No. 1 Biofilter
Air Emissions Test Report
at
Decorative Panels International, Inc.
Alpena, Michigan

Renewable Operating Permit MI-ROP-B1476-2009a
SRN: B1476

Prepared for

Decorative Panels International, Inc.
416 Ford Avenue
Alpena, Michigan

Bureau Veritas Project No. 11014-000132.00
August 18, 2014

BUREAU VERITAS

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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

RENEWABLE OPERATING PERMIT
REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating (RO) Permit program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as described in General Condition No. 22 in the RO Permit and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: Decorative Panels International — County: Alpena

Source Address: 416 Ford Avenue — City: Alpena

AQD Source ID (SRN): B1476 — RO Permit No.: MI-ROP-B1476-2009a — RO Permit Section No.: D

Please check the appropriate box(es):

☐ **Annual Compliance Certification (General Condition No. 28 and No. 29 of the RO Permit)**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the RO Permit.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the RO Permit, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (General Condition No. 23 of the RO Permit)**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From na To na

Additional monitoring reports or other applicable documents required by the RO Permit are attached as described:

Emissions test report to evaluate HAP/THC compliance for EUPRSS2S and FGPRESSES.
This form shall certify that the testing was conducted in accordance with the approved test plan and that the facility operating conditions were in compliance with permit requirements.

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete, and that any observed, documented or known instances of noncompliance have been reported as deviations, including situations where a different or no monitoring method is specified by the RO Permit.

Timothy P. Clark — President

Name of Responsible Official (print or type) — Title — Phone Number

Signature of Responsible Official — 8/15/14 — Date

* Photocopy this form as needed.

EQP 5736 (8/99)

Executive Summary

Decorative Panels International, Inc. retained Bureau Veritas North America, Inc. to test air emissions from the No. 1 Biofilter source at their hardboard manufacturing facility in Alpena, Michigan. The No. 1 Biofilter controls emissions from the EUPRESS2S and is included in the FGPRESSES flexible group. The objective of the testing was to evaluate compliance of the No. 1 Biofilter source with emission limits and requirements in:

- Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) MI-ROP-B1476-2009a for this FGMACTDDDD sources, and
- 40 CFR 63, Subpart DDDD, "National Emission Standards for Hazardous Air Pollutants: Plywood and Composite Wood Products."

Bureau Veritas measured THC, methanol, and formaldehyde at the inlet and outlet of the No. 1 Biofilter control device.

Four, 60-minute test runs were performed under maximum routine operating conditions following United States Environmental Protection Agency (USEPA) Methods 1 through 4, 25A, and 320. Run 1 of the testing was voided due to a fault between the outlet FTIR and data acquisition system causing the data acquisition system not to record HAP concentrations.

Detailed results are presented in Table 1 after the Tables Tab of this report. The following table summarizes the results of the testing conducted on July 18, 2014.

No. 1 Biofilter Formaldehyde, Methanol, and THC Results

No. 1 Biofilter Formaldehyde, Methanol, and THC Emissions Results

Parameter	Units	Run 1 (voided)	Run 2	Run 3	Run 4	Average (Runs 2, 3, 4)
Formaldehyde inlet concentration	ppmvd	35.2	26.1	38.2	35.1	**33.1**
Formaldehyde outlet concentration	ppmvd	-	1.3	1.4	1.5	**1.4**
Formaldehyde destruction efficiency	%	-	94.2	95.8	94.7	**94.9**
Methanol inlet concentration	ppmvd	43.9	28.5	42.6	41.0	**37.4**
Methanol outlet concentration	ppmvd	-	5.2	4.6	6.8	**5.5**
Methanol destruction efficiency	%	-	79.5	87.6	80.1	**82.4**
THC inlet concentration	ppmvd	298	190	279	312	**260**
THC outlet concentration	ppmvd	35	31.9	35.1	44.1	**37.0**
THC destruction efficiency	%	86.1	81.0	85.6	82.9	**83.2**

Note: Biofilter bed temperature during the three test runs was 80 °F.

The results of the July 18, 2014 emissions testing established the following:

- Compliance of the No. 1 Biofilter source with the formaldehyde destruction efficiency limit of 90% or greater at a biofilter bed temperature within the compliance range of 73 to 87 °F.

1.0 Introduction

1.1 Summary of Test Program

Decorative Panels International, Inc. retained Bureau Veritas North America, Inc. to test air emissions from the No. 1 Biofilter source at the hardboard manufacturing facility in Alpena, Michigan. The No. 1 Biofilter control emissions from the EUPRESS2S and is included in the FGPRESSES flexible group. The objective of the testing was to evaluate compliance of the No. 1 Biofilter source with emission limits and requirements in:

- Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) MI-ROP-B1476-2009a for this FGMACTDDDD sources
- 40 CFR 63, Subpart DDDD, "National Emission Standards for Hazardous Air Pollutants: Plywood and Composite Wood Products."

On July 18, 2014, Bureau Veritas measured THC, methanol, and formaldehyde at the inlet and outlet of No. 1 Biofilter sampling location.

Four, 60-minute test runs were performed under maximum routine operating conditions following United States Environmental Protection Agency (USEPA) Methods 1 through 4, 25A, and 320. Run 1 of the testing was voided due to a fault between the outlet FTIR and data acquisition system causing the data acquisition system not to record HAP concentrations.

1.2 Key Personnel

The key personnel involved in this test program are listed in Table 1-1 on the following page. Mr. Thomas Schmelter, Senior Project Manager with Bureau Veritas led the emission testing. Mr. Dennis Werblow, Director of Environmental and Quality with Decorative Panels International, Inc. provided process coordination and recorded operating parameters. William Rogers Jr., Environmental Quality Analyst, with Michigan Department of Environmental Quality witnessed portions of the testing. Mr. Rob Dickman with the MDEQ was involved with the test plan approval.

Table 1-1
Key Personnel

Facility Contact	Emission Testing Project Manager
Dennis Werblow Director of Environmental and Quality **Decorative Panels International, Inc.** 416 Ford Avenue Alpena, Michigan 49707 Telephone: 989.356.8542 Facsimile: 989.356.2504 dennis.werblow@DecPanels.com	Thomas Schmelter, QSTI Senior Project Manager **Bureau Veritas North America, Inc.** 22345 Roethel Drive Novi, Michigan 48375 Telephone: 248.344.3003 Facsimile: 248.344.2656 thomas.schmelter@us.bureauveritas.com
Regulatory Agency	**Regulatory Agency**
Rob Dickman Environmental Quality Analyst **Michigan Department of Environmental Quality** Air Quality Division Cadillac District Office 120 West Chapin Street Cadillac, Michigan 49601-2158 Telephone: 231.876.4412 Facsimile: 231.775.1511 dickmanr@michigan.gov	William J. Rogers Jr. Environmental Quality Analyst **Michigan Department of Environmental Quality** Air Quality Division Gaylord District Office 2100 West M-32 Gaylord, Michigan 49735-9282 Telephone: 989.705.3406 Facsimile: 989.731.6181 rogersw@michigan.gov

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 are purchased and stored in an outdoor raw material storage area and then reclaimed into silos. The wood chips are cooked and softened in one of four digesters using steam injection and then ground into wood pulp fibers.

The pulp fibers are conveyed to a forming machine, which forms a mat of unpressed hardboard. The mats are processed through a Coe™ dryer and are 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 apply pressure and heat to 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." After the board is tempered, it is heated in the bake ovens (No. 1 Press only) to cure the binding resins. The hardboard is humidified to approximate atmospheric conditions to limit warping. The boards are inspected, graded, cut, and packed for shipping.

The No. 1 Biofilter controls emissions from the Line 1 Board Press and cooler.

2.2 Process Operating Parameters

The process was operated under maximum routine operating conditions during testing. The facility was manufacturing ¼-inch thick board at the No. 1 Press. Table 2-1 summarizes the number of press loads, boards, and production based on the number of VOC concentration peaks that were measured during the test period for the No. 1 line (EUPRESS2S). The capacity of the press line is 24 to 26 thousand square feet per hour. Refer to Appendix E for process data recorded during testing.

Table 2-1
Summary of EUPRESS2S Production Data

Test Run	Production Rate (¼ inch board)
	msf/hour
1	26.9
2	21.8
3	28.2
4	28.2
Average†	**26.0**

msf: thousand square feet
†: average of Runs 2, 3, and 4

2.3 Control Equipment

Emissions from the No. 1 Board Press are controlled by a DynaWave Engineering water scrubber and No. 1 Biofilter. Emissions from the No. 1 Board Press are captured by a permanent total enclosure that surrounds the press area. The air from the enclosure continuously exhausts through a duct that exits the roof of the building and towards the pollution control equipment. The captured air enters the top of the scrubber and flows downwards in the vessel, where nozzles spray water treated with sodium hydroxide to maintain a neutral pH, to remove particulates and 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 into the No. 1 Biofilter.

The No. 1 Biofilter, manufactured by Monsanto Enviro-Chem., consists of six compartments. The air from the scrubber can be further humidified and heated by adding steam before being directed into the biobed compartments. The compartments contain Douglas-fir bark from the western United States and water sprayers that maintain a moist environment for biological activity. The Douglas-fir bark provides an environment where biologically active microbes remove the contaminants.

After passing through the bark the flue gas is drawn into fans that discharge the gas through stack, SVS2COOLR-STK28. Figures 1-1 and 1-2 depict the No. 1 Biofilter inlet and outlet sampling locations.

The biofilter bed temperature is continuously monitored by thermocouples in each chamber. These temperatures are reduced to 15-minute averages and were recorded during testing.

The No. 1 Biofilter average bed temperatures during testing are presented in Table 2-2. Refer to Appendix E for facility operating data.

Table 2-2
No. 1 Biofilter Bed Temperature During Testing

Test Run	Bed Temperature (°F)
1	79
2	80
3	80
4	80
Average	**80**

2.4 Flue Gas Sampling Locations

The figures on the following pages provide photographs that show the sampling ports at the sampling locations for the No. 1 Biofilter. Appendix Figures 1 and 2 present the No. 1 Biofilter inlet and outlet sampling ports and traverse point locations.

Figure 1-1. No. 1 Biofilter Inlet Sampling Location

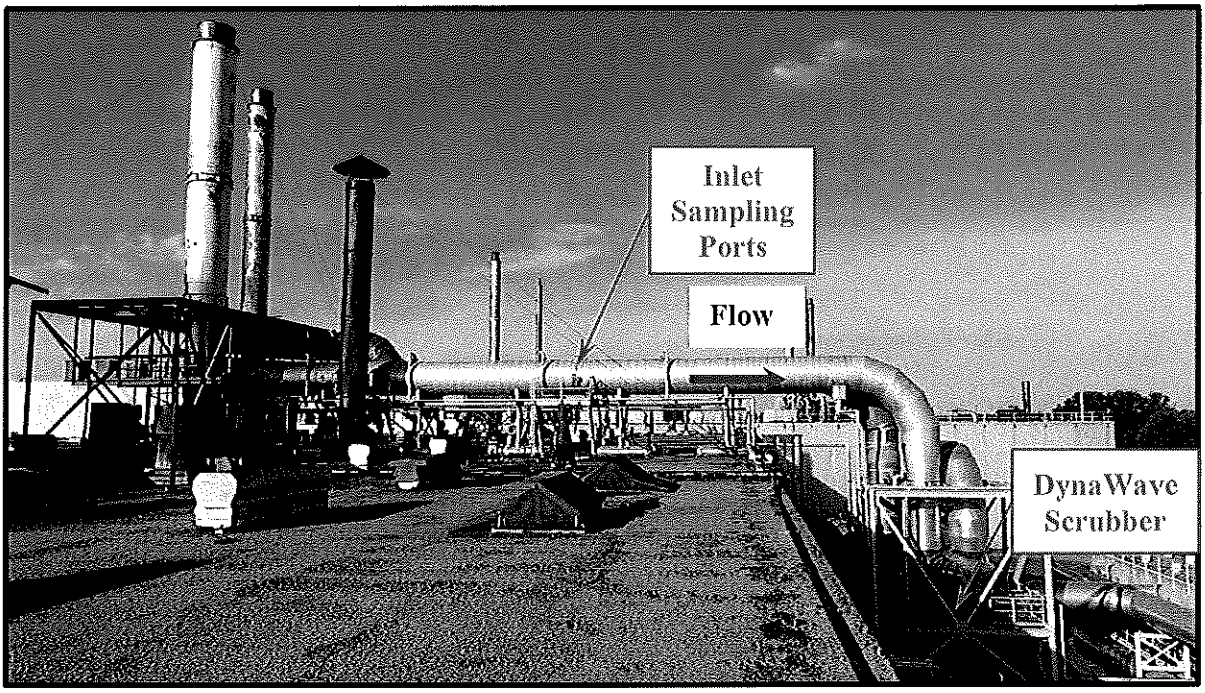
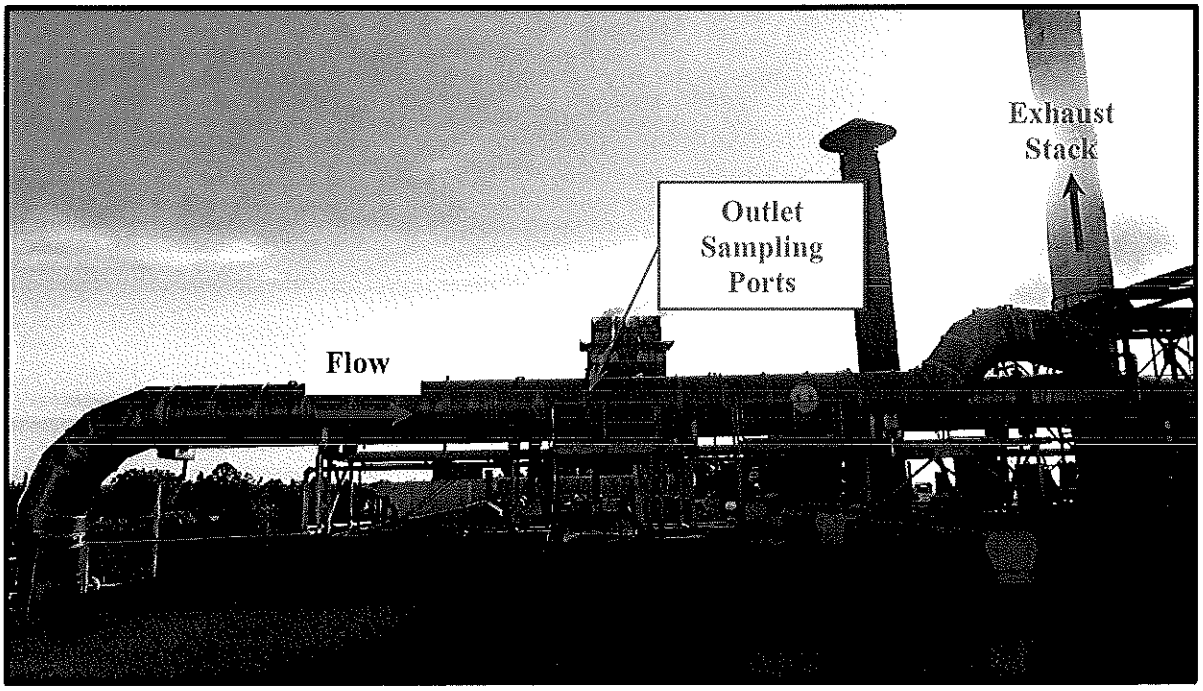


Figure 1-2. No. 1 Biofilter Outlet Sampling Locations



2.5 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 Objective

The objective of the testing was to evaluate compliance of the No. 1 Biofilter source with emission limits and requirements in:

- MDEQ ROP: MI-ROP-B1476-2009a for this FGMACTDDDD source.
- 40 CFR 63, Subpart DDDD, "National Emission Standards for Hazardous Air Pollutants: Plywood and Composite Wood Products."

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

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

Bureau Veritas measured THC, methanol, and formaldehyde at the No. 1 Biofilter sampling location.

3.2 Test Matrix

The purpose of the emission test program was to satisfy certain requirements and evaluate compliance with the two permits. Table 3-1 presents the sampling and analytical matrix.

Table 3-1
Test Matrix

Source	Date 2014	Run	Start Time	End Time	EPA Method
No. 1 Biofilter	July 18	1	12:15	13:15	1 through 4, 25A, 320
		2	13:40	14:40	
		3	15:20 16:16	15:57 16:39	
		4	16:51	17:51	

3.3 Field Test Changes and Issues

The testing was performed in accordance with USEPA procedures during maximum routine operating conditions as outlined in the original Intent-to-Test Plan submitted to MDEQ on April 17, 2013, and approved on May 2, 2013. An email notification was sent on June 18, 2014, regarding the retest of Biofilter 1, which was outlined in the original April 17, 2013 Intent-to-Test Plan.

No field test changes or issues were encountered during the test program, with the exception that Run 1 of the testing was voided due to a fault between the outlet FTIR and data acquisition system. The outlet HAPs were not recorded for Run 1. The run was voided in the field.

3.4 Summary of Results

The results of the testing are presented in Tables 3-2.

No. 1 Biofilter Formaldehyde, Methanol, and THC Results

Table 3-2
No. 1 Biofilter Formaldehyde, Methanol, and THC Emissions Results

Parameter	Units	Run 1 (voided)	Run 2	Run 3	Run 4	Average (Runs 2, 3, 4)
Formaldehyde inlet concentration	ppmvd	35.2	26.1	38.2	35.1	**33.1**
Formaldehyde outlet concentration	ppmvd	-	1.3	1.4	1.5	**1.4**
Formaldehyde destruction efficiency	%	-	94.2	95.8	94.7	**94.9**
Methanol inlet concentration	ppmvd	43.9	28.5	42.6	41.0	**37.4**
Methanol outlet concentration	ppmvd	-	5.2	4.6	6.8	**5.5**
Methanol destruction efficiency	%	-	79.5	87.6	80.1	**82.4**
THC inlet concentration	ppmvd	298	190	279	312	**260**
THC outlet concentration	ppmvd	35	31.9	35.1	44.1	**37.0**
THC destruction efficiency	%	86.1	81.0	85.6	82.9	**83.2**

Note: Biofilter bed temperature during the three test runs was 80 °F.

The results of the July 18, 2014 emissions testing established the following:

- Compliance of the No. 1 Biofilter source with the formaldehyde destruction efficiency limit of 90% or greater at a biofilter bed temperature within the compliance range of 73 to 87 °F.

Detailed results are presented in the Appendix Table 1 after the Tables Tab of this report. Graphs of the formaldehyde, methanol, and THC concentrations are presented after the Graphs Tab of this report. Sample calculations are presented in Appendix B.

4.0 Sampling and Analytical Procedures

Bureau Veritas measured emissions following the guidelines and procedures specified in 40 CFR 60, Appendix A, "Standards of Performance for New Stationary Sources," 40 CFR 63, Appendix A, "Test Methods Pollutant Measurement Methods from Various Waste Media," and State of Michigan Part 10 Rules, "Intermittent Testing and Sampling." The sampling and analytical methods used are presented in Table 4-1.

Table 4-1
Emission Test Methods

Method	Parameter	Analysis
EPA 1 and 2	Gas stream volumetric flowrate	Field measurement, S-type Pitot tube
EPA 3	molecular weight	Fyrite® chemical absorption
EPA 4	Moisture content	Gravimetric
EPA 25A	Total hydrocarbons	Flame ionization detector
EPA 320	Formaldehyde and methanol	Extractive Fourier transform infrared spectroscopy (FTIR)

4.1 Emission Test Methods

The table below outlines the test methods for the test parameters, including ancillary measurements required by the USEPA methods (i.e., traverse point selection, velocity, molecular weight, and moisture content).

Table 4-2
Emission Test Parameters

Parameter	Source		USEPA Reference	
	Inlet of No. 1 Biofilter	Outlet of No. 1 Biofilter	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
Moisture content	•	•	4	Determination of Moisture Content in Stack Gases
Total hydrocarbons	•	•	25A	Determination of Total Gaseous Organic Concentration using a Flame Ionization Analyzer

Table 4-2
Emission Test Parameters

Parameter	Source		USEPA Reference	
	Inlet of No. 1 Biofilter	Outlet of No. 1 Biofilter	Method	Title
Formaldehyde and methanol	•	•	320	Measurement of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared (FTIR) Spectroscopy

4.1.1 Volumetric Flowrate (USEPA Methods 1 and 2)

Method 1, "Sample and Velocity Traverses for Stationary Sources," from the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, was used to evaluate the sampling location, the number of traverse points for sampling, and the measurement of velocity profiles. Details of the sampling location and number of velocity traverse points are presented in Table 4-3.

Table 4-3
Sampling Location and Number of Traverse Points

Source	Sampling Location	Duct Diameter (inches)	Distance from Ports to Upstream Flow Disturbance (diameters)	Distance from Ports to Downstream Flow Disturbance (diameters)	Number of Ports Used	Traverse Points per Port	Total Traverse Points	Cyclonic Flow Null Angle (°)
No. 1 Biofilter	Inlet	59.75	8.8	8.0	2	12	24	3.1
No. 1 Biofilter	Outlet	59.25	7.6	3.4	2	12	24	9.8

Figures 2-1 and 2-2 are photographs depicting the sampling locations at the No. 1 Biofilter. Appendix Figures 1 and 2 present the No. 1 Biofilter inlet and outlet sampling ports and traverse point locations. 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 flowrate. 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 were within the specified limits, the baseline Pitot tube coefficient of 0.84 (dimensionless) was assigned. Refer to Appendix A for the Pitot tube inspection sheets.

Cyclonic Flow Check. Bureau Veritas evaluated whether cyclonic flow was present at the sampling locations on March 7, 2014. 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 degrees, the flue gas is considered cyclonic at that sampling location and an alternative location should be found.

The average of the measured traverse point flue gas velocity null angles was:

- 3.1° from the direction of flow for the No 1 Biofilter inlet
- 9.8° from the direction of flow for the No. 1 Biofilter outlet

The measurements indicate the absence of cyclonic flow at the biofilter sampling locations. 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)

Molecular weight at the No. 1 Biofilter locations was measured using Method 3, "Gas Analysis for the Determination of Dry Molecular Weight." 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 (CO_2) were measured by chemical absorption to within ±0.5%. The average CO_2 results of the grab samples were used to calculate molecular weight.

4.1.3 Moisture Content (USEPA Method 4)

Before testing, moisture content was estimated using previous test data, psychrometric charts, and/or saturation vapor pressure tables. This estimate was used in conjunction with preliminary velocity head and temperature data to (1) calculate flue gas velocity, 2) ideal nozzle diameter, and (3) establish isokinetic sampling rates.

At biofilter outlet sampling location, the moisture content of the flue gas was measured using the reference method outlined in Section 2 of Method 4, "Determination of Moisture Content in Stack Gases". Moisture content at the inlet sampling location was measured by infrared absorbance using USEPA Method 320.

4.1.4 Total Hydrocarbons (USEPA Method 25A)

The THC sampling followed USEPA Method 25A, "Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer" procedures. Samples were collected through a stainless steel probe and heated sample line into the analyzer. Bureau Veritas used J.U.M.

109A and/or J.U.M 3-300A flame ionization detector based hydrocarbon analyzers. Figure 5 in the Appendix depicts the USEPA Method 25A sampling train.

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.

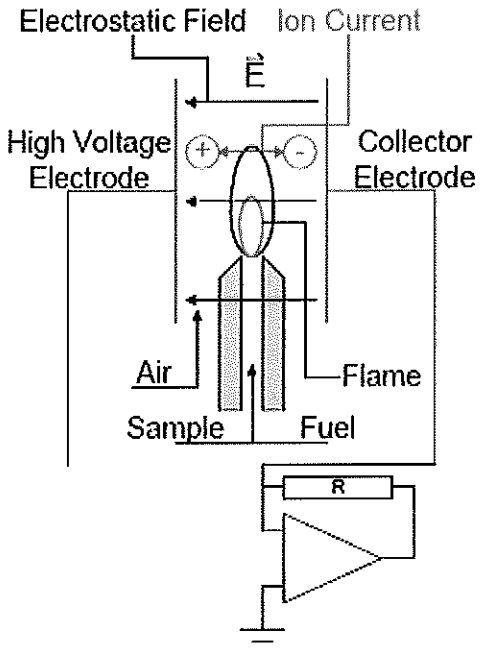


Figure 4-1. FID Flame Chamber

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

Before testing, the FID analyzers were 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 values were 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 were considered to be calibrated when the analyzer response was ±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 gases to the tip of the sampling probe. The test run data were considered valid if the calibration drift test demonstrated the analyzers responded within ±3% of calibration span from pre-test to post-test calibrations.

4.1.5 Formaldehyde and Methanol (USEPA Method 320)

VOC/HAP emissions were measured in accordance with USEPA Method 320, "Measurements of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared (FTIR) Spectroscopy." Gaseous samples were withdrawn from the stack and transferred to MKS Instruments MultiGas 2030 FTIR spectrometers for formaldehyde and methanol measurements. Figure 6 in the Appendix depicts the USEPA Method 320 sampling train.

The samples were directed through a heated probe, heated filter and heated transfer line connected to the FTIR. The probes, filters, transfer lines, and FTIRs were maintained at 191° C (375° F) during testing. The formaldehyde and methanol concentrations were measured based on their infrared absorbance compared to reference spectra. The FTIR analyzer scans the sample approximately once per second. A data point consists of the co-addition of 64 scans, with a data point generated every minute.

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

- The highest obtainable formaldehyde cylinder is 30 ppm: therefore, the spiked concentration would be 3 ppm (analyte spiking consists of sampling 1 part calibration gas in the presence of 9 parts effluent gas). The formaldehyde concentrations of the sources tested were much higher than 3 ppm.

- Acetaldehyde's physical and chemical properties are similar to those of formaldehyde. Formaldehyde is the C_1 aldehyde (CH_2O); acetaldehyde is the C_2 aldehyde (CH_3CHO).

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

4.2 Procedures for Obtaining Process Data

Process data was recorded by Decorative Panels International, Inc. personnel during testing. Refer to Section 2.1 and 2.2 for discussions of process and control device data and Appendix E for the operating parameters recorded during testing.

5.0 QA/QC Activities

5.1 Pretest QA/QC Activities

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 and Principles" and, Volume III, "Stationary Source Specific Methods." Refer to Appendix A for inspection and calibration sheets.

5.2 QA/QC Audits

The results of select sampling and equipment QA/QC audits and the acceptable USEPA tolerance are presented in the following sections.

5.2.1 Instrument Analyzer QA/QC Audits

The infrared, FID, and FTIR analyzers met the QA/QC requirements of USEPA Methods 3A, 25A, and 320. The analyzers were calibrated using USEPA Traceability Protocol calibration gases with an uncertainty ≤2% of certified value. FID calibration error tests indicated the analyzers were responding to ±5.0% of the cylinder concentration and did not drift more than ±3% before and after each test run. The FTIR analyzers passed all QA/QC procedures included acetaldehyde and methanol spike recoveries within the ±30% allowance.

Refer to Appendix A for the calibration gas certificates and analyzer calibration data and Appendix F for the FTIR calibration data.

5.2.2 Dry-Gas Meter QA/QC Audits

A dry-gas meter was used to sample the flue gas during measurement of moisture content. Table 5-1 summarizes the dry-gas meter (DGM) calibration checks in comparison to the acceptable USEPA tolerance.

Refer to Appendix A for the pre- and post- test DGM calibrations.

Table 5-1
DGM Calibration QA/QC Audit

Meter Box	Pre-test DGM Calibration Factor (Y) (dimensionless)	Post-Test DGM Calibration Check Value (Y_{qa}) (dimensionless)	Difference Between Pre- and Post-test DGM Calibrations	Acceptable Tolerance	Comment
8	1.006 (May 29, 2014)	1.007 (July 25, 2014)	0.001	0.05	Valid

5.2.3 Thermocouple QA/QC Audits

Temperature measurements using thermocouples and digital pyrometers were compared to a reference temperature (i.e., ice water bath, boiling water) prior to and after testing to evaluate accuracy of the equipment. The thermocouples and pyrometers measured temperature within ±1.5% of three reference temperatures and, therefore, the equipment met USEPA acceptance criteria. Thermocouple calibration sheets are presented in the Appendix A.

5.3 QA/QC Problems

QA/QC problems were not encountered during this test program.

Limitations

The information and opinions rendered in this report are exclusively for use by Decorative Panels International, Inc. Bureau Veritas North America, Inc. will not distribute or publish this report without Decorative Panels International, Inc.'s consent 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. Bureau Veritas North America, Inc. 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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Table

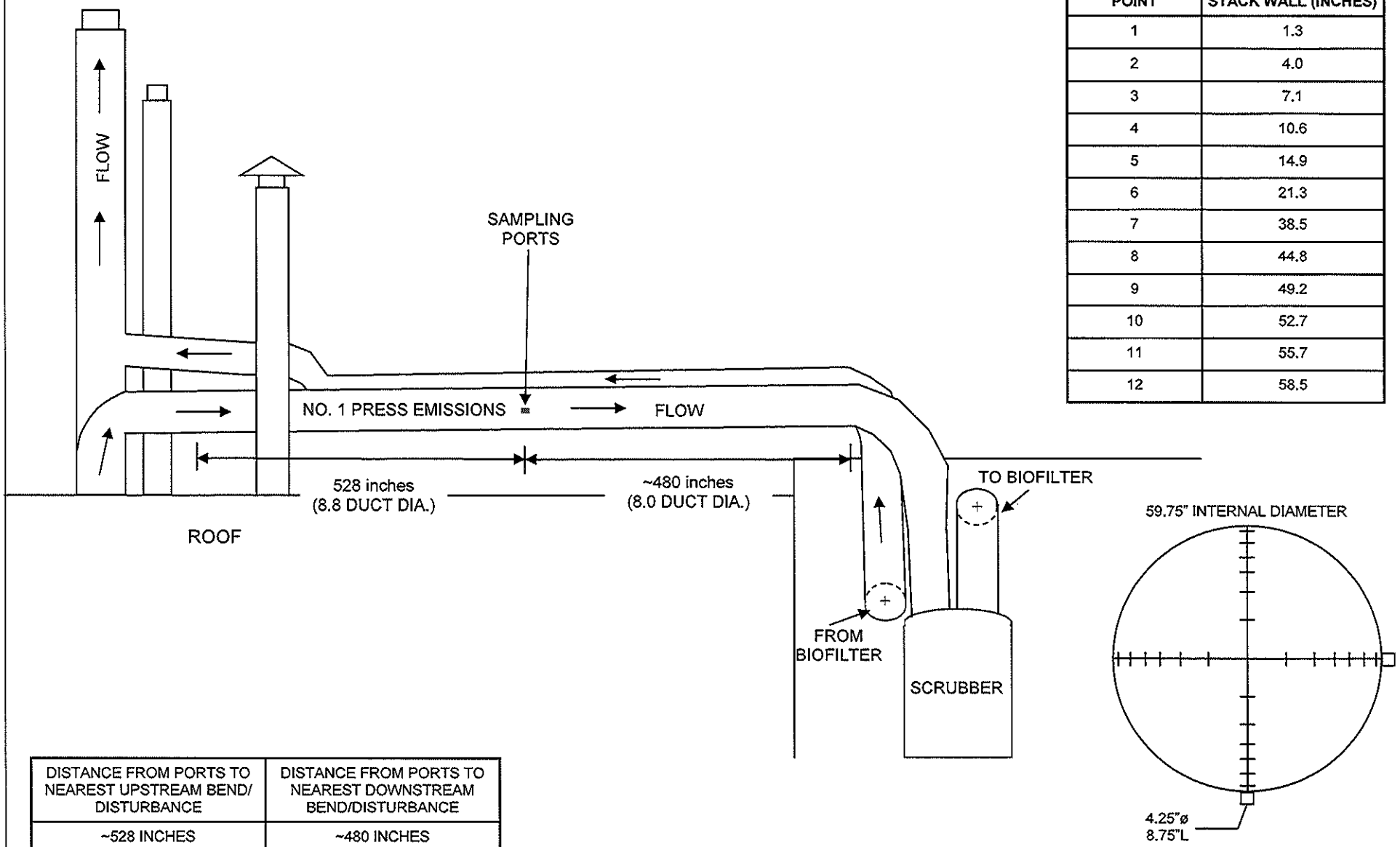
Table 1
No. 1 Biofilter Evaluation Results
Decorative Panels International, Inc.
Alpena, Michigan
Bureau Veritas Project No. 11014-000132.00
Sampling Date: July 18, 2014

Parameter		Units	Run 1	Run 2	Run 3	Run 4	Average Runs 2-4
Sampling Time			12:15-13:15	13:40-14:40	15:20-15:57; 16:16-16:39	16:51-17:51	
Duration		minutes	60	60	60	60	60
No. 1 Biofilter Temperature		°F	79	80	80	80	80
Inlet							
	Average Gas Stream Volumetric Flowrate	scfm	60,697	62,135	64,096	60,046	62,092
	Gas Stream Percent Moisture Content	%	2.2	2.1	2.3	2.2	2.2
	Formaldehyde Concentration	ppmv, as CH_2O	34.4	25.5	37.3	34.4	32.4
	Formaldehyde Concentration	ppmvd, as CH_2O	35.2	26.1	38.2	35.1	33.1
	Formaldehyde Mass Emission Rate	lb/hr, as CH_2O	9.8	7.4	11.2	9.7	9.4
	Methanol Concentration	ppmv, CH_3OH	42.9	27.9	41.6	40.1	36.5
	Methanol Concentration	ppmvd, CH_3OH	43.9	28.5	42.6	41.0	37.4
	Methanol Mass Emission Rate	lb/hr, as CH_3OH	13.0	8.7	13.3	12.0	11.3
	THC Concentration	ppmv, as propane	97.2	62.0	91.0	101.6	84.9
	THC Concentration	ppmv, as carbon	292	186	273	305	255
	THC Concentration	ppmvd, as carbon	298	190	279	312	260
	THC Mass Emission Rate	lb/hr, as propane	40	26	40	42	36
	THC Mass Emission Rate	lb/hr, as carbon	33	22	33	34	30
Outlet							
	Gas Stream Volumetric Flowrate	scfm	73,781	72,024	75,915	73,421	73,787
	Gas Stream Percent Moisture Content	%	4.5	4.4	5.7	3.5	4.5
	Formaldehyde Concentration	ppmv, as CH_2O	-	1.3	1.3	1.5	1.4
	Formaldehyde Concentration	**ppmvd, as CH_2O**	-	1.3	1.4	1.5	1.4
	Formaldehyde Mass Emission Rate	lb/hr, as CH_2O	-	0.4	0.5	0.5	0.5
	Methanol Concentration	ppmv, CH_3OH	-	4.9	4.4	6.5	5.3
	Methanol Concentration	**ppmvd, CH_3OH**	-	5.2	4.6	6.8	5.5
	Methanol Mass Emission Rate	lb/hr, as CH_3OH	-	1.8	1.6	2.4	1.9
	THC Concentration	ppmv, as propane	11.1	10.2	11.0	14.2	11.8
	THC Concentration	ppmv, as carbon	33.4	30.5	33.1	42.6	35.4
	THC Concentration	**ppmvd, as carbon**	35.0	31.9	35.1	44.1	37.0
	THC Mass Emission Rate	lb/hr, as propane	5.6	5.0	5.7	7.1	6.0
	THC Mass Emission Rate	lb/hr, as carbon	4.6	4.1	4.7	5.8	4.9
Formaldehyde Destruction Efficiency Results		%	-	94.2	95.8	94.7	94.9
Methanol Destruction Efficiency Results		%	-	79.5	87.6	80.1	82.4
No. 1 Biofilter THC Destruction Efficiency Results		%	86.1	81.0	85.6	82.9	83.2

Molecular weight of propane	44.00	g/mole	
Molecular weight of carbon	12.01	g/mole	
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		

Figures

TRAVERSE POINT	DISTANCE FROM STACK WALL (INCHES)
1	1.3
2	4.0
3	7.1
4	10.6
5	14.9
6	21.3
7	38.5
8	44.8
9	49.2
10	52.7
11	55.7
12	58.5



DISTANCE FROM PORTS TO NEAREST UPSTREAM BEND/ DISTURBANCE	DISTANCE FROM PORTS TO NEAREST DOWNSTREAM BEND/DISTURBANCE
~528 INCHES (8.8 DIAMETERS)	~480 INCHES (8.0 DIAMETERS)

SCALE	NOT TO SCALE
DATE	August 7, 2014
PRJ NO.	11014-000132.00

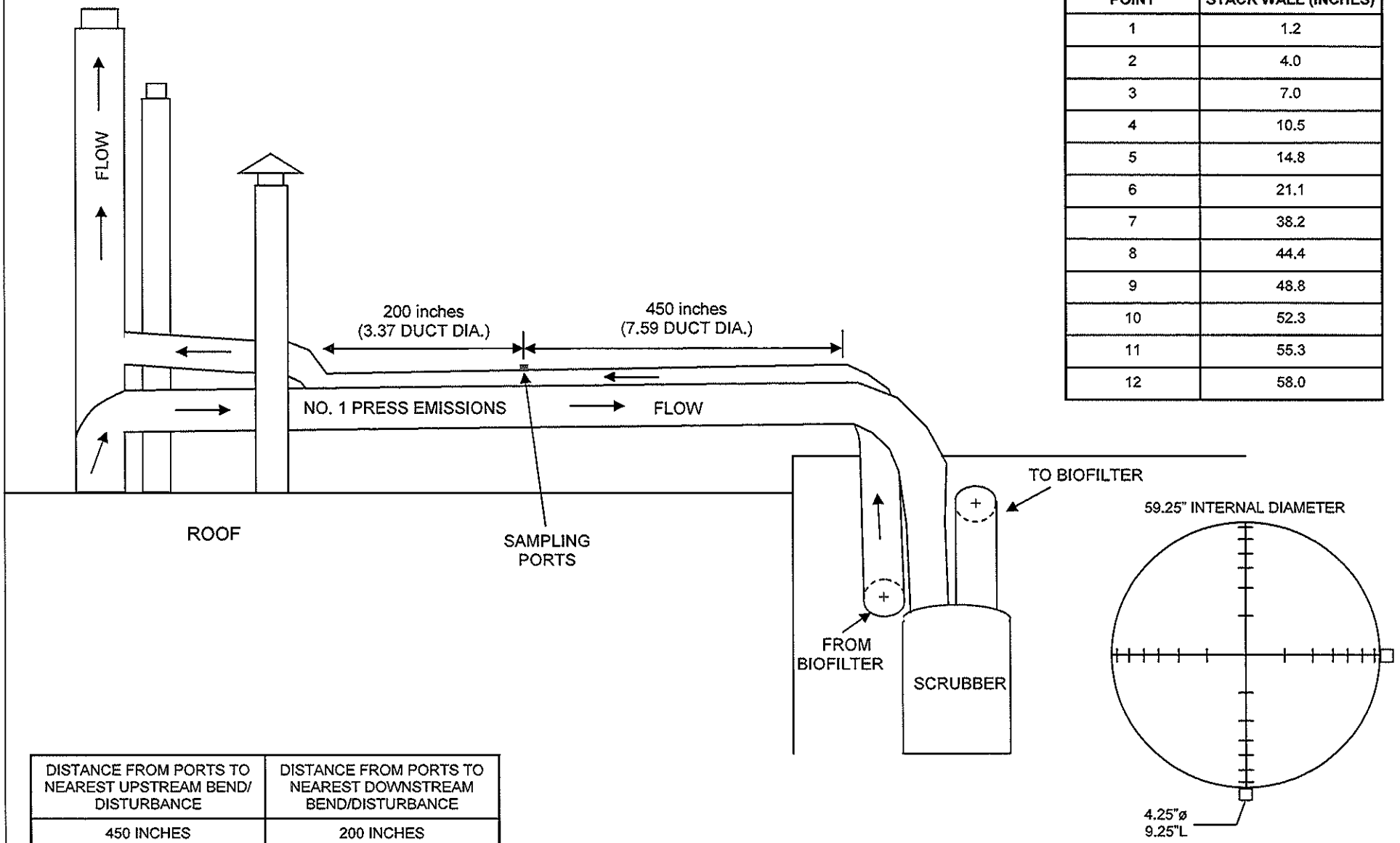
NO. 1 BIOFILTER INLET SAMPLING PORTS AND TRAVERSE POINT LOCATIONS

DECORATIVE PANELS INTERNATIONAL, INC.
ALPENA, MICHIGAN

BUREAU VERITAS

FIGURE 1

TRAVERSE POINT	DISTANCE FROM STACK WALL (INCHES)
1	1.2
2	4.0
3	7.0
4	10.5
5	14.8
6	21.1
7	38.2
8	44.4
9	48.8
10	52.3
11	55.3
12	58.0



DISTANCE FROM PORTS TO NEAREST UPSTREAM BEND/ DISTURBANCE	DISTANCE FROM PORTS TO NEAREST DOWNSTREAM BEND/DISTURBANCE
450 INCHES (7.59 DIAMETERS)	200 INCHES (3.37 DIAMETERS)

SCALE	NOT TO SCALE
DATE	August 7, 2014
PRJ NO.	11014-000132.00

NO. 1 BIOFILTER OUTLET SAMPLING PORTS AND TRAVERSE POINT LOCATIONS

DECORATIVE PANELS INTERNATIONAL, INC.
ALPENA, MICHIGAN

BUREAU VERITAS

FIGURE 2

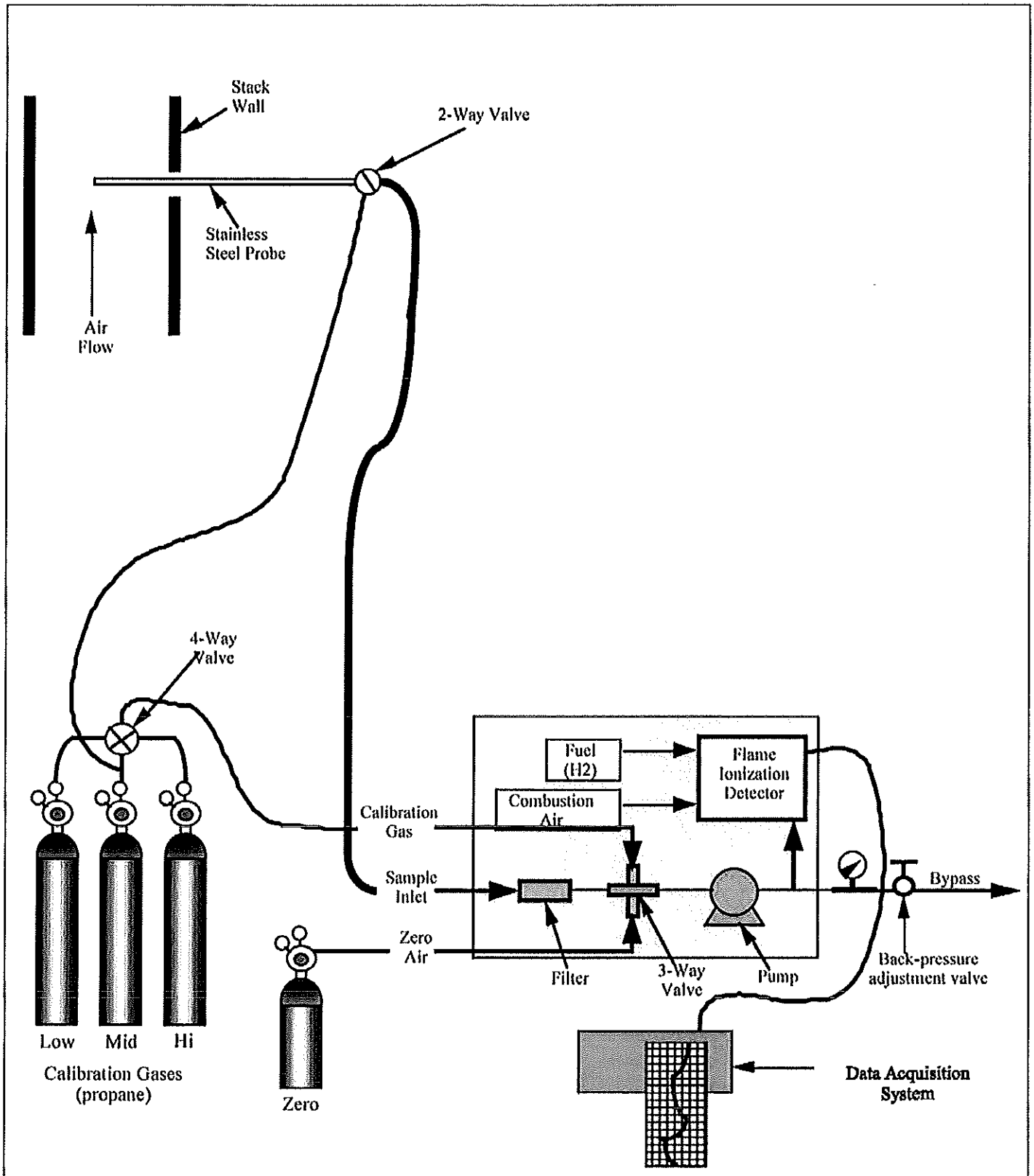


Figure 3
USEPA Method 25A Sampling Train

DECORATIVE PANELS INTERNATIONAL, INC.
ALPENA, MICHIGAN

Project No. 11014-000132.00

Last Revision:
August 7, 2014

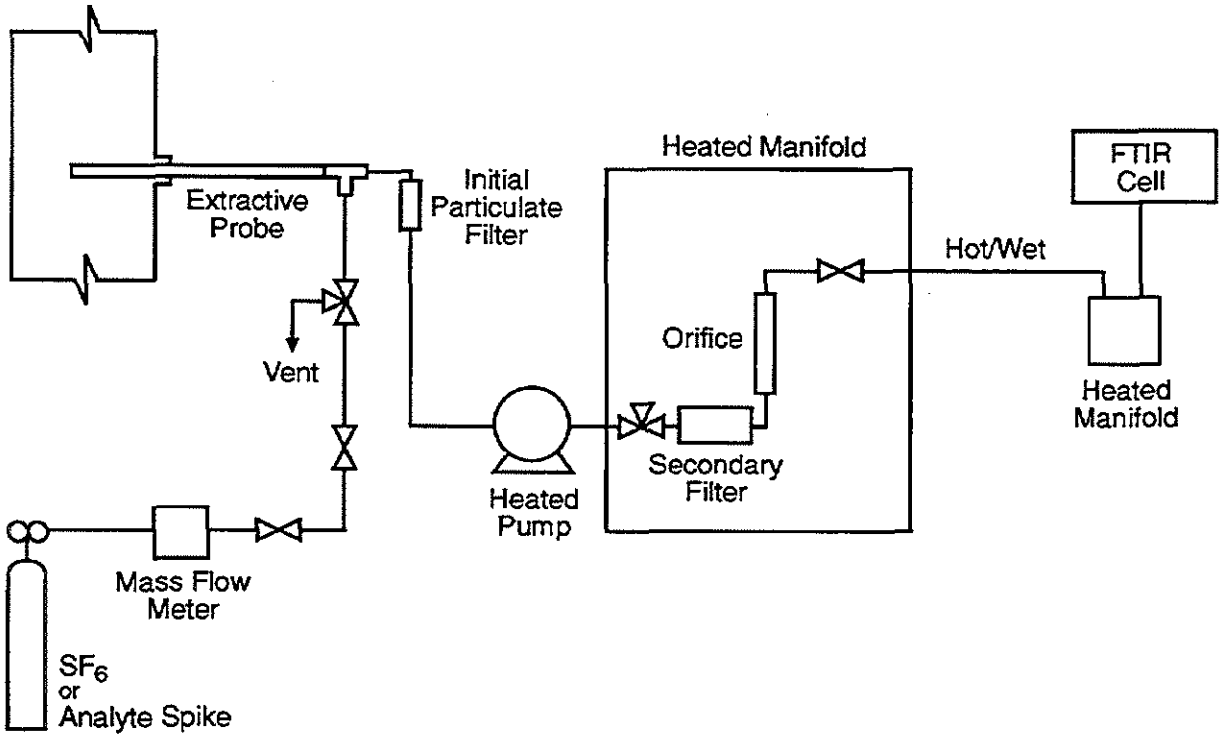


Figure 4
USEPA Method 320 Sampling Train

BUREAU VERITAS

DECORATIVE PANELS INTERNATIONAL, INC.
ALPENA, MICHIGAN

Project No. 11014-000132.00

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