



**Mercury and Air Toxics Standard Particulate Matter and
Hydrogen Chloride Emissions Test Report**

**Lansing Board of Water and Light
Eckert Station
Unit 4 ESP Outlet Duct
Lansing, Michigan
July 16, 2019**

**Revised Report Submittal Date
August 14, 2019**

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Project No. M192911D

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1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a Mercury and Air Toxics Standards (MATS) filterable particulate matter and hydrogen chloride emissions test program for the Lansing Board of Water and Light at the Eckert Station on the Unit 4 ESP Outlet Duct in Lansing, Michigan on July 16, 2019. This report summarizes the results of the test program and test methods used.

The test location, test date, and test parameters are summarized below.

TEST INFORMATION		
Test Location	Test Date	Test Parameters
Unit 4 ESP Outlet Duct	July 16, 2019	Filterable Particulate Matter (FPM) and Hydrogen Chloride (HCl)

The purpose of the test program was to document FPM and HCl emissions to qualify for the LEE designation as required by 40 CFR Part 63, Subpart UUUUU. Selected results of the test program are summarized below. A complete summary of emission test results follows the narrative portion of this report.

TEST RESULTS				
Test Location	Test Parameter	Emission Limits	LEE Emission Limits	Emission Rates
Unit 4 ESP Outlet Duct	FPM	≤0.030 lb/mmBtu	≤0.015 lb/mmBtu	*0.0020 lb/mmBtu
	FPM	≤0.20 lbs/1000 lbs of exhaust gases, corrected to 50% Excess Air	N/A	* 0.0023 dry lbs/1000 lbs of exhaust gases, corrected to 50% Excess Air
	FPM	≤0.20 lbs/1000 lbs of exhaust gases, corrected to 50% Excess Air	N/A	*0.0016 wet lbs/1000 lbs of exhaust gases, corrected to 50% Excess Air
	HCl	≤0.002 lb/mmBtu	≤0.001 lb/mmBtu	0.0004 lb/mmBtu

*Probe and filter were maintained at Method 5 MATS temperatures during testing

Emissions on lb/mmBtu basis were determined using a standard F_d -Factor of 9,820 dscf/mmBtu for sub-bituminous coal. Plant operating data as provided by Lansing Board of Water and Light is included in Appendix A.

The Stationary Source Audit Sample Program audit sample was obtained from ERA and submitted for analysis to Maxxam Analytical. The results of the audit sample were compared to the assigned value by ERA and found to be acceptable. The audit sample result and evaluation are appended to this report.

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

TEST PERSONNEL INFORMATION		
Location	Address	Contact
Test Coordinator	Lansing Board of Water and Light 1232 Haco Drive P.O. Box 13007 Lansing, Michigan 48912	Mr. Nathan Hude Environmental Regulatory Compliance (517) 490-3069 (cell phone) nathan.hude@lbwl.com
Test Facility	Lansing Board of Water and Light Eckert Station 601 Island Ave Lansing, Michigan 48901	
Testing Company Representative	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Chris Jensen Project Manager (630) 993-2100 (phone) cjensen@mp-mail.com

The test crew consisted of Messrs. A. Riddle, B. Garcia, D. Merbeth, P. Coleman, and C. Jensen of Mostardi Platt.

2.0 TEST METHODOLOGY

Emissions testing was conducted following the methods specified in 40CFR60, Appendix A. A schematic of the test section diagram is found in Appendix B and schematics of the sampling trains used are included in Appendix C. Calculation nomenclature and sample calculations are included in Appendix D. Laboratory analysis data are found in Appendix E. Copies of analyzer print-outs for each test run are included in Appendix F and field data sheets are found in Appendix G.

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 location are summarized below.

TEST POINT INFORMATION				
Location	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
Unit 4 ESP Outlet Duct	0.49	1.95	FPM, HCl	32

Method 2 Volumetric Flowrate Determination

Gas velocity was measured following Method 2, for purposes of calculating stack gas volumetric flow rate. An S-type pitot tube, differential pressure gauge, thermocouple and temperature readout were used to determine gas velocity at each sample point. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H.

Method 3A Oxygen (O₂)/Carbon Dioxide (CO₂) Determination

Stack gas molecular weight was determined in accordance with Method 3A. An ECOM analyzer was used to determine stack gas oxygen and carbon dioxide content and, by difference, nitrogen content. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H and copies of the gas cylinder certifications are found in Appendix I.

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. An Environmental Supply Company, Inc. sampling train was used to sample stack gas at an isokinetic rate, as specified in the Method. Filter and probe temperatures were elevated to 320° Fahrenheit as described in 40CFR63, Subpart UUUUU. Particulate matter in the sample probe was recovered using an acetone rinse. 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.

Method 26A Hydrogen Chloride (HCl) Determination

Stack gas HCl concentrations and emission rates were determined in accordance with Method 26A, 40CFR60, Appendix A. An Environmental Supply Company sampling train was used to sample stack gas, in the manner specified in the Method. Analyses of the samples collected were conducted at the Elmhurst, Illinois laboratory of Mostardi Platt. 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 RESULT SUMMARIES

Client: Lansing Board of Water and Light
Facility: Eckert Station
Test Location: Unit 4 ESP Outlet Duct
Test Method: 5 MATS

	Source Condition	Normal	Normal	Normal	
	Date	7/16/19	7/16/19	7/16/19	
	Start Time*	7:20	10:05	15:07	
	End Time*	9:28	12:16	16:07	
	Run 1	Run 2	Run 3	Average	
Stack Conditions					
Average Gas Temperature, °F		348.5	365.4	368.0	360.6
Flue Gas Moisture, percent by volume		12.5%	11.9%	13.6%	12.7%
Average Flue Pressure, in. Hg		28.30	28.30	28.30	28.30
Gas Sample Volume, dscf		80.036	78.442	78.72	79.066
Average Gas Velocity, ft/sec		59.837	59.910	61.036	60.261
Gas Volumetric Flow Rate, acfm		323,122	323,515	329,592	325,410
Gas Volumetric Flow Rate, dscfm		174,594	172,407	171,809	172,937
Gas Volumetric Flow Rate, scfm		199,612	195,762	198,814	198,063
Average %CO ₂ by volume, dry basis		15.7	15.7	15.8	15.7
Average %O ₂ by volume, dry basis		4.1	4.2	3.8	4.0
Isokinetic Variance		104.2	103.4	104.2	103.9
Standard Fuel Factor Fd, dscf/mmBtu		9,820.0	9,820.0	9,820.0	9,820.0
Filterable Particulate Matter (Method 5 MATS)					
grams collected		0.00722	0.00579	0.00500	0.00600
mg/dscm		3.186	2.607	2.243	2.6785
grains/acf		0.0008	0.0006	0.0005	0.0006
grains/dscf		0.0014	0.0011	0.0010	0.0012
lb/hr		2.083	1.683	1.443	1.736
Dry lbs particulate/1000 lbs of stack gas		0.0025	0.0021	0.0018	0.0021
Wet lbs particulate/1000 lbs of stack gas		0.0023	0.0019	0.0016	0.0019
Dry lbs particulate/1000 lbs of stack gas at 50%		0.0027	0.0022	0.0019	0.0023
Wet lbs particulate/1000 lbs of stack gas at 50%		0.0019	0.0016	0.0013	0.0016
lb/mmBtu (Standard Fd Factor)		0.0024	0.0020	0.0017	0.0020

* RM time changes to CEM time

Client: Lansing Board of Water and Light
Facility: Eckert Station
Test Location: Unit 4 ESP Outlet Duct
Test Method: 26A MATS

	Source Condition	Normal	Normal	Normal	
	Date	7/16/19	7/16/19	7/16/19	
	Start Time*	7:20	10:05	13:00	
	End Time*	9:15	12:01	14:50	
	Run 1	Run 2	Run 3	Average	
Stack Conditions					
Average Gas Temperature, °F		345.7	362.3	369.6	359.2
Flue Gas Moisture, percent by volume		12.2%	12.3%	12.6%	12.4%
Average Flue Pressure, in. Hg		28.50	28.50	28.50	28.50
Gas Sample Volume, dscf		78.876	78.624	77.173	78.224
Average Gas Velocity, ft/sec		59.832	60.816	60.786	60.478
Gas Volumetric Flow Rate, acfm		323,093	328,407	328,245	326,582
Gas Volumetric Flow Rate, dscfm		177,095	176,170	173,986	175,750
Gas Volumetric Flow Rate, scfm		201,682	200,854	198,993	200,510
Average %CO ₂ by volume, dry basis		15.7	15.7	15.8	15.7
Average %O ₂ by volume, dry basis		4.1	4.2	3.8	4.0
Isokinetic Variance		104.3	104.5	103.9	104.2
Standard Fuel Factor Fd, dscf/mmBtu		9,820.0	9,820.0	9,820.0	9,820.0
Hydrogen Chloride (HCl) Emissions					
ug of sample collected		1472.00	883.00	750.00	1035.00
ppm		0.44	0.26	0.23	0.31
mg/dscm		0.66	0.40	0.34	0.47
lb/hr		0.437	0.262	0.224	0.308
lb/mmBtu (Standard Fd Factor)		0.0005	0.0003	0.0003	0.0004

* RM time changes to CEM time

4.0 CERTIFICATION

MOSTARDI PLATT is pleased to have been of service to Lansing Board of Water and Light. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

CERTIFICATION

As project 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



Christopher E. Jensen

Program Manager



Scott W. Banach

Quality Assurance

APPENDICES

Appendix A - Plant Operating Data

Average Data

Plant: Eckert Station

Interval: 1 Hour

Type: Roll

Report Period: 07/16/2019 07:00 Through 07/16/2019 16:59

Time Online Criteria: 1 minute(s)

Source	UNIT04	
Parameter Unit	MW (MW)	
07/16/19 07:00		71
07/16/19 08:00		71
07/16/19 09:00		71
07/16/19 10:00		71
07/16/19 11:00		71
07/16/19 12:00		71
07/16/19 13:00		71
07/16/19 14:00		71
07/16/19 15:00		71
07/16/19 16:00		69

Average	71
Minimum	69
Maximum	71
Summation	708
Geometric Mean	71
Included Data Points	10
Total number of Data Points	10

F = Unit Offline **E = Exceedance** **C = Calibration** **S = Substituted** **I = Invalid**
M = Maintenance **T = Out Of Control** *** = Suspect** **U = Startup** **D = Shutdown**

Report Generated: 08/14/19 08:49

Report Version 6.0

BWL-DOMAIN1\innh

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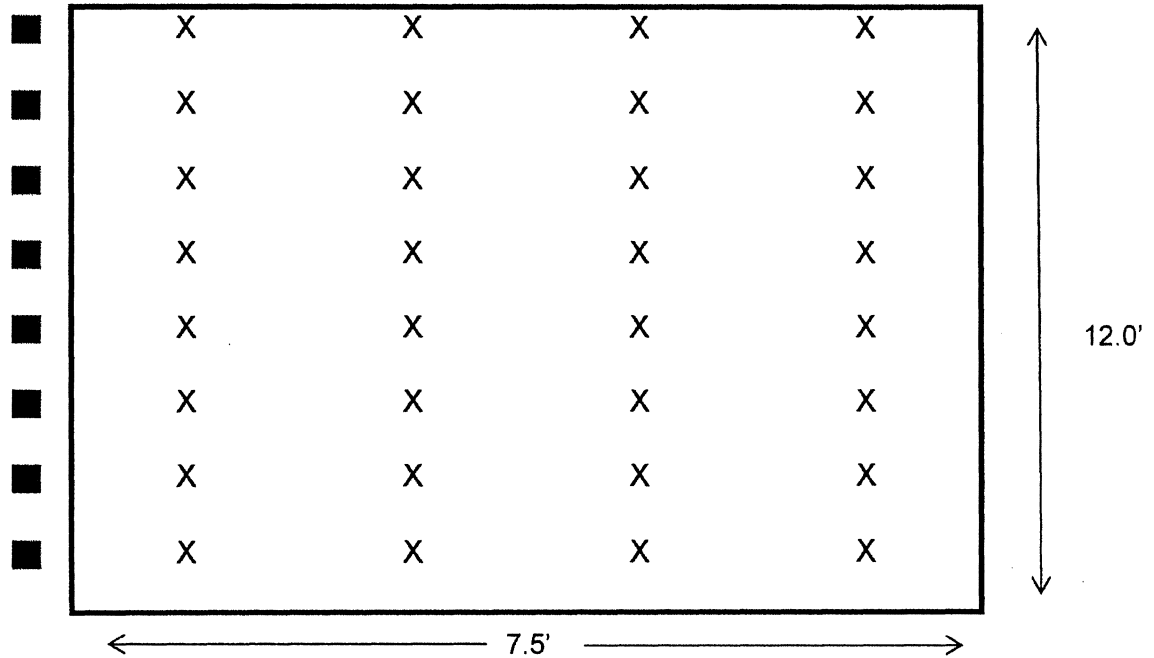
Project No. M192911D
Unit 4 ESP Outlet Duct

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Appendix B - Test Section Diagram

EQUAL AREA TRAVERSE FOR RECTANGULAR DUCTS



Job: Lansing Board of Water and Light
Eckert Station
Lansing, Michigan

Date: July 16, 2019

Area: 90.00 Square Feet

Test Location: Unit 4 ESP Outlet Duct

No. Test Ports: 8

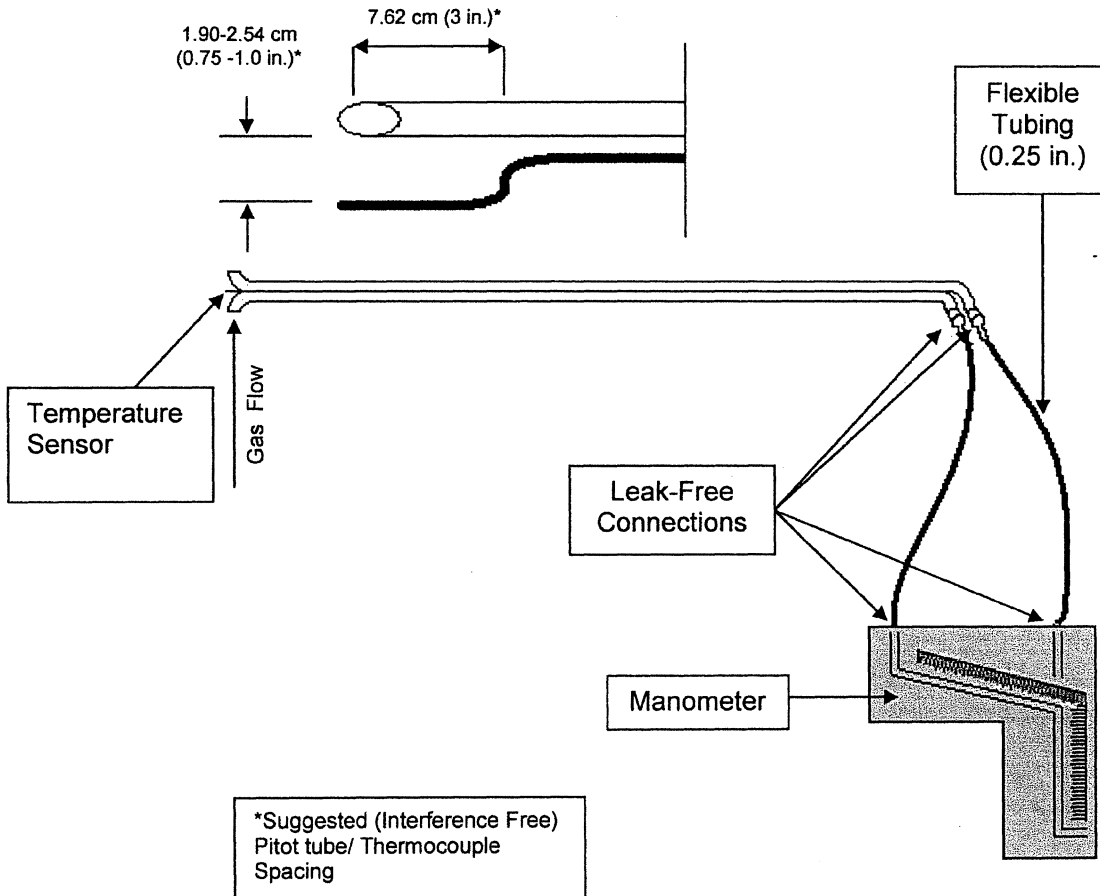
Length: 7.5 Feet

Tests Points per Port: 4

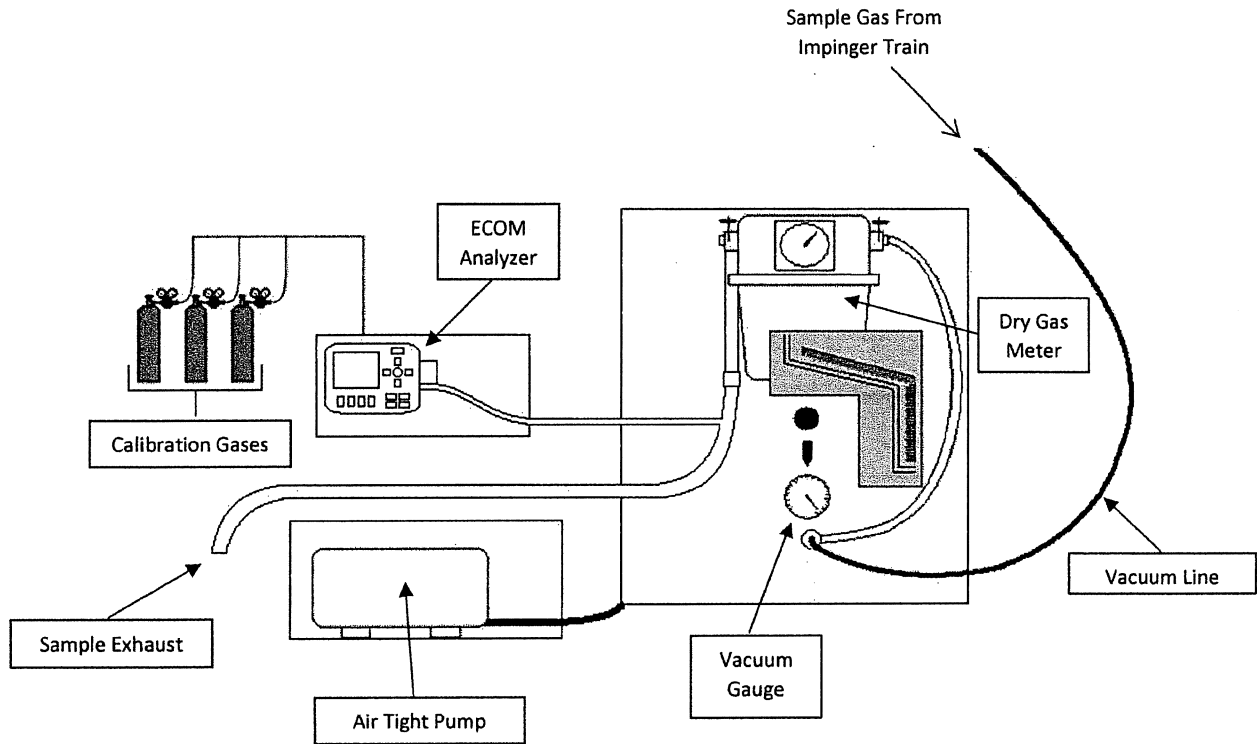
Width: 12 Feet

Appendix C - Sample Train Diagrams

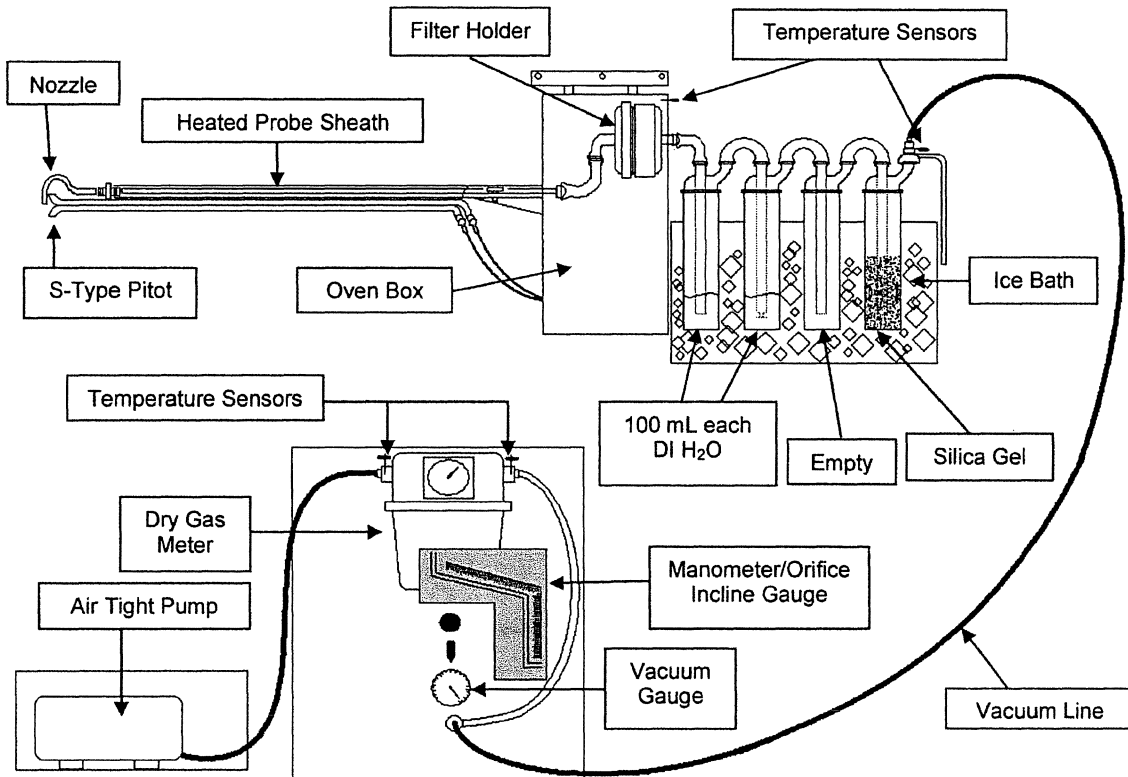
USEPA Method 2- Type S Pitot Tube Manometer Assembly



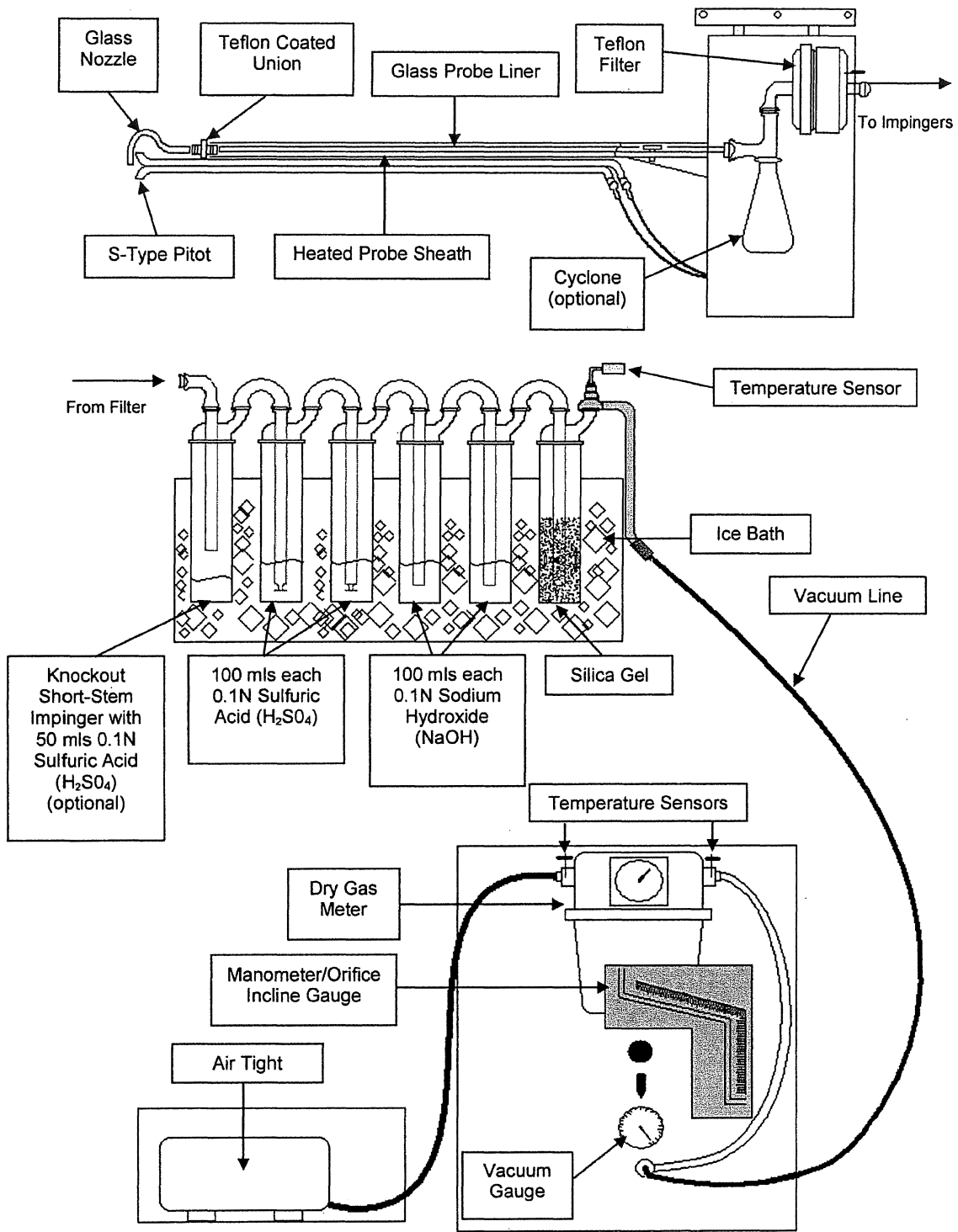
USEPA Method 3A - Integrated Oxygen/Carbon Dioxide Sample Train Diagram Utilizing ECOM To Measure From Sample Exhaust



USEPA Method 5- Particulate Matter Sample Train Diagram



USEPA Method 26A - HCl Sample Train Diagram



ATD-068 USEPA Method 26A

Rev. 1.1

8/17/2015

Appendix D - Calculation Nomenclature and Formulas