SOURCE TEST REPORT
2020 COMPLIANCE TESTING
OWENS BROCKWAY GLASS CONTAINER INC.
PLANT No. 21
FURNACE D COLOR CHANGE – AMBER GLASS
PORTLAND, OREGON

Prepared For:

Owens-Brockway Glass Container, Inc.
9710 NE Glass Plant Road
Portland, OR 97220

For Submittal To:

Oregon Department of Environmental Quality
4026 Fairview Industrial Drive SE
Salem, OR 97302

Prepared By:

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Document Number:	**W006AS-760936-RT-1054R1**
Test Dates:	**August 18-19, 2020**
Submittal Date:	**October 2, 2020**
Revision Date:	**November 4, 2020**

STAC STACK TESTING ACCREDITATION COUNCIL
ACCREDITED TO ASTM D7036 ONLY CERT #3925.01

MONTROSE AIR QUALITY SERVICES

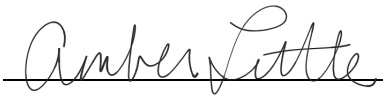
REVIEW AND CERTIFICATION

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Montrose operated in conformance with the requirements of the Montrose Quality Management System and ASTM D7036-04 during this test project.

Signature:  Date: 10/02/2020

Name: Joe Heffernan Title: Client Project Manager

I have reviewed, technically and editorially, details, calculations, results, conclusions, and other appropriate written materials contained herein. I hereby certify that, to the best of my knowledge, the presented material is authentic, accurate, and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature:  Date: 10/02/2020

Name: Amber Little Title: Reporting Hub Manager

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1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

Owens-Brockway Glass Container (Owens-Brockway) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on the Furnace D at the facility located in Portland, Oregon. The tests were conducted to satisfy requirements of the Cleaner Air Oregon program.

The specific objectives were to:

- Measure O_2, CO_2, SO_2, NOx, PM (total) as PM_{10}, Antimony (Sb), Arsenic (As), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se), Hexavalent Chromium (Cr^{+6}) at the outlet of Furnace D while making amber glass
- Conduct the test program with a focus on safety

Montrose performed the tests to measure the emission parameters listed in Table 1-1.

TABLE 1-1
SUMMARY OF TEST PROGRAM

Test Dates	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
8/18/2020	Furnace D	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	60
“”	“”	O_2, CO_2	EPA 3A	3	60
“”	“”	Moisture	EPA 4	3	60
“”	“”	SO_2	EPA 6C	3	60
“”	“”	NO_x	EPA 7E	3	60
“”	“”	TPM	EPA 5/202	3	60
8/19/2020	Furnace D	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	120
“”	“”	O_2, CO_2	EPA 3A	3	120
“”	“”	Moisture	EPA 4	3	120
“”	“”	Multi-Metals	EPA 29	3	120
“”	“”	Cr^{+6}	EPA 0061	3	120
8/18-19/2020	“”	Post-test thermocouple calibration check	EPA ALT-011	--	--

To simplify this report, a list of Units and Abbreviations is included in Appendix D.1. Throughout this report, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The average emission test results are summarized and compared to their respective permit limits in Table 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

The testing was conducted by the Montrose personnel listed in Table 1-3. The tests were conducted according to the test plan (protocol) dated July 21, 2020 that was submitted to and approved by the Oregon DEQ.

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
FURNACE D
AUGUST 18-19, 2020

Parameter/Units	Average Results	Emission Limit	Emission Factor
Filterable Particulate Matter (FPM)			
gr/dscf	0.09	--	0.10
lb/hr	4.3	--	--
lb/ton glass melted	0.5	1	0.6 / 1
g/kg glass melted	0.3	--	
Total Particulate Matter (PM)			
gr/dscf	0.11	0.10	--
lb/hr	5.3	--	--
lb/ton glass melted	0.7	--	0.6
g/kg glass melted	0.4	--	
Nitrogen Oxides (NO_x as NO_2)			
ppmvd	633	--	--
lb/hr	26.4	--	--
lb/ton glass	3.6	--	3.7
Sulfur Dioxide (SO_2)			
ppmvd	361	--	--
lb/hr	20.9	--	--
lb/ton glass	2.8	--	2.1
Lead (Pb)			
µg/dscm	1,727	--	--
lb/hr	3.83×10^{-2}	--	--
lb/ton glass melted	5.20×10^{-3}	--	1.65×10^{-3}
Hexavalent Chromium (Cr^{+6})			
ppmvd	7.4×10^{-5}	--	--
lb/hr	3.5×10^{-6}	--	--
lb/ton glass melted	4.8×10^{-7}	--	0.02

Note: The zero production rate was subtracted in Filterable PM calculations per Permit Condition 13.

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	Owens-Brockway Glass Container Plant No. 21 9710 NE Glass Plant Road Portland, OR 97220	
Project Contact:	Dennis Buenger, CHMM	Walter Tamukong
Role:	Global Environmental Technical Leader	North America Environmental Mgr
Company:	Owens-Brockway	O-I Glass Inc.
Telephone:	567-336-7519	567-336-7621
Email:	dennis.buenger@o-i.com	walter.tamukong@o-i.com

Agency Information

Regulatory Agency:	Oregon Department of Environmental Quality
Agency Contact:	Suzanne Blackburn
Telephone:	503-378-5034
Email:	suzanne.blackburn@state.or.us

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	Joe Heffernan	Jeremiah Hicks
Title:	Client Project Manager	Client Project Manager
Telephone:	503-702-8683	440-340-8189
Email:	jheffernan@montrose-env.com	jhicks@montrose-env.com

Laboratory Information

Laboratory:	Chester LabNet
City, State:	Tigard, OR
ORELAP ID No.	OR100051
Method:	EPA 5, 202, 29, 0061

Test personnel and observers are summarized in Table 1-3.

TABLE 1-3
TEST PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
Joe Heffernan	Montrose	Project Manager/Field Team Leader/Qualified Individual (QI)/Trailer operator/Sample recovery
Preston Bauder	Montrose	Sample train operator
Austin Goracke	Montrose	Sample train operator
Colin Rodkey	Montrose	Sample train operator
Andy Vella	Montrose	Calculations and report preparation
Dennis Buenger	Owens-Brockway	Observer/Client Liaison/Test Coordinator
Joe Palaoro	Owens-Brockway	Observer
Thomas Rhodes	Oregon DEQ	Regulatory review

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

The Portland facility is located at 9710 NE Glass Plant Road in Portland, Oregon. Owens-Brockway Glass Container, Inc. – Plant No. 21 in Portland, Oregon produces a variety of glass bottles and jars from post-consumer recycled glass with other essential raw materials. The glass manufacturing comprises of the following areas of operations: raw material and cullet, receiving and storage, materials blending and transport, glass melting furnaces, glass forming, final bottle treatment, and the maintenance and support systems such as boiler and storage tanks. The furnace tested was Glass Melting Furnace D (GM4) with an estimated maximum capacity of 190 tons per day.

2.2 FLUE GAS SAMPLING LOCATION

Information regarding the sampling location is presented in Table 2-1.

TABLE 2-1
SAMPLING LOCATION

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
Furnace D	29	60 / 2	348 / 12	Isokinetic: 24 (12/port); Gaseous: 3

Sample locations were verified in the field to conform to EPA Method 1. Acceptable cyclonic flow conditions were confirmed prior to testing using EPA Method 1, Section 11.4. See Appendix A.1 for more information.

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while the source/unit was operating at the conditions required by the permit. The unit was tested when operating at greater than 174.6 US tons per day or 158.4 metric tons per day, which represents the 90th percentile of production over the last 12 months. In addition, no more than 45.2% cullet was used which represents no more than two standard deviations from the minimum cullet usage of 30% over the past five years.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The process data that was provided is presented in Appendix B. Data collected includes the following parameters:

- Hourly production data and all glass colors for the previous 6 months
- Glass production
- Recycled-to-raw material ratios (% cullet)
- Natural gas usage

- Electric boost rate
- Bridgewall temperature
- Batch formulation

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 TEST METHODS

The test methods for this test program were presented previously in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

3.1.1 EPA Method 1, Sample and Velocity Traverses for Stationary Sources

EPA Method 1 is used to assure that representative measurements of volumetric flow rate are obtained by dividing the cross-section of the stack or duct into equal areas, and then locating a traverse point within each of the equal areas. Acceptable sample locations must be located at least two stack or duct equivalent diameters downstream from a flow disturbance and one-half equivalent diameter upstream from a flow disturbance.

3.1.2 EPA Method 2, Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Stausscheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1. The molecular weight of the gas stream is determined from independent measurements of O_2, CO_2, and moisture. The stack gas volumetric flow rate is calculated using the measured average velocity head, the area of the duct at the measurement plane, the measured average temperature, the measured duct static pressure, the molecular weight of the gas stream, and the measured moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - S-type pitot tube coefficient is 0.84
  - Inclined manometer is used to measure velocity
- Method Exceptions: NA

3.1.3 EPA Methods 3A, 6C, and 7E, Determination of Oxygen, Carbon Dioxide, Sulfur Dioxide, and Nitrogen Oxides, Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedures)

Concentrations of O_2, CO_2, SO_2, and NO_x are measured simultaneously using EPA Methods 3A, 6C, and 7E, which are instrumental test methods. Conditioned gas is sent to a series of analyzers to measure the gaseous emission concentrations. The performance requirements of the method must be met to validate the data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:

  - No filter is used since low PM is expected
  - A dry extractive sampling system is used to report emissions on a dry basis
  - A paramagnetic analyzer is used to measure O_2
  - A nondispersive infrared analyzer is used to measure CO_2
  - An ultraviolet absorption analyzer is used to measure SO_2
  - A chemiluminescent analyzer is used to measure NO_x
- Method Exceptions:
  - For gaseous emissions sampling, MDL are calculated for each analyzer. The ISDL is equal to the sensitivity of the instrumentation, which is 2% of the span value.
- Stratification check for SO_2 performed during first run indicated an average difference of 3.1% from the mean. Three points per port were sampled during each run.
- Minimum Required Sample Duration: 60 minutes

3.1.4 EPA Methods 5 and 202, Determination of Particulate Matter from Stationary Sources and Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources

EPA Methods 5 and 202 are manual, isokinetic methods used to measure FPM and CPM emissions. The methods are performed in conjunction with EPA Methods 1 through 4. The stack gas is sampled through a nozzle, probe, heated filter, unheated CPM filter, condenser, and impinger train. FPM is collected from the probe and heater filter. CPM is collected from the unheated CPM filter and the impinger train. The samples are analyzed gravimetrically. The sum of FPM and CPM represents TPM. The FPM, CPM, and TPM results are reported in emission concentration and emission rate units. Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Stainless steel sample nozzles and glass probe liners are used
  - Condensed water is measured gravimetrically
  - Polyethylene wash bottles and sample bottles are used
  - The post-test nitrogen purge is performed by passing nitrogen through the train under pressure
- Method Exceptions: NA
- Emission rates in units of g/kg glass were calculated using the equation found in section 13.a of the permit
- Minimum Required Sample Duration: 60 minutes
- Minimum Required Sample Volume: 31.8 dscf
- Method Quantifiable Limit: 3 mg for EPA 5, 4 mg for EPA 202
- Analytical Laboratory: Chester LabNet, Tigard, Oregon

3.1.5 EPA Method 29, Determination of Metals Emissions from Stationary Sources

EPA Method 29 is a manual, isokinetic test method to measure a variety of metals using inductively coupled argon plasma emission spectroscopy (ICAP) and cold vapor atomic absorption (CVAA) spectroscopy. This method is performed in conjunction with EPA Methods 1-4. A stack sample is withdrawn isokinetically from the source, filterable emissions are collected in the probe and on a heated filter, and condensable emissions are collected in an aqueous acidic solution of hydrogen peroxide (analyzed for all target analytes) and an optional aqueous acidic solution of potassium permanganate (required only when Hg is a target analyte). The recovered samples are digested, and appropriate fractions are analyzed for the target analytes which may include Hg by CVAAS and for Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, P, Se, Ag, Tl, and Zn by ICAP or atomic absorption spectroscopy (AAS). Graphite furnace atomic absorption spectroscopy (GFAAS) is used for analysis of Sb, As, Cd, Co, Pb, Se, and Tl if these elements require greater analytical sensitivity than can be obtained using ICAP. AAS may be used for analysis of all target analytes if the resulting in-stack method detection limits meet the goal of the testing program. Similarly, inductively coupled plasma-mass spectroscopy (ICP-MS) may be used for analysis of Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Ag, Tl and Zn. The results from analysis of individual fractions of the sample train are summed to obtain the total concentration of each metal per sample train.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - The method is performed for the following target analytes: Arsenic (As), Lead (Pb)
  - Since mercury is not a target analyte, the fourth, fifth, and sixth impingers of the sample train are eliminated
- Method Exceptions: NA
- Minimum Required Sample Duration: 120 minutes
- Minimum Required Sample Volume: 60 dscf
- Analytical Laboratory: Chester LabNet, Tigard, Oregon

3.1.6 EPA SW-846 Method 0061, Determination of Hexavalent Chromium Emissions from Stationary Sources

EPA SW-846 Method 0061 is a manual method used to measure hexavalent chromium (Cr^{+6}) emissions from hazardous waste incinerators, municipal waste incinerators, municipal waste combustors, and sewage sludge incinerators. For incinerators and combustors, the Cr^{+6} emissions are collected isokinetically from the source. To eliminate the possibility of Cr^{+6} reduction between the nozzle and impinger, the emission samples are collected with a recirculatory train where the impinger reagent is continuously recirculated to the nozzle. Recovery procedures include a post-sampling purge and filtration. The impinger train samples are analyzed for Cr^{+6} by an ion chromatograph equipped with a post-column reactor and a visible wavelength detector. The IC/PCR separates the Cr^{+6} as chromate (CrO_4^{2-}) from other diphenylcarbazide reactions that occur in the post-column reactor. To increase sensitivity for trace levels of chromium, a preconcentration system is used in conjunction with the IC/PCR.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Container No. 2 is not collected since total chromium is being performed in Method 29 sampling train
  - For this test program only Cr^{+6} was quantified
- Method Exceptions: NA
- Target and/or Minimum Required Sample Duration: 120 minutes
- Target and/or Minimum Required Sample Volume: 60 dscf
- Analytical Laboratory: Chester LabNet, Tigard, Oregon

3.1.7 EPA Method ALT-011, Alternative Method 2 Thermocouple Calibration

EPA Approved Alternative Method 011 (ALT-011) is used as an alternative to the EPA Method 2 two-point thermocouple calibration. This procedure involves a single-point in-field check using a reference thermometer to confirm that the thermocouple system is operating properly. The temperatures of the thermocouple and reference thermometers shall agree to within ±2 °F.

3.2 PROCESS TEST METHODS

The test plan did not require that process samples be collected during this test program; therefore, no process sample data are presented in this test report.

4.0 TEST DISCUSSION AND RESULTS

4.1 FIELD TEST DEVIATIONS AND EXCEPTIONS

During the first hexavalent chromium run it appeared that the first impinger lost sodium bicarbonate solution, either exiting the probe tip or being condensed in the other impingers. An additional 150 mL of $NaHCO_3$ was added to the impinger and was accounted for in the moisture recovery data sheet. The moisture measured during concurrent EPA Method 29 testing was used in calculations. For that same run there were no intermediate leak check volumes recorded on the data sheet. A volume of 0.2 cubic feet was subtracted from the meter volume as a conservative estimate, to avoid biasing the emissions high for that run. The value was approximated by rounding up the average amount subtracted during the second and third runs.

Montrose's data acquisition software (MAQDAQ) was programed to summarize run data for 60 minutes. Additional data was recovered from the strip chart recorder in order to quantify O_2 and CO_2 concentrations throughout the course of the multi-metals and hexavalent chromium runs in order to calculate a representative molecular weight. MAQDAQ run printouts and supplemental strip chart data are presented in Appendix A.5 of this report.

4.2 PRESENTATION OF RESULTS

The average results are compared to the permit limits in Table 1-2. The results of individual compliance test runs performed are presented in Tables 4-1 through 4-4. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

TABLE 4-1
SO_2 AND NO_X EMISSIONS RESULTS -
FURNACE D

Run Number	1	2	3	Average
Date	8/18/2020	8/18/2020	8/18/2020	--
Time	0756-0900	0928-1044	1114-1218	--
Process Data				
Glass melted, ton/hr	7.375	7.375	7.375	7.375
Type of glass processed		AR2-Amber Red B50		
% cullet	45 ext / 0 int	45 ext / 0 int	45 ext / 0 int	--
Natural gas rate, kscf/hr	21.6	22.1	22.7	22.1
Electric boost rate, kW/hr	830	830	831	830
Bridgewall temp., °F	2,834	2,829	2,827	2,830
Flue Gas Parameters				
O_2, % volume dry	7.0	7.2	6.9	7.0
CO_2, % volume dry	11.4	11.2	11.6	11.4
flue gas temperature, °F	699	709	711	706
moisture content, % volume	15.9	16.4	15.8	16.0
volumetric flow rate, dscfm	5,831	5,663	5,933	5,809
Nitrogen Oxides (NO_x as NO_2)				
ppmvd	642.5	611.8	644.9	633.1
lb/hr	26.8	24.8	27.4	26.4
lb/ton glass	3.64	3.37	3.72	3.57
Sulfur Dioxide (SO_2)				
ppmvd	363.9	355.5	362.3	360.6
lb/hr	21.1	20.1	21.4	20.9
lb/ton glass	2.87	2.72	2.90	2.83

TABLE 4-2
PM EMISSIONS RESULTS -
FURNACE D

Run Number	1	2	3	Average
Date	8/18/2020	8/18/2020	8/18/2020	--
Time	0756-0900	0928-1044	1114-1218	--
Process Data				
Glass rate, ton/hr	7.375	7.375	7.375	7.375
Type of glass processed		AR2-Amber Red B50		
% cullet	45 ext / 0 int	45 ext / 0 int	45 ext / 0 int	--
Natural gas rate, kscf/hr	21.6	22.1	22.7	22.1
Electric boost rate, kW/hr	830	830	831	830
Bridgewall temp., °F	2,834	2,829	2,827	2,830
Flue Gas Parameters				
O_2, % volume dry	7.0	7.2	6.9	7.0
CO_2, % volume dry	11.4	11.2	11.6	11.4
flue gas temperature, °F	699	709	711	706
moisture content, % volume	15.9	16.4	15.8	16.0
volumetric flow rate, dscfm	5,831	5,663	5,933	5,809
Filterable Particulate Matter (PM)				
gr/dscf	0.0853	0.0860	0.0858	0.0857
lb/hr	4.27	4.17	4.36	4.27
lb/ton glass melted	0.511	0.498	0.524	0.511
g/kg glass melted	0.255	0.249	0.262	0.255
Condensable PM				
gr/dscf	0.0134	0.0238	0.0231	0.0201
lb/hr	0.67	1.16	1.17	1.00
lb/ton glass melted	0.091	0.157	0.159	0.136
g/kg glass melted	0.046	0.078	0.079	0.068
Total PM				
gr/dscf	0.0988	0.1098	0.1088	0.1058
lb/hr	4.94	5.33	5.53	5.27
lb/ton glass melted	0.670	0.723	0.750	0.714
g/kg glass melted	0.335	0.361	0.375	0.357

Note: The zero production rate was subtracted in Filterable PM calculations per Permit Condition 13.

TABLE 4-3
HEXAVALENT CHROMIUM EMISSIONS RESULTS -
FURNACE D

Run Number	1	2	3	Average
Date	8/19/2020	8/19/2020	8/19/2020	--
Time	0816-1024	1107-1336	1413-1703	--
Process Data				
Glass rate, ton/hr	7.375	7.375	7.375	7.375
Type of glass processed		AR2-Amber Red B50		
% cullet	45 ext / 0 int	45 ext / 0 int	45 ext / 0 int	--
Natural gas rate, kscf/hr	22.8	22.7	22.4	22.6
Electric boost rate, kW/hr	839	863	880	861
Bridgewall temp., °F	2,819	2,827	2,824	2,823
Flue Gas Parameters				
O_2, % volume dry	7.0	7.1	6.9	7.0
CO_2, % volume dry	11.3	11.2	11.3	11.3
flue gas temperature, °F	690	702	691	694
moisture content, % volume	14.5	17.8	14.6	16.2
volumetric flow rate, dscfm	5,987	5,864	5,949	5,906
Hexavalent Chromium (Cr^{+6})				
ppmvd	4.3×10^{-5}	7.5×10^{-5}	7.2×10^{-5}	6.3×10^{-5}
lb/hr	2.1×10^{-6}	3.5×10^{-6}	3.3×10^{-6}	3.0×10^{-6}
lb/ton glass melted	2.8×10^{-7}	4.8×10^{-7}	4.5×10^{-7}	4.0×10^{-7}

Note: The first run was excluded from averages due to loss of impinger liquid. EPA Method 29 moisture data was used for run 1.

TABLE 4-4
METALS EMISSIONS RESULTS -
FURNACE D

Run Number	1	2	3	Average
Date	8/19/2020	8/19/2020	8/19/2020	--
Time	0816-1024	1107-1336	1413-1703	--
Process Data				
Glass rate, ton/hr	7.375	7.375	7.375	7.375
Flue Gas Parameters				
O_2, % volume dry	7.0	7.1	6.9	7.0
CO_2, % volume dry	11.3	11.2	11.3	11.3
flue gas temperature, °F	707	709	728	714
moisture content, % volume	14.5	15.4	14.8	14.9
volumetric flow rate, dscfm	5,890	6,003	5,901	5,931
Antimony				
µg/dscm	4.7	5.4	6.0	5.4
lb/hr	1.0×10^{-4}	1.2×10^{-4}	1.3×10^{-4}	1.2×10^{-4}
lb/ton glass melted	1.4×10^{-5}	1.6×10^{-5}	1.8×10^{-5}	1.6×10^{-5}
Arsenic				
µg/dscm	119	130	145	131
lb/hr	2.6×10^{-3}	2.9×10^{-3}	3.2×10^{-3}	2.9×10^{-3}
lb/ton glass melted	3.6×10^{-4}	4.0×10^{-4}	4.3×10^{-4}	3.9×10^{-4}
Beryllium				
µg/dscm	0.036	0.035	0.035	0.036
lb/hr	8.0×10^{-7}	8.0×10^{-7}	7.8×10^{-7}	7.9×10^{-7}
lb/ton glass melted	1.1×10^{-7}	1.1×10^{-7}	1.1×10^{-7}	1.1×10^{-7}
Cadmium				
µg/dscm	15	17	16	16
lb/hr	3.4×10^{-4}	3.7×10^{-4}	3.6×10^{-4}	3.6×10^{-4}
lb/ton glass melted	4.6×10^{-5}	5.0×10^{-5}	4.9×10^{-5}	4.8×10^{-5}
Chromium				
µg/dscm	120	137	132	130
lb/hr	2.6×10^{-3}	3.1×10^{-3}	2.9×10^{-3}	2.9×10^{-3}
lb/ton glass melted	3.6×10^{-4}	4.2×10^{-4}	3.9×10^{-4}	3.9×10^{-4}
Cobalt				
µg/dscm	0.43	0.45	0.18	0.35
lb/hr	9.5×10^{-6}	1.0×10^{-5}	3.9×10^{-6}	7.8×10^{-6}
lb/ton glass melted	1.3×10^{-6}	1.4×10^{-6}	5.3×10^{-7}	1.1×10^{-6}

TABLE 4-4 (CONTINUED)
METALS EMISSIONS RESULTS -
FURNACE D

Run Number	1	2	3	Average
Date	8/19/2020	8/19/2020	8/19/2020	--
Time	0816-1024	1107-1336	1413-1703	--
Process Data				
Glass rate, ton/hr	7.375	7.375	7.375	7.375
Flue Gas Parameters				
O_2, % volume dry	7.0	7.1	6.9	7.0
CO_2, % volume dry	11.3	11.2	11.3	11.3
flue gas temperature, °F	707	709	728	714
moisture content, % volume	14.5	15.4	14.8	14.9
volumetric flow rate, dscfm	5,890	6,003	5,901	5,931
Copper				
µg/dscm	29	30	29	29
lb/hr	6.3×10^{-4}	6.7×10^{-4}	6.4×10^{-4}	6.5×10^{-4}
lb/ton glass melted	8.5×10^{-5}	9.1×10^{-5}	8.6×10^{-5}	8.8×10^{-5}
Lead				
µg/dscm	1607	1761	1814	1727
lb/hr	3.5×10^{-2}	4.0×10^{-2}	4.0×10^{-2}	3.8×10^{-2}
lb/ton glass melted	4.8×10^{-3}	5.4×10^{-3}	5.4×10^{-3}	5.2×10^{-3}
Manganese				
µg/dscm	4.0	4.8	4.1	4.3
lb/hr	8.8×10^{-5}	1.1×10^{-4}	9.0×10^{-5}	9.5×10^{-5}
lb/ton glass melted	1.2×10^{-5}	1.5×10^{-5}	1.2×10^{-5}	1.3×10^{-5}
Mercury				
µg/dscm	3.2	2.9	3.0	3.0
lb/hr	7.0×10^{-5}	6.5×10^{-5}	6.6×10^{-5}	6.7×10^{-5}
lb/ton glass melted	9.5×10^{-6}	8.7×10^{-6}	9.0×10^{-6}	9.1×10^{-6}
Nickel				
µg/dscm	4.8	9.5	6.5	6.9
lb/hr	1.1×10^{-4}	2.1×10^{-4}	1.4×10^{-4}	1.5×10^{-4}
lb/ton glass melted	1.4×10^{-5}	2.9×10^{-5}	1.9×10^{-5}	2.1×10^{-5}
Selenium				
µg/dscm	94	77	110	93
lb/hr	2.1×10^{-3}	1.7×10^{-3}	2.4×10^{-3}	2.1×10^{-3}
lb/ton glass melted	2.8×10^{-4}	2.3×10^{-4}	3.2×10^{-4}	2.8×10^{-4}

5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC AUDITS

The meter boxes and sampling trains used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes, minimum sample durations, and percent isokinetics met the applicable QA/QC criteria.

EPA Method 3A, 6C, and 7E calibration audits were all within the measurement system performance specifications for the calibration drift checks, system calibration bias checks, and calibration error checks.

The NO_2 to NO converter efficiency check of the analyzer was conducted per the procedures in EPA Method 7E, Section 8.2.4. The conversion efficiency met the criteria.

EPA Method 5 analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met, except where noted in Section 5.2. An EPA Method 5 reagent blank was analyzed. The maximum allowable amount that can be subtracted is 0.001% of the weight of the acetone blank. The blank did not exceed the maximum residue allowed.

EPA Method 202 analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met. An EPA Method 202 Field Train Recovery Blank (FTRB) was performed for each source category. The maximum allowable amount that can be subtracted is 0.002 g (2.0 mg). For this project, the FTRB had a mass of 3.6 mg, and 2.0 mg was subtracted.

EPA Method 29 analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met.

EPA Method 0061 analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met, except where noted in Section 5.2.

5.2 QA/QC DISCUSSION

In the Method 0061 samples, a large interfering peak was present near the hexavalent chromium peak that caused the concentration to bias low based on the spike recovery. The samples were diluted fivefold which improved the spike recovery. The detection limit was raised for those samples by a factor of five to account for the dilution.

The EPA Method 5 filters were hygroscopic and gained mass after being put on the balance. After weighing them four times without being able to get constant masses, a modified approach was used. Masses were recorded manually approximately ten seconds after the filters were placed on the balance. This procedure yielded masses that passed the constant mass criteria.

All other QA/QC criteria were met during this test program.

5.3 QUALITY STATEMENT

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the report appendices. The content of this report is modeled after the EPA Emission Measurement Center Guideline Document (GD-043).

APPENDIX A
FIELD DATA AND CALCULATIONS

Appendix A.1
Sampling Locations

MONTROSE AIR QUALITY SERVICES

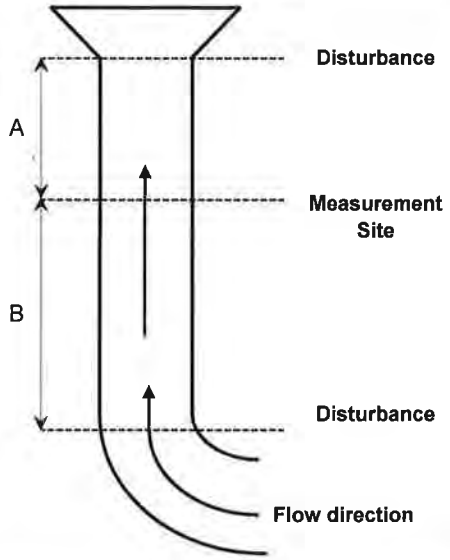
EPA METHOD 1 FIELD DATA

Project Information

Client / Facility: Owens Broadway container
Source / Location: Furnace D
Date: 8/18/20
Data taken by: AG

Duct Measurements

Type of duct (circular, rectangular, elliptical)	circular
Far wall to outside of port distance, in.: M1	35.5
Port length, in. (confirm flush with inside wall): M2	6.5
Duct inner diameter, in (M1 - M2)	29.0"
Duct ID using adjacent, 90° port (for elliptical ducts)	—
Upstream distance (A), in.	2348"
Downstream distance (B), in.	60.0"
Number of ports (for circular, must be 90° to each other)	2
Internal width (for rectangular ducts only), in. *	—
Port inner diameter, in.	6"



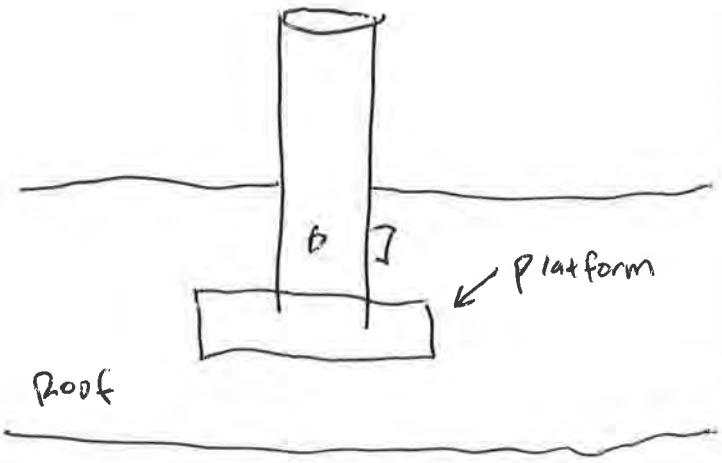
Duct Parameters

Material (steel, fiberglass, PVC)	Steel
Type of port (flange, npt nipple, etc.)	Nipple
Orientation (vertical, horizontal, if diagonal specify angle)	Vertical
Elevation of ports above ground, ft.	

Cyclonic flow expected?	NO
Pitot ID	45-13
Manometer ID	0-1
Angle finder / protractor ID	740

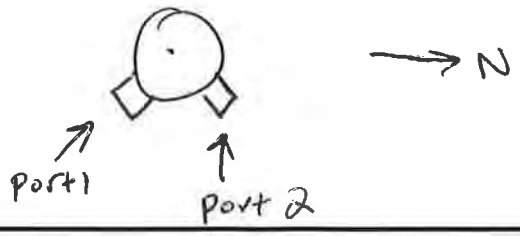
Traverse point	Outside port distance, in.	Null angle, α
1	7.5	4.9
2	8.4	6.0
3	9.9	7.9
4	11.6	5.1
5	13.8	7.9
6	16.8	8.0
7	24.9	2.3
8	28.3	1.6
9	30.4	3.1
10	32.1	2.6
11	33.6	0.5
12	34.5	1.0
1		3.8
2		0.6
3		8.6
4		8.6
5		6.5
6		5.9
7		11.7
8		9.1
9		9.8
10		6.9
11		2.8
12		3.3
Average of absolute α		

Diagram of duct and sampling location



Cross-section sketch showing port locations and numbering

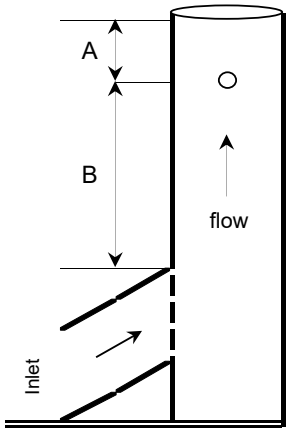
Label the following: port number 1, 2, etc.
north direction or other landmark
flow direction - ⊗ into page ⊙ out of page



*If schematics are unavailable, internal width can be estimated by measuring the portion of the port length not visible on the outside of the duct, which would be an estimate of the insulation thickness. Double this distance and subtract it from the outside width

OWENS BROCKWAY - FURNACE D
TRAVERSE POINT LAYOUT (PARTICULATE)
CIRCULAR STACKS OVER 24 INCHES

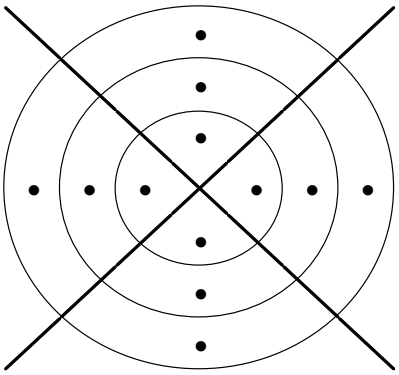
Stack diameter:	**29.0**	***inches***
Upstream diameter (A):	**348.0**	***inches***
Downstream diameter (B):	**60.0**	***inches***
Port length:	**6.50**	***inches***
Number of ports being used:	**2**	***see note***
Equivalent upstream diameter (A):	**12.000**	***Pass***
Equivalent downstream diameter (B):	**2.069**	***Pass***
All points at least 1.0" from stack wall:	**0.609**	***Adjust to 1.0 in.***
Total points:	**24**	
Points per port:	**12**	



Typical vertical exhaust stack

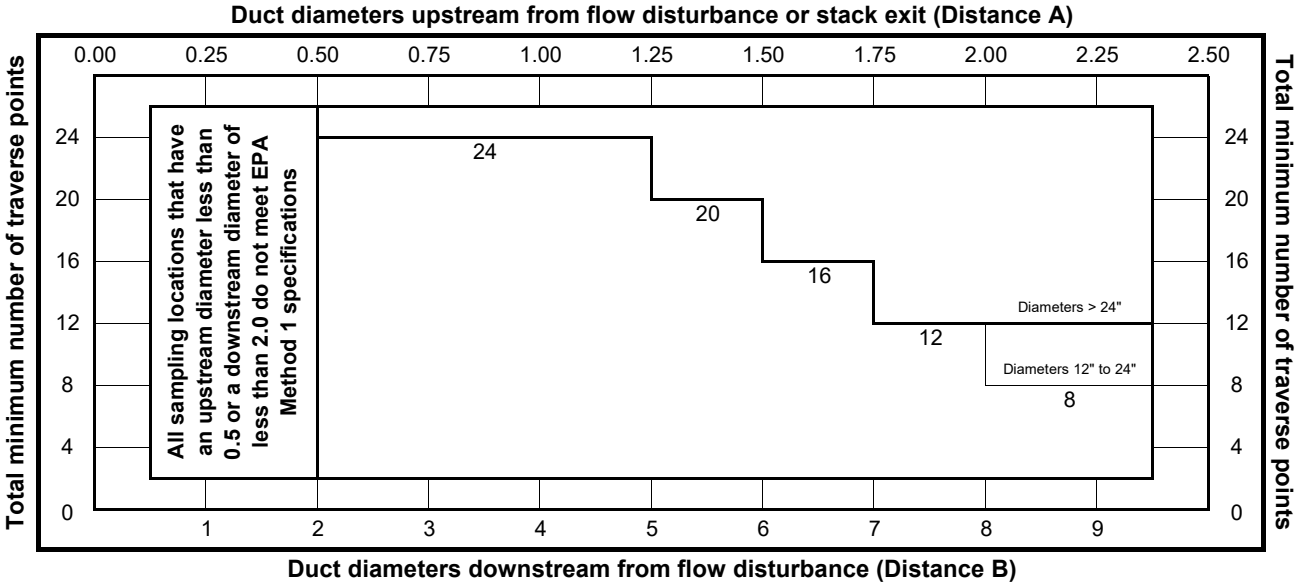
Point	% Diameter	Inside wall Distance (in)	Outside port Distance (in)
1	2.1	1.0	7.5
2	6.7	1.9	8.4
3	11.8	3.4	9.9
4	17.7	5.1	11.6
5	25.0	7.3	13.8
6	35.6	10.3	16.8
7	64.4	18.7	25.2
8	75.0	21.8	28.3
9	82.3	23.9	30.4
10	88.2	25.6	32.1
11	93.3	27.1	33.6
12	97.9	28.0	34.5

DUCT AREA = 4.587 ft^2



Example: Location of 12 points

Note: No traverse point shall be within 1.0" of the stack walls (see EPA 1 section 11.3.1). Points automatically adjusted to meet this criterion.



Appendix A.2
Particulate Matter Data Sheets

MONTROSE AIR QUALITY SERVICES

5/202 Method _____ Field Datasheet (Isokinetic)

Page 1 of 1

Project Information

Date 8/19/20 Project # 006AS-760936

Customer/Facility Owens Brockway Container

Unit ID/Sample Location Furnace D

Run # 1 Operator AG

Sampling Conditions

Static Pressure, in. H_2O -0.13 Ambient Temp, °F 64

Barometric Pressure, in. Hg 29.98 Ref. Barometer ID NOAA

Wind Speed / Direction 6/NW Precipitation, Y / N, type None

Probe / Filter Temp Range, °F 248±25 / 68-85 cpm

Sampling Equipment IDs

Meterbox ID MB32

Umbilical ID PDX-30-1

Nozzle ID 516

Pitot / Probe ID 4-14

Manometer ID MB32

Sensitivity 0.01

Calibration

Meterbox Y 1.0040

Meterbox ΔH@, in. H_2O 1.8371

Nozzle diameter, Dn, in. .3013

Pitot coefficient, Cp 0.84

Manometer zero and level ✓ yes

K-Factor 3.1 / 3.25

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 5	□ @	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 4	□ @	✓ @ 5
Pitot visual inspection	✓ pass	□ pass	✓ pass
Nozzle visual inspection	✓ pass	□ pass	✓ pass
Meter, cfm @ in. Hg	0.001 @ 9	@	0.001 @ 15
Intermediate leak check volume, ft³			

ALT 011 TC ID:

	Ambient °F	Ref. °F
Stack		
Probe	See Final Run	
Filter Box		
Filter Exit		
Meter outlet		
Impinger Exit		
Other		

Ref. Thermometer ID

Continuity Check □ Continuity w/ Proper Polarity

Notes:

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft³	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet	CPM	Pump Vacuum, in. Hg
1	0	0756	176.512	0.45	1.395	1.4	706	265	261	234	62		69	80	3
2	2.5		178.10	0.48	1.488	1.5	720	267	262	240	59		70	77	3
3	5.0		179.71	0.50	1.55	1.6	722	258	261	253	58		70	78	3
4	7.5		181.43	0.50	1.55	1.6	728	259	265	264	56		70	77	4
5	10.0		183.08	0.54	1.674	1.7	664	266	261	265	56		71	77	4.5
6	12.5		184.82	0.50	1.55	1.6	662	250	254	268	57		72	79	5
7	15.0		186.53	0.50	1.55	1.6	707	247	240	270	58		72	81	5
8	17.5		188.25	0.47	1.52	1.5	716	250	230	268	59		73	81	5
9	20.0		190.08	0.40	1.3	1.3	660	248	215	265	59		73	76	5
10	22.5		191.46	0.41	1.33	1.3	693	252	223	260	60		73	71	5
11	25.0		193.06	0.42	1.365	1.4	732	250	231	258	61		73	69	4.5
12	27.5		194.65	0.36	1.235	1.2	737	247	243	261	62		73	69	4.5
1	30.0	0826 ~~0830~~	196.08	0.34	1.105	1.1	707	251	248	243	60		74	73	3
2	32.5		197.50	0.40	1.3	1.3	767	249	251	255	56		75	78	4
3	35.0		199.03	0.45	1.46	1.5	775	252	239	247	56		75	77	5
4	37.5		200.71	0.45	1.46	1.5	653	249	235	256	55		76	76	5
5	40.0		202.35	0.43	1.397	1.4	665	251	230	257	56		76	77	5
6	42.5		203.90	0.48	1.56	1.6	673	251	238	261	56		76	79	6
7	45.0		205.65	0.45	1.96	1.5	676	248	244	265	57		77	80	6
8	47.5		207.28	0.40	1.3	1.3	677	251	240	268	58		78	81	7
9	50.0		208.85	0.38	1.235	1.2	675	249	234	268	59		78	82	7
10	52.5		210.31	0.36	1.235	1.2	676	253	228	264	59		78	82	7
11	55.0		211.86	0.36	1.17	1.2	680	249	220	258	60		79	83	7
12	57.5		213.41	0.35	1.13	1.1	683	252	230	252	60		80	83	7
	60.0	0930	214.835												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By _____ Team Leader _____

MONTROSE AIR QUALITY SERVICES

5/202 Method _____ Field Datasheet (Isokinetic)

Page 1 of 1

Project Information

Date 8/18/20 Project # 006AS-

Customer/Facility Owens Brockway container

Unit ID/Sample Location Furnace D

Run # 2 Operator AG

Sampling Conditions

Static Pressure, in. H_2O -.12 Ambient Temp, °F 70

Barometric Pressure, in. Hg 29.98 Ref. Barometer ID NOAA

Wind Speed / Direction 7/ NW Precipitation, Y / N, type None

Probe / Filter Temp Range, °F ~~248~~ 225/65-85 CPM

ALT 011 TC ID:

	Ambient °F	Ref. °F
Stack		
Probe		
Filter Box	See	
Filter Exit	Final	
Meter outlet	Run	
Impinger Exit		
Other		

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes: 2632

Sampling Equipment IDs

Meterbox ID MB32

Umbilical ID PDX-30-1

Nozzle ID 5116

Pitot / Probe ID 4-14

Manometer ID MB32

Sensitivity 0.01

Calibration

Meterbox Y 1.0040

Meterbox ΔH@, in. H_2O 1.8371

Nozzle diameter, Dn, in. .3013

Pitot coefficient, Cp 0.84

Manometer zero and level ✓ yes

K-Factor 3.25

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 5	☐ @	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 4	☐ @	✓ @ 5
Pitot visual inspection	✓ pass	☐ pass	✓ pass
Nozzle visual inspection	✓ pass	☐ pass	✓ pass
Meter, cfm @ in. Hg	0.001 @ 4	@	.001 @ 10
Intermediate leak check volume, ft^3	/	/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet	CPM	Pump Vacuum, in. Hg
1	0	0928	215.388	.40	1.30	1.30	756	259	232	225	63		83	93	2
2	2.5		217.01	.40	1.30	1.30	764	253	284	229	60		93	83	2
3	5.0		218.71	.43	1.39	1.40	769	247	291	232	57		85	83	4
4	7.5		220.08	.43	1.39	1.40	774	253	292	243	56		85	83	4
5	10.0	0940	221.52	.45	1.46	1.50	650	247	267	257	56		85	83	7
6	12.5	0953	223.10	.43	1.39	1.40	691	246	268	262	55		84	82	6
7	15.0		224.70	.42	1.36	1.40	677	253	271	268	55		84	83	6
8	17.5		226.63	.40	1.30	1.30	675	249	284	270	56		84	93	6
9	20.0		227.91	.37	1.20	1.20	675	249	280	272	56		84	82	6
10	22.5		229.42	.37	1.20	1.20	680	254	270	272	54		84	79	6
11	25.0		230.92	.38	1.23	1.20	679	244	261	270	55		84	80	6
12	27.5		232.46	.38	1.23	1.20	683	250	252	270	55		84	80	6
1	30.0	1010 1014	233.985	.49	1.59	1.60	707	246	264	236	58		84	80	6
2	32.5		235.36	.50	1.62	1.60	729	265	256	268	56		84	77	6.5
3	35.0		237.41	.48	1.56	1.60	736	254	252	270	56		84	75	7
4	37.5		239.03	.46	1.49	1.50	745	253	246	269	56		84	76	7
5	40.0		240.78	.46	1.49	1.50	751	251	245	267	54		84	76	7
6	42.5		242.37	.38	1.23	1.20	751	247	242	265	54		84	76	7
7	45.0		243.92	.40	1.30	1.30	754	251	244	266	55		85	78	7.5
8	47.5		247.07	.42	1.36	1.40	730	251	246	267	56		85	80	7.5
9	50.0		248.53	.40	1.30	1.30	655	247	241	263	56		86	82	7.5
10	52.5		249.14	.39	1.23	1.20	659	253	239	266	57		86	82	7.5
11	55.0		250.21	.39	1.27	1.20	660	246	240	266	57		86	78	8
12	57.5		251.82	.39	1.23	1.20	664	249	238	264	57		86	78	8
	60.0	1044	253.215												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By _____ Team Leader _____

MONTROSE AIR QUALITY SERVICES

5/202 Method _____ Field Datasheet (Isokinetic)

Page 1 of 1

Project Information

Date 8/18/20 Project # 006AS-760936

Customer/Facility Owens Brockway Container

Unit ID/Sample Location Furnace D

Run # 3 Operator AG

Sampling Conditions

Static Pressure, in. H_2O −0.13 Ambient Temp, °F 80

Barometric Pressure, in. Hg 29.98 Ref. Barometer ID NOAA

Wind Speed / Direction 0-5, NW Precipitation, Y / N, type None

Probe / Filter Temp Range, °F 248±25 / 68-85

Sampling Equipment IDs

Meterbox ID MB32

Umbilical ID PDX-30-1

Nozzle ID 516

Pitot / Probe ID 4-14

Manometer ID MB32

Sensitivity 0.01

Calibration

Meterbox Y 1.0040

Meterbox ΔH@, in. H_2O 1.8371

Nozzle diameter, Dn, in. .3013

Pitot coefficient, Cp 0.84

Manometer zero and level ✓ yes

K-Factor 3.25 / 3.3

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 4.0	□ @	✓ @ 4.5
Pitot (-), pass @ in. H_2O	✓ @ 4.0	□ @	✓ @ 4.5
Pitot visual inspection	✓ pass	□ pass	✓ pass
Nozzle visual inspection	✓ pass	□ pass	✓ pass
Meter, cfm @ in. Hg	0.001 @ 12	@	0.001 @ 13
Intermediate leak check volume, ft^3	— / —	— / —	— / —

ALT 011 TC ID:

	Ambient °F	Ref. °F
Stack 4-14	81	80.5
Probe 4-14	81	80.5
Filter Box 202-1	81	81
Filter Exit 202-2	81	81
Meter outlet MB32	81	80.5
Impinger Exit GS-2	81	80.5
Other (PM) 26032	81	80.5
Ref. Thermometer ID	1407 54303	

Continuity Check ✓ Continuity w/ Proper Polarity

Notes:

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet	CPM	Pump Vacuum, in. Hg
1	0	1114	253.464	.47	1.53	1.5	738	246		237	66	CE 92	70	84	7
2	2.5		255.129	.47	1.53	1.5	738	262		247	64		92	84	7
3	5.0		256.828	.46	1.57	1.5	7446	255		247	60		93	83	7
4	7.5		258.499	.48	1.58	1.6	753	255		258	59		93	83	7
5	10.0		260.191	.48	1.58	1.6	7461	251		257	56		94	83	7
6	12.5		261.900	.47	1.55	1.6	765	247		263	56		94	80	8
7	15.0		263.622	.49	1.62	1.6	770	251		266	55		94	78	8
8	17.5		265.308	.48	1.58	1.6	768	251		266	55		94	76	8
9	20.0		267.020	.46	1.52	1.5	753	250		263	57		94	75	8
10	22.5		268.704	.45	1.49	1.5	754	252		269	58		94	74	7
11	25.0		270.321	.39	1.29	1.3	6446	250		267	60		94	74	7
12	27.5		271.886	.41	1.35	1.4	652	252		261	61		94	74	7
1	30.0	~~1144~~ 1149	273.470	.50	1.65	1.6	694	252		244	60	CE 73	94	~~83~~	7
2	32.5		275.086	.47	1.55	1.6	700	250		237	59	8/19/2078	94	~~80~~	7
3	35.0		276.760	.48	1.58	1.6	702	250		252	58		94	74	8
4	37.5		278.468	.47	1.55	1.6	708	249		263	53		94	74	9
5	40.0		280.168	.48	1.58	1.6	710	252		265	51		94	80	10
6	42.5		281.884	.49	1.62	1.6	715	247		264	50		94	77	10
7	45.0		283.582	.46	1.52	1.5	713	251		264	51		94	71	10
8	47.5		285.274	.44	1.45	1.5	632	251		256	52		94	71	10
9	50.0		286.958	.38	1.25	1.3	660	249		245	53		94	71	10
10	52.5		288.537	.39	1.29	1.3	656	249		237	54		94	72	10
11	55.0		290.098	.40	1.32	1.3	659	245		241	55		94	72	10
12	57.5		291.647	.39	1.29	1.3	672	246		242	56		94	73	10
	600	1210	293.130												
Averages															

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By _____ Team Leader _____

MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet

Page 1 of 1

Project Information

Date 9/13/20 Project # 0060AS-

Customer / Facility Owens Brockway Cont.

Unit ID / Sample Location Furnace D

Run # 1-3 Operator JH

Equipment Identification

Ref. Thermometer —

Hygrometer —

Field Balance 629

Check Weights 10639

Calipers 38744

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date 9/13/20

Standard mass, g 500

Field balance mass, g 499.9

Ambient Conditions (Mobile Lab)

Relative humidity, % —

Temperature, °F —

Mobile lab # TU7

Moisture Determination

		Run1			Run 2			Run 3		
	Contents	Initial	Final	Net	Initial	Final	Net	Initial	Final	Net
Knockout										
Impinger 1	MT	635.4	752.0		629.9	757.3		591.9	722.1	
Impinger 2	MT	742.1	744.9		694.4	698.0		~~607.5~~ 700.8	702.6	
Impinger 3	H_2O	736.4	751.5		735.2	744.0		703.2	706.5	
Impinger 4										
Impinger 5										
Impinger 6										
Impinger 7										
Impinger 8										
Silica Gel	SC	1021.5	1029.4		1009.8	1023.7		1055.2	1070.9	
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

Nozzle 1 diameters .3020 D1 .3010 D2 .3010 D3 .3013 Average

Nozzle 2 diameters ____ D1 ____ D2 ____ D3 ____ Average

Nozzle 3 diameters ____ D1 ____ D2 ____ D3 ____ Average

Nozzle Material ☐ quartz ☐ glass ☒ steel ☐ titanium ☐ inconel ☐ other ____

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other ____

Probe Liner ☐ quartz ☒ glass ☐ steel ☐ Teflon ☐ other ____

Filter Information

Front Half: ☒ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other ____

Filter Number: Run 1: 182 Run 2: 184 Run 3: 183 Run ____

Back Half: ☐ quartz fiber ☐ glass fiber ☒ Teflon ☐ Teflon/quartz ☐ other ____

Reagent Information

Type	Lot Number
Acetone	19050406
Hexane	C181121CA5000HX95
H_2O	K097-03

Sample Observations

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X

Checked by: JH Team Leader: JH

001AS-QMS-FM-226

MONTROSE AIR QUALITY SERVICES

EPA Method 202 Purge Information

Page 1 of 1

Project Information		Equipment Identification	
Date	5/15/20	N_2 Cylinder	T-00 2551
Project #	006AS-760936	Thermocouple IDs	
Customer / Facility	Owens Brockway Cont.	CPM Filter Exit	202-1 12
Unit ID / Sample Location	Furnace D	Impinger Exit	NA
Run #	1-3	Operator	JH

Run 1 — Start Time: 0932 — Stop Time: 1032 — Water added for purge? Y ☐ N ☒

Elapsed Time min	Nitrogen Flow Rate LPM	CPM Filter Exit Temp °F	Impinger Exit Temp °F
0	15	65	NA
15	↓	66	↓
30	↓	67	↓
45	↓	66	↓
60	↓	66	↓

Run 2 — Start Time: 1121 — Stop Time: 1221 — Water added for purge? Y ☐ N ☒

Nitrogen Flow Rate LPM	CPM Filter Exit Temp °F	Impinger Exit Temp °F
15	65	NA
↓	↓	↓

Run 3 — Start Time: 1255 — Stop Time: 1355 — Water added for purge? Y ☐ N ☒

Nitrogen Flow Rate LPM	CPM Filter Exit Temp °F	Impinger Exit Temp °F
15	66	NA
↓	↓	↓

Run FTRB — Start Time: 1410 — Stop Time: 1510 — Water added for purge? Y ☒ N ☐

Elapsed Time min	Nitrogen Flow Rate LPM	CPM Filter Exit Temp °F	Impinger Exit Temp °F
0	15	66	NA
15	↓	↓	↓
30	↓	↓	↓
45	↓	↓	↓
60	↓	↓	↓

Run _____ — Start Time: — Stop Time: — Water added for purge? Y ☐ N ☐

Nitrogen Flow Rate LPM	CPM Filter Exit Temp °F	Impinger Exit Temp °F

Note:
- Was water added to dropout impinger for purge: check yes or no
- If water was added, input amount on Sample Recovery Sheet for Moisture Determination 001AS-QMS-FM-226
- Flow meter range must be at least 14 liters/minute
- CPM Filter Exit temp must be between 65 -85 °F
- Impinger Exit temp must be <68°F
- Impinger Exit temp is not required if impingers were weighed prior to purge

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X

Checked by: JH Data Custodian: JH

001AS-QMS-FM-227

Appendix A.3
Metals Data Sheets

MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

Page 1 of 1

Project Information

Date 8/19/20 Project # 006AS-760939

Customer/Facility Owens

Unit ID/Sample Location Furnace D

Run # 1 Operator PB

Sampling Conditions

Static Pressure, in. H_2O -.13 Ambient Temp, °F 63

Barometric Pressure, in. Hg 29.46 Ref. Barometer ID NOAA

Wind Speed / Direction 3/NW Precipitation, Y (N) type —

Probe / Filter Temp Range, °F 248 ± 25

ALT 011 TC ID:

	Ambient °F	Ref. °F
Stack		
Probe	Sel	
Filter Box		
Filter Exit	Final	
Meter outlet		
Impinger Exit	Run	
Other		

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID MB32

Umbilical ID DDX-30-1

Nozzle ID 29-1

Pitot / Probe ID 117-NP-41

Manometer ID MB32

Sensitivity .01

Calibration

Meterbox Y 1.0040

Meterbox ΔH@, in. H_2O 1.8371

Nozzle diameter, Dn, in. .2887

Pitot coefficient, Cp .84

Manometer zero and level ☑ yes

K-Factor 2.74

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 4	☐ @	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 5	☐ @	✓ @ 5
Pitot visual inspection	✓ pass	☐ pass	✓ pass
Nozzle visual inspection	✓ pass	☐ pass	✓ pass
Meter, cfm @ in. Hg	.001 @ 12	@	.001 @ 25
Intermediate leak check volume, ft^3			

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	0816	293.654	.33	.90	.90	644	249	248		53		78		2
2	5		296.34	.34	.93	.93	637	251	250		53		79		2
3	10		298.95	.38	1.04	1.0	716	251	249		53		79		2
4	15		301.68	.38	1.04	1.0	729	252	252		53		80		2
5	20		304.42	.40	1.09	1.10	760	250	251		53		81		2.5
6	25		307.28	.40	1.09	1.10	664	250	251		55		83		2.5
7	30		310.11	.43	1.17	1.20	683	252	250		57		83		3
8	35		313.55	.46	1.26	1.30	699	251	250		58		84		3
9	40		316.26	.46	1.26	1.30	711	250	250		57		84		3
10	45		319.37	.50	1.37	1.40	721	250	250		56		85		3.5
11	50		322.87	.50	1.37	1.40	727	250	250		57		86		3.5
12	55		325.93	.53	1.45	1.50	730	251	249		58		86		4
1	60	9/16 0814	329.219	.46	1.26	1.30	763	250	250		60		86		3
2	65		332.201	.46	1.26	1.30	772	251	251		56		86		3
3	70		335.38	.45	1.23	1.20	776	251	250		56		87		3
4	75		338.44	.38	1.04	1.00	647	250	251		58		87		3
5	80		341.28	.38	1.04	1.00	662	250	250		60		88		3
6	85		344.11	.43	1.17	1.20	662	251	250		61		88		3.5
7	90		347.13	.43	1.17	1.20	693	249	250		55		89		3.5
8	95		350.33	.45	1.23	1.20	703	250	250		54		89		3
9	100		353.16	.46	1.26	1.30	708	250	250		52		89		3
10	105		356.32	.46	1.26	1.30	693	251	250		52		90		3
11	110		359.47	.46	1.26	1.30	726	248	250		52		90		3
12	115		362.59	.49	1.28	1.30	743	250	250		53		91		3.5
Final	120	1024	365.640												
Averages															

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By JH Team Leader JH

MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

Page 1 of 1

Project Information

Date 8/19/20 Project # W06AS-760936

Customer/Facility Olin

Unit ID/Sample Location Furnace D

Run # 2 Operator JB

Sampling Conditions

Static Pressure, in. H_2O -.13 Ambient Temp, °F 73

Barometric Pressure, in. Hg 29.86 Ref. Barometer ID KOAA

Wind Speed / Direction 5 mph/ft Precipitation, Y (N), type —

Probe / Filter Temp Range, °F 248 ± 25

ALT 011 TC ID:

	Ambient °F	Ref. °F
Stack	Set	
Probe		
Filter Box	Furn	
Filter Exit		
Meter outlet	Furn	
Impinger Exit		
Other		

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID MB32

Umbilical ID PDA-30-1

Nozzle ID 117-NP-45

Pitot / Probe ID

Manometer ID MB32

Sensitivity .01

Calibration

Meterbox Y 1.0040

Meterbox ΔH@, in. H_2O 1.

Nozzle diameter, Dn, in.

Pitot coefficient, Cp .84

Manometer zero and level ✓ yes

K-Factor 2.74

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 5	☐ @	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 4	☐ @	✓ @ 5
Pitot visual inspection	✓ pass	☐ pass	✓ pass
Nozzle visual inspection	✓ pass	☐ pass	✓ pass
Meter, cfm @ in. Hg	.020 @ 15	@	.020 @ 10
Intermediate leak check volume, ft^3	/	/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	1107	366.063	.43	1.17	1.20	632	248	256		59		92		3
2	5		369.17	.49	1.34	1.3	666	249	253		51		92		3
3	10		372.66	.44	1.20	1.20	679	250	251		47		93		3
4	15		375.66	.43	1.17	1.20	713	250	250		47		93		3
5	20		378.65	.46	1.26	1.30	758	250	250		48		95		3
6	25		381.43	.50	1.37	1.40	782	249	250		49		95		3
7	30		384.68	.50	1.37	1.40	663	249	250		49		96		3.5
8	35		388.42	.49	1.34	1.3	681	250	250		52		96		3.5
9	40		391.90	.53	1.45	1.50	694	248	250		53		95		3.5
10	45		395.00	.50	1.37	1.40	703	249	251		54		96		3
11	50		398.91	.53	1.45	1.50	713	249	251		55		95		3
12	55		401.71	.53	1.45	1.50	722	250	251		55		96		3
1	60	1207 1220	405.073	.38	1.04	1.00	670	251	250		65		96		3
2	65		408.07	.38	1.04	1.00	648	250	250		55		96		3
3	70		410.74	.38	1.04	1.00	648	250	249		52		94		3
4	75		413.72	.40	1.09	1.1	649	249	251		54		98		3
5	80		416.55	.44	1.20	1.20	678	249	250		54		98		3
6	85	1251 1255	420.00	.44	1.20	1.20	719	251	250		56		98		3
7	90		422.59	.46	1.26	1.30	773	249	248		55		96		3
8	95		426.11	.46	1.26	1.30	773	251	250		55		96		3
9	100		429.00	.48	1.37	1.30	741	250	251		56		95		4
10	105		432.11	.46	1.26	1.30	757	251	250		57		94		4
11	110		435.58	.44	1.20	1.20	769	251	250		57		94		4
12	115		438.53	.44	1.20	1.20	787	248	250		58		94		4
Final	120	1336	441.132												
Averages															

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By JH Team Leader JH

MONTROSE AIR QUALITY SERVICES

EPA Method 201 Field Datasheet (Isokinetic)

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Project Information

Date 8/11/20 Project # 00645 -

Customer/Facility Owens

Unit ID/Sample Location Furnace 7

Run # 3 Operator KPS

Sampling Conditions

Static Pressure, in. H_2O -.17 Ambient Temp, °F 90

Barometric Pressure, in. Hg 29.90 Ref. Barometer ID KOAA

Wind Speed / Direction 3 / NNE Precipitation, Y (N) type

Probe / Filter Temp Range, °F 248 ± 25

ALT 011 TC ID:

	TC ID:	Ambient °F	Ref. °F
Stack	117-UK-1	80	80.6
Probe	117-UK-1	80	80.6
Filter Box	6540	81	80.6
Filter Exit	—	—	—
Meter outlet	MB32	81	80.6
Impinger Exit	7	81	80.6
Other			

Ref. Thermometer ID 140 75.4303

Continuity Check ✓ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID MB32

Umbilical ID PDX-30-1

Nozzle ID 201-1

Pitot / Probe ID 117-NP-1

Manometer ID MB32

Sensitivity .81

Calibration

Meterbox Y 1.00040

Meterbox ΔH@, in. H_2O 1.8371

Nozzle diameter, Dn, in. .2487

Pitot coefficient, Cp .84

Manometer zero and level ✓ yes

K-Factor 2.74

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 5	□ @	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 21	□ @	✓ @ 5
Pitot visual inspection	✓ pass	□ pass	✓ pass
Nozzle visual inspection	✓ pass	□ pass	✓ pass
Meter, cfm @ in. Hg	.600 @ 10	□ @	.600 @ 12

Intermediate leak check volume, ft^3 473.204 - 473.405

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	1413	441.515	.42	1.15	1.20	713	251	254		61		90		3
2	5		444.54	.46	1.26	1.30	733	250	253		56		90		3
3	10		447.38	.46	1.26	1.30	734	250	251		55		90		3
4	15		450.79	.41	1.20	1.20	749	250	251		55		90		3
5	20		454.03	.41	1.20	1.20	762	250	250		57		91		3
6	25		457.07	.41	1.20	1.20	770	248	250		57		92		3
7	30		460.07	.43	1.17	1.20	606	249	255		56		92		3
8	35		463.83	.43	1.17	1.20	690	251	252		57		93		3.5
9	40		466.39	.46	1.26	1.30	693	251	251		59		92		3.5
10	45		469.78	.46	1.26	1.30	726	248	250		59		93		3.5
11	50	1500 1459	472.92	.50	1.37	1.40	782	252	250		60		90		4
12	55		476.25	.44	1.20	1.20	785	250	251		60		90		4
1	60	1553 1554	478.404	.35	.96	.96	706	250	250		65		91		3
2	65	1559 1600	481.64	.35	.96	.96	713	250	249		66		91		3
3	70		484.93	.36	.99	.98	694	251	250		58		91		3
4	75		488.12	.46	1.26	1.30	744	250	250		57		92		3
5	80		490.80	.50	1.37	1.40	753	250	251		57		92		4
6	85		494.56	.50	1.37	1.40	764	250	251		55		92		4
7	90	1629 1633	497.101	.50	1.37	1.40	775	249	250		64		94		4
8	95		500.95	.42	1.15	1.20	673	250	250		60		94		4
9	100		503.95	.46	1.26	1.30	646	249	250		60		96		4
10	105		507.39	.46	1.26	1.30	706	252	249		60		96		4
11	110		510.71	.46	1.26	1.30	716	251	250		63		94		4
12	115		513.31	.46	1.31	1.30	724	250	250		64		97		4
FINAL	120	1705	516.359												
Averages															

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By JH Team Leader JH

MONTROSE AIR QUALITY SERVICES

29

Sample Recovery & Calibration Check Datasheet

Project Information		**Equipment Identification**	
Date	8/19/20	Ref. Thermometer	—
Project #	0006AS-760936	Hygrometer	—
Customer / Facility	Owens Brockway Cont.	Field Balance	629
Unit ID / Sample Location	Furnace D	Check Weights	10638
Run #	1-7	Calipers	39744
Operator	JH		

Balance Audit (Field balance must be within 0.5g of check weight mass)				**Ambient Conditions (Mobile Lab)**	
Date	8/19/20			Relative humidity, %	—
Standard mass, g	500.0			Temperature, °F	—
Field balance mass, g	500.0			Mobile lab #	TU3

Moisture Determination

		Run1			Run 2			Run 3		
	Contents	Initial	Final	Net	Initial	Final	Net	Initial	Final	Net
Knockout										
Impinger 1		629.2	788.3		697.1	898.7		632.9	826.9	
Impinger 2		858.0	927.7		819.7	869.4		860.6	903.6	
Impinger 3		807.5	805.1		824.3	820.9		809.8	815.7	
Impinger 4		756.1	758.7		713.2	714.7		757.9	759.2	
Impinger 5		841.6	844.5		827.4	828.3		872.1	872.3	
Impinger 6		870.7	872.2		804.6	805.5		840.5	841.5	
Impinger 7		1057.2	1070.9		1093.3	1108.0		1076.0	1085.7	
Impinger 8										
Silica Gel										
Line Rinse										
Train Net Gain (Vlc)										

29-1

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

Nozzle 1 diameters .2890 D1 .2895 D2 .2887 D3 .2887 Average

Nozzle 2 diameters ____ D1 ____ D2 ____ D3 ____ Average

Nozzle 3 diameters ____ D1 ____ D2 ____ D3 ____ Average

Nozzle Material ☒ quartz ☐ glass ☐ steel ☐ titanium ☐ inconel ☐ other ____

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other ____

Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other ____

Filter Information

Front Half: ☒ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other ____

Filter Number: Run 1: WA Run 2: — Run 3: — Run ____ : ____

Back Half: ☒ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other ____

Reagent Information		**Sample Observations**
Type	**Lot Number**	
5%/10%	60007/R075002	
SN HCL	9232	
.1N HNO3	220062	
10% H2SO4	8328	
DI	K097-03	

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X

Checked by: JH Team Leader: JH

001AS-QMS-FM-226

Appendix A.4
Hexavalent Chromium Data Sheets

MONTROSE AIR QUALITY SERVICES

0061 Method ______ Field Datasheet (Isokinetic)

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Project Information

Date 8/19/20 Project # 006AS-760936
Customer/Facility Owens Brockway Container
Unit ID/Sample Location Furnace D
Run # 1 Operator AG

Sampling Conditions

Static Pressure, in. H_2O -0.18 Ambient Temp, °F 65
Barometric Pressure, in. Hg 29.86 Ref. Barometer ID NOAA
Wind Speed / Direction 2/NW Precipitation, Y / N, type None
Probe / Filter Temp Range, °F —

ALT 011

	TC ID:	Ambient °F	Ref. °F
Stack			
Probe			
Filter Box	See		
Filter Exit	Final		
Meter outlet	Run		
Impinger Exit			
Other			

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs

Meterbox ID MB30
Umbilical ID PDX-50-3
Nozzle ID 61-1
Pitot / Probe ID 1311835
Manometer ID MB30
Sensitivity 0.01

Calibration

Meterbox Y 1.0018
Meterbox ΔH@, in. H_2O 1.7443
Nozzle diameter, Dn, in. .2892
Pitot coefficient, Cp 0.84
Manometer zero and level ✓ yes
K-Factor ~~2.88~~ 2.62

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 5	☐ ~~@~~	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 6	☐ ~~@~~	✓ @ 5
Pitot visual inspection	✓ pass	~~☐ pass~~	✓ pass
Nozzle visual inspection	✓ pass	~~☐ pass~~	✓ pass
Meter, cfm @ in. Hg	0.001 @ 6	~~@~~	0.001 @ 13
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	0816	353.551	0.49	1.28	1.3	708				65		81		5
2	5		355.99	0.49	1.28	1.3	744				63		81		6
3	10		359.15	0.45	1.179	1.2	757				61		82		10
4	15		362.25	0.47	1.23	1.2	765				60		85		9
5	20		365.45	0.47	1.23	1.2	772				60		86		9
6	25		368.63	0.50	1.31	1.3	657				59		88		8
7	30		371.89	0.45	1.179	1.2	675				60		89		6
8	35		374.93	0.43	1.12	1.1	681				61		90		6
9	40		377.91	0.40	1.048	1.0	687				63		91		5
10	45		380.79	0.40	1.048	1.0	680				63		91		5
11	50		383.58	0.38	0.9956	1.0	624				65		93		6
12	55		386.55	0.45	1.179	1.2	622				65		94		6
1	60	~~0916~~ 0924	389.656	0.48	1.25	1.3	730				64		95		6
2	65		392.78	0.53	1.38	1.4	767				59		95		8
3	70		396.15	0.50	1.31	1.3	772				55		96		8
4	75		399.42	0.45	1.179	1.2	644				59		97		8
5	80		402.53	0.47	1.23	1.2	657				60		98		8
6	85		405.74	0.47	1.23	1.2	667				62		98		6
7	90		408.92	0.40	1.048	1.0	678				62		98		6
8	95		411.82	0.40	1.048	1.0	678				59		99		6
9	100		414.68	0.38	0.995	1.0	677				57		99		6
10	105		417.60	0.40	1.048	1.0	619				55		100		6
11	110		420.47	0.37	0.969	0.97	637				53		101		6
12	115		423.31	0.35	0.917	0.92	655				53		102		5
	120	1024	426.152												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By JH Team Leader JH

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W2 purge 1119-1149

P1t I 8&5

MONTROSE AIR QUALITY SERVICES

0061 Method ____ Field Datasheet (Isokinetic)

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Project Information
Date 8/19/20 Project # 006AS-760936
Customer/Facility Owens Brockway Container
Unit ID/Sample Location Furnace D
Run # 2 Operator AG

Sampling Conditions
Static Pressure, in. H_2O -0.15 Ambient Temp, °F 73
Barometric Pressure, in. Hg 29.86 Ref. Barometer ID NOAA
Wind Speed / Direction 6/NW Precipitation, Y / N, type None
Probe / Filter Temp Range, °F —

ALT 011 TC ID:

	Ambient °F	Ref. °F
Stack		
Probe	See Final run	
Filter Box		
Filter Exit		
Meter outlet		
Impinger Exit		
Other		

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity

Sampling Equipment IDs
Meterbox ID MB30
Umbilical ID PDX-50-3
Nozzle ID 61-1
Pitot / Probe ID 13 NF35
Manometer ID MB30
Sensitivity 0.01

Calibration
Meterbox Y 1.0018
Meterbox ΔH@, in. H_2O 1.7443
Nozzle diameter, Dn, in.
Pitot coefficient, Cp 0.84
Manometer zero and level ✓ yes
K-Factor 2.62

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 4	☐ @	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 5	☐ @	✓ @ 4.5
Pitot visual inspection	✓ pass	☐ pass	☐ pass
Nozzle visual inspection	✓ pass	☐ pass	☐ pass
Meter, cfm @ in. Hg	0.001 @ 5	@	0.001 @ 9
Intermediate leak check volume, ft^3	465.004 /	/	

Notes: 477.390 volume at 80 min pause, restart @ 478.01)

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	1107	426.955	0.48	1.25	1.3	690				65		104		4.5
2	5		430.17	0.53	1.38	1.4	722				64		104		4
3	10		433.50	0.55	1.44	1.4	741				63		104		6
4	15		436.83	0.55	1.44	1.4	751				63		105		6
5	20		440.21	0.50	1.31	1.3	759				63		106		6
6	25		443.46	0.52	1.36	1.3	766				62		106		6
7	30		446.75	0.43	1.12	1.1	644				59		105		4
8	35		449.75	0.40	1.048	1.0	661				56		105		4
9	90		452.61	0.38	0.38	1.0	636				57		104		4
10	45		456.48	0.35	0.917	0.92	650				56		104		4
11	50		457.89	0.35	0.917	0.92	653				51		103		4
12	55		461.06	0.35	0.917	0.92	662				51		103		4
1	60	1207/1230	463.845	0.50	1.31	1.3	735				65		103		5
2	65		468.29	0.50	1.31	1.3	771				64		103		5
3	70		471.35	0.48	1.25	1.3	653				63		104		5
4	75		474.67	0.46	1.2	1.2	663				67		103		5
5	80	1251/1256	477.26	0.46	1.2	1.2	689				66		105		5
6	85		481.01	0.50	1.3	1.3	694				65		104		5
7	90		484.31	0.45	1.179	1.2	700				63		104		5
8	95		487.65	0.45	1.179	1.2	699				63		104		5
9	100		490.71	0.48	1.25	1.3	721				62		104		5
10	105		493.88	0.43	1.12	1.1	733				63		105		5
11	110		496.88	0.43	1.12	1.1	719				63		105		5
12	115		499.85	0.43	1.12	1.1	729				64		105		5
	120	1336	502.743												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By ____ Team Leader ____

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N2 purge 1431-1501

PH Check at port change. starting volume after port change is 465.004 PH ≥ 8.05
& Report writers; subtract out volumes from PH check and volumes in notes.

MONTROSE AIR QUALITY SERVICES

0061 Method _____ Field Datasheet (Isokinetic)

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Project Information

Date 8/19/20 Project # 006AS-760936

Customer/Facility Owens Brockway Container

Unit ID/Sample Location Furnace D

Run # 3 Operator AG

Sampling Conditions

Static Pressure, in. H_2O -0.15 Ambient Temp, °F 84

Barometric Pressure, in. Hg 29.86 Ref. Barometer ID NOAA

Wind Speed / Direction 5/NW Precipitation, Y / N, type None

Probe / Filter Temp Range, °F —

Sampling Equipment IDs

Meterbox ID MB30

Umbilical ID PDX-50-3

Nozzle ID 61-1

Pitot / Probe ID 1311435

Manometer ID MB30

Sensitivity 0.01

Calibration

Meterbox Y 1.0018

Meterbox ΔH@, in. H_2O 1.7463

Nozzle diameter, Dn, in. _____

Pitot coefficient, Cp 0.84

Manometer zero and level ✓ yes

K-Factor 2.62

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 4	☐ @	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 4	☐ @	✓ @ 4
Pitot visual inspection	✓ pass	☐ pass	✓ pass
Nozzle visual inspection	✓ pass	☐ pass	✓ pass
Meter, cfm @ in. Hg	0.000 @ 8	@	0.001 @ .11
Intermediate leak check volume, ft^3	/	/	/

ALT 011 TC ID:

	Ambient °F	Ref. °F
Stack 1311835	80	80.5
Probe 1311835	80	80.5
Filter Box —	—	—
Filter Exit —	—	—
Meter outlet MB30	81	80.5
Impinger Exit GS-2	80	80.5
Other		

Ref. Thermometer ID 140754303

Continuity Check ✓ Continuity w/ Proper Polarity

Notes: Pause after 45 min mark Volume 532.923, 533.251 restart

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	1413	503.712	0.53	1.38	1.4	697				58		96		7
2	5		507.07	0.48	1.25	1.3	732				58		95		7
3	10		510.76	0.48	1.25	1.3	752				56		94		7
4	15		513.88	0.46	1.20	1.2	759				58		94		8
5	20		517.01	0.40	1.048	1.0	638				61		94		7
6	25		519.88	0.47	1.23	1.2	669				61		95		7
7	30		523.09	0.45	1.179	1.2	679				61		95		7
8	35		526.11	0.45	1.179	1.2	682				58		95		7
9	90		529.19	0.45	1.179	1.2	697				55		96		7
10	45	1500/1524	532.28	0.38	0.99	1.0	691				58		95		6
11	50		535.33	0.35	0.917	0.92	655				55		94		5
12	55		538.17	0.35	0.917	0.92	613				56		93		5
1	60	1542/1559	540.77	0.48	1.25	1.3	685				61		95		8
2	65		544.75	0.48	1.25	1.3	708				56		95		8
3	70		547.88	0.50	1.31	1.3	685				58		94		8
4	75		551.11	0.55	1.4	1.4	728				61		94		9
5	80		554.26	0.48	1.25	1.3	737				63		95		8
6	85		557.86	0.45	1.17	1.2	749				64		95		8
7	90	1629/1633	560.278	0.45	1.17	1.2	768				64		96		8
8	95		563.51	0.40	1.048	1.0	648				63		96		7
9	100		566.38	0.38	0.99	1.0	655				64		96		7
10	105		569.25	0.35	0.917	0.92	651				65		98		6
11	110		572.11	0.35	0.917	0.92	653				65		96		6
12	115		574.69	0.38	0.99	1.0	659				66		98		6
	120	1703	577.562												
Averages															

* Report writers, subtract out volumes from PH Check and volumes in notes.

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____ Checked By _____ Team Leader _____

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N2 purge 1735–1805 PH checked at port change, restart Volume at 541564

Paused at 90 min mark, volume restart at 560.511

PH ≥ 6.5

MONTROSE AIR QUALITY SERVICES

6061

Sample Recovery & Calibration Check Datasheet

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Project Information		**Equipment Identification**	
Date	5/19/20	Ref. Thermometer	—
Project #	60BAS-760936	Hygrometer	—
Customer / Facility	Ohio Bicentennial Conf.	Field Balance	629
Unit ID / Sample Location	Furnace D	Check Weights	10638
Run #	1-3	Operator	JH
		Calipers	19744

Balance Audit (Field balance must be within 0.5g of check weight mass)				**Ambient Conditions (Mobile Lab)**	
Date	5/19/20			Relative humidity, %	—
Standard mass, g	500.0			Temperature, °F	—
Field balance mass, g	500.0			Mobile lab #	TU7

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout										
Impinger 1		565.0	407.0		512.8	471.1		577.6	526.1	
Impinger 2		497.4	553.5		437.1	536.4		475.9	503.2	
Impinger 3		433.0	614.8		436.3	524.9		486.6	540.4	
Impinger 4		413.4	553.4		357.1	496.0		413.6	561.0	
Impinger 5		946.9	965.0		550.1	579.1		~~845.4~~ 845.4 JH	603.3	
Impinger 6										
Impinger 7										
Impinger 8										
Silica Gel										
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

6l-1

Nozzle 1 diameters	.2540	D1	.2595	D2	.2590	D3	.2592	Average
Nozzle 2 diameters		D1		D2		D3		Average
Nozzle 3 diameters		D1		D2		D3		Average

Nozzle Material ☒ quartz ☐ glass ☐ steel ☐ titanium ☐ inconel ☐ other _____

Probe Type ☐ heated ☒ unheated ☐ air-cooled ☐ water-cooled ☐ other _____

Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other _____

Filter Information

Front Half: ☐ quartz fiber ☒ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other _____

Filter Number: Run 1: _____ Run 2: _____ Run 3: _____ Run _____

Back Half: ☐ quartz fiber ☒ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other _____

Reagent Information		**Sample Observations**
Type	**Lot Number**	
.1N NaHCO3	N313003	
1N NaHCO3	N313003	

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X

Checked by: JH Team Leader: JH

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Appendix A.5
Instrumental Test Method Data

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Run 1 Average Results

07:56:00 - 09:00:26

	Name:	O2 742	CO2 742		NOX 695		SO2 563		
	Make/Model:	SERVO 4900	SERVO 4900		CAI 700		Bovar 900		
Aug 18 2020	07:57:00	6.715	11.61		650.8		372.9		
Aug 18 2020	07:58:00	6.723	11.62		644.9		381.7		
Aug 18 2020	07:59:00	6.783	11.56		639.1		382.6		
Aug 18 2020	08:00:00	6.679	11.66		635.3		390.0		
Aug 18 2020	08:01:00	6.716	11.63		637.5		397.3		
Aug 18 2020	08:02:00	6.669	11.67		622.8		401.5		
Aug 18 2020	08:03:00	6.763	11.54		643.4		396.8		
Aug 18 2020	08:04:00	6.837	11.49		634.4		395.2		
Aug 18 2020	08:05:00	6.724	11.57		642.2		398.8		
Aug 18 2020	08:06:00	6.758	11.53		642.3		397.4		
Aug 18 2020	08:07:00	6.793	11.58		619.2		398.5		
Aug 18 2020	08:08:00	14.57	5.885		294.2		329.3		
Aug 18 2020	08:09:00	10.92	9.285		465.2		165.7		
Aug 18 2020	08:10:00	6.068	11.98		582.7		280.6		
Aug 18 2020	08:11:00	6.099	12.02		589.2		327.1		
Aug 18 2020	08:12:00	6.113	12.02		601.7		340.5		
Aug 18 2020	08:13:00	6.123	12.04		651.4		356.4		
Aug 18 2020	08:14:00	6.047	12.13		686.2		363.9		
Aug 18 2020	08:15:00	6.150	12.04		692.2		371.4		
Aug 18 2020	08:16:00	6.218	11.98		664.0		367.0		
End of port 1 point 1									
Aug 18 2020	08:17:00	6.102	12.12		698.7		380.1		
Aug 18 2020	08:18:00	6.225	12.03		670.6		379.2		
Aug 18 2020	08:19:00	6.253	11.94		644.4		382.0		
Aug 18 2020	08:20:00	6.305	11.92		648.2		380.5		
Aug 18 2020	08:21:00	6.317	11.90		603.2		382.3		
Aug 18 2020	08:22:00	6.308	11.89		604.7		382.7		
Aug 18 2020	08:23:00	6.337	11.87		584.1		383.8		
Aug 18 2020	08:24:00	6.415	11.77		629.3		383.2		
Aug 18 2020	08:25:00	6.287	11.90		632.1		388.4		
Aug 18 2020	08:26:00	6.318	11.82		600.8		393.2		
Aug 18 2020	08:31:26	6.509	11.62		630.0		391.6		
Aug 18 2020	08:32:26	6.374	11.78		625.8		402.4		
Aug 18 2020	08:33:26	6.539	11.66		587.0		405.7		
Aug 18 2020	08:34:26	6.401	11.86		592.7		403.5		
Aug 18 2020	08:35:26	6.455	11.79		591.0		410.6		
Aug 18 2020	08:36:26	6.558	11.56		600.4		399.8		
Aug 18 2020	08:37:26	7.366	11.06		587.4		401.6		
Aug 18 2020	08:38:26	17.31	4.244		173.2		218.0		
Aug 18 2020	08:39:26	8.053	10.42		641.8		203.7		
Aug 18 2020	08:40:26	6.769	11.14		688.7		288.2		
End of port 1 point 2									
Aug 18 2020	08:41:26	6.713	11.20		673.7		319.6		
Aug 18 2020	08:42:26	6.724	11.25		692.6		325.7		
Aug 18 2020	08:43:26	6.730	11.36		693.8		333.1		
Aug 18 2020	08:44:26	6.927	11.26		687.6		332.2		
Aug 18 2020	08:45:26	6.859	11.36		666.4		334.0		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Aug 18 2020	08:46:26	6.806	11.41		663.6		342.7		
Aug 18 2020	08:47:26	6.917	11.22		681.8		351.3		
Aug 18 2020	08:48:26	6.921	11.13		695.4		353.4		
Aug 18 2020	08:49:26	6.969	11.04		705.0		352.5		
Aug 18 2020	08:50:26	7.007	11.08		692.0		348.8		
Aug 18 2020	08:51:26	6.911	11.13		656.6		345.5		
Aug 18 2020	08:52:26	6.878	11.19		657.5		355.6		
Aug 18 2020	08:53:26	6.980	11.17		672.5		352.2		
Aug 18 2020	08:54:26	7.059	11.07		669.2		351.6		
Aug 18 2020	08:55:26	6.884	11.19		647.3		344.3		
Aug 18 2020	08:56:26	6.957	11.14		645.0		348.7		
Aug 18 2020	08:57:26	7.004	11.11		627.8		338.2		
Aug 18 2020	08:58:26	6.997	11.17		637.5		343.4		
Aug 18 2020	08:59:26	6.903	11.35		613.5		353.2		
Aug 18 2020	09:00:26	6.978	11.31		622.4		358.3		
End of port 1 point 3									

	Average:	7.030	11.29		626.2		357.7		
	Max:	17.31	12.13		705.0		410.6		
	Min:	6.047	4.244		173.2		165.7		

Stratification Results									
Port	**Point**	O2 742	CO2 742		NOX 695		SO2 563		
1	1	6.987	11.48		614.7		357.7		
1	2	7.048	11.42		604.6		366.9		
1	3	6.907	11.20		663.8		345.7		
	Strat diff:	0.067	0.113		36.10		10.13		
	Strat %:	1.055	1.466		5.751		3.102		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Run 1 Post run bias
07:56:00 - 09:00:26

	Name:	O2 742	CO2 742		NOX 695		SO2 563	
	Make/Model:	SERVO 4900	SERVO 4900		CAI 700		Bovar 900	
	25A or 7E:	7E	7E		7E		7E	

Run summary data								
	Raw Avg:	7.030	11.29		626.2		357.7	
	Max:	17.31	12.13		705.0		410.6	
	Min:	6.047	4.244		173.2		165.7	

Cylinder Concentrations								
	Zero:	0.000	0.000		0.000		0.000	
	Low:							
	Mid:	10.02	10.07		512.6		490.2	
	High:	20.28	18.52		1118		934.0	

Calibration Readings								
	Zero reading:	0.005	0.012		-0.036		0.693	
	Low reading:							
	Mid reading:	10.04	10.09		526.4		499.3	
	High reading:	20.30	18.42		1106		932.3	

EPA Method 7E Error Calculations								
Zero %Err:	**<2.0**	0.025	0.065		-0.003		0.074	
Mid %Err:	**<2.0**	0.099	0.108		1.234		0.974	
High %Err:	**<2.0**	0.099	-0.540		-1.073		-0.182	

Initial Bias Data								
	Zero reading:	0.119	0.047		0.516		-1.511	
	Span reading:	20.13	18.31		1092		482.2	
Zero % bias:	**<5.0**	0.562	0.189		0.049		-0.236	
Span % bias:	**<5.0**	-0.838	-0.594		-1.252		-1.831	

Final Bias Data								
	Zero reading:	0.101	0.153		1.284		1.107	
	Span reading:	20.08	18.34		1086		481.6	
Zero % bias:	**<5.0**	0.473	0.761		0.118		0.044	
Span % bias:	**<5.0**	-1.085	-0.432		-1.789		-1.895	
Zero % drift:	**<3.0**	0.089	0.572		0.069		0.280	
Span % drift:	**<3.0**	0.247	0.162		0.537		0.064	

Bias Corrected Averages								
	Cor Avg:	7.019	11.37		642.5		363.9	

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Run 2 Average Results

09:28:00 - 10:43:41

	Name:	O2 742	CO2 742		NOX 695		SO2 563		
	Make/Model:	SERVO 4900	SERVO 4900		CAI 700		Bovar 900		
Aug 18 2020	09:29:00	6.428	11.80		625.2		400.0		
Aug 18 2020	09:30:00	6.360	11.73		573.7		395.9		
Aug 18 2020	09:31:00	6.541	11.45		586.1		385.7		
Aug 18 2020	09:32:00	6.525	11.43		593.5		384.8		
Aug 18 2020	09:33:00	6.569	11.35		600.4		384.2		
Aug 18 2020	09:34:00	6.626	11.35		608.9		380.5		
Aug 18 2020	09:35:00	6.655	11.52		569.3		376.7		
Aug 18 2020	09:36:00	6.472	11.59		544.5		382.7		
Aug 18 2020	09:37:00	6.725	11.26		579.2		392.0		
Aug 18 2020	09:38:00	8.801	9.658		488.8		389.4		
Aug 18 2020	09:39:00	16.48	5.037		181.4		270.8		
Aug 18 2020	09:40:00	7.346	10.72		553.7		207.4		
Aug 18 2020	09:53:56	6.793	11.27		613.2		347.7		
Aug 18 2020	09:54:56	6.862	11.27		643.5		353.0		
Aug 18 2020	09:55:56	6.809	11.27		652.5		356.2		
Aug 18 2020	09:56:56	6.827	11.22		633.7		356.4		
Aug 18 2020	09:57:56	6.897	11.18		644.2		352.7		
Aug 18 2020	09:58:56	6.845	11.23		627.2		351.1		
Aug 18 2020	09:59:56	6.790	11.28		618.8		357.1		
Aug 18 2020	10:00:56	6.804	11.32		618.7		357.6		
End of port 1 point 1									
Aug 18 2020	10:01:56	6.847	11.29		638.3		359.1		
Aug 18 2020	10:02:56	6.819	11.30		611.9		358.7		
Aug 18 2020	10:03:56	6.693	11.43		594.9		367.8		
Aug 18 2020	10:04:56	6.829	11.33		609.6		370.9		
Aug 18 2020	10:05:56	6.783	11.36		608.5		372.4		
Aug 18 2020	10:06:56	6.837	11.37		603.7		367.8		
Aug 18 2020	10:07:56	13.31	6.598		354.1		338.4		
Aug 18 2020	10:08:56	12.32	8.480		412.8		155.4		
Aug 18 2020	10:09:56	5.954	12.03		582.7		252.4		
Aug 18 2020	10:10:56	6.085	11.86		662.8		304.2		
Aug 18 2020	10:14:41	6.252	11.62		670.0		325.8		
Aug 18 2020	10:15:41	6.228	11.62		680.8		328.9		
Aug 18 2020	10:16:41	6.237	11.63		643.2		335.6		
Aug 18 2020	10:17:41	6.312	11.58		644.2		333.4		
Aug 18 2020	10:18:41	6.274	11.71		657.6		334.3		
Aug 18 2020	10:19:41	6.280	11.75		632.4		338.0		
Aug 18 2020	10:20:41	6.358	11.66		618.9		339.0		
Aug 18 2020	10:21:41	6.297	11.75		656.9		337.6		
Aug 18 2020	10:22:41	6.204	11.87		668.7		347.9		
Aug 18 2020	10:23:41	6.276	11.85		663.8		352.1		
End of port 1 point 2									
Aug 18 2020	10:24:41	6.343	11.75		616.6		357.4		
Aug 18 2020	10:25:41	6.440	11.61		624.2		357.9		
Aug 18 2020	10:26:41	6.273	11.81		604.2		366.8		
Aug 18 2020	10:27:41	6.494	11.76		624.8		361.8		
Aug 18 2020	10:28:41	6.433	11.76		595.1		370.1		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Aug 18 2020	10:29:41	6.441	11.69		625.8		374.7		
Aug 18 2020	10:30:41	6.415	11.73		590.2		379.2		
Aug 18 2020	10:31:41	6.438	11.75		603.3		380.7		
Aug 18 2020	10:32:41	6.362	11.73		583.1		385.9		
Aug 18 2020	10:33:41	6.322	11.74		574.8		395.0		
Aug 18 2020	10:34:41	6.409	11.61		588.5		395.7		
Aug 18 2020	10:35:41	6.352	11.61		615.5		393.5		
Aug 18 2020	10:36:41	6.302	11.68		605.6		402.1		
Aug 18 2020	10:37:41	6.423	11.65		660.3		397.8		
Aug 18 2020	10:38:41	17.18	3.993		264.1		286.0		
Aug 18 2020	10:39:41	9.140	10.36		434.2		176.4		
Aug 18 2020	10:40:41	6.476	11.42		586.4		286.3		
Aug 18 2020	10:41:41	6.573	11.35		622.2		314.9		
Aug 18 2020	10:42:41	6.751	11.17		671.8		319.0		
Aug 18 2020	10:43:41	6.731	11.19		666.9		324.7		
End of port 1 point 3									

	Average:	7.161	11.11		592.2		347.1		
	Max:	17.18	12.03		680.8		402.1		
	Min:	5.954	3.993		181.4		155.4		

Stratification Results									
Port	**Point**	O2 742	CO2 742		NOX 695		SO2 563		
1	1	7.449	10.82		572.1		356.6		
1	2	7.025	11.20		610.9		329.8		
1	3	6.909	11.38		593.2		349.8		
	Strat diff:	0.321	0.247		18.83		11.20		
	Strat %:	4.508	2.814		3.372		4.517		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Run 2 Post run bias
09:28:00 - 10:43:41

	Name:	O2 742	CO2 742		NOX 695		SO2 563	
	Make/Model:	SERVO 4900	SERVO 4900		CAI 700		Bovar 900	
	25A or 7E:	7E	7E		7E		7E	

Run summary data								
	Raw Avg:	7.161	11.11		592.2		347.1	
	Max:	17.18	12.03		680.8		402.1	
	Min:	5.954	3.993		181.4		155.4	

Cylinder Concentrations								
	Zero:	0.000	0.000		0.000		0.000	
	Low:							
	Mid:	10.02	10.07		512.6		490.2	
	High:	20.28	18.52		1118		934.0	

Calibration Readings								
	Zero reading:	0.005	0.012		-0.036		0.693	
	Low reading:							
	Mid reading:	10.04	10.09		526.4		499.3	
	High reading:	20.30	18.42		1106		932.3	

EPA Method 7E Error Calculations								
Zero %Err:	**<2.0**	0.025	0.065		-0.003		0.074	
Mid %Err:	**<2.0**	0.099	0.108		1.234		0.974	
High %Err:	**<2.0**	0.099	-0.540		-1.073		-0.182	

Initial Bias Data								
	Zero reading:	0.101	0.153		1.284		1.107	
	Span reading:	20.08	18.34		1086		481.6	
Zero % bias:	**<5.0**	0.473	0.761		0.118		0.044	
Span % bias:	**<5.0**	-1.085	-0.432		-1.789		-1.895	

Final Bias Data								
	Zero reading:	0.135	0.085		2.712		2.619	
	Span reading:	20.04	18.26		1075		474.1	
Zero % bias:	**<5.0**	0.641	0.394		0.246		0.206	
Span % bias:	**<5.0**	-1.282	-0.864		-2.773		-2.698	
Zero % drift:	**<3.0**	0.168	0.367		0.128		0.162	
Span % drift:	**<3.0**	0.197	0.432		0.984		0.803	

Bias Corrected Averages								
	Cor Avg:	7.162	11.20		611.8		355.5	

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Run 3 Average Results
11:14:00 - 12:18:25

	Name:	O2 742	CO2 742		NOX 695		SO2 563		
	Make/Model:	SERVO 4900	SERVO 4900		CAI 700		Bovar 900		
Aug 18 2020	11:15:00	6.073	11.87		637.5		366.9		
Aug 18 2020	11:16:00	6.153	11.86		652.5		363.9		
Aug 18 2020	11:17:00	6.237	11.83		655.7		364.0		
Aug 18 2020	11:18:00	6.241	11.79		645.2		362.5		
Aug 18 2020	11:19:00	6.296	11.76		672.1		361.6		
Aug 18 2020	11:20:00	6.228	11.86		661.5		364.3		
Aug 18 2020	11:21:00	6.240	11.90		619.7		373.5		
Aug 18 2020	11:22:00	6.339	11.81		662.9		370.4		
Aug 18 2020	11:23:00	6.216	11.96		610.0		373.4		
Aug 18 2020	11:24:00	6.249	12.02		621.2		379.7		
Aug 18 2020	11:25:00	6.282	12.04		601.3		383.2		
Aug 18 2020	11:26:00	6.322	11.99		632.7		382.5		
Aug 18 2020	11:27:00	6.265	11.99		590.6		383.3		
Aug 18 2020	11:28:00	6.161	12.03		606.1		390.8		
Aug 18 2020	11:29:00	6.164	12.06		672.9		396.9		
Aug 18 2020	11:30:00	6.150	12.09		655.6		398.8		
Aug 18 2020	11:31:00	6.202	12.01		625.0		400.8		
Aug 18 2020	11:32:00	6.347	11.88		609.4		399.8		
Aug 18 2020	11:33:00	6.280	11.90		613.0		400.1		
Aug 18 2020	11:34:00	6.278	11.89		605.0		403.6		
End of port 1 point 1									
Aug 18 2020	11:35:00	6.205	11.98		596.6		407.6		
Aug 18 2020	11:36:00	6.370	11.86		586.7		410.8		
Aug 18 2020	11:37:00	6.364	11.83		605.3		404.7		
Aug 18 2020	11:38:00	7.824	10.84		567.8		406.4		
Aug 18 2020	11:39:00	16.99	4.638		171.0		244.6		
Aug 18 2020	11:40:00	7.879	10.73		513.1		202.8		
Aug 18 2020	11:41:00	6.437	11.47		618.7		299.6		
Aug 18 2020	11:42:00	6.552	11.33		678.3		319.8		
Aug 18 2020	11:43:00	6.640	11.26		680.7		329.7		
Aug 18 2020	11:44:00	6.692	11.25		696.5		329.8		
Aug 18 2020	11:49:25	6.678	11.35		688.0		340.5		
Aug 18 2020	11:50:25	6.780	11.31		683.8		346.6		
Aug 18 2020	11:51:25	6.823	11.29		668.4		347.5		
Aug 18 2020	11:52:25	6.766	11.33		680.0		348.8		
Aug 18 2020	11:53:25	6.797	11.33		687.6		353.9		
Aug 18 2020	11:54:25	6.773	11.36		675.1		355.4		
Aug 18 2020	11:55:25	6.771	11.39		662.1		357.5		
Aug 18 2020	11:56:25	6.767	11.42		665.2		359.3		
Aug 18 2020	11:57:25	6.763	11.42		675.0		361.8		
Aug 18 2020	11:58:25	6.793	11.43		658.2		364.8		
End of port 1 point 2									
Aug 18 2020	11:59:25	6.748	11.45		645.3		367.0		
Aug 18 2020	12:00:25	6.720	11.48		632.2		370.8		
Aug 18 2020	12:01:25	6.770	11.46		630.6		376.4		
Aug 18 2020	12:02:25	6.623	11.57		607.5		386.2		
Aug 18 2020	12:03:25	6.778	11.45		652.8		388.7		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Aug 18 2020	12:04:25	6.812	11.44		660.5		386.1		
Aug 18 2020	12:05:25	6.706	11.48		635.6		389.9		
Aug 18 2020	12:06:25	6.739	11.42		624.1		396.3		
Aug 18 2020	12:07:25	6.562	11.53		616.7		401.3		
Aug 18 2020	12:08:25	13.22	6.690		469.2		375.1		
Aug 18 2020	12:09:25	12.58	8.082		276.8		190.7		
Aug 18 2020	12:10:25	6.095	11.70		573.1		251.9		
Aug 18 2020	12:11:25	6.028	11.81		615.9		311.3		
Aug 18 2020	12:12:25	5.997	11.81		610.4		331.7		
Aug 18 2020	12:13:25	6.008	11.77		639.1		345.1		
Aug 18 2020	12:14:25	6.207	11.72		662.3		348.1		
Aug 18 2020	12:15:25	6.090	11.92		629.7		349.6		
Aug 18 2020	12:16:25	6.218	11.75		627.6		357.0		
Aug 18 2020	12:17:25	6.243	11.69		634.8		361.1		
Aug 18 2020	12:18:25	6.308	11.60		633.0		364.9		
End of port 1 point 3									

	Average:	6.864	11.39		619.8		359.4		
	Max:	16.99	12.09		696.5		410.8		
	Min:	5.997	4.638		171.0		190.7		

Stratification Results									
Port	**Point**	O2 742	CO2 742		NOX 695		SO2 563		
1	1	6.254	11.92		636.9		382.0		
1	2	7.349	11.04		629.3		342.7		
1	3	7.031	11.19		598.8		351.2		
	Strat diff:	0.471	0.537		15.23		23.37		
	Strat %:	9.072	4.714		3.678		6.515		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Run 3 Post run bias
11:14:00 - 12:18:25

	Name:	O2 742	CO2 742		NOX 695		SO2 563	
	Make/Model:	SERVO 4900	SERVO 4900		CAI 700		Bovar 900	
	25A or 7E:	7E	7E		7E		7E	

Run summary data								
	Raw Avg:	6.864	11.39		619.8		359.4	
	Max:	16.99	12.09		696.5		410.8	
	Min:	5.997	4.638		171.0		190.7	

Cylinder Concentrations								
	Zero:	0.000	0.000		0.000		0.000	
	Low:							
	Mid:	10.02	10.07		512.6		490.2	
	High:	20.28	18.52		1118		934.0	

Calibration Readings								
	Zero reading:	0.005	0.012		-0.036		0.693	
	Low reading:							
	Mid reading:	10.04	10.09		526.4		499.3	
	High reading:	20.30	18.42		1106		932.3	

EPA Method 7E Error Calculations								
Zero %Err:	**<2.0**	0.025	0.065		-0.003		0.074	
Mid %Err:	**<2.0**	0.099	0.108		1.234		0.974	
High %Err:	**<2.0**	0.099	-0.540		-1.073		-0.182	

Initial Bias Data								
	Zero reading:	0.135	0.085		2.712		2.619	
	Span reading:	20.04	18.26		1075		474.1	
Zero % bias:	**<5.0**	0.641	0.394		0.246		0.206	
Span % bias:	**<5.0**	-1.282	-0.864		-2.773		-2.698	

Final Bias Data								
	Zero reading:	0.092	0.225		2.532		3.509	
	Span reading:	19.91	18.06		1070		496.4	
Zero % bias:	**<5.0**	0.429	1.150		0.230		0.302	
Span % bias:	**<5.0**	-1.923	-1.944		-3.220		-0.311	
Zero % drift:	**<3.0**	0.212	0.756		0.016		0.095	
Span % drift:	**<3.0**	0.641	1.080		0.447		2.388	

Bias Corrected Averages								
	Cor Avg:	6.893	11.56		644.9		362.3	

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Run 1 Average Results
08:16:00 - 09:16:00

	Name:	O2 742	CO2 742						
	Make/Model:	SERVO 4900	SERVO 4900						
Aug 19 2020	08:17:00	6.208	11.46						
Aug 19 2020	08:18:00	6.312	11.41						
Aug 19 2020	08:19:00	6.230	11.53						
Aug 19 2020	08:20:00	6.358	11.44						
Aug 19 2020	08:21:00	6.265	11.53						
Aug 19 2020	08:22:00	6.292	11.58						
Aug 19 2020	08:23:00	6.362	11.53						
Aug 19 2020	08:24:00	6.376	11.46						
Aug 19 2020	08:25:00	6.437	11.41						
Aug 19 2020	08:26:00	6.426	11.42						
Aug 19 2020	08:27:00	6.402	11.46						
Aug 19 2020	08:28:00	6.376	11.55						
Aug 19 2020	08:29:00	6.423	11.59						
Aug 19 2020	08:30:00	6.399	11.59						
Aug 19 2020	08:31:00	6.432	11.62						
Aug 19 2020	08:32:00	6.478	11.59						
Aug 19 2020	08:33:00	6.342	11.64						
Aug 19 2020	08:34:00	6.319	11.62						
Aug 19 2020	08:35:00	6.449	11.53						
Aug 19 2020	08:36:00	6.409	11.59						
End of port 1 point 1									
Aug 19 2020	08:37:00	6.468	11.58						
Aug 19 2020	08:38:00	6.383	11.67						
Aug 19 2020	08:39:00	10.97	8.329						
Aug 19 2020	08:40:00	13.54	7.421						
Aug 19 2020	08:41:00	7.605	10.67						
Aug 19 2020	08:42:00	6.725	11.35						
Aug 19 2020	08:43:00	6.684	11.41						
Aug 19 2020	08:44:00	6.771	11.35						
Aug 19 2020	08:45:00	6.699	11.42						
Aug 19 2020	08:46:00	6.712	11.47						
Aug 19 2020	08:47:00	6.857	11.38						
Aug 19 2020	08:48:00	6.685	11.52						
Aug 19 2020	08:49:00	6.669	11.53						
Aug 19 2020	08:50:00	6.672	11.53						
Aug 19 2020	08:51:00	6.653	11.56						
Aug 19 2020	08:52:00	6.829	11.43						
Aug 19 2020	08:53:00	6.751	11.63						
Aug 19 2020	08:54:00	6.728	11.54						
Aug 19 2020	08:55:00	6.620	11.63						
Aug 19 2020	08:56:00	6.703	11.56						
End of port 1 point 2									
Aug 19 2020	08:57:00	6.753	11.51						
Aug 19 2020	08:58:00	6.671	11.57						
Aug 19 2020	08:59:00	6.654	11.56						
Aug 19 2020	09:00:00	6.608	11.63						
Aug 19 2020	09:01:00	6.646	11.58						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Aug 19 2020	09:02:00	6.753	11.52						
Aug 19 2020	09:03:00	6.735	11.55						
Aug 19 2020	09:04:00	6.601	11.65						
Aug 19 2020	09:05:00	6.621	11.66						
Aug 19 2020	09:06:00	6.656	11.58						
Aug 19 2020	09:07:00	6.578	11.56						
Aug 19 2020	09:08:00	6.691	11.45						
Aug 19 2020	09:09:00	10.70	8.650						
Aug 19 2020	09:10:00	14.02	7.062						
Aug 19 2020	09:11:00	6.325	11.67						
Aug 19 2020	09:12:00	6.018	11.83						
Aug 19 2020	09:13:00	5.936	11.92						
Aug 19 2020	09:14:00	5.923	11.92						
Aug 19 2020	09:15:00	5.915	11.91						
Aug 19 2020	09:16:00	5.945	11.85						
End of port 1 point 3									

	Average:	6.896	11.30						
	Max:	14.02	11.92						
	Min:	5.915	7.062						

Stratification Results									
Port	**Point**	O2 742	CO2 742						
1	1	6.382	11.53						
1	2	7.387	10.98						
1	3	7.113	11.17						
	Strat diff:	0.426	0.303						
	Strat %:	8.313	2.702						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Run 1 Post run bias
08:16:00 - 09:16:00

	Name:	O2 742	CO2 742						
	Make/Model:	SERVO 4900	SERVO 4900						
	25A or 7E:	7E	7E						

Run summary data									
	Raw Avg:	6.896	11.30						
	Max:	14.02	11.92						
	Min:	5.915	7.062						

Cylinder Concentrations									
	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	10.07						
	High:	20.28	18.52						

Calibration Readings									
	Zero reading:	0.014	0.012						
	Low reading:								
	Mid reading:	10.02	9.983						
	High reading:	20.09	18.39						

EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	0.069	0.065						
Mid %Err:	**<2.0**	0.000	-0.470						
High %Err:	**<2.0**	-0.937	-0.702						

Initial Bias Data									
	Zero reading:	0.197	0.038						
	Span reading:	20.05	18.25						
Zero % bias:	**<5.0**	0.902	0.140						
Span % bias:	**<5.0**	-0.197	-0.756						

Final Bias Data									
	Zero reading:	0.115	0.263						
	Span reading:	19.95	18.16						
Zero % bias:	**<5.0**	0.498	1.355						
Span % bias:	**<5.0**	-0.690	-1.242						
Zero % drift:	**<3.0**	0.404	1.215						
Span % drift:	**<3.0**	0.493	0.486						

Bias Corrected Averages									
	Cor Avg:	6.888	11.44						

MoleDAQ Stripchart file

Time	O2	CO2	
9:17:00	6.12	11.65	
9:18:00	6.09	11.71	
9:19:00	8.20	10.77	bias checks
9:20:00	1.23	1.52	bias checks
9:21:00	0.14	0.30	bias checks
9:22:00	0.10	0.21	bias checks
9:23:00	2.94	2.34	bias checks
9:24:00	18.67	16.57	bias checks
9:25:00	19.91	18.01	bias checks
9:26:00	19.97	18.12	bias checks
9:27:00	19.98	18.17	bias checks
9:28:00	20.00	18.19	bias checks
9:29:00	17.52	17.14	bias checks
9:30:00	7.20	11.85	bias checks
9:31:00	6.44	11.44	
9:32:00	6.27	11.52	
9:33:00	6.39	11.36	
9:34:00	6.39	11.24	
9:35:00	6.29	11.26	
9:36:00	6.45	11.14	
9:37:00	6.46	11.15	
9:38:00	6.42	11.16	
9:39:00	9.75	8.88	
9:40:00	14.88	5.95	
9:41:00	7.96	10.06	
9:42:00	6.70	10.95	
9:43:00	6.72	11.00	
9:44:00	6.81	11.05	
9:45:00	6.80	11.08	
9:46:00	6.76	11.11	
9:47:00	6.79	10.99	
9:48:00	6.82	10.89	
9:49:00	6.84	10.88	
9:50:00	6.96	10.87	
9:51:00	6.93	10.94	
9:52:00	6.85	11.04	
9:53:00	6.83	11.10	
9:54:00	6.87	11.06	
9:55:00	6.89	11.15	
9:56:00	6.91	11.00	
9:57:00	6.80	11.09	
9:58:00	6.89	11.06	
9:59:00	6.85	11.13	

Gray shaded cells excluded from average (calibration bias conducted)

Time	O2	CO2
10:00:00	6.85	11.17
10:01:00	6.78	11.25
10:02:00	6.93	11.16
10:03:00	6.80	11.23
10:04:00	6.79	11.30
10:05:00	6.79	11.42
10:06:00	6.83	11.37
10:07:00	6.73	11.43
10:08:00	6.73	11.48
10:09:00	10.18	9.02
10:10:00	14.03	6.99
10:11:00	7.02	10.92
10:12:00	6.31	11.48
10:13:00	6.13	11.74
10:14:00	6.21	11.68
10:15:00	6.20	11.67
10:16:00	6.18	11.68
10:17:00	6.25	11.56
10:18:00	6.20	11.65
10:19:00	6.29	11.63
10:20:00	6.33	11.63
10:21:00	6.26	11.77
10:22:00	6.28	11.78
10:23:00	6.32	11.74
10:24:00	6.32	11.71

56 additional minutes (gray shaded cells excluded):

	O2	CO2
Average	7.01	11.02
Min	6.09	5.95
Max	14.88	11.78

Raw MAQDAQ Data (60 minutes):

	O2	CO2
Average	6.896	11.30

Combined, time-weighted average (116 minutes):

	O2	CO2
Average	6.95	11.17

Bias-corrected run average (116 minutes):

	O2	**CO2**
Average	**6.99**	**11.34**

Gray shaded cells excluded from average (calibration bias conducted)

MoleDAQ Stripchart file

Time	O2	CO2
11:08:00	6.60	11.26
11:09:00	6.79	11.16
11:10:00	14.55	6.09
11:11:00	10.36	8.93
11:12:00	6.18	11.45
11:13:00	6.01	11.55
11:14:00	5.96	11.52
11:15:00	6.01	11.44
11:16:00	6.08	11.37
11:17:00	6.08	11.42
11:18:00	6.10	11.42
11:19:00	6.18	11.45
11:20:00	6.12	11.56
11:21:00	6.14	11.52
11:22:00	6.24	11.43
11:23:00	6.09	11.53
11:24:00	6.17	11.47
11:25:00	6.27	11.39
11:26:00	6.30	11.36
11:27:00	6.29	11.38
11:28:00	6.40	11.34
11:29:00	6.30	11.46
11:30:00	6.33	11.50
11:31:00	6.44	11.46
11:32:00	6.32	11.55
11:33:00	6.35	11.63
11:34:00	6.21	11.81
11:35:00	6.25	11.76
11:36:00	6.43	11.57
11:37:00	6.33	11.66
11:38:00	6.28	11.72
11:39:00	6.34	11.58
11:40:00	11.78	7.65
11:41:00	12.58	7.99
11:42:00	7.39	10.69
11:43:00	6.68	11.20
11:44:00	6.60	11.25
11:45:00	6.59	11.25
11:46:00	6.61	11.23
11:47:00	6.61	11.21
11:48:00	6.67	11.17
11:49:00	6.79	11.12
11:50:00	6.80	11.12

Gray shaded cells excluded from average (calibration bias conducted)

Time	O2	CO2
11:51:00	6.84	11.13
11:52:00	6.82	11.13
11:53:00	6.72	11.23
11:54:00	6.78	11.21
11:55:00	6.82	11.20
11:56:00	6.81	11.21
11:57:00	6.76	11.27
11:58:00	6.70	11.33
11:59:00	6.69	11.38
12:00:00	6.70	11.36
12:01:00	6.69	11.36
12:02:00	6.71	11.36
12:03:00	6.75	11.33
12:04:00	6.68	11.36
12:05:00	6.68	11.35
12:06:00	6.66	11.39
12:07:00	6.69	11.40
12:08:00	6.63	11.46
12:09:00	6.65	11.41
12:10:00	8.55	10.02
12:11:00	14.01	6.74
12:12:00	7.07	10.89
12:13:00	6.12	11.48
12:14:00	6.04	11.55
12:15:00	6.04	11.54
12:16:00	6.17	11.42
12:17:00	6.20	11.42
12:18:00	6.27	11.40
12:19:00	6.30	11.40
12:20:00	6.28	11.43
12:21:00	6.28	11.48
12:22:00	6.39	11.48
12:23:00	6.46	11.43
12:24:00	6.36	11.46
12:25:00	6.53	11.29
12:26:00	6.53	11.26
12:27:00	6.55	11.23
12:28:00	6.52	11.23
12:29:00	6.62	11.14
12:30:00	6.54	11.19
12:31:00	6.59	11.13
12:32:00	6.69	11.04
12:33:00	6.73	10.99
12:34:00	6.69	11.02
12:35:00	6.79	10.99
12:36:00	6.79	11.06

Gray shaded cells excluded from average (calibration bias conducted)

Time	O2	CO2
12:37:00	6.75	11.15
12:38:00	6.83	11.10
12:39:00	7.58	10.60
12:40:00	15.84	5.10
12:41:00	9.53	9.45
12:42:00	7.18	10.69
12:43:00	7.13	10.77
12:44:00	7.08	10.86
12:45:00	7.14	10.86
12:46:00	7.20	10.75
12:47:00	7.32	10.62
12:48:00	7.33	10.62
12:49:00	7.29	10.66
12:50:00	7.42	10.59
12:51:00	7.39	10.62
12:52:00	7.34	10.65
12:53:00	7.36	10.61
12:54:00	7.43	10.58
12:55:00	7.30	10.74
12:56:00	7.45	10.64
12:57:00	7.42	10.63
12:58:00	7.45	10.60
12:59:00	7.36	10.69
13:00:00	7.42	10.63
13:01:00	7.36	10.64
13:02:00	7.34	10.65
13:03:00	7.28	10.68
13:04:00	7.06	10.80
13:05:00	7.09	10.79
13:06:00	7.24	10.73
13:07:00	7.62	10.42
13:08:00	7.66	10.47
13:09:00	7.75	10.49
13:10:00	8.00	10.25
13:11:00	13.55	6.55
13:12:00	9.30	9.38
13:13:00	6.69	11.23
13:14:00	6.24	11.58
13:15:00	6.07	11.73
13:16:00	6.14	11.65
13:17:00	6.24	11.59
13:18:00	6.20	11.65
13:19:00	6.33	11.58
13:20:00	6.29	11.64
13:21:00	6.35	11.54
13:22:00	6.21	11.64

Gray shaded cells excluded from average (calibration bias conducted)

Time	O2	CO2
13:23:00	6.43	11.53
13:24:00	6.28	11.70
13:25:00	6.39	11.59
13:26:00	6.37	11.63
13:27:00	6.39	11.61
13:28:00	6.36	11.64
13:29:00	6.27	11.71
13:30:00	6.29	11.67
13:31:00	6.45	11.50
13:32:00	6.48	11.45
13:33:00	6.37	11.54
13:34:00	6.28	11.61
13:35:00	6.29	11.56
13:36:00	6.22	11.65

149 additional minutes (gray shaded cells excluded):

	O2	CO2
Average	7.01	11.00
Min	5.96	5.10
Max	15.84	11.81

Raw MAQDAQ Data (0 minutes):

	O2	CO2
Average	NA	NA

Combined, time-weighted average (149 minutes):

	O2	CO2
Average	7.01	11.00

Bias-corrected run average (149 minutes):

	O2	**CO2**
Average	**7.05**	**11.17**

Gray shaded cells excluded from average (calibration bias conducted)

MoleDAQ Stripchart file

Time	O2	CO2
14:14:00	6.00	11.47
14:15:00	6.06	11.47
14:16:00	6.13	11.50
14:17:00	6.16	11.53
14:18:00	6.28	11.58
14:19:00	6.14	11.79
14:20:00	6.19	11.69
14:21:00	6.33	11.59
14:22:00	6.13	11.77
14:23:00	6.24	11.69
14:24:00	6.29	11.68
14:25:00	6.29	11.62
14:26:00	6.20	11.70
14:27:00	6.28	11.64
14:28:00	6.21	11.75
14:29:00	6.29	11.70
14:30:00	6.31	11.64
14:31:00	6.40	11.52
14:32:00	6.44	11.44
14:33:00	6.29	11.50
14:34:00	6.29	11.53
14:35:00	6.42	11.49
14:36:00	6.24	11.71
14:37:00	6.23	11.76
14:38:00	6.41	11.57
14:39:00	10.00	9.02
14:40:00	14.12	6.89
14:41:00	7.20	10.85
14:42:00	6.52	11.22
14:43:00	6.53	11.24
14:44:00	6.62	11.16
14:45:00	6.62	11.20
14:46:00	6.57	11.26
14:47:00	6.69	11.21
14:48:00	6.77	11.11
14:49:00	6.70	11.15
14:50:00	6.59	11.24
14:51:00	6.61	11.23
14:52:00	6.75	11.11
14:53:00	6.63	11.19
14:54:00	6.65	11.20
14:55:00	6.68	11.17
14:56:00	6.66	11.15

Gray shaded cells excluded from average (calibration bias conducted)

Time	O2	CO2
14:57:00	6.67	11.14
14:58:00	6.73	11.11
14:59:00	6.80	11.11
15:00:00	6.75	11.17
15:01:00	6.71	11.18
15:02:00	6.70	11.20
15:03:00	6.67	11.21
15:04:00	6.62	11.22
15:05:00	6.70	11.13
15:06:00	6.75	11.07
15:07:00	6.75	11.22
15:08:00	6.63	11.18
15:09:00	13.75	6.25
15:10:00	12.60	7.77
15:11:00	6.30	11.27
15:12:00	6.01	11.49
15:13:00	6.12	11.42
15:14:00	6.01	11.49
15:15:00	6.16	11.38
15:16:00	6.17	11.37
15:17:00	6.17	11.38
15:18:00	6.33	11.30
15:19:00	6.30	11.35
15:20:00	6.33	11.34
15:21:00	6.26	11.42
15:22:00	6.33	11.36
15:23:00	6.41	11.31
15:24:00	6.37	11.39
15:25:00	6.34	11.43
15:26:00	6.43	11.34
15:27:00	6.27	11.43
15:28:00	6.28	11.46
15:29:00	6.43	11.41
15:30:00	6.22	11.72
15:31:00	6.27	11.65
15:32:00	6.32	11.56
15:33:00	6.34	11.51
15:34:00	6.18	11.61
15:35:00	6.27	11.54
15:36:00	6.34	11.49
15:37:00	6.49	11.38
15:38:00	6.39	11.45
15:39:00	10.18	8.82
15:40:00	14.30	6.66
15:41:00	7.42	10.70
15:42:00	6.70	11.11

Gray shaded cells excluded from average (calibration bias conducted)

Time	O2	CO2
15:43:00	6.63	11.09
15:44:00	6.72	10.98
15:45:00	6.68	11.00
15:46:00	6.78	10.96
15:47:00	6.82	10.96
15:48:00	6.76	11.01
15:49:00	6.78	11.02
15:50:00	6.76	11.09
15:51:00	6.75	11.14
15:52:00	6.86	10.99
15:53:00	6.75	10.97
15:54:00	6.79	10.91
15:55:00	6.78	10.94
15:56:00	6.81	10.98
15:57:00	6.89	10.96
15:58:00	6.88	11.09
15:59:00	6.76	11.05
16:00:00	6.91	11.00
16:01:00	6.87	11.12
16:02:00	6.73	11.20
16:03:00	6.75	11.19
16:04:00	6.92	11.10
16:05:00	6.85	11.20
16:06:00	6.88	11.17
16:07:00	6.79	11.24
16:08:00	6.81	11.26
16:09:00	10.36	8.77
16:10:00	14.01	6.89
16:11:00	6.90	11.04
16:12:00	6.17	11.71
16:13:00	6.15	11.72
16:14:00	6.15	11.70
16:15:00	6.19	11.66
16:16:00	6.21	11.69
16:17:00	6.25	11.78
16:18:00	6.23	11.83
16:19:00	6.23	11.82
16:20:00	6.30	11.77
16:21:00	6.37	11.79
16:22:00	6.31	11.82
16:23:00	6.33	11.78
16:24:00	6.34	11.82
16:25:00	6.21	12.02
16:26:00	6.19	12.03
16:27:00	6.16	11.99
16:28:00	6.19	11.88

Gray shaded cells excluded from average (calibration bias conducted)

Time	O2	CO2
16:29:00	6.20	11.87
16:30:00	6.36	11.77
16:31:00	6.32	11.76
16:32:00	6.22	11.82
16:33:00	6.19	11.82
16:34:00	6.37	11.71
16:35:00	6.36	11.66
16:36:00	6.38	11.60
16:37:00	6.28	11.61
16:38:00	6.35	11.51
16:39:00	10.90	8.24
16:40:00	13.64	7.24
16:41:00	6.87	11.05
16:42:00	6.55	11.16
16:43:00	6.59	11.05
16:44:00	6.60	11.01
16:45:00	6.54	11.10
16:46:00	6.68	11.01
16:47:00	6.62	11.05
16:48:00	6.63	11.02
16:49:00	6.72	11.04
16:50:00	6.75	11.07
16:51:00	6.74	11.10
16:52:00	6.78	11.05
16:53:00	6.81	10.99
16:54:00	6.64	11.11
16:55:00	6.61	11.13
16:56:00	6.74	11.06
16:57:00	6.78	11.04
16:58:00	6.71	11.11
16:59:00	6.72	11.16
17:00:00	6.67	11.21
17:01:00	6.71	11.15
17:02:00	6.80	10.99
17:03:00	6.77	10.98

170 additional minutes (gray shaded cells excluded):

	O2	CO2
Average	6.85	11.13
Min	6.00	6.25
Max	14.30	12.03

Raw MAQDAQ Data (0 minutes):

	O2	CO2
Average	NA	NA

Gray shaded cells excluded from average (calibration bias conducted)

Combined, time-weighted average (170 minutes):

	O2	CO2
Average	6.85	11.13

Bias-corrected run average (170 minutes):

	O2	**CO2**
Average	**6.89**	**11.31**

Gray shaded cells excluded from average (calibration bias conducted)

Appendix A.6
Particulate Calculations/Results

SOURCE TEST DATA SUMMARY

EPA METHOD 5/202

	Client				Owens Brockway
	Unit / Location				Furnace D
	A (stack area), ft^2				4.587
	T_{ref} (reference temperature), °F				68
	Glass rate, ton/hr	7.375	7.375	7.375	7.375
	Test number	1-PM	2-PM	3-PM	Average
	Date	8/18/2020	8/18/2020	8/18/2020	--
	Start / Stop time	0756-0900	0928-1044	1114-1218	--
	Meter box number	MB32	MB32	MB32	--
	C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
	Y (meter calibration factor), dimensionless	1.0040	1.0040	1.0040	1.0040
	Θ (sample time), min	60.00	60.00	60.00	60.00
	Nozzle diameter, in	0.3013	0.3013	0.3013	0.3013
	P_{bar} (barometric pressure), in Hg	29.84	29.84	29.84	29.84
	V_m (meter box volume), acf	38.323	37.827	39.666	38.605
	V_{lc} (impinger liquid mass), g	152.4	153.3	150.9	152.2
	T_m (meter temperature), °F	74.2	84.5	93.8	84.1
	ΔH (meter pressure), in. H_2O	1.400	1.350	1.500	1.417
	ΔP (velocity head), in. H_2O	0.4325	0.4154	0.4517	0.4332
	P_g (static pressure), in. Hg	-0.13	-0.12	-0.13	-0.13
	T_s (stack temperature), °F	698.9	709.1	711.0	706.3
	$\%O_2$ (oxygen stack gas), % volume dry	7.02	7.16	6.89	7.02
	$\%CO_2$ (carbon dioxide stack gas), % volume dry	11.37	11.20	11.56	11.38
	PM				
	m_{nf} (F½ particulate matter catch - combined), mg	210.84	205.68	211.62	209.38
	m_{nb} (B½ particulate matter catch - combined), mg	33.21	56.96	56.89	49.02
	m_n (total particulate matter catch - combined), mg	244.05	262.64	268.51	258.40
1a	$V_{m(std)}$ (standard sample volume), dscf	38.043	36.839	37.996	37.626
1b	$V_{w(std)}$ (water vapor volume), scf	7.186	7.228	7.115	7.176
	B_{ws} (moisture fraction), non-dimensional	0.1589	0.1640	0.1577	0.1602
	B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	NA
1c	B_{ws} (moisture fraction applicable), non-dimensional	0.1589	0.1640	0.1577	0.1602
	Moisture, %	15.89	16.40	15.77	16.02
1d	MW_{dry} (stack gas molecular weight), dry	30.100	30.078	30.125	30.101
1e	MW_{wet} (stack gas molecular weight), wet	28.178	28.097	28.213	28.163
1f	P_s (absolute stack pressure), in Hg	29.830	29.831	29.830	29.831
1g	V_s (stack gas velocity), ft/sec	55.453	54.661	56.933	55.682
1h	Q (stack flow rate), acfm	15,262	15,044	15,669	15,325
1i	Q_{ws} (stack flow rate), wscfm	6,932	6,774	7,044	6,917
1j	Q_{ds} (stack flow rate), dscfm	5,831	5,663	5,933	5,809
1k	I (isokinetic ratio), %	100.7	100.4	98.9	100.0
3a	G (F½ grain loading), gr/dscf	0.0853	0.0860	0.0858	0.0857
3c	M (F½ mass emissions), lb/hr	4.27	4.17	4.36	4.27
	E (F½ mass emissions), lb/ton glass	0.511	0.498	0.524	0.511
	M (F½ mass emissions), g/kg glass	0.255	0.249	0.262	0.255
3a	G (B½ grain loading), gr/dscf	0.0134	0.0238	0.0231	0.0201
3c	M (B½ mass emissions), lb/hr	0.67	1.16	1.17	1.00
	E (B½ mass emissions), lb/ton glass	0.091	0.157	0.159	0.136
	M (B½ mass emissions), g/kg glass	0.046	0.078	0.079	0.068
3a	G (total grain loading), gr/dscf	0.0988	0.1098	0.1088	0.1058
3c	M (total mass emissions), lb/hr	4.94	5.33	5.53	5.27
	E (total mass emissions), lb/ton glass	0.670	0.723	0.750	0.714
	M (total mass emissions), g/kg glass	0.335	0.361	0.375	0.357

Note: The zero production rate was subtracted in Filterable PM calculations per Permit Condition 13.

LAB SUMMARY
EPA METHOD 5/202

Client	Owens Brockway				
Unit / Location	Furnace D				
Test number	1-PM	2-PM	3-PM	Average	Field Train
Date	8/18/2020	8/18/2020	8/18/2020	--	Blank
Start / Stop time	0756-0900	0928-1044	1114-1218	--	--
BLANK					
Solvent	Acetone	Ammonium Hydroxide			
V_a (volume of blank), ml	158	--			
m_a (mass of residue in solvent), mg-PM residue	*0.00*	--			
m_{max} (mass of residue in solvent correction limit), mg-PM residue	1.25	--			
ρ_a (density of solvent) mg-solvent/ml-solvent	791	--			
C_a (solvent blank residue conc.) mg-PM residue/mg-solvent	0.000000	--			
C_{max} (solvent blank residue conc. limit) mg-PM residue/mg-solvent	0.000010	--			
C_a (solvent blank residue conc. applicable) mg-PM residue/mg-solvent	0.000000	--			
Titrant normality	--	0.1			
FILTERABLE PM					
m_f (F½ particulate matter catch - filter), mg	195.35	194.15	195.89	195.13	--
V_{aw} (volume of acetone wash used) ml-Acetone	154	116	120	--	--
W_a (residue in acetone wash) mg-PM residue	0.000	0.000	0.000	--	--
m_a (F½ particulate matter catch - acetone rinse), mg	15.49	11.53	15.73	14.25	--
m_a (F½ particulate matter catch - acetone rinse corrected), mg	15.49	11.53	15.73	14.25	--
m_{nf} (F½ particulate matter catch - combined), mg	210.84	205.68	211.62	209.38	--
CONDENSABLE INORGANIC PM					
V_{C1} (volume of DI H_2O sample), ml-water	193	242	246	--	148
m_r (B½ particulate matter catch - water fraction), mg	38.48	73.71	65.77	59.32	2.00
V_t Volume of titrant used	5.33	11.43	6.65	7.80	0.05
m_c (mass of NH_4^+ added to sample to form ammonium sulfate), mg	9.07	19.46	11.32	13.28	0.09
m_i (B½ particulate matter catch - water fraction, titrant corrected), mg	29.41	54.25	54.45	46.04	1.91
CONDENSABLE ORGANIC PM					
V_{C2} (volume of acetone/DCM sample), ml	122	133	92	--	126
m_o (B½ particulate matter catch - organic fraction), mg	5.80	4.71	4.44	4.98	1.67
COMBINED CONDENSABLE PM					
m_{fb} (B½ particulate matter catch - field blank), mg	--	--	--	--	3.58
m_{fb} (maximum allowable subtraction - field blank), mg	--	--	--	--	2.00
m_{fb} (applicable subtraction - field blank), mg	2.00	2.00	2.00	2.00	--
m_{cpm} (B½ particulate matter catch - combined), mg	33.21	56.96	56.89	49.02	--
TOTAL PM					
m_{nf} (F½ particulate matter catch - combined), mg	210.84	205.68	211.62	209.38	--
m_{cpm} (B½ particulate matter catch - combined), mg	33.21	56.96	56.89	49.02	--
m_n (total particulate matter catch), mg	244.05	262.64	268.51	258.40	--

Appendix A.7
NOx/SO_2 Calculations/Results

SOURCE TEST DATA SUMMARY

Client				Owens Brockway
Unit / Location				Furnace D
A (stack area), ft^2				4.587
Reference temperature, °F				68
Test number	Run 1	Run 2	Run 3	Average
Date	8/18/2020	8/18/2020	8/18/2020	--
Start / Stop time	0756-0900	0928-1043	1114-1218	--
OPERATING DATA				
Glass rate, ton/hr	7.375	7.375	7.375	7.375
ANALYZER DATA				
O_2, % volume dry	7.02	7.16	6.89	7.02
CO_2, % volume dry	11.37	11.20	11.56	11.38
NO_X emissions, ppm volume dry	642.5	611.8	644.9	633.1
SO_2 emissions, ppm volume dry	363.9	355.5	362.3	360.6
VOLUMETRIC FLOW RATE				
Stack flow rate - based on pitot, dscfm	5,831	5,663	5,933	5,809
EMISSIONS				
NO_X concentrations, ppm volume dry	642.5	611.8	644.9	633.1
2e NO_X mass emissions, lb/hr as NO_2	26.8	24.8	27.4	26.4
NO_X mass emissions, lb/ton glass	3.64	3.37	3.72	3.57
SO_2 concentrations, ppm volume dry	363.9	355.5	362.3	360.6
2e SO_2 mass emissions, lb/hr	21.1	20.1	21.4	20.9
SO_2 mass emissions, lb/ton glass	2.87	2.72	2.90	2.83

Appendix A.8
Metals Calculations/Results

SOURCE TEST DATA SUMMARY

Method	EPA 29
Project No	006AS-760936
Client	Owens-Brockway
Unit / Location	Furnace D
Duct area, ft^2	4.587
Reference temperature, °F	68

	Run 1	Run 2	Run 3	Average
Test number				
Date	8/19/20	8/19/20	8/19/20	--
Start / Stop time	0816-1024	1107-1336	1413-1703	--
Meter Box Number	MB32	MB32	MB32	--
Meter Calibration (Y_d)	1.0040	1.0040	1.0040	--
Sample Time, minutes	120	120	120	--
Pitot Coefficient	0.84	0.84	0.84	--
Nozzle Diameter, inches	0.2887	0.2887	0.2887	--
A_n (cross-sectional area of nozzle), ft^2	0.000455	0.000455	0.000455	--
Glass rate, ton/hr	7.375	7.375	7.375	7.375
Barometric pressure, in Hg	29.86	29.86	29.86	29.86
Meter box volume, acf	72.036	75.069	74.844	73.983
Impinger liquid volume, ml	251.1	276.2	264.9	264.1
Meter temperature, °F	85.3	95.3	92.3	91.0
Meter pressure, (Delta H) iwg	1.197	1.263	1.242	1.234
Velocity head, (Delta P) iwg	0.4319	0.4568	0.4440	0.444
Static pressure, iwg	-0.13	-0.13	-0.12	-0.13
Stack temperature, °F	707.0	708.6	727.5	714.4
O_2, % volume dry	6.99	7.05	6.89	6.98
CO_2, % volume dry	11.34	11.17	11.31	11.27
1a Standard sample volume, dscf	70.063	71.720	71.879	71.221
1b Water vapor volume, scf	11.839	13.023	12.490	12.451
Moisture fraction, nondimensional	0.1446	0.1537	0.1480	0.1488
Moisture fraction saturated, nondimensional	NA	NA	NA	NA
1c Moisture fraction applicable, nondimensional	0.1446	0.1537	0.1480	0.1488
1d Stack gas molecular weight, dry	30.094	30.069	30.085	30.083
1e Stack gas molecular weight, wet	28.346	28.214	28.296	28.285
1f Absolute stack pressure, in Hg	29.850	29.850	29.851	29.851
1g Stack gas velocity, ft/sec	55.425	57.171	56.734	56.444
1h Stack flow rate, acfm	15,254	15,735	15,614	15,534
1i Stack flow rate, wscfm	6,885	7,093	6,926	6,968
1j Stack flow rate, dscfm	5,890	6,003	5,901	5,931
Isokinetic ratio, %	100.0	100.5	102.4	101.0

LAB DATA SUMMARY

Method	EPA 29
Project No	006AS-760936
Client	Owens-Brockway
Unit / Location	Furnace D
Duct area, ft^2	4.587
Reference temperature, °F	68

	1-MDL	2-MDL	3-MDL	Reagent Blank	Run 1	Run 2	Run 3	Average
Test number				--				
Date	Method Detection Limits			--	8/19/20	8/19/20	8/19/20	--
Start / Stop time	(MDL)			--	0816-1024	1107-1336	1413-1703	--

				Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result
Antimony (Sb), µg	1.25	1.25	1.25	ND	1.25	ADL	7.78	ADL	10.1	ADL	11.7	ADL	9.86
Arsenic (As), µg	1.75	1.75	1.75	ND	1.75	ADL	207	ADL	250	ADL	280	ADL	246
Beryllium (Be), µg	0.050	0.050	0.050	ND	0.050	ND	0.050	ND	0.050	ND	0.050	ND	0.050
Cadmium (Cd), µg	0.100	0.100	0.100	ND	0.100	ADL	28.5	ADL	33.2	ADL	33.2	ADL	31.6
Chromium (Cr), µg	0.200	0.200	0.200	ND	0.200	ADL	224	ADL	275	ADL	265	ADL	255
Cobalt (Co), µg	0.125	0.125	0.125	ND	0.125	ADL	0.222	ADL	0.388	ADL	0.302	ADL	0.304
Copper (Cu), µg	1.25	1.25	1.25	ND	1.25	ADL	51.8	ADL	58.6	ADL	57.5	ADL	56.0
Lead (Pb), µg	1.25	1.25	1.25	ND	1.25	ADL	3030	ADL	3570	ADL	3680	ADL	3427
Manganese (Mn), µg	0.075	0.075	0.075	ND	0.075	ADL	6.29	ADL	8.30	ADL	7.06	ADL	7.22
Mercury (Hg)													
Front Half, µg	0.0219	0.0219	0.0219	ND	0.0219	ND	0.0219	ND	0.0219	ND	0.0219	ND	0.0219
Impingers (HNO_3/H_2O_2), µg	0.0472	0.0481	0.0499	ND	0.0172	ADL	2.73	ADL	2.53	ADL	2.71	ADL	2.657
Impinger (Empty), µg	0.00910	0.00910	0.00919	ND	0.00892	ADL	0.0598	ADL	0.0416	ADL	0.0906	ADL	0.06400
Impingers ($H_2SO_4/KMnO_4$), µg	0.0324	0.0319	0.0315	ADL	0.0230	ADL	3.46	ADL	3.25	ADL	3.29	ADL	3.33
HCl Rinse, µg	0.0196	0.0198	0.0198	ND	0.0196	ADL	0.0336	ADL	0.0367	ND	0.0198	DLL	0.030
Total Mercury (Hg), µg	**0.130**	**0.131**	**0.132**	DLL	**0.091**	DLL	**6.305**	DLL	**5.880**	DLL	**6.132**	DLL	**6.106**
Nickel (Ni), µg	0.750	0.750	0.750	ND	0.750	ADL	6.76	ADL	15.2	ADL	11.9	ADL	11.3
Selenium (Se), µg	3.75	3.75	3.75	ND	3.75	ADL	7.75	ADL	9.52	ADL	8.58	ADL	8.62

Flags: ND - The result was measured below the RL and could not be approximated by the lab.
ADL - The result was detected in the fraction.
DLL - The result was detected in some fractions that contribute to this calculation, but not all.

BLANK CORRECTION SUMMARY

Method	EPA 29
Project No	006AS-760936
Client	Owens-Brockway
Unit / Location	Furnace D
Duct area, (ft^2)	4.59
Reference temperature, °F	68.00
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	8/19/20	8/19/20	8/19/20	--
Start / Stop time	0816-1024	1107-1336	1413-1703	--
Antimony (Sb), µg	**7.78**	**10.10**	**11.70**	**9.86**
Antimony (Sb), Mmdl, µg	1.250	1.250	1.250	1.250
Antimony (Sb), Mfhb exceeds A, µg	No	No	No	
Antimony (Sb), I. "A", µg	13.8	13.8	13.8	13.8
Antimony (Sb), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Antimony (Sb), II.b 5% of Mfh, µg	0.39	0.51	0.59	0.49
Antimony (Sb), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Antimony (Sb), Greater of I or II, µg	13.80	13.80	13.80	13.80
Antimony (Sb), Mfhb - final, µg	0.00	0.00	0.00	0.00
Antimony (Sb), Mfh - Mfhb, µg	7.78	10.10	11.70	9.86
Antimony (Sb), Mfh, blank corrected final, µg	**7.780**	**10.100**	**11.700**	**9.860**
Arsenic (As), µg	**207.00**	**250.00**	**280.00**	**245.67**
Arsenic (As), Mmdl, µg	1.750	1.750	1.750	1.750
Arsenic (As), Mfhb exceeds A, µg	No	No	No	
Arsenic (As), I. "A", µg	13.8	13.8	13.8	13.8
Arsenic (As), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Arsenic (As), II.b 5% of Mfh, µg	10.35	12.50	14.00	12.28
Arsenic (As), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Arsenic (As), Greater of I or II, µg	13.80	13.80	13.80	13.80
Arsenic (As), Mfhb - final, µg	0.00	0.00	0.00	0.00
Arsenic (As), Mfh - Mfhb, µg	207.00	250.00	280.00	245.67
Arsenic (As), Mfh, blank corrected final, µg	**207.000**	**250.000**	**280.000**	**245.667**
Beryllium (Be), µg	**0.05**	**0.05**	**0.05**	**0.05**
Beryllium (Be), Mmdl, µg	0.050	0.050	0.050	0.050
Beryllium (Be), Mfhb exceeds A, µg	No	No	No	
Beryllium (Be), I. "A", µg	13.8	13.8	13.8	13.8
Beryllium (Be), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Beryllium (Be), II.b 5% of Mfh, µg	0.00	0.00	0.00	0.00
Beryllium (Be), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Beryllium (Be), Greater of I or II, µg	13.80	13.80	13.80	13.80
Beryllium (Be), Mfhb - final, µg	0.00	0.00	0.00	0.00
Beryllium (Be), Mfh - Mfhb, µg	0.05	0.05	0.05	0.05
Beryllium (Be), Mfh, blank corrected final, µg	**0.050**	**0.050**	**0.050**	**0.050**
Cadmium (Cd), µg	**28.50**	**33.20**	**33.20**	**31.63**
Cadmium (Cd), Mmdl, µg	0.100	0.100	0.100	0.100
Cadmium (Cd), Mfhb exceeds A, µg	No	No	No	
Cadmium (Cd), I. "A", µg	13.8	13.8	13.8	13.8
Cadmium (Cd), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Cadmium (Cd), II.b 5% of Mfh, µg	1.43	1.66	1.66	1.58
Cadmium (Cd), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Cadmium (Cd), Greater of I or II, µg	13.80	13.80	13.80	13.80
Cadmium (Cd), Mfhb - final, µg	0.00	0.00	0.00	0.00
Cadmium (Cd), Mfh - Mfhb, µg	28.50	33.20	33.20	31.63
Cadmium (Cd), Mfh, blank corrected final, µg	**28.500**	**33.200**	**33.200**	**31.633**
Chromium (Cr), µg	**224.00**	**275.00**	**265.00**	**254.67**
Chromium (Cr), Mmdl, µg	0.200	0.200	0.200	0.200
Chromium (Cr), Mfhb exceeds A, µg	No	No	No	
Chromium (Cr), I. "A", µg	13.8	13.8	13.8	13.8
Chromium (Cr), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Chromium (Cr), II.b 5% of Mfh, µg	11.20	13.75	13.25	12.73
Chromium (Cr), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Chromium (Cr), Greater of I or II, µg	13.80	13.80	13.80	13.80
Chromium (Cr), Mfhb - final, µg	0.00	0.00	0.00	0.00
Chromium (Cr), Mfh - Mfhb, µg	224.00	275.00	265.00	254.67
Chromium (Cr), Mfh, blank corrected final, µg	**224.000**	**275.000**	**265.000**	**254.667**
Cobalt (Co), µg	**0.22**	**0.39**	**0.30**	**0.30**
Cobalt (Co), Mmdl, µg	0.125	0.125	0.125	0.125
Cobalt (Co), Mfhb exceeds A, µg	No	No	No	
Cobalt (Co), I. "A", µg	13.8	13.8	13.8	13.8
Cobalt (Co), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Cobalt (Co), II.b 5% of Mfh, µg	0.01	0.02	0.02	0.02
Cobalt (Co), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Cobalt (Co), Greater of I or II, µg	13.80	13.80	13.80	13.80
Cobalt (Co), Mfhb - final, µg	0.00	0.00	0.00	0.00
Cobalt (Co), Mfh - Mfhb, µg	0.22	0.39	0.30	0.30
Cobalt (Co), Mfh, blank corrected final, µg	**0.222**	**0.388**	**0.302**	**0.304**

Copper (Cu), µg	**51.80**	**58.60**	**57.50**	**55.97**
Copper (Cu), Mmdl, µg	1.250	1.250	1.250	1.250
Copper (Cu), Mfhb exceeds A, µg	No	No	No	
Copper (Cu), I. "A", µg	13.8	13.8	13.8	13.8
Copper (Cu), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Copper (Cu), II.b 5% of Mfh, µg	2.59	2.93	2.88	2.80
Copper (Cu), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Copper (Cu), Greater of I or II, µg	13.80	13.80	13.80	13.80
Copper (Cu), Mfhb - final, µg	0.00	0.00	0.00	0.00
Copper (Cu), Mfh - Mfhb, µg	51.80	58.60	57.50	55.97
Copper (Cu), Mfh, blank corrected final, µg	**51.800**	**58.600**	**57.500**	**55.967**
Lead (Pb), µg	**3030.00**	**3570.00**	**3680.00**	**3426.67**
Lead (Pb), Mmdl, µg	1.250	1.250	1.250	1.250
Lead (Pb), Mfhb exceeds A, µg	No	No	No	
Lead (Pb), I. "A", µg	13.8	13.8	13.8	13.8
Lead (Pb), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Lead (Pb), II.b 5% of Mfh, µg	151.50	178.50	184.00	171.33
Lead (Pb), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Lead (Pb), Greater of I or II, µg	13.80	13.80	13.80	13.80
Lead (Pb), Mfhb - final, µg	0.00	0.00	0.00	0.00
Lead (Pb), Mfh - Mfhb, µg	3030.00	3570.00	3680.00	3426.67
Lead (Pb), Mfh, blank corrected final, µg	**3030.000**	**3570.000**	**3680.000**	**3426.667**
Manganese (Mn), µg	**6.29**	**8.30**	**7.06**	**7.22**
Manganese (Mn), Mmdl, µg	0.075	0.075	0.075	0.075
Manganese (Mn), Mfhb exceeds A, µg	No	No	No	
Manganese (Mn), I. "A", µg	13.8	13.8	13.8	13.8
Manganese (Mn), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Manganese (Mn), II.b 5% of Mfh, µg	0.31	0.42	0.35	0.36
Manganese (Mn), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Manganese (Mn), Greater of I or II, µg	13.80	13.80	13.80	13.80
Manganese (Mn), Mfhb - final, µg	0.00	0.00	0.00	0.00
Manganese (Mn), Mfh - Mfhb, µg	6.29	8.30	7.06	7.22
Manganese (Mn), Mfh, blank corrected final, µg	**6.290**	**8.300**	**7.060**	**7.217**
Mercury (Hg), front half, µg	**0.02**	**0.02**	**0.02**	**0.02**
Mercury (Hg), back half, µg	**6.28**	**5.86**	**6.11**	**6.08**
Mercury (Hg) - FH, Mmdl, µg	0.022	0.022	0.022	0.022
Mercury (Hg) - BH, Mmdl, µg	0.108	0.109	0.110	0.109
Mercury (Hg), (Hgfhb + Hgbhb) exceeds 0.6 µg	No	No	No	
Mercury (Hg), I. 0.60, µg	0.6	0.6	0.6	0.6
Mercury (Hg), II.a.1 Hgfhb, µg (detected)	0.00	0.02	0.02	0.01
Mercury (Hg), II.a.2 Hgbhb, µg (detected)	0.02	0.02	0.02	0.02
Mercury (Hg), II.a (Hgfhb + Hgbhb), µg (detected)	0.02	0.04	0.04	0.04
Mercury (Hg), II.b 5% of (Hgfh+Hgbh), µg	0.32	0.29	0.31	0.31
Mercury (Hg), II final - lesser of II(a) or II(b), µg	0.02	0.04	0.04	0.04
Mercury (Hg), Greater of I or II, µg	0.60	0.60	0.60	0.60
Mercury (Hg), (Hgfhb + Hgbhb) - final, µg	0.02	0.04	0.04	0.04
Mercury (Hg), (Hgfh - Hgfhb) + (Hgbh - Hgbhb), µg	6.28	5.84	6.09	6.07
Mercury (Hg), total, blank corrected final, µg	**6.282**	**5.835**	**6.087**	**6.068**
Nickel (Ni), µg	**6.76**	**15.20**	**11.90**	**11.29**
Nickel (Ni), Mmdl, µg	0.750	0.750	0.750	0.750
Nickel (Ni), Mfhb exceeds A, µg	No	No	No	
Nickel (Ni), I. "A", µg	13.8	13.8	13.8	13.8
Nickel (Ni), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Nickel (Ni), II.b 5% of Mfh, µg	0.34	0.76	0.60	0.56
Nickel (Ni), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Nickel (Ni), Greater of I or II, µg	13.80	13.80	13.80	13.80
Nickel (Ni), Mfhb - final, µg	0.00	0.00	0.00	0.00
Nickel (Ni), Mfh - Mfhb, µg	6.76	15.20	11.90	11.29
Nickel (Ni), Mfh, blank corrected final, µg	**6.760**	**15.200**	**11.900**	**11.287**
Selenium (Se), µg	**7.75**	**9.52**	**8.58**	**8.62**
Selenium (Se), Mmdl, µg	3.750	3.750	3.750	3.750
Selenium (Se), Mfhb exceeds A, µg	No	No	No	
Selenium (Se), I. "A", µg	13.8	13.8	13.8	13.8
Selenium (Se), II.a Mfhb, µg (detected)	0.00	0.00	0.00	0.00
Selenium (Se), II.b 5% of Mfh, µg	0.39	0.48	0.43	0.43
Selenium (Se), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Selenium (Se), Greater of I or II, µg	13.80	13.80	13.80	13.80
Selenium (Se), Mfhb - final, µg	0.00	0.00	0.00	0.00
Selenium (Se), Mfh - Mfhb, µg	7.75	9.52	8.58	8.62
Selenium (Se), Mfh, blank corrected final, µg	**7.750**	**9.520**	**8.580**	**8.617**

RESULTS SUMMARY

Method	EPA 29
Project No	006AS-760936
Client	Owens-Brockway
Unit / Location	Furnace D
Duct area, ft^2	4.587
Reference temperature, °F	68

	Run 1	Run 2	Run 3	Average
Test number				
Date	8/19/20	8/19/20	8/19/20	--
Start / Stop time	0816-1024	1107-1336	1413-1703	--
O_2, % volume dry	6.99	7.05	6.89	6.98
CO_2, % volume dry	11.34	11.17	11.31	11.27
Stack Temperature, °F	707.0	708.6	727.5	714.4
Moisture Content, % by volume	14.46	15.37	14.80	14.88
Stack Flow Rate, dscfm	5,890	6,003	5,901	5,931
Standard Sample Volume, dscf	70.063	71.720	71.879	71.221

	Run 1		Run 2		Run 3		Average	
Antimony (Sb)								
µg/dscm	ADL	3.9	ADL	5.0	ADL	5.7	ADL	4.9
lb/hr	ADL	8.64E-05	ADL	1.12E-04	ADL	1.27E-04	ADL	1.08E-04
lb/ton glass	ADL	1.17E-05	ADL	1.51E-05	ADL	1.72E-05	ADL	1.47E-05
Arsenic (As)								
µg/dscm	ADL	104	ADL	123	ADL	138	ADL	122
lb/hr	ADL	2.30E-03	ADL	2.77E-03	ADL	3.04E-03	ADL	2.70E-03
lb/ton glass	ADL	3.12E-04	ADL	3.75E-04	ADL	4.12E-04	ADL	3.66E-04
Beryllium (Be)								
µg/dscm	ND	0.025	ND	0.025	ND	0.025	ND	0.025
lb/hr	ND	5.56E-07	ND	5.53E-07	ND	5.42E-07	ND	5.50E-07
lb/ton glass	ND	7.53E-08	ND	7.50E-08	ND	7.36E-08	ND	7.46E-08
Cadmium (Cd)								
µg/dscm	ADL	14	ADL	16	ADL	16	ADL	16
lb/hr	ADL	3.17E-04	ADL	3.67E-04	ADL	3.60E-04	ADL	3.48E-04
lb/ton glass	ADL	4.29E-05	ADL	4.98E-05	ADL	4.88E-05	ADL	4.72E-05
Chromium (Cr)								
µg/dscm	ADL	113	ADL	135	ADL	130	ADL	126
lb/hr	ADL	2.49E-03	ADL	3.04E-03	ADL	2.88E-03	ADL	2.80E-03
lb/ton glass	ADL	3.37E-04	ADL	4.12E-04	ADL	3.90E-04	ADL	3.80E-04
Cobalt (Co)								
µg/dscm	ADL	0.11	ADL	0.19	ADL	0.15	ADL	0.15
lb/hr	ADL	2.47E-06	ADL	4.29E-06	ADL	3.28E-06	ADL	3.34E-06
lb/ton glass	ADL	3.34E-07	ADL	5.82E-07	ADL	4.44E-07	ADL	4.54E-07
Copper (Cu)								
µg/dscm	ADL	26	ADL	29	ADL	28	ADL	28
lb/hr	ADL	5.76E-04	ADL	6.48E-04	ADL	6.24E-04	ADL	6.16E-04
lb/ton glass	ADL	7.80E-05	ADL	8.79E-05	ADL	8.46E-05	ADL	8.35E-05
Lead (Pb)								
µg/dscm	ADL	1527	ADL	1758	ADL	1808	ADL	1697
lb/hr	ADL	3.37E-02	ADL	3.95E-02	ADL	3.99E-02	ADL	3.77E-02
lb/ton glass	ADL	4.56E-03	ADL	5.35E-03	ADL	5.41E-03	ADL	5.11E-03
Manganese (Mn)								
µg/dscm	ADL	3.2	ADL	4.1	ADL	3.5	ADL	3.6
lb/hr	ADL	6.99E-05	ADL	9.18E-05	ADL	7.66E-05	ADL	7.94E-05
lb/ton glass	ADL	9.48E-06	ADL	1.24E-05	ADL	1.04E-05	ADL	1.08E-05
Mercury (Hg)								
µg/dscm	DLL	3.2	DLL	2.9	DLL	3.0	DLL	3.0
lb/hr	DLL	6.98E-05	DLL	6.45E-05	DLL	6.60E-05	DLL	6.68E-05
lb/ton glass	DLL	9.46E-06	DLL	8.75E-06	DLL	8.96E-06	DLL	9.06E-06
Nickel (Ni)								
µg/dscm	ADL	3.4	ADL	7.5	ADL	5.8	ADL	5.6
lb/hr	ADL	7.51E-05	ADL	1.68E-04	ADL	1.29E-04	ADL	1.24E-04
lb/ton glass	ADL	1.02E-05	ADL	2.28E-05	ADL	1.75E-05	ADL	1.68E-05
Selenium (Se)								
µg/dscm	ADL	3.9	ADL	4.7	ADL	4.2	ADL	4.3
lb/hr	ADL	8.61E-05	ADL	1.05E-04	ADL	9.31E-05	ADL	9.48E-05
lb/ton glass	ADL	1.17E-05	ADL	1.43E-05	ADL	1.26E-05	ADL	1.29E-05

LAB DATA SUMMARY

Method	EPA 29
Project No.	006AS-760936
Client	Owens-Brockway
Unit / Location	Furnace D
Duct area, ft^2	4.587
Reference temperature, °F	68.0

	1-MDL	2-MDL	3-MDL	Reagent Blank		Run 1		Run 2		Run 3		Average	
Test number				--		--		--		--		--	
Date	Method Detection Limits			--		8/19/20		8/19/20		8/19/20		--	
Start / Stop time	(MDL)			--		0816-1024		1107-1336		1413-1703		--	
				Flag	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**
Antimony (Sb), µg	0.560	0.540	0.540	ND	0.630	ADL	1.57	ADL	0.807	ND	0.540	DLL	0.972
Arsenic (As), µg	0.784	0.756	0.756	ND	0.882	ADL	29.3	ADL	13.9	ADL	14.4	ADL	19.2
Beryllium (Be), µg	0.022	0.022	0.022	ND	0.025	ND	0.022	ND	0.022	ND	0.022	ND	0.022
Cadmium (Cd), µg	0.045	0.043	0.043	ND	0.050	ADL	1.80	ADL	0.334	ADL	0.142	ADL	0.759
Chromium (Cr), µg	0.090	0.086	0.086	ND	0.101	ADL	14.6	ADL	3.62	ADL	3.07	ADL	7.10
Cobalt (Co), µg	0.056	0.054	0.054	ND	0.063	ADL	0.634	ADL	0.523	ADL	0.060	ADL	0.406
Copper (Cu), µg	0.560	0.540	0.540	ND	0.630	ADL	4.96	ADL	2.38	ADL	1.21	ADL	2.85
Lead (Pb), µg	0.560	0.540	0.540	ND	0.630	ADL	159	ADL	6.73	ADL	11.7	ADL	59.1
Manganese (Mn), µg	0.034	0.032	0.032	ADL	0.114	ADL	1.77	ADL	1.55	ADL	1.34	ADL	1.55
Nickel (Ni), µg	0.336	0.324	0.324	ND	0.378	ADL	2.85	ADL	4.05	ADL	1.29	ADL	2.73
Selenium (Se), µg	1.68	1.62	1.62	ND	1.89	ADL	178	ADL	147	ADL	209	ADL	178

Flags: ND - The result was measured below the RL and could not be approximated by the lab.
ADL - The result was detected in the fraction.
DLL - The result was detected in some fractions that contribute to this calculation, but not all.

BLANK CORRECTION SUMMARY

Method	EPA 29
Project No.	006AS-760936
Client	Owens-Brockway
Unit / Location	Furnace D
Duct area, ft^2	4.59
Reference temperature, °F	68.00

Test number	Run 1	Run 2	Run 3	Average
Date	8/19/20	8/19/20	8/19/20	--
Start / Stop time	0816-1024	1107-1336	1413-1703	--
Antimony (Sb), µg	**1.57**	**0.81**	**0.54**	**0.97**
Antimony (Sb), Mmdl, µg	0.560	0.540	0.540	0.547
Antimony (Sb), If Mbhb exceeds 1, µg	No	No	No	
Antimony (Sb), I. 1 µg	1	1	1	1
Antimony (Sb), II.a Mbhb, µg (detected)	0.00	0.00	0.00	0.00
Antimony (Sb), II.b 5% of Mbh, µg	0.08	0.04	0.03	0.05
Antimony (Sb), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Antimony (Sb), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Antimony (Sb), Mbhb - final, µg	0.00	0.00	0.00	0.00
Antimony (Sb), Mbh - Mfhb, µg	1.57	0.81	0.54	0.97
Antimony (Sb), Mbh, blank corrected final, µg	**1.57**	**0.81**	**0.54**	**0.97**
Arsenic (As), µg	**29.30**	**13.90**	**14.40**	**19.20**
Arsenic (As), Mmdl, µg	0.784	0.756	0.756	0.765
Arsenic (As), If Mbhb exceeds 1, µg	No	No	No	
Arsenic (As), I. 1 µg	1	1	1	1
Arsenic (As), II.a Mbhb, µg (detected)	0.00	0.00	0.00	0.00
Arsenic (As), II.b 5% of Mbh, µg	1.47	0.70	0.72	0.96
Arsenic (As), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Arsenic (As), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Arsenic (As), Mbhb - final, µg	0.00	0.00	0.00	0.00
Arsenic (As), Mbh - Mfhb, µg	29.30	13.90	14.40	19.20
Arsenic (As), Mbh, blank corrected final, µg	**29.30**	**13.90**	**14.40**	**19.20**
Beryllium (Be), µg	**0.02**	**0.02**	**0.02**	**0.02**
Beryllium (Be), Mmdl, µg	0.022	0.022	0.022	0.022
Beryllium (Be), If Mbhb exceeds 1, µg	No	No	No	
Beryllium (Be), I. 1 µg	1	1	1	1
Beryllium (Be), II.a Mbhb, µg (detected)	0.00	0.00	0.00	0.00
Beryllium (Be), II.b 5% of Mbh, µg	0.00	0.00	0.00	0.00
Beryllium (Be), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Beryllium (Be), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Beryllium (Be), Mbhb - final, µg	0.00	0.00	0.00	0.00
Beryllium (Be), Mbh - Mfhb, µg	0.02	0.02	0.02	0.02
Beryllium (Be), Mbh, blank corrected final, µg	**0.02**	**0.02**	**0.02**	**0.02**
Cadmium (Cd), µg	**1.80**	**0.33**	**0.14**	**0.76**
Cadmium (Cd), Mmdl, µg	0.045	0.043	0.043	0.044
Cadmium (Cd), If Mbhb exceeds 1, µg	No	No	No	
Cadmium (Cd), I. 1 µg	1	1	1	1
Cadmium (Cd), II.a Mbhb, µg (detected)	0.00	0.00	0.00	0.00
Cadmium (Cd), II.b 5% of Mbh, µg	0.09	0.02	0.01	0.04
Cadmium (Cd), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Cadmium (Cd), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Cadmium (Cd), Mbhb - final, µg	0.00	0.00	0.00	0.00
Cadmium (Cd), Mbh - Mfhb, µg	1.80	0.33	0.14	0.76
Cadmium (Cd), Mbh, blank corrected final, µg	**1.80**	**0.33**	**0.14**	**0.76**
Chromium (Cr), µg	**14.60**	**3.62**	**3.07**	**7.10**
Chromium (Cr), Mmdl, µg	0.090	0.086	0.086	0.087
Chromium (Cr), If Mbhb exceeds 1, µg	No	No	No	
Chromium (Cr), I. 1 µg	1	1	1	1
Chromium (Cr), II.a Mbhb, µg (detected)	0.00	0.00	0.00	0.00
Chromium (Cr), II.b 5% of Mbh, µg	0.73	0.18	0.15	0.35
Chromium (Cr), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Chromium (Cr), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Chromium (Cr), Mbhb - final, µg	0.00	0.00	0.00	0.00
Chromium (Cr), Mbh - Mfhb, µg	14.60	3.62	3.07	7.10
Chromium (Cr), Mbh, blank corrected final, µg	**14.60**	**3.62**	**3.07**	**7.10**
Cobalt (Co), µg	**0.63**	**0.52**	**0.06**	**0.41**
Cobalt (Co), Mmdl, µg	0.056	0.054	0.054	0.055
Cobalt (Co), If Mbhb exceeds 1, µg	No	No	No	
Cobalt (Co), I. 1 µg	1	1	1	1
Cobalt (Co), II.a Mbhb, µg (detected)	0.00	0.00	0.00	0.00
Cobalt (Co), II.b 5% of Mbh, µg	0.03	0.03	0.00	0.02
Cobalt (Co), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Cobalt (Co), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Cobalt (Co), Mbhb - final, µg	0.00	0.00	0.00	0.00
Cobalt (Co), Mbh - Mfhb, µg	0.63	0.52	0.06	0.41
Cobalt (Co), Mbh, blank corrected final, µg	**0.63**	**0.52**	**0.06**	**0.41**

Copper (Cu), µg	**4.96**	**2.38**	**1.21**	**2.85**
Copper (Cu), Mmdl, µg	0.560	0.540	0.540	0.547
Copper (Cu), If Mbhb exceeds 1, µg	No	No	No	
Copper (Cu), I. 1 µg	1	1	1	1
Copper (Cu), II.a Mbhb, µg (detected)	0.00	0.00	0.00	0.00
Copper (Cu), II.b 5% of Mbh, µg	0.25	0.12	0.06	0.14
Copper (Cu), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Copper (Cu), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Copper (Cu), Mbhb - final, µg	0.00	0.00	0.00	0.00
Copper (Cu), Mbh - Mfhb, µg	4.96	2.38	1.21	2.85
Copper (Cu), Mbh, blank corrected final, µg	**4.96**	**2.38**	**1.21**	**2.85**
Lead (Pb), µg	**159.00**	**6.73**	**11.70**	**59.14**
Lead (Pb), Mmdl, µg	0.560	0.540	0.540	0.547
Lead (Pb), If Mbhb exceeds 1, µg	No	No	No	
Lead (Pb), I. 1 µg	1	1	1	1
Lead (Pb), II.a Mbhb, µg (detected)	0.00	0.00	0.00	0.00
Lead (Pb), II.b 5% of Mbh, µg	7.95	0.34	0.59	2.96
Lead (Pb), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Lead (Pb), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Lead (Pb), Mbhb - final, µg	0.00	0.00	0.00	0.00
Lead (Pb), Mbh - Mfhb, µg	159.00	6.73	11.70	59.14
Lead (Pb), Mbh, blank corrected final, µg	**159.00**	**6.73**	**11.70**	**59.14**
Manganese (Mn), µg	**1.77**	**1.55**	**1.34**	**1.55**
Manganese (Mn), Mmdl, µg	0.034	0.032	0.032	0.033
Manganese (Mn), If Mbhb exceeds 1, µg	No	No	No	
Manganese (Mn), I. 1 µg	1	1	1	1
Manganese (Mn), II.a Mbhb, µg (detected)	0.11	0.11	0.11	0.11
Manganese (Mn), II.b 5% of Mbh, µg	0.09	0.08	0.07	0.08
Manganese (Mn), II final - lesser of II(a) or II(b), µg	0.09	0.08	0.07	0.08
Manganese (Mn), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Manganese (Mn), Mbhb - final, µg	0.11	0.11	0.11	0.11
Manganese (Mn), Mbh - Mfhb, µg	1.66	1.44	1.23	1.44
Manganese (Mn), Mbh, blank corrected final, µg	**1.66**	**1.44**	**1.23**	**1.44**
Nickel (Ni), µg	**2.85**	**4.05**	**1.29**	**2.73**
Nickel (Ni), Mmdl, µg	0.336	0.324	0.324	0.328
Nickel (Ni), If Mbhb exceeds 1, µg	No	No	No	
Nickel (Ni), I. 1 µg	1	1	1	1
Nickel (Ni), II.a Mbhb, µg (detected)	0.00	0.00	0.00	0.00
Nickel (Ni), II.b 5% of Mbh, µg	0.14	0.20	0.06	0.14
Nickel (Ni), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Nickel (Ni), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Nickel (Ni), Mbhb - final, µg	0.00	0.00	0.00	0.00
Nickel (Ni), Mbh - Mfhb, µg	2.85	4.05	1.29	2.73
Nickel (Ni), Mbh, blank corrected final, µg	**2.85**	**4.05**	**1.29**	**2.73**
Selenium (Se), µg	**178.00**	**147.00**	**209.00**	**178.00**
Selenium (Se), Mmdl, µg	1.680	1.620	1.620	1.640
Selenium (Se), If Mbhb exceeds 1, µg	No	No	No	
Selenium (Se), I. 1 µg	1	1	1	1
Selenium (Se), II.a Mbhb, µg (detected)	0.00	0.00	0.00	0.00
Selenium (Se), II.b 5% of Mbh, µg	8.90	7.35	10.45	8.90
Selenium (Se), II final - lesser of II(a) or II(b), µg	0.00	0.00	0.00	0.00
Selenium (Se), Mbhb - greater of I or II, µg	**1.00**	**1.00**	**1.00**	**1.00**
Selenium (Se), Mbhb - final, µg	0.00	0.00	0.00	0.00
Selenium (Se), Mbh - Mfhb, µg	178.00	147.00	209.00	178.00
Selenium (Se), Mbh, blank corrected final, µg	**178.00**	**147.00**	**209.00**	**178.00**

RESULTS SUMMARY

Method	EPA 29
Project No.	006AS-760936
Client	Owens-Brockway
Unit / Location	Furnace D
Duct area, ft^2	0.000
Reference temperature, °F	68

	Run 1	Run 2	Run 3	Average
Test number				
Date	8/19/20	8/19/20	8/19/20	--
Start / Stop time	0816-1024	1107-1336	1413-1703	--
O_2, % volume dry	6.99	7.05	6.89	6.98
CO_2, % volume dry	11.34	11.17	11.31	11.27
Stack Temperature, °F	707.0	708.6	727.5	714.4
Moisture Content, % by volume	14.46	15.37	14.80	14.88
Stack Flow Rate, dscfm	5,890	6,003	5,901	5,931
Standard Sample Volume, dscf	70.063	71.720	71.879	71.221

	Run 1		Run 2		Run 3		Average	
Antimony (Sb)								
µg/dscm	ADL	0.79	ADL	0.0	ND	0.40	DLL	0.40
lb/hr	ADL	1.74E-05	ADL	0.00E+00	ND	8.76E-06	DLL	8.73E-06
lb/ton glass	ADL	2.37E-06	ADL	0.00E+00	ND	1.19E-06	DLL	1.18E-06
Arsenic (As)								
µg/dscm	ADL	15	ADL	6.8	ADL	7.1	ADL	9.6
lb/hr	ADL	3.26E-04	ADL	1.54E-04	ADL	1.56E-04	ADL	2.12E-04
lb/ton glass	ADL	4.41E-05	ADL	2.08E-05	ADL	2.12E-05	ADL	2.87E-05
Beryllium (Be)								
µg/dscm	ND	0.011	ND	0.011	ND	0.011	ND	0.011
lb/hr	ND	2.44E-07	ND	2.43E-07	ND	2.39E-07	ND	2.42E-07
lb/ton glass	ND	3.31E-08	ND	3.30E-08	ND	3.24E-08	ND	3.28E-08
Cadmium (Cd)								
µg/dscm	ADL	0.91	ADL	0.16	ADL	0.070	ADL	0.38
lb/hr	ADL	2.00E-05	ADL	3.69E-06	ADL	1.54E-06	ADL	8.41E-06
lb/ton glass	ADL	2.71E-06	ADL	5.01E-07	ADL	2.09E-07	ADL	1.14E-06
Chromium (Cr)								
µg/dscm	ADL	7.4	ADL	1.8	ADL	1.5	ADL	3.5
lb/hr	ADL	1.62E-04	ADL	4.00E-05	ADL	3.33E-05	ADL	7.85E-05
lb/ton glass	ADL	2.20E-05	ADL	5.43E-06	ADL	4.52E-06	ADL	1.06E-05
Cobalt (Co)								
µg/dscm	ADL	0.32	ADL	0.26	ADL	0.029	ADL	0.20
lb/hr	ADL	7.04E-06	ADL	5.79E-06	ADL	6.51E-07	ADL	4.49E-06
lb/ton glass	ADL	9.55E-07	ADL	7.84E-07	ADL	8.83E-08	ADL	6.09E-07
Copper (Cu)								
µg/dscm	ADL	2.5	ADL	1.2	ADL	0.59	ADL	1.4
lb/hr	ADL	5.51E-05	ADL	2.63E-05	ADL	1.31E-05	ADL	3.15E-05
lb/ton glass	ADL	7.47E-06	ADL	3.57E-06	ADL	1.78E-06	ADL	4.27E-06
Lead (Pb)								
µg/dscm	ADL	80	ADL	3.3	ADL	5.7	ADL	30
lb/hr	ADL	1.77E-03	ADL	7.44E-05	ADL	1.27E-04	ADL	6.56E-04
lb/ton glass	ADL	2.40E-04	ADL	1.01E-05	ADL	1.72E-05	ADL	8.89E-05
Manganese (Mn)								
µg/dscm	ADL	0.83	ADL	0.71	ADL	0.60	ADL	0.71
lb/hr	ADL	1.84E-05	ADL	1.59E-05	ADL	1.33E-05	ADL	1.59E-05
lb/ton glass	ADL	2.49E-06	ADL	2.15E-06	ADL	1.80E-06	ADL	2.15E-06
Nickel (Ni)								
µg/dscm	ADL	1.4	ADL	2.0	ADL	0.63	ADL	1.4
lb/hr	ADL	3.17E-05	ADL	4.48E-05	ADL	1.40E-05	ADL	3.02E-05
lb/ton glass	ADL	4.29E-06	ADL	6.07E-06	ADL	1.90E-06	ADL	4.09E-06
Selenium (Se)								
µg/dscm	ADL	90	ADL	72	ADL	100	ADL	88
lb/hr	ADL	1.98E-03	ADL	1.63E-03	ADL	2.27E-03	ADL	1.96E-03
lb/ton glass	ADL	2.68E-04	ADL	2.20E-04	ADL	3.07E-04	ADL	2.65E-04

LAB DATA SUMMARY

Method	EPA 29
Project No	006AS-760936
Client	Owens-Brockway
Unit / Location	Furnace D
Duct area, ft^2	4.587
Reference temperature, °F	68

Test number	Run 1	Run 2	Run 3	Average
Date	8/19/20	8/19/20	8/19/20	--
Start / Stop time	0816-1024	1107-1336	1413-1703	--

Antimony (Sb), fh blank corrected, µg	ADL	7.78	ADL	10.10	ADL	11.70	ADL	9.86
Antimony (Sb) bh blank corrected, µg	ADL	1.57	ADL	0.81	ND	0.54	DLL	0.97
Antimony (Sb) total, µg	ADL	9.35	ADL	10.91	DLL	12.24	DLL	10.83
Arsenic (As), fh blank corrected, µg	ADL	207.00	ADL	250.00	ADL	280.00	ADL	245.67
Arsenic (As) bh blank corrected, µg	ADL	29.30	ADL	13.90	ADL	14.40	ADL	19.20
Arsenic (As) total, µg	ADL	236.30	ADL	263.90	ADL	294.40	ADL	264.87
Beryllium (Be), fh blank corrected, µg	ND	0.05	ND	0.05	ND	0.05	ND	0.05
Beryllium (Be) bh blank corrected, µg	ND	0.02	ND	0.02	ND	0.02	ND	0.02
Beryllium (Be) total, µg	ND	0.07	ND	0.07	ND	0.07	ND	0.07
Cadmium (Cd), fh blank corrected, µg	ADL	28.50	ADL	33.20	ADL	33.20	ADL	31.63
Cadmium (Cd) bh blank corrected, µg	ADL	1.80	ADL	0.33	ADL	0.14	ADL	0.76
Cadmium (Cd) total, µg	ADL	30.30	ADL	33.53	ADL	33.34	ADL	32.39
Chromium (Cr), fh blank corrected, µg	ADL	224.00	ADL	275.00	ADL	265.00	ADL	254.67
Chromium (Cr) bh blank corrected, µg	ADL	14.60	ADL	3.62	ADL	3.07	ADL	7.10
Chromium (Cr) total, µg	ADL	238.60	ADL	278.62	ADL	268.07	ADL	261.76
Cobalt (Co), fh blank corrected, µg	ADL	0.22	ADL	0.39	ADL	0.30	ADL	0.30
Cobalt (Co) bh blank corrected, µg	ADL	0.63	ADL	0.52	ADL	0.06	ADL	0.41
Cobalt (Co) total, µg	ADL	0.86	ADL	0.91	ADL	0.36	ADL	0.71
Copper (Cu), fh blank corrected, µg	ADL	51.80	ADL	58.60	ADL	57.50	ADL	55.97
Copper (Cu) bh blank corrected, µg	ADL	4.96	ADL	2.38	ADL	1.21	ADL	2.85
Copper (Cu) total, µg	ADL	56.76	ADL	60.98	ADL	58.71	ADL	58.82
Lead (Pb), fh blank corrected, µg	ADL	3030.00	ADL	3570.00	ADL	3680.00	ADL	3426.67
Lead (Pb) bh blank corrected, µg	ADL	159.00	ADL	6.73	ADL	11.70	ADL	59.14
Lead (Pb) total, µg	ADL	3189.00	ADL	3576.73	ADL	3691.70	ADL	3485.81
Manganese (Mn), fh blank corrected, µg	ADL	6.29	ADL	8.30	ADL	7.06	ADL	7.22
Manganese (Mn) bh blank corrected, µg	ADL	1.66	ADL	1.44	ADL	1.23	ADL	1.44
Manganese (Mn) total, µg	ADL	7.95	ADL	9.74	ADL	8.29	ADL	8.66
Mercury (Hg), total blank corrected, µg	DLL	6.28	DLL	5.84	DLL	6.09	DLL	6.07
Nickel (Ni), fh blank corrected, µg	ADL	6.76	ADL	15.20	ADL	11.90	ADL	11.29
Nickel (Ni) bh blank corrected, µg	ADL	2.85	ADL	4.05	ADL	1.29	ADL	2.73
Nickel (Ni) total, µg	ADL	9.61	ADL	19.25	ADL	13.19	ADL	14.02
Selenium (Se), fh blank corrected, µg	ADL	7.75	ADL	9.52	ADL	8.58	ADL	8.62
Selenium (Se) bh blank corrected, µg	ADL	178.00	ADL	147.00	ADL	209.00	ADL	178.00
Selenium (Se) total, µg	ADL	185.75	ADL	156.52	ADL	217.58	ADL	186.62

RESULTS SUMMARY

Method	EPA 29
Project No	006AS-760936
Client	Owens-Brockway
Unit / Location	Furnace D
Duct area, ft^2	4.587
Reference temperature, °F	68

	Run 1	Run 2	Run 3	Average
Test number				
Date	8/19/20	8/19/20	8/19/20	--
Start / Stop time	0816-1024	1107-1336	1413-1703	--
O_2, % volume dry	6.99	7.05	6.89	6.98
CO_2, % volume dry	11.34	11.17	11.31	11.27
Stack Temperature, °F	707.0	708.6	727.5	714.4
Moisture Content, % by volume	14.46	15.37	14.80	14.88
Stack Flow Rate, dscfm	5,890	6,003	5,901	5,931
Standard Sample Volume, dscf	70.063	71.720	71.879	71.221

	Run 1		Run 2		Run 3		Average	
Antimony (Sb)								
µg/dscm	ADL	4.7	ADL	5.4	DLL	6.0	DLL	5.4
lb/hr	ADL	1.04E-04	ADL	1.21E-04	DLL	1.33E-04	DLL	1.19E-04
lb/ton glass	ADL	1.41E-05	ADL	1.64E-05	DLL	1.80E-05	DLL	1.62E-05
Arsenic (As)								
µg/dscm	ADL	119	ADL	130	ADL	145	ADL	131
lb/hr	ADL	2.63E-03	ADL	2.92E-03	ADL	3.19E-03	ADL	2.91E-03
lb/ton glass	ADL	3.56E-04	ADL	3.96E-04	ADL	4.33E-04	ADL	3.95E-04
Beryllium (Be)								
µg/dscm	ND	0.036	ND	0.035	ND	0.035	ND	0.036
lb/hr	ND	8.00E-07	ND	7.96E-07	ND	7.81E-07	ND	7.93E-07
lb/ton glass	ND	1.08E-07	ND	1.08E-07	ND	1.06E-07	ND	1.07E-07
Cadmium (Cd)								
µg/dscm	ADL	15	ADL	17	ADL	16	ADL	16
lb/hr	ADL	3.37E-04	ADL	3.71E-04	ADL	3.62E-04	ADL	3.56E-04
lb/ton glass	ADL	4.56E-05	ADL	5.03E-05	ADL	4.91E-05	ADL	4.83E-05
Chromium (Cr)								
µg/dscm	ADL	120	ADL	137	ADL	132	ADL	130
lb/hr	ADL	2.65E-03	ADL	3.08E-03	ADL	2.91E-03	ADL	2.88E-03
lb/ton glass	ADL	3.59E-04	ADL	4.18E-04	ADL	3.94E-04	ADL	3.91E-04
Cobalt (Co)								
µg/dscm	ADL	0.43	ADL	0.45	ADL	0.18	ADL	0.35
lb/hr	ADL	9.51E-06	ADL	1.01E-05	ADL	3.93E-06	ADL	7.84E-06
lb/ton glass	ADL	1.29E-06	ADL	1.37E-06	ADL	5.33E-07	ADL	1.06E-06
Copper (Cu)								
µg/dscm	ADL	29	ADL	30	ADL	29	ADL	29
lb/hr	ADL	6.31E-04	ADL	6.75E-04	ADL	6.37E-04	ADL	6.47E-04
lb/ton glass	ADL	8.55E-05	ADL	9.15E-05	ADL	8.64E-05	ADL	8.78E-05
Lead (Pb)								
µg/dscm	ADL	1607	ADL	1761	ADL	1814	ADL	1727
lb/hr	ADL	3.54E-02	ADL	3.96E-02	ADL	4.01E-02	ADL	3.83E-02
lb/ton glass	ADL	4.80E-03	ADL	5.36E-03	ADL	5.43E-03	ADL	5.20E-03
Manganese (Mn)								
µg/dscm	ADL	4.0	ADL	4.8	ADL	4.1	ADL	4.3
lb/hr	ADL	8.83E-05	ADL	1.08E-04	ADL	8.99E-05	ADL	9.53E-05
lb/ton glass	ADL	1.20E-05	ADL	1.46E-05	ADL	1.22E-05	ADL	1.29E-05
Mercury (Hg)								
µg/dscm	DLL	3.2	DLL	2.9	DLL	3.0	DLL	3.0
lb/hr	DLL	6.98E-05	DLL	6.45E-05	DLL	6.60E-05	DLL	6.68E-05
lb/ton glass	DLL	9.46E-06	DLL	8.75E-06	DLL	8.96E-06	DLL	9.06E-06
Nickel (Ni)								
µg/dscm	ADL	4.8	ADL	9.5	ADL	6.5	ADL	6.9
lb/hr	ADL	1.07E-04	ADL	2.13E-04	ADL	1.43E-04	ADL	1.54E-04
lb/ton glass	ADL	1.45E-05	ADL	2.89E-05	ADL	1.94E-05	ADL	2.09E-05
Selenium (Se)								
µg/dscm	ADL	94	ADL	77	ADL	110	ADL	93
lb/hr	ADL	2.06E-03	ADL	1.73E-03	ADL	2.36E-03	ADL	2.05E-03
lb/ton glass	ADL	2.80E-04	ADL	2.35E-04	ADL	3.20E-04	ADL	2.78E-04

Appendix A.9
Hexavalent Chromium Calculations/Results

SOURCE TEST DATA SUMMARY

Client				Owens Brockway
Unit / Location				Furnace D
A (stack area), ft^2				4.587
Reference temperature, °F				68
Test number	Run 1	Run 2	Run 3	Average
Date	8/19/2020	8/19/2020	8/19/2020	--
Start / Stop time	0816-1024	1107-1336	1413-1703	--
OPERATING DATA				
Glass rate, ton/hr	7.375	7.375	7.375	7.375
SAMPLE TRAIN DATA				
Meter box number	MB30	MB30	MB30	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	1.0018	1.0018	1.0018	1.002
Θ (sample time), min	120	120	120	120
Nozzle diameter, in	0.2892	0.2892	0.2892	0.2892
P_{bar} (barometric pressure), in Hg	29.86	29.86	29.86	29.86
V_m (meter box volume), acf	70.601	73.978	72.495	73.237
V_{lc} (impinger liquid volume), ml	195.0	319.0	250.5	284.8
T_m (meter temperature), °F	92.9	104.3	95.3	99.8
ΔH (meter pressure), in. H_2O	1.145	1.190	1.153	1.172
ΔP (velocity head), in. H2O	0.4395	0.4547	0.4356	0.4451
P_g (static pressure), in. Hg	-0.15	-0.15	-0.15	-0.15
T_s (stack temperature), °F	689.7	701.7	690.8	696.3
ANALYZER DATA				
O_2, % volume dry	6.99	7.05	6.89	6.97
CO_2, % volume dry	11.34	11.17	11.31	11.24
VOLUMETRIC FLOW RATE				
1a V_{mstd}, standard sample volume, dscf	67.574	69.386	69.091	69.238
1b V_{wcstd}, water vapor volume, scf	9.194	15.041	11.811	13.426
$B_{ws,meas}$ (moisture fraction measured), non-dimensional	0.1198	0.1782	0.1460	0.1621
$B_{ws,sat}$ (moisture fraction at saturation), non-dimensional	NA	NA	NA	NA
1c B_{ws} (moisture fraction), non-dimensional	0.1445	0.1782	0.1460	0.1621
1d M_d, stack gas dry molecular weight, lb/lb-mole	30.094	30.069	30.085	30.077
1e M_s, stack gas wet molecular weight, lb/lb-mole	28.346	27.919	28.321	28.120
1f P_s, absolute stack pressure, in. Hg	29.849	29.849	29.849	29.849
1g V_s, stack gas velocity, ft/sec	55.497	57.175	55.298	56.236
1h Stack flow rate, acfm	15,274	15,735	15,219	15,477
1i Stack flow rate, wscfm	6,998	7,135	6,966	7,050
Stack flow rate - based on pitot, dscfm	5,987	5,864	5,949	5,906
I (isokinetic ratio), %	94.6	99.2	97.3	98.2
Cr VI INDUCTIVELY COUPLED PLASMA				
Cr^{+6} mass collected, µg/sample	0.178	0.317	0.307	0.312
Sample volume, ml	650	709	674	692
EMISSIONS				
Cr^{+6} concentrations, mg/dscm	9.30E-05	1.61E-04	1.57E-04	1.59E-04
Cr^{+6} concentrations, ppm volume dry	4.30E-05	7.46E-05	7.25E-05	7.35E-05
2e Cr^{+6} mass emissions, lb/hr	2.08E-06	3.54E-06	3.49E-06	3.52E-06
Cr^{+6} mass emissions, lb/ton glass	2.83E-07	4.80E-07	4.74E-07	4.77E-07

Note(s): Run 1 excluded from averages due to loss of impinger liquid. EPA 29 moisture data used for run 1. See report for discussion.

Appendix A.10
Example Calculations

MONTROSE AIR QUALITY SERVICES

EXAMPLE CALCULATIONS
STACK GAS VOLUMETRIC FLOW RATE

Project name:	Owens-Brockway	**Project number:**	006AS-760936
Computed by:	A Vella	**Calculation date:**	2020-10-28
Run number:	PM R1		

SAMPLE TRAIN DATA

Meter calibration factor, Y_d	1.0040	Y
Stack area, square feet	4.587	A_s
Pitot Coefficient	0.84	C_p
Barometric pressure, in. Hg	29.84	P_{bar}
Meter box volume, acf	38.323	V_m
Impinger liquid volume, g	152.4	V_{lc}
Meter temperature, °R	534.2	T_m = (°F plus 460)
Meter pressure, (delta H) iwg	1.4	ΔH
Velocity head, (delta P) iwg	0.4325	ΔP
Static pressure, iwg	-0.13	P_{sg}
Stack temperature, °R	1158.9	T_s = (°F plus 460)
Stack O_2, % volume dry	7.02	O_2
Stack CO_2, % volume dry	11.37	CO_2
Stack N_2, % volume dry	81.61	N_2 = (100 - %O_2 - %CO_2)
Nozzle area, square feet	0.000495	$A_n = \pi (D_n / 2)^2 (1\ ft/ 12\ in)^2$
PM sampling time, minutes	60	Θ
Reference temperature, °R	528	T_{std} = (°F plus 460)

Note: The results calculated in the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.

1 VOLUMETRIC FLOW RATE

a. Standard sample gas volume, dscf

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

$$V_{m\,std} = \frac{17.64 \times (38.323)(1.004)[29.84+(1.4)/(13.6)]}{534.2}$$

$V_{m\,std}$ = 38.044 dscf

b. Water vapor volume, scf

$$V_{w\,std} = (0.04715)(V_{lc})\left(\frac{T_{std}}{528}\right)$$

$$V_{w\,std} = \frac{(0.04715)(152.4)(528)}{(528)}$$

$V_{w\,std}$ = 7.186 scf

c. Moisture content, non-dimensional

$$B_{ws} = \left(\frac{V_{w\,std}}{V_{m\,std} + V_{w\,std}}\right)$$

$$B_{ws} = \frac{(7.186)}{(38.044 + 7.186)}$$

B_{ws} = 0.1589 moisture content (multiply by 100 for % by volume)

d. Stack gas molecular weight, lb/lb mole (dry)

MW_{dry} = [0.44(%CO_2)] + [0.32(%O_2)] + [0.28(%N_2)]

MW_{dry} = [0.44(11.37)] + [0.32(7.02)] + [0.28(81.61)]

MW_{dry} = 30.100 lb/lb mole

e. Stack gas molecular weight, lb/lb mole (wet)

MW_{wet} = [MW_{dry}(1-B_{ws})] + [18(B_{ws})]

MW_{wet} = [30.1(1-0.1589)] + [18(0.1589)]

MW_{wet} = 28.177 lb/lb mole

f. Absolute stack pressure, in Hg

$$P_s = P_{bar} + \left(\frac{P_{sg}}{13.6}\right)$$

P_s = 29.84 + (-0.13/13.6)

P_s = 29.830 in. Hg

g. Stack velocity, ft/sec

$$v_s = (85.49)(C_p)(\sqrt{\Delta P})\sqrt{\frac{T_s}{(P_s)(MW_{wet})}}$$

v_s = $(85.49)(0.84)\sqrt{\frac{(0.4325)(1158.9)}{(29.83)(28.177)}}$

v_s = 55.454 ft/sec

h. Actual stack flow rate, acfm

$$Q = (v_s)(A_s)(60\ min/hr)$$

$Q =$ $(55.454)(4.587)(60)$

$Q =$ 15,262 acfm

i. Standard stack gas flow rate, wscfm

$$Q_{ws} = (v_s)(A_s)(60\ min/hr)\left(\frac{T_{std}}{T_s}\right)\left(\frac{P_s}{P_{std}}\right)$$

$Q_{ws} =$ $(55.454)(4.587)(60)(528/1158.9)(29.83/29.92)$

$Q_{ws} =$ 6,933 wscfm

j. Standard stack gas flow rate, dscfm

$$Q_{ds} = (v_s)(A_s)(60\ min/hr)(1 - B_{ws})\left(\frac{T_{std}}{T_s}\right)\left(\frac{P_s}{P_{std}}\right)$$

$Q_{ds} =$ $(55.454)(4.587)(60)(1\text{-}0.1589)(528/1158.9)(29.83/29.92)$

$Q_{ds} =$ 5,831 dscfm

k. Percent Isokinetic, %

$$I = \frac{(T_s)(V_{m\,std})(P_{std})(100)}{(T_{std})(v_s)(\theta)(A_n)(P_s)(60)(1 - B_{ws})}$$

$I =$ $\dfrac{(1158.9)(38.044)(29.92)(100)}{(528)(55.454)(60)(0.000495)(29.83)(60)(1\ -\ 0.1589)}$

$I =$ 100.8 %

MONTROSE AIR QUALITY SERVICES

EXAMPLE CALCULATIONS
PARTICULATE MATTER EMISSIONS

Project name:	Owens-Brockway	**Project number:**	006AS-760936
Computed by:	A Vella	**Calculation date:**	2020-10-28
Run number:	R1		

EMISSIONS DATA

Mass of collected particulate matter, mg (filterable)	210.84	G_m
Dry stack gas flow rate at standard conditions, dscfm	5,831	Q_{ds}
Dry meter volume at standard conditions, dscf	38.043	$V_{m\,std}$
Stack O_2, % volume dry	7.02	O_2
Stack CO_2, % volume dry	11.37	CO_2
Glass melted, ton/hr	7.375	R

1 PARTICULATE MATTER EMISSIONS

a. Grain loading, gr/dscf

$$G = (0.0154)\left(\frac{G_m}{V_{m\,std}}\right)$$

$$G = (0.0154)\ \frac{(210.84)}{(38.043)}$$

G = 0.0853 gr/dscf

Note: The results calculated on these pages may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.

b. Mass emission rate, lb/hr

$$M = (G)(Q_{ds})\frac{(60\ min/hr)}{(7{,}000\ gr/lb)}$$

$$M = \frac{(0.0853)(5{,}831)(60)}{(7{,}000)}$$

M = 4.26 lb/hr

c. Emission rate, g/kg glass melted

$E = \big((c_s Q_{sd}) - A\big)/P$ (see Permit section 13.a)
(applies to filterable PM only; A = 0 for CPM and total PM)

where:

$$c_s = G \times \frac{1\ g}{15.432\ gr} \times \frac{35.315\ dscf}{1\ dscm}$$

$$Q_{sd} = Q_{ds} \times \frac{60\ min}{1\ hr} \times \frac{1\ dscm}{35.315\ dscf}$$

A = 227 g/hr

$$P = R \times \frac{2000\ lb}{1\ ton} \times \frac{453.6\ g}{1\ lb} \times \frac{1\ kg}{1000\ g}$$

$$E = \frac{[((0.0853 \times 35.315/15.432) \times (5831 \times 60/35.315)) - 227]}{7.375 \times 2000 \times 453.6/1000}$$

E = 0.255 g/kg glass melted

d. Emission rate, lb/ton glass melted

$$E' = E \times \frac{1\ lb}{453.6\ g} \times \frac{0.4536\ kg}{1\ lb} \times \frac{2000\ lb}{1\ ton}$$

E' = 0.255 x 2

E' = 0.510 lb/ton glass melted

MONTROSE AIR QUALITY SERVICES

EXAMPLE CALCULATIONS
PARTICULATE MATTER EMISSIONS

Project name:	Owens-Brockway	**Project number:**	006AS-760936
Computed by:	A Vella	**Calculation date:**	2020-10-28
Run number:	R1		

EMISSIONS DATA

Mass of collected particulate matter, mg (total)	244.05	G_m
Dry stack gas flow rate at standard conditions, dscfm	5,831	Q_{ds}
Dry meter volume at standard conditions, dscf	38.043	$V_{m\,std}$
Stack O_2, % volume dry	7.02	O_2
Stack CO_2, % volume dry	11.37	CO_2
Glass melted, ton/hr	7.375	R

1 PARTICULATE MATTER EMISSIONS

a. Grain loading, gr/dscf

$$G = (0.0154)\left(\frac{G_m}{V_{m\,std}}\right)$$

$$G = (0.0154)\ \frac{(244.05)}{(38.043)}$$

G = 0.0988 gr/dscf

Note: The results calculated on these pages may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.

b. Mass emission rate, lb/hr

$$M = (G)(Q_{ds})\frac{(60\ min/hr)}{(7{,}000\ gr/lb)}$$

$$M = \frac{(0.0988)(5{,}831)(60)}{(7{,}000)}$$

M = 4.94 lb/hr

c. Emission rate, g/kg glass melted

$E = \big((c_s Q_{sd}) - A\big)/P$ (see Permit section 13.a)
(applies to filterable PM only; A = 0 for CPM and total PM)

where:

$$c_s = G \times \frac{1\ g}{15.432\ gr} \times \frac{35.315\ dscf}{1\ dscm}$$

$$Q_{sd} = Q_{ds} \times \frac{60\ min}{1\ hr} \times \frac{1\ dscm}{35.315\ dscf}$$

A = 0 g/hr

$$P = R \times \frac{2000\ lb}{1\ ton} \times \frac{453.6\ g}{1\ lb} \times \frac{1\ kg}{1000\ g}$$

$$E = \frac{[((0.0988 \times 35.315/15.432) \times (5831 \times 60/35.315)) - 0]}{7.375 \times 2000 \times 453.6/1000}$$

E = 0.335 g/kg glass melted

d. Emission rate, lb/ton glass melted

$$E' = E \times \frac{1\ lb}{453.6\ g} \times \frac{0.4536\ kg}{1\ lb} \times \frac{2000\ lb}{1\ ton}$$

E' = 0.335 x 2

E' = 0.670 lb/ton glass melted

MONTROSE AIR QUALITY SERVICES

EXAMPLE CALCULATIONS
GASEOUS EMISSIONS

Project name:	Owens-Brockway	**Project number:**	006AS-760936
Computed by:	A Vella	**Calculation date:**	2020-10-28
Run number:	R1	**Gaseous Species:**	NO_X

EMISSIONS DATA

Reference temperature, °R	528	T_{ref} = (°F plus 460)
Concentration of gaseous species, ppmvd	642.5	C
Dry stack gas flow rate at standard conditions, dscfm	5,831	Q_{ds}
Stack O_2, % volume dry	7.02	O_2
Glass melted, ton/hr	7.375	R
Molecular weight of gaseous species, lb/lb-mol	46.01	MW_S, where

MW_S = 28.01 for CO; 46.01 for NO_X as NO_2; 64.06 for SO_X as SO_2

Conversion factor from ppm to lb/scf	1.19E-07	CF where

1.194E-07 [(lb/scf) / ppm] for NO_X

1.660E-07 [(lb/scf) / ppm] for SO_2

1.194E-07 x MW_x/MW_{NOX} [(lb/scf) / ppm] for other compounds (x)

1 GASEOUS EMISSIONS

a. Mass emission rate, lb/hr

$$M = (C)(CF)(Q_{ds})(60\ min/hr)$$

$$M = (642.5)(1.19E\text{-}07)(5,831)(60)$$

M = 26.8 lb/hr

Note: The results calculated on these pages may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.

b. Emission rate, lb/ton glass melted

$$E = \frac{M}{R}$$

$$E = \frac{26.8}{7.4}$$

$E =$ 3.63 lb/ton glass melted

MONTROSE AIR QUALITY SERVICES

EXAMPLE CALCULATIONS
GASEOUS EMISSIONS

Project name:	Owens-Brockway	**Project number:**	006AS-760936
Computed by:	A Vella	**Calculation date:**	2020-10-28
Run number:	R1	**Gaseous Species:**	SO_2

EMISSIONS DATA

Reference temperature, °R	528	T_{ref} = (°F plus 460)
Concentration of gaseous species, ppmvd	363.9	C
Dry stack gas flow rate at standard conditions, dscfm	5,831	Q_{ds}
Stack O_2, % volume dry	7.02	O_2
Glass melted, ton/hr	7.375	R
Molecular weight of gaseous species, lb/lb-mol	64.06	MW_S, where

MW_S = 28.01 for CO; 46.01 for NO_X as NO_2; 64.06 for SO_X as SO_2

Conversion factor from ppm to lb/scf	1.66E-07	CF where

1.194E-07 [(lb/scf) / ppm] for NO_X

1.660E-07 [(lb/scf) / ppm] for SO_2

1.194E-07 x MW_x/MW_{NOX} [(lb/scf) / ppm] for other compounds (x)

1 GASEOUS EMISSIONS

a. Mass emission rate, lb/hr

$$M = (C)(CF)(Q_{ds})(60\ min/hr)$$

$$M = (363.9)(1.66E\text{-}07)(5{,}831)(60)$$

M = 21.2 lb/hr

Note: The results calculated on these pages may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.

b. Emission rate, lb/ton glass melted

$$E = \frac{M}{R}$$

$$E = \frac{21.2}{7.4}$$

$E =$ 2.87 lb/ton glass melted

EXAMPLE CALCULATIONS
METALS EMISSIONS

Project name:	Owens-Brockway	**Project number:**	006AS-760936
Computed by:	A Vella	**Calculation date:**	2020-09-30
Run number:	R1	**Gaseous Species:**	Lead (Pb)

EMISSIONS DATA

Reference temperature, °R	528	T_{ref} = (°F plus 460)
Mass of measured compound in sample, µg/sample	3,189	m
Standard volume of gas sampled, dscf	70.063	V_{mstd}
Dry stack gas flow rate at standard conditions, dscfm	5,890	Q_{ds}
Glass melted, ton/hr	7.375	R

1 GASEOUS EMISSIONS

a. Concentration, mg/dscm

$$C = \frac{(m)}{(V_{mstd})} \times \frac{1\ mg}{1000\ \mu g} \times \frac{35.315\ ft^3}{1\ m^3}$$

$$C = \frac{(3189)(35.315)}{(70.063)(1000)}$$

C = 1.6074 mg/dscm = 1607 µg/dscm

b. Mass emission rate, lb/hr

$$M = C \times \frac{1\ m^3}{35.31\ ft^3} \times Q_{ds} \times \frac{60\ min}{1\ hr} \times \frac{1\ g}{10^3\ mg} \times \frac{1\ lb}{454\ g}$$

$$M = \frac{(1.6074)(5,890)(60)}{(35.31)(1,000)(454)}$$

M = 3.54E-02 lb/hr

Note: The results calculated on this page may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.

c. Process-based rate, lb/ton glass melted

$$E = \frac{M}{R}$$

$$E = \frac{3.54E\text{-}02}{7.38}$$

$E =$ 4.80E-03 lb/ton glass melted

d. Process-based rate, g/kg glass melted

$$E' = E \times \frac{453.6\ g}{1\ lb} \times \frac{1\ ton}{2000\ lb} \times \frac{1\ lb}{0.4536\ kg}$$

$$E' = \frac{4.80E\text{-}03}{2}$$

$E' =$ 2.40E-03 g/kg glass melted

MONTROSE AIR QUALITY SERVICES

EXAMPLE CALCULATIONS
HEXAVALENT CHROMIUM EMISSIONS

Project name:	Owens-Brockway	**Project number:**	006AS-760936
Computed by:	A Vella	**Calculation date:**	2020-09-30
Run number:	R1	**Gaseous Species:**	Hex-Chrome (Cr^{+6})

EMISSIONS DATA

Reference temperature, °R	528	T_{ref} = (°F plus 460)
Mass of measured compound in sample, µg/sample	0.178	m
Standard volume of gas sampled, dscf	67.574	V_{mstd}
Dry stack gas flow rate at standard conditions, dscfm	5,987	Q_{ds}
Glass melted, ton/hr	7.375	R

1 GASEOUS EMISSIONS

a. Concentration, mg/dscm

$$C = \frac{(m)}{(V_{mstd})} \times \frac{1\ mg}{1000\ \mu g} \times \frac{35.315\ ft^3}{1\ m^3}$$

$$C = \frac{(0.178)(35.315)}{(67.574)(1000)}$$

C = 9.30E-05 mg/dscm = 0.093 µg/dscm

b. Mass emission rate, lb/hr

$$M = C \times \frac{1\ m^3}{35.31\ ft^3} \times Q_{ds} \times \frac{60\ min}{1\ hr} \times \frac{1\ g}{10^3\ mg} \times \frac{1\ lb}{454\ g}$$

$$M = \frac{(0.00009302)(5,987)(60)}{(35.31)(1,000)(454)}$$

M = 2.08E-06 lb/hr

Note: The results calculated on this page may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.

c. Process-based rate, lb/ton glass melted

$$E = \frac{M}{R}$$

$$E = \frac{2.08E\text{-}06}{7.38}$$

E = 2.83E-07 lb/ton glass melted

d. Process-based rate, g/kg glass melted

$$E' = E \times \frac{453.6\ g}{1\ lb} \times \frac{1\ ton}{2000\ lb} \times \frac{1\ lb}{0.4536\ kg}$$

$$E' = \frac{2.83E\text{-}07}{2}$$

E' = 1.41E-07 g/kg glass melted

Appendix A.11
General Equations

EMISSION CALCULATIONS

1. Volumetric Flow and Isokinetics

   a. Standard sample gas volume, dscf

   $$V_{m\,std} = 17.64 \times (V_m)(Y)\frac{\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{(T_m + 460)}$$

   b. Water vapor volume, scf

   $$V_{w\,std} = (0.04715)(V_{lc})\left(\frac{T_{std} + 460}{528}\right)$$

   c. Moisture content, non-dimensional

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

   d. Stack gas molecular weight, lb/lb mole (dry)

   $$MW_{dry} = [0.44(\%CO_2)] + [0.32(\%O_2)] + [0.28(\%N_2)]$$

   e. Stack gas molecular weight, lb/lb mole (wet)

   $$MW_{wet} = \left[MW_{dry}(1 - B_{ws})\right] + [18(B_{ws})]$$

   f. Absolute stack pressure, in Hg

   $$P_s = P_{bar} + \left(\frac{P_{sg}}{13.6}\right)$$

   g. Stack velocity, ft/sec

   $$v_s = (85.49)\left(C_p\right)\left(\sqrt{\Delta P}\right)\sqrt{\frac{T_s}{(P_s)(MW_{wet})}}$$

   h. Actual stack flow rate, acfm

   $$Q = (v_s)(A_s)(60\ min/hr)$$

   i. Standard stack gas flow rate, wscfm

   $$Q_{ws} = (v_s)(A_s)(60\ min/hr)\left(\frac{T_{std} + 460}{T_s + 460}\right)\left(\frac{P_s}{P_{std}}\right)$$

   j. Standard stack gas flow rate, dscfm

   $$Q_{ds} = (v_s)(A_s)(60\ min/hr)(1 - B_{ws})\left(\frac{T_{std} + 460}{T_s + 460}\right)\left(\frac{P_s}{P_{std}}\right)$$

   k. Percent isokinetic

   $$I = \frac{(T_s)(V_{m\,std})(P_{std})(100)}{(T_{std} + 460)(v_s)(\theta)(A_n)(P_s)(60)(1 - B_{ws})}$$

2. Gaseous Emissions

a. Concentration, ppm volume wet (i.e. to calculate wet ppm from dry ppm)

$$C_w = (C)(1 - B_{ws})$$

b. Concentration, ppm @ 3% O_2 dry

$$C_3 = (C)\left[\frac{(20.9 - 3.0)}{(20.9 - \%\ O_2)}\right]$$

c. Concentration, ppm @ 12% CO_2 dry

$$C_{12} = (C)\left(\frac{12.0}{\%\ CO_2}\right)$$

d. Concentration, ppm volume dry (i.e. to calculate dry ppm from wet ppm)

$$C = \left[\frac{C_w}{(1 - B_{ws})}\right]$$

e. Mass emission rate, lb/hr

$$M = (C)(CF)(Q_{ds})(60\ min/hr)$$

where,

CF = conversion factor from ppm to lb/scf:

$$CF_{NOx} = 1.194 \times 10^{-7}\left(\frac{lb/scf}{ppm}\right)$$

$$CF_{SO2} = 1.660 \times 10^{-7}\left(\frac{lb/scf}{ppm}\right)$$

$CF_X = CF_{NOX}\left(\frac{MW_X}{MW_{NOX}}\right)$ for other compounds (x)

f. Emission rate, lb/MMBtu

$$E = (C)(CF)(F_d)\left(\frac{20.9}{20.9 - \%\ O_2}\right)$$

g. Mass emission rate, grams/bhp-hr

$$M_j = (M)\left(\frac{453.59\ g/lb}{J}\right)$$

3. Particulate Emissions

   a. Grain loading, gr/dscf

   $$G = (0.0154)\left(\frac{G_m}{V_{m\,std}}\right)$$

   b. Grain loading corrected to 12% CO_2, gr/dscf @ 12% CO_2

   $$G_{12} = (G)\left(\frac{12.0}{\%\ CO_2}\right)$$

   c. Mass emission rate, lb/hr

   $$M = (G)(Q_{ds})\left(\frac{60\ min/hr}{7{,}000\ gr/lb}\right)$$

   d. Emission rate, lb/MMBtu

   $$E = (G)\left(\frac{1\ lb}{7{,}000\ gr}\right)(F_d)\left(\frac{20.9}{20.9 - \%\ O_2}\right)$$

4. Fuel Factor "F"

   a. Choice #1 – use the values for F_d provided in Method 19, Table 19-1
   Choice #2 – if you have fuel ultimate and proximate analysis, calculate F_d (need fuel weight %CHONS, HHV)
   Stoichiometric fuel factor at 68 °F, dscf/MMBtu at 0% O_2:

   $$F_d = \frac{(10^6)[3.64(\%\ H) + 1.53(\%\ C) + 0.14(\%\ N) + 0.57(\%\ S) - 0.46(\%\ O)]}{HHV, Btu/lb}$$

   b. Fuel factor at 60 °F (use if all your volumes and flows are at 60 °F)

   $$F_{d\,60} = F_d\left(\frac{520°R}{528°R}\right)$$

5. Miscellaneous Equations

a. Standard stack gas flow rate, calculated from fuel flow and F factor, dscfm

Note: Q_f and HHV need to be in units of either lb/hr and Btu/lb, or scf/hr and Btu/scf. *Do not mix units!*

(calculation based on stack $\%O_2$)

$$Q_{ds} = (Q_f)(HHV)(10^{-6})(F_d)\left(\frac{20.9}{20.9 - \%\ O_2}\right)/(60\ min/hr)$$

or (calculation based on stack $\%CO_2$ – see EPA Method 19 for values of F_c)

$$Q_{ds} = (Q_f)(HHV)(10^{-6})(F_c)\left(\frac{100}{\%\ CO_2}\right)/(60\ min/hr)$$

b. Destruction efficiency of emission control device, %

$EFF = \left(\frac{C_{in} - C_{out}}{C_{in}}\right)(100\%)$ based on concentrations

or

$EFF = \left(\frac{M_{in} - M_{out}}{M_{in}}\right)(100\%)$ based on mass emission rates

c. Cylinder gas audit, % accuracy

$$A_c = \left(\frac{C_m - C_a}{C_a}\right)(100\%)$$

Nomenclature:

A_c	=	accuracy of CEMS during cylinder gas audit (CGA), % difference
A_n	=	nozzle area, in^2 (πr^2), where π = 3.1416 and r = radius (½ diameter) in inches
A_s	=	stack area, ft^2 (πr^2), where π = 3.1416 and r = radius (½ diameter) in feet
B_{ws}	=	flue gas moisture content (multiply by 100 for % by volume)
C	=	concentration of gaseous species, ppm volume dry
C_a	=	concentration of audit gas, ppm (for CGA, equation 5c)
C_m	=	concentration measured by CEMS, ppm (for CGA, equation 5c)
C_p	=	calibration factor for pitot tube, dimensionless
C_w	=	concentration of gaseous species, ppm volume wet
C_3	=	corrected concentration of gaseous species, ppm @ 3% O_2 dry
C_{12}	=	corrected concentration of gaseous species, ppm @ 12% CO_2 dry
E	=	mass emission rate, lb/MMBtu
EFF	=	destruction or removal efficiency of emission control device, % efficiency
F_c	=	stoichiometric “F” factor of fuel based on CO_2, dscf/MMBtu @ 100% CO_2
F_d	=	stoichiometric “F” factor of fuel based on O_2, dscf/MMBtu @ 0% O_2
G	=	particulate matter grain loading, grains/dscf
G_{12}	=	corrected particulate matter grain loading, grains/dscf @ 12% CO_2
G_m	=	mass of collected particulate matter, mg
HHV	=	higher heating value, Btu/cubic foot
I	=	% isokinetic sampling rate, %
J	=	brake horsepower, bhp
M_j	=	mass emission rate of measured species (s), g/hp-hr
M	=	mass emission rate, lb/hr
MW_{dry}	=	molecular weight of stack gas, dry basis
MW_{wet}	=	molecular weight of stack gas, wet basis
MW_s	=	molecular weight of gaseous species (s), lb/lb mole:

CO:	28.01	(can use 28)	NO_x as NO_2:	46.01	(can use 46)
SO_x as SO_2:	64.06	(can use 64)	Hydrocarbons as C:	12.01	(can use 12)
Hydrocarbons as CH_4:	16.04	(can use 16)	Hydrocarbons as C_3H_8:	44.10	(can use 44)
NH_3:	17.03	(can use 17)			

N_2	=	nitrogen content of stack gas, % volume dry
P_{bar}	=	barometric pressure, in. Hg
P_s	=	stack absolute pressure, in. Hg
P_{sg}	=	stack static pressure, inches of water, gauge (iwg)
Q	=	wet stack gas flow rate at actual conditions, acfm
Q_f	=	fuel flow rate, scfh or lb/hr (be careful of units)
Q_{ds}	=	dry stack gas flow rate at standard conditions, dscfm
Q_{ws}	=	wet stack gas flow rate at standard conditions, wscfm
SV	=	specific molar volume of an ideal gas at standard conditions, ft^3/lb mole
T_m	=	meter temperature, °R
T_{std}	=	reference temperature, °R
T_s	=	stack gas temperature, °R
v_s	=	stack gas velocity, ft/sec
V_{lc}	=	volume of liquid collected in impingers, ml
V_m	=	dry meter volume uncorrected, acf
$V_{m\ std}$	=	dry meter volume corrected to standard conditions, dscf
$V_{w\ std}$	=	volume of water vapor at standard conditions, scf
Y	=	meter calibration coefficient, dimensionless
ΔH	=	average pressure differential across meter, inches water
ΔP	=	average velocity head of stack gas, inches water
Θ	=	sampling time, minutes

APPENDIX B
FACILITY PROCESS DATA

D FURNACE SOURCE TESTING DATA
08/18/2020

DATE	TIME	Daily Tons/2	BWO	NG METER	NG/hr	BE Meter	CD Meter	BE/Hr	CD/HR	KWH/hr
8/18/2020	733	7.375	2834	404530		7742157	16896608			
8/18/2020	833	7.375	2837	404755	225	7742423	16897202	266	594	860
8/18/2020	933	7.375	2832	404961	206	7742671	16897754	248	552	800
8/18/2020	1033	7.375	2833	405188	227	7742927	16898334	256	580	836
8/18/2020	1133	7.375	2812	405412	224	7743183	16898900	256	566	822
8/18/2020	1233	7.375	2836	405643	231	7743442	16899476	259	576	835
8/18/2020	1333	7.375	2826	405869	226	7743693	16900042	251	566	817
8/18/2020	1433	7.375	2824	406098	229	7743946	16900610	253	568	821
8/18/2020	1533	7.375	2820	406318	220	7744191	16901180	245	570	815
8/18/2020										
8/18/2020										
8/18/2020										
8/18/2020										
8/18/2020										
8/18/2020										

D FURNACE SOURCE TESTING DATA
08/19/2020

DATE	TIME	Daily Tons/2	BWO	NG METER	NG/hr	BE Meter	CD Meter	BE/Hr	CD/HR	KWH/hr
8/19/2020	733	7.375	2812	409942		7748201	16910454			
8/19/2020	833	7.375	2820	410178	236	7748457	16911048	256	594	850
8/19/2020	933	7.375	2823	410409	231	7748708	16911630	251	582	833
8/19/2020	1033	7.375	2820	410625	216	7748957	16912216	249	586	835
8/19/2020	1133	7.375	2826	410859	234	7749202	16912824	245	608	853
8/19/2020	1233	7.375	2839	411094	235	7749454	16913448	252	624	876
8/19/2020	1333	7.375	2822	411310	216	7749702	16914060	248	612	860
8/19/2020	1433	7.375	2829	411542	232	7749958	16914694	256	634	890
8/19/2020	1533	7.375	2830	411768	226	7750206	16915320	248	626	874
8/19/2020	1633	7.375	2823	411988	220	7750465	16915946	259	626	885
8/19/2020	1733	7.375	2815	412216	228	7750725	16916576	260	630	890
8/19/2020										
8/19/2020										
8/19/2020										
8/19/2020										

APPENDIX C
LABORATORY ANALYSIS DATA

Appendix C.1
PM/Metals/Cr^{+6} Analyses

MONTROSE AIR QUALITY SERVICES

PROJECT: 006AS-760936
OWENS BROCKWAY

CLIENT # H007
REPORT # 20-350

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Case Narrative

Date: September 11, 2020

General Information

Client:	Montrose Air Quality Services
Client Number:	H007
Report Number:	20-350
Sample Description:	Impinger Trains
Sample Numbers:	20-S1380 – 20-S1384, 20-U182 – 20-U185, 20-S1403 – 20-S1431

Analysis

Analytes:	Hexavalent Chromium, Particulate Mass, Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mn, Hg, Ni, Se
Analytical Protocols:	SW-846 Method 0061 (revision 0, December 1996) EPA Method 5 (8/2/17 version) EPA Method 202 (8/2/17 version) EPA Method 29 (8/2/17 version)
Analytical Notes:	In the method 0061 samples, a large interfering peak was present near the hexavalent chromium peak that caused the concentration to bias low based on the spike recovery. The samples were diluted fivefold which improved the spike recovery. The detection limit has been raised for those samples by a factor of five to account for the dilution. The method 5 filters were hygroscopic and gained mass after being put on the balance. Masses were recoded manually approximately ten seconds after the filters were placed on the balance. This procedure yielded masses that passed the constant mass criteria. No problems were encountered during the method 202 or method 29 analyses. Results have not been blank corrected.
QA/QC Review:	All of the data have been reviewed by the analysts performing the analyses and the project manager. All of the quality control and sample-specific information in this package is complete and meets or exceeds the minimum requirements for acceptability.
Comments:	If you have any questions or concerns regarding this analysis, please feel free to contact the project manager.

Disclaimer: This report shall not be reproduced, except in full, without the written approval of the laboratory. The results only represent that of the samples as received into the laboratory. All data are reported to the detection limit. Results <5x DL must be considered to have a higher degree of uncertainty associated with them. Due to the statistical process of detection limit determination, data in this report should not be used for statistical analysis as the data has been censored in such a manner as to bias statistical analyses high.

Paul Duda 9/14/20

Project Manager Date
Paul Duda

Client: H007 - Montrose Air Quality Services
Report Number: 20-350

Lab ID: 20-S1380
Client ID: R1
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20
Comments: Interference - diluted 5x
Sample Volume: 650. mL

Analyte	µg/L Conc.	DL	µg/sample Conc.	DL
Cr VI	0.274	0.050	0.178	0.0325

Lab ID: 20-S1381
Client ID: R2
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20
Comments: Interference - diluted 5x
Sample Volume: 709. mL

Analyte	µg/L Conc.	DL	µg/sample Conc.	DL
Cr VI	0.447	0.050	0.317	0.0354

Lab ID: 20-S1382
Client ID: R3
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20
Comments: Interference - diluted 5x
Sample Volume: 674. mL

Analyte	µg/L Conc.	DL	µg/sample Conc.	DL
Cr VI	0.455	0.050	0.307	0.0337

Lab ID: 20-S1383
Client ID: NaHCO3 Blank
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20
Sample Volume: 299. mL

Analyte	µg/L Conc.	DL	µg/sample Conc.	DL
Cr VI	< DL	0.010	< DL	0.0030

Lab ID: 20-S1384
Client ID: H2O Blank
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20
Sample Volume: 267. mL

Analyte	µg/L Conc.	DL	µg/sample Conc.	DL
Cr VI	< DL	0.010	< DL	0.0027

Montrose Air Quality Services
Project: 006AS-760936 Owens Brockway - Furnace D Exit
Method 5 Data - Report # 20-350

Sample ID	Client ID	Sample Date	Sample Volume (mL)	Net Weight (mg) Acetone Probe Rinse	Net Weight (mg) Filter	Comments
Lab_Blk				**-0.17**		
Meth_Blk				**-0.06**		
20-U182	1-PM Filter	8/18/20			**195.35**	Hygroscopic
20-S1403	1-PM Acetone	8/18/20	154	**15.49**		
20-U184	2-PM Filter	8/18/20			**194.15**	Hygroscopic
20-S1404	2-PM Acetone	8/18/20	116	**11.53**		
20-U183	3-PM Filter	8/18/20			**195.89**	Hygroscopic
20-S1405	3-PM Acetone	8/18/20	120	**15.73**		
20-U185	RB-PM Filter	8/18/20			**-0.25**	
20-S1406	RB-PM Acetone	8/18/20	158	**-0.32**		

Montrose Air Quality Services
Project: 006AS-760936 Owens Brockway - Furnace D Exit
Method 202 Data - Report # 20-350

Sample ID	Client ID	Sample Date	Sample Volume (mL) Aqueous Phase	Sample Volume (mL) Organic Phase	**Net Weight (mg)** Aqueous Phase	**Net Weight (mg)** Organic Phase	Comments
Lab_Blk					**0.06**	**0.19**	
Meth_Blk					**2.02**	**0.58**	
20-S1407	1-PM M202	8/18/20	193	122	**29.41**	**5.80**	
20-S1408	2-PM M202	8/18/20	242	133	**54.25**	**4.71**	
20-S1409	3-PM M202	8/18/20	246	92	**54.45**	**4.44**	
20-S1410	FRB-PM M202	8/18/20	148	126	**1.91**	**1.67**	

Client: H007 - Montrose Air Quality Services
Report Number: 20-350

Lab ID: 20-S1411
Client ID: 1-MM Cont. 1 & 3
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Antimony, ICP	7.78	1.25	µg/sample
Arsenic, ICP	207.	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	28.5	0.100	µg/sample
Chromium, ICP	224.	0.200	µg/sample
Cobalt, ICP	0.222	0.125	µg/sample
Copper, ICP	51.8	1.25	µg/sample
Lead, ICP	3,030	1.25	µg/sample
Manganese, ICP	6.29	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	6.76	0.750	µg/sample
Selenium, ICP	7.75	3.75	µg/sample

Lab ID: 20-S1412
Client ID: 1-MM Cont. 4
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Antimony, ICP	1.57	0.560	µg/sample
Arsenic, ICP	29.3	0.784	µg/sample
Beryllium, ICP	< DL	0.022	µg/sample
Cadmium, ICP	1.80	0.045	µg/sample
Chromium, ICP	14.6	0.090	µg/sample
Cobalt, ICP	0.634	0.056	µg/sample
Copper, ICP	4.96	0.560	µg/sample
Lead, ICP	159.	0.560	µg/sample
Manganese, ICP	1.77	0.034	µg/sample
Mercury, CVAA	2.73	0.0472	µg/sample
Nickel, ICP	2.85	0.336	µg/sample
Selenium, ICP	178.	1.68	µg/sample

Lab ID: 20-S1413
Client ID: 1-MM Cont. 5a
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	0.0598	0.00910	µg/sample

Lab ID: 20-S1414
Client ID: 1-MM Cont. 5b
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	3.46	0.0324	µg/sample

Client: H007 - Montrose Air Quality Services
Report Number: 20-350

Lab ID: 20-S1415
Client ID: 1-MM Cont. 5c
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	0.0336	0.0196	µg/sample

Lab ID: 20-S1416
Client ID: 2-MM Cont. 1 & 3
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Antimony, ICP	10.1	1.25	µg/sample
Arsenic, ICP	250.	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	33.2	0.100	µg/sample
Chromium, ICP	275.	0.200	µg/sample
Cobalt, ICP	0.388	0.125	µg/sample
Copper, ICP	58.6	1.25	µg/sample
Lead, ICP	3,570	1.25	µg/sample
Manganese, ICP	8.30	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	15.2	0.750	µg/sample
Selenium, ICP	9.52	3.75	µg/sample

Lab ID: 20-S1417
Client ID: 2-MM Cont. 4
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Antimony, ICP	0.807	0.540	µg/sample
Arsenic, ICP	13.9	0.756	µg/sample
Beryllium, ICP	< DL	0.022	µg/sample
Cadmium, ICP	0.334	0.043	µg/sample
Chromium, ICP	3.62	0.086	µg/sample
Cobalt, ICP	0.523	0.054	µg/sample
Copper, ICP	2.38	0.540	µg/sample
Lead, ICP	6.73	0.540	µg/sample
Manganese, ICP	1.55	0.032	µg/sample
Mercury, CVAA	2.53	0.0481	µg/sample
Nickel, ICP	4.05	0.324	µg/sample
Selenium, ICP	147.	1.62	µg/sample

Lab ID: 20-S1418
Client ID: 2-MM Cont. 5a
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	0.0416	0.00910	µg/sample

Client: H007 - Montrose Air Quality Services
Report Number: 20-350

Lab ID: 20-S1419
Client ID: 2-MM Cont. 5b
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	3.25	0.0319	µg/sample

Lab ID: 20-S1420
Client ID: 2-MM Cont. 5c
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	0.0367	0.0198	µg/sample

Lab ID: 20-S1421
Client ID: 3-MM Cont. 1 & 3
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Antimony, ICP	11.7	1.25	µg/sample
Arsenic, ICP	280.	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	33.2	0.100	µg/sample
Chromium, ICP	265.	0.200	µg/sample
Cobalt, ICP	0.302	0.125	µg/sample
Copper, ICP	57.5	1.25	µg/sample
Lead, ICP	3,680	1.25	µg/sample
Manganese, ICP	7.06	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	11.9	0.750	µg/sample
Selenium, ICP	8.58	3.75	µg/sample

Lab ID: 20-S1422
Client ID: 3-MM Cont. 4
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Antimony, ICP	< DL	0.540	µg/sample
Arsenic, ICP	14.4	0.756	µg/sample
Beryllium, ICP	< DL	0.022	µg/sample
Cadmium, ICP	0.142	0.043	µg/sample
Chromium, ICP	3.07	0.086	µg/sample
Cobalt, ICP	0.060	0.054	µg/sample
Copper, ICP	1.21	0.540	µg/sample
Lead, ICP	11.7	0.540	µg/sample
Manganese, ICP	1.34	0.032	µg/sample
Mercury, CVAA	2.71	0.0499	µg/sample
Nickel, ICP	1.29	0.324	µg/sample
Selenium, ICP	209.	1.62	µg/sample

Client: H007 - Montrose Air Quality Services
Report Number: 20-350

Lab ID: 20-S1423
Client ID: 3-MM Cont. 5a
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	0.0906	0.00919	µg/sample

Lab ID: 20-S1424
Client ID: 3-MM Cont. 5b
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	3.29	0.0315	µg/sample

Lab ID: 20-S1425
Client ID: 3-MM Cont. 5c
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	< DL	0.0198	µg/sample

Lab ID: 20-S1426
Client ID: RB-MM-8a 0.1N HNO3 Blank
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Antimony, ICP	< DL	1.25	µg/sample
Arsenic, ICP	< DL	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	< DL	0.100	µg/sample
Chromium, ICP	< DL	0.200	µg/sample
Cobalt, ICP	< DL	0.125	µg/sample
Copper, ICP	< DL	1.25	µg/sample
Lead, ICP	< DL	1.25	µg/sample
Manganese, ICP	< DL	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	< DL	0.750	µg/sample
Selenium, ICP	< DL	3.75	µg/sample

Client: H007 - Montrose Air Quality Services
Report Number: 20-350

Lab ID: 20-S1427
Client ID: RB-MM-12 Filter Blank
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Antimony, ICP	< DL	1.25	µg/sample
Arsenic, ICP	< DL	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	< DL	0.100	µg/sample
Chromium, ICP	1.56	0.200	µg/sample
Cobalt, ICP	< DL	0.125	µg/sample
Copper, ICP	< DL	1.25	µg/sample
Lead, ICP	< DL	1.25	µg/sample
Manganese, ICP	1.10	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	< DL	0.750	µg/sample
Selenium, ICP	4.70	3.75	µg/sample

Lab ID: 20-S1428
Client ID: RB-MM-9 H2O2/HNO3 Blank
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Antimony, ICP	< DL	0.630	µg/sample
Arsenic, ICP	< DL	0.882	µg/sample
Beryllium, ICP	< DL	0.025	µg/sample
Cadmium, ICP	< DL	0.050	µg/sample
Chromium, ICP	< DL	0.101	µg/sample
Cobalt, ICP	< DL	0.063	µg/sample
Copper, ICP	< DL	0.630	µg/sample
Lead, ICP	< DL	0.630	µg/sample
Manganese, ICP	0.114	0.038	µg/sample
Mercury, CVAA	< DL	0.0172	µg/sample
Nickel, ICP	< DL	0.378	µg/sample
Selenium, ICP	< DL	1.89	µg/sample

Lab ID: 20-S1429
Client ID: RB-MM-8b H2O Blank
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	< DL	0.00892	µg/sample

Lab ID: 20-S1430
Client ID: RB-MM-10 KMnO4 Blank
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	0.0230	0.00805	µg/sample

Client: H007 - Montrose Air Quality Services
Report Number: 20-350

Lab ID: 20-S1431
Client ID: RB-MM-11 HCl Blank
Site: Owens Brockway
Source: Furnace D Exit
Sample Date: 8/19/20

Analyte	Result	DL	Units
Mercury, CVAA	< DL	0.0196	µg/sample

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: IC-PCR
Sample Description: SW846-0061
Report Number: 20-350

Blank Data

Analyte	Sample ID	Measured Conc. µg/L	DL Conc. µg/L
Cr VI	ICB	< DL	0.010
Cr VI	CCB	< DL	0.010
Cr VI	CCB	< DL	0.010

*: Sample Media Blank (SM_Blk) concentration in µg/filter
ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
Cr VI	ICV	0.500	0.501	100.2
Cr VI	LL-LCS	0.030	0.033	110.0
Cr VI	CCV	0.500	0.498	99.6
Cr VI	CCV	0.500	0.504	100.8

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

Analyte	Sample ID	Sample Conc. µg/L	Duplicate Conc. µg/L	RPD
Cr VI	20-S1381	0.447	0.414	7.67

RPD = {(sample-duplicate)/[(sample+duplicate)/2]}x100
N/C: RPD is not calculated when sample or duplicate is below detection limit
#: per EPA CLP protocol, control limits do not apply if sample and/or duplicate concentration is less than 5x the detection limit

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Cr VI	20-S1380	0.274	2.27	2.50	79.8

*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

ION CHROMATOGRAPHY RAW DATA

Available upon request

All masses in grams (g)			M5 filter:	Montrose 20-350				
Sx ID	Tare	Tare QC	Tare - QC	Gross	Gross QC	Gross - QC	Net Mass*	Net Mass
date/init:	3/19/20 TP	3/20/20 TP		9/4/20 TP	9/9/20 TP			(mg)
time:	14:20	15:39		07:40	12:23			
		Ambient						
Rel. Humidity	39.3%	39.9%		42.5%	37.6%			
Temp (C/F)	21.8C / 71.2F	21.9C / 71.4F		21.8C / 71.2F	20.3C / 68.5F			
		Desiccator						
Rel. Humidity	0.5%	0.6%		0.8%	2.0%			
Temp (C/F)	21.4C / 70.5F	21.8C / 71.2F		21.9C / 71.4F	20.5C / 68.9F			
0.30000g QC	0.30000	0.30002		0.29998	0.30001			
0.50000g QC	0.50000	0.50001		0.50004	0.50002			
3.00000g QC	3.00003	3.00003		2.99997	2.99996			
20-U182	0.47857	0.47855	0.00002	0.67392	0.67363	0.00029	0.19535	195.35
20-U183	0.47534	0.47544	-0.00010	0.67123	0.67108	0.00015	0.19589	195.89
20-U184	0.47538	0.47537	0.00001	0.66953	0.66923	0.00030	0.19415	194.15
20-U185	0.48198	0.48200	-0.00002	0.48173	0.48170	0.00003	-0.00025	-0.25
*net mass = gross - tare (g)								
Quartz tissue filters								
Data collected electronically by proprietary BERT II software.								

All masses in grams (g)		M5 Acetone: Montrose 20-350						
Sx ID	Tare	Tare QC	Tare - QC	Gross	Gross QC	Gross - QC	*net (g)	net (mg)
date/init:	8/29/20 TP	8/30/20 TP		9/9/20 TP	9/10/20 TP		(total mass liq)	
time:	13:40	09:14		12:55	11:57			
		Ambient						
Rel. Humidity	37.9%	37.7%		38.2%	43.4%			
Temp (C/F)	22.7C / 72.9F	21.5C / 70.7F		20.7C / 69.3F	21.2C / 70.2F			
		Desiccator						
Rel. Humidity	0.8%	0.8%		0.8%	0.8%			
Temp (C/F)	21.9C / 71.4F	21.4C / 70.5F		22.1C / 71.8F	21.3C / 70.3F			
0.30000g QC	0.30000	0.30004		0.30001	0.30004			
3.00000g QC	2.99996	3.00000		2.99998	3.00000			
100.00000g QC	100.00001	100.00006		100.00004	100.00013			
Lab Blank	102.80290	102.80294	-0.00004	102.80273	102.80290	-0.00017	-0.00017	-0.17
Method Blank	97.53154	97.53169	-0.00015	97.53148	97.53155	-0.00007	-0.00006	-0.06
20-S1403	101.27942	101.27977	-0.00035	101.29491	101.29511	-0.00020	0.01549	15.49
20-S1404	101.54631	101.54616	0.00015	101.55784	101.55819	-0.00035	0.01153	11.53
20-S1405	104.57791	104.57808	-0.00017	104.59364	104.59395	-0.00031	0.01573	15.73
20-S1406	102.84106	102.84107	-0.00001	102.84074	102.84072	0.00002	-0.00032	-0.32
*net mass = gross - tare (g)								
100g weight: S/N 14091 certified value: 100.00004 (99.99994 - 100.00014)								
Data collected electronically by proprietary BERT II software.								

All masses in grams (g)			M202: Montrose 20-350				
Aqueous Phase							
Sx ID	Tare	Tare QC	Tare - QC	Gross	Gross QC	Gross - QC	*net (g)	net (mg)**
date/init:	8/29/20 TP	8/30/20 TP		9/9/20 TP	9/10/20 TP		(total mass liq)	less NH3
time:	13:56	09:29		13:06	12:06			
Ambient								
Rel. Humidity	38.9%	38.3%		38.7%	43.9%			
Temp (C/F)	22.4C / 72.3F	21.6C / 70.9F		20.9C / 69.6F	21.1C / 70.0F			
Desiccator								
Rel. Humidity	0.8%	0.8%		0.8%	0.8%			
Temp (C/F)	21.9C / 71.4F	21.4C / 70.5F		21.1C / 70.0F	21.3C / 70.3F			
0.30000g QC	0.30001	0.30001		0.29997	0.29999			
3.00000g QC	3.00000	2.99998		3.00002	2.99997			
5.00000g QC	5.00000	5.00001		4.99999	4.99998			
Lab Blank	1.73702	1.73711	-0.00009	1.73708	1.73692	0.00016	0.00006	0.06
Method Blank	1.74859	1.74859	0.00000	1.75078	1.75047	0.00031	0.00219	2.02
20-S1407	1.74587	1.74585	0.00002	1.78435	1.78418	0.00017	0.03848	29.41
20-S1408	1.74011	1.74017	-0.00006	1.81382	1.81355	0.00027	0.07371	54.25
20-S1409	1.75290	1.75296	-0.00006	1.81867	1.81852	0.00015	0.06577	54.45
20-S1410	1.74529	1.74521	0.00008	1.74729	1.74724	0.00005	0.00200	1.91
*net mass = gross - tare (g)								
**corrected net mass = net mass - (Normality NH4OH x mL NH4OH x 17.03 mg NH3/mmol)								

Montrose 20-350

DATE/INIT: 9/5/20 TP

NH_4OH titrant check

g KHP	pH-start	pH-end	mL NH_4OH	N NH_4OH*	% certified N
0.1543	4.094	7.034	7.9625	0.0949	94.9

*note: if calculated Normality is within 10% of certified value, certified value used.

	pH-start	pH-end	mL NH_4OH	mass NH_3 (mg)
Meth Blank	5.732	7.084	0.1000	0.17
20-S1407	2.331	7.097	5.3250	9.07
20-S1408	2.038	7.077	11.4250	19.46
20-S1409	2.046	7.087	6.6500	11.32
20-S1410	5.101	7.036	0.0500	0.09

N NH_4OH = (g KHP) × (1 mol/204.22 g KHP) × (mol NH_4OH/mol KHP) × (1/mL NH_4OH) × (1000 mL/L)

mass NH_3 = (N NH_4OH) × (mL NH_4OH) × (17.03 mg NH_3/mmol)

QC:

% Nernst slope: 99.1

CAL	pH 4.000	4.009
CAL	pH 7.000	7.002
QC	pH 7.000	6.959
QC	pH 7.000	6.973

All masses in grams (g)			M202: Montrose 20-350				
Organic Phase							
Sx ID	Tare	Tare QC	Tare - QC	Gross	Gross QC	Gross - QC	*net (g)	net (mg)*
date/init:	8/29/20 TP	8/30/20 TP		9/9/20 TP	9/10/20 TP		(total mass liq)	
time:	14:15	09:42		13:16	12:20			
			Ambient					
Rel. Humidity	35.8%	38.3%		37.7%	42.4%			
Temp (C/F)	22.7C / 72.9F	21.7C / 71.1F		20.6C / 69.1F	21.2C / 70.2F			
			Desiccator					
Rel. Humidity	0.8%	0.8%		0.8%	0.8%			
Temp (C/F)	21.9C / 71.4F	21.4C / 70.5F		21.1C / 70.0F	21.3C / 70.3F			
0.30000g QC	0.29996	0.29997		0.30000	0.29997			
3.00000g QC	3.00000	2.99998		2.99995	2.99997			
5.00000g QC	5.00001	4.99998		4.99998	5.00002			
Lab Blank	1.73289	1.73288	0.00001	1.73308	1.73302	0.00006	0.00019	0.19
Method Blank	1.75217	1.75214	0.00003	1.75275	1.75273	0.00002	0.00058	0.58
20-S1407	1.73813	1.73815	-0.00002	1.74393	1.74373	0.00020	0.00580	5.80
20-S1408	1.74463	1.74454	0.00009	1.74934	1.74923	0.00011	0.00471	4.71
20-S1409	1.75359	1.75346	0.00013	1.75803	1.75781	0.00022	0.00444	4.44
20-S1410	1.73528	1.73527	0.00001	1.73695	1.73673	0.00022	0.00167	1.67
*net mass = gross - tare (g)								
Data collected electronically by proprietary BERT II software.								

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 20-350

Blank Data

Analyte	Sample ID	Measured Conc. µg/L	DL Conc. µg/L
As	ICB	< DL	7.00
As	Meth_Blk	< DL	7.00
As	CCB	< DL	7.00
As	CCB	< DL	7.00
Be	ICB	< DL	0.200
Be	Meth_Blk	< DL	0.200
Be	CCB	< DL	0.200
Be	CCB	< DL	0.200
Cd	ICB	< DL	0.400
Cd	Meth_Blk	< DL	0.400
Cd	CCB	< DL	0.400
Cd	CCB	< DL	0.400
Co	ICB	< DL	0.500
Co	Meth_Blk	< DL	0.500
Co	CCB	< DL	0.500
Co	CCB	< DL	0.500
Cr	ICB	< DL	0.800
Cr	Meth_Blk	< DL	0.800
Cr	CCB	< DL	0.800
Cr	CCB	< DL	0.800
Cu	ICB	< DL	5.00
Cu	Meth_Blk	< DL	5.00
Cu	CCB	< DL	5.00
Cu	CCB	< DL	5.00
Mn	ICB	< DL	0.300
Mn	Meth_Blk	< DL	0.300
Mn	CCB	< DL	0.300
Mn	CCB	< DL	0.300
Ni	ICB	< DL	3.00
Ni	Meth_Blk	< DL	3.00
Ni	CCB	< DL	3.00
Ni	CCB	< DL	3.00
Pb	ICB	< DL	5.00
Pb	Meth_Blk	< DL	5.00
Pb	CCB	< DL	5.00
Pb	CCB	< DL	5.00
Sb	ICB	< DL	5.00
Sb	Meth_Blk	< DL	5.00
Sb	CCB	< DL	5.00
Sb	CCB	< DL	5.00
Se	ICB	< DL	15.0
Se	Meth_Blk	< DL	15.0
Se	CCB	< DL	15.0
Se	CCB	< DL	15.0

*: Sample Media Blank (SM_Blk) concentration in µg/filter
ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
As	ICV	2500	2490	99.8

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 20-350

Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
As	LL-CCV	35.0	35.8	102.3
As	LL-LCS	20.0	19.4	96.9
As	CCV	2500	2410	96.4
As	CCV	2500	2420	97.0
Be	ICV	2500	2440	97.7
Be	LL-CCV	1.00	0.922	92.2
Be	LL-LCS	0.500	0.467	93.4
Be	CCV	2500	2380	95.2
Be	CCV	2500	2370	94.7
Cd	ICV	2500	2430	97.3
Cd	LL-CCV	2.00	1.71	85.6
Cd	LL-LCS	1.50	1.66	110.4
Cd	CCV	2500	2320	93.0
Cd	CCV	2500	2330	93.3
Co	ICV	2500	2440	97.6
Co	LL-CCV	2.50	2.82	112.6
Co	LL-LCS	1.50	2.07	137.9
Co	CCV	2500	2350	93.9
Co	CCV	2500	2360	94.5
Cr	ICV	2500	2460	98.4
Cr	LL-CCV	4.00	3.52	88.0
Cr	LL-LCS	2.00	1.61	80.4
Cr	CCV	2500	2360	94.6
Cr	CCV	2500	2380	95.0
Cu	ICV	2500	2400	95.9
Cu	LL-CCV	25.0	27.7	110.9
Cu	LL-LCS	15.0	16.6	110.3
Cu	CCV	2500	2360	94.4
Cu	CCV	2500	2400	95.8
Mn	ICV	2500	2530	101.1
Mn	LL-CCV	1.50	1.30	86.4
Mn	LL-LCS	1.00	0.748	74.8
Mn	CCV	2500	2430	97.2
Mn	CCV	2500	2440	97.8
Ni	ICV	2500	2420	96.6
Ni	LL-CCV	15.0	16.4	109.3
Ni	LL-LCS	6.00	6.83	113.9
Ni	CCV	2500	2300	91.8
Ni	CCV	2500	2310	92.2
Pb	ICV	2500	2550	101.9
Pb	LL-CCV	25.0	27.9	111.4
Pb	LL-LCS	15.0	15.0	99.9
Pb	CCV	2500	2520	101.0
Pb	CCV	2500	2470	98.7
Sb	ICV	2500	2470	98.7
Sb	LL-CCV	25.0	23.3	93.2
Sb	LL-LCS	15.0	41.0	273.0
Sb	CCV	2500	2420	96.7
Sb	CCV	2500	2420	96.6
Se	ICV	2500	2420	96.7
Se	LL-CCV	75.0	63.7	85.0
Se	LL-LCS	30.0	28.8	95.8
Se	CCV	2500	2340	93.6
Se	CCV	2500	2340	93.8

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 20-350

Replicate Data

Analyte	Sample ID	Sample Conc. µg/L	Replicate Conc. µg/L	RPD	
As	20-S1411	826.2	818.0	1.00	
Be	20-S1411	< 0.2	< 0.2	N/C	#
Cd	20-S1411	114.0	113.1	0.79	
Co	20-S1411	0.887	1.055	17.3	#
Cr	20-S1411	896.5	884.2	1.38	
Cu	20-S1411	207.3	206.2	0.53	
Mn	20-S1411	25.16	24.77	1.56	
Ni	20-S1411	27.03	26.67	1.34	
Pb	20-S1411	12120	11590	4.47	
Sb	20-S1411	31.13	30.90	0.74	
Se	20-S1411	30.99	20.29	41.7	#

N/C: RPD is not calculated when sample or replicate is below detection limit
Replicate Limit: 20% RPD
#: per EPA CLP protocol, control limits do not apply if sample and/or replicate concentration is less than 5x the detection limit

Laboratory Control Sample/Post Digestion Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
As	LCS	< 7	2580.	2500.	103.
As	LCS	< 7	2566.	2500.	103.
As	20-S1416	999.1	3256.	2500.	90.3
Be	LCS	< 0.2	2508.	2500.	100.
Be	LCS	< 0.2	2511.	2500.	100.
Be	20-S1416	< 0.2	2259.	2500.	90.4
Cd	LCS	< 0.4	2445.	2500.	97.8
Cd	LCS	< 0.4	2452.	2500.	98.1
Cd	20-S1416	133.0	2263.	2500.	85.2
Co	LCS	< 0.5	2396.	2500.	95.8
Co	LCS	< 0.5	2400.	2500.	96.0
Co	20-S1416	1.553	2070.	2500.	82.7
Cr	LCS	< 0.8	2405.	2500.	96.2
Cr	LCS	< 0.8	2409.	2500.	96.4
Cr	20-S1416	1100.	3210.	2500.	84.4
Cu	LCS	< 5	2476.	2500.	99.0
Cu	LCS	< 5	2472.	2500.	98.9
Cu	20-S1416	234.3	2580.	2500.	93.8
Mn	LCS	< 0.3	2431.	2500.	97.2
Mn	LCS	< 0.3	2434.	2500.	97.4
Mn	20-S1416	33.19	2186.	2500.	86.1
Ni	LCS	< 3	2385.	2500.	95.4
Ni	LCS	< 3	2390.	2500.	95.6
Ni	20-S1416	60.62	2118.	2500.	82.3
Pb	LCS	< 5	2511.	2500.	100.
Pb	LCS	< 5	2537.	2500.	101.
Pb	20-S1416	14270	36960	25000	90.8
Sb	LCS	< 5	2444.	2500.	97.8
Sb	LCS	< 5	2439.	2500.	97.6
Sb	20-S1416	40.44	2219.	2500.	87.1
Se	LCS	< 15	2560.	2500.	102.
Se	LCS	< 15	2546.	2500.	102.
Se	20-S1416	38.08	2291.	2500.	90.1

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 20-350

Laboratory Control Sample Duplicate Data

Analyte	Sample ID	Spike Conc. µg/L	Duplicate Conc. µg/L	RPD
As	LCS-DUP	2580	2570	0.54
Be	LCS-DUP	2510	2510	0.12
Cd	LCS-DUP	2440	2450	0.29
Co	LCS-DUP	2400	2400	0.17
Cr	LCS-DUP	2400	2410	0.17
Cu	LCS-DUP	2480	2470	0.16
Mn	LCS-DUP	2430	2430	0.12
Ni	LCS-DUP	2380	2390	0.21
Pb	LCS-DUP	2510	2540	1.03
Sb	LCS-DUP	2440	2440	0.20
Se	LCS-DUP	2560	2550	0.55

Duplicate Limit: 20% RPD

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 4
Report Number: 20-350

Blank Data

Analyte	Sample ID	Measured Conc. µg/L	DL Conc. µg/L
As	ICB	< DL	7.00
As	Meth_Blk	< DL	7.00
As	CCB	< DL	7.00
As	CCB	< DL	7.00
Be	ICB	< DL	0.200
Be	Meth_Blk	< DL	0.200
Be	CCB	< DL	0.200
Be	CCB	< DL	0.200
Cd	ICB	< DL	0.400
Cd	Meth_Blk	< DL	0.400
Cd	CCB	< DL	0.400
Cd	CCB	< DL	0.400
Co	ICB	< DL	0.500
Co	Meth_Blk	< DL	0.500
Co	CCB	< DL	0.500
Co	CCB	< DL	0.500
Cr	ICB	< DL	0.800
Cr	Meth_Blk	< DL	0.800
Cr	CCB	< DL	0.800
Cr	CCB	< DL	0.800
Cu	ICB	< DL	5.00
Cu	Meth_Blk	< DL	5.00
Cu	CCB	< DL	5.00
Cu	CCB	< DL	5.00
Mn	ICB	< DL	0.300
Mn	Meth_Blk	2.11	0.300
Mn	CCB	< DL	0.300
Mn	CCB	< DL	0.300
Ni	ICB	< DL	3.00
Ni	Meth_Blk	< DL	3.00
Ni	CCB	< DL	3.00
Ni	CCB	< DL	3.00
Pb	ICB	< DL	5.00
Pb	Meth_Blk	< DL	5.00
Pb	CCB	< DL	5.00
Pb	CCB	< DL	5.00
Sb	ICB	< DL	5.00
Sb	Meth_Blk	< DL	5.00
Sb	CCB	< DL	5.00
Sb	CCB	< DL	5.00
Se	ICB	< DL	15.0
Se	Meth_Blk	< DL	15.0
Se	CCB	< DL	15.0
Se	CCB	< DL	15.0

*: Sample Media Blank (SM_Blk) concentration in µg/filter
ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
As	ICV	2500	2340	93.7

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 4
Report Number: 20-350

Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
As	LL-CCV	35.0	30.8	88.1
As	LL-LCS	20.0	17.5	87.5
As	CCV	2500	2290	91.7
As	CCV	2500	2370	94.7
Be	ICV	2500	2330	93.0
Be	LL-CCV	1.00	0.912	91.2
Be	LL-LCS	0.500	0.446	89.2
Be	CCV	2500	2350	93.8
Be	CCV	2500	2330	93.2
Cd	ICV	2500	2300	92.1
Cd	LL-CCV	2.00	1.80	89.9
Cd	LL-LCS	1.50	1.22	81.0
Cd	CCV	2500	2330	93.1
Cd	CCV	2500	2340	93.6
Co	ICV	2500	2280	91.2
Co	LL-CCV	2.50	2.38	95.0
Co	LL-LCS	1.50	1.56	103.8
Co	CCV	2500	2320	92.6
Co	CCV	2500	2330	93.3
Cr	ICV	2500	2320	92.8
Cr	LL-CCV	4.00	3.39	84.7
Cr	LL-LCS	2.00	1.38	68.8
Cr	CCV	2500	2340	93.8
Cr	CCV	2500	2360	94.3
Cu	ICV	2500	2310	92.5
Cu	LL-CCV	25.0	24.2	97.0
Cu	LL-LCS	15.0	13.6	90.8
Cu	CCV	2500	2280	91.1
Cu	CCV	2500	2300	92.2
Mn	ICV	2500	2370	94.8
Mn	LL-CCV	1.50	1.31	87.3
Mn	LL-LCS	1.00	2.56	256.1
Mn	CCV	2500	2400	95.9
Mn	CCV	2500	2410	96.6
Ni	ICV	2500	2290	91.6
Ni	LL-CCV	15.0	14.4	96.1
Ni	LL-LCS	6.00	5.62	93.7
Ni	CCV	2500	2300	92.1
Ni	CCV	2500	2320	92.7
Pb	ICV	2500	2310	92.6
Pb	LL-CCV	25.0	22.8	91.0
Pb	LL-LCS	15.0	13.5	89.8
Pb	CCV	2500	2290	91.4
Pb	CCV	2500	2360	94.6
Sb	ICV	2500	2310	92.4
Sb	LL-CCV	25.0	23.8	95.4
Sb	LL-LCS	15.0	12.4	82.8
Sb	CCV	2500	2300	92.1
Sb	CCV	2500	2400	95.9
Se	ICV	2500	2350	93.9
Se	LL-CCV	75.0	59.1	78.9
Se	LL-LCS	30.0	25.5	85.1
Se	CCV	2500	2310	92.4
Se	CCV	2500	2350	94.0

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 4
Report Number: 20-350

Replicate Data

Analyte	Sample ID	Sample Conc. µg/L	Replicate Conc. µg/L	RPD
As	20-S1412	261.4	255.9	2.13
Be	20-S1412	< 0.2	< 0.2	N/C #
Cd	20-S1412	16.03	16.32	1.79
Co	20-S1412	5.662	5.678	0.28
Cr	20-S1412	130.7	130.7	0.00
Cu	20-S1412	44.26	44.07	0.43
Mn	20-S1412	15.78	15.75	0.19
Ni	20-S1412	25.44	25.44	0.00
Pb	20-S1412	1416.	1425.	0.63
Sb	20-S1412	14.01	16.22	14.6 #
Se	20-S1412	1592.	1572.	1.26

N/C: RPD is not calculated when sample or replicate is below detection limit
Replicate Limit: 20% RPD
#: per EPA CLP protocol, control limits do not apply if sample and/or replicate concentration is less than 5x the detection limit

Laboratory Control Sample/Post Digestion Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
As	LCS	< 7	2255.	2500.	90.2
As	LCS	< 7	2274.	2500.	91.0
As	20-S1417	128.5	2295.	2500.	86.7
Be	LCS	< 0.2	2221.	2500.	88.8
Be	LCS	< 0.2	2287.	2500.	91.5
Be	20-S1417	< 0.2	2125.	2500.	85.0
Cd	LCS	< 0.4	2120.	2500.	84.8
Cd	LCS	< 0.4	2260.	2500.	90.4
Cd	20-S1417	3.097	2021.	2500.	80.7
Co	LCS	< 0.5	2105.	2500.	84.2
Co	LCS	< 0.5	2247.	2500.	89.9
Co	20-S1417	4.847	2071.	2500.	82.6
Cr	LCS	< 0.8	2187.	2500.	87.5
Cr	LCS	< 0.8	2316.	2500.	92.6
Cr	20-S1417	33.50	2108.	2500.	83.0
Cu	LCS	< 5	2225.	2500.	89.0
Cu	LCS	< 5	2227.	2500.	89.1
Cu	20-S1417	22.04	2164.	2500.	85.7
Mn	LCS	2.106	2183.	2500.	87.2
Mn	LCS	2.106	2325.	2500.	92.9
Mn	20-S1417	14.36	2087.	2500.	82.9
Ni	LCS	< 3	2136.	2500.	85.4
Ni	LCS	< 3	2272.	2500.	90.9
Ni	20-S1417	37.48	2111.	2500.	82.9
Pb	LCS	< 5	2208.	2500.	88.3
Pb	LCS	< 5	2229.	2500.	89.2
Pb	20-S1417	62.27	2029.	2500.	78.7
Sb	LCS	< 5	2166.	2500.	86.6
Sb	LCS	< 5	2192.	2500.	87.7
Sb	20-S1417	7.476	1951.	2500.	77.7
Se	LCS	< 15	2240.	2500.	89.6
Se	LCS	< 15	2218.	2500.	88.7
Se	20-S1417	1363.	4001.	2500.	106.

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 4
Report Number: 20-350

Laboratory Control Sample Duplicate Data

Analyte	Sample ID	Spike Conc. µg/L	Duplicate Conc. µg/L	RPD
As	LCS-DUP	2260	2270	0.84
Be	LCS-DUP	2220	2290	2.93
Cd	LCS-DUP	2120	2260	6.39
Co	LCS-DUP	2100	2250	6.53
Cr	LCS-DUP	2190	2320	5.73
Cu	LCS-DUP	2220	2230	0.09
Mn	LCS-DUP	2180	2320	6.30
Ni	LCS-DUP	2140	2270	6.17
Pb	LCS-DUP	2210	2230	0.95
Sb	LCS-DUP	2170	2190	1.19
Se	LCS-DUP	2240	2220	0.99

Duplicate Limit: 20% RPD

ICP RAW DATA

Available upon request

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: CVAA
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 20-350

Blank Data

Analyte	Sample ID	Measured Conc. µg	DL Conc. µg
Hg	ICB	< DL	0.007
Hg	Meth_Blk	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg	Measured Conc. µg	Percent Recovery
Hg	ICV	5.00	5.25	105.0
Hg	LL-LCS	0.020	0.016	80.0
Hg	CCV	5.00	5.13	102.6
Hg	CCV	5.00	5.05	101.0

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 100% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

All samples analyzed in duplicate. The reported concentrations are the average of the two measurements.

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Hg	LCS	< 0.007	4.85	5.00	97.0
Hg	LCS	< 0.007	4.82	5.00	96.4
Hg	20-S1411	< 0.007	5.41	5.00	108.

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

Laboratory Control Sample Duplicate Data

Analyte	Sample ID	Spike Conc. µg/L	Duplicate Conc. µg/L	RPD
Hg	LCS-DUP	4.85	4.82	0.70

Duplicate Limit: 20% RPD

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: CVAA
Sample Description: EPA Method 29 Cont. 4, 5a
Report Number: 20-350

Blank Data

Analyte	Sample ID	Measured Conc. µg	DL Conc. µg
Hg	ICB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg	Measured Conc. µg	Percent Recovery
Hg	ICV	5.00	4.92	98.3
Hg	LL-LCS	0.020	0.020	100.0
Hg	CCV	5.00	4.93	98.6
Hg	CCV	5.00	4.95	99.0
Hg	CCV	5.00	4.94	98.7

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 100% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

All samples analyzed in duplicate. The reported concentrations are the average of the two measurements.

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Hg	20-S1412	0.405	5.48	5.00	101.
Hg	20-S1413	0.046	4.99	5.00	98.9

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: CVAA
Sample Description: EPA Method 29 Cont. 5b, 5c
Report Number: 20-350

Blank Data

Analyte	Sample ID	Measured Conc. µg	DL Conc. µg
Hg	ICB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg	Measured Conc. µg	Percent Recovery
Hg	ICV	5.00	4.95	99.0
Hg	LL-LCS	0.020	0.017	85.0
Hg	CCV	5.00	4.97	99.4
Hg	CCV	5.00	5.04	100.9
Hg	CCV	5.00	5.00	100.0
Hg	CCV	5.00	5.05	101.0

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 100% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

All samples analyzed in duplicate. The reported concentrations are the average of the two measurements.

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Hg	20-S1414	0.749	5.74	5.00	99.8
Hg	20-S1415	0.012	5.03	5.00	100.

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

CVAA RAW DATA

Available upon request

CHESTER LABNET
SOURCE SAMPLE RECEIPT CHECKLIST

Client	Montrose Air Quality Services	Date	8/21/20
# Runs	3 + Blanks	Report #	20-350

Custody Seals Inspected, If Present	None	
Chain-of-Custody Form Inspected	✓	
CoC present with samples?	✓	*
CoC indicate analytical methodology to be used? (eg M29 etc)	M29, M5/202, 0061	!!
CoC indicate if compliance testing? (esp. M26)	Not stated	!!
M26 samples have Thiosulfate added in field?	N/A	!!
M29 indicate FH/BH separate or combined?	Hg – Separate	!!
Has Form Been Signed?	✓	
Have Date and Time Custody Released Been Noted on Form?	✓	
All Sample Containers Inspected	✓	
Does Number of Samples Match Number on CoC Form?	✓	!!
Do All Sample ID Numbers Match Those on the CoC Form?	✓	!!
Did client mark sample volumes prior to shipment?	✓	*
If required by method, did client vent samples prior to shipment?	✓	
Are the Sample Containers Intact?	✓	!!
Are signs of leakage present?	NO	*
Chain-of-Custody Form Signed and Dated by CLN	✓	
Corrective Actions		
Client Contacted Due to Mismatching Sample ID Numbers		
Client Contacted Due to Broken Sample Container(s)		
Client Contacted Due to Leaking Sample Container(s)		
Client contacted for verification of methodology?	8/21/20	
Corrective Actions Documented?	✓	
Corrective Actions Accomplished?		

*Items marked !! shall be addressed **prior to any analytical work being started**.*
*Items marked * shall be **noted in case narrative** upon reporting of results to client.*

Signed Lisa Ball

Notes

MONTROSE
AIR QUALITY SERVICES

CHAIN OF CUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info:
Chesterlabnet

Client / Project:	**Project / Sample Location:**	**Test / Analytical Method:**
Owens Brockway Cont.	Furnace D Exit	0061
Project No.:	**Purchase Order No:**	**Special Analysis / Reporting Instructions:**
006AS-760936		
Send Analytical Report To:	**Sampler or PM Signature:**	Cr+6
Portland QA/QC: PortlandQA-QC@montrose-env.com ***add Project Manager here***		

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R1	8/19/20	1030	1			20-51380
R2	8/19/20	1340	1			51381
R3	8/19/20	1715	1			51382
NAHCO3 Blank	8/19/20	1730	1			51383
H20 Blank	8/19/20	1730	1			51384
Total Containers			5			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	8/20/20	1400		8.20.20	14:00	
	8.21.20	10:20		8.21.20	10:20	Amb

MAQS Chain of Custody Macro-R2

MONTROSE AIR QUALITY SERVICES

CHAIN OF CUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
Phone (503) 255-5050 | Fax (503) 255-0505

Lab info: Chesterlabnet

Client / Project:	Project / Sample Location:	Test / Analytical Method:
Owens Brockway Cont.	Furnace D Exit	EPA 5/202
Project No.: 006AS-760936	**Purchase Order No:**	**Special Analysis / Reporting Instructions:**
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent M202	Lab / Sample ID No.
1-PM	8/19/20	0940	1	FPM Container 1 - filter	--	204182
"			1	FPM Container 2 - filterable PM rinse	acetone	2051403
"			1	CPM Cont. 1 - aqueous liquid impinger contents	water F	2051407
"			1	CPM Container 2 - organic rinses	acetone & hexane	↓
"			1	CPM Container 3 - CPM filter	--	↓
2-PM		1045	5	Same as Run 1	" 2051406	204184 / 51404
3-PM		1220	5	Same as Run 1	" 2051409	204183 / 51405
FRB-PM		1230	4	Field Recovery Blank - FPM C1, CPM C1-C3	" 2051410	
						204185 ~~51407~~ 51406
RB-PM-A	↓	1230	1	CPM Container 6 - acetone reagent blank	acetone	51406
Total Containers			20			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	8/20/20	1400		8:20:20	14:00	
	8.21.20	10:20		8.21.20	10:20	Amb

Key: FPM = Filterable Particulate Matter, CPM = Condensable Particulate Matter, RB = Reagent Blank, FRB = Field Recovery Blank, TPB = Train Proof Blank

MONTROSE AIR QUALITY SERVICES

CHAIN OF CUSTODY

20-350

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info: Chesterlabnet

Client / Project:	Project / Sample Location:	Test / Analytical Method:
Owens Brockway Cont.	Furnace D Exit	EPA 29 (multiple metals)
Project No.: 006AS-760936	**Purchase Order No:**	**Special Analysis / Reporting Instructions:**
Send Analytical Report To: Portland QA/QC: : PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mn, Hg, Ni, Se

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
1-MM	8/19/20	1020	1	Container 1 - filter	--	20S1411
"			1	Container 3 - front-half rinse	0.1N HNO3	↓
"			1	Container 4 - [KO], Impingers 1-3 contents, rinses	5% HNO3 / 10% H2O2	S1412
"			1	Container 5a - Impinger 4 contents and rinse	0.1N HNO3	S1413
"			1	Container 5b - Impingers 5 & 6 contents and rinses	10% H2SO4 / 4% KMnO4	S1414
"		↓	1	Container 5c - Impingers 5 & 6 acid rinse	8N HCl	S1415
2-MM		1340	6	Same as Run 1	"	20S1416 – S1420
3-MM		1715	6	Same as Run 1	"	20S1421 – S1425
RB-MM-8a/b		1730	2	Containers 8a/b - 0.1N HNO3, water reagent blanks	0.1N HNO3, water	20 S1426 / S1429
RB-MM-9			1	Container 9 - HNO3 / H2O2 reagent blank	5% HNO3 / 10% H2O2	S1428
RB-MM-10			1	Container 10 - H2SO4 / KMnO4 reagent blank	10% H2SO4 / 4% KMnO4	S1429
RB-MM-11			1	Container 11 - 8N HCl reagent blank	8N HCl	S1431
RB-MM-12		↓	1	Container 12 - filters (1) reagent blank	--	S1427
Total Containers			24			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	8/20/20	1400		8.20.20	14:00	
Relinquished by	Date	Time	Received by	Date	Time	Temp.
	8.21.20	10:20		8.21.20	10:20	Amb
Relinquished by	Date	Time	Received by	Date	Time	Temp.

Key: [KO] = Knockout impinger, "[ ]" denotes an option in the method, FB = Field Blank, RB = Reagent Blank

APPENDIX D
QUALITY ASSURANCE/QUALITY CONTROL

Appendix D.1
Units and Abbreviations

UNITS AND ABBREVIATIONS

@ X% O_2	corrected to X% oxygen (corrected for dilution air)
|CC|	absolute value of the confidence coefficient
|d|	absolute value of the mean differences
ºC	degrees Celsius (centrigade)
ºF	degrees Fahrenheit
ºR	degrees Rankine
" H_2O	inches of water column
13.6	specific gravity of mercury
ΔH	pressure drop across orifice meter, inches H_2O
ΔP	velocity head of stack gas, inches H_2O
θ	total sampling time, minutes
µg	microgram
ρ_a	density of acetone, mg/ml
ρ_w	density of water, 0.9982 g/ml or 0.002201 lb/ml
acfm	actual cubic feet of gas per minute at stack conditions
A_n	cross-sectional area of nozzle, ft^2
A_s	cross-sectional area of stack, square feet (ft^2)
Btu	British thermal unit
B_{ws}	proportion by volume of water vapor in gas stream
C_a	particulate matter concentration in stack gas, gr/acf
C_{Avg}	average unadjusted gas concentration, ppmv
C_{Dir}	measured concentration of calibration gas, ppmv
cf or ft^3	cubic feet
cfm	cubic feet per minute
C_{Gas}	average gas concentration adjusted for bias, ppmv
C_M	average of initial and final system bias check responses from upscale calibration gas, ppmv
cm or m^3	cubic meters
C_{MA}	actual concentration of the upscale calibration gas, ppmv
C_O	average of initial and final system bias check responses from low-level calibration gas, ppmv
C_p	pitot tube coefficient
C_s	particulate matter concentration in stack gas, gr/dscf
CS	calibration span, % or ppmv
C_S	measured concentration of calibration gas, ppmv
C_V	manufactured certified concentration of calibration gas, ppmv
D	drift assessment, % of span
dcf	dry cubic feet
dcm	dry cubic meters
D_n	diameter of nozzle, inches
D_s	diameter of stack, inches
dscf	dry standard cubic feet
dscfm	dry standard cubic feet per minute
dscm	dry standard cubic meters
F_d	F-factor, dscf/MMBtu of heat input
fpm	feet per minute
fps	feet per second
ft	feet
ft^2	square feet
g	gram
gal	gallons
gr	grains (7000 grains per pound)

UNITS AND ABBREVIATIONS

gr/dscf	grains per dry standard cubic feet
hr	hour
I	percent of isokinetic sampling
in	inch
k	kilo or thousand (metric units, multiply by 10^3)
K	kelvin (temperature)
K_3	conversion factor 0.0154 gr/mg
K_4	conversion factor 0.002669 ((in. Hg)(ft^3))/((ml)(°R))
kg	kilogram
K_p	pitot tube constant (85.49 ft/sec)
kwscfh	thousand wet standard cubic feet per hour
l	liters
lb/hr	pounds per hour
lb/MMBtu	pounds per million Btu
lpm	liters per minute
m	meter or milli
M	thousand (English units) or mega (million, metric units)
m^3	cubic meters
m_a	mass of residue of acetone after evaporation, mg
M_d	molecular weight of stack gas; dry basis, lb/lb-mole
meq	milliequivalent
mg	milligram
Mg	megagram (10^6 grams)
min	minute
ml or mL	milliliter
mm	millimeter
MM	million (English units)
MMBtu/hr	million Btu per hour
m_n	total amount of particulate matter collected, mg
mol	mole
mol. wt. or MW	molecular weight
M_s	molecular weight of stack gas; wet basis, lb/lb-mole
MW	molecular weight or megawatt
n	number of data points
ng	nanogram
nm	nanometer
P_{bar}	barometric pressure, inches Hg
pg	picogram
P_g	stack static pressure, inches H_2O
P_m	barometric pressure of dry gas meter, inches Hg
ppb	parts per billion
ppbv	parts per billion, by volume
ppbvd	parts per billion by volume, dry basis
ppm	parts per million
ppmv	parts per million, by volume
ppmvd	parts per million by volume, dry basis
P_s	absolute stack gas pressure, inches Hg
psi	pounds per square inch
psia	pounds per square inch absolute
psig	pounds per square inch gauge
P_{std}	standard absolute pressure, 29.92 inches Hg
Q_a	volumetric flow rate, actual conditions, acfm

UNITS AND ABBREVIATIONS

Q_s	volumetric flow rate, standard conditions, scfm
Q_{std}	volumetric flow rate, dry standard conditions, dscfm
R	ideal gas constant 21.85 ((in. Hg) ($ft^{3)}$)/((°R) (lbmole))
SB_{final}	post-run system bias check, % of span
SB_i	pre-run system bias check, % of span
scf	standard cubic feet
scfh	standard cubic feet per hour
scfm	standard cubic feet per minute
scm	standard cubic meters
scmh	standard cubic meters per hour
sec	second
sf, sq. ft., or ft^2	square feet
std	standard
t	metric ton (1000 kg)
$T_{0.975}$	t-value
T_a	absolute average ambient temperature, ºR (+460 for English)
T_m	absolute average dry gas meter temperature, ºR (+460 for English)
ton or t	ton = 2000 pounds
tph or tons/hr	tons per hour
tpy or tons/yr	tons per year
T_s	absolute average stack gas meter temperature, ºR (+460 for English)
T_{std}	absolute temperature at standard conditions
V	volt
V_a	volume of acetone blank, ml
V_{aw}	volume of acetone used in wash, ml
V_{lc}	total volume H_2O collected in impingers and silica gel, grams
V_m	volume of gas sampled through dry gas meter, ft^3
$V_{m(std)}$	volume of gas measured by the dry gas meter, corrected to standard conditions, dscf
V_{ma}	stack gas volume sampled, acf
V_n	volume collected at stack conditions through nozzle, acf
V_s	average stack gas velocity, feet per second
$V_{wc(std)}$	volume of water vapor condensed, corrected to standard conditions, scf
$V_{wi(std)}$	volume of water vapor in gas sampled from impingers, scf
$V_{wsg(std)}$	volume of water vapor in gas sampled from silica gel, scf
W	watt
W_a	weight of residue in acetone wash, mg
W_{imp}	total weight of impingers, grams
W_{sg}	total weight of silica gel, grams
Y	dry gas meter calibration factor, dimensionless

ACRONYMS

AAS	atomic absorption spectroscopy
ACDP	air contaminant discharge permit
ACE	analyzer calibration error, percent of span
AD	absolute difference
ADL	above detection limit
AETB	Air Emissions Testing Body
AS	applicable standard (emission limit)
ASTM	American Society For Testing And Materials
BACT	best achievable control technology
BDL	below detection limit
BHP	brake horsepower
BIF	boiler and industrial furnace
BLS	black liquor solids
CC	confidence coefficient
CD	calibration drift
CE	calibration error
CEM	continuous emissions monitor
CEMS	continuous emissions monitoring system
CERMS	continuous emissions rate monitoring system
CET	calibration error test
CFR	Code of Federal Regulations
CGA	cylinder gas audit
CHNOS	elemental analysis for determination of C, H, N, O, and S content in fuels
CNCG	concentrated non-condensable gas
CO	catalytic oxidizer
COC	chain of custody
COMS	continuous opacity monitoring system
CPM	condensible particulate matter
CPMS	continuous parameter monitoring system
CT	combustion turbine
CTM	conditional test method
CTO	catalytic thermal oxidizer
CVAAS	cold vapor atomic absorption spectroscopy
D_e	equivalent diameter
DE	destruction efficiency
Dioxins	polychlorinated dibenzo-p-dioxins (pcdd's)
DLL	detection level limited
DNCG	dilute non-condensable gas
ECD	electron capture detector
EIT	Engineer In Training
ELCD	electoconductivity detector (hall detector)
EMPC	estimated maximum possible concentration
EPA	US Environmental Protection Agency
EPRI	Electric Power Research Institute
ES	emission standard (applicable limit)
ESP	electrostatic precipitator
EU	emission unit
FCCU	fluid catalytic cracking unit
FGD	flue gas desulfurization
FI	flame ionization
FIA	flame ionization analyzer
FID	flame ionization detector
FPD	flame photometric detector
FPM	filterable particulate matter

ACRONYMS

FTIR	Fourier-transform infrared spectroscopy
FTPB	field train proof blank
FTRB	field train recovery blank
Furans	polychlorinated dibenzofurans (pcdf's)
GC	gas chromatography
GC/MS	gas chromatography/mass spectroscopy
GFAAS	graphite furnace atomic absorption spectroscopy
GFC	gas filter correlation
GHG	greenhouse gas
HAP	hazardous air pollutant
HC	hydrocarbons
HHV	higher heating value
HPLC	high performance liquid chromatography
HRGC/HRMS	high-resolution gas chromatography/high-resolution mass spectroscopy
HRSG	heat recovery steam generator
IC	ion chromatography
ICAP	inductively-coupled argon plasmography
ICPCR	ion chromatography with a post-column reactor
IR	infrared radiation
ISO	International Standards Organization
kW	kilowatts
LFG	landfill gas
LHV	lower heating value
LPG	liquified petroleum gas
MACT	maximum achievable control technology
MDI	methylene diphyenyl diisocyanate
MDL	method detection limit
MNOC	maximum normal operating conditions
MRL	method reporting limit
MS	mass spectrometry
NA	not applicable or not available
NCASI	National Council For Air And Steam Improvement
NCG	non-condensable gases
NDIR	non-dispersive infrared
NESHAP	National Emissions Standards For Hazardous Air Pollutants
NG	natural gas
NIOSH	National Institute For Occupational Safety And Health
NIST	National Institute Of Standards And Technology
NMC	non-methane cutter
NMOC	non-methane organic compounds
NMVOC	non-methane volatile organic compounds
NPD	nitrogen phosphorus detector
NSPS	New Source Performance Standards
OSHA	Occupational Safety And Health Administration
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl compounds
PCWP	plywood and composite wood products
PE	Professional Engineer
PFAS	per- and polyfluoroalkyl substances (PFAS)
PI	photoionization
PID	photoionization detector
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in aerodynamic diameter

ACRONYMS

POM	polycyclic organic matter
PS	performance specification
PSD	particle size distribution
PSEL	plant site emission limits
PST	performance specification test
PTE	permanent total enclosure
PTM	performance test method
QA/QC	quality assurance and quality control
QI	Qualified Individual
QSTI	Qualified Source Testing Individual
RA	relative accuracy
RAA	relative accuracy audit
RACT	reasonably available control technology
RATA	relative accuracy test audit
RCTO	rotary concentrator thermal oxidizer
RICE	stationary reciprocating internal combustion engine
RM	reference method
RTO	regenerative thermal oxidizer
SAM	sulfuric acid mist
SCD	sulfur chemiluminescent detector
SCR	selective catalytic reduction system
SD	standard deviation
Semi-VOST	semivolatile organic compounds sample train
SRM	standard reference material
TAP	toxic air pollutant
TBD	to be determined
TCA	thermal conductivity analyzer
TCD	thermal conductivity detector
TGNENMOC	total gaseous non-ethane non-methane organic compounds
TGNMOC	total gaseous non-methane organic compounds
TGOC	total gaseous organic compounds
THC	total hydrocarbons
TIC	tentatively identified compound
TO	thermal oxidizer
TO	toxic organic (as in EPA Method TO-15)
TPM	total particulate matter
TSP	total suspended particulate matter
TTE	temporary total enclosure
ULSD	ultra-low sulfur diesel
UV	ultraviolet radiation range
VE	visible emissions
VOC	volatile organic compounds
VOST	volatile organic sample train
WC	water column
WWTP	waste water treatment plant

CHEMICAL NOMENCLATURE

Ag	silver
As	arsenic
Ba	barium
Be	beryllium
C	carbon
Cd	cadmium
CdS	cadmium sulfide
CH_2O	formaldehyde
CH_3CHO	acetaldehyde
CH_3OH	methanol
CH_4	methane
C_2H_4O	ethylene oxide
C_2H_6	ethane
C_3H_4O	acrolein
C_3H_6O	propionaldehyde
C_3H_8	propane
C_6H_5OH	phenol
Cl_2	chlorine
ClO_2	chlorine dioxide
CO	carbon monoxide
Co	cobalt
CO_2	carbon dioxide
Cr	chromium
Cu	copper
EtO	ethylene oxide
EtOH	ethyl alcohol (ethanol)
H_2	hydrogen
H_2O	water
H_2O_2	hydrogen peroxide
H_2S	hydrogen sulfide
H_2SO_4	sulfuric acid
HCl	hydrogen chloride
Hg	mercury
IPA	isopropyl alcohol
MDI	methylene diphyenyl diisocyanate
MEK	methyl ethyl ketone
MeOH	methanol
Mn	manganese
N_2	nitrogen
NH_3	ammonia
Ni	nickel
NO	nitric oxide
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_2	oxygen
P	phosphorus
Pb	lead
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
Sb	antimony
Se	selenium
SO_2	sulfur dioxide
SO_3	sulfur trioxide
SO_x	sulfur oxides
TCDD	tetrachlorodibenzodioxin
TCDF	tetrachlorodibenzofuran
TGOC	total gaseous organic concentration
THC	total hydrocarbons
Tl	thallium
TRS	total reduced sulfur compounds
Zn	zinc

Appendix D.2
Manual Test Method QA/QC Data

MONTROSE

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice, Leak Check, and Thermocouple Calibration Check

English Meter Box Units, English K' Factor

Meter box ID:	MB30
Meter ID (if applicable):	MB30
Orifice set ID:	IZ
Calibrated by:	CR
Expires:	**12/16/20**

Date:	6/16/20
Location:	OFFICE
No. of orifices used (min. 3)	3
Barometric pressure (in. Hg):	30.04 in. Hg
Theoretical critical vacuum	14.17 in. Hg

Yd:	**1.0018**
ΔH@:	**1.7443**

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		– Ambient Temperature –		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
1.10	16.00	79.785	89.282	9.497	XX	65	XX	67	55	0.4514	20.0	68	68	67.8
0.64	20.00	89.282	98.366	9.084	XX	67	XX	70	48	0.3498	22.0	68	68	67.8
1.90	13.00	98.366	108.406	10.040	XX	70	XX	72	63	0.6027	18.0	68	67	67.5

--- SAMPLE RATE ---
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
1.10	0.590
0.64	0.457
1.90	0.788

— DRY GAS METER —
VOLUME CORRECTED

Vm(std) (cu ft)
9.593
9.122
10.066

------- ORIFICE -------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
9.445	9.406
9.147	9.111
10.248	10.201

-- DRY GAS METER --
CALIBRATION FACTOR Yd

Value (number)	Variation (number)
0.9845	-0.017
1.0027	0.001
1.0181	0.016

------- ORIFICE -------
CALIBRATION FACTOR ΔH@

Value (in H2O)	Variation (in H2O)
1.790	0.045
1.726	-0.018
1.717	-0.027

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	1.0018
Average ΔH@	1.7443
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Pressure Leak Check

Test Pressure, (in H_2O):	6	Should be 5-7 in. H_2O
Leak Rate, (in H_2O/min):	0	Must be zero (manometer level stable for 1 minute)

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	27	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Meter Box Thermocouple Readout Calibration Check

Input Temperature	Allowable Temp. Dev.*
25	7
75	8
125	9
250	11
350	12
500	14
700	17
900	20

Stack	Probe	Filter	Exit	Aux.	Meter In	Meter Out
27	27	26	27	28	26	26
78	79	74	78	77	76	77
128	127	125	129	127	126	126
253	253	250				
353	352	355				
502						
XX						
XX						

Thermocouple simulator	
Make/Model:	Omega CL-300-500F
Serial No.	647
Cal Date:	1/10/2020

Meter Thermocouple Calibration

Ref. Temp	Allowable Temp. Dev.*	Meter In	Meter Out
67.1	8	67	68
210.2	10	211	212

Reference Thermometer	
Make/Model:	Control Company 90205-05
Serial No.	CR
Cal Date:	9/11/2018

* Reading values must be within 1.5% of reference thermometer values (based on absolute temperature scale) for calibration to be acceptable.

Performed by: Name: Colin Rodkey Signature: [signature] Date: 6/16/20

Approved by: Name: Peter Ben Signature: [signature] Date: 6-16-20

MONTROSE ENVIRONMENTAL

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice: Post-Test, English Meter Box Units, English K' Factor

Meter box ID:	MB 30
Meter ID (if applicable):	XXXX
Orifice set ID:	TV3
Calibrated by (initials):	MG
Current 6-month calibration Yd:	1.0018
Date of 6-month calibration:	6/16/20

Date:	8/26/20
Location:	PDX Shop
No. of runs (default 3)	3
Barometric pressure (in. Hg):	30.00 in. Hg
Theoretical critical vacuum:	14.15 in. Hg

Current Cal. Yd:	**1.0018**
Post-test Yd:	**0.9835**
Post-test Result:	**PASS**

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
2.10	9.00	612.065	619.503	7.438	XX	74	XX	75	65	0.6238	17.0	80	80	80.0
2.10	13.00	619.503	630.222	10.719	XX	75	XX	77	65	0.6238	17.0	80	80	80.0
2.10	14.00	630.222	641.770	11.548	XX	77	XX	79	65	0.6238	17.0	80	80	80.0

--- SAMPLE RATE ---
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
2.10	0.81
2.10	0.81
2.10	0.81

--- DRY GAS METER ---
VOLUME CORRECTED

Vm(std) (cu ft)
7.402
10.637
11.418

-------- ORIFICE -------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
7.247	7.395
10.468	10.682
11.274	11.504

-- DRY GAS METER --
CALIBRATION FACTOR Yd

Value (number)	Variation (number)
0.9791	-0.004
0.9841	0.001
0.9874	0.004

------- ORIFICE -------
CALIBRATION FACTOR ΔH@

Value (in H2O)	Variation (in H2O)
1.80	0.006
1.80	0.001
1.79	-0.006

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	0.9835
Average ΔH@	1.7987
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	29	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Performed by: Name: Max Gouvea Signature: [signature] Date: 8/26/20

Approved by: Name: Peter Becker Signature: [signature] Date: 8.26.20

MONTROSE

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice, Leak Check, and Thermocouple Calibration Check

English Meter Box Units, English K' Factor

Meter box ID:	MB32
Meter ID (if applicable):	MB32
Orifice set ID:	TV-5
Calibrated by:	CR
Expires:	**12/18/20**

Date:	6/18/20
Location:	OFFICE
No. of orifices used (min. 3)	3
Barometric pressure (in. Hg):	30.31 in. Hg
Theoretical critical vacuum	14.30 in. Hg

Yd:	**1.0040**
ΔH@:	**1.8371**

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min))

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
0.98	13.00	120.742	127.827	7.085	XX	64	XX	67	16	0.4218	19.0	67	67	67.0
1.40	12.00	127.827	135.375	7.548	XX	67	XX	67	18	0.4878	18.0	67	67	67.1
0.54	13.00	145.494	150.819	5.325	XX	70	XX	70	12	0.3150	21.0	68	68	67.8

--- SAMPLE RATE ---
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
0.98	0.557
1.40	0.644
0.54	0.416

--- DRY GAS METER ---
VOLUME CORRECTED

Vm(std) (cu ft)
7.226
7.684
5.379

------ ORIFICE ------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
7.240	7.135
7.727	7.617
5.403	5.333

-- DRY GAS METER --
CALIBRATION FACTOR Yd

Value (number)	Variation (number)
1.0019	-0.002
1.0057	0.002
1.0044	0.000

------ ORIFICE ------
CALIBRATION FACTOR ΔH@

Value (in H2O)	Variation (in H2O)
1.809	-0.028
1.927	0.090
1.775	-0.062

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	1.0040
Average ΔH@	1.8371
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Pressure Leak Check

Test Pressure, (in H_2O):	6	Should be 5-7 in. H_2O
Leak Rate, (in H_2O/min):	0	Must be zero (manometer level stable for 1 minute)

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	27	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Meter Box Thermocouple Readout Calibration Check

Input Temperature	Allowable Temp. Dev.*
25	7
75	8
125	9
250	11
350	12
500	14
700	17
900	20

Stack	Probe	Filter	Exit	Aux	Meter In	Meter Out
25	27	25	25	25	26	24
75	77	75	75	75	76	75
126	127	124	125	125	126	126
251	254	250				
351	353	350				
501						
XX						
XX						

Thermocouple simulator	
Make/Model:	Omega CL-300-500F
Serial No.	647
Cal Date:	1/10/2020

Meter Thermocouple Calibration

Ref. Temp	Allowable Temp. Dev.*	Meter In	Meter Out
71.2	8	69.9	69.8
144.6	9	144.8	144.7

Reference Thermometer	
Make/Model:	Control Company 90205-05
Serial No.	CR
Cal Date:	9/11/2018

* Reading values must be within 1.5% of reference thermometer values (based on absolute temperature scale) for calibration to be acceptable.

Performed by: Name: Colin Rodkey Signature: [signature] Date: 6/18/20

Approved by: Name: Peter Beltz Signature: [signature] Date: 6.18.20

MONTROSE ENVIRONMENTAL

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice: Post-Test, English Meter Box Units, English K' Factor

Meter box ID:	MB32
Meter ID (if applicable):	XXXX
Orifice set ID:	Shop #1
Calibrated by (initials):	AG
Current 6-month calibration Yd:	1.0040
Date of 6-month calibration:	6/18/20

Date:	9/11/20
Location:	Portland
No. of runs (default 3)	3
Barometric pressure (in. Hg):	29.92 in. Hg
Theoretical critical vacuum:	14.11 in. Hg

Current Cal. Yd:	**1.0040**
Post-test Yd:	**0.9746**
Post-test Result:	**PASS**

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min))

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
2.00	9.00	747.548	754.621	7.073	XX	72	XX	73	63	0.5864	16.0	73	73	73.0
2.00	8.00	754.621	760.887	6.266	XX	73	XX	74	63	0.5864	16.0	73	73	73.0
2.00	7.00	760.887	766.375	5.488	XX	74	XX	75	63	0.5864	16.0	73	73	73.0

--- SAMPLE RATE ---
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
2.00	0.76
2.00	0.76
2.00	0.76

--- DRY GAS METER ---
VOLUME CORRECTED

Vm(std) (cu ft)
7.045
6.229
5.446

------- ORIFICE -------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
6.840	6.907
6.080	6.140
5.320	5.372

-- DRY GAS METER --
CALIBRATION FACTOR Yd

Value (number)	Variation (number)
0.9709	-0.004
0.9760	0.001
0.9769	0.002

------- ORIFICE -------
CALIBRATION FACTOR ΔH@

Value (in H2O)	Variation (in H2O)
1.93	0.004
1.93	0.000
1.92	-0.004

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0 02

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0 75 cfm of air at 68 F and 29 92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2

QA Criteria:	
Average Yd	0.9746
Average ΔH@	1.9277
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	25	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Performed by: Name: Austin Gonzalez Signature: [signature] Date: 9/11/20

Approved by: Name: Preston Beveler Signature: [signature] Date: 9/11/20

Critical Orifice Calibration

Client	MONTROSE										1/3/20	Date
Set ID	IZ										in house	Job
DGM (Y) =	1.0046		Fluke ID	526		PLC	0 at		6 inH2O		MG/AG	Calibrated
DGM ID #	19461089		Std Manometer	537		NLC	0 at		22 inHg		JH	QA/QC
Dry Gas Meter			Orifice ID #	40	Orifice ID #	48	Orifice ID #	55	Orifice ID #	63	Orifice ID #	73
K' Critical Orifice Coefficient				**0.23892**		**0.34978**		**0.45142**		**0.60270**		**0.78069**
	Symbol	Units	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
Initial volume	V_i	ft³	841.525	848.013	854.495	860.350	866.765	872.000	877.295	882.790	888.250	894.345
Final Volume	V_f	ft³	848.013	854.495	860.350	866.710	872.000	877.295	882.790	888.250	894.345	900.420
Difference	V_m	ft³	6.488	6.482	5.855	6.360	5.235	5.295	5.495	5.460	6.095	6.075
Temperatures												
Ambient	T_a	°F	60.0	60.0	61.3	61.3	61.3	61.3	61.3	61.3	61.3	61.3
Absolute ambient	T_a	°R	519.67	519.67	520.97	520.97	520.97	520.97	520.97	520.97	520.97	520.97
Initial Inlet	T_i	°F	61.9	63.7	64.1	65.9	65.6	69.7	70.9	72.7	73.3	77.7
Outlet	T_f	°F	61.8	62	62.5	62.5	62.6	63.1	63.5	63.9	64.4	65.1
Final Inlet	T_i	°F	63.7	64.1	65.9	67.1	69.7	70.9	72.7	73.3	77.7	79.2
Outlet	T_f	°F	62	62.5	62.5	62.8	63.1	63.5	63.9	64.4	65.1	65.8
Avg. Temp	T_m	°R	522.02	522.745	523.42	524.245	524.92	526.47	527.42	528.245	529.795	531.62
Time		min	21	21	13	14	9	9	7	7	6	5
		sec	0	0	0	0	0	0	0	0	0	0
			21.00	21.00	13.00	14.00	9.00	9.00	7.00	7.00	6.00	6.00
SAMPLE RATE		ACFM	0.3078	0.3087	0.4504	0.4543	0.5817	0.5883	0.7850	0.7800	1.0158	1.0125
Orifice man. rdg	dH@	in H_2O	0.30	0.30	0.70	0.70	1.30	1.30	2.20	2.20	4.20	4.20
Barometric. Pressure	Pbar	inHg	30.05	30.05	30.05	30.05	30.05	30.05	30.05	30.05	30.05	30.05
Pump vacuum		inHg	24.0	24.0	22.5	22.5	21.0	21.0	19.0	19.0	16.0	16.0
K' factor			0.2392	0.2386	0.3485	0.3510	0.4495	0.4533	0.6051	0.6003	0.7833	0.7781
K' factor Average				0.2389		0.3498		0.4514		0.6027		0.7807
% Error (+/- 0.5)		%	PASS	0.116%	PASS	0.352%	PASS	0.422%	PASS	0.398%	PASS	0.336%

Critical Orifice Calibration

Client	MONTROSE										1/7/20	Date
Set ID	TV 3										in house	Job
DGM (Y) =	1.0046		Fluke ID	526		PLC	0 at		6 inH2O		MG	Calibrated
DGM ID #	19461089		Std Manometer	537		NLC	0 at		22 inHg		JH	QA/QC
Dry Gas Meter			Orifice ID #	35	Orifice ID #	44	Orifice ID #	51	Orifice ID #	56	Orifice ID #	65
K' Critical Orifice Coefficient				**0.17801**		**0.29037**		**0.37677**		**0.47290**		**0.62375**
	Symbol	Units	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
Initial volume	V_i	ft³	962.410	967.930	973.460	979.970	996.635	991.265	2.000	8.130	14.260	19.920
Final Volume	V_f	ft³	967.930	973.460	979.870	986.370	1002.000	996.635	8.130	14.260	19.920	25.610
Difference	V_m	ft³	5.520	5.530	6.410	6.400	5.365	5.370	6.130	6.130	5.660	5.690
Temperatures												
Ambient	T_a	°F	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Absolute ambient	T_a	°R	519.67	519.67	519.67	519.67	519.67	519.67	519.67	519.67	519.67	519.67
Initial Inlet	T_i	°F	63.9	64.2	65.8	66.7	67.4	66.9	65.9	70.5	70.5	74.5
Outlet	T_f	°F	60.7	61	62.3	63.2	61.6	61.3	61.3	62	62.2	62.9
Final Inlet	T_i	°F	64.2	65.4	66.6	68.4	67.8	67.4	70.5	70.6	74.5	75.9
Outlet	T_f	°F	61	62.3	63.2	63.7	61.7	61.6	62	62.3	62.9	63.3
Avg. Temp	T_m	°R	522.12	522.895	524.145	525.17	524.295	523.97	524.595	526.02	527.195	528.82
Time		min	24	24	17	17	11	11	10	10	7	7
		sec	0	0	0	0	0	0	0	0	0	0
			24.00	24.00	17.00	17.00	11.00	11.00	10.00	10.00	7.00	7.00
SAMPLE RATE		ACFM	0.3078	0.2304	0.3771	0.3765	0.4877	0.4882	0.6130	0.6130	0.8086	0.8129
Orifice man. rdg	dH@	in H_2O	0.17	0.17	0.48	0.48	0.85	0.85	1.40	1.40	2.40	2.40
Barometric. Pressure	Pbar	inHg	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03
Pump vacuum		inHg	24.5	24.5	23.0	23.0	22.0	22.0	20.5	20.5	18.5	18.5
K' factor			0.1780	0.1780	0.2909	0.2899	0.3765	0.3771	0.4735	0.4723	0.6231	0.6244
K' factor Average				0.1780		0.2904		0.3768		0.4729		0.6238
% Error (+/- 0.5)		%	PASS	0.016%	PASS	0.176%	PASS	0.078%	PASS	0.136%	PASS	0.110%

Critical Orifice Calibration

Client	MONTROSE										1/2/20	Date
Set ID	TV5										in house	Job
DGM (Y) =	1.0046		Fluke ID	526		PLC	0 at			6 inH2O	MG	Calibrated
DGM ID #	19461089		Std Manometer	537		NLC	0 at			22 inHg	JH	QA/QC
Dry Gas Meter			Orifice ID #	12	Orifice ID #	16	Orifice ID #	18	Orifice ID #	24	Orifice ID #	31
K' Critical Orifice Coefficient				**0.31501**		**0.42176**		**0.48775**		**0.63116**		**0.80825**
	Symbol	Units	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
Initial volume	V_i	ft³	771.310	776.575	781.860	787.320	792.790	797.827	802.925	808.670	815.245	820.505
Final Volume	V_f	ft³	776.575	781.860	787.320	792.790	797.830	802.925	808.670	815.245	820.505	825.780
Difference	V_m	ft³	5.265	5.285	5.460	5.470	5.040	5.098	5.745	6.575	5.260	5.275
Temperatures												
Ambient	T_a	°F	60.3	60.1	60.1	60.1	60.1	60.1	60.1	60.1	60.1	60.1
Absolute ambient	T_a	°R	519.97	519.77	519.77	519.77	519.77	519.77	519.77	519.77	519.77	519.77
Initial Inlet	T_i	°F	60.3	62.9	65.5	67.6	69.6	69.6	72.3	74	76.1	79.8
Outlet	T_f	°F	57.3	60.4	62.1	62.5	62.4	63.7	63.7	64	64.9	64.9
Final Inlet	T_i	°F	62.9	65.5	67.6	69.6	69.6	72.3	74	76.1	79.8	80.9
Outlet	T_f	°F	60.4	61.2	62.5	63.4	63.7	63.7	64	64.9	65.1	66.1
Avg. Temp	T_m	°R	519.895	522.17	524.095	525.445	525.995	526.995	528.17	529.42	531.145	532.595
Time		min	13	13	10	10	8	8	7	8	5	5
		sec	0	0	0	0	0	0	0	0	0	0
			13.00	13.00	10.00	10.00	8.00	8.00	7.00	8.00	5.00	5.00
SAMPLE RATE		ACFM	0.3078	0.4065	0.5460	0.5470	0.6300	0.6372	0.8207	0.8219	1.0520	1.0550
Orifice man. rdg	dH@	in H_2O	0.55	0.55	1.10	1.10	1.40	1.40	2.50	2.50	4.20	4.20
Barometric. Pressure	Pbar	inHg	30.09	30.09	30.09	30.09	30.09	30.09	30.09	30.09	30.09	30.09
Pump vacuum		inHg	18.0	18.0	16.5	16.5	15.5	15.5	13.5	13.5	10.5	10.5
K' factor			0.3151	0.3149	0.4219	0.4216	0.4854	0.4901	0.6315	0.6309	0.8082	0.8083
K' factor Average				0.3150		0.4218		0.4878		0.6312		0.8082
% Error (+/- 0.5)		%	PASS	0.038%	PASS	0.037%	PASS	0.477%	PASS	0.048%	PASS	0.006%

Critical Orifice Calibration

Client	MONTROSE										1/7/20	Date
Set ID	YD 40-73										in house	Job
DGM (Y) =	1.0046		Fluke ID	526		PLC	0 at		6 inH2O		MG/AG	Calibrated
DGM ID #	19461089		Std Manometer	537		NLC	0 at		22 inHg		JH	QA/QC
Dry Gas Meter			Orifice ID #	40	Orifice ID #	48	Orifice ID #	55	Orifice ID #	63	Orifice ID #	73
K' Critical Orifice Coefficient				**0.23431**		**0.34215**		**0.45156**		**0.58694**		**0.80436**
	Symbol	Units	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
Initial volume	V_i	ft³	900.650	906.415	912.190	917.520	922.835	928.110	941.400	946.680	951.985	957.190
Final Volume	V_f	ft³	906.415	912.190	917.520	922.835	928.110	933.385	946.680	951.985	957.190	962.410
Difference	V_m	ft³	5.765	5.775	5.330	5.315	5.275	5.275	5.280	5.305	5.205	5.220
Temperatures												
Ambient	T_a	°F	61.4	61.4	61.4	61.4	61.4	61.4	59.8	59.8	59.8	59.8
Absolute ambient	T_a	°R	521.07	521.07	521.07	521.07	521.07	521.07	519.47	519.47	519.47	519.47
Initial Inlet	T_i	°F	65.5	66.3	65.3	67.8	68.3	70.3	63.8	68.2	69.5	75.7
Outlet	T_f	°F	63.6	64.2	63.5	63.5	63	63.8	57.9	58.9	59.8	65.9
Final Inlet	T_i	°F	66.3	65.3	67.8	68.3	70.3	70.9	68.2	69.5	75.7	77.3
Outlet	T_f	°F	64.2	63.5	63.5	63.9	63.8	63.9	58.9	59.8	65.9	61.6
Avg. Temp	T_m	°R	524.57	524.495	524.695	525.545	526.02	526.895	521.87	523.77	527.395	529.795
Time		min	19	19	12	12	9	9	7	7	5	5
		sec	0	0	0	0	0	0	0	0	0	0
			19.00	19.00	12.00	12.00	9.00	9.00	7.00	7.00	5.00	5.00
SAMPLE RATE		ACFM	0.3078	0.3039	0.4442	0.4429	0.5861	0.5861	0.7543	0.7579	1.0410	1.0440
Orifice man. rdg	dH@	in H_2O	0.30	0.30	0.68	0.68	1.20	1.20	2.10	2.10	4.10	4.10
Barometric. Pressure	Pbar	inHg	30.05	30.05	30.05	30.05	30.05	30.05	30.03	30.03	30.03	30.03
Pump vacuum		inHg	24.0	24.0	22.5	22.5	21.0	21.0	19.0	19.0	16.0	16.0
K' factor			0.2341	0.2345	0.3429	0.3414	0.4519	0.4512	0.5866	0.5873	0.8050	0.8037
K' factor Average				0.2343		0.3422		0.4516		0.5869		0.8044
% Error (+/- 0.5)		%	PASS	0.094%	PASS	0.222%	PASS	0.083%	PASS	0.054%	PASS	0.083%

Secondary Standard Calibration

DATE: 7/2/2019

Operator: Joe Camodeca

Meter Box No:	19461089	Meter Box H@:	0.0000	Meter Box Yd	1.0046	Barometric Pressure:	29.69

				Standard Meter Gas Volume			Meter Box Gas Volume (ft‹)			Std. Meter Temperature (ÞF)			Meter Box Temperature (ÞF)					
Q	P	H	Yds	Initial	Final	Vf	Initial	Final	Vf	Inlet	Outlet	Avg.	Inlet	Outlet	Avg.	Time	Yd	H@
0.38	-0.50	0.00	1.0000	0.0	5.000	5.000	52.700	57.664	4.964	70.0	70.0	70.0	70.0	70.0	70.0	12.88	1.0085	0.0000
0.38	-0.50	0.00	1.0000	0.0	5.000	5.000	57.664	62.635	4.971	70.0	70.0	70.0	70.0	70.0	70.0	12.88	1.0071	0.0000
0.38	-0.50	0.00	1.0000	0.0	5.000	5.000	62.635	67.593	4.958	70.0	70.0	70.0	70.0	70.0	70.0	12.90	1.0097	0.0000
0.60	-0.60	0.00	1.0000	0.0	5.000	5.000	69.400	74.381	4.981	70.0	70.0	70.0	70.0	70.0	70.0	8.18	1.0053	0.0000
0.61	-0.60	0.00	1.0000	0.0	5.000	5.000	74.381	79.360	4.979	70.0	70.0	70.0	70.0	70.0	70.0	8.15	1.0057	0.0000
0.60	-0.60	0.00	1.0000	0.0	5.000	5.000	79.360	84.336	4.976	70.0	70.0	70.0	70.0	70.0	70.0	8.17	1.0063	0.0000
0.80	-0.70	0.00	1.0000	0.0	6.000	6.000	90.100	96.094	5.994	70.0	70.0	70.0	70.0	70.0	70.0	7.40	1.0027	0.0000
0.80	-0.70	0.00	1.0000	0.0	5.000	5.000	96.094	101.092	4.998	70.0	70.0	70.0	70.0	70.0	70.0	6.17	1.0021	0.0000
0.80	-0.70	0.00	1.0000	0.0	5.000	5.000	101.092	106.081	4.989	70.0	70.0	70.0	70.0	70.0	70.0	6.17	1.0039	0.0000
0.95	-0.80	0.00	1.0000	0.0	5.000	5.000	111.400	116.388	4.988	70.0	70.0	70.0	70.0	70.0	70.0	5.18	1.0044	0.0000
0.95	-0.80	0.00	1.0000	0.0	5.000	5.000	116.388	121.373	4.985	70.0	70.0	70.0	70.0	70.0	70.0	5.18	1.0050	0.0000
0.95	-0.80	0.00	1.0000	0.0	7.500	7.500	121.373	128.843	7.470	70.0	70.0	70.0	70.0	70.0	70.0	7.80	1.0060	0.0000
1.24	-1.00	0.00	1.0000	0.0	5.000	5.000	133.000	138.011	5.011	70.0	70.0	70.0	70.0	70.0	70.0	3.98	1.0003	0.0000
1.24	-1.00	0.00	1.0000	0.0	5.000	5.000	138.011	143.022	5.011	70.0	70.0	70.0	70.0	70.0	70.0	3.97	1.0003	0.0000
1.24	-1.00	0.00	1.0000	0.0	5.000	5.000	143.022	148.030	5.008	70.0	70.0	70.0	70.0	70.0	70.0	3.98	1.0009	0.0000
															AVERAGE		1.0046	0.0000

Millennium Instruments Inc.
2402 Springridge Drive unit A
Spring Grove IL. 60081
PHONE#(815)675-3225
FAX#(815)675-6965
E-mail millennium@millinst.com
www.millinst.com

Calibrated By: Joe Camodeca

Signature:

Vacuum Gauge

(in. Hg)	Gauge
5.0	5.0
10.0	10.0
15.0	15.0
20.0	20.0
25.0	25.0

Secondary Standard Calibration

DATE: 6/20/2020

Operator: Joe Camodeca

Meter Box No:	19461089	Meter Box ¯H@:	0.0000	Meter Box Yd	0.9906	Barometric Pressure:	29.69

				Standard Meter Gas Volume			Meter Box Gas Volume (ft‹)			Std. Meter Temperature (ÞF)			Meter Box Temperature (ÞF)					
Q	P	H	Yds	Initial	Final	Vf	Initial	Final	Vf	Inlet	Outlet	Avg.	Inlet	Outlet	Avg.	Time	Yd	H@
0.41	-1.00	0.00	1.0000	0.0	5.000	5.000	339.600	344.644	5.044	72.0	72.0	72.0	72.0	72.0	72.0	12.00	0.9937	0.0000
0.41	-1.00	0.00	1.0000	0.0	5.000	5.000	344.644	349.673	5.029	72.0	72.0	72.0	72.0	72.0	72.0	12.00	0.9967	0.0000
0.41	-1.00	0.00	1.0000	0.0	5.000	5.000	349.673	354.723	5.050	72.0	72.0	72.0	72.0	72.0	72.0	12.00	0.9926	0.0000
0.60	-1.00	0.00	1.0000	0.0	5.000	5.000	355.287	360.337	5.050	72.0	72.0	72.0	72.0	72.0	72.0	8.25	0.9926	0.0000
0.60	-1.00	0.00	1.0000	0.0	5.000	5.000	360.337	365.400	5.063	72.0	72.0	72.0	72.0	72.0	72.0	8.25	0.9900	0.0000
0.61	-1.00	0.00	1.0000	0.0	5.100	5.100	365.400	370.540	5.140	72.0	72.0	72.0	72.0	72.0	72.0	8.25	0.9947	0.0000
0.78	-1.10	0.00	1.0000	0.0	5.000	5.000	373.737	378.797	5.060	72.0	72.0	72.0	72.0	72.0	72.0	6.33	0.9908	0.0000
0.78	-1.10	0.00	1.0000	0.0	5.000	5.000	378.797	383.872	5.075	72.0	72.0	72.0	72.0	72.0	72.0	6.33	0.9879	0.0000
0.78	-1.10	0.00	1.0000	0.0	5.000	5.000	383.872	388.923	5.051	72.0	72.0	72.0	72.0	72.0	72.0	6.33	0.9926	0.0000
0.98	-1.10	0.00	1.0000	0.0	5.000	5.000	390.040	395.133	5.093	72.0	72.0	72.0	73.0	73.0	73.0	5.00	0.9863	0.0000
0.98	-1.10	0.00	1.0000	0.0	5.000	5.000	395.133	400.211	5.078	72.0	72.0	72.0	73.0	73.0	73.0	5.00	0.9892	0.0000
0.98	-1.10	0.00	1.0000	0.0	5.000	5.000	400.211	405.296	5.085	72.0	72.0	72.0	73.0	73.0	73.0	5.00	0.9878	0.0000
1.43	-1.20	0.00	1.0000	0.0	6.000	6.000	407.165	413.276	6.111	72.0	72.0	72.0	74.0	74.0	74.0	5.05	0.9885	0.0000
1.19	-1.20	0.00	1.0000	0.0	5.000	5.000	413.286	418.382	5.096	72.0	72.0	72.0	74.0	74.0	74.0	4.12	0.9878	0.0000
1.19	-1.20	0.00	1.0000	0.0	5.000	5.000	418.382	423.480	5.098	72.0	72.0	72.0	74.0	74.0	74.0	4.12	0.9874	0.0000
															AVERAGE		0.9906	0.0000

Millennium Instruments Inc.
2402 Springridge Drive unit A
Spring Grove IL. 60081
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E-mail millennium@millinst.com
www.millinst.com

Calibrated By: Joe Camodeca

Signature:

Vacuum Gauge

(in. Hg)	Gauge
5.0	5.0
10.0	10.0
15.0	15.0
20.0	20.0
25.0	25.0

MONTROSE
AIR QUALITY SERVICES

13585 NE Whitaker Way
Portland, OR 97230
503-255-5050

Peristaltic Pump Calibrations

Pump #2

Run 1 (500 mL pulled)
Time to pull 500 ml = 5 minutes and 3 seconds
99.01 mL/min

Run 2 (500 mL pulled)
Time to pull 500 ml = 5 minutes and 8 seconds
97.40 mL/min

Run 3 (500 mL pulled)
Time to pull 500 ml = 5 minutes and 6 seconds
98.04 mL/min

Average of Pump #2 = 98.15 mL/min

Pump #3

Run 1 (500 mL pulled)
Time to pull 500 ml = 4 minutes and 56 seconds.
101.4 mL/min

Run 2 (500 mL pulled)
Time to pull 500 ml = 4 minutes and 58 seconds
100.4 mL/min

Run 3 (500 mL pulled)
Time to pull 500 ml = 5 minutes and 0 seconds
100 mL/min

Average of Pump # 3 = 100.6 mL/min

Date: 8/13/2020
Print Name: Austin Goracke
Signature: Austin Goracke

MONTROSE ENVIRONMENTAL

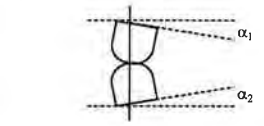
Pitot Tube Calibration Data Sheet

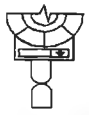
Calibration Date:	July 15, 2020	**Performed by:**	Max Gouveia	**Expiration Date:**	January 15, 2021
		ID No.:	4-14	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	4-14	**No damage:**	Yes
Probe Description:	Nonself Supporting Probe (NP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?		**Thermocouple passed calibration?**			Yes

Protractor or Digital Angle Finder ID: 709
Measuring Tape ID: 720
Caliper ID: 705

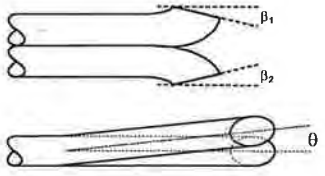
Calibration performed using the procedures of EPA Method 2, Section 10.1

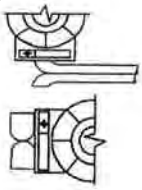
Alignment and Tubing Dimensions





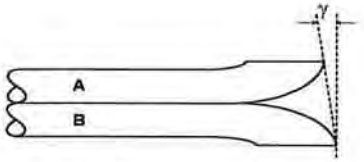
Degree indicating level position for determining α_1 and α_2.

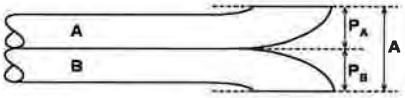




Degree indicating level position for determining θ.

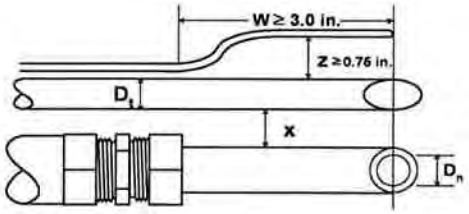
α_1 ($-10° < \alpha_1 < +10°$)	2.0	
α_2 ($-10° < \alpha_2 < +10°$)	1.7	
β_1 ($-5° < \beta_1 < +5°$)	-1.0	
β_2 ($-5° < \beta_2 < +5°$)	-1.3	
γ	2.6	
θ	0.0	
A	0.9262	
$z = A \tan \gamma$ ($\pm$ 0.125")	0.0421	Pass
$w = A \tan \theta$ ($\pm$ 0.03125")	0.0000	Pass
D_t (0.1875" < D_t < 0.375")	0.3740	Pass
P_A ($1.05D_t < P_A < 1.5D_t$)	0.4631	Pass
P_B ($1.05D_t < P_B < 1.5D_t$)	0.4631	Pass
$\lvert P_A - P_B \rvert \leq 0.0625$	0.0000	Pass

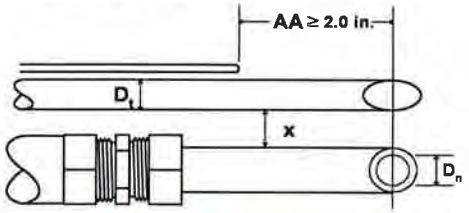




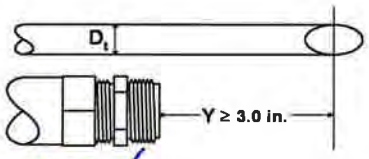
Degree indicating level position for determining γ then calculating Z.

Assembly Inter-Component Spacing Requirements





W (≥ 3.0")	6.100	Pass	Offset TC only
-or- AA (≥ 2.0")			Setback TC only
X	0.850		
D_n	0.185		
X / D_n (≥ 1.5)	4.595	Pass	
Y (≥ 3.0")	3.100	Pass	
Z ≥ 0.75"	1.000	Pass	Offset TC only



Performed By: Max Gouveia Signature: _____ Date: 7/15/20

Approved By: Peter Becker Signature: _____ Date: 7.15.20

MONTROSE ENVIRONMENTAL

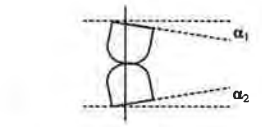
Pitot Tube Calibration Data Sheet

Calibration Date:	August 21, 2020	**Performed by:**	AG	**Expiration Date:**	N/A
		ID No.:	4--14	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	4--14	**No damage:**	Yes
Probe Description:	Nonself Supporting Probe (NP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?	Yes	**Thermocouple passed calibration?**	Yes		

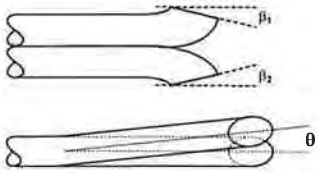
Protractor or Digital Angle Finder ID: 703
Measuring Tape ID: 720
Caliper ID: 702

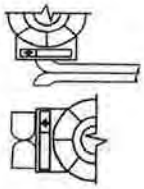
Calibration performed using the procedures of EPA Method 2, Section 10 1

Alignment and Tubing Dimensions

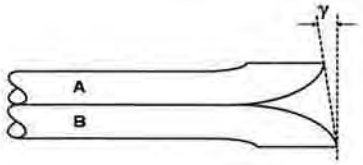


Degree indicating level position for determining α_1 and α_2.

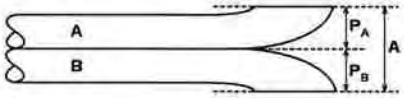




Degree indicating level position for determining θ.

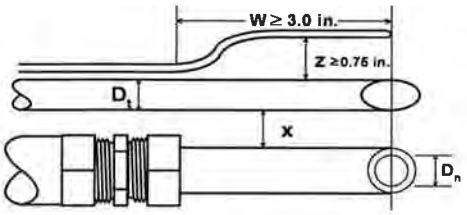


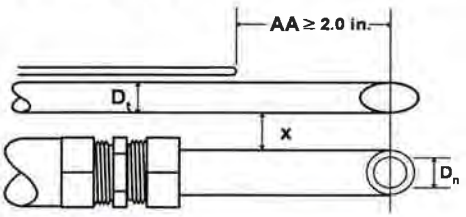
Degree indicating level position for determining γ then calculating Z.

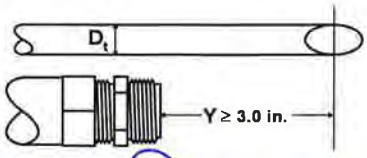


α_1 $(-10° < \alpha_1 < +10°)$	1.0	
α_2 $(-10° < \alpha_2 < +10°)$	1.5	
β_1 $(-5° < \beta_1 < +5°)$	2.0	
β_2 $(-5° < \beta_2 < +5°)$	2.0	
γ	0.8	
θ	0.7	
A	0.9700	
z= A tan γ (± 0.125")	0.0135	Pass
w= A tan θ (± 0.03125")	0.0119	Pass
D_t (0.1875" < D_t < 0.375")	0.3720	Pass
P_A (1.05D_t < P_A < 1.5D_t)	0.4850	Pass
P_B (1.05D_t < P_B < 1.5D_t)	0.4850	Pass
$\lvert P_A - P_B \rvert \leq 0.0625$	0.0000	Pass

Assembly Inter-Component Spacing Requirements







W (≥ 3.0")	4.050	Pass	Offset TC only
-or- AA (≥ 2.0")			Setback TC only
X	1.400		
D_n	0.300		
X / D_n (≥ 1.5)	4.750	Pass	
Y (≥ 3.0")	3.580	Pass	
Z ≥ 0.75"	0.900	Pass	Offset TC only

Performed By: Austin Goracke
Signature: [signature] Date: 8/21/20

Approved By: [signature]
Signature: [signature] Date: 8/25/20

MONTROSE ENVIRONMENTAL

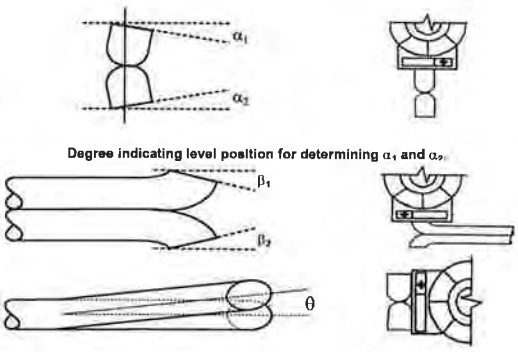
Pitot Tube Calibration Data Sheet

Calibration Date:	July 30, 2020	**Performed by:**	Max Gouveia	**Expiration Date:**	January 30, 2021
		ID No.:	117-NP-4	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	117-NP-4	**No damage:**	Yes
Probe Description:	Self Supporting Probe (SP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?		**Thermocouple passed calibration?**			Yes

Protractor or Digital Angle Finder ID: 712
Measuring Tape ID: 720
Caliper ID: 702

Calibration performed using the procedures of EPA Method 2, Section 10.1

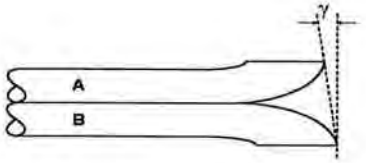
Alignment and Tubing Dimensions



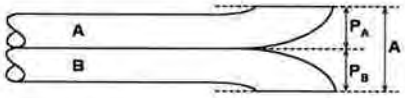
Degree indicating level position for determining α_1 and α_2.

Degree indicating level position for determining θ.

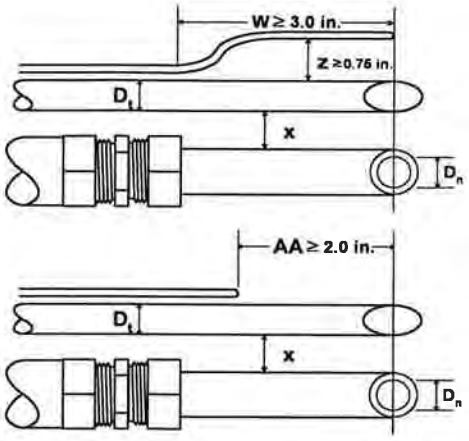
α_1 $(-10° < \alpha_1 < +10°)$	2.8	
α_2 $(-10° < \alpha_2 < +10°)$	3.0	
β_1 $(-5° < \beta_1 < +5°)$	1.0	
β_2 $(-5° < \beta_2 < +5°)$	0.8	
γ	1.9	
θ	0.7	
A	0.9264	
$z = A \tan\gamma$ $(\pm\ 0.125")$	0.0307	Pass
$w = A \tan\theta$ $(\pm\ 0.03125")$	0.0113	Pass
D_t $(0.1875" < D_t < 0.375")$	0.3740	Pass
P_A $(1.05D_t < P_A < 1.5D_t)$	0.4632	Pass
P_B $(1.05D_t < P_B < 1.5D_t)$	0.4632	Pass
$\lvert P_A - P_B \rvert \leq 0.0625$	0.0000	Pass



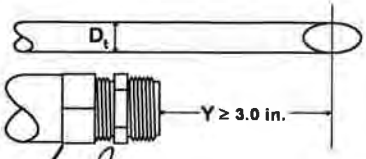
Degree indicating level position for determining γ then calculating Z.



Assembly Inter-Component Spacing Requirements



W (≥ 3.0")	4.000	Pass	Offset TC only
-or- AA (≥ 2.0")			Setback TC only
X	0.500		
D_n	0.190		
X / D_n (≥ 1.5)	2.632	Pass	
Y (≥ 3.0")	3.550	Pass	
Z ≥ 0.75"	1.000	Pass	Offset TC only



Performed By: Max Gouveia
Signature: [signature] Date: 7/30/20

Approved By: Robert Beals
Signature: [signature] Date: 7.30.20

MONTROSE
ENVIRONMENTAL

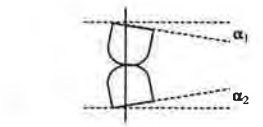
Pitot Tube Calibration Data Sheet

Calibration Date:	August 21, 2020	**Performed by:**	AG	**Expiration Date:**	N/A
		ID No.:	117	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	117-NP-4	**No damage:**	Yes
Probe Description:	Nonself Supporting Probe (NP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?		Yes	**Thermocouple passed calibration?**		Yes

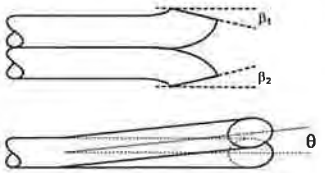
Protractor or Digital Angle Finder ID: 703
Measuring Tape ID: 720
Caliper ID: 702

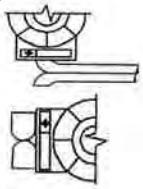
Calibration performed using the procedures of EPA Method 2, Section 10.1

Alignment and Tubing Dimensions

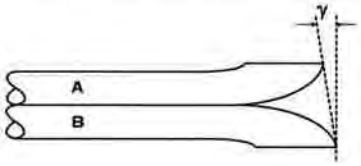


Degree indicating level position for determining α_1 and α_2.

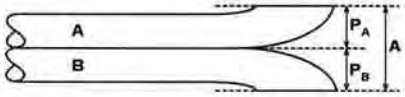




Degree indicating level position for determining θ.

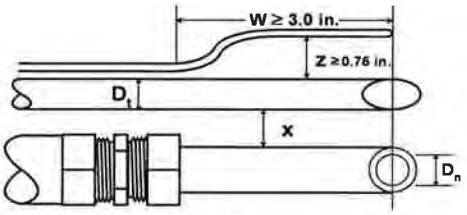


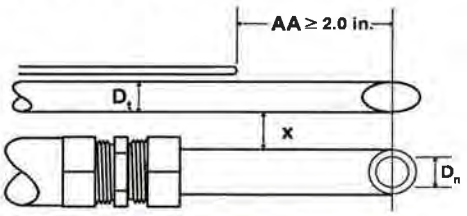
Degree indicating level position for determining γ then calculating Z.

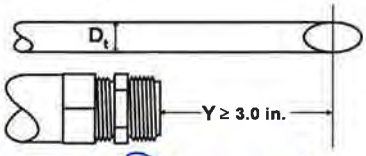


α_1 $(-10° < \alpha_1 < +10°)$	0.8	
α_2 $(-10° < \alpha_2 < +10°)$	0.6	
β_1 $(-5° < \beta_1 < +5°)$	1.4	
β_2 $(-5° < \beta_2 < +5°)$	1.0	
γ	0.5	
θ	0.1	
A	0.9100	
z= A tan γ (± 0.125")	0.0079	Pass
w= A tan θ (± 0.03125")	0.0016	Pass
D_t (0.1875" < D_t < 0.375")	0.3720	Pass
P_A (1.05D_t < P_A < 1.5D_t)	0.4550	Pass
P_B (1.05D_t < P_B < 1.5D_t)	0.4550	Pass
$\lvert P_A - P_B \rvert \leq 0.0625$	0.0000	Pass

Assembly Inter-Component Spacing Requirements







W (≥ 3.0")	5.600	Pass	Offset TC only
-or- AA (≥ 2.0")			Setback TC only
X	0.950		
D_n	0.200		
X / D_n (≥ 1.5)	4.650	Pass	
Y (≥ 3.0")	3.450	Pass	
Z ≥ 0.75"	1.650	Pass	Offset TC only

Performed By: Austin Gonzalez Signature: [signature] Date: 8/21/20

Approved By: JM Signature: [signature] Date: 9/21/20

MONTROSE

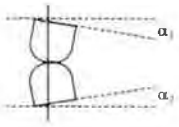
Pitot Tube Calibration Data Sheet

Calibration Date:	August 13, 2020	**Performed by:**	Joe Hefferman III	**Expiration Date:**	February 13, 2021
		ID No.:	1311835	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	#N/A	**No damage:**	Yes
Probe Description:	CUSTOM (CTM)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?	Yes	**Thermocouple passed calibration?**			Yes

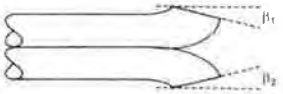
Protractor or Digital Angle Finder ID: 709
Measuring Tape ID:
Caliper ID: 705

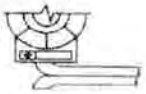
Calibration performed using the procedures of EPA Method 2, Section 10.1

Alignment and Tubing Dimensions

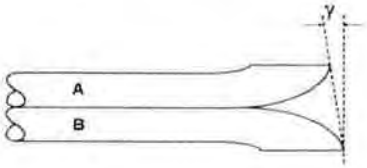


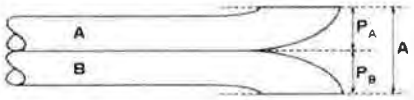
Degree indicating level position for determining α_1 and α_2.





Degree indicating level position for determining θ.

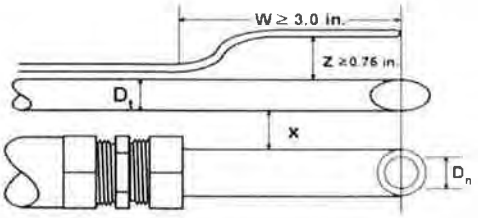


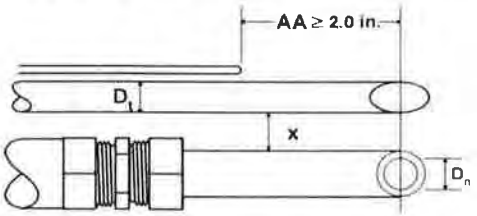


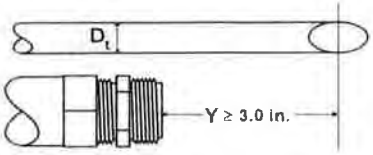
Degree indicating level position for determining γ then calculating Z.

α_1 ($-10° < \alpha_1 < +10°$)	0.5	
α_2 ($-10° < \alpha_2 < +10°$)	0.6	
β_1 ($-5° < \beta_1 < +5°$)	0.3	
β_2 ($-5° < \beta_2 < +5°$)	0.2	
γ	0.8	
θ	0.5	
A	0.9140	
$z = A \tan\gamma$ ($\pm$ 0.125")	0.0128	Pass
$w = A \tan\theta$ ($\pm$ 0.03125")	0.0080	Pass
D_t (0.1875" < D_t < 0.375")	0.3745	Pass
P_A ($1.05D_t < P_A < 1.5D_t$)	0.4280	Pass
P_B ($1.05D_t < P_B < 1.5D_t$)	0.4680	Pass
$\lvert P_A - P_B \rvert \leq 0.0625$	-0.0400	Pass

Assembly Inter-Component Spacing Requirements







W (≥ 3.0")			Offset TC only
-or- AA (≥ 2.0")	2.110	Pass	Setback TC only
X	0.610		
D_n	0.250		
X / D_n (≥ 1.5)	2.440	Pass	
Y (≥ 3.0")	3.400	Pass	
Z ≥ 0.75"			Offset TC only

Performed By: JBA Colin Radtke
Signature: [signature] Date: 7/13/20
Approved By: Colin Radtke
Signature: [signature] Date: 7/13/20

MONTROSE
ENVIRONMENTAL

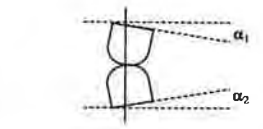
Pitot Tube Calibration Data Sheet

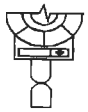
Calibration Date:	August 21, 2020	**Performed by:**	AG	**Expiration Date:**	N/A
		ID No.:	1311835'	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	1311835'	**No damage:**	Yes
Probe Description:	Nonself Supporting Probe (NP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?		Yes	**Thermocouple passed calibration?**		Yes

Protractor or Digital Angle Finder ID: 703
Measuring Tape ID: 720
Caliper ID: 702

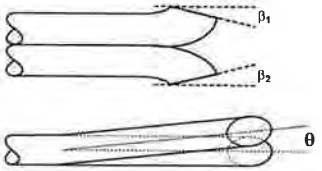
Calibration performed using the procedures of EPA Method 2, Section 10.1

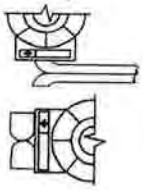
Alignment and Tubing Dimensions



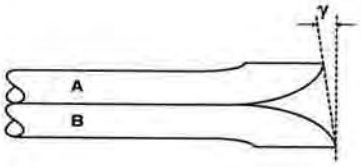


Degree indicating level position for determining α_1 and α_2.

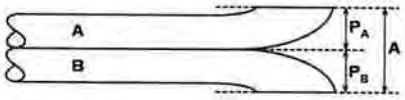




Degree indicating level position for determining θ.

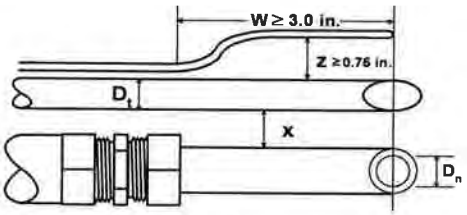


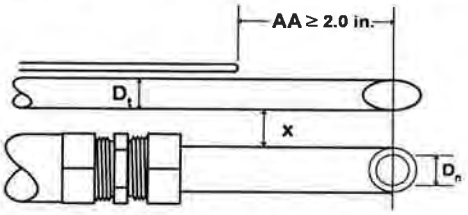
Degree indicating level position for determining γ then calculating Z.

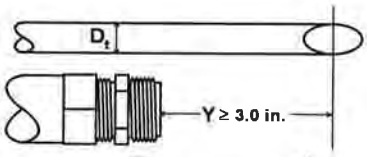


α_1 $(-10° < \alpha_1 < +10°)$	3.0	
α_2 $(-10° < \alpha_2 < +10°)$	2.0	
β_1 $(-5° < \beta_1 < +5°)$	1.0	
β_2 $(-5° < \beta_2 < +5°)$	2.0	
γ	0.8	
θ	1.0	
A	0.9015	
z= A tan γ (± 0.125")	0.0126	Pass
w= A tan θ (± 0.03125")	0.0157	Pass
D_t (0.1875" < D_t < 0.375")	0.3740	Pass
P_A (1.05D_t < P_A < 1.5D_t)	0.4508	Pass
P_B (1.05D_t < P_B < 1.5D_t)	0.4508	Pass
$\lvert P_A - P_B \rvert \leq 0.0625$	0.0000	Pass

Assembly Inter-Component Spacing Requirements







W (≥ 3.0")	3.120	Pass	Offset TC only
-or- AA (≥ 2.0")			Setback TC only
X	0.550		
D_n	0.288		
X / D_n (≥ 1.5)	1.909	Pass	
Y (≥ 3.0")	4.050	Pass	
Z ≥ 0.75"	0.800	Pass	Offset TC only

Performed By: Austin Gorecke
Signature: [signature] Date: 8/21/20

Approved By: JG
Signature: [signature] Date: 8/21/20

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

ACCREDITED A2LA Certificate No. 1750.01 Calibration

Cert. No.: 4039-11351530

Traceable® Certificate of Calibration for Water-Proof Thermometer °F/°C

Customer :Montrose Environmental ,13585 NE Whitaker Way ,Portland ,OR-97230 ,U.S.A.

Instrument Identification:

Model: 90205-22, S/N: 140754303 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Thermistor Module	A27129	04 Feb 2021	1000451212
Temperature Calibration Bath	B16388		
Temperature Probe	5267	21 Feb 2021	C0220028
Temperature Calibration Bath	B3A444		
Thermistor Module	B96382	19 Aug 2020	B9628006
Temperature Probe	5410	13 Sep 2020	B9801031

Certificate Information:

Technician: 420 Procedure: CAL-03 Cal Date: 16 Jun 2020 Cal Due Date: 16 Jun 2021

Test Conditions: 53.14%RH 22.9°C 1019mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
°C	0.00	0.3	Y	0.00	0.3	Y	-1	1	0.058	>4:1
°C	100.00	99.4	Y	100.00	99.4	Y	99	101	0.058	>4:1

This certificate indicates Traceability to standards provided by (NIST) National Institute of Standards and Technology and/or a National Standards Laboratory.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement : (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min=As Left Nominal(Rounded) – Tolerance; Max= As Left Nominal(Rounded) + Tolerance;

Nicol Rodriguez, Quality Manager

Marisa Elms, Technical Manager

Note :

Maintaining Accuracy:

In our opinion once calibrated your Water-Proof Thermometer °F/°C should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Water-Proof Thermometer °F/°C change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

Issue Date : 16 Jun 2020

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.traceable.com

Barometric Pressure Determination

Date: 08/18/20

Time: 0726

Data By: JH

Reference: http://forecast.weather.gov/MapClick.php?CityName=Orange&state

Reference Barometer ID	**Portland, Portland International Airport (KPDX)**
Reference Barometer Location	Lat: 45.59578°NLon: 122.60917°WElev: 20ft.
Reference Barometer Other Info.	Last Update on 18 Aug 06:55 AM PDT
Reference Barometer Indication, corrected to sea level	**29.98**
Reference Barometer Reference Elevation	**20**
Reference Barometer Actual Pressure	29.96
Test Barometer Location/Site	**Indigo**
Location/Site Elevation	**81**
Location/Site Barometric Pressure	29.90
Sampling Location Height (above/below site elevation)	**60**
Sampling Location Barometric Pressure	**29.84**

Barometric Pressure Determination

Date: 08/19/20

Time: 0653

Data By: JH

Reference: http://forecast.weather.gov/MapClick.php?CityName=Orange&state

Reference Barometer ID	**Portland, Portland International Airport (KPDX)**
Reference Barometer Location	Lat: 45.59578°NLon: 122.60917°WElev: 20ft.
Reference Barometer Other Info.	Last Update on 19 Aug 06:53 AM PDT
Reference Barometer Indication, corrected to sea level	**30.00**
Reference Barometer Reference Elevation	**20**
Reference Barometer Actual Pressure	29.98
Test Barometer Location/Site	**Indigo**
Location/Site Elevation	**81**
Location/Site Barometric Pressure	29.92
Sampling Location Height (above/below site elevation)	**60**
Sampling Location Barometric Pressure	**29.86**

Appendix D.3
Instrumental Test Method QA/QC Data

MONTROSE AIR QUALITY SERVICES

CEMS CONFIGURATION DATA

Project Information

Client / Facility: Owens Brockway Cont. | Project No. W006AS-760936
Source / Location: Furnace D Exit | Method(s): 3A 7E 6C
Test Dates: 8/18-8/19 | Project Manager / Team (initials): JH PB AG CR

Analyzers In Service

Please circle all applicable	O_2	CO_2	CO	NO_x	SO_2			TRS	THC
Response Time (seconds)	35	35	-	40	45				

Filtration (circle)

Filter Type	In-Stack	Out-of-Stack	Sintered	Other		
Filter Material	Glass	Quartz	Steel	N/A	Other	

Sample Probe (circle)

Length	4'	6'	8'	10'	12'	14'	Other		
Material	Steel	Glass	Teflon	Titanium	Quartz	Inconel	Other		
Heated	Yes	No							
Probe Temperature	250 °F	N/A							

Conditioner / Moisture Knock-Out (circle)

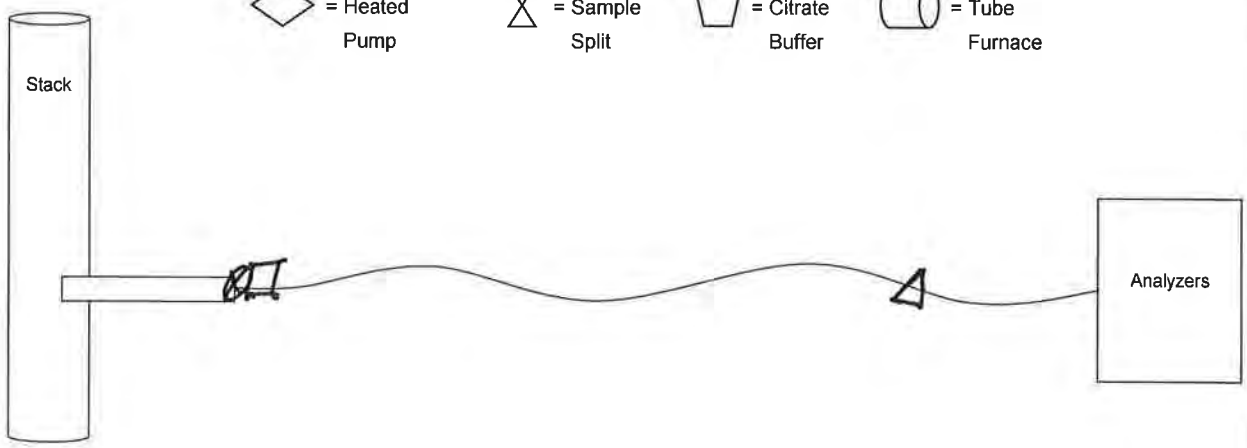
In Use?	Yes	No				
Coolant	Ice and Water	Anti-Freeze	Electric	Other		
Trap Material	Steel	Glass	Teflon	Other		

Leak Checks LPM

Pre-Test	0.0 cfh @ 20 in. Hg		____ cfh @ ____ in. Hg	
Post-Test	0.0 cfh @ 20 in. Hg		____ cfh @ ____ in. Hg	
System Flow Rate	3 cfh LPM		____ cfh	
Leak Rate	Post-Test (cfh) / System Flow Rate (cfh) * 100 = ____ %			____ %

Fill in locations of elements of the CEM system, as applicable

Legend: ⊗ = Cal Tee; □ = Filter; △ = Gas Conditioner; ◇ = Heated Pump; ⧖ = Sample Split; ▽ = Citrate Buffer; ⬭ = Tube Furnace



Upstream of conditioner

Sample Line Length: 100 feet
Sample Line Material: TFE
Sample Line Temp: 250 deg. F

Downstream of conditioner

Sample Line Length: 130 feet
Sample Line Material: TFE
Sample Line Temp: - deg. F

If this information is not accurate for all runs, note exceptions here.

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Analyzer Configuration

Name:	O2 742	CO2 742		NOX 695		SO2 563		
Make/Model:	SERVO 1400	SERVO 1400		CAI 600		Bovar 900		
25A or 7E:	7E	7E		7E		7E		
Voltage max:	10	10		10		10		
Voltage offset:	0	0		0		0		
Range:	10	10		1200		1035		
Upscale:								
Downscale:								

Cylinder Information

Zero Number:	ALM030171	ALM030171		ALM030171		ALM030171		
Zero Conc:	0	0		0		0		
Low Number:								
Low Conc:								
Mid Number:	ALM066309	ALM066309		CC207681		SG139281BAL		
Mid Conc:	10.02	10.07		512.6		490.2		
High Number:	EB0097045	EB0097045		CC161150		CC57702		
High Conc:	20.28	18.52		1118		934		
Bias Number:	EB0097045	EB0097045		CC161150		SG139281BAL		
Bias Conc:	20.28	18.52		1118		490.2		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Calibration

	Name:	O2 742	CO2 742		NOX 695		SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400		CAI 600		Bovar 900		
	25A or 7E:	7E	7E		7E		7E		

Cylinder Concentrations									
	Zero:	0.000	0.000		0.000		0.000		
	Low:								
	Mid:	10.02	10.07		512.6		490.2		
	High:	20.28	18.52		1118		934.0		

Calibration Readings									
	Zero reading:	0.005	0.012		-0.036		0.693		
	Low reading:	0.000	0.000		0.000		0.000		
	Mid reading:	10.04	10.09		526.4		499.3		
	High reading:	20.30	18.42		1106		932.3		

EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	0.025	0.065		-0.003		0.074		
Mid %Err:	**<2.0**	0.099	0.108		1.234		0.974		
High %Err:	**<2.0**	0.099	-0.540		-1.073		-0.182		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Initial bias									
	Name:	O2 742	CO2 742		NOX 695		SO2 563		
	Make/Model:	SERVO 4900	SERVO 4900		CAI 700		Bovar 900		
	25A or 7E:	7E	7E		7E		7E		

Cylinder Concentrations									
	Zero:	0.000	0.000		0.000		0.000		
	Low:								
	Mid:	10.02	10.07		512.6		490.2		
	High:	20.28	18.52		1118		934.0		

Calibration Readings									
	Zero reading:	0.005	0.012		-0.036		0.693		
	Low reading:	0.000	0.000		0.000		0.000		
	Mid reading:	10.04	10.09		526.4		499.3		
	High reading:	20.30	18.42		1106		932.3		

EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	0.025	0.065		-0.003		0.074		
Mid %Err:	**<2.0**	0.099	0.108		1.234		0.974		
High %Err:	**<2.0**	0.099	-0.540		-1.073		-0.182		

Initial Bias Data									
	Zero reading:	0.119	0.047		0.516		-1.511		
	Span reading:	20.13	18.31		1092		482.2		
Zero % bias:	**<5.0**	0.562	0.189		0.049		-0.236		
Span % bias:	**<5.0**	-0.838	-0.594		-1.252		-1.831		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Analyzer Configuration

Name:	O2 742	CO2 742						
Make/Model:	SERVO 4900	SERVO 4900						
25A or 7E:	7E	7E						
Voltage max:	10	10						
Voltage offset:	0	0						
Range:	10	10						
Upscale:								
Downscale:								

Cylinder Information

Zero Number:	ALM030171	ALM030171						
Zero Conc:	0	0						
Low Number:								
Low Conc:								
Mid Number:	ALM066309	ALM066309						
Mid Conc:	10.02	10.07						
High Number:	EB0097045	EB0097045						
High Conc:	20.28	18.52						
Bias Number:	EB0097045	EB0097045						
Bias Conc:	20.28	18.52						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Calibration

	Name:	O2 742	CO2 742						
	Make/Model:	SERVO 4900	SERVO 4900						
	25A or 7E:	7E	7E						

Cylinder Concentrations									
	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	10.07						
	High:	20.28	18.52						

Calibration Readings									
	Zero reading:	0.014	0.012						
	Low reading:	0.000	0.000						
	Mid reading:	10.02	9.983						
	High reading:	20.09	18.39						

EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	0.069	0.065						
Mid %Err:	**<2.0**	0.000	-0.470						
High %Err:	**<2.0**	-0.937	-0.702						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

Initial bias

	Name:	O2 742	CO2 742						
	Make/Model:	SERVO 4900	SERVO 4900						
	25A or 7E:	7E	7E						

Cylinder Concentrations									
	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	10.07						
	High:	20.28	18.52						

Calibration Readings									
	Zero reading:	0.014	0.012						
	Low reading:	0.000	0.000						
	Mid reading:	10.02	9.983						
	High reading:	20.09	18.39						

EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	0.069	0.065						
Mid %Err:	**<2.0**	0.000	-0.470						
High %Err:	**<2.0**	-0.937	-0.702						

Initial Bias Data									
	Zero reading:	0.197	0.038						
	Span reading:	20.05	18.25						
Zero % bias:	**<5.0**	0.902	0.140						
Span % bias:	**<5.0**	-0.197	-0.756						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-760936	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(00)

NOx Converter Check		
Time	**NOx reading, ppm**	**Efficiency, %**
7:45:38	48.920	95.5%
7:45:39	48.120	93.9%
7:45:40	47.020	91.8%
7:45:41	47.020	91.8%
7:45:42	49.660	96.9%
7:45:43	50.620	98.8%
7:45:44	50.420	98.4%
7:45:45	50.530	98.6%
7:45:46	50.570	98.7%
7:45:47	47.420	92.5%

Summary	
Analyzer:	NOX 695
NO2 Cylinder Concentration:	51.24
NO2 Cylinder Number:	CC500374
NOx Analyzer Reading:	47.420
Efficiency:	92.5%

MONTROSE
AIR QUALITY SERVICES

INTERFERENCE RESPONSE TEST

Date of Test: 7/1/20 Name: Josh Muswieck
Analyzer: Type / Model: O2/CO2 Servomex 4900 HE# 742
Serial Number: 100321

Method Referenced: EPA Method 7E

O_2 Results:

Test Gas	Concentration, ppmv or %	Analyzer Output Response %	Interference % of Span (20.93 %)
SO_2	490.2	-0.03	0.14
H_2S	3.819	-0.04	0.19
NO	475.5	0.00	0.00
NO_2	50.93	0.04	0.19
H_2	40	0.14	0.67
CO	469.6	-0.09	0.43

A Calibration Cylinder containing 20.93% oxygen was used to Span Analyzer

Interference Response Results:

Sum of Absolute Differences	Sum of Individual Gases Percent Interferences	Max Allowable Percent of Span Interference (%)
0.34	1.62	2.5

CO_2 Results:

Test Gas	Concentration, ppmv or %	Analyzer Output Response %	Interference % of Span (18.55 %)
SO_2	490.2	-0.08	0.43
O_2	21.0	-0.09	0.49
NO	94.96	-0.09	0.49
NO_2	50.93	-0.09	0.49
H_2	40	0.00	0.00
CO	469.6	0.00	0.00

A Calibration Cylinder containing 18.55% carbon dioxide was used to Span Analyzer

Interference Response Results:

Sum of Absolute Differences	Sum of Individual Gases Percent Interferences	Max Allowable Percent of Span Interference (%)
0.35	1.9	2.5

MONTROSE AIR QUALITY SERVICES

INTERFERENCE RESPONSE TEST

Date of Test: 2/7/2018 Name: Sleight Halley
Analyzer: Type / Model: NO_x, O_2 / CAI 700 Series
Serial Number: 92/ PN # 1712003

Method Referenced: EPA Method 7E

NO_x Results:

Test Gas	Concentration, ppmv or %	Analyzer Output Response ppmv	Interference % of Span (127.0 ppmv)
SO_2	50.59	-0.1	0.08
O_2	21.1	-0.1	0.08
CO	24.21	-0.1	0.08
CO_2	19.43	-0.1	0.08
CH_4	909	-0.1	0.08

A Calibration Cylinder containing 127.0 ppm NO_x was used to calibrate the analyzer.

Results:

Test Gas	Sum of Absolute Differences	Sum of Individual Gases % Interferences	Max Allowable Percent of Span Interference (%)
NO_x	0.5	0.4	2.5

O_2 Results:

Test Gas	Concentration, ppmv or %	Analyzer Output Response %	Interference % of Span (21.1%)
SO_2	50.59	0.01	0.00
CO_2	19.43 / 5.05 O_2	4.97	0.38
CO.	24.21	-0.01	0.00
NO	126.2	-0.01	0.00
NO_2	50.15	0.12	0.57
CH_4	909 / 20.95 O_2	20.95	0.00

A Calibration Cylinder containing 21.1% Oxygen was used to Span Analyzer.

Results:

Test Gas	Sum of Absolute Differences	Sum of Individual Gases % Interferences	Max Allowable Percent of Span Interference (%)
O_2	0.20	0.95	2.5

MONTROSE
AIR QUALITY SERVICES

INTERFERENCE RESPONSE TEST

Date of Test: 3/07/02 Name: Tim Hertel
Analyzer: Type / Model: SO_2 / Ametek 900 Series Serial Number: 000563

Results:

Test Gas	Concentration, ppmv or %	Analyzer Output Response, %	% of Span (180 ppmv)
O_2	20.95%	0.0	0.0
*CO_2	10%	0.0	0.0
**CO	512 ppmv	0.6	0.3

*Used bottle of CO_2 at 100% concentration and diluted it with 100% N2 to get a concentration of about 10% CO_2.

**Used CO cylinder with 5% concentration and diluted it with 100% N_2 to get a concentration of about 500 ppmv CO.

Bias Check:

Test Gas	Concentration, ppmv	Analyzer Output Response, ppmv	Bias Check (%)
SO_2	170.3	170.0	0.2

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI80E15A0138	Reference Number:	153-401643430-1
Cylinder Number:	ALM066309	Cylinder Volume:	150.9 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72019	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Nov 05, 2019

Expiration Date: Nov 05, 2027

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 DIOXIDE	10.00 %	10.07 %	G1	+/- 0.8% NIST Traceable	11/05/2019
OXYGEN	10.00 %	10.02 %	G1	+/- 0.3% NIST Traceable	11/05/2019
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060422	CC413673	7.489 % CARBON DIOXIDE/NITROGEN	0.6%	May 14, 2025
NTRM	11060608	CC338459	14.93 % OXYGEN/NITROGEN	0.2%	Dec 13, 2022

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801550 CO2 HCO2	FTIR	Oct 22, 2019
Horiba MPA-510 W603MM58 O2	O2 Paramagnetic (Mason)	Oct 31, 2019

Triad Data Available Upon Request

Signature on file

Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI60E15A2996	Reference Number:	153-401183959-1
Cylinder Number:	EB0097045	Cylinder Volume:	158.9 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72018	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Apr 23, 2018

Expiration Date: Apr 23, 2026

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 DIOXIDE	19.00 %	18.52 %	G1	+/- 1% NIST Traceable	04/23/2018
OXYGEN	21.00 %	20.28 %	G1	+/- 1% NIST Traceable	04/23/2018
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060726	CC413742	16.939 % CARBON DIOXIDE/NITROGEN	0.6%	May 08, 2019
NTRM	09061433	CC282486	22.53 % OXYGEN/NITROGEN	0.4%	Mar 08, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA-510 SV4MEUTJ CO2	CO2 NDIR (Dixon)	Apr 19, 2018
Horiba MPA-510 X9A4UGL8 O2	O2 Paramagnetic (Dixon)	Apr 18, 2018

Triad Data Available Upon Request

Signature on file

Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI94E15A00E0	Reference Number:	153-401125323-1
Cylinder Number:	CC207681	Cylinder Volume:	146.9 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72018	Valve Outlet:	660
Gas Code:	CO,CO2,NO,NOX,BALN	Certification Date:	Feb 20, 2018

Expiration Date: Feb 20, 2026

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
NOX	500.0 PPM	512.6 PPM	G1	+/- 0.6% NIST Traceable	02/13/2018, 02/20/2018
NITRIC OXIDE	500.0 PPM	510.0 PPM	G1	+/- 0.6% NIST Traceable	02/13/2018, 02/20/2018
CARBON MONOXIDE	550.0 PPM	550.9 PPM	G1	+/- 1% NIST Traceable	02/13/2018
CARBON DIOXIDE	5.000 %	5.022 %	G1	+/- 1% NIST Traceable	02/13/2018
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	15060415	CC449821	496.8 PPM NITRIC OXIDE/NITROGEN	0.5%	May 04, 2021
PRM	12367	APEX1099237	9.82 PPM NITROGEN DIOXIDE/NITROGEN	1.6%	May 29, 2016
GMIS	1114201604	CC507567	4.955 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Nov 14, 2019
NTRM	15060555	CC454021	491.9 PPM CARBON MONOXIDE/NITROGEN	0.6%	Jan 08, 2021
NTRM	13060410	CC413504	7.489 % CARBON DIOXIDE/NITROGEN	0.6%	Jan 14, 2019

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA-510 SV4MEUTJ CO2	CO2 NDIR (Dixon)	Feb 07, 2018
Horiba VIA-510 46E0F8YY LCO	CO NDIR (Dixon)	Jan 25, 2018
Nicolet 6700 AMP0900119 NO MNO	FTIR	Feb 14, 2018
Nicolet 6700 AMP0900119 NO2 impurity	FTIR NO2 impurity	Feb 14, 2018

Triad Data Available Upon Request

Signature on file

Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI94E15A0084	Reference Number:	153-401477335-1
Cylinder Number:	CC161150	Cylinder Volume:	147.0 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72019	Valve Outlet:	660
Gas Code:	CO,CO2,NO,NOX,BALN	Certification Date:	Apr 30, 2019

Expiration Date: Apr 30, 2027

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
NOX	1100 PPM	1118 PPM	G1	+/- 0.7% NIST Traceable	04/23/2019, 04/30/2019
CARBON MONOXIDE	1100 PPM	1086 PPM	G1	+/- 0.4% NIST Traceable	04/23/2019
NITRIC OXIDE	1100 PPM	1116 PPM	G1	+/- 0.7% NIST Traceable	04/23/2019, 04/30/2019
CARBON DIOXIDE	5.000 %	5.019 %	G1	+/- 1.0% NIST Traceable	04/23/2019
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	09010357	KAL004691	970.0 PPM CARBON MONOXIDE/NITROGEN	0.4%	May 14, 2021
PRM	12376	D562879	10.01 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Aug 17, 2018
NTRM	15010303	KAL003293	980.7 PPM NITRIC OXIDE/NITROGEN	0.5%	Aug 21, 2021
GMIS	7301017103	CC506597	4.451 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Dec 18, 2020
NTRM	08010530	K021127	4.954 % CARBON DIOXIDE/NITROGEN	0.5%	Dec 14, 2023

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801550 CO2 HCO2	FTIR	Apr 10, 2019
Horiba VIA-510 46E0F8YY LCO	CO NDIR (Dixon)	Apr 11, 2019
Nicolet 6700 AHR0801550 NO HNO	FTIR	Apr 03, 2019
Nicolet 6700 AHR0801550 NO2 impurity	FTIR NO2 impurity	Apr 04, 2019

Triad Data Available Upon Request

Signature on file

Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0646	Reference Number:	83-124359172-1
Cylinder Number:	SG9139281BAL	Cylinder Volume:	144.4 CF
Laboratory:	124 - Port Allen - LA	Cylinder Pressure:	2015 PSIG
PGVP Number:	B42013	Valve Outlet:	660
Gas Code:	SO2,BALN	Certification Date:	Feb 25, 2013

Expiration Date: Feb 25, 2021

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
SULFUR DIOXIDE	500.0 PPM	490.2 PPM	G1	+/- 0.8% NIST Traceable	02/18/2013, 02/25/2013
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM/SO2	09061002	CC352201	499.3 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	May 15, 2015

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900119 SO2 MSO2	FTIR	Feb 12, 2013

Triad Data Available Upon Request

Signature on file

Approved for Release

SCOTT-MARRIN, INC. PGVP Vendor ID: H12014

6531 Box Springs Blvd • Riverside, CA 92507-0725
Phone: +1(951)653-6780 • Fax: +1(951)653-2430 • www.scottmarrin.com

Report Of Analysis
EPA Protocol Gas Mixtures

S7

HENG01
TO: Horizon Engineering/Infrared NW
Attn: David Bagwell
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

REPORT NO: 61941-01
REPORT DATE: October 5, 2012
CUSTOMER PO NO: 1721

CYLINDER SIZE: 150A (85 std cu ft)
CYLINDER NUMBER: CC57702 **CYLINDER PRESSURE:** 1200 psig

COMPONENT	CONCENTRATION (v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	REPLICATE ANALYSIS DATA
Sulfur dioxide	934 ± 9 ppm	GMIS CYLINDER #: CC104247 @ 1067 ppm	Bovar/W Res Model 922M Serial # 9228379-1 Continuous UV Photometry **LAST CAL DATE:** 8/30/2012	9/26/2012 935 ppm 935 ppm 935 ppm **MEAN:** 935 ppm
Nitrogen	Balance			

EPA EXPIRATION DATE: September 27, 2020

ppm = umole/mole **% = mole-%**

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997. Expiration dates are as amended by Table 2-3 of the EPA Traceability Protocol, Report Number EPA600/R-12/531, dated May 2012.
The above analyses are invalid if the cylinder pressure is less than 150 psig.

ANALYST: Mark Monson M.J.Monson **APPROVED:** J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

CERTIFICATE OF BATCH ANALYSIS

Grade of Product: CEM-CAL ZERO

Part Number:	NI CZ15A	Reference Number:	153-401869915-1
Cylinder Analyzed:	CC723069	Cylinder Volume:	142.0 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2000 PSIG
Analysis Date:	Jul 29, 2020	Valve Outlet:	580
Lot Number:	153-401869915-1		

Expiration Date: Jul 29, 2028

ANALYTICAL RESULTS

Component	Requested Purity	Certified Concentration
NITROGEN	99.9995 %	99.9995 %
CARBON DIOXIDE	< 1.0 PPM	<LDL 0.02 PPM
NOx	< 0.1 PPM	<LDL 0.03 PPM
SO2	< 0.1 PPM	<LDL 0.1 PPM
THC	< 0.1 PPM	<LDL 0.04 PPM
CARBON MONOXIDE	< 0.5 PPM	<LDL 0.03 PPM

Permanent Notes: Airgas certifies that the contents of this cylinder meet the requirements of 40 CFR 72.2

Cylinders in Batch:

AAL-18895, ALM030171, CC212599, CC215320, CC255545, CC322429, CC340119, CC476262, CC476271, CC476820, CC484961, CC486041, CC709761, CC723069, EB0106604, EB0106865, EB0122947, EB0122952, EB0123114, SG9149074BAL

Impurities verified against analytical standards traceable to NIST by weight and/or analysis.

Signature on file

Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0055	Reference Number:	153-401274149-1
Cylinder Number:	CC500374	Cylinder Volume:	144.0 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72018	Valve Outlet:	660
Gas Code:	NO2,BALN	Certification Date:	Aug 28, 2018

Expiration Date: Aug 28, 2021

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
NITROGEN DIOXIDE	50.00 PPM	51.24 PPM	G1	+/- 2%	08/21/2018, 08/28/2018
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	7282071710	CC511229	57.89 PPM NITROGEN DIOXIDE/NITROGEN	1.1%	Dec 18, 2020
PRM	12378	D562913	100.1 PPM NITROGEN DIOXIDE/NITROGEN	1.0%	Sep 04, 2018

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
MKS FTIR NO2 018143349	FTIR	Aug 16, 2018

Triad Data Available Upon Request

PERMANENT NOTES:OXYGEN ADDED TO MAINTAIN STABILITY

Signature on file

Approved for Release

Appendix D.4
Accreditation Information/Certifications

STAC STACK TESTING ACCREDITATION COUNCIL

A2LA American Association for Laboratory Accreditation

Accredited Air Emission Testing Body

A2LA has accredited

MONTROSE AIR QUALITY SERVICES

In recognition of the successful completion of the joint A2LA and Stack Testing Accreditation Council (STAC) evaluation process, this laboratory is accredited to perform testing activities in compliance with ASTM D7036:2004 - Standard Practice for Competence of Air Emission Testing Bodies.

Presented this 11th day of February 2020.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3925.01
Valid to February 28, 2022

This accreditation program is not included under the A2LA ILAC Mutual Recognition Arrangement.

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

JOSEPH M. HEFFERNAN, III

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 17TH DAY OF DECEMBER 2015 AND EFFECTIVE UNTIL DECEMBER 16TH, 2020

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Theresa Lowe, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE NO. 2009-325

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

JOSEPH M. HEFFERNAN, III

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 17TH DAY OF DECEMBER 2015 AND EFFECTIVE UNTIL DECEMBER 16TH, 2020

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Theresa Lowe, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE NO. 2009-325

CERTIFICATE OF COMPLETION

Joe Heffernan III

This document certifies that this individual has passed a comprehensive examination and is now a Qualified Individual (QI) as defined in Section 8.3 of ASTM D7036-04 for the following method(s):

Source Evaluation Society Group 3: *EPA Gaseous Pollutants Instrumental Sampling Methods*

Certificate Number: 006-2019-4

Tate Strickler, Accreditation Director

DATE OF ISSUE: 4/11/19

DATE OF EXPIRATION: 4/11/24

MONTROSE ENVIRONMENTAL

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

JOSEPH M. HEFFERNAN, III

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

ISSUED THIS 18TH DAY OF DECEMBER 2015 AND EFFECTIVE UNTIL DECEMBER 17TH, 2020

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Theresa Lowe, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Bruce Randall, QSTI/QSTO Review Board

CERTIFICATE NO. 2009-325

CERTIFICATE OF COMPLETION

Joe Heffernan

This document certifies that this individual has passed a comprehensive examination and is now a Qualified Individual (QI) as defined in Section 8.3 of ASTM D7036-04 for the following method(s):

EPA SW846 Methods 0050, 0060 & 0061

Certificate Number: 006-2017-106

Tate Strickler, Accreditation Director

DATE OF ISSUE: 10/2/17

DATE OF EXPIRATION: 10/2/22

MONTROSE ENVIRONMENTAL

Appendix D.5
Quality Assurance Program Summary and Equipment Calibration Schedule

QUALITY ASSURANCE PROGRAM SUMMARY AND CERTIFICATIONS

Montrose Air Quality Services, LLC (Montrose) ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance (QA) program. The program is developed and administered by internal QA personnel and encompasses seven major areas:

1. Development and use of an internal QA manual
2. QA reviews of reports, laboratory work, and field testing
3. Equipment calibration and maintenance
4. Chain of custody
5. Continuous training
6. Knowledge of current test methods
7. Audit program

Each of these areas is discussed individually below.

Quality Assurance Manual. Montrose has prepared a QA Manual according to EPA guidelines and ASTM D-7036. The manual serves to document and formalize all of Montrose's QA efforts. The manual is constantly updated, and each employee involved in technical services for emission measurements is required to read, understand its contents, and sign a statement that all work they perform will conform to its practices. The manual includes details on the other seven QA areas discussed below.

QA Reviews. Montrose 's review procedure includes review of each source test report by the QA Manager or equivalent position including data input, calculations and averages, and report text. The laboratory manager or equivalent reviews all laboratory work, and the qualified individual on-site reviews all field work and data sheets.

The most important review is the one that takes place before a test program begins. The QA Manager works with testing personnel to prepare and review test protocols. Test protocol review includes selection of appropriate test procedures, evaluation of any interferences or other restrictions that might preclude use of standard test procedures, and evaluation and/or development of alternate procedures.

Equipment Calibration and Maintenance. The equipment used to conduct the emission measurements is maintained according to the manufacturer's instructions to ensure proper operation. In addition to the maintenance program, calibrations are carried out on each measurement device according to the schedule outlined below. The schedules for maintenance and calibrations are given in Tables A-1 and A-2.

Quality control checks are also conducted in the field for each test program. A partial list of checks made as part of each continuous analyzer system test series is included below as an example of the field QA procedures.

- Sample acquisition and conditioning system leak check
- 3-point analyzer calibrations (all analyzers)
- Complete system calibration check ("dynamic calibration" through entire sample system)

- Periodic analyzer calibration checks are conducted at the start and end of each test run. Any change between pre- and post-test readings are recorded.
- All calibrations are conducted using EPA Protocol gases certified by the manufacturer
- Calibration and continuous analyzer performance data are fully documented, and are included in each source test report

Chain of Custody. Montrose maintains full chain of custody documentation on all samples and data sheets. In addition to normal documentation of changes between field sample custodians, laboratory personnel, and field test personnel, Montrose documents every individual who handles any test component in the field (e.g., probe wash, impinger loading and recovery, filter loading and recovery, etc.).

Samples are stored in a locked area to which only laboratory personnel have access. Neither other Montrose employees nor cleaning crews have keys to this area.

Training. Personnel training is essential to ensure quality testing. Montrose has formal and informal training programs which may include some or all of the following:

1. Attendance at EPA-sponsored training courses
2. A requirement for all technicians to read, understand, and sign Montrose 's QA Manual
3. In-house training and Montrose meetings on a regular basis
4. Maintenance of training records
5. Administration of internal qualified individual (QI) tests for all methods performed
6. Participation in the Qualified Source Testing Individual (QSTI) program administered by the Source Evaluation Society (SES)

Knowledge of Current Test Methods. With the constant updating of standard test methods and the wide variety of emerging test methods, it is essential that any qualified source tester keep abreast of new developments. Montrose subscribes to services which provide updates on EPA reference methods, and on EPA and local agency rules and regulations. Additionally, source test personnel regularly attend and present papers at testing and emission-related seminars and conferences.

Audit Program. Montrose participates in the TNI Stationary Source Audit Sample (SSAS) audit program for all methods for which audit samples are available.

TABLE A-1
SAMPLING INSTRUMENTS AND
EQUIPMENT CALIBRATION SCHEDULE

Instrument Type	Frequency of Calibration[1]	Standard of Comparison or Method of Calibration	Acceptance Limits
Orifice Meter(large)	12 months	Calibrated dry test meter	± 2% of volume measured
Dry Gas Meter	6 months or when repaired	Calibrated dry test meter	± 2% of volume measured
Critical Orifice	6 months	Calibrated dry test meter	± 0.5% of average K’
S-Type Pitot (for use with EPA-type sampling train)	6 months	EPA Method 2	Geometric measurements within method-specified ranges
Vacuum Gauges	12 months	NIST-traceable gauge	≤ 1.0 in Hg difference
Temperature Measurement (thermocouples)	12 months	NBS mercury thermometer or NBS calibrated platinum RTD	±4 °F for <400 °F ± 1.5% for >400 °F
Temperature Readout Devices	6 months	Thermocouple simulator	± 2% full scale reading
Analytical Balance	12 months (check prior to each use)	NIST-traceable weights	± 0.5 mg of stated weight
Probe Nozzles	12 months	Nozzle diameter check	Range <± 0.10 mm for micrometer three measurements
Continuous Analyzers	Every field day, Depends upon use, frequency and performance	As specified by manufacturers’ operating manuals, EPA NBS gases and/or reference methods	Satisfy all limits specified in operating specifications

[1] The tabulated calibration frequencies are minimum standards. In certain instances, calibrations are performed more frequently.

TABLE A-2
EQUIPMENT MAINTENANCE SCHEDULE
Based on Manufacturer's Specifications and Montrose's Experience

Equipment	Performance Requirement	Maintenance Interval[2]	Corrective Action
Pumps	1. Absence of leaks 2. Ability to draw manufacturer required vacuum and flow	6 months	1. Visual inspection 2. Clean 3. Replace worn parts 4. Leak check
Flow Measuring Device	1. Free mechanical movement 2. Absence of malfunction	6 months	1. Visual inspection 2. Clean 3. Calibrate
Sampling Instruments	1. Absence of malfunction 2. Proper response to zero, span gas	As required by the manufacturer	As recommended by manufacturer
Mobile Van Sampling Systems	Absence of leaks	Depends on nature of use	1. Change filters 2. Leak check 3. Check for system contamination
Sampling Lines	Sample degradation less than 2%	After each test or test series	Blow filtered air through line until dry

[2] The tabulated maintenance intervals are minimum standards. In certain instances, maintenance is performed more frequently.

APPENDIX E
REGULATORY INFORMATION

Appendix E.1
Regulatory Correspondence

SOURCE TEST PLAN
2020 COMPLIANCE TESTING
OWENS BROCKWAY GLASS CONTAINER INC.
FURNACE D COLOR CHANGE COMPLIANCE
AMBER GLASS
PORTLAND, OR

Prepared For:

Owens-Brockway Glass Container Inc.
9710 NE Glass Plant Road
Portland, OR 97220

For Submittal To:

Oregon Department of Environmental Quality
4026 Fairview Industrial Drive SE
Salem, OR 97302

Prepared By:

Montrose Air Quality Services, LLC
13585 NE Whitaker Way
Portland, OR 97230

Document Number:	**W006AS-760936-PP-450R1**
Proposed Test Date:	**August 18-19, 2020**
Submittal Date:	**July 17, 2020**
Revision Data:	**July 21, 2020**

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1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

Montrose Air Quality Services, LLC (Montrose) has been contracted by Owens-Brockway Glass Container (Owens-Brockway) to perform a series of air emission tests at the facility located in Portland, Oregon. The tests will be conducted to determine compliance with the source testing limitations of the Oregon Department of Environmental Quality Permit # 26-1876-TV-01. Tests are scheduled to be conducted on August 18-19, 2020. The specific objectives are to:

- Measure O_2, CO_2, SO_2, NOx, PM (total) as PM10, Antimony (Sb), Arsenic (As), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se), Hexavalent Chromium (Cr^{+6}) at the outlet of Furnace D while making amber glass
- Conduct the test program with a focus on safety

Montrose will provide the test personnel and the necessary equipment to measure emissions as outlined in this test plan. Facility personnel will provide the process and production data to be included in the final report. A summary of the test program and proposed schedule is presented in Table 1-1.

TABLE 1-1
SUMMARY OF TEST PROGRAM AND PROPOSED SCHEDULE

Proposed Test Date(s)	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
August 18, 2020	Furnace D	Velocity/Volumetric Flow Rate, Moisture	EPA 1, 2 and 4	3	60
		O_2, CO_2	EPA 3A	3	60
		PM (total) as PM10	EPA 5/202	3	60
		SO_2	EPA 6C	3	60
		NO_x	EPA 7E	3	60
		Post-test thermocouple calibration check	EPA ALT-011	--	--

August 19, 2020	Furnace D	Velocity/Volumetric Flow Rate, Moisture	EPA 1, 2 and 4	3	120
		O_2, CO_2	EPA 3A	3	60
		Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mn, Hg, Ni, Se	EPA 29	3	120
		Cr^{+6}	EPA 0061	3	120
		Post-test thermocouple calibration check	EPA ALT-011	--	--

To simplify this test plan, a list of Units and Abbreviations is included in Appendix A. Throughout this test plan, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

1.2 APPLICABLE REGULATIONS AND EMISSION LIMITS

The results from this test program are presented in units consistent with those listed in the applicable regulations or requirements. The reporting units and emission limits are presented in Table 1-2.

TABLE 1-2
REPORTING UNITS AND EMISSION LIMITS / FACTORS

Unit ID/ Source Name	Parameter	Reporting Units	Emission Limit / Factors	Emission Limit Reference
Furnace D	SO_2	lbs/ton of glass	2.1	Permit 33.b.ii
	NO_x	lbs/ton of glass	3.7	Permit 33.b.ii
	Pb	lbs/ton of glass	$1.65*10^{-3}$	Permit 33.b.ii
	Cr	lbs/ton of glass	.02	40 CFR 63.11451 & Table 1 to Subpart SSSSSS of 40 CFR 63
	PM & PM_{10}	gr/dscf lbs/ton of glass lbs/ton of glass	.10 1 .6	Permit table II Permit table II Permit 33.b.ii

1.3 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	Owens-Brockway Glass Container 9710 NE Glass Plant Road Portland, OR 97220	
Project Contact:	Dennis Buenger, CHMM	Andrew Stewart MBA, CHMM
Role:	Global Environmental Technical Leader	Regional EHS Manager
Telephone:	567-336-7519	419-554-4017
Email:	Dennis.buenger@o-i.com	Andrew.Stewart@o-i.com

Agency Information

Regulatory Agency:	Oregon Department of Environmental Quality
Agency Contact:	Suzanne Blackburn
Telephone:	503-378-5034
Email:	Suzanne.blackburn@state.or.us

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC (Montrose)	
Contact:	Joe Heffernan III	Jeremiah Hicks
Title:	Client Project Manager	Client Account Manager
Telephone:	503-702-8683	440-340-8189
Email:	jheffernan@montrose-env.com	jhicks@montrose-env.com

Laboratory Information

Laboratory:	Chesterlabnet
City, State:	Tigard, OR

Table 1-3 details the roles and responsibilities of the test team.

TABLE 1-3
TEST PERSONNEL AND RESPONSIBILITIES

Role	Primary Assignment	Additional Responsibilities
Client Project Manager	Coordinate Project Operate mobile lab	Post-test follow-up Facility interface, test crew coordination
Field Technicians	Execute stack platform responsibilities	Preparation, support PM

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

The Portland facility is located at 9710 NE Glass Plant Road Portland, Oregon. Owens-Brockway Glass Container Inc. - Plant No. 21 in Portland, Oregon, produces a variety of glass bottles and jars from post-consumer recycled glass with other essential raw materials. The glass manufacturing comprises of the following areas of operations: raw material and cullet receiving and storage, materials blending and transport, glass melting furnaces, glass forming, final bottle treatment, and the maintenance and support systems such as boiler and storage tanks. The plant has four glass melting furnaces (EU4) at their Portland, Oregon, facility (Plant No. 21), but Furnaces B (GM2) and C (GM3) are no longer in operation. The furnace to be tested is Glass Melting Furnaces D (GM4) with an estimated maximum capacity of 190 tons per day.

2.2 FLUE GAS SAMPLING LOCATION

Actual stack measurements, number of traverse points, and location of traverse points will be evaluated in the field as part of the test program. Table 2-1 presents the anticipated stack measurements and traverse points for the sampling locations listed.

TABLE 2-1
SAMPLING LOCATION

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
Furnace D	29	60/≥2	348/12	Isokinetic: 24 (12/port); Gaseous: 3

Sample locations are verified in the field to conform to EPA Method 1. Acceptable cyclonic flow conditions are confirmed prior to testing using EPA Method 1, Section 11.4.

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests will be performed while the Furnace D runs at greater than or equal to 174.6 US tons per day, which represents the 90th percentile of amber production over the past 12 months. There was a total of 85 days of amber production over the last 12-months. In addition, no more than 45.2% cullet will be used which represents the no more than 2 standard deviation from the minimum cullet usage of 30% over the past five years.

Plant personnel are responsible for establishing the test conditions and collecting all applicable unit-operating data. Data collected includes the following parameters:

- Hourly production data and all glass colors for the previous 12 months
- Glass production rate
- Type of glass produced

- Recycled-to-raw material ratios (% cullet)
- % of each cullet type used
- Raw material addition rates
- Natural gas usage
- Electric boost rate
- Bridgewall temperature
- COMS data

2.4 PLANT SAFETY

Montrose will comply with all safety requirements at the facility. The facility Client Sponsor, or designated point of contact, is responsible for ensuring routine compliance with plant entry, health, and safety requirements. The Client Sponsor has the authority to impose or waive facility restrictions. The Montrose test team leader has the authority to negotiate any deviations from the facility restrictions with the Client Sponsor. Any deviations must be documented.

2.4.1 Safety Responsibilities

Planning

- Montrose must complete a field review with the Client Sponsor prior to the project date. The purpose of the review is to develop a scope of work that identifies the conditions, equipment, methods, and physical locations that will be utilized along with any policies or procedures that will affect our work.
- We must reach an agreement on the proper use of client emergency services and ensure that proper response personnel are available, as needed.
- The potential for chemical exposure and actions to be taken in case of exposure must be communicated to Montrose. This information must include expected concentrations of the chemicals and the equipment used to identify the substances.
- Montrose will provide a list of equipment being brought to the site, if required by the client.

Project Day

- Montrose personnel will arrive with the appropriate training and credentials for the activities they will be performing and the equipment that they will operate.
- Our team will meet daily to review the Project Scope, Job Hazard Assessment, and Work Permits. The Client Sponsor and Operations Team are invited to participate.
- Montrose will provide equipment that can interface with the client utilities previously identified in the planning phase and only work with equipment that our client has made ready and prepared for connection.
- We will follow client direction regarding driving safety, safe work permitting, staging of equipment, and other crafts or work in the area.

- As per 40 CFR Part 60 Subpart A, Section 60.8, the facility must provide the following provisions at each sample location:
  - Sampling ports, which meet EPA minimum requirements for testing. The caps should be removed or be hand-tight.
  - Safe sampling platforms.
  - Safe access to the platforms and test ports, including any scaffolding or man lifts.
  - Sufficient utilities to perform all necessary testing.
- Montrose will use the client communication system, as directed, in case of plant or project emergency.
- Any adverse conditions, unplanned shutdowns or other deviations to the agreed scope and project plan must be reviewed with the Client Sponsor prior to continuing work. This will include any safe work permit and hazard assessment updates.

Completion

- Montrose personnel will report any process concerns, incidents or near misses to the Client Sponsor prior to leaving the site.
- Montrose will clean up our work area to the same condition as it was prior to our arrival.
- We will ensure that all utilities, connection points or equipment have been returned to the pre-project condition or as stated in the safe work permit. In addition, we will walk out the job completion with Operations and the Client Sponsor if required by the facility.

2.4.2 Safety Program and Requirements

Montrose has a comprehensive health and safety program that satisfies State and Federal OSHA requirements. The program includes an Illness and Injury Prevention Program, site-specific safety meetings, and training in safety awareness and procedures. The basic elements include:

- All regulatory required policies/procedures and training for OSHA, EPA and FMCSA
- Medical monitoring, as necessary
- Use of Personal Protective Equipment (PPE) and chemical detection equipment
- Hazard communication
- Pre-test and daily toolbox meetings
- Continued evaluation of work and potential hazards.
- Near-miss and incident reporting procedures as required by Montrose and the Client

Montrose will provide standard PPE to employees. The PPE will include but is not limited to; hard hats, safety shoes, glasses with side shields or goggles, hearing protection, hand protections, and fall protection. In addition, our trailers are equipped with four gas detectors to ensure that workspace has no unexpected equipment leaks or other ambient hazards.

The detailed Site Safety Plan for this project is attached to this test plan in Appendix “S”.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 TEST METHODS

The test methods for this test program were presented previously in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

3.1.1 EPA Method 1, Sample and Velocity Traverses for Stationary Sources

EPA Method 1 is used to assure that representative measurements of volumetric flow rate are obtained by dividing the cross-section of the stack or duct into equal areas, and then locating a traverse point within each of the equal areas. Acceptable sample locations must be located at least two stack or duct equivalent diameters downstream from a flow disturbance and one-half equivalent diameter upstream from a flow disturbance.

3.1.2 EPA Method 2, Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Stausscheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1. The molecular weight of the gas stream is determined from independent measurements of O_2, CO_2, and moisture. The stack gas volumetric flow rate is calculated using the measured average velocity head, the area of the duct at the measurement plane, the measured average temperature, the measured duct static pressure, the molecular weight of the gas stream, and the measured moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - S-type pitot tube coefficient is 0.84

3.1.3 EPA Method 3A, Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 3A is an instrumental test method used to measure the concentration of O_2 and CO_2 in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentration of O_2 and CO_2. The performance requirements of the method must be met to validate data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:

  - If the stratification test provisions in section 8.1.2 of Method 7E are used to reduce the number of required sampling points, the alternative acceptance criterion for three point sampling will be ±0.5 percent CO_2 or O_2, and the alternative acceptance criterion for single-point sampling will be ±0.3 percent CO_2 or O_2.
- Target and/or Minimum Required Sample Duration: 60 minutes

3.1.4 EPA Method 4, Determination of Moisture Content in Stack Gas

EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed in an ice water bath. The impingers are weighed after each run to determine the percent moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Condensed water is measured gravimetrically
  - Moisture sampling is performed as part of the pollutant sample trains

3.1.5 EPA Methods 5 and 202, Determination of Particulate Matter from Stationary Sources and Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources

EPA Methods 5 and 202 are manual, isokinetic methods used to measure FPM and CPM emissions. The methods are performed in conjunction with EPA Methods 1 through 4. The stack gas is sampled through a nozzle, probe, heated filter, unheated CPM filter, condenser, and impinger train. FPM is collected from the probe and heater filter. CPM is collected from the unheated CPM filter and the impinger train. The samples are analyzed gravimetrically. The sum of FPM and CPM represents TPM. The FPM, CPM, and TPM results are reported in emission concentration and emission rate units. Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Stainless steel sample nozzles and glass probe liners are used
  - Condensed water is measured gravimetrically
  - TFE or Polyethylene wash bottles and glass sample bottles are used
  - The post-test nitrogen purge is performed by passing nitrogen through the train under pressure
- Minimum Required Sample Duration: 60 minutes
- Minimum Required Sample Volume: 31.8 dscf
- Method 5 Detection Limit: 3 mg
- Method 202 Detection Limit: 4 mg
- Analytical Laboratory: Chesterlabnet Tigard, OR

3.1.6 EPA Method 6C, Determination of Sulfur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 6C is an instrumental test method used to continuously measure emissions of SO_2. Conditioned gas is sent to an ultraviolet (UV) absorption analyzer to measure the concentration of SO_2. The performance requirements of the method must be met to validate the data.

Pertinent information regarding the performance of the method is presented below:

- Method Exceptions:
  - For gaseous emissions sampling, MDL are calculated for each analyzer. The ISDL is equal to the sensitivity of the instrumentation, which is 2% of the span value.
- Target and/or Minimum Required Sample Duration: 60 minutes

3.1.7 EPA Method 7E, Determination of Nitrogen Oxides Emissions from Stationary Source (Instrumental Analyzer Procedure)

EPA Method 7E is an instrumental test method used to continuously measure emissions of NO_x as NO_2. Conditioned gas is sent to a chemiluminescent analyzer to measure the concentration of NO_x. NO and NO_2 can be measured separately or simultaneously together but, for the purposes of this method, NO_x is the sum of NO and NO_2. The performance requirements of the method must be met to validate the data.

Pertinent information regarding the performance of the method is presented below:

- Method Exceptions:
  - For gaseous emissions sampling, MDL are calculated for each analyzer. The ISDL is equal to the sensitivity of the instrumentation, which is 2% of the span value.
- Target and/or Minimum Required Sample Duration: 60 minutes

3.1.8 EPA Method 29, Determination of Metals Emissions from Stationary Sources

EPA Method 29 is a manual, isokinetic test method to measure a variety of metals using inductively coupled argon plasma emission spectroscopy (ICAP) and cold vapor atomic absorption (CVAA) spectroscopy. This method is performed in conjunction with EPA Methods 1-4. A stack sample is withdrawn isokinetically from the source, filterable emissions are collected in the probe and on a heated filter, and condensable emissions are collected in an aqueous acidic solution of hydrogen peroxide (analyzed for all target analytes) and an optional aqueous acidic solution of potassium permanganate (required only when Hg is a target analyte). The recovered samples are digested, and appropriate fractions are analyzed for the target analytes which may include Hg by CVAAS and for Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, P, Se, Ag, Tl, and Zn by ICAP or atomic absorption spectroscopy (AAS). Graphite furnace atomic absorption spectroscopy (GFAAS) is used for analysis of Sb, As, Cd, Co, Pb, Se, and Tl if these elements require greater analytical sensitivity than can be obtained using ICAP. AAS may be used for analysis of all target analytes if the resulting in-stack method detection limits meet the goal of the testing program. Similarly, inductively coupled plasma-mass spectroscopy (ICP-MS) may be used for analysis of Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Ag, Tl and Zn. The results from analysis

of individual fractions of the sample train are summed to obtain the total concentration of each metal per sample train.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - The method is performed for the following target analytes: Antimony (Sb), Arsenic (As), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se)
  - Based on the testing results from 2019 it is anticipated that some metals may be below the detection limit of the test method. If a concentration is below the minimum detection limit of the applicable analytical method then the mass emission rates will be calculated using the applicable minimum detection limit as the concentration value in lieu of a measured concentration.
- Sampling Manual Target and/or Minimum Required Sample Duration: 120 minutes
- Target and/or Minimum Required Sample Volume: 60 dscf
- Analytical Laboratory: Chester Labnet Tigard, OR.

TABLE 3-1
EPA METHOD 29 DETECTION LIMITS

Metal	Detection Limit (µg/L)	Front Half Detection Limit (µg)	Back Half Detection Limit (µg)
Antimony (Sb)	5	1.25	.53
Arsenic (As)	7	1.75	0.70
Beryllium (Be)	0.2	0.05	0.02
Cadmium (Cd)	0.5	0.13	0.05
Chromium (Cr)	0.5	0.13	0.05
Cobalt (Co)	0.5	0.13	0.05
Copper (Cu)	5.0	1.25	0.50
Lead (Pb)	5.0	1.25	0.50
Manganese (Mn)	0.30	0.08	0.03
Mercury (Hg)	0.007	0.022	0.009
Nickel (Ni)	1.00	0.25	0.10
Selenium (Se)	10.00	2.50	1.00

3.1.9 EPA Method SW-846 0061, Determination of Hexavalent Chromium Emissions from Stationary Sources

EPA Method SW-846 0061 is a manual method used to measure hexavalent chromium (Cr^{+6}) emissions. This method is performed in conjunction with EPA Methods 1, 2, 3A, and 4. For incinerators and combustors, the Cr emissions are collected isokinetically from the source. To eliminate the possibility of Cr^{+6} reduction between the nozzle and impinger, the emission samples are collected with a recirculatory train where the impinger reagent is continuously recirculated to the nozzle. Recovery procedures include a post-sampling purge and filtration. The impinger train samples are analyzed for Cr^{+6} by an ion chromatograph equipped with a post-column reactor and a visible wavelength detector. The IC/PCR separates the Cr^{+6} as chromate (CrO_4) from other diphenylcarbazide reactions that occur in the post-column reactor. To increase sensitivity for trace levels of chromium, a preconcentration system may also be used in conjunction with the IC/PCR.

- Method Options:
  - An air-cooled probe will be used due to elevated stack temperatures above 300F
- Method Exceptions:
  - We request that NaOH be used as the impinger solution in lieu of KOH. We've found that NaOH has much lower background contamination and is Chester Labnets recommended reagent for this sampling as it doesn't melt their IC column
- Target and/or Minimum Required Sample Duration: 120 minutes
- Target and/or Minimum Required Sample Volume: 60 dscf
- Detection Limit: 0.02 µg/L
- Based on the testing results from 2019 120 minutes of total sample time shall be enough to satisfy the detection limit requirements of Section 2.7.a of the ODEQ Source Sampling Manual. If a concentration is below the minimum detection limit of the applicable analytical method then the mass emission rates will be calculated using the applicable minimum detection limit as the concentration value in lieu of a measured concentration
- Analytical Laboratory: Chester Labnet, Tigard, OR

3.1.10 EPA Method ALT-011, Alternative Method 2 Thermocouple Calibration

EPA Approved Alternative Method 011 (ALT-011) is used as an alternative to the EPA Method 2 two-point thermocouple calibration. This procedure involves a single-point in-field check using a reference thermometer to confirm that the thermocouple system is operating properly. The temperatures of the thermocouple and reference thermometers shall agree to within ±2 °F.

3.2 PROCESS TEST METHODS

The applicable regulations do not require process samples to be collected during this test program.

4.0 QUALITY ASSURANCE AND REPORTING

4.1 QA AUDITS

Montrose has instituted a rigorous QA/QC program for its air quality testing. Quality assurance audits are performed as part of the test program to ensure that the results are calculated using the highest quality data available. This program ensures that the emissions data we report are as accurate as possible. The procedures included in the cited reference methods are followed during preparation, sampling, calibration, and analysis. Montrose is responsible for preparation, calibration, and cleaning of the sampling apparatus. Montrose will also perform the sampling, sample recovery, storage, and shipping. Approved contract laboratories may perform some of the preparation and sample analyses, as needed.

4.2 QUALITY CONTROL PROCEDURES

Montrose calibrates and maintains equipment as required by the methods performed and applicable regulatory guidance. Montrose follows internal procedures to prevent the use of malfunctioning or inoperable equipment in test programs. All equipment is operated by trained personnel. Any incidence of nonconforming work encountered during testing is reported and addressed through the corrective action system.

4.2.1 Equipment Inspection and Maintenance

Each piece of field equipment that requires calibration is assigned a unique identification number to allow tracking of its calibration history. All field equipment is visually inspected prior to testing and includes pre-test calibration checks as required by the test method or regulatory agency.

4.2.2 Audit Samples

When required by the test method and available, Montrose obtains EPA TNI SSAS audit samples from an accredited provider for analysis along with the samples. Currently, the SSAS program has been suspended pending the availability of a second accredited audit sample provider. If the program is reinstated, the audit samples will be ordered. If required as part of the test program, the audit samples are stored, shipped, and analyzed along with the emissions samples collected during the test program. The audit sample results are reported along with the emissions sample results.

4.3 DATA ANALYSIS AND VALIDATION

Montrose converts the raw field, laboratory, and process data to reporting units consistent with the permit or subpart. Calculations are made using proprietary computer spreadsheets or data acquisition systems. One run of each test method is also verified using a separate example calculation. The example calculations are checked against the spreadsheet results and are included in the final report. The “Standard Conditions” for this project are 29.92 inches of mercury and 68 °F.

4.4 SAMPLE IDENTIFICATION AND CUSTODY

The on-site Field Project Manager will assume or assign the role of sample and data custodian until relinquishing custody. The sample custodian will follow proper custody procedures before departing from the test site including:

- Assign the unique sample identification number to each sample
- Attach sample labels and integrity seals to all samples
- Complete COC form(s), ensuring that the sample identification numbers on the samples match the sample identification numbers on the COC
- Pack and store samples in accordance with the test method requirements in appropriate transport containers for protection from breakage, contamination, or loss
- Keep samples in a secure locked area if not in the direct presence of Montrose staff

The sample custodian will follow proper custody procedures upon arriving at the Montrose office including:

- Remove samples and COC documents from vehicles and check into designated secure sample holding areas
- Store samples requiring additional measures such as refrigeration or dry ice appropriately

4.5 QUALITY STATEMENT

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the appendices. The content of this test plan is modeled after the EPA Emission Measurement Center Guideline Document (GD-042).

4.6 REPORTING

Montrose will prepare a final report to present the test data, calculations/equations, descriptions, and results. Prior to release by Montrose, each report is reviewed and certified by the project manager and their supervisor, or a peer. Source test reports will be submitted to the facility or appropriate regulatory agency (upon customer approval) within 45 days of the completion of the field work. The report will include a series of appendices to present copies of the intermediate calculations and example calculations, raw field data, laboratory analysis data, process data, and equipment calibration data.

4.6.1 Example Report Format

The report is divided into various sections describing the different aspects of the source testing program. Table 4-1 presents a typical Table of Contents for the final report.

TABLE 4-1
TYPICAL REPORT FORMAT

Cover Page	
Certification of Report	
Table of Contents	
Section	
1.0	INTRODUCTION
2.0	PLANT AND SAMPLING LOCATION DESCRIPTIONS
3.0	SAMPLING AND ANALYTICAL PROCEDURES
4.0	TEST DISCUSSION AND RESULTS
5.0	INTERNAL QA/QC ACTIVITIES
Appendices	
A	FIELD DATA AND CALCULATIONS
B	FACILITY PROCESS DATA
C	LABORATORY ANALYSIS DATA
D	QUALITY ASSURANCE/QUALITY CONTROL
E	REGULATORY INFORMATION

4.6.2 Example Presentation of Test Results

Table 4-2 presents the typical tabular format that is used to summarize the results in the final source test report. Separate tables will outline the results for each target analyte and compare them to their respective emissions limits.

TABLE 4-2
EXAMPLE EMISSIONS RESULTS -
FURNACE D

Run Number	1	2	3	Average
Date	X	X	X	--
Time	X	X	X	--
Process Data				
Hourly production data and all glass colors for the previous 12 months				
Glass production	X	X	X	X
% cullet	X	X	X	X
Natural gas usage	X	X	X	X
Electric boost rate	X	X	X	X
Bridgewall temperature	X	X	X	X
Flue Gas Parameters				
O_2, % volume dry	X	X	X	X
CO_2, % volume dry	X	X	X	X
flue gas temperature, °F	X	X	X	X
moisture content, % volume	X	X	X	X
volumetric flow rate, dscfm	X	X	X	X
Species Emissions: PM as PM_{10}				
gr/dscf	X	X	X	X
lb/hr	X	X	X	X
tons/yr	X	X	X	X
lbs/ton of glass	X	X	X	X
g/kg glass	X	X	X	X
Species Emissions: SO_2, NO_x				
ppm	X	X	X	X
lb/hr	X	X	X	X
lbs/ton of glass	X	X	X	X
tons/yr	X	X	X	X
	X	X	X	X
Species Emissions: Multi-metals				
µg/dscm	X	X	X	X
lb/hr	X	X	X	X
tons/yr	X	X	X	X
lbs/ton of glass	X	X	X	X
g/kg glass	X	X	X	X

Oregon
Kate Brown, Governor

Department of Environmental Quality
Agency Headquarters
700 NE Multnomah Street, Suite 600
Portland, OR 97232
(503) 229-5696
FAX (503) 229-6124
TTY 711

July 23, 2020

Andrew Stewart
Owens-Brockway Glass Container
9710 NE Glass Plant Rd.
Portland, OR 97220

Mr. Stewart,

We have reviewed the revised source test plan submitted by Owens-Brockway Glass Container (Owens) on July 21, 2020 as required by the Cleaner Air Oregon (CAO) process. Based on our review the source test plan is approved with the following comments.

General Comments

DEQ approves the requested method deviations to use quartz probes and nozzles instead of Teflon and the use of NaOH as the reagent instead of KOH for the Method SW-846 0061 testing. The source test report should include an evaluation of the impact of this deviation on the test data.

All further modifications and/or alternatives to testing methods or procedures that are implemented to satisfy DEQ testing requirements must receive approval from DEQ prior to their use in the field. Changes not acknowledged by the DEQ could be the basis for invalidating an entire test run and potentially the entire testing program.

The source test plan includes testing for SO_2, NO_X and Particulate Matter. Testing for those pollutants was not required by the February 6, 2020 letter requiring test on Furnace D while producing amber glass. DEQ has reviewed and approves the additional testing.

The source test plan was required to be submitted 30 days before conducting the source test. Source testing is scheduled for August 18-19, 2020. DEQ received the initial, incomplete test plan on July 20 that did not include sampling for all of the required air toxics. A revised test plan with the correct list of air toxics was submitted on July 21, 2020.

DEQ appreciates the continued assistance with this process. The results will provide valuable information that will help us better understand emissions from the facility, and allow for completing the CAO emissions inventory. If you have any questions or concerns please contact me directly. Thank you for your continued efforts with this process.

Sincerely,

Thomas Rhodes

Thomas Rhodes
DEQ CAO Source Test Coordinator

Cc: Dennis Buenger, Owens-Brockway Glass Container
Keith Johnson, DEQ
Kenzie Billings, DEQ

26-1876 Owens-Brockway Glass Container

Steve Dietrich, DEQ
George Yun, DEQ

Appendix E.2
Permit Excerpts

Table-II. Requirements for GM1 and GM4 Furnaces

Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Monitoring Condition
40 CFR 60.293(b)	12	PM/PM_{10}	1 lb PM/ton glass	Source Testing	13
340-226-0210(2)(a)	14	PM/PM_{10}	0.10 gr/scf	Source Testing	13, 35
40 CFR 60.293(c)	15 & 16	Opacity	See Condition 15	COMS	15 & 16
340-208-0110	17	Opacity	< 20%, 6 min block avg.	COMS	18
AQ/V-NWR-11-092	19	Opacity	Corrective Action Plan	I&M Recordkeeping	19
40 CFR 63.11451	20	Metal HAPs	0.02 lb HAPs/ton glass (glass manufacturing metal HAPs)	Source Testing I&M Recordkeeping	21 22

12. **PARTICULATE MATTER NSPS EMISSIONS STANDARD FOR GM1 & GM4 FURNACES:** The emissions of particulate matter from glass melting furnaces GM1 or GM4 must not exceed 0.5 grams per kilogram of glass produced (1 lb PM/ton glass), as measure in accordance with methods and procedures specified in Condition 13. [40 CFR 60.293 (b)(1)]

13. **TESTING REQUIREMENT FOR GM1 & GM4:** Within 5 years from the date of the previous source test and every 5 years thereafter, the permittee must determine the PM emissions from glass melting furnaces GM1 and GM4 in accordance with the following methods and procedures:

13.a. Compute the PM emission rate from each furnace using the following equation:

$$E = ((c_s Q_{sd}) - A) / P$$

where:
- E = emission rate of particulate matter, g/kg
- c_s = concentration of particulate matter, g/dscm
- Q_{sd} = volumetric flow rate, dscm/hr
- A = zero production rate correction, 227 g/hr
- P = glass production rate, kg/hr

13.b. Use EPA method 5 to determine the PM concentration (c_s) and volumetric flow rate (Q_{sd}) of the effluent gas. The sampling time and sample volume for each run must be at least 60 minutes and 0.90 dscm (31.8 dscf).

13.c. Use direct measurement or material balance using good engineering practice to determine the amount of glass pulled during the performance test.

---

14. **PARTICULATE MATTER EMISSIONS STANDARD FOR GM1 & GM4 FURNACES:** The permittee must not cause or allow the emissions of particulate matter in excess of 0.10 grain per dry standard cubic foot, from glass melting furnaces GM1 and GM4. Particulate matter emissions can be calculated from the source test results obtained from Condition 35. [OAR 340-226-0210]

PLANT SITE EMISSION LIMITS

32. **ANNUAL PSEL REQUIREMENT:** The plant site emissions must not exceed the following limits for any 12 consecutive calendar month period: [OAR 340-222-0035 through OAR 340-222-0041]:

Pollutant:	PM_{10}	$PM_{2.5}$	SO_2	NO_x	CO	VOC	GHG (CO_{2e})	Pb
PSEL: (tons/yr)	109	100	184	382	99	39	100,521	0.5

33. **MONITOR AND RECORD:** The permittee must determine compliance with the Plant Site Emissions Limits specified in Condition 32 in accordance with the procedures, test methods, and frequencies identified in this condition. The permittee must retain records of all parameters used to determine compliance with the PSEL:

33.a. The permittee must monitor and maintain monthly and annual records of the following material and process parameters:

Operating Parameter (P_i)		EU ID	Min. frequency	Method
Raw materials (tons) processed, excluding cullet	P_1	EU1	monthly	Recordkeeping
Cullet (tons) processed	P_2	EU2	monthly	Recordkeeping
Raw materials (tons) processed	P_3	EU3	monthly	Recordkeeping
Glass (tons) melted Natural Gas (10^6 ft^3) burned	P_4	GM1 & GM4	monthly	Production Records, Fuel usage from meter/ gauge readings, etc.
Swab materials (lbs) used (MS1-4). MBTT (tons) used (HEST1-4).	P_5	EU5	monthly	Recordkeeping
Natural Gas (10^6 ft^3) burned	P_6	EU6	monthly	Fuel usage estimates from meter/gauge readings.
Natural Gas (10^6 ft^3) burned Fuel Oil (gallons) burned	P_7	EU7	monthly	
Estimated hours of operations.	P_{10}	EU10	monthly	Recordkeeping

33.b. At the end of each month, calculate the monthly emissions from each of the emissions units identified by applying operating parameter (P_i) identified in Condition 33.a and the emission factors identified for that unit and specific pollutant specified in this Condition 33.b below:

$$E_{MO,i} = P_i \; EF_{i,j} \; K$$

where: $E_{MO,i}$ = monthly pollutant emissions from individual EU_i; lbs/month, or tons/month.
P_i = operating parameters identified in Condition 33.a.
$EF_{i,j}$ = emission factor for the pollutant and EU identified in this condition.
K = Conversion factor; 1 ton/2,000 lbs

Emissions of fine particulate matter, $PM_{2.5}$ is
$E_{PM2.5} = 0.92 \times E_{PM10}$

33.b.i. Emission Factors (EF_i) for Process emissions units EU1, EU2, EU3, EU5, EU10

Emissions Unit	PM_{10}	SO_2	VOC	Unit
EU1	18×10^{-4}	--	--	lbs/ton raw materials
EU2	18×10^{-2}	--	--	lbs/ton cullet
EU3	18×10^{-4}	--	--	lbs/ton raw materials
EU5	1 22	-- --	-- 90	lbs/lb swab material lbs/ton MBTT used
EU10	0.2	--	--	lbs/hr operated (-A-)

(-A-) multiply EF to estimated number of hours operated in month or year. Default = 8760 hrs/yr.

33.b.ii. Emission Factors (EF_i) for EU4 Glass Melting Furnaces

EU ID	Parameter	PM_{10} (2)	SO_2 (1)	NO_X	CO	VOC	Pb	UNIT
EU4	Natural Gas	-b-	-b-	-b-	35	5.8	--	lbs/10^6 ft^3
GM1	Glass melted	0.7	2.1	4.7	-a-	-a-	1.65×0^{-3}	lbs/ton glass
GM4	Glass melted	0.6	2.1	3.7	-a-	-a-	1.65×10^{-3}	lbs/ton glass

(1) SO_2 EF for oil is a function of sulfur content (%S), which is obtained per monitoring specified in Condition 27.
(2) **96% of PM/PM_{10}** is consider to be $PM_{2.5}$
-a- The CO & VOC emissions from the furnaces are a function of the NG combustion.
-b- The emissions are reported under emissions from glass melting.

33.b.iii. Emission Factors (EF_i) for Combustion emissions units EU6 & EU7.

EU ID	Fuel	PM_{10}	SO_2	NO_X	CO	VOC	UNIT
EU6	Nat. gas(-3-)	2.5	2.6	100	21	5.8	lbs/10^6 ft^3
EU7	Nat. gas(-3-)	2.5	2.6	140	35	5.8	lbs/10^6 ft^3
	Distillate Oil	2	142 (%S)	20	5	0.56	lbs/10^3 gal

(3) The permittee is allowed to switch from/to NG to/from Propane (LPG) at any time.

33.c. The compliance with the annual PSELs set forth in Condition 32 is determined 12 times per year. At the end of each month, add up the monthly emissions for each criteria pollutant for the previous 12 month period:

$$E_{Annual} = \sum_{Past\ 12\text{-}month} E_{MO,i}$$

33.d. The emissions factors listed in Condition 33.b, by themselves, are not enforceable limits. The operating parameters monitored per Conditions 33.a and emission factors provided in condition 33.b shall only be used to determine compliance with PSELs.

Table 1 to Subpart SSSSSS of Part 63—Emission Limits

As required in §63.11451, you must comply with each emission limit that applies to you according to the following table:

For each. . .	You must meet one of the following emission limits. . .
1. New or existing glass melting furnace that produces glass at an annual rate of at least 45 Mg/yr (50 tpy) AND is charged with compounds of arsenic, cadmium, chromium, manganese, lead, or nickel as raw materials	a. The 3-hour block average production-based PM mass emission rate must not exceed 0.1 gram per kilogram (g/kg) (0.2 pound per ton (lb/ton)) of glass produced; OR b. The 3-hour block average production-based metal HAP mass emission rate must not exceed 0.01 g/kg (0.02 lb/ton) of glass produced.

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If you have any questions, please contact one of the following individuals by email or phone.

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