

FINAL REPORT RECEIVED

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AIR QUALITY DIVISION

**PACKAGING CORPORATION
OF AMERICA**

FILER CITY, MICHIGAN

**FILER CITY MILL:
2022 EUBOILERS5 TESTING REPORT**

RWDI #2201967

October 14, 2022

SUBMITTED TO

**Michigan Department of Environment,
Great Lakes, and Energy**
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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) has been retained by Packaging Corporation of America (PCA) to complete the emission sampling program at the Filer City Mill located at 2246 Udell Street, Filer City, Michigan. The testing evaluated particulate matter (PM), hydrochloric acid (HCl), and mercury (Hg) concentrations at the outlet of EUBOILER5. The test program was completed on August 23rd, 2022.

Executive Table i: Boiler 5 Results

Parameter	Concentration	
	Average Emission Rate	Limit
Mercury	4.83E-07 lb/MMBtu	8.00E-07 lb/MMBtu
	5.83E-03 kg/24-hour period	3.2 kg/24-hour period
Particulate Matter	1.50E-03 lb/MMBtu	9.80E-03 lb/MMBtu
HCl	1.10E-03 lb/MMBtu	2.20E-02 lb/MMBtu



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2.1 Operating Data 5
2.2 Operating Event Number



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1 INTRODUCTION

RWDI USA LLC (RWDI) has been retained by Packaging Corporation of America (PCA) to complete the emission sampling program at the Filer City Mill located at 2246 Udell Street, Filer City, Michigan. The testing evaluated particulate matter (PM), hydrochloric acid (HCl), and mercury (Hg) concentrations at the outlet of EUBOILER5. The test program was completed on August 23rd, 2022.

1.1 Location and Dates of Testing

The test program was completed on August 23rd, 2022.

1.2 Purpose of Testing

This testing was conducted to verify EUBOILER5 emissions per Permit to Install (PTI) 209-18A.

1.3 Description of Source

EUBOILER5 is a bubbling fluidized bed (BFB) boiler with a heat input capacity of 302 MMBtu/hr. The boiler can burn wood, wood waste, primary clarifier residuals, paper recycling residuals, tire derived fuel (TDF), and natural gas.

1.4 Personnel Involved in Testing

Table 1.4: Testing Personnel

Josh Kosmowski Environmental Engineer Joshkosmowski@packagingcorp.com	Packaging Corporation of America	(231) 510-6390
Brad Bergeron Senior Project Manager Brad.Bergeron@rwdi.com	RWDI USA LLC 2239 Star Court Rochester Hills, MI 48309	(519) 817-9888
Mason Sakshaug Senior Scientist Mason.Sakshaug@rwdi.com		(989) 323-0355

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4 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Description of Sampling Train and Field Procedures

4.1.1 Stack Velocity, Temperature, and Volumetric Flow Rate Determination

The exhaust velocities and flow rates were determined following the US EPA Method 2, "Determination of Stack Gas Velocity and Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type pitot tube and shortridge. Volumetric flow rates were determined following the equal area method as outlined in US EPA Method 1. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type "k" thermocouple in conjunction with a digital temperature indicator.

The dry molecular weights of the stack gas were determined following calculations outlined in US EPA Method 3, "Determination of Molecular Weight of Dry Stack Gas" by fyrite. Stack moisture content was determined by wet bulb/dry bulb. Flow rate determination, temperature and moisture were collected at the outlet of each RCO.

4.1.2 Particulate Matter and Hydrochloric Acid

Gaseous and particulate pollutants were withdrawn isokinetically on a filter, and in absorbing solutions. The filter and probe collect PM and were recovered per Method 5. The back half followed Method 26A, where the acidic absorbing solution collects the gaseous hydrogen halides. The back half was recovered per Method 26A and sent to Bureau Veritas for analysis.

4.1.3 Mercury

Known volumes of flue gas was extracted from EUBOILER5 through paired, in-stack sorbent media traps at an appropriate flow rate. Collection of mercury on the sorbent media in the stack mitigates potential loss of mercury during transportation through probe/sample line. For each test run, paired train sampling is required to determine measurement precision and verify acceptability of the measured emissions data. The sorbent traps were recovered from the sampling system and sent to Ohio Lumex for analysis.



5.6 Re-Test

This was not a retest.

5.7 Audit Samples

This test did not require any audit samples.

5.8 Calibration Sheets

Calibration sheets can be found in **Appendix B**.

5.9 Sample Calculations

Sample calculations can be found in **Appendix C**.

5.10 Field Data Sheets

Field data sheets can be found in **Appendix D and E**.

5.11 Laboratory Data

Laboratory data can be found in **Appendix F**.

TABLES



Company
Source
Date

PCA
Boiler 5
23-Aug-22 23-Aug-22 23-Aug-22

Test Number	Test 1	Test 2	Test 3	Average
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Stack Information

Flow ft3 (Actual)	146,522	150,448	157,388	151,453
Flow ft3 (Standard Wet)	95,543	97,778	102,165	98,495
Flow ft3 (Standard Dry)	78,502	80,034	82,891	80,475
Flow m3 (Standard Dry)	2,223	2,266	2,347	2,279

Percent Moisture	17.8	18.1	18.9	18.3
Pressure Ps ("Hg)	29.32	29.32	29.32	29.32
Average Stack Temperature Ts (F)	333.4	336.1	337.0	335.5
Molecular Weight of Stack Gas dry (Md)	30.34	30.34	30.34	30.34
Molecular Weight of Stack Gas wet (Ms)	28.14	28.10	28.01	28.08
Stack Gas Specific Gravity (Gs)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction	0.2	0.2	0.2	0.2
Average Stack Velocity Vs (ft/sec)	55.5	57.0	59.6	57.4
Area of Stack (ft2)	44.0	44.0	44.0	44.0
Percent Carbon Dioxide	13.0	13.0	13.0	13.0
Percent Oxygen	6.5	6.5	6.5	6.5
Percent Carbon Monoxide	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location	44.1	44.1	44.1	44.1

Meter Info

Isokinetic Variation I	101.8	102.4	102.6	102.3
Meter Pressure Pm ("Hg)	29.5	29.5	29.5	29.5
Meter Temperature Tm (F)	69.8	81.3	87.0	79.3
Measured Sample Volume Vm	49.39	51.75	54.21	51.78
Sample Volume (Vm St ft3)	48.20	49.45	51.28	49.64
Sample Volume (Vm St m3)	1.36	1.40	1.45	1.41
Total Weight of Sampled Gas (m g lbs) wet	4.27	4.39	4.58	4.41
Total Weight of Sampled Gas (m g lbs) dry	3.78	3.88	4.02	3.89
Gas Density Ps wet	0.07	0.07	0.07	0.07
Gas Density Ps dry	0.08	0.08	0.08	0.08
Condensate Volume	10.46	10.96	11.92	11.12
Nozzle Size	0.00042	0.00042	0.00042	0.00
Impinger Gain	221.9	232.5	252.9	235.8
Silica Gel Gain	0.0	0.0	0.0	0.0
Total Gas Sampled (vm st ft3 + condensate volume)	58.66	60.41	63.21	60.76

Particulate Results

Nozzle/Probe/Filter Weight (mg)	1.4	1.7	1.7	1.6
lb/hr	0.30	0.37	0.36	0.34
lb/1000 lb (wet)	0.001	0.001	0.001	0.001
lb/1000 lb (dry)	0.001	0.001	0.001	0.001
mg/dscm (dry)	1.026	1.214	1.171	1.137
gr/dscf	4.48E-04	5.31E-04	5.12E-04	4.97E-04
lb/MMBtu	1.34E-03	1.58E-03	1.59E-03	1.50E-03
mg/acm	0.553	0.650	0.621	0.608
lbs/1,000 lbs Gas @ 50% EA (wet)	0.001	0.001	0.001	0.001
Heat Input (MMBtu)	226	231	229	229
F-Factor (dscf/MMBtu)	9366.9	9359.5	9395.3	9374

HCl Results

Sample Weight (ug)	1200	1200	1100	1167
lb/1000 lb (wet)	0.0006	0.0006	0.0005	0.0006
lb/1000 lb (dry)	0.0007	0.0007	0.0006	0.0007
mg/dscm (dry)	0.8793	0.8571	0.7575	0.8313
lb/hr	0.2595	0.2579	0.2361	0.2512
lb/MMBtu	1.15E-03	1.12E-03	1.03E-03	1.10E-03

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3/7/2022

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Table 2 Mercury Results - M30B

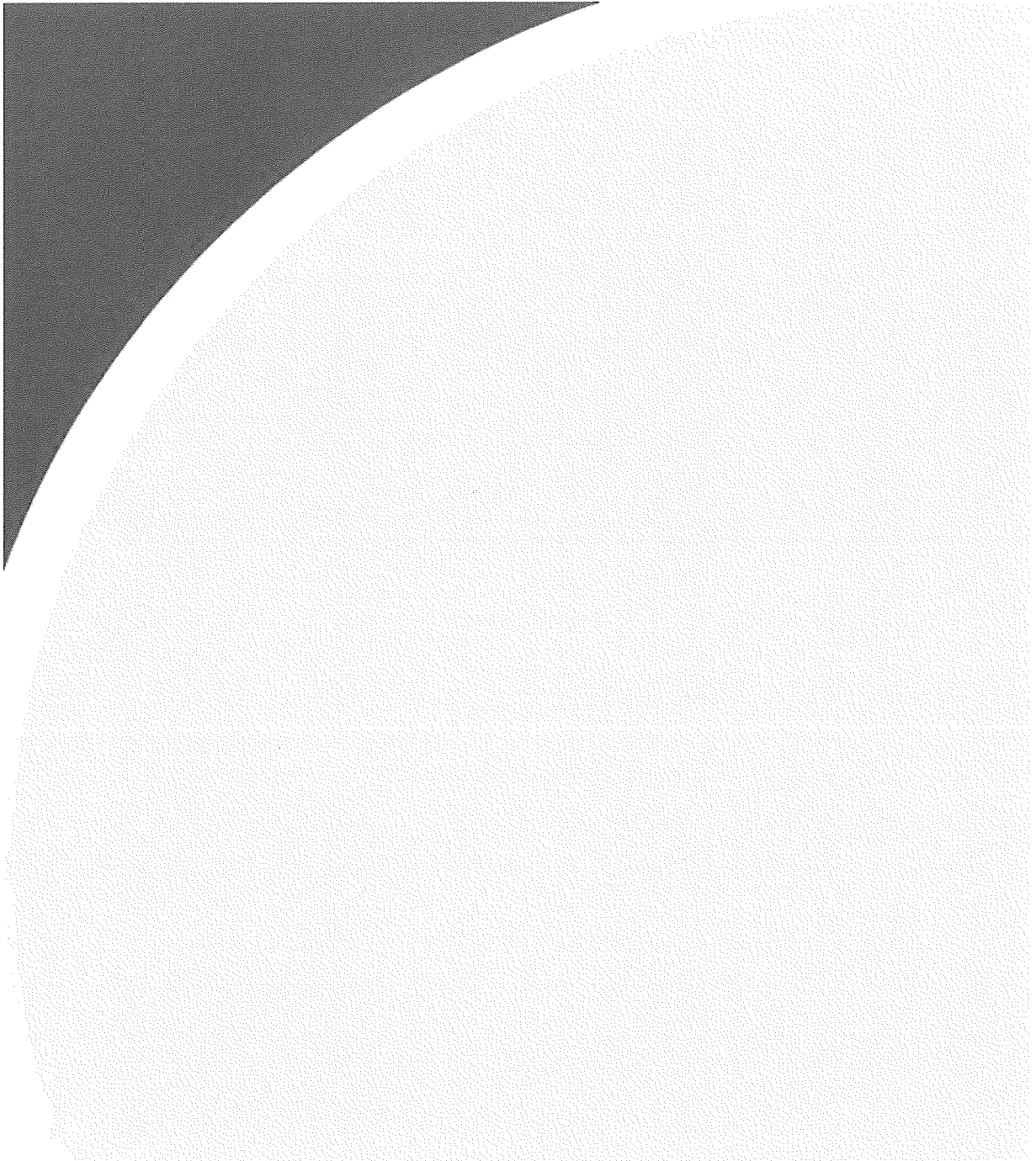
Test 1											
Hg (ng)	Spike Value	Hg (ug)	Sample Volume (L)	Sample Volume (ft ³)	lb/ft ³	ft ³ /min	minutes	lb/hr	kg/24hr	MMBtu/hr	lb/MMBtu
54.9	0	0.0549	114.90	4.06	2.98E-11	78502	60	1.41E-04	7.43E-03	226	6.22E-07
86.7	30	0.0567	114.71	4.05	3.09E-11	78502	60	1.45E-04	7.69E-03	226	6.43E-07

Test 2											
Hg (ng)	Spike Value	Hg (ug)	Sample Volume (L)	Sample Volume (ft ³)	lb/ft ³	ft ³ /min	minutes	lb/hr	kg/24hr	MMBtu/hr	lb/MMBtu
40.6	0	0.0406	121.02	4.27	2.09469E-11	80034	60	0.0001	5.32E-03	231	4.4E-07
69.1	30	0.0391	121.01	4.27	2.01746E-11	80034	60	9.7E-05	5.13E-03	231	4.2E-07

Test 3											
Hg (ng)	Spike Value	Hg (ug)	Sample Volume (L)	Sample Volume (ft ³)	lb/ft ³	ft ³ /min	minutes	lb/hr	kg/24hr	MMBtu/hr	lb/MMBtu
35.1	0	0.0351	119.54	4.22	1.83332E-11	82891	60	9.1E-05	4.82E-03	229	3.98E-07
63.4	30	0.0334	119.58	4.22	1.74387E-11	82891	60	8.7E-05	4.59E-03	229	3.79E-07

Average	1.10E-04	5.83E-03	229	4.83E-07
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FIGURES



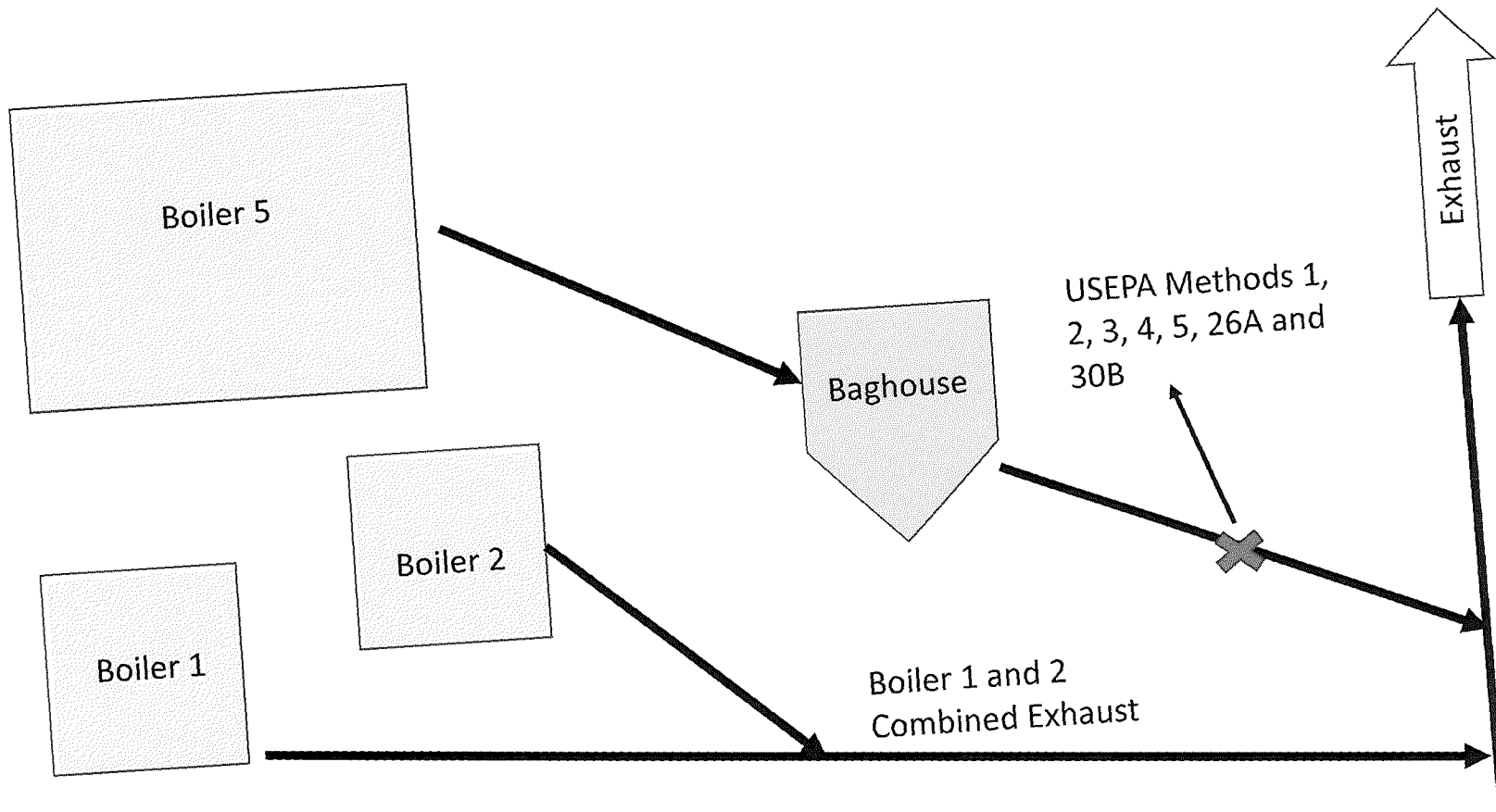


Figure 1: EUBOILER5 Sampling Location

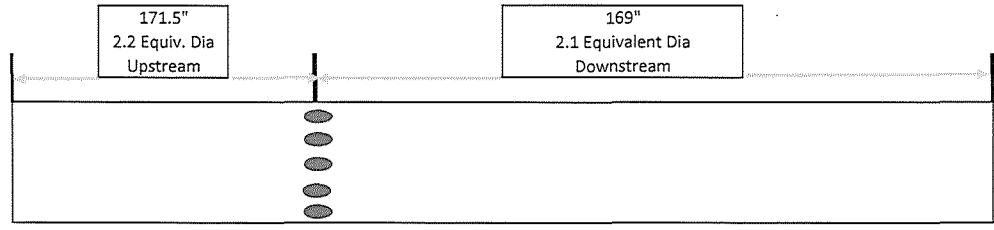
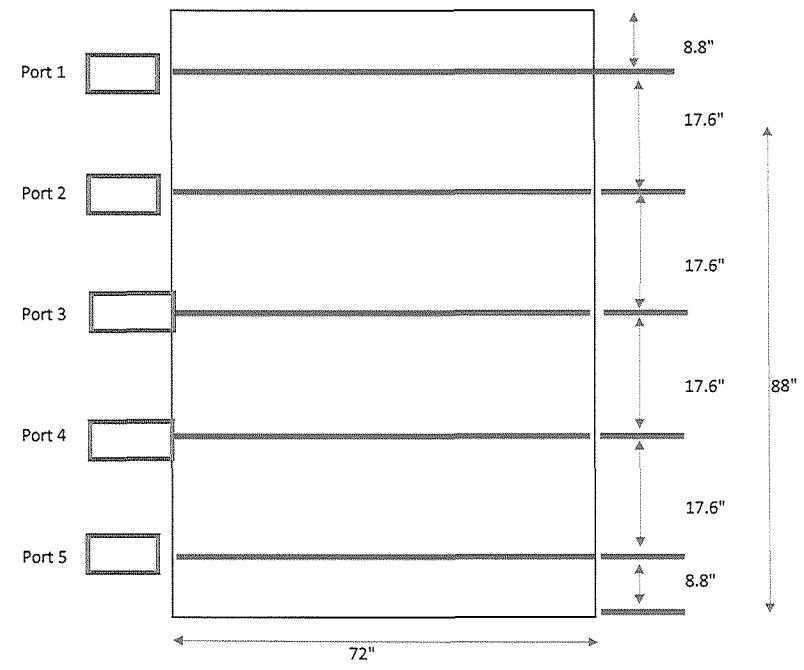


Figure No. 2: Traverse Point Locations

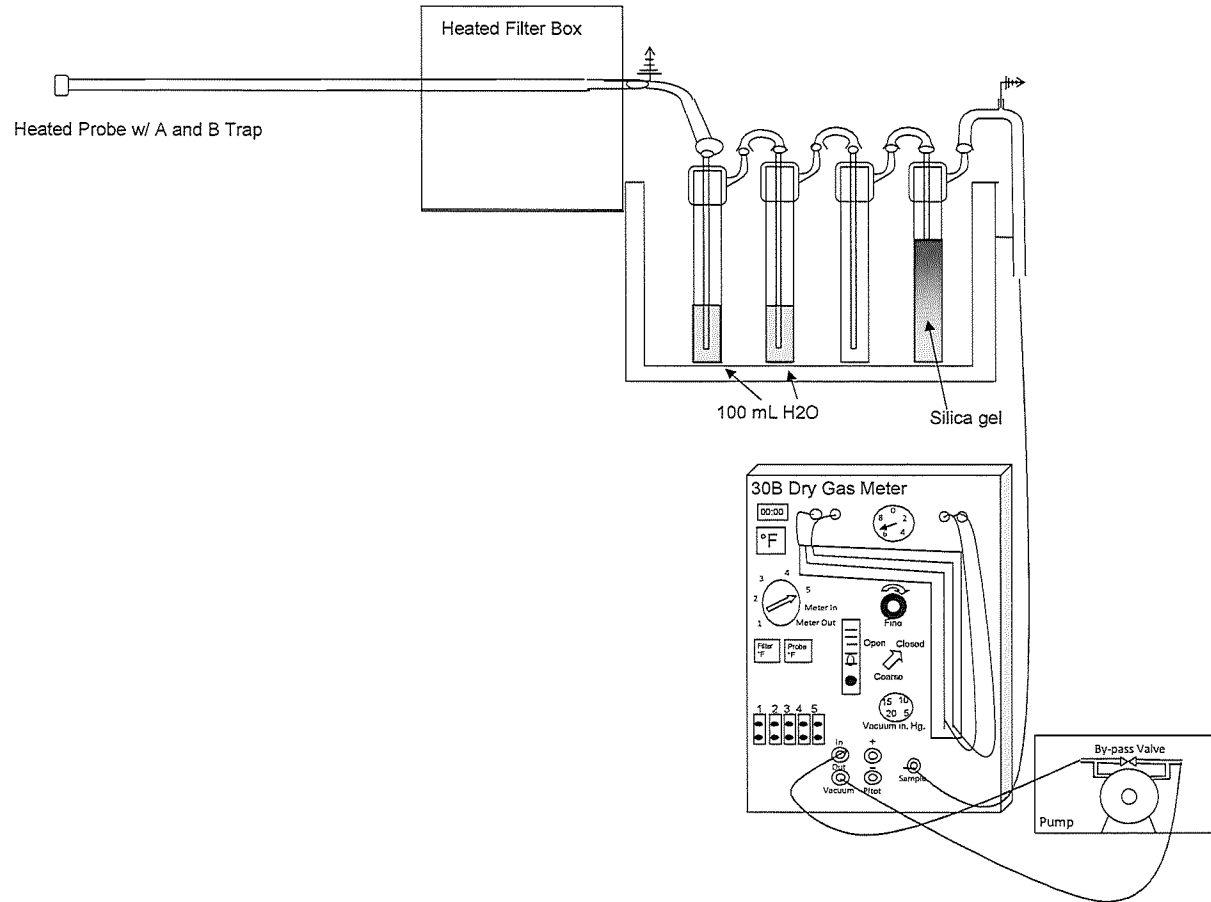
Point	% of Stack Depth	Distance from inside Wall				
		Port 1	Port 2	Port 3	Port 4	Port 4
1	10	8.8	8.8	8.8	8.8	8.8
2	30	26.4	26.4	26.4	26.4	26.4
3	50	44.0	44.0	44.0	44.0	44.0
4	70	61.6	61.6	61.6	61.6	61.6
5	90	79.2	79.2	79.2	79.2	79.2



Not to scale



Figure No. 3



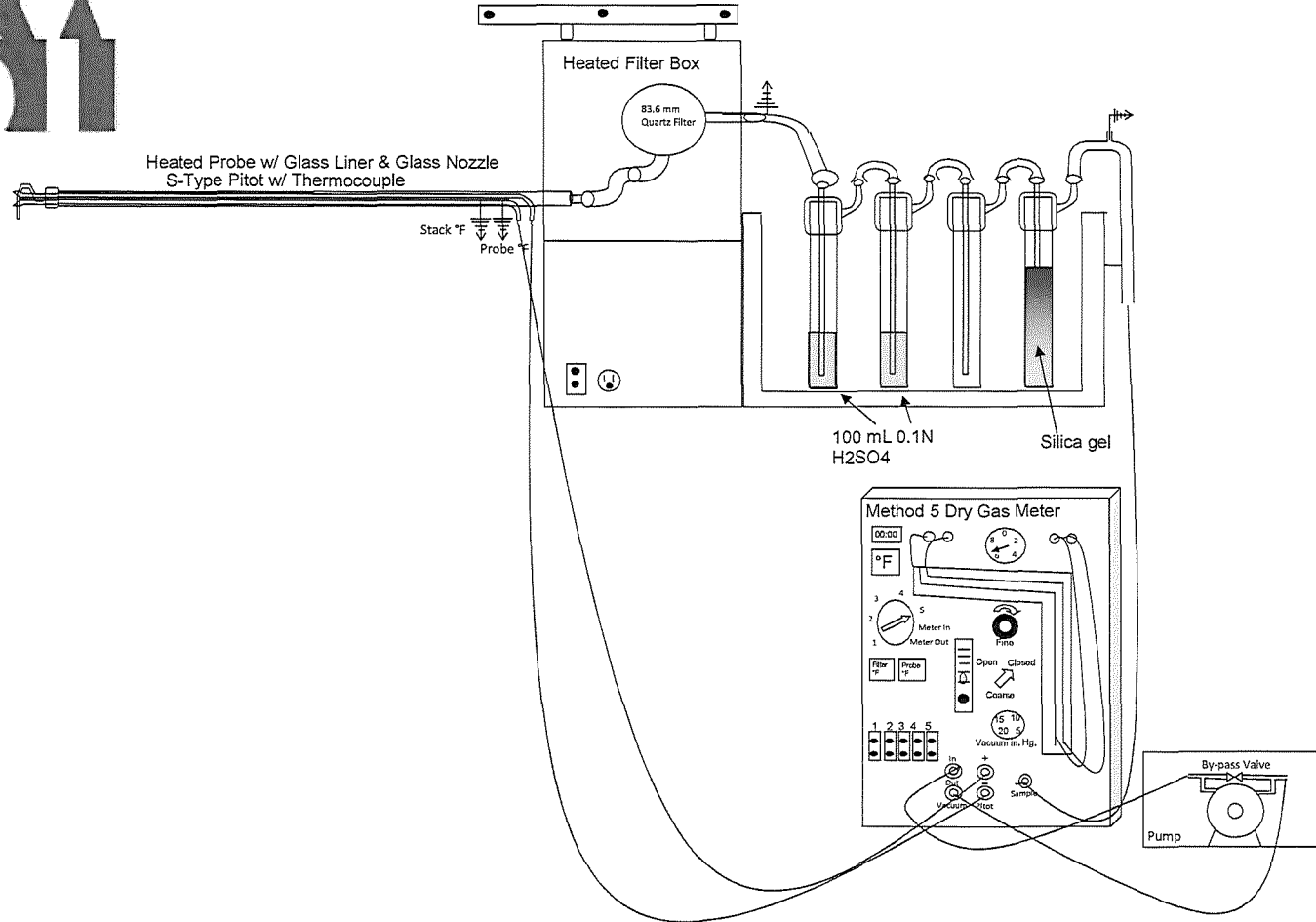
USEPA Method 30B

PCA
Filer City Mill
EUBOILERS
Filer City, Michigan





Figure No. 4



USEPA Method 5/26A

PCA
Filer City Mill
EUBOILERS
Filer City, Michigan

