



**Total Particulate Matter
Compliance Emissions
Test Report**

**Billerud Escanaba
Escanaba Mill
Chip Thickness Screening System Stacks
Escanaba, Michigan
June 7 through 9, 2022**

**Report Submittal Date
August 12, 2022**

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Project No. M222314



MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
AIR QUALITY DIVISION

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**RENEWABLE OPERATING PERMIT
REPORT CERTIFICATION**

AIR QUALITY DIVISION

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 Permit (ROP) 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 specified in Rule 213(3)(b)(ii), and be made available to the Department of Environment, Great Lakes, and Energy, Air Quality Division upon request.

Source Name Billerud Escanaba LLC County Delta

Source Address 7100 County Road 416 City Escanaba

AQD Source ID (SRN) A0884 ROP No. MI-ROP-A0884-2021a ROP Section No. 1

Please check the appropriate box(es):

Annual Compliance Certification (Pursuant to Rule 213(4)(c))

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 ROP, 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 ROP.
- 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, 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 ROP, unless otherwise indicated and described on the enclosed deviation report(s).

Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))

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

- 1. During the entire reporting period, ALL monitoring and associated recordkeeping requirements in the ROP 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 ROP 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 Jan 1, 2022 To Dec, 31 2022

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

Woodyard Chip Thickness Screening Testing

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

Brian Peterson Mill Manager 906-233-2600
Name of Responsible Official (print or type) Title Phone Number

[Signature] 12 Aug 2022
Signature of Responsible Official Date

* Photocopy this form as needed.

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1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a compliance emissions test program for Billerud Escanaba at the chip thickness screening system (#1 Chip Reclaim Cyclone (East), #2 Chip Reclaim Cyclone (West), Air Density Separator (ADS) Cyclone #1A, ADS Cyclone #1B, ADS Cyclone #2A, and ADS Cyclone #2B) on June 7 through 9, 2022. This report summarizes the results of the test program and test methods used.

The test locations, test dates, and test parameters are summarized below.

TEST INFORMATION		
Test Locations	Test Dates	Test Parameter
Chip Thickness Screening System total	June 7 through 9, 2022	Total Particulate Matter (TPM)

The purpose of this test program was to determine total particulate matter (TPM) compliance in accordance with the Michigan Department of Environment, Great Lakes and Energy (EGLE) issued Renewable Operating Permit (ROP) Number MI-ROP-A0884-2021a.

Since the stack temperature never exceeded 30°C (85°F), the use of Method 202 was not required to measure TPM and the probe and oven were not heated. TPM collected was reported as PM₁₀.

Twelve points were utilized for #1 Chip Reclaim Cyclone East and #2 Chip Reclaim Cyclone West sampling instead of the 40 points that were traversed during the site acceptability testing.

Location	Test Parameter	Emission Limit	Emission Result
Chip Thickness Screening System total	TPM	0.00750 gr/dscf	0.00137 gr/dscf weighted by DSCFM
		5.58 lb/hr	0.742 lb/hr

Operating data as provided by Billerud Escanaba are included in Appendix A.

The identifications of individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	Address	Contact
Test Facility	Billerud Escanaba 7100 County Road 426 M.5 Rd Escanaba, MI 49829	Mr. Adam Becker Environmental Engineer (906) 233-2929 Adam.becker@billerud.com
Testing Company Representative	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Daniel J. Kossack Project Supervisor (630) 993-2100 dkossack@mp-mail.com

The test crew consisted of J. Priesz, M. Friduss, S. Plesha, V. Panateri, and D. Kossack of Mostardi Platt.

2.0 TEST METHODOLOGY

Emissions testing were conducted following the methods specified in 40 CFR Part 60, Appendix A. Drawings depicting the test location and sampling trains are found in Appendices B and C, respectively. Explanations of nomenclature and calculations are found in Appendix D. Sample analysis data are found in Appendix E. Reference method data and field data sheets for each run are found in Appendices F and G, respectively.

The following methodologies were used during the test program:

Method 1 Traverse Point Determination

Test measurement points were selected in accordance with Method 1. The characteristics of the measurement locations are summarized below.

Location	Stack Diameter (Feet)	No. of Ports	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
#1 Chip Reclaim Cyclone East	3.667	2	0.5	2.0	FPM	12
#2 Chip Reclaim Cyclone West	3.667	2	0.5	2.0	FPM	12
ADS Cyclone #1A	2.167	2	>2	>8	FPM	12
ADS Cyclone #1B	2.167	2	>2	>8	FPM	12
ADS Cyclone #2A	2.167	2	>2	>8	FPM	12
ADS Cyclone #2B	2.167	2	>2	>8	FPM	12

Method 2 Volumetric Flow Rate Determination

Gas velocity was measured following Method 2, for purposes of calculating stack gas volumetric flow rate at the outlet of each scrubber. A standard pitot tube, differential pressure gauge, thermocouple and temperature readout were used to determine gas velocity at each sample point at each test location. A null point was performed at each Reclaim Cyclone locations to show the absence of cyclonic flow. Copies of field data sheets are included in Appendix G. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H. This testing met the performance specifications as outlined in the Method.

The O₂ and CO₂ concentrations was determined per section 8.6 of USEPA Method 2 – “for processes emitting essentially air, an analysis need not be conducted; use a dry molecular weight of 29.0” – the oxygen and carbon dioxide concentrations will be assumed to be ambient.

Method 4 Moisture Determination

USEPA Method 4, 40CFR60, Appendix A, was utilized to determine water (H₂O) content of the exhaust gas. 100 milliliters (ml) of water were added to each of the first two impingers, the third impinger was left empty, and the fourth impinger was charged with approximately 200 grams of silica gel. The impingers were placed in an ice bath to maintain the sampled gas passed through the silica gel impinger outlet below 68°F in order to increase the accuracy of the sampled dry gas volume measurement. The water volumes of the impinger train were measured and the silica gel was weighed before and after each test run to determine the mass of moisture condensed.

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Each sample was extracted through a heated stainless-steel probe and filter assembly at a constant sample rate of approximately 0.75 cubic feet per minute, which was maintained throughout the course of the test run. A minimum of 21 dry standard cubic feet (dscf) are sampled for each moisture run. After each run, a leak check of the sampling train was performed at a vacuum greater than the sampling vacuum to determine if any leakage had occurred during sampling. Following the leak check, the impingers were removed from the ice bath, water levels were measured, and the silica gel weight was recorded.

All of the equipment used was calibrated in accordance with the specifications of the Method. Copies of field data sheets are included in Appendix G. Calibration data is presented in Appendix H.

Method 5 Filterable Particulate Matter (FPM) Determination

Stack gas FPM concentrations and emission rates were determined in accordance with USEPA Method 5, 40CFR60, Appendix A at all test locations. An Environmental Supply Company, Inc. sampling train was used to sample stack gas at an isokinetic rate, as specified in the Method. Particulate matter in the sample probe was recovered using a deionized water wash. The probe wash and filter catch were analyzed by Mostardi Platt in accordance with the Method in the Elmhurst, Illinois laboratory. Sample analysis data are found in Appendix E. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H.

3.0 TEST RESULTS SUMMARIES

Client: Billerud Escanaba
Facility: Escanaba Mill
Test Location: #1 Chip Reclaim Cyclone (East)
Test Method: 5

	Source Condition	Normal	Normal	Normal	
	Date	6/9/22	6/9/22	6/9/22	
	Start Time	7:39	8:51	10:05	
	End Time	8:41	9:56	11:08	
		Run 1	Run 2	Run 3	Average
Stack Conditions					
Average Gas Temperature, °F		64.3	68.8	68.5	67.2
Flue Gas Moisture, percent by volume		2.1%	2.4%	2.0%	2.2%
Average Flue Pressure, in. Hg		29.00	29.00	29.00	29.00
Gas Sample Volume, dscf		44.776	44.244	42.674	43.898
Average Gas Velocity, ft/sec		10.529	10.595	10.179	10.434
Gas Volumetric Flow Rate, acfm		6,672	6,714	6,450	6,612
Gas Volumetric Flow Rate, dscfm		6,377	6,343	6,119	6,280
Gas Volumetric Flow Rate, scfm		6,514	6,499	6,247	6,420
Isokinetic Variance		102.2	101.5	101.5	101.7
Filterable Particulate Matter (Method 5)					
grams collected		0.00581	0.00366	0.00218	0.00388
grains/acf		0.0019	0.0012	0.0007	0.0013
grains/dscf		0.0020	0.0013	0.0008	0.0014
lb/hr		0.109	0.069	0.041	0.073

Client: Billerud Escanaba
 Facility: Escanaba Mill
 Test Location: #2 Chip Reclaim Cyclone (West)
 Test Method: 5

	Normal	Normal	Normal	
Source Condition	Normal	Normal	Normal	
Date	6/8/22	6/8/22	6/8/22	
Start Time	9:25	10:43	11:56	
End Time	10:28	11:45	12:58	
	Run 1	Run 2	Run 3	Average
Stack Conditions				
Average Gas Temperature, °F	71.5	72.0	68.0	70.5
Flue Gas Moisture, percent by volume	2.6%	2.7%	2.4%	2.6%
Average Flue Pressure, in. Hg	29.20	29.20	29.20	29.20
Gas Sample Volume, dscf	39.088	39.207	38.721	39.005
Average Gas Velocity, ft/sec	9.362	9.368	9.215	9.315
Gas Volumetric Flow Rate, acfm	5,932	5,936	5,839	5,902
Gas Volumetric Flow Rate, dscfm	5,603	5,595	5,563	5,587
Gas Volumetric Flow Rate, scfm	5,752	5,750	5,700	5,734
Isokinetic Variance	101.6	102.0	101.3	101.6
Filterable Particulate Matter (Method 5)				
grams collected	0.00651	0.00671	0.00919	0.00747
grains/acf	0.0024	0.0025	0.0035	0.0028
grains/dscf	0.0026	0.0026	0.0037	0.0030
lb/hr	0.123	0.127	0.175	0.142

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Client: Billerud Escanaba
Facility: Escanaba Mill
Test Location: ADS Cyclone #1A
Test Method: 5

	Normal	Normal	Normal	
Source Condition	Normal	Normal	Normal	
Date	6/7/22	6/7/22	6/7/22	
Start Time	9:00	10:18	11:40	
End Time	10:03	11:20	12:42	
	Run 1	Run 2	Run 3	Average
Stack Conditions				
Average Gas Temperature, °F	65.7	69.5	73.0	69.4
Flue Gas Moisture, percent by volume	1.3%	1.3%	1.5%	1.4%
Average Flue Pressure, in. Hg	29.19	29.19	29.19	29.19
Gas Sample Volume, dscf	36.66	36.221	36.299	36.393
Average Gas Velocity, ft/sec	59.466	59.277	59.766	59.503
Gas Volumetric Flow Rate, acfm	13,159	13,117	13,226	13,167
Gas Volumetric Flow Rate, dscfm	12,724	12,593	12,592	12,636
Gas Volumetric Flow Rate, scfm	12,894	12,760	12,781	12,812
Isokinetic Variance	100.3	100.1	100.3	100.2
Filterable Particulate Matter (Method 5)				
grams collected	0.00061	0.00093	0.00056	0.00070
grains/acf	0.0002	0.0004	0.0002	0.0003
grains/dscf	0.0003	0.0004	0.0002	0.0003
lb/hr	0.028	0.043	0.026	0.032

Client: Billerud Escanaba
Facility: Escanaba Mill
Test Location: ADS Cyclone #1B
Test Method: 5

Source Condition	Normal	Normal	Normal	
Date	6/7/22	6/7/22	6/7/22	
Start Time	9:00	10:18	11:40	
End Time	10:02	11:20	12:42	
	Run 1	Run 2	Run 3	Average
Stack Conditions				
Average Gas Temperature, °F	67.3	69.9	72.6	69.9
Flue Gas Moisture, percent by volume	1.5%	1.8%	1.8%	1.7%
Average Flue Pressure, in. Hg	29.19	29.19	29.19	29.19
Gas Sample Volume, dscf	47.101	47.39	47.506	47.332
Average Gas Velocity, ft/sec	53.019	53.474	53.785	53.426
Gas Volumetric Flow Rate, acfm	11,732	11,833	11,902	11,822
Gas Volumetric Flow Rate, dscfm	11,289	11,297	11,309	11,298
Gas Volumetric Flow Rate, scfm	11,462	11,502	11,511	11,492
Isokinetic Variance	99.9	100.5	100.6	100.3
Filterable Particulate Matter (Method 5)				
grams collected	0.00227	0.00040	0.00040	0.00102
grains/acf	0.0007	0.0001	0.0001	0.0003
grains/dscf	0.0007	0.0001	0.0001	0.0003
lb/hr	0.072	0.013	0.013	0.033

Client: Billerud Escanaba
Facility: Escanaba Mill
Test Location: ADS Cyclone #2A
Test Method: 5

	Source Condition	Normal	Normal	Normal	
	Date	6/7/22	6/7/22	6/7/22	
	Start Time	14:02	15:14	16:25	
	End Time	15:04	16:16	17:27	
		Run 1	Run 2	Run 3	Average
Stack Conditions					
Average Gas Temperature, °F		74.7	76.0	75.6	75.4
Flue Gas Moisture, percent by volume		1.3%	1.0%	1.7%	1.3%
Average Flue Pressure, in. Hg		29.19	29.19	29.19	29.19
Gas Sample Volume, dscf		41.745	41.3	41.517	41.521
Average Gas Velocity, ft/sec		68.616	68.682	68.543	68.614
Gas Volumetric Flow Rate, acfm		15,184	15,199	15,168	15,184
Gas Volumetric Flow Rate, dscfm		14,437	14,454	14,338	14,410
Gas Volumetric Flow Rate, scfm		14,628	14,606	14,587	14,607
Isokinetic Variance		100.6	99.5	100.8	100.3
Filterable Particulate Matter (Method 5)					
grams collected		0.00693	0.01191	0.00723	0.00869
grains/acf		0.0024	0.0042	0.0025	0.0030
grains/dscf		0.0026	0.0044	0.0027	0.0032
lb/hr		0.317	0.551	0.330	0.399

Client: Billerud Escanaba
Facility: Escanaba Mill
Test Location: ADS Cyclone #2B
Test Method: 5

	Source Condition	Normal	Normal	Normal	
	Date	6/7/22	6/7/22	6/7/22	
	Start Time	14:02	15:14	16:25	
	End Time	16:04	16:16	17:27	
		Run 1	Run 2	Run 3	Average
Stack Conditions					
Average Gas Temperature, °F		72.0	72.0	72.3	72.1
Flue Gas Moisture, percent by volume		0.6%	1.6%	0.6%	0.9%
Average Flue Pressure, in. Hg		29.17	29.17	29.17	29.17
Gas Sample Volume, dscf		54.335	53.402	52.947	53.561
Average Gas Velocity, ft/sec		63.020	62.208	61.505	62.244
Gas Volumetric Flow Rate, acfm		13,945	13,766	13,610	13,774
Gas Volumetric Flow Rate, dscfm		13,414	13,110	13,079	13,201
Gas Volumetric Flow Rate, scfm		13,495	13,321	13,163	13,326
Isokinetic Variance		99.7	100.3	99.7	99.9
Filterable Particulate Matter (Method 5)					
grams collected		0.00276	0.00211	0.00090	0.00192
grains/acf		0.0008	0.0006	0.0003	0.0006
grains/dscf		0.0008	0.0006	0.0003	0.0006
lb/hr		0.090	0.069	0.029	0.063

4.0 CERTIFICATION

Mostardi Platt is pleased to have been of service to Billerud Escanaba. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

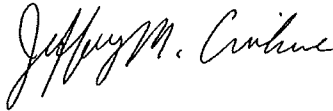
As program manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT



Daniel J. Kossack

Program Manager



Jeffrey M. Crivlare

Quality Assurance

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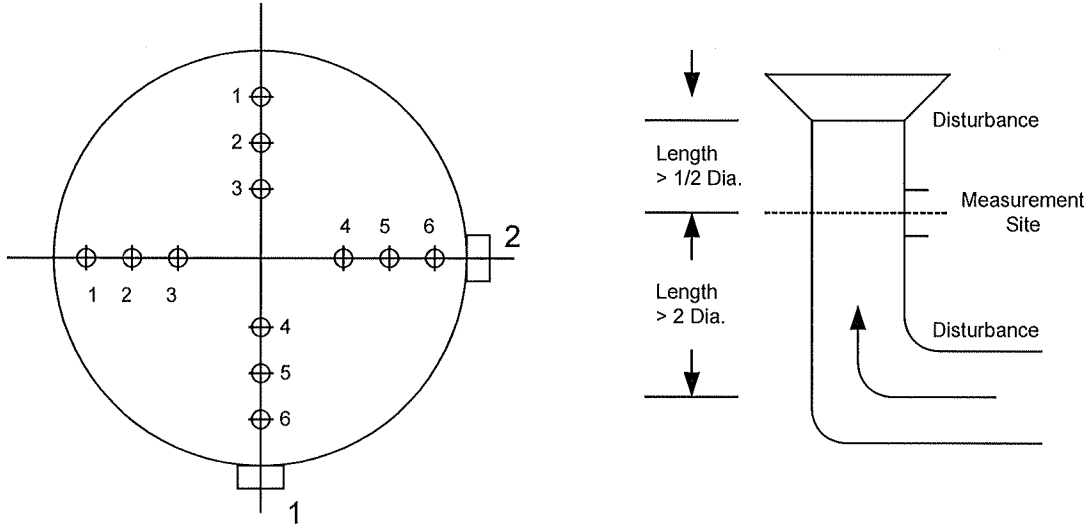
APPENDICES

Appendix A- Operating Data

ADS Cyclone	Run	Date	Start Time	End Time	ADS Production Rate	
					TPH	TPD
1A	Run 1	7-Jun-22	9:00	10:03	15	359
	Run 2	7-Jun-22	10:18	11:20	9	208
	Run 3	7-Jun-22	11:40	12:42	12	280
1B	Run 1	7-Jun-22	9:00	10:03	6	154
	Run 2	7-Jun-22	10:18	11:20	4	89
	Run 3	7-Jun-22	11:40	12:42	5	120
2A	Run 1	7-Jun-22	14:02	15:04	8	203
	Run 2	7-Jun-22	15:14	16:16	10	251
	Run 3	7-Jun-22	16:25	17:27	11	258
2B	Run 1	7-Jun-22	14:02	15:04	4	87
	Run 2	7-Jun-22	15:14	16:16	4	107
	Run 3	7-Jun-22	16:25	17:27	5	110
Purchased Chips	Run	Date	Start Time	End Time	Purchased Chips Production Rate	
					TPH	TPD
#1 Chip Reclaim Cyclone (East)	Run 1	9-Jun-22	7:39	8:41	23	562
	Run 2	9-Jun-22	8:51	9:56	23	562
	Run 3	9-Jun-22	10:05	11:08	23	562
#2 Chip Reclaim Cyclone (West)	Run 1	8-Jun-22	9:25	10:28	20	480
	Run 2	8-Jun-22	10:43	11:45	20	480
	Run 3	8-Jun-22	11:56	12:58	20	480

Appendix B - Test Section Diagrams

EQUAL AREA TRAVERSE FOR ROUND DUCTS



Job: Billerud Escanaba
Escanaba Mill
Escanaba, Michigan

Date: June 7, 2022

Test Location: ADS Cyclone 1A, 1B, 2A, and 2B Stacks (Identical)

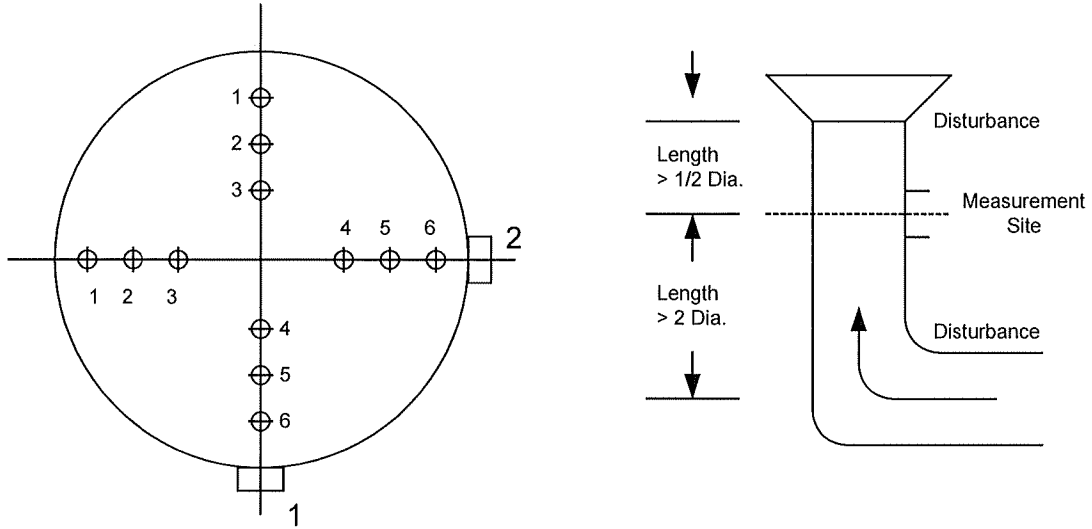
Duct Diameter: 2.167 Feet

Duct Area: 3.688 Square Feet

No. Points Across Diameter: 6

No. of Ports: 2

EQUAL AREA TRAVERSE FOR ROUND DUCTS



Job: Billerud Escanaba
Escanaba Mill
Escanaba, Michigan

Date: June 8, 2022

Test Location: #2 Chip Reclaim Cyclone Stack (West)

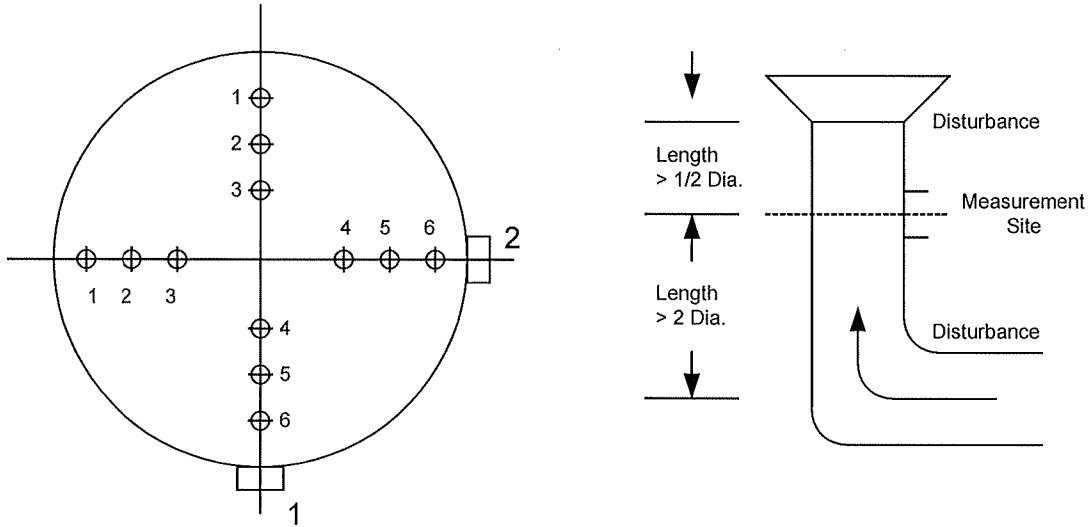
Duct Diameter: 3.667 Feet

Duct Area: 10.561 Square Feet

No. Points Across Diameter: 6

No. of Ports: 2

EQUAL AREA TRAVERSE FOR ROUND DUCTS



Job: Billerud Escanaba
Escanaba Mill
Escanaba, Michigan

Date: June 9, 2022

Test Location: #1 Chip Reclaim Cyclone Stack (East)

Duct Diameter: 3.667 Feet

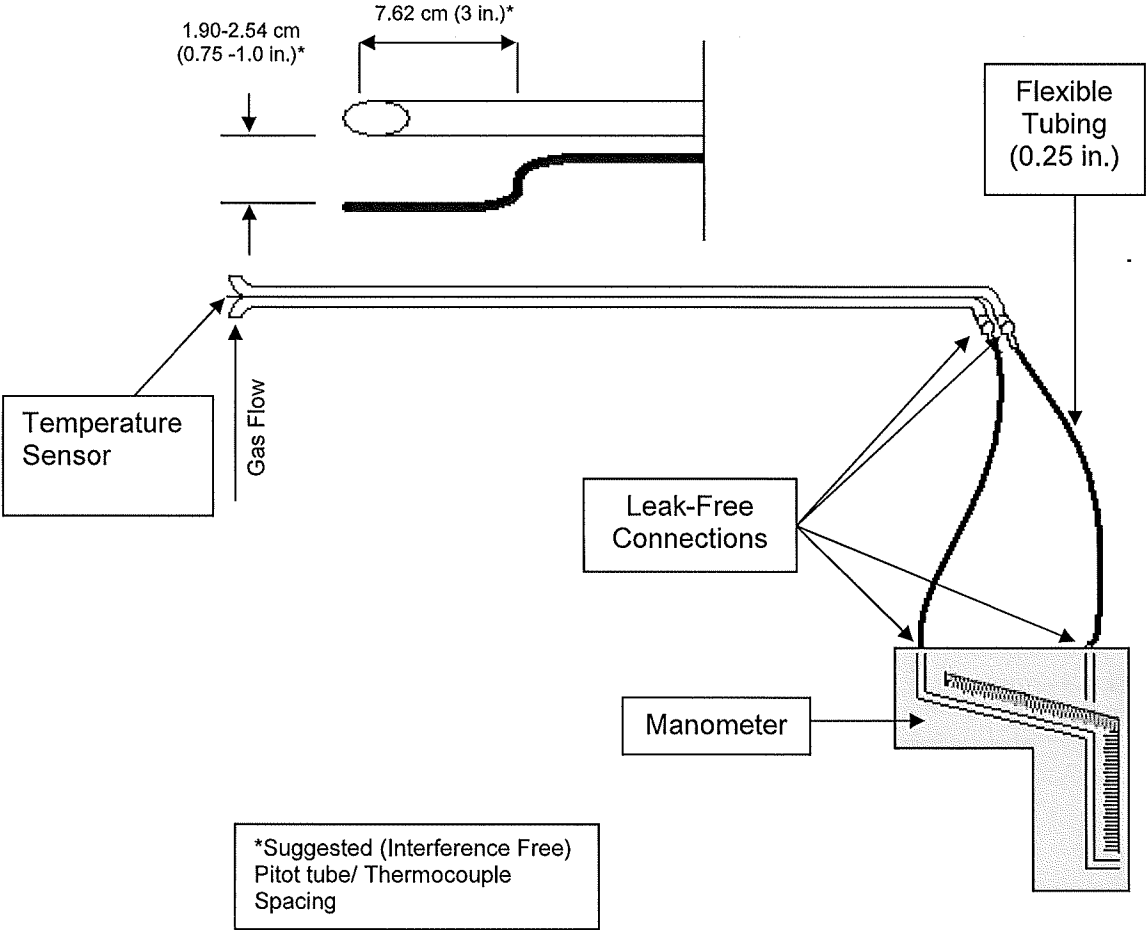
Duct Area: 10.561 Square Feet

No. Points Across Diameter: 6

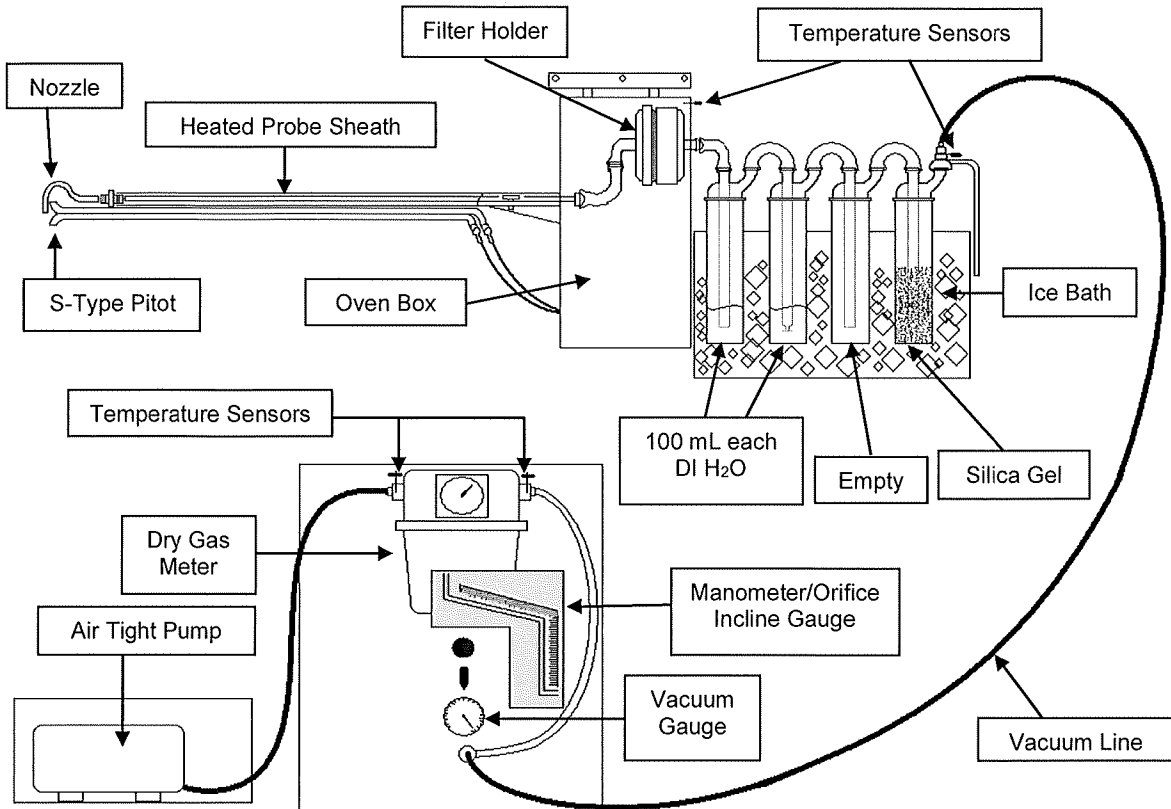
No. of Ports: 2

Appendix C- Sample Train Diagrams

USEPA Method 2 – Type S Pitot Tube Manometer Assembly



USEPA Method 5- Particulate Matter Sample Train Diagram



Appendix D- Calculation Nomenclature and Formulas