EMISSION TEST REPORT

Report Title	RESULTS FOR THE VERIFICATION OF VOLATILE ORGANIC COMPOUND CAPTURE EFFICIENCY FOR COATING PROCESSES
Report Date	June 25, 2019
Test Date	June 20, 2019

Facility Information	
Name	Pioneer Metal Finishing Industrial Hwy facility
Street Address	24600 Industrial Hwy.
City, County	Warren, Macomb
Phone	(586) 759-3559

Facility Permit Information	
Permit to Install:	MI-PTI-2-03M

Testing Contractor	
Company	Impact Compliance & Testing, Inc.
Mailing Address	39395 Schoolcraft Road Livonia, Michigan 48150
Phone	(734) 464-3880
Project No.	1900041

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EMISSION TEST REPORT

RESULTS FOR THE VERIFICATION OF VOLATILE ORGANIC COMPOUND CAPTURE EFFICIENCY FOR COATING PROCESSES

PIONEER METAL FINISHING
WARREN, MICHIGAN

1.0 INTRODUCTION

Pioneer Metal Finishing (Pioneer Metal) operates a metal parts coating facility located at 24600 Industrial Hwy., Warren, Macomb County, Michigan (Industrial Hwy facility, State Registration No. N5747). Coating is transferred metal parts using dip and spray application and dried or cured in coating ovens. The coating lines are equipped with a process air collection system that exhausts captured volatile organic compounds (VOC) to a regenerative thermal oxidizer (RTO) for VOC reduction.

Pioneer Metal received a State of Michigan Permit to Install (PTI No. 2-03M issued February 6, 2015) from the Michigan Department of Environment, Great Lakes, and Energy - Air Quality Division (EGLE-AQD) that specifies capture and control system requirements for its coating lines. The PTI requires Pioneer Metal to demonstrate VOC capture efficiency of its three (3) large dip-spin coating lines using the smoke tube test method. At the same time, the facility is required to verify capture efficiency of the three chain-on-edge coating lines (COE 2 and 3) and a stand-alone batch oven.

A Test Plan for the capture efficiency demonstration was originally submitted to the EGLE-AQD in May 2014. Following approval of the procedures specified in the Test Notification, capture efficiency testing was performed in June 2014, December 2014, June 2015, December 2015, July 2016, December 2016, June 2017, January 2018, June 2018, December 2018, and June 2019. The capture efficiency demonstration is required to be performed semi-annually and will be repeated in December 2019 by Impact Compliance & Testing, Inc. (ICT) representatives. The project was coordinated by Jay Cronin, Process Control Manager for Pioneer Metal. The EGLE-AQD was notified in May 2019 of the planned capture efficiency testing of test date of June 20, 2019.

Questions regarding this emission test report should be directed to:

Tyler J. Wilson
Senior Project Manager
Impact Compliance & Testing, Inc.
39395 Schoolcraft Road
Livonia, MI 48150
(734) 464-3880

Mr. Jay Cronin
Process Control Manager
Pioneer Metal Finishing
24600 Industrial Hwy.
Warren, MI 48089
(586) 480-1703

1.1 Report Certification

A Renewable Operating Permit Report Certification Form (EQP 5736) signed by the Pioneer Metal Responsible Official (or the Responsible Official's authorized representative) accompanies this report.

This test report was prepared by Impact Compliance & Testing, Inc. based on the field sampling data collected by Impact Compliance & Testing, Inc. I certify that the testing was conducted in accordance with the approved test plan unless otherwise specified in this report. I believe the information provided in this report and its attachments are true, accurate, and complete.

Report Prepared By:

Tyler J. Wilson
Senior Project Manager
Impact Compliance & Testing, Inc.

2.0 SUMMARY OF RESULTS

VOC capture efficiency for three (3) large dip-spin coating lines was evaluated using the smoke tube test method; observation of the airflow direction of visual smoke at enclosure openings. Smoke observations were also performed for the oven associated with one chain-on-edge coating line (COE2), a stand-alone batch oven, and a small dip-spin line (Model 10).

Capture efficiency for the spray booths associated with COE2 and COE3 and a small dip-spin line (Model 10) was verified using differential pressure measurements.

The results of the capture efficiency evaluation are presented in Table 2.1 below. All enclosures are connected to the VOC collection system and exhibited inward flow as indicated by the observation of air current smoke. The average measured differential pressure for all enclosures classified as permanent total enclosures (PTE) satisfied the PTE criteria of maintaining a differential pressure (vacuum) of at least 0.007 inches of water as compared to the surrounding environment, except for the small dip-spin line (Model 10) which is no longer required to maintain a differential pressure (vacuum) of at least 0.007 inches of water.

Table 2.1 Summary of capture efficiency test results for each coating line

Emission Unit Coating Process	Smoke Tube Verified Inward Flow (Y/N)	Differential Pressure (inches w.c.)
EU-LINE1-MODEL24	Y	NA
EU-LINE4-COE2 (Primer Booth)	Y	-0.020
EU-LINE4-COE2 (Topcoat Booth)	Y	-0.011
EU-LINE4-COE2 (Oven)	Y	NA
EU-LINE5-COE3	Y	-0.020
EU-LINE6-MODEL10	Y	-0.005
EU-LINE7-MODEL25	Y	NA
EULINE13-MODEL26	Y	NA
EUBATCHOVEN	Y	NA

NA These systems are classified as non-fugitive enclosures. Differential pressure measurements not required.

3.0 SOURCE DESCRIPTION

3.1 Coating Line Processes

Pioneer Metal operates a number of spay and dip coating processes:

- Three (3) large dip-spin coating lines that are identified as EU-LINE1-MODEL24, EU-LINE7-MODEL25, and EU-LINE13-MODEL26 in the PTI.
- A small dip-spin coating line (EU-LINE6-MODEL) that operates as a permanent total enclosure (PTE).
- One (1) chain-on-edge (COE) coating line, identified as EU-LINE4-COE2 in the PTI, that consist of a continuously moving chain, two spray booths and a curing oven. The booths operate as PTEs; the curing oven operates as a non-fugitive enclosure.
- A Sprimag COE spray coating line, identified as EU-LINE5-COE3 in the PTI. The Sprimag line is an enclosed conveyorized coating line used for coating the interior surface of metal parts. The line is operated as a PTE from the coating section through the attached curing oven.
- A batch oven (identified as EUBATCHOVEN in the PTI) that is a stand-alone enclosed oven. Parts are loaded into the oven in bulk on carts, containers, or pallets and the oven is sealed (door secured closed) while in operation.
- Four (4) Tumble Spray coating lines. In these lines the parts are tumbled within a sealed drum while the coating is spray applied with an HVLP applicator. During operation the tumble spray cover is in the closed position and the opening is sealed by the vacuum caused by the evacuation fan. There are no natural draft openings while the unit is in operation.

3.2 Type of Raw Materials Used

The coatings applied by the processes are either for corrosion resistance, adhesion, or surface priming. The high performance coatings are primarily solvent based, though some waterborne formulations are used. These coatings are received from the manufacturer and diluted (reduced) with organic solvents or water prior to their application.

3.3 Emission Control System Description

Solvent laden air from the individual processes is combined in a mixing plenum near the center of the facility and exhausted to the RTO emissions control system.

The RTO system consists of a variable frequency drive (VFD) fan, three (3) energy recovery columns packed with ceramic heat exchange media and a high-temperature combustion chamber containing natural gas-fired burners. The VFD fan maintains an appropriate vacuum within the process air collection system and directs the collected air to the RTO unit where it is oxidized (combusted) at high temperatures.

The RTO effluent gas is released to atmosphere via a rectangular vertical exhaust stack.

3.4 Process Operating Conditions During the Compliance Testing

During the capture efficiency evaluation, the coating processes operated normally. Tumble Spray No. 1 was not operating during all of the observations of the tumble spray lines because it were shut down for maintenance. Tumble Spray Nos. 2 and 3 were not operating during some of the observations of the tumble spray lines because they were not coating parts at that time. Tumble Spray No. 4 was not operating during all of the observations of the tumble spray lines because it has been uninstalled and removed from operation completely. All other lines applied solvent-based coating at typical application rates.

The RTO inlet fan was operated normally to maintain an appropriate vacuum within the main air collection header. The fan operated at 60.0 Hertz (Hz) as indicated by the VFD output display, which resulted in a captured gas volumetric flowrate of 19,077 actual cubic feet per minute (acfm) based on airflow measurements performed at the inlet to the RTO fan.

The RTO combustion chamber temperature was set at 1,500°F and ranged between 1,504°F and 1,513°F during the testing as observed by the test crew (based on intermittent observations, not continuous monitoring records).

A summary of the VOC capture and emission control system operating parameters during the test event is presented in Table 3.1 below.

Attachment 1 provides RTO operating records and flowrate measurements for the capture efficiency evaluation period.

Table 3.1 VOC capture and emission control system-operating parameters

Operating parameter	Value	
Average fan speed	60.0	Hz
Average RTO inlet vacuum	-1.1	in wc
Avg RTO inlet flowrate, actual	19,077	acfm
Avg RTO inlet flowrate, standard	16,540	scfm
Chamber temperature setpoint	1,500	°F
Chamber temp (min.)	1,504	°F
Chamber temp (max.)	1,513	°F

4.0 SAMPLING AND ANALYTICAL PROCEDURES

A description of the sampling and analytical procedures is provided in the previous Test Plan dated May 21, 2014, which was approved by the EGLE-AQD. Following approval of the procedures specified in the Test Plan, a Test Notification was sent to the EGLE-AQD for this test event and capture efficiency testing was performed on June 20, 2019. The capture efficiency demonstration is required to be performed semi-annually and will be repeated in December 2019.

This section provides a summary of the capture efficiency verification procedures.

4.1 Smoke Tube Air Current Observations for Non-Fugitive Enclosures

Ventilation or air current smoke tubes were used to observe the direction of air flow for the air collection systems associated with the three (3) large dip-spin lines (Model 24, 25 and 26), chain on edge oven (COE2), batch oven, and small dip-spin (Model 10).

The smoke tube was placed in front of each natural draft opening, an adequate amount of smoke was generated manually using the squeeze bulb, and the direction of airflow (into or out of the natural draft opening) was noted. All natural draft openings for each process were tested and recorded on a data sheet.

Attachment 2 provides field data sheets that were used to identify natural draft openings and record the direction of airflow.

4.2 Differential Pressure Measurements for Permanent Total Enclosures

Enclosure differential pressure measurements for the chain-on-edge coating booths (COE2), Sprimag Booth/Oven and the Model#10 dip-spin line was performed using a Heise® PTE-1 Handheld Pressure Calibrator.

Prior to use, the pressure measurement instrument performs a self zero and calibration procedure. To measure enclosure differential pressure, the low-pressure side of the differential pressure measurement cell was connected by flexible tubing to a port installed on the enclosure wall (or inserted into the enclosure if a measurement port doesn't exist) and the high-pressure side of the measurement cell was open to the surrounding environment. Five (5) individual differential pressure (inches water column) readings were recorded using the 'hold' function on the instrument. The average recorded differential pressure was calculated for each enclosure.

Attachment 3 provides field data sheets that were used to record differential pressure readings.

4.3 Captured Gas Flowrate to the RTO

The captured gas volumetric flowrate was measured at the inlet to the RTO near the beginning and end of the capture efficiency evaluation period. The sampling location for the combined coating line exhaust (RTO inlet) is in the 30-inch diameter duct exterior to the facility wall.

Velocity traverse locations for the sampling points were determined in accordance with USEPA Method 1. The exhaust gas velocity pressure and temperature were measured at each sampling location in accordance with USEPA Method 2. An S-type Pitot tube connected to a red-oil manometer was used to determine velocity pressure and a K-type thermocouple mounted to the Pitot tube was used for temperature measurements. The Pitot tube and connective tubing were leak-checked to verify the integrity of the measurement system onsite, prior to the test event. The gas molecular weight was verified using a Fyrite® combustion gas analyzer. A summary of the volumetric airflow measurement methods is summarized below:

Method 1	Velocity and sampling locations were selected based on physical duct measurements in accordance with USEPA Method 1.
Method 2	Gas velocity pressure were determined using a Type-S Pitot tube connected to a red oil incline manometer. Exhaust gas temperature will be measured using a K-type thermocouple connected to the Pitot tube.
Method 3	RTO inlet gas O_2 and CO_2 content were determined by Fyrite® combustion gas analyzer.
Method 4	RTO inlet gas moisture was determined by wet bulb/dry bulb temperature measurements.

The velocity measurement field data sheets and flowrate calculations are provided in Attachment 1 with the RTO operating data.

5.0 TEST RESULTS AND DISCUSSION

5.1 Evaluation of Test Results

The results of the capture efficiency evaluation are presented in Table 2.1. All enclosures are connected to the VOC collection system and exhibited inward flow as indicated by the observation of air current smoke.

The average measured differential pressure for all enclosures classified as permanent total enclosures exceeded -0.007 inches of water (the PTE criteria), except for the small dip-spin line (Model 10), which is no longer required to meet this criteria.

The captured gas (RTO inlet) flowrate measured on June 20, 2019 was comparable to that measured on December 21, 2018 (16,540 scfm compared to 16,919 scfm).

5.2 Variations from Normal Sampling Procedures or Operating Conditions

The testing was performed in accordance with the Test Notification dated November 21, 2018. During the testing program the coating lines were operated at normal operating conditions, at or near maximum capacity and satisfied the parameters specified in the EGLE-AQD test plan approval letter.

ATTACHMENT 1

RTO OPERATING RECORDS AND FLOWRATE MEASUREMENTS

EXHAUST GAS VELOCITY, MOISTURE, AND FLOWRATE CALCULATION SHEET

Company	PMF-Industrial Hwy		
Source Designation	Oxidizer Inlet	**Pitot Tube Number**	4F-3
Test Date	6/20/2019	**Pitot Tube Corr. Factor**	0.84
Test Number	Pre	**% CO_2**	0.0
Time	8:35	**% O_2**	20.9
Barometric Press. (in. Hg)	28.98	**% CO**	0.0
Stack Static Press. (in w.c.)	-3.50	**% N_2**	79.1
Stack Diameter (in.)	30		
Traverse points	16	**Wet Bulb Temp (°F)**	85.0
Operator	BB/JV	**Moisture Content (%)**	2.8

Traverse Point Number	Stack Temp. (°F)	Velocity Pres. ("H_2O)	Traverse Point Number	Stack Temp. (°F)	Velocity Pres. ("H_2O)
Side A			Side B		
1	127	0.80	1	122	1.20
2	128	0.95	2	118	1.20
3	128	0.95	3	120	1.30
4	128	0.95	4	123	1.30
5	128	0.95	5	124	1.30
6	125	1.20	6	126	1.30
7	126	1.20	7	127	1.20
8	127	1.30	8	127	1.30
Average	127	1.04		123	1.26

Average Velocity Pressure Sqrt ("H_2O)	1.069
Stack Pressure ("Hg)	28.72
Moisture Content (Bws)	0.028
Stack Gas Molecular Weight (dry, Md)	28.84
Stack Gas Molecular Weight (Ms)	28.54
Stack Gas Specific Gravity (Gs)	0.99
Average Stack Temperature (°F)	125
Average Stack Velocity (fps)	64.9
Average Stack Velocity (fpm)	3,893
Area of Stack (ft^2)	4.909
Flowrate (Actual-CFM)	19,111
Flowrate (Standard Wet-SCFM)	16,556
Flowrate (Standard Dry-DSCFM)	16,098

EXHAUST GAS VELOCITY, MOISTURE, AND FLOWRATE CALCULATION SHEET

Company	PMF-Industrial Hwy		
Source Designation	Oxidizer Inlet	**Pitot Tube Number**	4F-3
Test Date	6/20/2019	**Pitot Tube Corr. Factor**	0.84
Test Number	Post	**% CO_2**	0.0
Time	9:45	**% O_2**	20.9
Barometric Press. (in. Hg)	28.98	**% CO**	0
Stack Static Press. (in w.c.)	-3.40	**% N_2**	79.1
Stack Diameter (in.)	30		
Traverse points	16	**Wet Bulb Temp (°F)**	85.0
Operator	BB/JV	**Moisture Content (%)**	2.8

Traverse Point Number	Stack Temp. (°F)	Velocity Pres. ("H_2O)	Traverse Point Number	Stack Temp. (°F)	Velocity Pres. ("H_2O)
Side A			Side B		
1	107	0.85	1	122	0.95
2	114	0.92	2	122	1.20
3	119	0.95	3	123	1.30
4	125	1.20	4	125	1.30
5	126	1.20	5	127	1.30
6	129	1.20	6	129	1.20
7	129	1.20	7	129	1.20
8	131	1.20	8	131	1.10
Average	123	1.09		126	1.19

Average Velocity Pressure Sqrt ("H_2O)	1.066
Stack Pressure ("Hg)	28.73
Moisture Content (Bws)	0.028
Stack Gas Molecular Weight (dry, Md)	28.84
Stack Gas Molecular Weight (Ms)	28.53
Stack Gas Specific Gravity (Gs)	0.99
Average Stack Temperature (°F)	124
Average Stack Velocity (fps)	64.7
Average Stack Velocity (fpm)	3,879
Area of Stack (ft^2)	4.909
Flowrate (Actual-CFM)	19,042
Flowrate (Standard Wet-SCFM)	16,524
Flowrate (Standard Dry-DSCFM)	16,063

Impact Compliance and Testing, Inc.

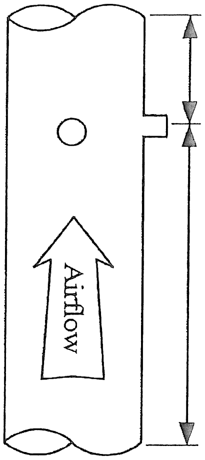
USEPA Method 2
Gas Velocity Measurement Data Sheet

Company: PMF - Industrial Highway
Source Designation: RTO Inlet
Test Date: 6/20/19
Test Number: Pre
Time (24-hr clock): 835
Barometric Press. (in. Hg): 28.98
Static Pressure (in. H_2O): -3.8

No. of Points: 16
Operator(s): BB/JV
Pitot Type: [✓ Type S] or Standard
Pitot Identification: 4F-3
O_2 Content (%): 20.9
CO_2 Content (%): 0.0
Wet Bulb Temp.: 85°F

Inches from Stack Wall	Traverse Point Number	Stack Temperature (°F)	Velocity Head (in. H_2O)	Null Angel (zero angle)
0.96	1	127.2	0.84	
3.15	2	127.6	0.95	
5.82	3	127.9	0.95	
9.69	4	127.9	0.95	
20.31	5	128.0	0.95	
24.18	6	124.6	1.2	
26.85	7	125.6	1.2	
29.04	8	126.9	1.3	
	1	122.0	1.2	
	2	118.0	1.2	
	3	119.8	1.3	
	4	122.7	1.3	
	5	123.7	1.3	
	6	125.5	1.3	
	7	126.6	1.2	
	8	127.4	1.3	

Stack / Duct Measurements



A = 45"

Sample Ports

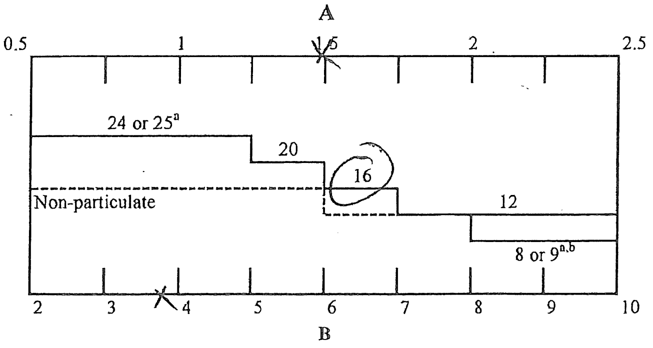
B = 115"

Round Duct Dia. (D): 30"

Square Duct (LxW): ~~x~~

Square Duct Dia. (De):
De = 2LW / (L+W)

Straight Length: (diameters)
A / D 1.5
B / D 3.8



a- Higher No. for rectanguar stacks
b- For stacks between 12 and 24 in.

Traverse Point	No. of Traverse Points Per Dia. 6	[✓ 8]	10	12
1	4.4	3.2	2.6	2.1
2	14.6	10.5	8.2	6.7
3	29.6	19.4	14.6	11.8
4	70.4	32.2	22.6	17.7
5	85.4	67.7	34.2	25.0
6	95.6	80.6	65.8	35.6
7		89.5	77.4	64.4
8		96.8	85.4	75.0
9			91.8	82.3
10			97.4	88.2
11				93.3
12				97.9

Impact Compliance and Testing, Inc.

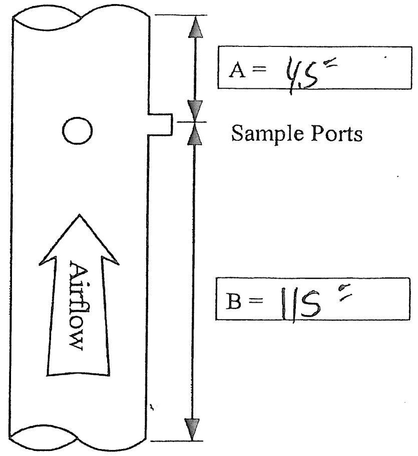
USEPA Method 2
Gas Velocity Measurement Data Sheet

Company PMF - Industrial Highway
Source Designation RTO Inlet
Test Date 6 / 20 / 19
Test Number Post
Time (24-hr clock) 9:45
Barometric Press. (in. Hg) 28.98
Static Pressure (in. H_2O) -3.4

No. of Points 16
Operator(s) BB/JV
Pitot Type [✓ Type S] or Standard
Pitot Identification 4F-3
O_2 Content (%) 20.9
CO_2 Content (%) 0.0
Wet Bulb Temp. 85°F

Inches from Stack Wall	Traverse Point Number	Stack Temperature (°F)	Velocity Head (in. H_2O)	Null Angel (zero angle)
0.96	1	107	0.85	
3.15	2	114	0.92	
5.82	3	119	0.95	
9.69	4	125	1.2	
20.31	5	126	1.2	
24.18	6	129	1.2	
26.85	7	129	1.2	
29.04	8	131	1.2	
	1	122	0.95	
	2	122	1.2	
	3	123	1.3	
	4	125	1.3	
	5	127	1.3	
	6	129	1.2	
	7	129	1.2	
	8	131	1.1	

Stack / Duct Measurements



A = 45"

B = 115"

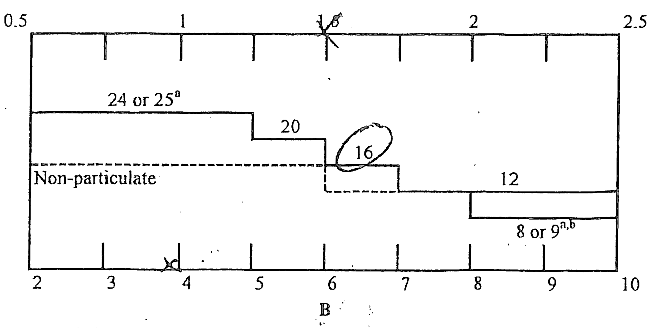
Round Duct Dia. (D) 30"

Square Duct (LxW) x

Square Duct Dia. (De):
De = 2LW / (L+W)

Straight Length: (diameters) A / D 1.5

B / D 38



a- Higher No. for rectangular stacks
b- For stacks between 12 and 24 in.

Traverse Point	No. of Traverse Points Per Dia. 6	[✓ 8]	10	12
1	4.4	3.2	2.6	2.1
2	14.6	10.5	8.2	6.7
3	29.6	19.4	14.6	11.8
4	70.4	32.2	22.6	17.7
5	85.4	67.7	34.2	25.0
6	95.6	80.6	65.8	35.6
7		89.5	77.4	64.4
8		96.8	85.4	75.0
9			91.8	82.3
10			97.4	88.2
11				93.3
12				97.9

Impact Compliance & Testing, Inc.

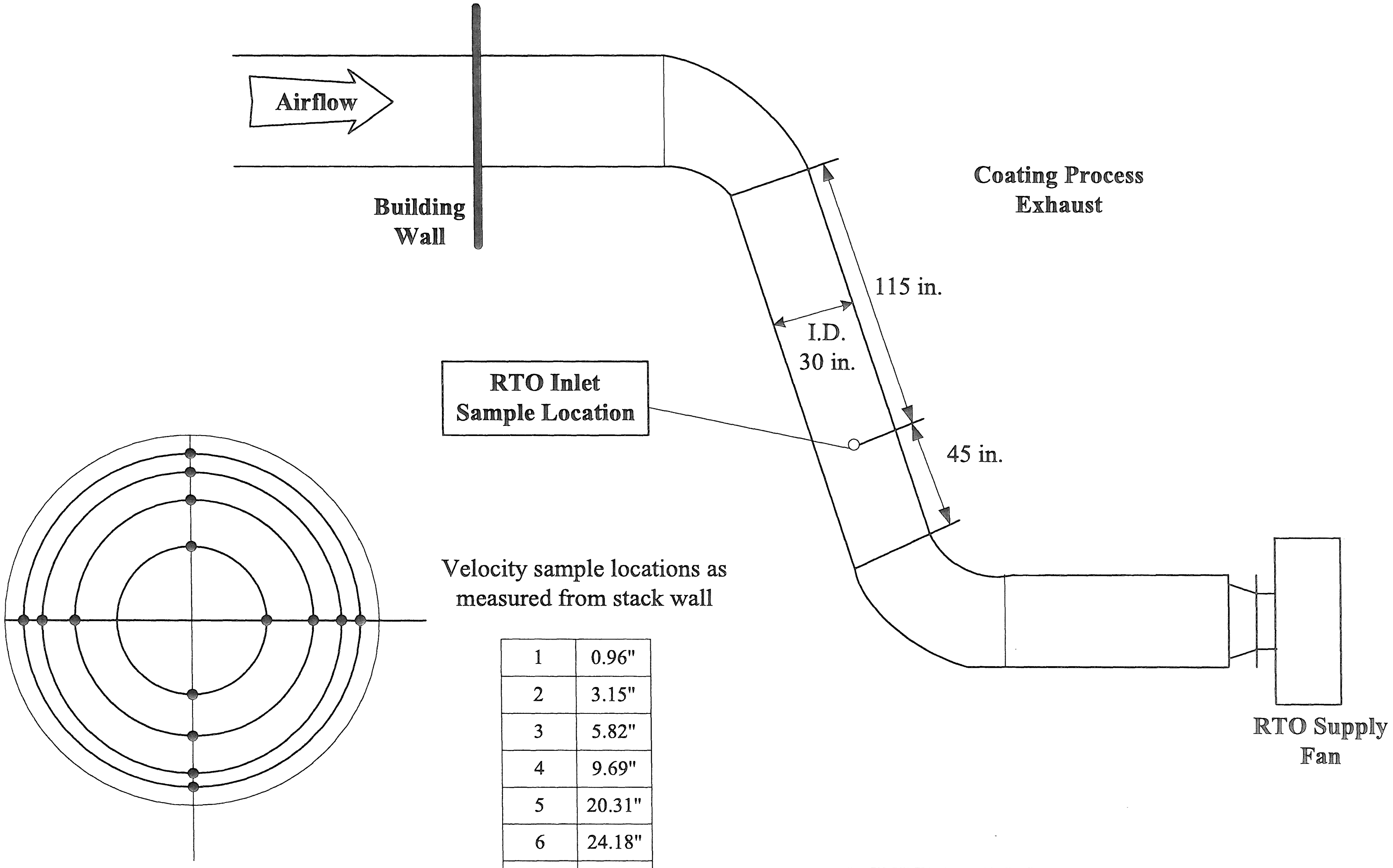
Facility Pioneer Metal Finishing - Industrial Hwy

Date 6/20/19

	RTO Fan Speed	RTO Inlet	RTO Chamber Temp.	Tumble 1	Tumble 2	Tumble 3	Tumble 4
Time	(Hz)	(in. w.c.)	°F	(Pa)	(Pa)	(Pa)	(Pa)
830	60	-0.8	1505	down for maint.	down	down	not installed
913	60	-0.8	~~14~~1513	│	4	4	│
940	60	-1.7	1504	│	down	down	│

BB

Recorded by



Velocity sample locations as measured from stack wall

1	0.96"
2	3.15"
3	5.82"
4	9.69"
5	20.31"
6	24.18"
7	26.85"
8	29.04"

8-20-14

Pioneer Metal Finishing, Industrial Hwy
RTO Inlet Sample Location

Scale	Sheet	
None	1 of 1	Impact Compliance & Testing, Inc.