2%	101%	-1b88ffd8:18e56fe9e:	3/19/2024 13:58
5.0	5.005			0.1%	100%	-1b88ffd8:18e56fe9e:	3/19/2024 14:16
10.0	9.991			-0.1%	100%	-1b88ffd8:18e56fe9e:	3/19/2024 14:33
0.1	0.090			-10.0%	90%	-1b88ffd8:18e56fe9e:	3/20/2024 8:36
1.0	0.961			-3.9%	96%	-1b88ffd8:18e56fe9e:	3/20/2024 8:54
3.0	3.004			0.1%	100%	-1b88ffd8:18e56fe9e:	3/20/2024 9:11
5.0	4.995			-0.1%	100%	-1b88ffd8:18e56fe9e:	3/20/2024 9:29
10.0	9.947			-0.5%	99%	-1b88ffd8:18e56fe9e:	3/20/2024 9:46
Correlation-	0.999980						
QC	5.118		5.00		102%	-1b88ffd8:18e56fe9e:	3/19/2024 14:51
QC	5.051		5.00		101%	-1b88ffd8:18e56fe9e:	3/19/2024 15:08
QC	5.024		5.00		100%	-1b88ffd8:18e56fe9e:	3/19/2024 19:30
QC	4.991		5.00		100%	-1b88ffd8:18e56fe9e:	3/19/2024 19:48
QC	5.086		5.00		102%	-1b88ffd8:18e56fe9e:	3/19/2024 23:35
QC	5.059		5.00		101%	-1b88ffd8:18e56fe9e:	3/19/2024 23:52
QC	5.083		5.00		102%	-1b88ffd8:18e56fe9e:	3/20/2024 3:39
QC	5.101		5.00		102%	-1b88ffd8:18e56fe9e:	3/20/2024 3:57
QC	5.094		5.00		102%	-1b88ffd8:18e56fe9e:	3/20/2024 7:44
QC	5.037		5.00		101%	-1b88ffd8:18e56fe9e:	3/20/2024 10:04
DL	0.108		0.10		108%	-1b88ffd8:18e56fe9e:	3/19/2024 16:01
DL	0.096		0.10		96%	-1b88ffd8:18e56fe9e:	3/19/2024 16:18
DL	0.092		0.10		92%	-1b88ffd8:18e56fe9e:	3/20/2024 8:01
DL	0.091		0.10		91%	-1b88ffd8:18e56fe9e:	3/20/2024 10:21
36783-5 QC	6.508	1	6.96		98%	-1b88ffd8:18e56fe9e:	3/20/2024 10:56
36783-5 QC DUP	6.563	1	6.96		99%	-1b88ffd8:18e56fe9e:	3/20/2024 11:14
BLK	0.000					-1b88ffd8:18e56fe9e:	3/19/2024 15:26
BLK	0.000					-1b88ffd8:18e56fe9e:	3/19/2024 15:43
BLK	0.000					-1b88ffd8:18e56fe9e:	3/19/2024 20:05
BLK	0.000					-1b88ffd8:18e56fe9e:	3/19/2024 20:23
BLK	0.000					-1b88ffd8:18e56fe9e:	3/20/2024 0:10
BLK	0.000					-1b88ffd8:18e56fe9e:	3/20/2024 0:27
BLK	0.000					-1b88ffd8:18e56fe9e:	3/20/2024 4:14
BLK	0.000					-1b88ffd8:18e56fe9e:	3/20/2024 4:32
BLK	0.000					-1b88ffd8:18e56fe9e:	3/20/2024 8:19
BLK	0.000					-1b88ffd8:18e56fe9e:	3/20/2024 10:39

HF Data 2 of 2

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IC Sample Sheet/Digestion Worksheet

Lab ID #: 42190

Date: 03/19/24

Column: IonPac AS22

Instrument: 930/858

Analyst: LWS

Conc. Eluent: 4.5 mM Na₂CO₃/ 1.4 mM NaHCO₃

Lot# 1C11-143-2

Batch name: 031924-42190

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

Regenerant: 500 mM H₂SO₄

Lot # 1C11-134-5

Flow Rate: 1.2 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			GC	MANF	R2	
2	0.1		F-	BBCJ0524	SummaTech	999980	
3	1.0						
4	3.0						
5	5.0						
6	10.0						
7	GC						
8	GC						
9	BLK						
10	BLK						
11	DL						
12	DL						
13	LRB						
14	LRB						
15	LRB+						
16	LRB+						
17	42190-1	Deeco	HF		—	5X	
18	-1D	↓	↓		—	↓	
19	-3	↓	↓		—	↓	
20	-3D	↓	↓		—	↓	
21	-3+	↓	↓		4.621	↓	
22	-3+D	↓	↓		4.666	↓	
23	GC						
24	GC						
25	BLK						

Manual integrations noted by M

Curve IC Lot # 1C11-146-4

Comments: pg 1 of 3

Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #s 2303079-250115 IC ME Solution 2303079-250115 IC NO2 Solution 2308942-250115

QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SQ Std. to 10mL sample; lot #'s listed above.

QC: Spike 20 uL from 1000 ug/mL NO₂, NO₃, and PO₄ Std. to 10mL sample; lot #'s listed above.

Submitted for QC- Date: 03/20/24 Time: 12:00 By: LWS QC Review- Date: 03/20/24 Time: By:

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IC Sample Sheet/Digestion Worksheet

Lab ID #: 42190

Date: 03-19-24

Column: IonPac AS22

Instrument: 930/858

Analyst: LMS

Conc. Eluent: 4.5 mM Na₂CO₃/ 1.4 mM NaHCO₃

Lot# 1C11-143-2

Batch name: 031924-42190

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

Regenerant: 500 mM H₂SO₄

Lot # 1C11-134-5

Flow Rate: 1.2 mL/min.

Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
26	BK						
27	42190-2	Deeco	HF		—	5X	
28	-2D				—		
29	-4				—		
30	-4D				—		
31	-5				—		
32	-5D				—		
33	-6				—		
34	-6D				—		
35	-6+				4.641		
36	-6+D				4.682	✓	
37	GC						
38	GC						
39	BK						
40	BK						
41	42190-7	Deeco	HF		—	5X	
42	-7D				—		
43	-8				—		
44	-8D				—		
45	-9				—		
46	-9D				—		
47	-9+				4.664		
48	-9+D				4.698		
49	-10				—		
50	-10D				—		

Manual integrations noted by M

Curve IC Lot #

Comments:

pg 20F3

Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #s: IC ME Solution

IC NO2 Solution

QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SQ Std. to 10mL sample; lot #'s listed above.

QC: Spike 20 uL from 1000 ug/mL NO₂, NO₃, and PO₄ Std. to 10mL sample; lot #'s listed above.

Submitted for QC- Date:

Time:

By:

QC Review- Date:

Time:

By:

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IC Sample Sheet/Digestion Worksheet

Lab ID #: 42190

Date: 03-19-24

Column: IonPac AS22

Instrument: 930/858

Analyst: LMO

Conc. Eluent: 4.5 mM Na₂CO₃/ 1.4 mM NaHCO₃

Lot# 1C11-143-2

Batch name: 031924-42190

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

Regenerant: 500 mM H₂SO₄

Lot # 1C11-134-5

Flow Rate: 1.2 mL/min.

Method: 300/26A

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	42190-11	Deeco	HF		—	5x	
56	-11D				—		
57	-12				—		
58	-12D				—		
59	-12+				4.757		
60	-12+D				4.736		
61	-13FB				—		
62	-13FBD				—		
63	-14FB				—		
64	-14FBD				—		
65	GC						
66	DL						
67	BLK						
68	0.1						
69	1.0						
70	3.0						
71	5.0						
72	10.0						
73	GC						
74	DL						
75	BLK						

Manual integrations noted by M

Curve IC Lot #

Comments:

Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: 30F3

IC NO2 Solution

QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SQ Std. to 10mL sample; lot #'s listed above.

QC: Spike 20 uL from 1000 ug/mL NO₂, NO₃, and PO₄ Std. to 10mL sample; lot #'s listed above.

Submitted for QC- Date:

Time:

By:

QC Review- Date:

Time:

By:

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M26A-Cl₂ IC Data Sheet

Lab ID #: 42190

Client: Deeco

Date: 03.22.24

Analyst: LAW

Detection Limit, (µg/ml): 0.10

Column: IonPac AS14A

Eluent: 8.0 mM Na₂CO₃/ 1.0 mM NaHCO₃

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	-0.056	1	10	< 0.001			-20c080a1:18e5c928b7b:-7b9a	3/20/2024 18:36
LRB	-0.061	1	10	< 0.001		NA	-20c080a1:18e5c928b7b:-7b98	3/20/2024 19:01
LRB SPK	5.180	1	10	0.052	5.00	105%	-20c080a1:18e5c928b7b:-7b96	3/20/2024 19:27
LRB SPK	5.144	1	10	0.051	5.00	104%	-20c080a1:18e5c928b7b:-7b94	3/20/2024 19:52
42190-1	-0.023	5	325	< 0.163			-20c080a1:18e5c928b7b:-7b92	3/20/2024 20:18
42190-1 DUP	-0.050	5	325	< 0.163		NA	-20c080a1:18e5c928b7b:-7b90	3/20/2024 20:43
42190-2	0.031	5	330	< 0.165			-20c080a1:18e5c928b7b:-7b7e	3/21/2024 0:33
42190-2 DUP	0.056	5	330	< 0.165		NA	-20c080a1:18e5c928b7b:-7b7c	3/21/2024 0:58
42190-3	0.016	5	305	< 0.153			-20c080a1:18e5c928b7b:-7b8e	3/20/2024 21:09
42190-3 DUP	0.020	5	305	< 0.153		NA	-20c080a1:18e5c928b7b:-7b8c	3/20/2024 21:34
42190-3 SPK	5.077	5	305	7.74	5.00	101%	-20c080a1:18e5c928b7b:-7b8a	3/20/2024 22:00
42190-3 SPK DUP	5.044	5	305	7.69	5.00	100%	-20c080a1:18e5c928b7b:-7b88	3/20/2024 22:25
42190-4	-0.036	5	305	< 0.153			-20c080a1:18e5c928b7b:-7b7a	3/21/2024 1:24
42190-4 DUP	-0.021	5	305	< 0.153		NA	-20c080a1:18e5c928b7b:-7b78	3/21/2024 1:49
42190-5	0.197	5	305	0.300			-20c080a1:18e5c928b7b:-7b76	3/21/2024 2:15
42190-5 DUP	0.204	5	305	0.311		3.5%	-20c080a1:18e5c928b7b:-7b74	3/21/2024 2:40
42190-6	0.146	5	305	0.223			-20c080a1:18e5c928b7b:-7b72	3/21/2024 3:06
42190-6 DUP	0.152	5	305	0.232		4.0%	-20c080a1:18e5c928b7b:-7b70	3/21/2024 3:31
42190-6 SPK	5.358	5	305	8.17	5.00	104%	-20c080a1:18e5c928b7b:-7b6e	3/21/2024 3:57
42190-6 SPK DUP	5.192	5	305	7.92	5.00	101%	-20c080a1:18e5c928b7b:-7b6c	3/21/2024 4:22
42190-7	0.000	5	305	< 0.153			-20c080a1:18e5c928b7b:-7b62	3/21/2024 6:29
42190-7 DUP	0.045	5	305	< 0.153		NA	-20c080a1:18e5c928b7b:-7b60	3/21/2024 6:55
42190-8	0.143	5	315	0.225			-20c080a1:18e5c928b7b:-7b5e	3/21/2024 7:20
42190-8 DUP	0.148	5	315	0.233		3.4%	-20c080a1:18e5c928b7b:-7b5c	3/21/2024 7:46
42190-9	0.159	5	300	0.239			-20c080a1:18e5c928b7b:-7b5a	3/21/2024 8:11
42190-9 DUP	0.153	5	300	0.230		3.8%	-20c080a1:18e5c928b7b:-7b58	3/21/2024 8:37
42190-9 SPK	5.349	5	300	8.02	5.00	104%	-20c080a1:18e5c928b7b:-7b56	3/21/2024 9:03
42190-9 SPK DUP	5.270	5	300	7.91	5.00	102%	-20c080a1:18e5c928b7b:-7b54	3/21/2024 9:28
42190-10	0.151	5	315	0.238			-20c080a1:18e5c928b7b:-7aeb	3/21/2024 9:54
42190-10 DUP	0.151	5	315	0.238		0.0%	-20c080a1:18e5c928b7b:-7ae9	3/21/2024 10:19
42190-11	0.102	5	310	0.158			-20c080a1:18e5c928b7b:-79fe	3/21/2024 12:27
42190-11 DUP	0.103	5	310	0.160		1.0%	-20c080a1:18e5c928b7b:-79fc	3/21/2024 12:52
42190-12	0.144	5	315	0.227			-20c080a1:18e5c928b7b:-799d	3/21/2024 13:18
42190-12 DUP	0.147	5	315	0.232		2.1%	-20c080a1:18e5c928b7b:-799b	3/21/2024 13:43
42190-12 SPK	5.398	5	315	8.50	5.00	105%	-20c080a1:18e5c928b7b:-793c	3/21/2024 14:09
42190-12 SPK DUP	5.432	5	315	8.56	5.00	106%	-20c080a1:18e5c928b7b:-793a	3/21/2024 14:34
42190-13 FB	0.078	5	320	< 0.16			-20c080a1:18e5c928b7b:-7938	3/21/2024 15:00
42190-13 FB DUP	0.083	5	320	< 0.16		NA	-20c080a1:18e5c928b7b:-77db	3/21/2024 15:25
42190-14 FB	0.095	5	310	< 0.155			-20c080a1:18e5c928b7b:-77d9	3/21/2024 15:51
42190-14 FB DUP	0.047	5	310	< 0.155		NA	-20c080a1:18e5c928b7b:-77d7	3/21/2024 16:16

Cl₂-Data 1 of 2

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e 42190-Cl₂

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Certification: NJ NELAP NC009
 42190 Deeco M26A Report Packet
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elementOne

M26A-Cl₂ IC Data Sheet

Lab ID #: 42190

Client: Deeco

Column: IonPac AS14A

Date: 03.22.24

Eluent: 8.0 mM Na₂CO₃/ 1.0 mM NaHCO₃

Analyst: LAW

Flow Rate: 1.0 mL/min.

Detection Limit, (µg/ml): 0.10

Standards	Cl ⁻ µg/ml	Dilution	QC µg/ml	%Relative Error	% Recovery	File Name	Date Time
0	0.000					-20c080a1:18e5c928b7b:-77e7	3/20/2024 13:30
0.1	0.102			2.0%	102%	-20c080a1:18e5c928b7b:-77e5	3/20/2024 13:55
1	0.996			-0.4%	100%	-20c080a1:18e5c928b7b:-77e3	3/20/2024 14:21
3	2.835			-5.5%	95%	-20c080a1:18e5c928b7b:-77e1	3/20/2024 14:46
5	5.224			4.5%	104%	-20c080a1:18e5c928b7b:-77df	3/20/2024 15:12
10	9.941			-0.6%	99%	-20c080a1:18e5c928b7b:-77dd	3/20/2024 15:37
0.1	0.103			3.0%	103%	-20c080a1:18e5c928b7b:-77cf	3/21/2024 17:58
1	0.959			-4.1%	96%	-20c080a1:18e5c928b7b:-77cd	3/21/2024 18:24
3	2.858			-4.7%	95%	-20c080a1:18e5c928b7b:-77cb	3/21/2024 18:49
5	4.945			-1.1%	99%	-20c080a1:18e5c928b7b:-77c9	3/21/2024 19:15
10	9.603			-4.0%	96%	-20c080a1:18e5c928b7b:-77c7	3/21/2024 19:40

Correlation- 0.999361

QC	4.760		5.00		95%	-20c080a1:18e5c928b7b:-7ba6	3/20/2024 16:03
QC	5.135		5.00		103%	-20c080a1:18e5c928b7b:-7ba4	3/20/2024 16:28
QC	4.932		5.00		99%	-20c080a1:18e5c928b7b:-7b86	3/20/2024 22:51
QC	5.027		5.00		101%	-20c080a1:18e5c928b7b:-7b84	3/20/2024 23:16
QC	4.748		5.00		95%	-20c080a1:18e5c928b7b:-7b6a	3/21/2024 4:48
QC	4.879		5.00		98%	-20c080a1:18e5c928b7b:-7b68	3/21/2024 5:13
QC	4.627		5.00		93%	-20c080a1:18e5c928b7b:-7a06	3/21/2024 10:45
QC	4.780		5.00		96%	-20c080a1:18e5c928b7b:-7a04	3/21/2024 11:10
QC	4.778		5.00		96%	-20c080a1:18e5c928b7b:-77d5	3/21/2024 16:42
QC	4.514		5.00		90%	-20c080a1:18e5c928b7b:-77c5	3/21/2024 20:06
DL	0.101		0.10		101%	-20c080a1:18e5c928b7b:-7b9e	3/20/2024 17:45
DL	0.095		0.10		95%	-20c080a1:18e5c928b7b:-7b9c	3/20/24 18:10
DL	0.090		0.10		90%	-20c080a1:18e5c928b7b:-77d3	3/21/2024 17:07
DL	0.106		0.10		106%	-20c080a1:18e5c928b7b:-77c3	3/21/2024 20:31
41959-7 QC	6.999	10	71.4		98%	-20c080a1:18e5c928b7b:-77bf	3/21/2024 21:22
41959-7 QC DUP	7.076	10	71.4		99%	-20c080a1:18e5c928b7b:-77bd	3/21/2024 21:47
BLK	0.000					-20c080a1:18e5c928b7b:-7ba2	3/20/2024 16:54
BLK	0.000					-20c080a1:18e5c928b7b:-7ba0	3/20/2024 17:19
BLK	0.000					-20c080a1:18e5c928b7b:-7b82	3/20/2024 23:42
BLK	0.000					-20c080a1:18e5c928b7b:-7b80	3/21/2024 0:07
BLK	0.000					-20c080a1:18e5c928b7b:-7b66	3/21/2024 5:39
BLK	0.000					-20c080a1:18e5c928b7b:-7b64	3/21/2024 6:04
BLK	0.000					-20c080a1:18e5c928b7b:-7a02	3/21/2024 11:36
BLK	0.000					-20c080a1:18e5c928b7b:-7a00	3/21/2024 12:01
BLK	0.000					-20c080a1:18e5c928b7b:-77d1	3/21/2024 17:33
BLK	0.000					-20c080a1:18e5c928b7b:-77c1	3/21/2024 20:56

Cl₂-Data 2 of 2

elementOne

e 42190-Cl₂

elementOne

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IC Sample Sheet/Digestion Worksheet

Lab ID #: 42190

Date: 03-20-24
Analyst: LMSColumn: IonPac AS14A
Conc. Eluent: 8.0 mM Na₂CO₃/ 1.0mM NaHCO₃Instrument: 881/858
Lot# 1C11-129-2

Batch name: 032024-42190

10mL Conc. Eluent Diluted to FV=1L with filtered UPDI
Regenerant: 100mM H₃PO₄
Flow Rate: 1.0 mL/min.Lot # 1C11-142-3
Method: 26A NaOH

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
1	0.0			GC	MANP	EC	
2	0.1		Cl ⁻	4358 JSS	RICCA	0.00361	
3	1.0						
4	3.0						
5	5.0						
6	10.0						
7	GC						
8	GC						
9	BLK						
10	BLK						
11	DL						
12	DL						
13	LEB						
14	LEB						
15	LEBT						
16	LEBT						
17	42190-1	Deeco	Cl ₂		—	5X	
18	-1D				—		
19	-3				—		
20	-3D				—		
21	-3+				5072		
22	-3+D				5044		
23	GC						
24	GC						
25	BLK						

Manual integr:

Curve IC Lot # 1C11-142-2 Sodium Thiosulfate Lot # 1C11-124-3 Comments: pg 10 F 3

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

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

Submitted for QC- Date: 03-22-24 Time: 8:28 By: LMS QC Review- Date: [check] Time: By:

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IC Sample Sheet/Digestion Worksheet

Lab ID #: 42190

Date: 03-20-24

Column: IonPac AS14A

Instrument: 8811858

Analyst: LHW

Conc. Eluent: 8.0 mM Na₂CO₃/ 1.0mM NaHCO₃

Lot# 1C11-129-2

Batch name: 032024-42190

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

Regenerant: 100mM H₃PO₄

Lot # 1C11-142-3

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)
26	Blk						
27	42190-2	Deeco	Cl ₂		—	5X	
28	-2D				—		
29	-4				—		
30	-4D				—		
31	-5				0.192		
32	-5D				6.204		
33	-6				0.146		
34	-6D				0.152		
35	-6+				5.358		
36	-6+D				5.192		
37	GC						
38	GC						
39	Blk						
40	Blk						
41	42190-7	Deeco	Cl ₂		—	5X	
42	-7D				—		
43	-8				0.143		
44	-8D				6.148		
45	-9				6.159		
46	-9D				6.153		
47	-9+				5.349		
48	-9+D				5.270		
49	-10				0.151		
50	-10D				0.151		

Manual integr:

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 listed above.

Submitted for QC- Date: Time: By: QC Review- Date: Time: By:

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Certification: NJ NELAP NC009
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elementOne

IC Sample Sheet/Digestion Worksheet

Lab ID #: 42190

Date: 03.20.24

Column: IonPac AS14A

Instrument: 881/858

Analyst: LMS

Conc. Eluent: 8.0 mM Na₂CO₃/ 1.0mM NaHCO₃

Lot# 1C11-129-2

Batch name: 032024-42190

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

Regenerant: 100mM H₃PO₄

Lot # 1C11-142-3

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	42190-11	Deeco	Cl ₂		0.162	5x	
56	-11D				0.103		
57	-12				0.144		
58	-12D				0.147		
59	-12+				5.398		
60	-12+D				5.432		
61	-13FB				—		
62	-13FBD				—		
63	-14FB				—		
64	-14FBD				—		
65	GC						
66	DL						
67	BLK						
68	0.1						
69	1.0						
70	3.0						
71	5.0						
72	10.0						
73	GC						
74	DL						
75	BLK						

Manual integr: 76 41959-76

22 6.999

TV=71.4 @10X 7076

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 listed above.

Submitted for QC- Date: Time: By: QC Review- Date: Time: By:

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Certification: NJ NELAP NC009
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Appendix D

Plant Process Data

Holcim
Hagerstown MD
Run 1

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/13/2024 10:00	100.6
03/13/2024 10:01	100.6
03/13/2024 10:02	100.6
03/13/2024 10:03	100.6
03/13/2024 10:04	100.6
03/13/2024 10:05	100.6
03/13/2024 10:06	100.6
03/13/2024 10:07	100.6
03/13/2024 10:08	100.6
03/13/2024 10:09	100.6
03/13/2024 10:10	100.6
03/13/2024 10:11	100.6
03/13/2024 10:12	100.6
03/13/2024 10:13	100.6
03/13/2024 10:14	100.6
03/13/2024 10:15	100.6
03/13/2024 10:16	100.6
03/13/2024 10:17	100.6
03/13/2024 10:18	100.6
03/13/2024 10:19	100.6
03/13/2024 10:20	100.6
03/13/2024 10:21	100.6
03/13/2024 10:22	100.6
03/13/2024 10:23	100.6
03/13/2024 10:24	100.6
03/13/2024 10:25	100.6
03/13/2024 10:26	100.6
03/13/2024 10:27	100.6
03/13/2024 10:28	100.6
03/13/2024 10:29	100.6
03/13/2024 10:30	100.6
03/13/2024 10:31	100.6
03/13/2024 10:32	100.6
03/13/2024 10:33	100.6
03/13/2024 10:34	100.6
03/13/2024 10:35	100.6
03/13/2024 10:36	100.6
03/13/2024 10:37	100.6
03/13/2024 10:38	100.6
03/13/2024 10:39	100.6
03/13/2024 10:40	100.6
03/13/2024 10:41	100.6
03/13/2024 10:42	100.6

Holcim
Hagerstown MD
Run 1

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/13/2024 10:43	100.6
03/13/2024 10:44	100.6
03/13/2024 10:45	100.6
03/13/2024 10:46	100.6
03/13/2024 10:47	100.6
03/13/2024 10:48	100.6
03/13/2024 10:49	100.6
03/13/2024 10:50	100.6
03/13/2024 10:51	100.6
03/13/2024 10:52	100.7
03/13/2024 10:53	100.7
03/13/2024 10:54	100.7
03/13/2024 10:55	100.6
03/13/2024 10:56	100.7
03/13/2024 10:57	100.6
03/13/2024 10:58	100.6
03/13/2024 10:59	100.6
03/13/2024 11:00	100.7
03/13/2024 11:01	100.6
03/13/2024 11:02	100.6
03/13/2024 11:03	100.6
03/13/2024 11:04	100.6
03/13/2024 11:05	100.6
03/13/2024 11:06	100.7

Run 1 Averages 100.6

Holcim
Hagerstown MD
Run 2

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/13/2024 11:25	100.6
03/13/2024 11:26	100.6
03/13/2024 11:27	100.6
03/13/2024 11:28	100.6
03/13/2024 11:29	100.6
03/13/2024 11:30	100.6
03/13/2024 11:31	100.6
03/13/2024 11:32	100.6
03/13/2024 11:33	100.6
03/13/2024 11:34	100.6
03/13/2024 11:35	100.6
03/13/2024 11:36	100.6
03/13/2024 11:37	100.6
03/13/2024 11:38	100.6
03/13/2024 11:39	100.6
03/13/2024 11:40	100.6
03/13/2024 11:41	100.6
03/13/2024 11:42	100.6
03/13/2024 11:43	100.6
03/13/2024 11:44	100.6
03/13/2024 11:45	100.7
03/13/2024 11:46	100.6
03/13/2024 11:47	100.7
03/13/2024 11:48	100.6
03/13/2024 11:49	100.6
03/13/2024 11:50	100.6
03/13/2024 11:51	100.6
03/13/2024 11:52	100.6
03/13/2024 11:53	100.6
03/13/2024 11:54	100.6
03/13/2024 11:55	100.6
03/13/2024 11:56	100.6
03/13/2024 11:57	100.6
03/13/2024 11:58	100.6
03/13/2024 11:59	100.6
03/13/2024 12:00	100.6
03/13/2024 12:01	100.6
03/13/2024 12:02	100.6
03/13/2024 12:03	100.6
03/13/2024 12:04	100.6
03/13/2024 12:05	100.6
03/13/2024 12:06	100.6
03/13/2024 12:07	100.6

Holcim
Hagerstown MD
Run 2

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/13/2024 12:08	100.6
03/13/2024 12:09	100.6
03/13/2024 12:10	100.6
03/13/2024 12:11	100.7
03/13/2024 12:12	100.6
03/13/2024 12:13	100.6
03/13/2024 12:14	100.6
03/13/2024 12:15	100.6
03/13/2024 12:16	100.6
03/13/2024 12:17	100.6
03/13/2024 12:18	100.6
03/13/2024 12:19	100.6
03/13/2024 12:20	100.6
03/13/2024 12:21	100.7
03/13/2024 12:22	100.6
03/13/2024 12:23	100.6
03/13/2024 12:24	100.6
03/13/2024 12:25	100.6
03/13/2024 12:26	100.6
03/13/2024 12:27	100.6
03/13/2024 12:28	100.6
03/13/2024 12:29	100.6
03/13/2024 12:30	100.6
03/13/2024 12:31	100.6
Run 2 Averages	100.6

Holcim
Hagerstown MD
Run 4

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/13/2024 14:20	100.6
03/13/2024 14:21	100.6
03/13/2024 14:22	100.6
03/13/2024 14:23	100.6
03/13/2024 14:24	100.7
03/13/2024 14:25	100.6
03/13/2024 14:26	100.6
03/13/2024 14:27	100.6
03/13/2024 14:28	100.6
03/13/2024 14:29	100.6
03/13/2024 14:30	100.6
03/13/2024 14:31	100.6
03/13/2024 14:32	100.6
03/13/2024 14:33	100.6
03/13/2024 14:34	100.6
03/13/2024 14:35	100.6
03/13/2024 14:36	100.6
03/13/2024 14:37	100.6
03/13/2024 14:38	100.6
03/13/2024 14:39	100.6
03/13/2024 14:40	100.6
03/13/2024 14:41	100.6
03/13/2024 14:42	100.6
03/13/2024 14:43	100.6
03/13/2024 14:44	100.6
03/13/2024 14:45	100.6
03/13/2024 14:46	100.6
03/13/2024 14:47	100.7
03/13/2024 14:48	100.6
03/13/2024 14:49	100.6
03/13/2024 14:50	100.6
03/13/2024 14:51	100.6
03/13/2024 14:52	100.6
03/13/2024 14:53	100.6
03/13/2024 14:54	100.6
03/13/2024 14:55	100.6
03/13/2024 14:56	100.6
03/13/2024 14:57	100.7
03/13/2024 14:58	100.6
03/13/2024 14:59	100.6
03/13/2024 15:00	100.6
03/13/2024 15:01	100.6
03/13/2024 15:02	100.6

Holcim
Hagerstown MD
Run 4

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/13/2024 15:03	100.6
03/13/2024 15:04	100.7
03/13/2024 15:05	100.6
03/13/2024 15:06	100.6
03/13/2024 15:07	100.7
03/13/2024 15:08	100.6
03/13/2024 15:09	100.6
03/13/2024 15:10	100.6
03/13/2024 15:11	100.6
03/13/2024 15:12	100.6
03/13/2024 15:13	100.6
03/13/2024 15:14	100.6
03/13/2024 15:15	100.6
03/13/2024 15:16	100.6
03/13/2024 15:17	100.6
03/13/2024 15:18	100.6
03/13/2024 15:19	100.6
03/13/2024 15:20	100.6
03/13/2024 15:21	100.6
03/13/2024 15:22	100.6
03/13/2024 15:23	100.6
03/13/2024 15:24	100.6
03/13/2024 15:25	100.6
03/13/2024 15:26	100.6

Run 4 Averages 100.6

Holcim
Hagerstown MD
Run 5

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/13/2024 15:43	100.6
03/13/2024 15:44	100.6
03/13/2024 15:45	100.6
03/13/2024 15:46	100.6
03/13/2024 15:47	100.6
03/13/2024 15:48	100.6
03/13/2024 15:49	100.6
03/13/2024 15:50	100.6
03/13/2024 15:51	100.6
03/13/2024 15:52	100.6
03/13/2024 15:53	100.6
03/13/2024 15:54	100.6
03/13/2024 15:55	100.6
03/13/2024 15:56	100.6
03/13/2024 15:57	100.6
03/13/2024 15:58	100.6
03/13/2024 15:59	100.6
03/13/2024 16:00	100.6
03/13/2024 16:01	100.6
03/13/2024 16:02	100.6
03/13/2024 16:03	100.6
03/13/2024 16:04	100.6
03/13/2024 16:05	100.6
03/13/2024 16:06	100.6
03/13/2024 16:07	100.6
03/13/2024 16:08	100.6
03/13/2024 16:09	100.6
03/13/2024 16:10	100.6
03/13/2024 16:11	100.6
03/13/2024 16:12	100.6
03/13/2024 16:13	100.6
03/13/2024 16:14	100.6
03/13/2024 16:15	100.6
03/13/2024 16:16	100.6
03/13/2024 16:17	100.7
03/13/2024 16:18	100.6
03/13/2024 16:19	100.6
03/13/2024 16:20	100.6
03/13/2024 16:21	100.6
03/13/2024 16:22	100.6
03/13/2024 16:23	100.6
03/13/2024 16:24	100.6
03/13/2024 16:25	100.6

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Run 5

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/13/2024 16:26	100.6
03/13/2024 16:27	100.6
03/13/2024 16:28	100.6
03/13/2024 16:29	100.6
03/13/2024 16:30	100.6
03/13/2024 16:31	100.6
03/13/2024 16:32	100.6
03/13/2024 16:33	100.6
03/13/2024 16:34	100.6
03/13/2024 16:35	100.6
03/13/2024 16:36	100.6
03/13/2024 16:37	100.6
03/13/2024 16:38	100.6
03/13/2024 16:39	100.6
03/13/2024 16:40	100.6
03/13/2024 16:41	100.6
03/13/2024 16:42	100.6
03/13/2024 16:43	100.6
03/13/2024 16:44	100.6
03/13/2024 16:45	100.6
03/13/2024 16:46	100.6
03/13/2024 16:47	100.6
03/13/2024 16:48	100.6
03/13/2024 16:49	100.6

Run 5 Averages

100.6

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Run 6

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/13/2024 17:20	100.6
03/13/2024 17:21	100.6
03/13/2024 17:22	100.6
03/13/2024 17:23	100.6
03/13/2024 17:24	100.6
03/13/2024 17:25	100.6
03/13/2024 17:26	100.6
03/13/2024 17:27	100.7
03/13/2024 17:28	100.6
03/13/2024 17:29	100.6
03/13/2024 17:30	100.6
03/13/2024 17:31	100.6
03/13/2024 17:32	100.6
03/13/2024 17:33	100.6
03/13/2024 17:34	100.6
03/13/2024 17:35	100.6
03/13/2024 17:36	100.6
03/13/2024 17:37	100.6
03/13/2024 17:38	100.6
03/13/2024 17:39	100.6
03/13/2024 17:40	100.6
03/13/2024 17:41	100.6
03/13/2024 17:42	100.6
03/13/2024 17:43	100.6
03/13/2024 17:44	100.6
03/13/2024 17:45	100.6
03/13/2024 17:46	100.6
03/13/2024 17:47	100.6
03/13/2024 17:48	100.6
03/13/2024 17:49	100.7
03/13/2024 17:50	100.6
03/13/2024 17:51	100.6
03/13/2024 17:52	100.6
03/13/2024 17:53	100.6
03/13/2024 17:54	100.6
03/13/2024 17:55	100.6
03/13/2024 17:56	100.6
03/13/2024 17:57	100.6
03/13/2024 17:58	100.6
03/13/2024 17:59	100.6
03/13/2024 18:00	100.6
03/13/2024 18:01	100.7
03/13/2024 18:02	100.6

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Run 6

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/13/2024 18:03	100.6
03/13/2024 18:04	100.6
03/13/2024 18:05	100.6
03/13/2024 18:06	100.6
03/13/2024 18:07	100.6
03/13/2024 18:08	100.7
03/13/2024 18:09	100.6
03/13/2024 18:10	100.6
03/13/2024 18:11	100.6
03/13/2024 18:12	100.6
03/13/2024 18:13	100.7
03/13/2024 18:14	100.6
03/13/2024 18:15	100.6
03/13/2024 18:16	100.6
03/13/2024 18:17	100.6
03/13/2024 18:18	100.6
03/13/2024 18:19	100.6
03/13/2024 18:20	100.6
03/13/2024 18:21	100.6
03/13/2024 18:22	100.6
03/13/2024 18:23	100.6
03/13/2024 18:24	100.6
03/13/2024 18:25	100.6
03/13/2024 18:26	100.6

Run 6 Averages

100.6

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Run 7

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/15/2024 12:20	100.1
03/15/2024 12:21	100.0
03/15/2024 12:22	100.0
03/15/2024 12:23	100.0
03/15/2024 12:24	100.0
03/15/2024 12:25	100.0
03/15/2024 12:26	100.0
03/15/2024 12:27	100.1
03/15/2024 12:28	100.0
03/15/2024 12:29	100.0
03/15/2024 12:30	100.0
03/15/2024 12:31	100.0
03/15/2024 12:32	100.0
03/15/2024 12:33	100.0
03/15/2024 12:34	100.0
03/15/2024 12:35	100.0
03/15/2024 12:36	100.0
03/15/2024 12:37	100.0
03/15/2024 12:38	100.0
03/15/2024 12:39	100.0
03/15/2024 12:40	100.0
03/15/2024 12:41	100.0
03/15/2024 12:42	100.0
03/15/2024 12:43	100.0
03/15/2024 12:44	100.1
03/15/2024 12:45	100.0
03/15/2024 12:46	100.0
03/15/2024 12:47	100.0
03/15/2024 12:48	100.0
03/15/2024 12:49	100.0
03/15/2024 12:50	100.1
03/15/2024 12:51	100.0
03/15/2024 12:52	100.0
03/15/2024 12:53	100.0
03/15/2024 12:54	100.0
03/15/2024 12:55	100.0
03/15/2024 12:56	100.0
03/15/2024 12:57	100.0
03/15/2024 12:58	100.0
03/15/2024 12:59	100.1
03/15/2024 13:00	100.0
03/15/2024 13:01	100.0
03/15/2024 13:02	100.1

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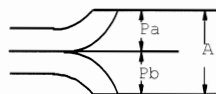
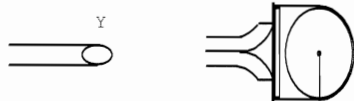
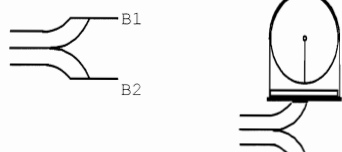
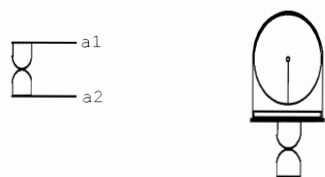
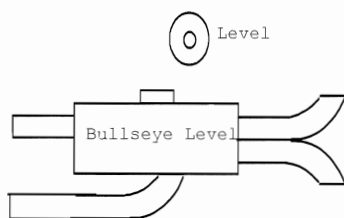
Run 7

Date/Time	Kiln: CLINKER (TNHR) Raw Value
03/15/2024 13:03	100.0
03/15/2024 13:04	100.0
03/15/2024 13:05	100.0
03/15/2024 13:06	100.1
03/15/2024 13:07	100.0
03/15/2024 13:08	100.0
03/15/2024 13:09	100.1
03/15/2024 13:10	100.1
03/15/2024 13:11	100.0
03/15/2024 13:12	100.0
03/15/2024 13:13	100.0
03/15/2024 13:14	100.0
03/15/2024 13:15	100.0
03/15/2024 13:16	100.0
03/15/2024 13:17	100.0
03/15/2024 13:18	100.0
03/15/2024 13:19	100.0
03/15/2024 13:20	100.0
03/15/2024 13:21	100.0
03/15/2024 13:22	100.1
03/15/2024 13:23	100.1
03/15/2024 13:24	100.0
03/15/2024 13:25	100.0
03/15/2024 13:26	100.1
Run 7 Averages	100.0

Appendix E

Calibration Documents

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
Barometric 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%

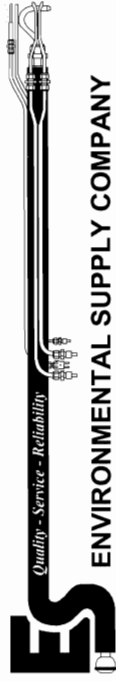
Windtunnel Calibration

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

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES



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: 12/21/23		METER SERIAL #: m5-25		INITIAL 30.18		FINAL 30.15		AVG (P _{bar}) 30.165		IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED					
METER PART #: m5-25		CRITICAL ORIFICE SET SERIAL #: 1431S		BAROMETRIC PRESSURE (in Hg):		ELAPSED TIME (MIN) 0		DGM ΔH (in H ₂ O)		VARIATION (%) Y					
ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT ³)		TEMPERATURES °F				DGM ΔH (in H ₂ O)	V _m (STD)	V _{cr} (STD)	Y	ΔH _@	
				INITIAL	FINAL	AMBIENT	DGM INLET INITIAL	DGM INLET FINAL	DGM OUTLET INITIAL						DGM OUTLET FINAL
12	1	0.3283													
	2														
	3														
15	1	0.4094	18	576.201	581.661	55	53	55	53	54	54	53.75	5.4435	0.960	1.91
	2	0.4094	18	581.661	587.119	55	55	58	54	55	55	55.5	5.4435	0.963	1.91
	3											0			
19	1	0.5047	18	587.424	594.121	55	57	61	55	56	57	57.25	6.7106	0.970	1.94
	2	0.5047	18	594.121	600.831	57	59	63	56	57	58.75	6.6976	0.969	1.94	
	3											0			
23	1	0.6426	18	601.129	609.648	57	62	65	58	59	61	61	8.5276	0.974	1.99
	2	0.6426	18	609.648	618.182	58	63	62	58	55	55.5	55.5	8.5194	0.968	2.00
	3											0			
32	1	0.8587													
	2														
	3														

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

$$(1) \quad V_{m(std)} = K_1 * V_m * \frac{P_{bar} + (\Delta H / 13.6)}{T_m}$$

$$(2) \quad V_{cr(std)} = K' * \frac{P_{bar} * \Theta}{\sqrt{T_{amb}}}$$

$$(3) \quad Y = \frac{V_{cr(std)}}{V_{m(std)}}$$

= Net volume of gas sample passed through DGM, corrected to standard conditions
K₁ = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)
T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

= 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

= DGM calibration factor

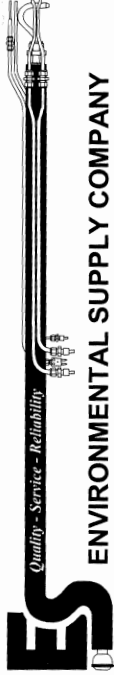
AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = **0.967**

AVERAGE ΔH_@ = **1.95**

Potentiometer Check, °F
(per manufacturer procedure)
0 @ 0 F
498 @ 500 F
1004 @ 1000 F

Avg Absolute Difference = **0.0%**

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES



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: 12/20/23		METER PART #: M5-15		METER SERIAL #: M5-15		CRITICAL ORIFICE SET SERIAL #: 14315		BAROMETRIC PRESSURE (in Hg):		INITIAL 30.24		FINAL 30.21		AVG (P _{bar}) 30.225		IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED		
ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT ³)		TEMPERATURES °F				ELAPSED TIME (MIN)	DGM ΔH (in H ₂ O)	V _m (STD)	(1)	(2)	(3)	Y VARIATION (%)	ΔH ₀	
				INITIAL	FINAL	NET (V _m)	AMBIENT	DGM INLET	DGM OUTLET									DGM AVG
12	1	0.3283																
	2																	
	3																	
15	1	0.4094	18	995.698	1,001.118	5.420	71	80	81	78	79	79.5	10.00	0.84	5.3704	5.3715	1.000	
	2	0.4094	18	1,001.118	1,006.558	5.440	71	80	81	79	79	79.75	10.00	0.84	5.3877	5.3715	0.997	1.62
	3					0.000						0						1.62
19	1	0.5047	18	964.454	971.201	6.747	72	76	79	76	76	76.75	10.00	1.3	6.7271	6.6156	0.983	1.67
	2	0.5047	18	971.201	977.968	6.767	70	77	79	77	77	77.5	10.00	1.3	6.7376	6.6281	0.984	1.66
	3					0.000						0						
23	1	0.6426	18	978.129	986.805	8.676	70	78	80	77	77	78	10.00	2.1	8.6470	8.4391	0.976	1.65
	2	0.6426	18	986.805	995.456	8.651	71	79	83	77	78	79.25	10.00	2.1	8.6021	8.4311	0.980	1.65
	3					0.000						0						
32	1	0.8587																
	2																	
	3																	

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

- (1) $V_{m(Std)} = K' * V_m * \frac{P_{bar} + (\Delta H / 13.6)}{T_m}$
= Net volume of gas sample passed through DGM, corrected to standard conditions
K₁ = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)
T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)
- (2) $V_{cr(Std)} = K' * \frac{P_{bar} * \Theta}{\sqrt{T_{amb}}}$
= 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) $Y = \frac{V_{cr(Std)}}{V_{m(Std)}}$
= DGM calibration factor

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = **0.987**

AVERAGE ΔH₀ = **1.65**

Potentiometer Check, °F
@ 0 F
496
@ 500 F
1000
@ 1000 F

Avg Absolute Difference = **0.1%**

Company: Holcim; Hagerstown MD
Source: Main Stack; Raw Mill Off
Job ID: 24-3331
Train Type: EPA Method 26A

Alt-009 Alternate Post Test Calibration Data

	M5-25 4A	M5-15 4B	M5-25 5A	M5-15 5B	M5-25 6A	M5-15 6B	M5-15 Averages	M5-25 Averages
	03/13/24 1420-1526	03/13/24 1420-1526	03/13/24 1543-1649	03/13/24 1543-1649	03/13/24 1720-1826	03/13/24 1720-1826	M5-15 Averages	M5-25 Averages
Vm	53.859	55.586	50.272	54.306	49.517	51.203		
Tm	554.5	558.8	565.4	560.5	522	561.3		
Pb	29.29	29.29	29.29	29.29	29.29	29.29		
Havg	2.53	2.16	2.4	2.04	2.35	2		
H@	1.95	1.65	1.95	1.65	1.95	1.65		
Md	30.548	30.548	30.48	30.48	30.356	30.356		
(Havg) ^{0.5}	1.58086401	1.46173642	1.54334879	1.42389929	1.52859479	1.41022531		
Run Time, Min	60	60	60	60	60	60		

Calculated Gamma (Yqa)	0.952	0.931	1.007	0.931	0.975	0.981	0.978	0.948
Meter Gamma	0.967	0.987	0.967	0.987	0.967	0.987	0.967	0.987
% difference from Actual Y	1.56%	5.66%	4.10%	5.67%	0.79%	0.64%	2.15%	3.99%

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.

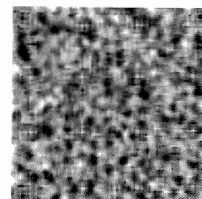
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

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

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.

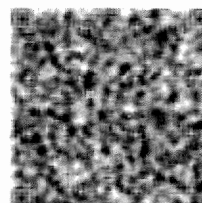
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

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

CERTIFICATE OF ANALYSIS

Grade of Product: CERTIFIED STANDARD-SPEC

Part Number:	X03NI99C15AC0W8	Reference Number:	160-402845897-1
Cylinder Number:	CC768222	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
Analysis Date:	Sep 11, 2023	Valve Outlet:	350SS
Lot Number:	160-402845897-1		

Expiration Date: Sep 11, 2024

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

ANALYTICAL RESULTS

Component	Req Conc	Actual Concentration (Mole %)	Analytical Uncertainty
SULFUR HEXAFLUORIDE	5.000 PPM	5.000 PPM	+/- 5%
HYDROGEN CYANIDE	50.00 PPM	49.90 PPM	+/- 5%
NITROGEN	Balance		



A handwritten signature in black ink, appearing to read 'B. L. SE', positioned above the 'Approved for Release' text.

Approved for Release

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

Client: Holcim Hagerstpn
Test Location: Main Stack Mill On
Date: Mar 13 24 Start Time: 10:00:02
Run number Stratification Check
One Minute Averages

	Reference O2 %,dry	Plant O2 %,dry
10:01:00 AM	14.2	13.7
10:02:00 AM	14.2	13.6
10:03:00 AM	14.2	13.7
10:04:00 AM	14.3	13.7
10:05:00 AM	14.3	13.7
Point A	14.3	13.7
10:06:00 AM	14.3	13.8
10:07:00 AM	14.2	13.7
10:08:00 AM	14.1	13.7
10:09:00 AM	14.1	13.6
10:10:00 AM	14.1	13.6
Point B	14.2	13.7
10:11:00 AM	14.2	13.6
10:12:00 AM	14.1	13.6
10:13:00 AM	14.1	13.6
10:14:00 AM	14.2	13.6
10:15:00 AM	14.2	13.6
Point C	14.2	13.6

Holcim

Hagerstown MD

Run 1

Date/Time	Kiln: O2_DRY (PCT) Expression Value
03/13/2024 10:00	13.67
03/13/2024 10:01	13.63
03/13/2024 10:02	13.68
03/13/2024 10:03	13.71
03/13/2024 10:04	13.73
03/13/2024 10:05	13.82
03/13/2024 10:06	13.74
03/13/2024 10:07	13.69
03/13/2024 10:08	13.62
03/13/2024 10:09	13.60
03/13/2024 10:10	13.60
03/13/2024 10:11	13.58
03/13/2024 10:12	13.63
03/13/2024 10:13	13.60
03/13/2024 10:14	13.61

Pretest QA
MKS 2030
SN 17791098

Spectrum	Date	Time	HCN (200) PCA 191C 191c	HF ppm (10) 191C	SNR 2500	sBeam @ 2500
SPC__157232.LAB	03/06/24	14:51:29.458	-0.070	0.012	3392.51	1.17
SPC__157233.LAB	03/06/24	14:52:31.978	0.026	0.004	3673.29	1.17
SPC__157234.LAB	03/06/24	14:53:34.515	-0.059	0.008	3315.68	1.17
SPC__157235.LAB	03/06/24	14:54:37.098	-0.015	0.011	3273.98	1.17
SPC__157236.LAB	03/06/24	14:55:39.552	-0.009	0.005	4401.05	1.17
SPC__157237.LAB	03/06/24	14:56:42.090	0.087	-0.004	3727.15	1.17
SPC__157238.LAB	03/06/24	14:57:44.665	-0.071	0.007	4182.04	1.17
STDS X 3			0.174	0.016		
Averages					3709.39	1.17

Analysis Validation Report

Sample Filename: F:\Hagerstown RTR March 2024\March 13\SPC_1828.LAB

Filename for noise: F:\Hagerstown RTR March 2024\March 15\SPC_2374.LAB

Interferences Filenames: F:\Hagerstown RTR March 2024\March 15\SPC_2376.LAB

F:\Hagerstown RTR March 2024\March 15\SPC_2377.LAB

F:\Hagerstown RTR March 2024\March 15\SPC_2378.LAB

F:\Hagerstown RTR March 2024\March 15\SPC_2379.LAB

F:\Hagerstown RTR March 2024\March 15\SPC_2380.LAB

F:\Hagerstown RTR March 2024\March 15\SPC_2381.LAB

F:\Hagerstown RTR March 2024\March 15\SPC_2382.LAB

F:\Hagerstown RTR March 2024\March 15\SPC_2383.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
HCN 9 (200) PCA 191C R1 191C	0.72	0.18	0.98	0.16	0.18	0.21	0.21	1.5	1.5	0.52	0.33	0-200	-	Close to DL
HF PPM (10) 191C	0.1	0.3	0.56	0.08	0.15	0.54	0.54	0.73	0.73	0.16	0.19	0-10	-	Close to DL
SF6 (10) 191C	0	0.03	0.01	0	0	0.03	0.03	0.02	0.02	0.01	0	0-10	-	Close to DL
ETHYLENE (100,3000) 191C	1.14	2.01	0.17	0.19	0.33	3.51	3.51	0.35	1.8	0.18	0.06	0-3000	-	Close to DL
H2O% (40) 191C	9.12	0.27	-	0.02	0.03	0.53	0.53	-	0.18	-	-	0-40	-	Good
CO2% (40) 191C	11.19	0.36	0.02	0.02	0.02	0.51	0.51	0.04	0.23	0.02	0.01	0-40	-	Good
HCL PPM (100) 191C	0.13	0.23	4.09	0.22	0.39	0.41	0.41	5.47	5.47	1.38	1.36	0-100	-	Close to DL
SO2 (1000) 191C	65.11	1.48	0.19	0.23	0.44	2.83	2.83	0.25	1.33	0.06	0.06	0-1000	-	Good
NO (350,3000) 191C	72.1	4.97	0.29	0.29	0.4	6.75	6.75	0.35	2.91	0.05	0.1	0-3000	-	Good
NH3 (300) 191C (10F2)	1.58	1.4	0.18	0.17	0.28	2.37	2.37	0.26	1.19	0.08	0.06	0-300	-	Close to DL
CO (500) 191C (10F2)	169.97	5.89	0.38	0.3	0.64	11.98	11.98	0.57	3.45	0.19	0.13	0-500	-	Good
CO% (1) 191C (20F2)	0.02	0	0	0	0	0	0	0	0	0	0	0-1	-	Good
FORMALDEHYDE (70) 191C	0.24	0.41	0.18	0.25	0.3	0.5	0.5	0.2	0.2	0.02	0.06	0-70	-	Close to DL
ACETALDEHYDE (1000) 191C	1.45	0.9	0.38	0.5	0.54	0.98	0.98	0.6	0.6	0.22	0.13	0-1000	-	Close to DL
CH4 (250) 191C (10F2)	6.6	1.68	0.97	0.35	0.93	4.44	4.44	1.45	1.46	0.48	0.32	0-250	-	Close to DL
PROPANE (100) 191C	0.25	0.67	0.23	0.19	0.22	0.8	0.8	0.24	0.48	0.01	0.08	0-100	-	Close to DL
HBR (100) 180C	0.3	1.82	0.23	0.94	1.91	3.69	3.69	0.3	0.91	0.07	0.08	0-100	-	Close to DL
NO2 (150) 191C (10F2)	-0.09	0.5	0.05	0.03	0.03	0.53	0.53	0.06	0.47	0.01	0.02	0-150	-	Close to DL
NO2 (2000) 191C (20F2)	-1.86	5.75	1.45	1.27	1.61	7.32	7.32	2.17	4.47	0.71	0.48	0-2000	-	Close to DL
N2O (100,200,300) 191C	0.51	0.38	0.15	0.05	0.05	0.45	0.45	0.33	0.33	0.08	0.05	0-300	-	Close to DL
NH3 (3000) 191C (20F2)	2.74	6.34	0.82	2.29	4.33	11.98	11.98	0.84	4.11	0.02	0.27	0-3000	-	Close to DL
CH4 (3000) 191C (20F2)	6.04	14.13	1.42	1.9	3.14	23.33	23.33	1.96	12.3	0.53	0.47	0-3000	-	Close to DL
ACETYLENE (1000) 191C	1.24	3.84	0.12	0.4	0.49	4.65	4.65	0.13	3.41	0.01	0.04	0-1000	-	Check it!
PROPYLENE (200,1000) 191C	0.71	4.55	0.37	0.57	0.67	5.32	5.32	0.46	3.97	0.09	0.12	0-1000	-	Close to DL
COS (100) 150C	0.24	0.29	0.02	0.02	0.03	0.39	0.39	0.02	0.26	0	0.01	0-100	-	Check it!
ETHANE (500) 191C	0.46	-	-	-	-	-	-	-	0.01	-	-	0-500	-	Good
H2SO4 (50) 150C	0.05	0.15	0.08	0.07	0.08	0.16	0.16	0.08	0.08	0.01	0.03	0-50	-	Close to DL
MEOH (10) 191C	0.07	0.69	0.27	0.17	0.2	0.79	0.79	0.27	0.53	0	0.09	0-10	-	Close to DL
SO3 (150) 191C	-2.77	0.81	1.28	0.03	0.03	0.88	0.88	1.29	1.29	0.01	0.43	0-150	-	Close to DL

Analysis Validation Report

Sample Filename: F:\Hagerstown RTR March 2024\March 13\SPC_1829.LAB

Filename for noise: F:\Hagerstown RTR March 2024\March 15\SPC_2374.LAB
 Interferences Filenames: F:\Hagerstown RTR March 2024\March 15\SPC_2376.LAB
 F:\Hagerstown RTR March 2024\March 15\SPC_2377.LAB
 F:\Hagerstown RTR March 2024\March 15\SPC_2378.LAB
 F:\Hagerstown RTR March 2024\March 15\SPC_2379.LAB
 F:\Hagerstown RTR March 2024\March 15\SPC_2380.LAB
 F:\Hagerstown RTR March 2024\March 15\SPC_2381.LAB
 F:\Hagerstown RTR March 2024\March 15\SPC_2382.LAB
 F:\Hagerstown RTR March 2024\March 15\SPC_2383.LAB

Recipe path: C:\OLTRecipes\Cement Testing R3.MGRCP

Gas calibration Name	Conc	MDC3	MDC2	MDC1	MAU	FMU*R	OCU	~DL	~CL	~Bias	Sigma	Range	Span	Comment
HCN 9 (200) PCA 191C R1 191C	0.71	0.2	0.98	0.16	0.18	0.23	0.23	1.5	1.5	0.52	0.33	0-200	-	Close to DL
HF PPM (10) 191C	0.14	0.29	0.56	0.08	0.15	0.53	0.53	0.73	0.73	0.16	0.19	0-10	-	Close to DL
SF6 (10) 191C	0	0.03	0.01	0	0	0.03	0.03	0.02	0.02	0.01	0	0-10	-	Close to DL
ETHYLENE (100,3000) 191C	1.13	1.97	0.17	0.19	0.33	3.44	3.44	0.35	1.76	0.18	0.06	0-3000	-	Close to DL
H2O% (40) 191C	9.15	0.27	-	0.02	0.03	0.54	0.54	-	0.18	-	-	0-40	-	Good
CO2% (40) 191C	10.9	0.34	0.02	0.02	0.02	0.49	0.49	0.04	0.22	0.02	0.01	0-40	-	Good
HCL PPM (100) 191C	0.12	0.28	4.09	0.22	0.39	0.5	0.5	5.47	5.47	1.38	1.36	0-100	-	Close to DL
SO2 (1000) 191C	56.62	1.49	0.19	0.23	0.44	2.85	2.85	0.25	1.16	0.06	0.06	0-1000	-	Good
NO (350,3000) 191C	82.27	5.16	0.29	0.29	0.4	7	7	0.35	2.92	0.05	0.1	0-3000	-	Good
NH3 (300) 191C (10F2)	1.58	1.36	0.18	0.17	0.28	2.3	2.3	0.26	1.15	0.08	0.06	0-300	-	Close to DL
CO (500) 191C (10F2)	160.25	5.57	0.38	0.3	0.64	11.37	11.37	0.57	3.25	0.19	0.13	0-500	-	Good
CO% (1) 191C (20F2)	0.02	0	0	0	0	0	0	0	0	0	0	0-1	-	Good
FORMALDEHYDE (70) 191C	0.3	0.4	0.18	0.25	0.3	0.48	0.48	0.2	0.2	0.02	0.06	0-70	-	Close to DL
ACETALDEHYDE (1000) 191C	1.52	1	0.38	0.5	0.54	1.09	1.09	0.6	0.6	0.22	0.13	0-1000	-	Close to DL
CH4 (250) 191C (10F2)	6.12	1.68	0.97	0.35	0.93	4.47	4.47	1.45	1.46	0.48	0.32	0-250	-	Close to DL
PROPANE (100) 191C	0.13	0.66	0.23	0.19	0.22	0.79	0.79	0.24	0.48	0.01	0.08	0-100	-	Close to DL
HBR (100) 180C	0.04	1.74	0.23	0.94	1.91	3.52	3.52	0.3	0.84	0.07	0.08	0-100	-	Close to DL
NO2 (150) 191C (10F2)	-0.11	0.51	0.05	0.03	0.03	0.54	0.54	0.06	0.48	0.01	0.02	0-150	-	Close to DL
NO2 (2000) 191C (20F2)	-1.68	5.7	1.45	1.27	1.61	7.26	7.26	2.17	4.43	0.71	0.48	0-2000	-	Close to DL
N2O (100,200,300) 191C	0.57	0.4	0.15	0.05	0.05	0.47	0.47	0.23	0.35	0.08	0.05	0-300	-	Close to DL
NH3 (3000) 191C (20F2)	3.19	6.41	0.82	2.29	4.33	12.12	12.12	0.84	4.17	0.02	0.27	0-3000	-	Close to DL
CH4 (3000) 191C (20F2)	5.9	13.9	1.42	1.9	3.14	22.95	22.95	1.96	12.08	0.53	0.47	0-3000	-	Close to DL
ACETYLENE (1000) 191C	1.25	3.92	0.12	0.4	0.49	4.75	4.75	0.13	3.5	0.01	0.04	0-1000	-	Check it!
PROPYLENE (200,1000) 191C	0.74	4.43	0.37	0.57	0.67	5.19	5.19	0.46	3.85	0.09	0.12	0-1000	-	Close to DL
COS (100) 150C	0.24	0.28	0.02	0.02	0.03	0.38	0.38	0.02	0.25	0	0.01	0-100	-	Check it!
ETHANE (500) 191C	0.47	-	-	-	-	-	-	-	0.01	-	-	0-500	-	Good
H2SO4 (50) 150C	0.03	0.15	0.08	0.07	0.08	0.17	0.17	0.08	0.09	0.01	0.03	0-50	-	Close to DL
MEOH (10) 191C	0.15	0.69	0.27	0.17	0.2	0.8	0.8	0.27	0.54	0	0.09	0-10	-	Close to DL
SO3 (150) 191C	-3.07	0.81	1.28	0.03	0.03	0.88	0.88	1.29	1.29	0	0.43	0-150	-	Close to DL

Holcim, Hagerstown MD

Kiln Main Stack; Raw Mill On

Post Run 7 HCl Single Beam

Spectrum	Date	Time	SNR 2500	sBeam @ 2500
SPC__2628.LAB	03/15/24	13:57:13.687	3116.82	1.15

Calibration
Generated
03/19/2024

Gas ID
LRF Path

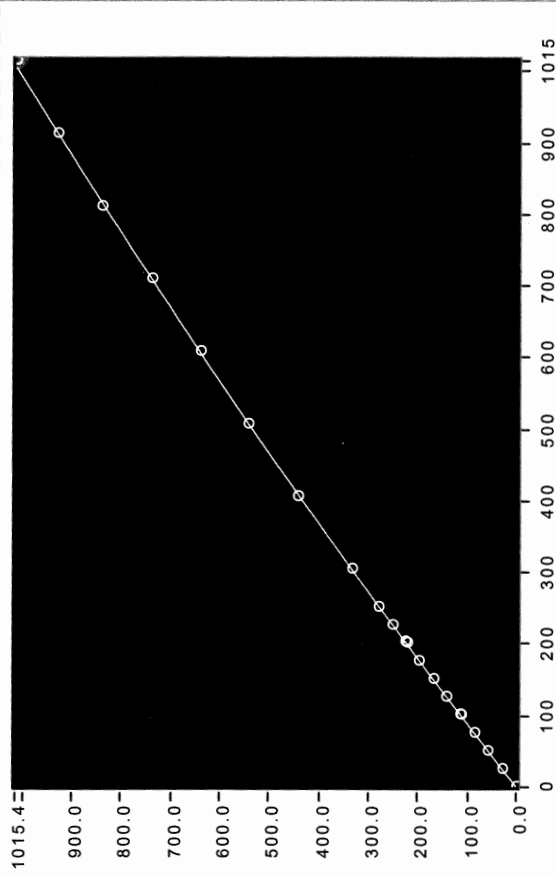
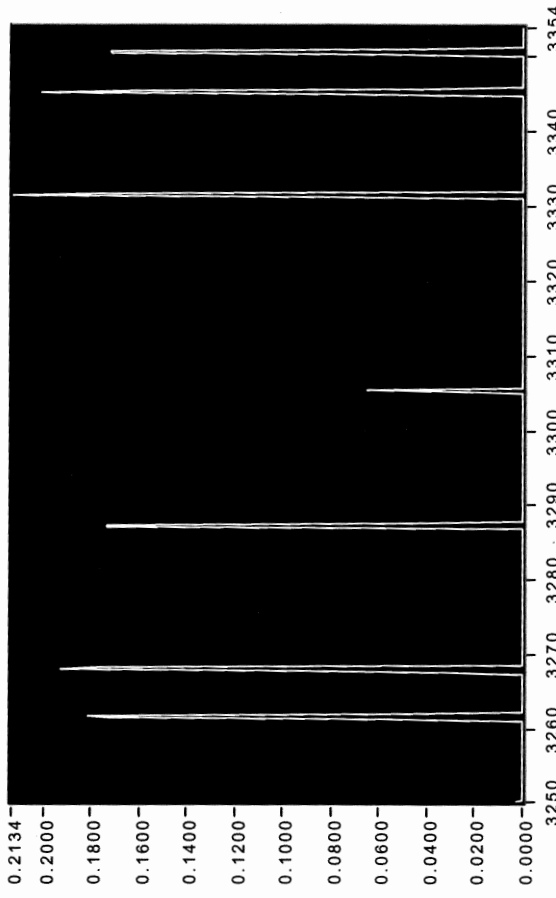
HCN 9 (200) PCA 191C R1 191c

Lo Alarm
Hi Alarm

NaN
NaN

Span
Mutations

Offse...
FALSE



Cal Spectra	Temp (C)	Pres (atm)	Conc (ppm-m)	Actual	Calc'd
HCN PCA 191c R1 (4.93ppm, 5.11m,	191.212	0.977	25.192	25.175	28.457
HCN PCA 191c R1 (9.86ppm, 5.11m,	191.209	0.977	50.385	50.338	58.013
HCN PCA 191c R1 (14.79ppm, 5.11m,	191.194	0.977	75.577	75.505	85.181
HCN PCA 191c R1 (19.72ppm, 5.11m,	191.202	0.977	100.769	100.670	112.555
HCN PCA 191c R1 (19.87ppm, 5.11m,	191.196	0.978	101.536	101.566	114.225
HCN PCA 191c R1 (24.65ppm, 5.11m,	191.204	0.977	125.962	125.832	142.465
HCN PCA 191c R1 (29.58ppm, 5.11m,	191.209	0.977	151.154	150.999	168.169
HCN PCA 191c R1 (34.51ppm, 5.11m,	191.225	0.977	176.346	176.168	198.160
HCN PCA 191c R1 (39.44ppm, 5.11m,	191.217	0.977	201.538	201.349	222.259
HCN PCA 191c R1 (39.74ppm, 5.11m,	191.194	0.978	203.071	203.055	225.996
HCN PCA 191c R1 (44.37ppm, 5.11m,	191.203	0.977	226.731	226.500	251.674
HCN PCA 191c R1 (49.30ppm, 5.11m,	191.199	0.977	251.923	251.691	279.597
HCN PCA 191c R1 (59.61ppm, 5.11m,	191.221	0.978	304.607	304.577	333.647
HCN PCA 191c R1 (79.48ppm, 5.11m,	191.195	0.977	406.143	405.954	442.951
HCN PCA 191c R1 (99.35ppm, 5.11m,	191.258	0.977	507.679	507.181	542.661
HCN PCA 191c R1 (119.22ppm, 5.11m,	191.209	0.977	609.214	608.643	639.842
HCN PCA 191c R1 (139.09ppm, 5.11m,	191.246	0.977	710.750	709.953	739.391
HCN PCA 191c R1 (158.96ppm, 5.11m,	191.263	0.977	812.286	811.364	841.420
HCN PCA 191c R1 (178.83ppm, 5.11m,	191.221	0.977	913.821	913.339	930.899

Interpolation

Quadratic

Force Through Zero

Min % Residuals

Excl. Zero

Quant w/ Highest

Spectral Regions

Region 00 - 3250.25 to 3353.90 cm-1

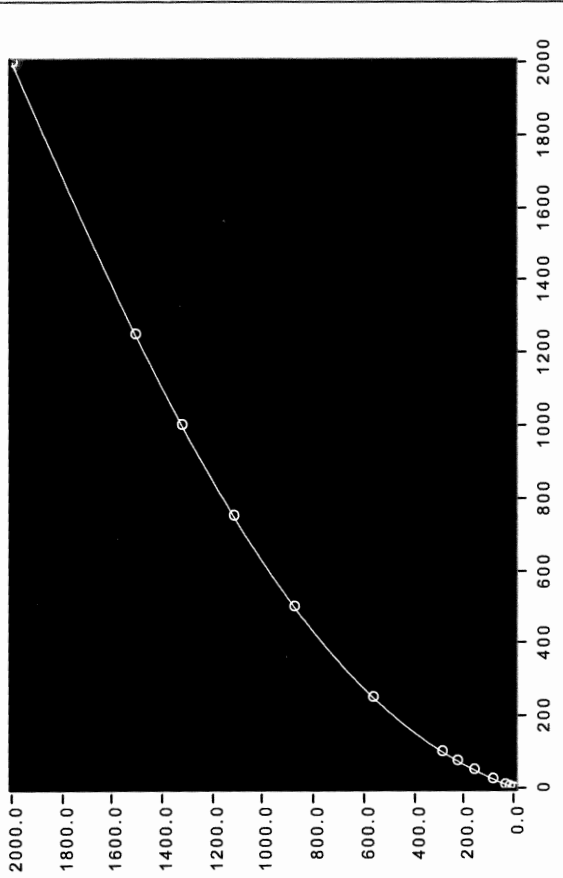
Region 01 - 600.00 to 840.34 cm-1

Region 02 - 1295.95 to 1518.21 cm-1

Region 03 - 3172.38 to 3250.01 cm-1

Region 04 - 3354.14 to 3409.59 cm-1

HF ppm (10) 191C

[illegible]

07/09/2012 2:34 PM

Gas ID	REF Path
1	1
2	2
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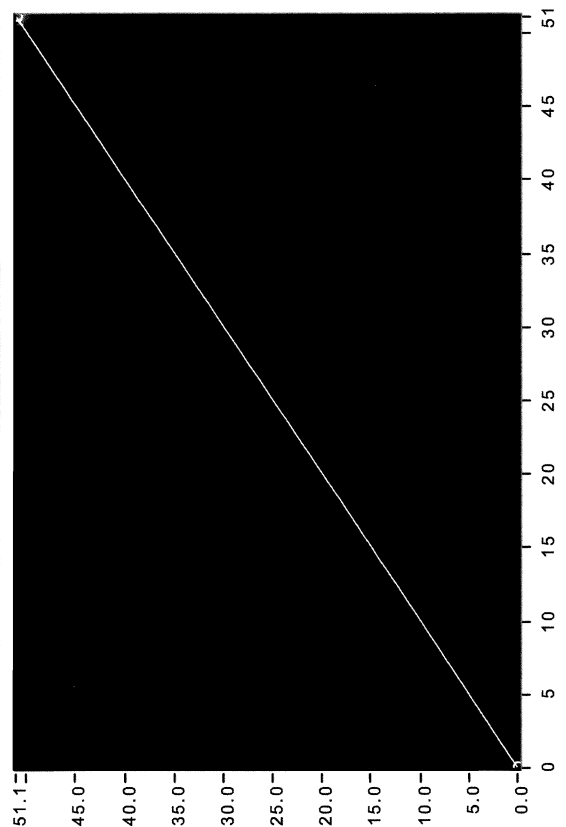
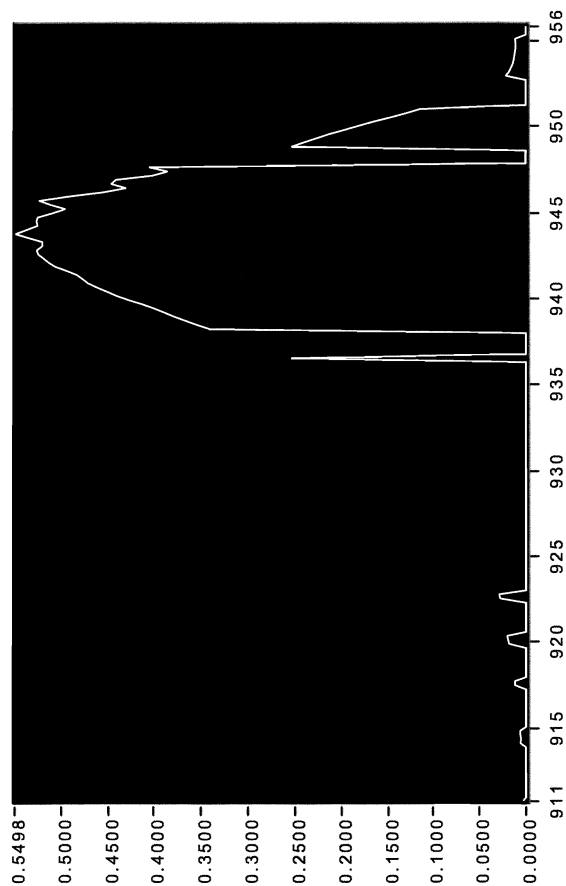
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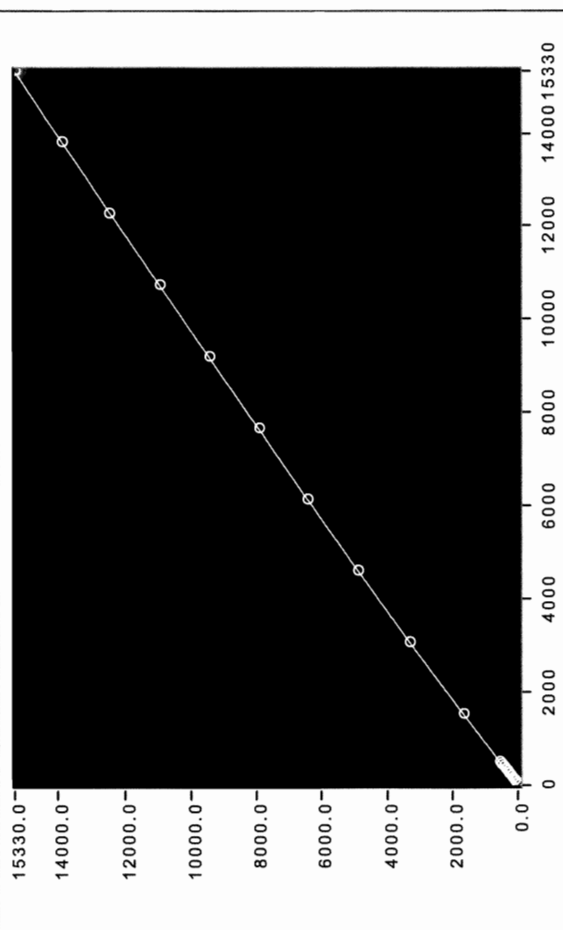
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Appendix F

Test Participants

Scott Steinsberger	Project Manager and FTIR Operator
Dustin Carpenter	Sample Recovery Technician
Gage Meyer	Sampling Technician
Michael Powell	Sampling Technician
Peter Muriuki	Holcim Plant Contact

Appendix G

RTR Sampling and Analytical Protocol



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www.deeco.com

**PROTOCOL TO PERFORM A SAMPLING
AND ANALYTICAL TESTING PROGRAM
AS PART OF THE US EPA RISK AND TECHNOLOGY REVIEW
at
Holcim Inc.
Hagerstown Facility
1260 Security Road
Hagerstown, MD 21742**

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

September 29, 2023

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APPENDICES

Appendix A - Sampling and Analytical Methods

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 will be included in this 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

Holcim (US) Inc.
1260 Security Rd
Hagerstown, MD 21742

Peter Muriuki
Office (240)452-4896
peter.muriuki@holcim.com

1.3 PROCESS OF INTEREST

The process to be tested at the Hagerstown facility is a preheater, with inline calciner, pyro-processing system with an inline raw mill producing portland cement.

1.4 AIR POLLUTION CONTROL EQUIPMENT

The air pollution control equipment at the Hagerstown facility consists of three control devices. A selective noncatalytic reduction (SNCR) post combustion emissions control technology for reducing NO_x by injecting ammonia into the kiln at a properly determined location. A dry sorbent injection system utilizing lime is used to control acid gas emissions. Exhaust from the raw mill, coal mill, alkali bypass, and kiln are directed through respective fabric filters for particulate removal, and directed into a common duct before exhausting out a common stack.

1.5 EMISSION POINTS AND SAMPLING LOCATIONS

The emissions from the clinker cooler, alkali bypass, coal mill and kiln are co-mingled in to a common stack.

1.6 POLLUTANTS TO BE MEASURED

Emission testing will be conducted for hydrogen cyanide (HCN), hydrogen fluoride (HF), and diatomic chlorine (Cl₂). Concurrent measurements to determine volumetric flow rate will be made. The sampling and analytical procedures to be followed are discussed in detail in Section 4.

1.7 EXPECTED TEST DATES

Test dates are to be determined.

1.8 TEST PROGRAM ORGANIZATION

The test program organizational chart is presented in Figure 1.1.

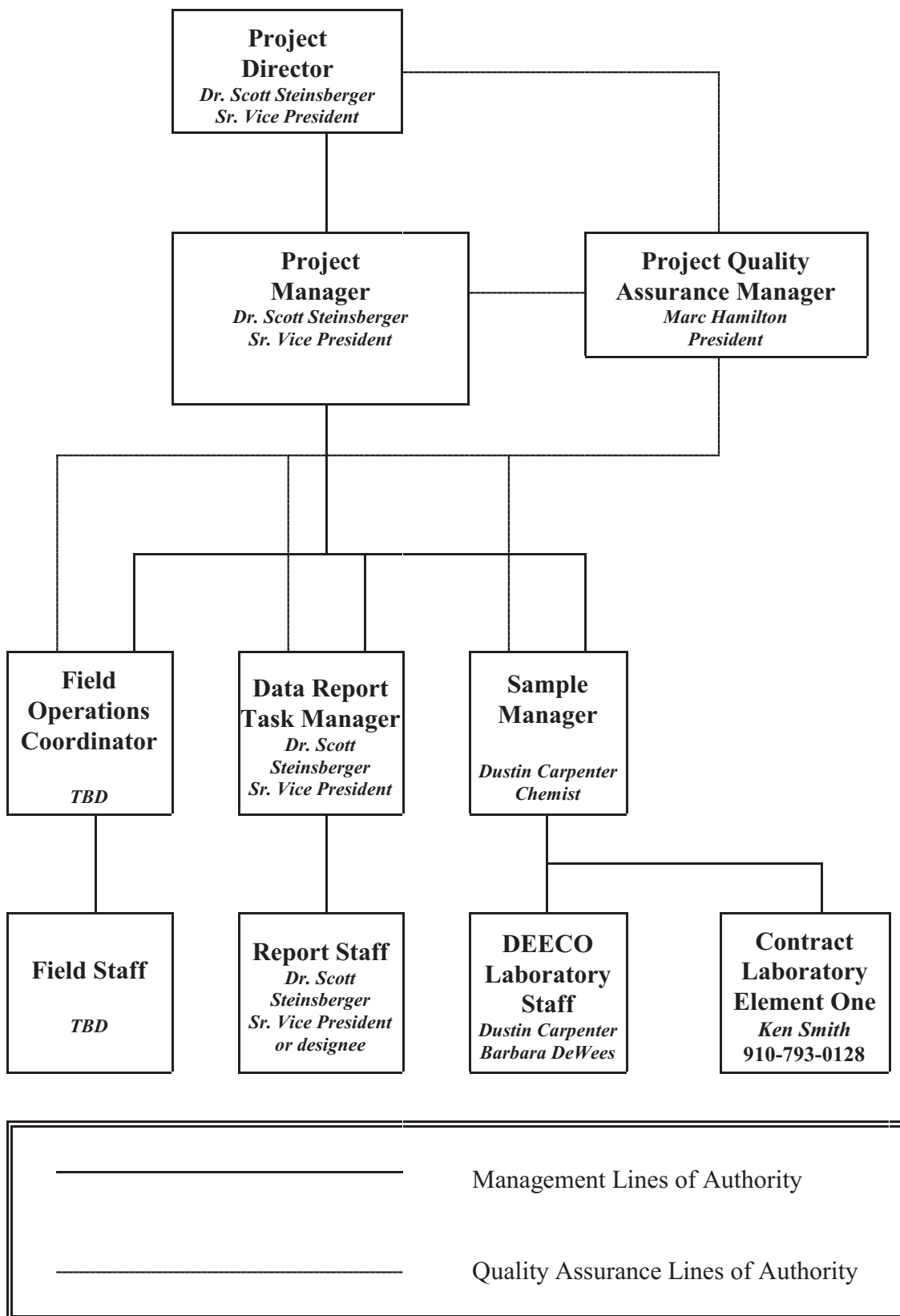


Figure 1.1 Organizational Chart

2.0 SOURCE DESCRIPTION

2.1 PROCESS DESCRIPTION

Holcim's Hagerstown Plant consists of a single production line, incorporating a preheater, with inline calciner, dry process capable of producing 2,400 metric Tons per day. The plant produces various Portland and blended cements.

Facility operations include the mining of the raw materials, the operation of the raw mill for material processing, the operation of an alkali bypass system, the production of clinker in a dry kiln, the operation of a clinker cooler, and the operation of finish mills for the production of cement. The kiln and calcin are fired using coal, diesel (for the heater), and/or various alternative fuels.

2.2 CONTROL EQUIPMENT DESCRIPTION

The air pollution control equipment at the Hagerstown facility consists of three control devices. A selective non catalytic reduction (SNCR) post combustion emissions control technology for reducing NO_x by injecting ammonia into the calciner at a properly determined location. A dry sorbent injection system utilizing lime is used to control acid gas emissions. Exhaust from the raw mill, coal mill, alkali bypass, and kiln are directed through respective fabric filters for particulate removal, and directed into a common duct before exhausting out a common stack.

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

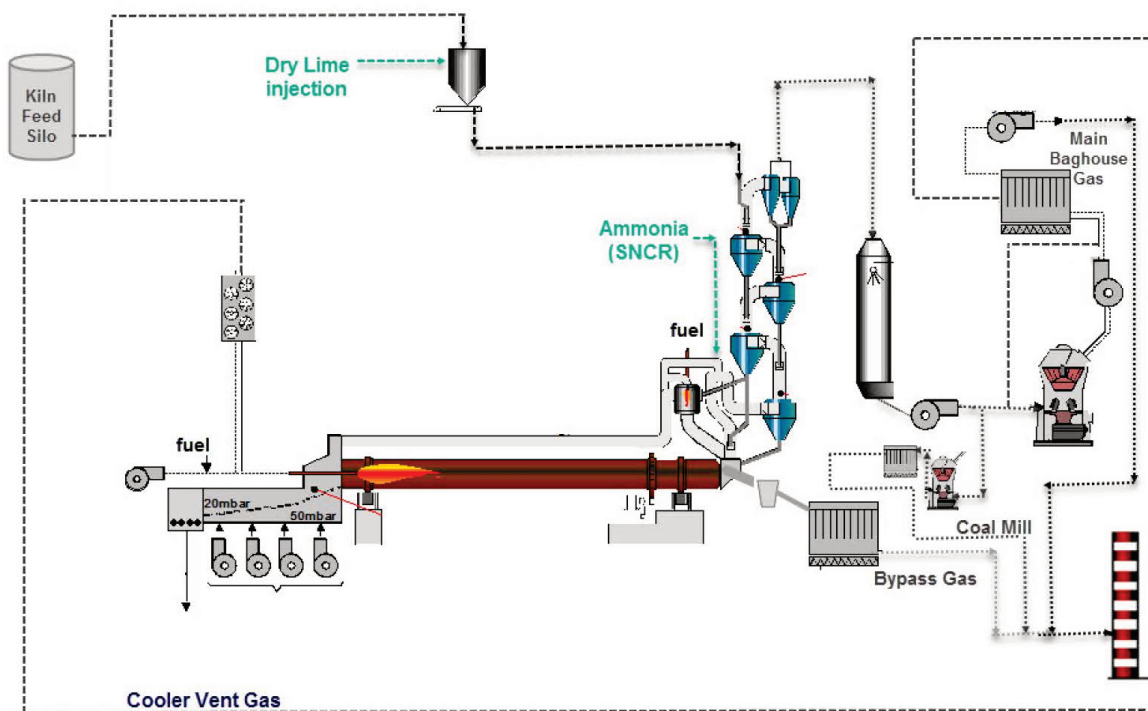


Figure 2.1 Hagerstown Detailed Process Schematic

3.0 TEST PROGRAM

3.1 OBJECTIVES

An air emissions sampling and analytical program will be conducted on the Common stack at the Hagerstown cement facility located in Hagerstown, MD. 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 "DRAFT GENERAL TEST PLAN Testing To Determine HCN, HF, and Cl₂ Emissions From Cement Kilns" dated March 2, 2023" and the 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 (Cl₂) 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 on a date to be determined. Testing will be conducted under representative process and control system operating conditions. For facilities with inline raw mills, 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

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						
Stack; Raw Mill On	3	O ₂ /CO ₂	EPA Method 3A	60	Paramagnetic (O ₂) NDIR (CO ₂)	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						
Stack; Raw Mill Off	3	O ₂ /CO ₂	EPA Method 3A	60	Paramagnetic (O ₂) NDIR (CO ₂)	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

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

3.3 TEST COORDINATION

Mr. Peter Muriuki, the Hagerstown 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 Common Stack is a vertically oriented circular duct with a measured inside diameter of about 126 inches. Four equidistant sampling ports are located at about 184 feet (~17.5 diameters) above the duct breaching, and about 51 feet (~4.9 diameters) below the stack outlet.

This sampling location meets 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 will be conducted at the Common stack test location.

A twelve (12) point sampling traverse will be made using six (6) point traverses in each of two perpendicular directions (or 3 points in each of 4 sampling ports) at the Common stack. Each traverse will be made at each sampling location using a type-S pitot tube in accordance with EPA Methods 2 procedures. Gas temperatures are to be measured using calibrated Type K thermocouples and digital readout devices. All measurements are to be performed in accordance with the procedures in EPA Methods 2, and 26A.

A schematic of the Common stack is provided in Figure 4.1.

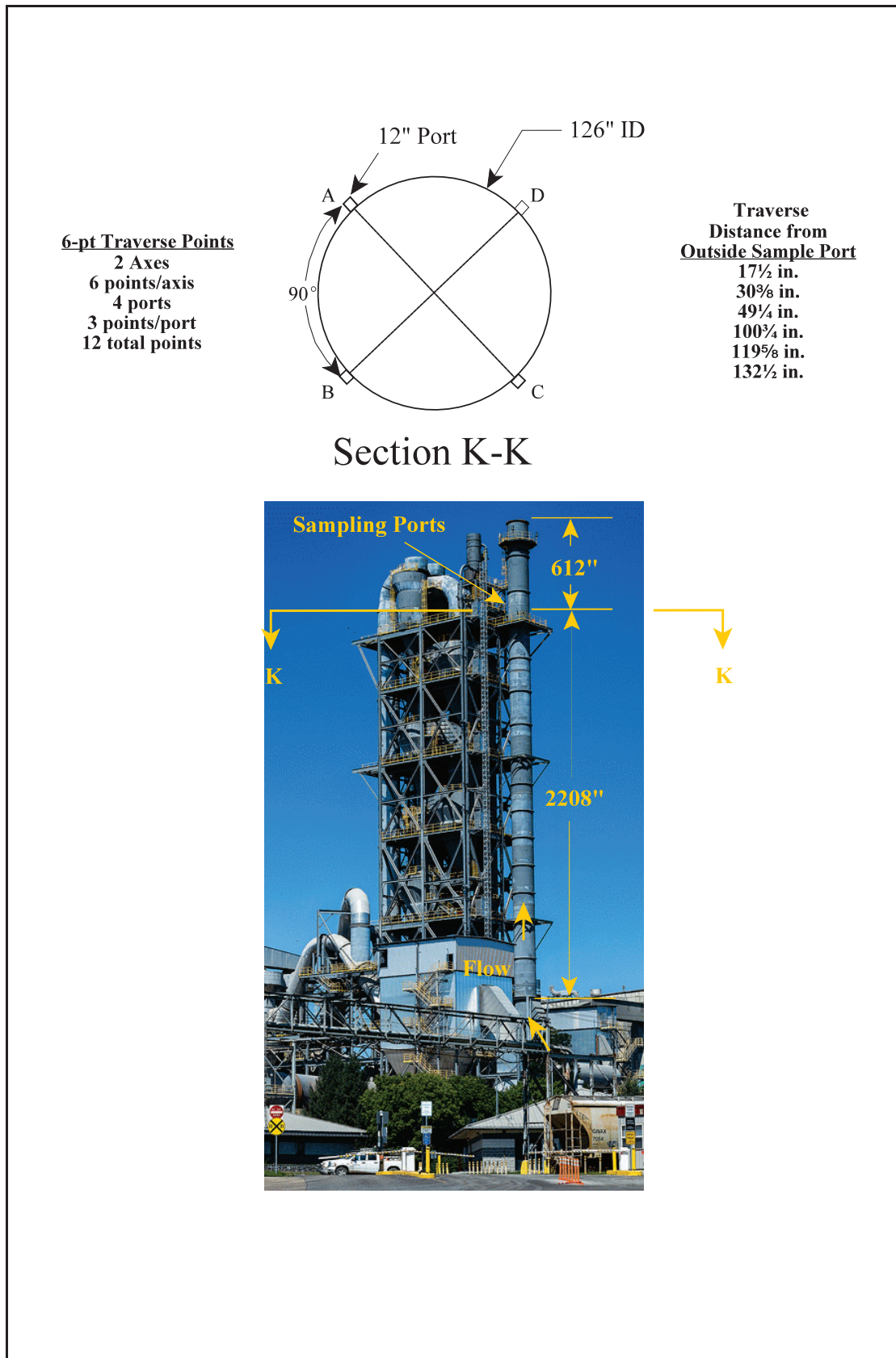


Figure 4.1 Schematic of Stack Sampling Location

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 (O₂) and carbon dioxide (CO₂) 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 O₂ sampling, a three-point O₂ 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 O₂ 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 sent to a CAI Model 200 O₂ (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 O₂ gas present induces a pressure differential in the detector cell. The amount of differential pressure is proportional to the concentration of O₂ 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 proceeding.

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 $\pm 2\%$ 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, an empty fourth 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 ($\pm 10\%$) 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 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 be 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 (2nd knockout or fourth) impinger will be quantitatively transferred to the tare-weighted, 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 H₂SO₄ 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-weighted, 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 1st knockout, H₂SO₄ impingers, and 2nd 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 H₂SO₄, 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 H₂SO₄ 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/Cl₂ 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 Cl₂ 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 O₂/CO₂ 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 (H₂O) and carbon dioxide (CO₂) 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/QC Activities During Field Test Program- During the field test program, following QA/QC activities will be performed and criterion 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 375°F or 191°C (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 quantified for at least 128 scans;
- 6) The sample probe will be positioned 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 $\pm 20\%$ 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 meet 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 $\pm 20\%$ 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 H₂O. 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% O₂ Span is 10%, 15%, or 20% (for co-mingled stacks only) Acceptance criteria are 0.2% O₂ difference for analyzer calibration error, and 0.3% O₂ 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 from 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 it 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 $\pm 5.4^{\circ}\text{F}$. 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 $\pm 10\%$ 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 $\leq 67^{\circ}\text{F}$.

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 Cl₂ 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%O₂), pounds-per-hour (lbs/hr), and pounds-per-ton of clinker (lbs/ton). Additional supporting data for CO₂, O₂, and H₂O 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.

Appendix A

Sampling and Analytical Methods

The sampling and analytical methods for this sampling effort can be found at the following website:

Promulgated EPA test methods, 40 CFR 60 (Methods 1-4, 26A, and 320)

<https://www.epa.gov/emc/emc-promulgated-test-methods>