

Executive Summary

Decorative Panels International, Inc. (DPI) retained Apex Companies, LLC (Apex) to test air emissions from the No. 3 Biofilter at the DPI facility in Alpena, Michigan. The No. 3 Biofilter controls emissions from the No. 3 Board Press and cooler (EU3-PRESS-AREA).

The source is regulated by (1) Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit (ROP) No. MI-ROP-B1476-2015a, effective April 6, 2016, and (2) National Emission Standards for Hazardous Air Pollutants: Plywood and Composite Wood Products, 40 CFR 63, Subpart DDDD.

Compliance with the FGMACTDDDD total hazardous air pollutant (HAP) permit limits based on the use of an add-on control device can be demonstrated by one of the following:

1. 90% reduction of total HAP mass emission rate, measured as total hydrocarbons
2. Total HAP concentration less than 20 ppmvd, measured as total hydrocarbons
3. Total HAP reduction so that methanol mass emission rate is reduced by 90%
4. Total HAP reduction such that methanol concentration is less than 1 ppmvd, if the uncontrolled methanol concentration entering the control device is greater than 10 ppmvd
5. Total HAP reduction so that formaldehyde mass emission rate is reduced by 90%
6. Total HAP reduction such that formaldehyde concentration is less than 1 ppmvd, if the uncontrolled formaldehyde concentration entering the control device is greater than 10 ppmvd

Apex measured formaldehyde, methanol, and total hydrocarbons (THC) at the inlet and outlet of the No. 3 Biofilter control device. The testing followed United States Environmental Protection Agency Reference Methods 1 through 3, 25A, 205, and 320.

Detailed results are presented in Table 1 after the Tables Tab of this report. The following table summarizes the results of testing conducted on October 14, 2020.

No. 3 Biofilter Hazardous Air Pollutants Emissions Results

Parameter	Unit	Average Result Test Runs 1 to 3	Permit Limit
Formaldehyde inlet concentration	ppmv, wet	13.06	--
Formaldehyde inlet emission rate	lb/hr	2.5	--
Formaldehyde outlet concentration	ppmv, wet	<0.3	1 [†]
Formaldehyde outlet emission rate	lb/hr	<0.1	--
Formaldehyde removal efficiency	%	97	≥90 [†]
Methanol inlet concentration	ppmv, wet	23.74	--
Methanol inlet emission rate	lb/hr	4.9	--
Methanol outlet concentration	ppmv, wet	17.98	1 [†]
Methanol outlet emission rate	lb/hr	4.2	--
Methanol removal efficiency	%	18	≥90 [†]
THC inlet concentration	ppmv, wet	204.8	--
THC inlet emission rate	lb/hr	15.9	--
THC outlet concentration	ppmv, wet	50.7	20 [†]
THC outlet emission rate	lb/hr	4.4	--
THC removal efficiency	%	71	≥90 [†]

THC: total hydrocarbons

ppmv, wet: part per million by volume, wet basis

lb/hr: pound per hour

[†] Only one of the six permit limits need to be met in order to demonstrate compliance.

1.0 Introduction

1.1 Summary of Test Program

Decorative Panels International (DPI) retained Apex Companies, LLC (Apex) to conduct air emissions testing at the DPI facility in Alpena, Michigan. The No. 3 Biofilter controls emissions from the No. 3 Board Press and cooler (EU3-PRESS-AREA).

The purpose of the air emission testing was to evaluate compliance with certain emission limits in (1) Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit (ROP) MI-ROP-B1476-2015a, effective April 6, 2016, and (2) National Emission Standards for Hazardous Air Pollutants (NESHAP): Plywood and Composite Wood Products, 40 CFR 63, Subpart DDDD.

Apex measured formaldehyde, methanol, and total hydrocarbons (THC) at the inlet and outlet of the No. 3 Biofilter control device. The testing followed United States Environmental Protection Agency (USEPA) Reference Methods 1 through 3, 25A, 205, and 320.

Table 1-1 lists the emission sources tested, parameters, and test date.

Table 1-1
Sources Tested, Parameters, and Test Dates

Source	Test Parameter	Test Date
No. 3 Biofilter Inlet and Outlet	Formaldehyde Methanol Total hydrocarbons (THCs)	October 14, 2020

1.2 Key Personnel

The key personnel involved in this test program are listed in Table 1-2. Mr. David Kawasaki, Staff Consultant with Apex, led the emission testing program. Mr. Duncan Gray, Plant Manager with DPI, provided process coordination and recorded operating parameters. Ms. Rebecca Radulski and Ms. Lindsey Wells, with EGLE, witnessed the testing and verified production parameters were recorded.

**Table 1-2
Key Contact Information**

Client	Apex
Duncan Gray Plant Manager Decorative Panels International, Inc. 416 Ford Avenue Alpena, Michigan 49707 Phone: 989.464.8810 duncan.gray@decpanels.com	David Kawasaki, QSTI Staff Consultant Apex Companies, LLC 46555 Humboldt Drive, Suite 103 Novi, Michigan 48377 Phone: 248.590.5134 david.kawasaki@apexcos.com
EGLE	
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2.0 Source and Sampling Locations

2.1 Process Description

Decorative Panels International, Inc. produces a variety of hardboard products including wall paneling, pegboard, and marker board. Hardwood chips, such as aspen, ash, maple, and beech chips, are purchased and stored in an outdoor raw material storage area and reclaimed into silos. The wood chips are cooked and softened in one of four digesters using steam injection and ground into wood pulp fibers.

The pulp fibers are conveyed to a forming machine, which forms a mat of un-pressed hardboard. The mats are processed through a Coe® dryer and cut using a trimmer and panel brush. The mats are conveyed to one of two hardboard lines, Line 1 or 3. Line 2 was historically operated but has since been decommissioned.

On the hardboard lines, the mats enter a predryer, a press, cooler, and tempering area. The predryer ensures the mat has the desired moisture content before the mat enters presses that heat and form hardboard. The hardboard is coated with linseed or Oxi-Cure® oil in the tempering area. The oil tempers the board thereby increasing its strength and "paintability." Once the board has been tempered, it is superheated to cure the binding resins in the bake ovens (No. 3 Press Line only). The hardboard is humidified to approximate atmospheric conditions to limit warping. The boards are inspected, graded, cut, and packed for shipping.

The No. 3 Biofilter controls emissions from the No. 3 Board Press and cooler.

Operating parameters were measured and recorded by DPI personnel during testing. Table 2-1 summarizes the operating conditions during hazardous air pollutant (HAP) compliance testing of the No. 3 Biofilter source. Additional operating parameter data are included in Appendix F.

Table 2-1
Summary of EU3PRESS-AREA Operating Data

Test Run	Number of Press Cycles
1	16
2	15
3	16
Average	16

2.2 Control Equipment Description

Gaseous emissions from the No. 3 Board Press are controlled by a humidifier and Envirogen manufactured biofilter (No. 3 Biofilter). Emissions from the No. 3 Board Press enters the top of the scrubber and flows downwards in the vessel, where water treated with sodium hydroxide to maintain a neutral pH, is sprayed to humidify the inlet air to the biofilter.

As the gas mixes with the water, particulates and other pollutants are removed. The water drains to the bottom of the vessel and a portion is recirculated into the system with the remaining portion discharged to the onsite water treatment system. The flue gas exits the top of the scrubber and flows into the No. 3 Biofilter.

The No. 3 Biofilter consists of four compartments. The air exiting the humidifier can be further humidified and heated by adding steam into the ductwork upstream of the biobed compartments. The compartments contain water sprayers to maintain a moist environment, and layers of Douglas-fir bark from the western United States. The Douglas-fir bark provides an environment where biologically active microbes can oxidize and remove contaminants.

After passing through the bark, the flue gas is drawn into fans that discharge the gas through Stack SV#3PRESS-STK68. Biofilter bed temperature and pressure drop were measured and recorded by DPI personnel during testing. Table 2-2 summarizes the operating conditions during testing of the No. 3 Biofilter. Detailed operating parameter data are included in Appendix F.

**Table 2-2
Summary of No. 3 Biofilter Operating Data**

Test Run	Bed Temperature (°F)	Bed Pressure Drop (inch H ₂ O)
1	83	1.1
2	84	1.1
3	83	1.1

2.3 Flue Gas Sampling Locations

2.3.1 No. 3 Biofilter Inlet Sampling Location

Two sampling ports oriented at 90° to one another are located in a straight section of a 51.0 inch-internal-diameter duct. The sampling ports are located:

- Approximately 75 inches (1.47 duct diameters) from the nearest downstream disturbance.
- Approximately 135 inches (2.64 duct diameters) from the nearest upstream disturbance.

The sampling ports are accessible via platform. A photograph of the No. 3 Biofilter inlet sampling location is presented in Figure 2-1. Figure 1 in the Appendix depicts the No. 3 Biofilter inlet sampling ports and traverse point locations.

2.3.2 No. 3 Biofilter Outlet Sampling Location

Two sampling ports oriented at 90° to one another are located in a straight section of a 51.25 inch-internal-diameter duct. The sampling ports are located:

- Approximately 180 inches (3.51 duct diameters) from the nearest downstream disturbance.
- Approximately 300 inches (5.85 duct diameters) from the nearest upstream disturbance.

The sampling ports are accessible from the roof of the building. A photograph of the No. 3 Biofilter outlet sampling location is presented in Figure 2-1. Figure 2 in the Appendix depicts the No. 3 Biofilter outlet sampling ports and traverse point locations.

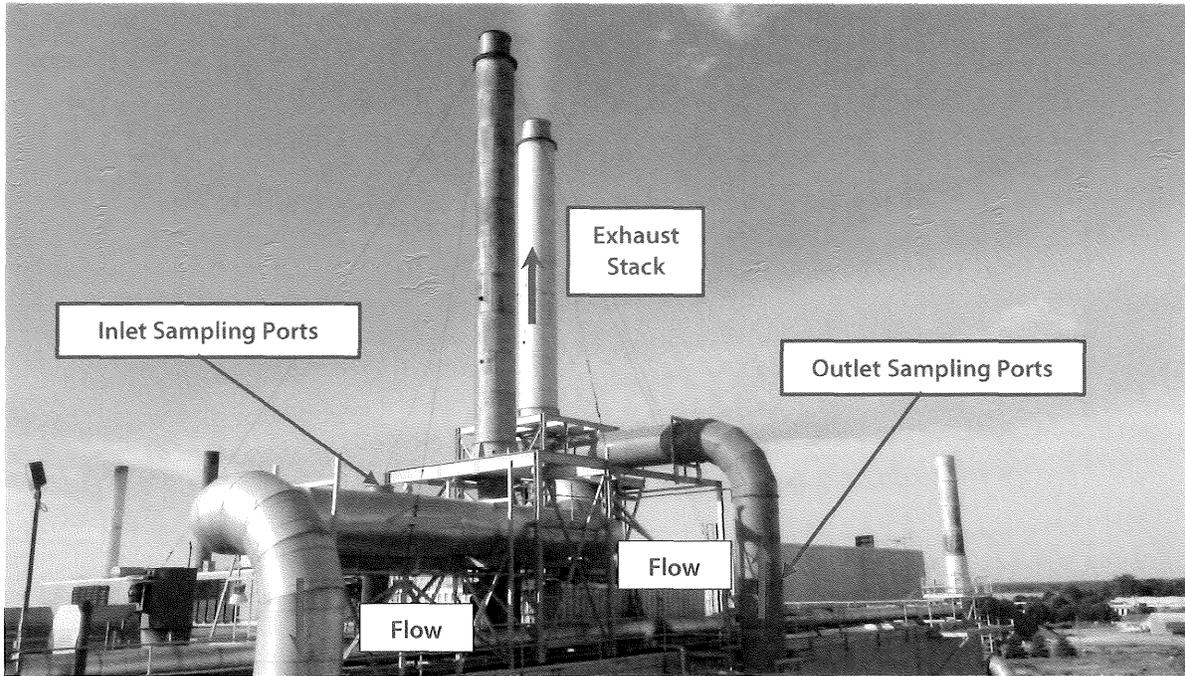


Figure 2-1. No. 3 Biofilter Inlet and Outlet Sampling Locations

2.4 Process Sampling Locations

Process sampling was not required during this test program. A process sample is a sample that is analyzed for operational parameters, such as calorific value of a fuel (e.g., natural gas, coal), organic compound content (e.g., paint coatings), or composition (e.g., polymers).

3.0 Summary and Discussion of Results

3.1 Objectives and Test Matrix

The objective of the air emission testing was to evaluate compliance of the No. 3 Biofilter with certain emission limits and requirements in (1) EGLE ROP MI-ROP-B1476-2015a, effective April 6, 2016, and (2) National Emission Standards for Hazardous Air Pollutants (NESHAP): Plywood and Composite Wood Products, 40 CFR 63, Subpart DDDD.

Compliance with the FGMACTDDDD total HAP permit limits based on the use of an add-on control device can be demonstrated by one of the following:

1. 90% reduction of total HAP mass emission rate, measured as total hydrocarbons
2. Total HAP concentration less than 20 ppmvd, measured as total hydrocarbons
3. Total HAP reduction so that methanol mass emission rate is reduced by 90%
4. Total HAP reduction such that methanol concentration is less than 1 ppmvd, if the uncontrolled methanol concentration entering the control device is greater than 10 ppmvd
5. Total HAP reduction so that formaldehyde mass emission rate is reduced by 90%
6. Total HAP reduction such that formaldehyde concentration is less than 1 ppmvd, if the uncontrolled formaldehyde concentration entering the control device is greater than 10 ppmvd

Apex measured formaldehyde, methanol, and THC at the inlet and outlet of the No. 3 Biofilter control device. Table 3-1 summarizes the sampling and analytical matrix.

**Table 3-1
Sampling and Analytical Matrix**

Source	Sample/Type of Pollutant	Sampling Method	Date (2020)	Run	Start Time	End Time	Analytical Laboratory
No. 3 Biofilter Inlet and Outlet	Flowrate, molecular weight, formaldehyde, methanol, THC	USEPA 1, 2, 3, 25A, 205, and 320	Oct. 14	1	08:05	09:05	Not applicable
				2	09:28	10:28	
				3	10:55	11:55	

3.2 Field Test Changes and Issues

Communication between DPI, Apex, and EGLE allowed the testing to be completed, as proposed in the September 14, 2020 Intent-to-Test Plan.

3.3 Summary of Results

The results of testing are presented in Table 3-2. Detailed results are presented in Table 1 after the Tables Tab of this report. Graphs are presented after the Graphs Tab of this report. Sample calculations are presented in Appendix B.

Table 3-2
No. 3 Biofilter Hazardous Air Pollutants
Emissions Results

Parameter	Unit	Run 1	Run 2	Run 3	Average Result	Permit Limit
Formaldehyde inlet concentration	ppmv, wet	16.68	12.56	9.93	13.06	--
Formaldehyde inlet emission rate	lb/hr	3.2	2.4	2.0	2.5	--
Formaldehyde outlet concentration	ppmv, wet	<0.3	<0.3	<0.3	<0.3	1†
Formaldehyde outlet emission rate	lb/hr	<0.1	<0.1	<0.1	<0.1	--
Formaldehyde removal efficiency	%	98	97	97	97	≥90†
Methanol inlet concentration	ppmv, wet	28.11	24.45	18.65	23.74	--
Methanol inlet emission rate	lb/hr	5.8	5.0	3.9	4.9	--
Methanol outlet concentration	ppmv, wet	17.29	17.80	18.85	17.98	1†
Methanol outlet emission rate	lb/hr	4.0	3.9	4.6	4.2	--
Methanol removal efficiency	%	31	22	0	18	≥90†
THC inlet concentration	ppmv, wet	234.7	223.0	156.7	204.8	--
THC inlet emission rate	lb/hr	18.1	17.2	12.3	15.9	--
THC outlet concentration	ppmv, wet	48.8	53.3	49.9	50.7	20†
THC outlet emission rate	lb/hr	4.2	4.4	4.6	4.4	--
THC removal efficiency	%	77	74	63	71	≥90†

THC: total hydrocarbons

ppmv, wet: part per million by volume, wet basis

lb/hr: pound per hour

† Only one of the six permit limits need to be met in order to demonstrate compliance.

4.0 Sampling and Analytical Procedures

Apex measured emissions in accordance with USEPA sampling methods. Table 4-1 presents the emissions test parameters and sampling methods.

**Table 4-1
Emission Testing Methods**

Parameter	No. 3 Biofilter Inlet and Outlet	USEPA Reference	
		Method	Title
Sampling ports and traverse points	•	1	Sample and Velocity Traverses for Stationary Sources
Velocity and flowrate	•	2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
Molecular weight	•	3	Gas Analysis for the Determination of Dry Molecular Weight
Total hydrocarbons	•	25A	Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer
Gas dilution	•	205	Verification of Gas Dilution Systems for Field Instrument Calibrations
Formaldehyde, methanol, and moisture content	•	320	Measurements of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared

4.1 Emission Test Methods

4.1.1 Volumetric Flowrate (USEPA Methods 1 and 2)

USEPA Method 1, "Sample and Velocity Traverses for Stationary Sources," was used to evaluate the sampling locations and the number of traverse points for sampling and the measurement of velocity profiles. Figures 1 and 2 in the Appendix depict the source locations and traverse points.

USEPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)," was used to measure flue gas velocity and calculate volumetric flowrates. S-type Pitot tubes and thermocouple assemblies, calibrated in accordance with Method 2, Section 10.0, were used during testing. Because the dimensions of the Pitot tubes met the requirements outlined in Method 2, Section 10.1, and are within the specified limits, the baseline Pitot tube coefficient of 0.84 (dimensionless) was assigned. The digital manometer and thermometer are calibrated using calibration standards that are traceable to National Institute of Standards and Technology (NIST). Pitot tube inspection sheets are included in Appendix A.

Cyclonic Flow Check. Apex evaluated whether cyclonic flow was present at the sampling locations. Cyclonic flow is defined as a flow condition with an average null angle greater than 20°. The direction of flow can be determined by aligning the Pitot tube to obtain zero (null) velocity head reading—the direction would be parallel to the Pitot tube face openings or perpendicular to the null position. By measuring the angle of the Pitot tube face openings in relation to the stack walls when a null angle is obtained, the direction of flow is measured. If the absolute average of the flow direction angles is greater than 20°, the flue gas is considered to be cyclonic at that sampling location and an alternative location should be selected.

The average of the measured traverse point flue gas velocity null angles were less than 20° at the sampling locations. The measurements indicate the absence of cyclonic flow.

Field data sheets are included in Appendix C. Computer-generated field data sheets are included in Appendix D.

4.1.2 Molecular Weight (USEPA Method 3)

USEPA Method 3, "Gas Analysis for the Determination of Dry Molecular Weight," was used to determine the molecular weight of the flue gas. Flue gas was extracted from the stack through a probe positioned near the centroid of the duct and directed into a Fyrite® gas analyzer. The concentrations of carbon dioxide (CO₂) and oxygen (O₂) were measured by chemical absorption to within ±0.5%. The average CO₂ and O₂ results of the grab samples were used to calculate molecular weight.

4.1.3 Total Hydrocarbons (USEPA Method 25A)

USEPA Method 25A, "Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer," was used to measure total hydrocarbon concentrations in the flue gas. Samples were collected through a stainless steel probe and heated sample line into an analyzer.

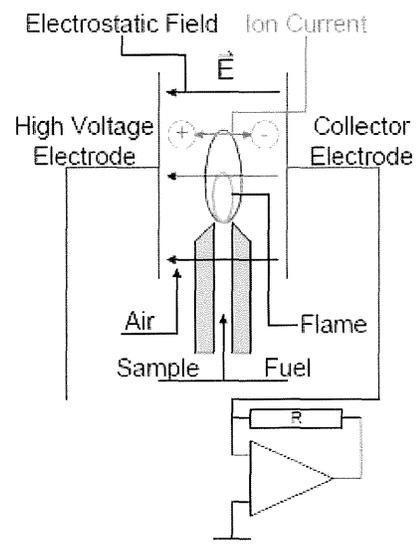
A flame ionization detector (FID) determines the average hydrocarbon concentration in part per million by volume (ppmv) of THC as the calibration gas (i.e., propane). The FID is fueled by 100% hydrogen, which generates a flame with a negligible number of ions. Flue gas is introduced into the FID and enters the flame chamber. The combustion of flue gas generates electrically charged ions. The analyzer applies a polarizing voltage between two electrodes around the flame, producing an electrostatic field. Negatively charged ions, anions, migrate to a collector electrode, while positive charged ions, cations, migrate to a high-voltage electrode. The current between the electrodes is directly proportional to the hydrocarbon concentration in the sample. The flame chamber is depicted at right.

Using the voltage analog signal, measured by the FID, the concentration of THCs was recorded by a data acquisition system (DAS). The average concentration of THCs is reported as the calibration gas (i.e., propane) in equivalent units.

Before testing, the analyzer was calibrated by introducing a zero-calibration range gas (<1% of span value) and high-calibration range gas (80-90% span value) to the tip of the sampling probe. The span value was set to 1.5 to 2.5 times the expected concentration (e.g., 0-100 ppmv). Next, a low-calibration range gas (25-35% of span value) and mid-calibration range gas (45-55% of span value) were introduced. The analyzers are considered to be calibrated when the analyzer response is ±5% of the calibration gas value.

At the conclusion of a test run, a calibration drift test was performed by introducing the zero- and mid-calibration gas to the tip of the sampling probe. The test run data was considered valid if the calibration drift test demonstrated the analyzers are responding within 3% of the calibration span from pre-test to post-test calibrations.

Figure 4-1 depicts the USEPA Method 25A sampling train.



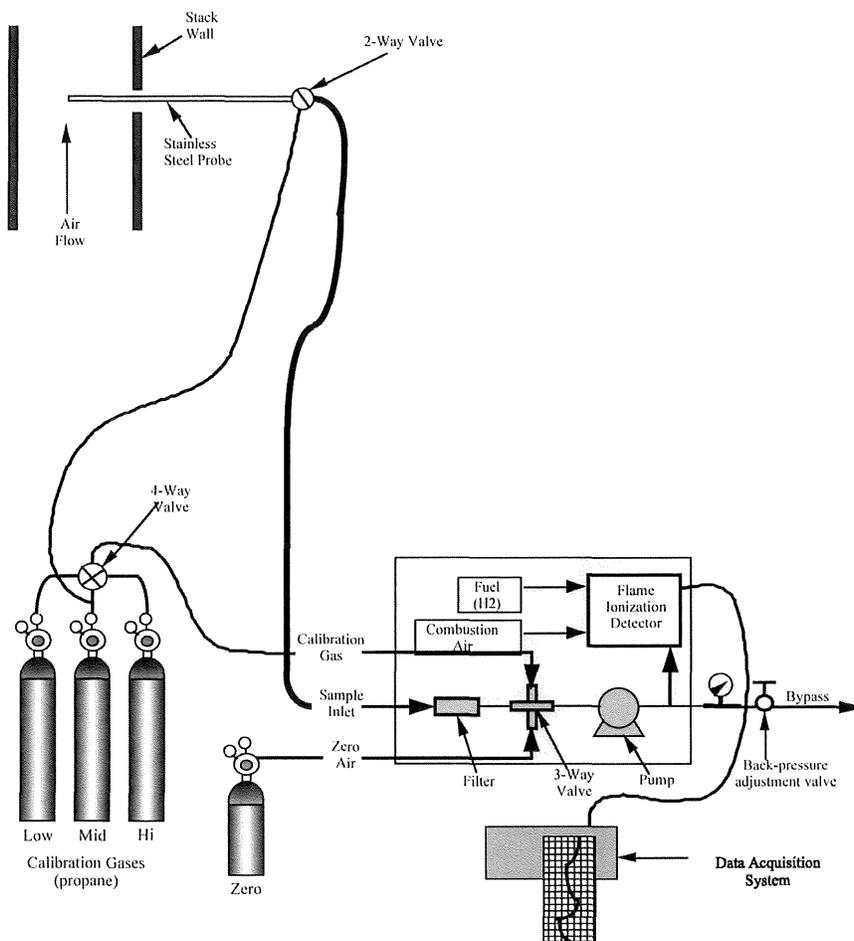


Figure 4-1. USEPA Method 25A Sampling Train

4.1.4 Gas Dilution (USEPA Method 205)

USEPA Method 205, "Verification of Gas Dilution Systems for Field Instrument Calibrations," was used to introduce known values of calibration gases into the analyzers. The gas dilution system consists of calibrated orifices or mass flow controllers and dilutes a high-level calibration gas to within $\pm 2\%$ of predicted values. The gas divider is capable of diluting gases at set increments and was evaluated for accuracy in the field in accordance with USEPA Method 205.

Prior to testing, the gas divider dilutions were measured to evaluate that they were within $\pm 2\%$ of predicted values. Two sets of three dilutions of the high-level calibration gas were performed. In addition, a certified mid-level calibration gas was introduced into an analyzer; this calibration gas concentration was within $\pm 10\%$ of a gas divider dilution concentration.

4.1.5 Formaldehyde, Methanol, and Moisture Content (USEPA Method 320)

USEPA Method 320, "Measurements of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared (FTIR) Spectroscopy," was used to measure formaldehyde, methanol, and moisture content in the flue gas. Gaseous samples were withdrawn from the stack and transferred to an MKS Instruments MultiGas 2030 FTIR spectrometer.

The sample gas was directed through a heated probe, heated filter and heated transfer line connected to the FTIR. The probe, filter, transfer line, and FTIR were maintained at 191°C (375°F) during testing. The formaldehyde, methanol, and moisture concentrations were measured based on their infrared absorbance compared to reference spectra. The FTIR analyzer scanned the sample gas approximately once per second. A data point was generated every half minute as the co-addition of 32 scans.

FTIR quality assurance procedures followed USEPA Method 320. A calibration transfer standard (CTS) was analyzed before and after testing. Acetaldehyde and methanol matrix spiking were performed prior to testing. Section 3.29 of USEPA Method 320 allows the use of a surrogate analyte for the purposes of analyte spiking. Acetaldehyde was chosen as a surrogate to formaldehyde for the following reason:

- Acetaldehyde's physical and chemical properties are similar to those of formaldehyde. Formaldehyde is the C1 aldehyde (CH₂O); acetaldehyde is the C2 aldehyde (CH₃CHO).

The analyte spikes were set to a target dilution ratio of 1:10 or less. Valid tests required spike recoveries to be within the Method 320 allowance of 100±30%.

The FTIR data is included in Appendix E. Figure 4-2 depicts the USEPA Method 320 sampling train.

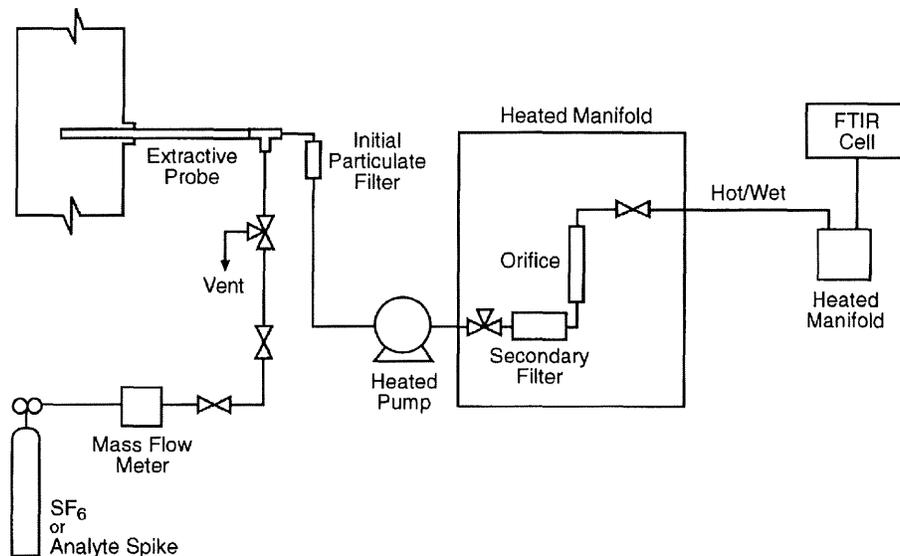


Figure 4-2. USEPA Method 320 Sampling Train

4.2 Process Data

DPI recorded process data during testing. EGLE personnel verified the requested operating and process data were recorded. Process data are included in Appendix F.

5.0 Quality Assurance and Quality Control

5.1 QA/QC Procedures

Equipment used in this emissions test program passed quality assurance (QA) and quality control (QC) procedures. Refer to Appendix A for equipment calibrations. Before testing, the sampling equipment was cleaned, inspected, and calibrated according to procedures outlined in the applicable USEPA sampling method and USEPA's "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III, Stationary Source-Specific Methods."

5.2 QA/QC Audits

Onsite QA/QC procedures (i.e., Pitot tube inspections, calibrations) were performed in accordance with the respective USEPA sampling methods. Equipment inspection and calibration measurements are presented in Appendix A.

5.2.1 Audit Sample Results QA/QC

QA audit samples were not proposed during this test program. Currently, audit samples for the parameters to be measured are not available from the EPA Stationary Source Audit Program.

5.2.2 Instrument Analyzer QA/QC

The instrument analyzer sampling trains described in Section 4.1 were audited for measurement accuracy and data reliability. The analyzers passed the applicable calibration criteria. Table 5-1 summarizes the gas cylinders used during this test program. Analyzer calibration, bias, and drift data are included in Appendix A.

**Table 5-1
Calibration Gas Cylinder Information**

Parameter	Gas Vendor	Cylinder Serial Number	Cylinder Value	Expiration Date
Air	Airgas	ALM-011814	--	11/01/2026
Propane	Airgas	ALM-036155	110.0 ppm	3/02/2028
Propane	Airgas	CC469695	1,113 ppm	3/02/2028
Nitrogen	Airgas	AAL-17660	99.9995%	9/21/2028
Ethylene	Airgas	ALM 026651	103.4 ppm	1/16/2021
Acetaldehyde, methanol, sulfur hexafluoride	Airgas	CC716034	100.8 ppm 100.3 ppm 10.42 ppm	12/10/2020

5.3 Data Reduction and Validation

The emissions testing Project Manager and/or the QA/QC Officer validated computer spreadsheets. The computer spreadsheets were used to ensure that field calculations were accurate. Random inspection of the field data sheets were conducted to verify data have been recorded appropriately. At the completion of a test, the raw field data were

entered into computer spreadsheets to provide applicable onsite emissions calculations. The computer data were checked against the raw field sheets for accuracy during review of the report.

5.4 QA/QC Problems

Equipment audits and QA/QC procedures demonstrate sample collection accuracy and compliance for the test runs.

6.0 Limitations

The information and opinions rendered in this report are exclusively for use by Decorative Panels International, Inc. Apex Companies, LLC will not distribute or publish this report without consent of Decorative Panels International, Inc. except as required by law or court order. The information and opinions are given in response to a limited assignment and should be implemented only in light of that assignment. Apex Companies, LLC accepts responsibility for the competent performance of its duties in executing the assignment and preparing reports in accordance with the normal standards of the profession, but disclaims any responsibility for consequential damages

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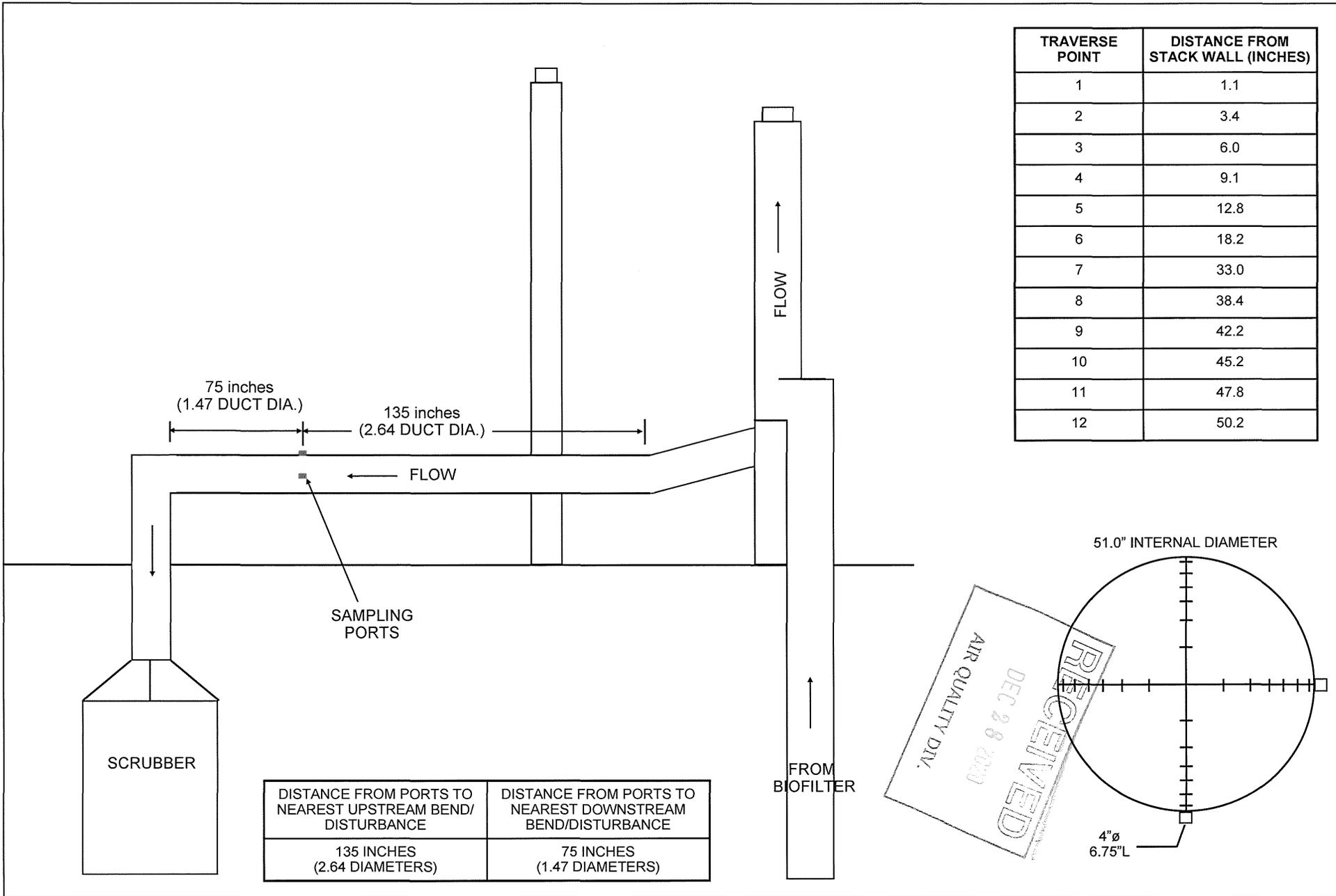
248.875.7581



Table 1
No. 3 Biofilter Emissions Results
Decorative Panels International, Inc.
Alpena, Michigan
Apex Companies Project No. 11020-000061.00
Sampling Date: October 14, 2020

Parameter		Units	Run 1	Run 2	Run 3	Average
Sampling Start Time			8:05-9:05	9:28-10:28	10:55-11:55	
Duration		min	60	60	60	
Inlet						
	Average Gas Stream Volumetric Flowrate	scfm	41,226	41,315	42,074	41,538
	Gas Stream Percent Moisture Content	%	1.65	1.56	1.41	1.54
	Formaldehyde Concentration	ppmv, as CH ₂ O	16.68	12.56	9.93	13.06
	Formaldehyde Concentration	ppmvd, as CH ₂ O	17.0	12.8	10.1	13.3
	Formaldehyde Mass Emission Rate	lb/hr, as CH ₂ O	3.2	2.4	2.0	2.5
	Methanol Concentration	ppmv, CH ₃ OH	28.11	24.45	18.65	23.74
	Methanol Concentration	ppmvd, CH ₃ OH	28.6	24.8	18.9	24.1
	Methanol Mass Emission Rate	lb/hr, as CH ₃ OH	5.8	5.0	3.9	4.9
	THC Concentration	ppmv, as propane	78.2	74.3	52.2	68.3
	THC Concentration	ppmv, as carbon	234.7	223.0	156.7	204.8
	THC Concentration	ppmvd, as carbon	238.7	226.5	158.9	208.0
	THC Mass Emission Rate	lb/hr, as propane	22.1	21.1	15.1	19.4
	THC Mass Emission Rate	lb/hr, as carbon	18.1	17.2	12.3	15.9
Outlet						
	Gas Stream Volumetric Flowrate	scfm	46,015	44,409	48,733	46,385
	Gas Stream Percent Moisture Content	%	3.65	3.54	3.63	3.61
	Formaldehyde Concentration	ppmv, as CH ₂ O	<0.3	<0.3	<0.3	<0.3
	Formaldehyde Concentration	ppmvd, as CH₂O	<0.3	<0.3	<0.3	<0.3
	Formaldehyde Mass Emission Rate	lb/hr, as CH ₂ O	<0.1	<0.1	<0.1	<0.1
	Methanol Concentration	ppmv, CH ₃ OH	17.29	17.80	18.85	17.98
	Methanol Concentration	ppmvd, CH₃OH	17.9	18.5	19.6	18.7
	Methanol Mass Emission Rate	lb/hr, as CH ₃ OH	4.0	3.9	4.6	4.2
	THC Concentration	ppmv, as propane	16.3	17.8	16.6	16.9
	THC Concentration	ppmv, as carbon	48.8	53.3	49.9	50.7
	THC Concentration	ppmvd, as carbon	50.6	55.2	51.8	52.5
	THC Mass Emission Rate	lb/hr, as propane	5.1	5.4	5.6	5.4
	THC Mass Emission Rate	lb/hr, as carbon	4.2	4.4	4.6	4.4
Formaldehyde Destruction Efficiency Results		%	98	97	97	97
Methanol Destruction Efficiency Results		%	31	22	0	18
No. 3 Biofilter THC Destruction Efficiency Results		%	77	74	63	71
lb/hr pound per hour scfm standard cubic feet per minute ppmv part per million by volume ppmvd part per million by volume dry basis						

TRAVERSE POINT	DISTANCE FROM STACK WALL (INCHES)
1	1.1
2	3.4
3	6.0
4	9.1
5	12.8
6	18.2
7	33.0
8	38.4
9	42.2
10	45.2
11	47.8
12	50.2



DISTANCE FROM PORTS TO NEAREST UPSTREAM BEND/DISTURBANCE	DISTANCE FROM PORTS TO NEAREST DOWNSTREAM BEND/DISTURBANCE
135 INCHES (2.64 DIAMETERS)	75 INCHES (1.47 DIAMETERS)

SCALE	NOT TO SCALE
DATE	November 11, 2020
PRJ NO.	11020-000061.00

NO. 3 BIOFILTER INLET SAMPLING PORTS AND TRAVERSE POINT LOCATIONS

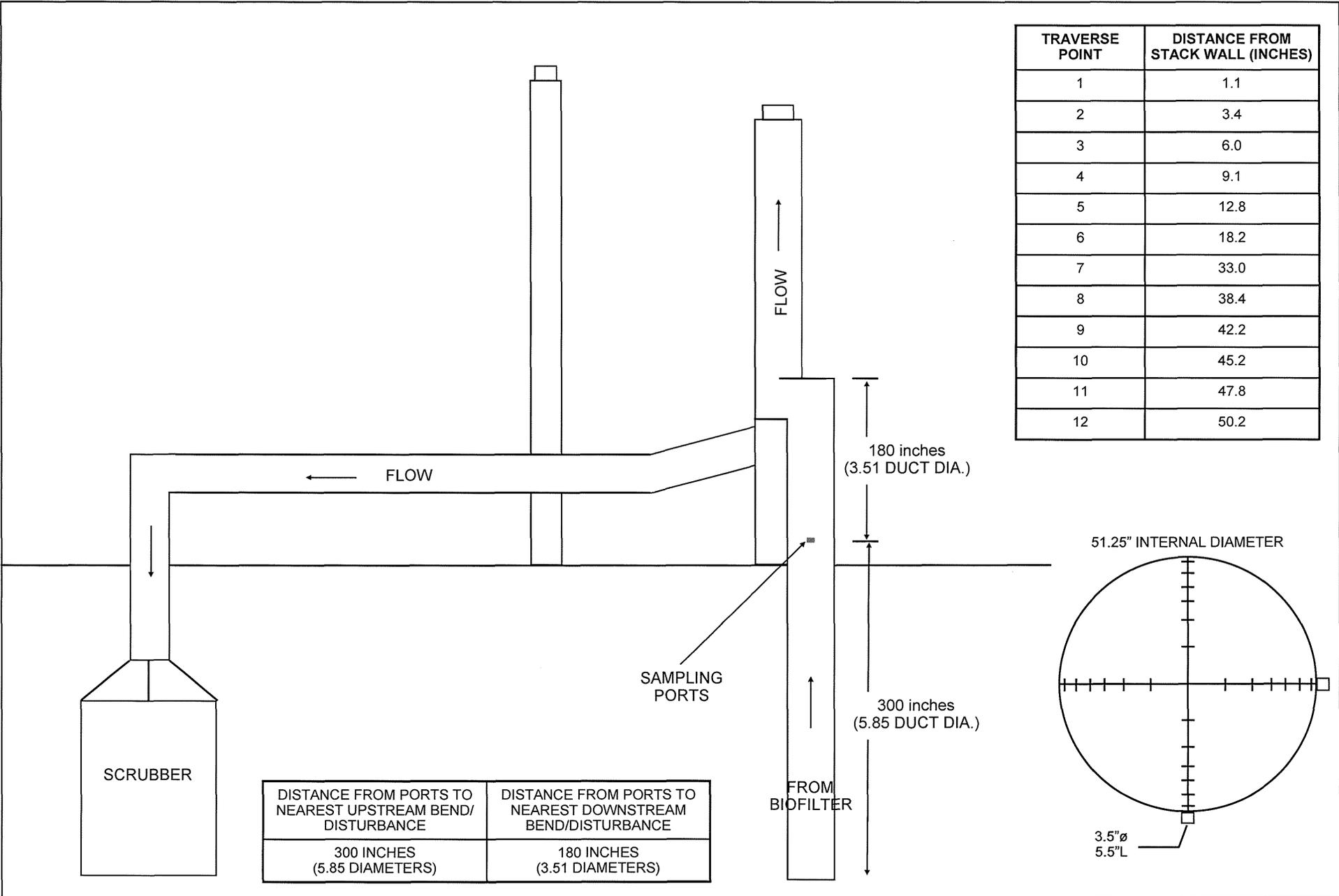
DECORATIVE PANELS INTERNATIONAL, INC.
ALPENA, MICHIGAN



FIGURE

1

TRAVERSE POINT	DISTANCE FROM STACK WALL (INCHES)
1	1.1
2	3.4
3	6.0
4	9.1
5	12.8
6	18.2
7	33.0
8	38.4
9	42.2
10	45.2
11	47.8
12	50.2



DISTANCE FROM PORTS TO NEAREST UPSTREAM BEND/DISTURBANCE	DISTANCE FROM PORTS TO NEAREST DOWNSTREAM BEND/DISTURBANCE
300 INCHES (5.85 DIAMETERS)	180 INCHES (3.51 DIAMETERS)

SCALE	NOT TO SCALE
DATE	November 11, 2020
PRJ NO.	11020-000061.00

NO. 3 BIOFILTER OUTLET SAMPLING PORTS AND TRAVERSE POINT LOCATIONS

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FIGURE

2