

## 1.0 EXECUTIVE SUMMARY

Mostardi Platt conducted a sulfur dioxide (SO<sub>2</sub>) compliance air emissions testing program for Holcim (US) Inc. d/b/a Lafarge Alpena at the Alpena Cement Plant in Alpena, Michigan, at the Raw Mills 14 and 15 stacks. This report summarizes the results of the test program and test methods.

The test locations, test date, and test parameter are summarized below.

TEST INFORMATION		
Test Locations	Test Date	Test Parameters
Raw Mill 14 and 15 Stacks	June 22, 2021	SO <sub>2</sub> and Volumetric Flow Rate

The purpose of the test program was to demonstrate SO<sub>2</sub> emission rates on a lb/ton basis were in compliance with permitted limits. The test results indicate that both Raw Mills are in compliance with their respective SO<sub>2</sub> emission limits, as shown in the table below.

TEST RESULTS				
Location	Parameter	Units	Emission Limit	Test Results
Raw Mill 14	SO <sub>2</sub>	lb/ton of raw material processed	0.0147 lb/ton	0.002 lb/ton
Raw Mill 15	SO <sub>2</sub>	lb/ton of raw material processed	0.0147 lb/ton	0.002 lb/ton

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

TEST PERSONNEL INFORMATION		
Location	Address	Contact
Test Facility	Holcim (US) Inc. Alpena Cement Plant 1435 Ford Avenue Alpena, Michigan 49707	Mr. Travis Weide Area Environmental & Public Affairs Manager 989-358-3321 travis.weide@lafargeholcim.com
Testing Company Supervisor	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Eric L. Ehlers Director, Field Operations 630-993-2663 (phone) eehlers@mp-mail.com
Testing Company Personnel		Mr. Jared Priesz Test Engineer Mr. Chis Buglio Test Engineer



## 2.0 TEST METHODOLOGY

Emission testing was conducted following the USEPA methods specified in 40CFR60, Appendix A in addition the Mostardi Platt Quality Manual. Schematics of the test section diagrams and sampling trains used are included in Appendix A and B respectively. Calculation nomenclature are included in Appendix C. Copies of analyzer print-outs for each test run are included in Appendix D. Process data as provided by Holcim (US) Inc. are also included in Appendix E.

The following methodologies were used during the test program:

### Method 1 Sample and Velocity Traverse Determination

Test measurement points were selected in accordance with USEPA Method 1, 40CFR60, Appendix A. The characteristics of the measurement locations are summarized below.

SAMPLE LOCATION INFORMATION						
Test Locations	Stack Diameter (Feet)	Stack Area (Square Feet)	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
Raw Mill 14 and 15	5.46	23.41	6.0	4.5	SO <sub>2</sub> /O <sub>2</sub> /CO <sub>2</sub>	3
					Volumetric Flow Rate	16

### Method 2 Volumetric Flow Rate Determination

Gas velocity was measured following USEPA Method 2, 40CFR60, Appendix A, for purposes of calculating stack gas volumetric flow rate and emission rates on a lb/hr and lb/ton basis. An S-type pitot probe is utilized for the test procedure. Wet bulb/dry bulb measurements were performed to determine flue gas moisture content.

All of the equipment used was calibrated in accordance with the specifications of the Method. Copies of field data sheets are included in Appendix F. Calibration data are presented in Appendix G. This testing met the performance specifications as outlined in the Method.

### Method 3A Oxygen (O<sub>2</sub>)/Carbon Dioxide (CO<sub>2</sub>) Determination

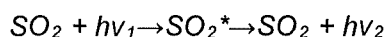
Flue gas O<sub>2</sub> and CO<sub>2</sub> concentrations were determined in accordance with USEPA Method 3A for volumetric flow molecular weight determination. A Servomex analyzer was used to determine the O<sub>2</sub> and CO<sub>2</sub> concentrations in the manner specified in the Method. The instrument has a paramagnetic detector and the O<sub>2</sub> operates in the nominal range of 0% to 25% while the CO<sub>2</sub> operates in the nominal range of 0% to 20% with the specific range determined by the high-level calibration gas. All calibrations were performed using USEPA Protocol gas. Zero nitrogen (a low ppm pollutant in balance nitrogen calibration gases) was introduced during other instrument calibrations to check instrument zero. High- and a mid-range % O<sub>2</sub> levels in balance nitrogen were also introduced. Zero and mid-range calibrations were performed using USEPA Protocol gas after each series of test runs. Copies of the gas cylinder certifications are found in Appendix H. This testing met the performance specifications as outlined in the Method.



## Method 6C Sulfur Dioxide (SO<sub>2</sub>) Determination

Stack gas SO<sub>2</sub> concentrations and emission rates were determined in accordance with USEPA Method 6C, 40CFR60, Appendix A. Thermo Scientific Model 43i Pulsed Fluorescence Sulfur Dioxide Analyzers were used to determine sulfur dioxide concentrations, in the manner specified in the Method. The instrument operated in the nominal range of 0 ppm to 100 ppm with the specific range determined by the high-level span calibration gas.

The Model 43i operates on the principle that SO<sub>2</sub> molecules absorb ultraviolet (UV) light and become excited at one wavelength, then decay to a lower energy state emitting UV light at a different wavelength. Specifically,



The sample is drawn into the Model 43i through the sample bulkhead. The sample flows through a hydrocarbon "kicker", which removes hydrocarbons from the sample by forcing the hydrocarbon molecules to permeate through the tube wall. The SO<sub>2</sub> molecules pass through the hydrocarbon "kicker" unaffected.

The sample flows into the fluorescence chamber, where pulsating UV light excites the SO<sub>2</sub> molecules. The condensing lens focuses the pulsating UV light into the mirror assembly. The mirror assembly contains four selective mirrors that reflect only the wavelengths which excite SO<sub>2</sub> molecules.

As the excited SO<sub>2</sub> molecules decay to lower energy states, they emit UV light that is proportional to the SO<sub>2</sub> concentration. The bandpass filter allows only the wavelengths emitted by the excited SO<sub>2</sub> molecules to reach the photomultiplier tube (PMT). The PMT detects the UV light emission from the decaying SO<sub>2</sub> molecules. The photodetector, located at the back of the fluorescence chamber, continuously monitors the pulsating UV light source and is connected to a circuit that compensates for fluctuations in the lamp intensity.

As the sample leaves the optical chamber, it passes through a flow sensor, a capillary, and the "shell" side of the hydrocarbon kicker. The Model 43i outputs the SO<sub>2</sub> concentration to the front panel display, the analog outputs, and also makes the data available over the serial or Ethernet connection.

Stack gas was delivered to the analyzer through a heated probe, heated line, electronic gas chiller, and delivered to each analyzer through a flow panel sampling system. The entire system was calibrated in accordance with the Method, using USEPA Protocol gases introduced at the probe, before and after every three test runs.

A list of calibration gases used and the results of all calibration and other required quality assurance checks are found in Appendix G. Copies of the gas cylinder certifications are found in Appendix H. This testing met the performance specifications as outlined in the Method.



### 3.0 TEST RESULT SUMMARIES

Holcim (US) Inc. Alpena Cement Plant Raw Mill 14 Gaseous Summary								
Test No.	Date	Start Time	End Time	RM 14 SO <sub>2</sub> ppmvd	RM 14 Flowrate, DSCFM	RM 14 SO <sub>2</sub> lb/hr	Tons of Clinker	RM 14 SO <sub>2</sub> lb/ton
1	06/22/21	12:40	13:41	0.9	69,246	0.62	258.33	0.002
2	06/22/21	14:00	15:07	0.0	67,671	0.00	227.49	0.000
3	06/22/21	15:25	16:24	1.0	65,927	0.66	270.14	0.002
<b>Average</b>				0.6	67,615	0.43	251.99	0.002

Holcim (US) Inc. Alpena Cement Plant Raw Mill 15 Gaseous Summary								
Test No.	Date	Start Time	End Time	RM 15 SO <sub>2</sub> ppmvd	RM 15 Flowrate, DSCFM	RM 15 SO <sub>2</sub> lb/hr	Tons of Clinker	RM 15 SO <sub>2</sub> lb/ton
1	06/22/21	08:15	10:44	1.4	64,049	0.89	213.56	0.004
2	06/22/21	11:10	12:09	0.8	63,495	0.51	218.18	0.002
3	06/22/21	12:40	13:39	0.0	64,346	0.00	211.36	0.000
<b>Average</b>				0.7	63,963	0.47	214.37	0.002





## 4.0 CERTIFICATION

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

As the 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. The test program was performed in accordance with the test methods and the Mostardi Platt Quality Manual, as applicable.

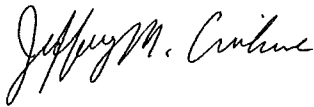
MOSTARDI PLATT



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Eric L. Ehlers

Project Manager



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Jeffrey M. Crivlare

Quality Assurance

RECEIVED

JUL 26 2021

AIR QUALITY DIVISION  
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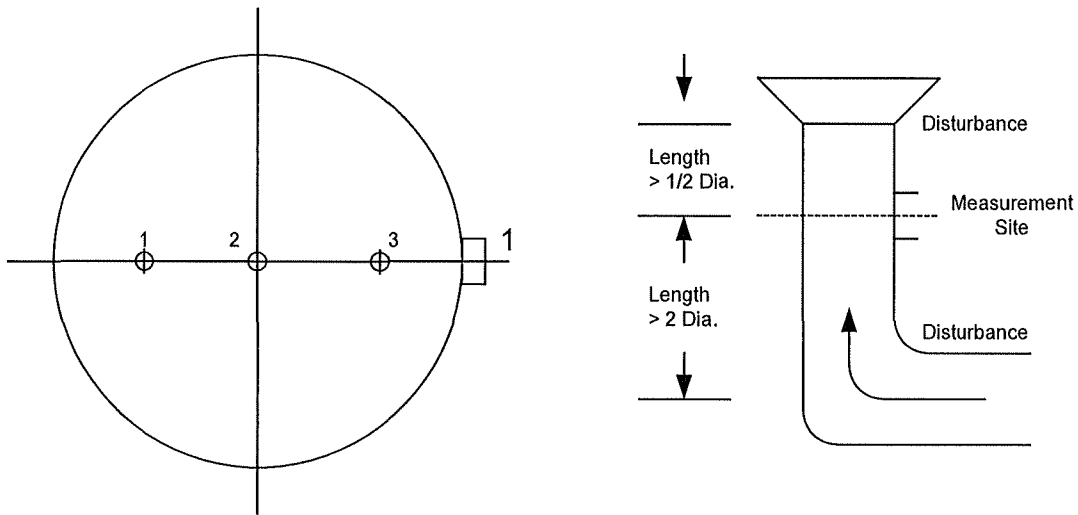
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# APPENDICES



## Appendix A - Test Section Diagrams

# GASEOUS TRAVERSE FOR ROUND DUCTS



Job: Holcim (US) Inc.  
Alpena Cement Plant  
Alpena, Michigan

Test Date: June 22, 2021

Test Location: Raw Mill 14 and 15 Stacks

Stack Diameter: 5.46 Feet

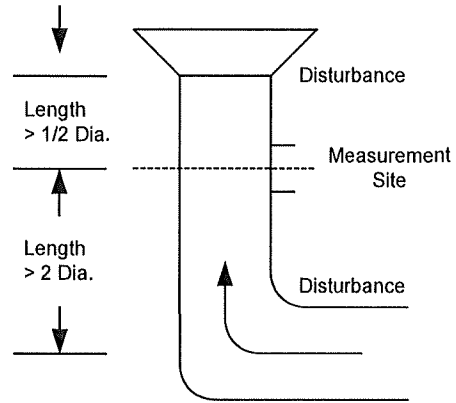
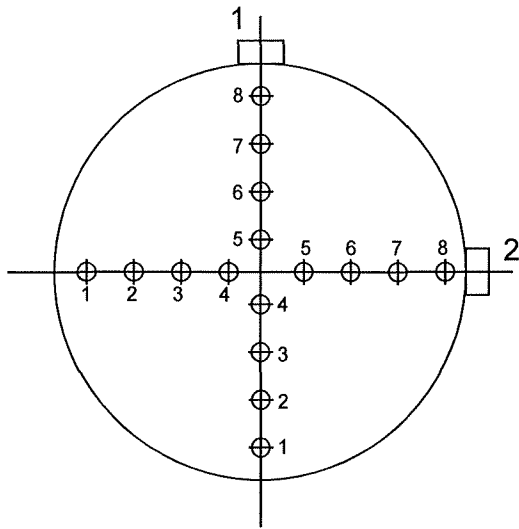
Stack Area: 23.41 Square Feet

Upstream  
Disturbance: >2.0 diameters

Downstream  
Disturbance: ~4.0 diameters

No. Sample Points: 3

# VOLUMETRIC FLOW RATE TRAVERSE FOR ROUND DUCTS



Job: Holcim (US) Inc.  
Alpena Cement Plant  
Alpena, Michigan

Test Date: June 22, 2021

Test Location: Raw Mills 14 and 15

Stack Diameter: 5,46 Feet

Stack Area: 23.41 Square Feet

Upstream  
Disturbance: ~2.0 diameters

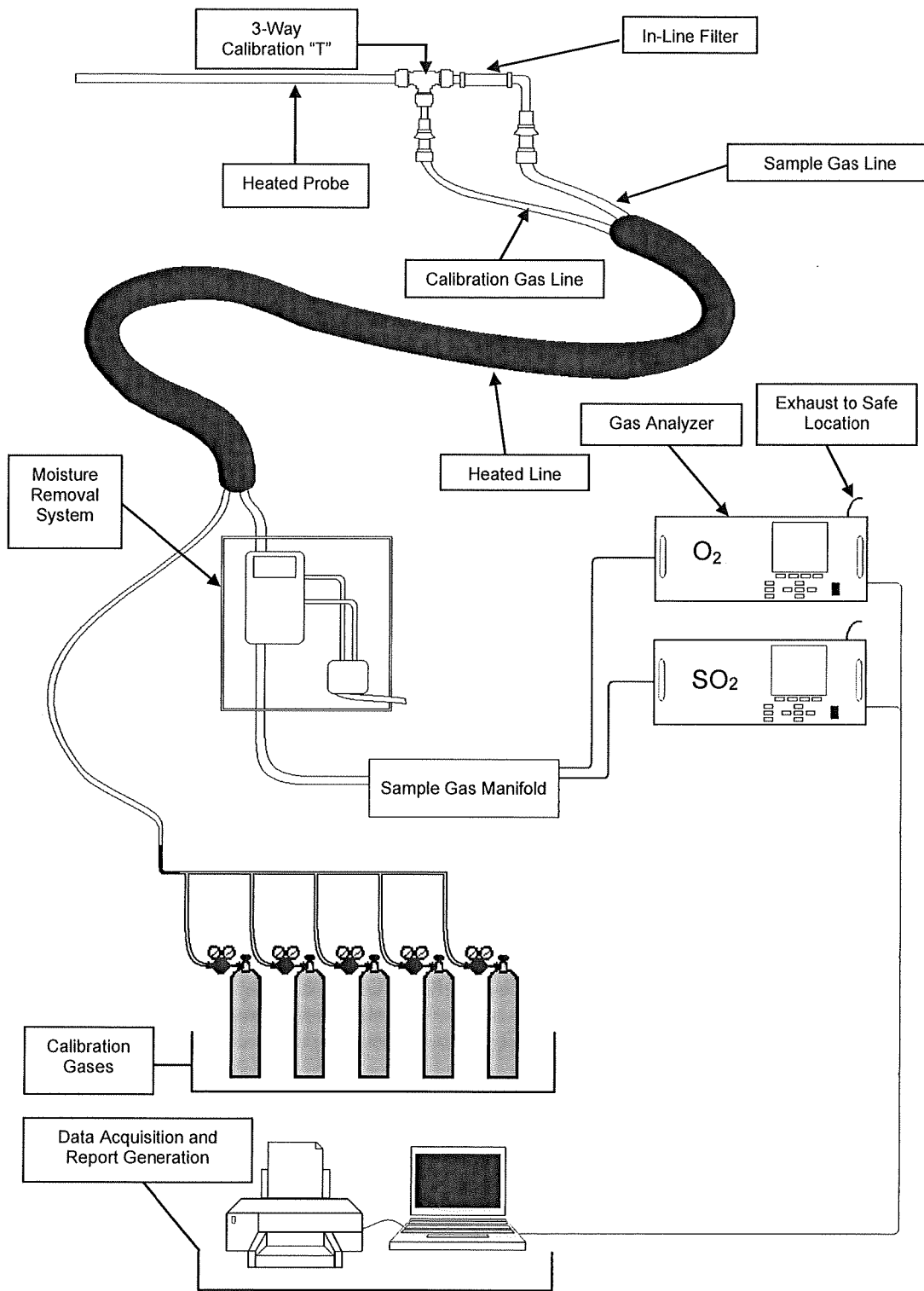
Downstream  
Disturbance: ~4.0 diameters

No. Sample Points: 16

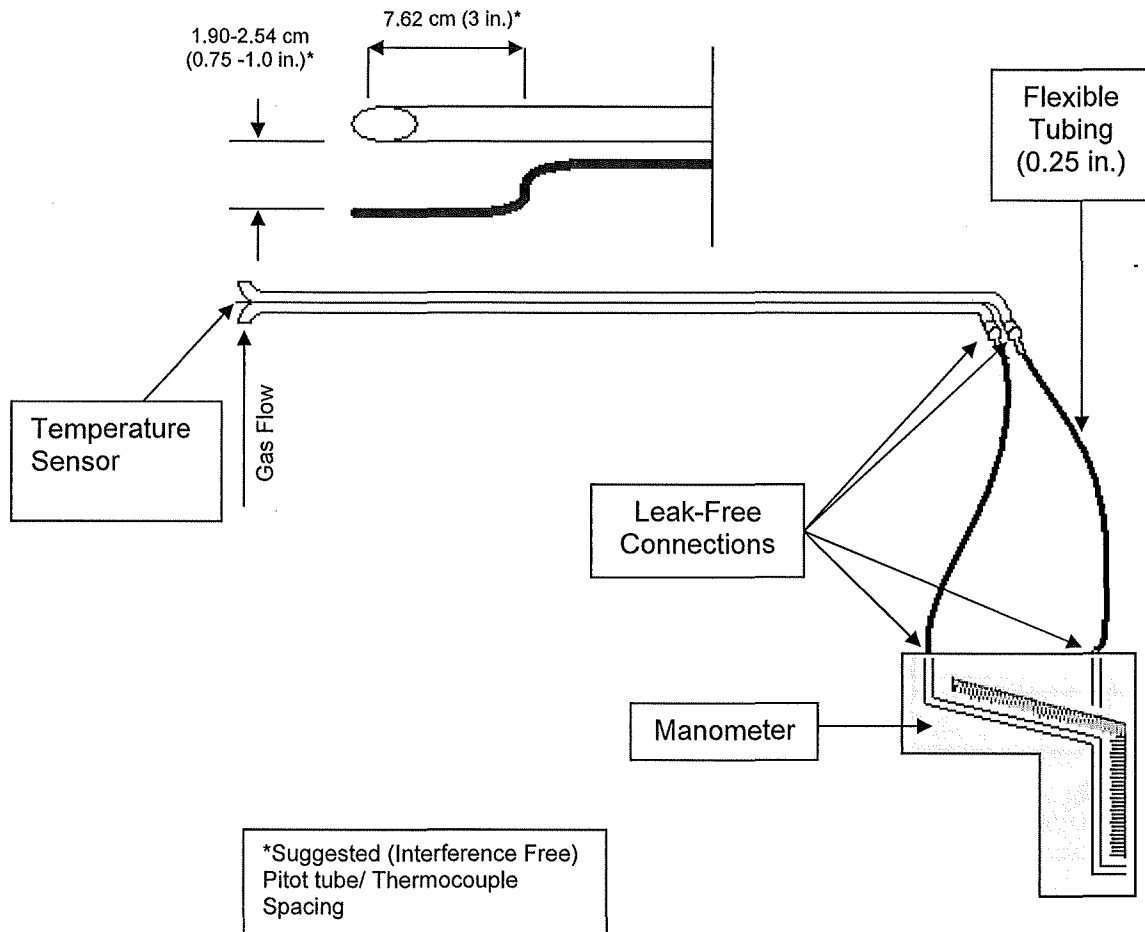
## Appendix B - Sample Train Diagrams



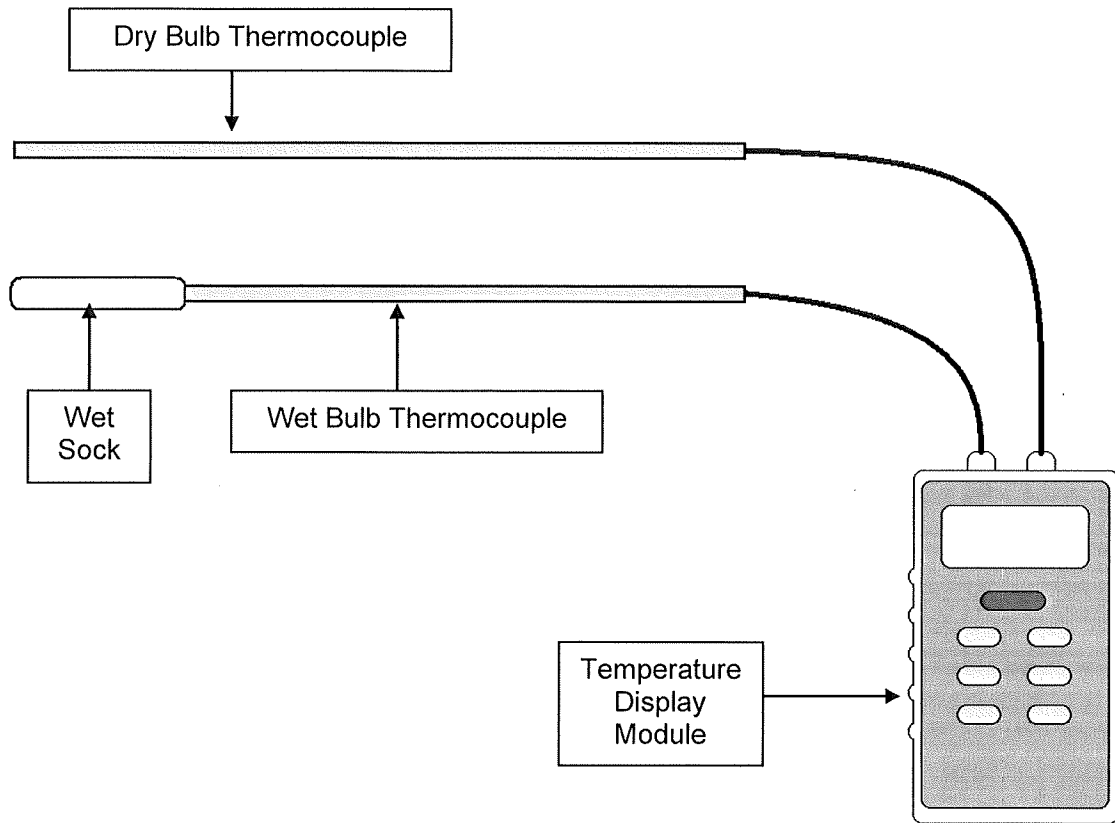
# USEPA Methods 3A and 6C Extractive Gaseous Sampling Diagram



## USEPA Method 2 – Type S Pitot Tube Manometer Assembly



# Moisture Determination ASTM Method E337-02, Reapproved 2002



## Appendix C - Calculation Nomenclature and Formulas