BTEC Inc.

Particulate Matter Emissions Test Report

B3518

Prepared for:

United States Gypsum Company

United States Gypsum Company
10090 West Jefferson
River Rouge, Michigan 48218

Project No. 13-4430.00
November 22, 2013

BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, Michigan 48073
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EXECUTIVE SUMMARY

BT Environmental Consulting, Inc. (BTEC) was retained by United States Gypsum Company (US Gypsum) to conduct a compliance emissions test program on two sources at the US Gypsum facility in River Rouge, Michigan. This emissions testing program included evaluation of particulate matter (PM) concentrations and emission rates as well as exhaust gas opacity from the Cement Board Process Dust Collector (EU-55) and the Warehouse Dust Collector (EU-10). The emissions test program was conducted on October 1, 2013.

Evaluation of pollutant emission rates consisted of triplicate 60-minute test runs for PM and triplicate 30-minute test runs for opacity at each stack. Overall results for the emissions test program are summarized by Table E-I.

Table E-I
Overall Emission Test Results Summary
Test Date: October 1, 2013

Emission Unit	Emission Unit ID	Pollutant	Permit Limit	Test Result
CB Process DC	EU-55	Particulate Matter	1.54 lb / hr	0.016 lb / hr
			0.015 gr/dscf	0.0003 gr/dscf
		Opacity	7%	0%
Warehouse DC	EU-10	Particulate Matter	0.9 lb / hr	0.02 lb / hr
			0.029 lbs/1,000 lbs	0.001 lbs/1,000 lbs
		Opacity	7%	0%

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1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by United States Gypsum Company (US Gypsum) to conduct a compliance emissions test program on two sources at the US Gypsum facility in River Rouge, Michigan. This emissions testing program included evaluation of particulate matter (PM) concentrations and emission rates as well as exhaust gas opacity from the Cement Board Process Dust Collector (EU-55) and the Warehouse Dust Collector (EU-10). The emissions test program was conducted on October 1, 2013.

AQD has published a guidance document entitled "Format for Submittal of Source Emission Test Plans and Reports" (February 2008). The following is a summary of the emissions test program and results in the format suggested by the aforementioned document.

1.a Identification, Location, and Dates of Test

Sampling and analysis for the emission test program was conducted on October 1, 2013 at the US Gypsum facility in River Rouge, Michigan. The test program included evaluation of PM emissions and opacity from the Cement Board Process Dust Collector (EU-55) and the Warehouse Dust Collector (EU-10).

1.b Purpose of Testing

AQD issued Permit No. MI-ROP-B3518-2011 to US Gypsum on November 11, 2011. This permit requires verification of particulate matter and opacity emission rates from EU-10. Particulate matter and opacity emissions from EU-55 were evaluated for informational purposes.

1.c Source Description

The emission units included the dust collectors for the cement board process and for the warehouse ventilation system.

1.d Test Program Contacts

The contact for the source and test report is:

Mr. John Kempton
Quality Supervisor
United States Gypsum Company
10090 West Jefferson
River Rouge, MI 48218
313-642-4278

Mr. Barry Boulianne
Source Testing Manager
BTEC
4949 Fernlee Avenue
Royal Oak, MI 48073
313-449-2361

Names and affiliations for personnel who were present during the testing program are summarized by Table 1.

2. Summary of Results

Sections 2.a through 2.d summarize the results of the emissions compliance test program.

2.a Operating Data

Process operating data is available in Appendix E.

2.b Applicable Permit

The applicable permit for this emissions test program is Renewable Operating Permit (ROP) No. MI-ROP-B3518-2011.

2.c Results

The overall results of the emission test program are summarized by Table 2. (see Section 5.a). Detailed results for each source are summarized by Tables 3 and 4.

3. Source Description

Sections 3.a through 3.e provide a detailed description of the process.

3.a Process Description

The emission units included the dust collectors for the cement board process and for the warehouse ventilation system.

3.b Raw and Finished Materials

The raw material is primarily gypsum and the finished materials and cement board and other gypsum based products.

3.c Process Capacity

Calcining kettles operate at 17 tons/hour. Warehouse DC operates during all operating hours.

3.d Process Instrumentation

Process operating data is available in Appendix E.

4. Sampling and Analytical Procedures

Sections 4.a through 4.d provide a summary of the sampling and analytical procedures used.

4.a Sampling Train and Field Procedures

The emissions test program utilized the following test methods codified at Title 40, Part 60, Appendix A of the Code of Federal Regulations (40 CFR 60, Appendix A):

Method 1 – "Sample and Velocity Traverses for Stationary Sources"

Method 2 – "Determination of Stack Gas Velocity and Volumetric Flowrate

Method 3 – "Determination of Molecular Weight of Dry Stack Gas" (Fyrite)

Method 4 – "Determination of Moisture Content in Stack Gases

Method 9 – "Visual Determination of Opacity of Emissions from Stationary Sources"

Method 17 – "Determination of Particulate Matter Emissions from Stationary Sources" (instack filter method on ambient sources)

Stack gas velocity traverses were conducted in accordance with the procedures outlined in Methods 1 and 2. Figures 1 and 2 present the test port and traverse/sampling point locations used. A cyclonic flow evaluation was conducted at each sampling location. An S-type pitot tube and thermocouple assembly calibrated in accordance with Method 2, Section 4.1.1 was used to measure exhaust gas velocity pressures and temperatures during testing. Because the pitot tube dimensions outlined in Sections 2.6 through 2.8 were within the specified limits, the baseline pitot tube coefficient of 0.84 (dimensionless) was assigned for this testing.

Molecular weight determinations were conducted according to Method 3. The equipment used for this evaluation consisted of a one-way squeeze bulb with connecting tubing and a set of Fyrite® combustion gas analyzers. Moisture content was determined from the condensate collected in the Method 17 sampling trains according to Method 4.

40 CFR 60, Appendix A, Method 17, *"Determination of Particulate Emissions from Stationary Sources"* was used to measure PM concentrations and calculate PM emission rates (see Figure 3 for a schematic of the sampling train). Triplicate 60-minute test runs were conducted on each source.

BTEC's Nutech® Model 2010 modular isokinetic stack sampling system (USEPA Method 17) consisted of (1) a stainless-steel nozzle, (2) an in stack stainless-steel filter housing with a pre weighed 45-mm diameter filter, (3) a steel probe, (4) a set of four Greenburg-Smith (GS) impingers with the first modified and second standard GS impingers each containing 100 ml of deionized water, and with a third dry modified GS impinger and a fourth modified GS impinger containing approximately 300 g of silica gel desiccant, (5) a length of sample line, and (6) a Nutech® control case equipped with a pump, dry gas meter, and calibrated orifice. A schematic drawing of the Method 17 particulate sample train is provided as Figure 3.

A sampling train leak test was conducted before and after each test run. After completion of the final leak test for each test run, the filter was recovered, and the nozzle and the front half of the filter holder assembly were brushed and triple rinsed with acetone. The acetone rinses were collected in a pre-cleaned sample container.

BTEC labeled each container with the test number, test location, and test date, and marked the level of liquid on the outside of the container. In addition, blank samples of the acetone and filter were collected. BTEC personnel carried all samples to BTEC's laboratory (for filter and acetone gravimetric analysis) in Royal Oak, Michigan.

4.b Recovery and Analytical Procedures

Recovery and analytical procedures were described in Section 4.a.

4.c Sampling Ports

A diagram of the stack showing sampling ports is included as Figures 1 and 2.

4.d Traverse Points

A diagram of the stacks indicating traverse point locations and stack dimensions is included as Figures 1 and 2.

5. Test Results and Discussion

Sections 5.a through 5.k provide a summary of the test results.

5.a Results Tabulation

A summary of the overall results of the emissions test program is provided as Table 2. All opacity readings were zero. Opacity data sheets and observer certification documents are provided in Appendix D.

5.b Discussion of Results

As summarized by Table 2, PM and opacity emissions were less than corresponding emission limitations.

5.c Sampling Procedure Variations

There were no sampling variations used during the emission compliance test program.

5.d Process or Control Device Upsets

No upset conditions occurred during testing.

5.e Control Device Maintenance

There was no control equipment maintenance performed during the emissions test program.

5.f Re-Test

The emissions test program was not a re-test.

5.g Audit Sample Analyses

No audit samples were collected as part of the test program.

5.h Calibration Sheets

Relevant equipment calibration documents are provided in Appendix B.

5.i Sample Calculations

Sample calculations are provided in Appendix C.

5.j Field Data Sheets

Field documents relevant to the emissions test program are presented in Appendix A.

5.k Laboratory Data

Analytical results documents relevant to the emissions test program are provided in Appendix F.

TABLES

Table 1
Test Personnel

Name and Title	Affiliation	Telephone
Mr. John Kempton Quality Supervisor	US Gypsum Company 10090 West Jefferson River Rouge, Michigan 48218	(313) 624-4278
Mr. Matthew Young Project Manager	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070
Mr. Paul Molenda Environmental Technician	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070
Mr. Thomas Maza Air Quality Division, MDEQ	SE Michigan District Office 27700 Donald Court Warren, MI 48092	(313) 753-3745

Table 2
Overall Emission Test Results Summary
Test Date: October 1, 2013

Emission Unit	Emission Unit ID	Pollutant	Permit Limit	Test Result
CB Process DC	EU-55	Particulate Matter	1.54 lb / hr	0.016 lb / hr
			0.015 gr/dscf	0.0003 gr/dscf
		Opacity	7%	0%
Warehouse DC	EU-10	Particulate Matter	0.9 lb / hr	0.02 lb / hr
			0.029 lbs/1,000 lbs	0.001 lbs/1,000 lbs
		Opacity	7%	0%

Table 3
Particulate Matter Emission Rates

Company	USG			
Source Designation	CBP DC			
Test Date	10/1/2013	10/1/2013	10/1/2013	
Meter/Nozzle Information	P-1	P-2	P-3	Average
Meter Temperature Tm (F)	84.8	92.3	94.3	90.4
Meter Pressure - Pm (in. Hg)	29.6	29.6	29.6	29.6
Measured Sample Volume (Vm)	59.2	65.4	60.6	61.7
Sample Volume (Vm-Std ft3)	57.8	63.1	58.2	59.7
Sample Volume (Vm-Std m3)	1.64	1.79	1.65	1.69
Condensate Volume (Vw-std)	1.023	1.179	1.330	1.177
Gas Density (Ps(std) lbs/ft3) (wet)	0.0740	0.0740	0.0739	0.0740
Gas Density (Ps(std) lbs/ft3) (dry)	0.0745	0.0745	0.0745	0.0745
Total weight of sampled gas (m g lbs) (wet)	4.36	4.76	4.40	4.50
Total weight of sampled gas (m g lbs) (dry)	4.31	4.70	4.34	4.45
Nozzle Size - An (sq. ft.)	0.000558	0.000616	0.000558	0.000578
Isokinetic Variation - I	98.3	99.1	100.5	99.3
Stack Data				
Average Stack Temperature - Ts (F)	86.3	88.0	89.6	88.0
Molecular Weight Stack Gas- dry (Md)	28.8	28.8	28.8	28.8
Molecular Weight Stack Gas-wet (Ms)	28.6	28.6	28.6	28.6
Stack Gas Specific Gravity (Gs)	0.989	0.989	0.987	0.988
Percent Moisture (Bws)	1.74	1.83	2.23	1.94
Water Vapor Volume (fraction)	0.0174	0.0183	0.0223	0.0194
Pressure - Ps ("Hg)	29.3	29.3	29.3	29.3
Average Stack Velocity -Vs (ft/sec)	31.4	31.0	31.3	31.2
Area of Stack (ft2)	3.9	3.9	3.9	3.9
Exhaust Gas Flowrate				
Flowrate ft^3(Actual)	7,350	7,246	7,319	7,305
Flowrate ft^3 (Standard Wet)	6,966	6,847	6,896	6,903
Flowrate ft^3 (Standard Dry)	6,845	6,721	6,742	6,769
Flowrate m^3 (standard dry)	194	190	191	192
Total Particulate Weights (mg)				
Nozzle/Probe/Filter	0.0	1.4	1.9	1.1
Total Particulate Concentration				
lb/1000 lb (wet)	0.000	0.001	0.001	0.001
lb/1000 lb (dry)	0.000	0.001	0.001	0.001
mg/dscm (dry)	0.0	0.8	1.2	0.6
gr/dscf	0.0000	0.0003	0.0005	0.0003
Total Particulate Emission Rate				
lb/ hr	0.000	0.020	0.029	0.016

Table 4
Particulate Matter Emission Rates

Company	USG			
Source Designation	Warehouse DC			
Test Date	10/1/2013	10/1/2013	10/1/2013	
Meter/Nozzle Information	P-1	P-2	P-3	Average
Meter Temperature Tm (F)	74.4	85.2	83.4	81.0
Meter Pressure - Pm (in. Hg)	29.5	29.5	29.5	29.5
Measured Sample Volume (Vm)	49.3	54.1	48.8	50.7
Sample Volume (Vm-Std ft3)	47.2	50.8	46.0	48.0
Sample Volume (Vm-Std m3)	1.34	1.44	1.30	1.36
Condensate Volume (Vw-std)	0.839	0.655	0.726	0.740
Gas Density (Ps(std) lbs/ft3) (wet)	0.0740	0.0742	0.0741	0.0741
Gas Density (Ps(std) lbs/ft3) (dry)	0.0745	0.0745	0.0745	0.0745
Total weight of sampled gas (m g lbs) (wet)	3.56	3.82	3.46	3.61
Total weight of sampled gas (m g lbs) (dry)	3.52	3.79	3.43	3.58
Nozzle Size - An (sq. ft.)	0.000558	0.000616	0.000558	0.000578
Isokinetic Variation - I	100.6	99.2	100.1	100.0
Stack Data				
Average Stack Temperature - Ts (F)	75.6	90.8	95.6	87.3
Molecular Weight Stack Gas- dry (Md)	28.8	28.8	28.8	28.8
Molecular Weight Stack Gas-wet (Ms)	28.6	28.7	28.7	28.7
Stack Gas Specific Gravity (Gs)	0.989	0.991	0.990	0.990
Percent Moisture (Bws)	1.75	1.27	1.55	1.53
Water Vapor Volume (fraction)	0.0175	0.0127	0.0155	0.0153
Pressure - Ps ("Hg)	29.3	29.3	29.3	29.3
Average Stack Velocity -Vs (ft/sec)	24.6	24.9	24.9	24.8
Area of Stack (ft2)	2.3	2.3	2.3	2.3
Exhaust Gas Flowrate				
Flowrate ft^3(Actual)	3,459	3,505	3,507	3,491
Flowrate ft^3 (Standard Wet)	3,343	3,294	3,268	3,302
Flowrate ft^3 (Standard Dry)	3,285	3,252	3,217	3,252
Flowrate m^3 (standard dry)	93	92	91	92
Total Particulate Weights (mg)				
Nozzle/Probe/Filter	1.8	2.0	1.7	1.8
Total Particulate Concentration				
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)	1.3	1.4	1.3	1.3
gr/dscf	0.0006	0.0006	0.0006	0.0006
Total Particulate Emission Rate				
lb/ hr	0.017	0.017	0.016	0.016

FIGURES

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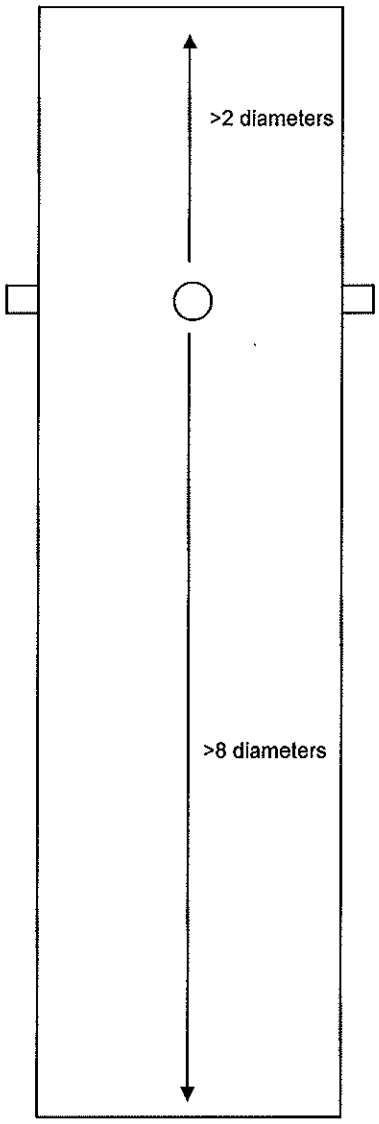
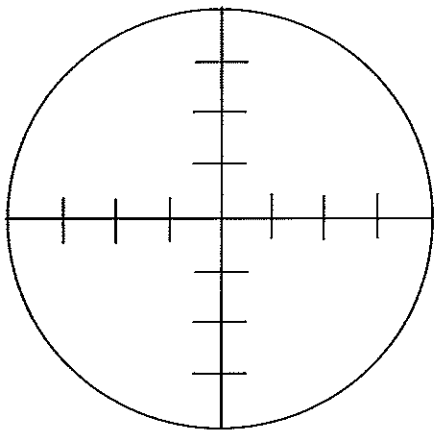
diameter = 26.75





Not to Scale

Points	Distance "
1	1.2
2	3.9
3	7.9
4	18.8
5	22.8
6	25.6

Figure 1

Site:	Sampling Date:	
CBP Dust Collector (EU-55)	October 1, 2013	BT Environmental Consulting, Inc.
United States Gypsum Company		4949 Fernlee Avenue
River Rouge, Michigan		Royal Oak, Michigan 48073

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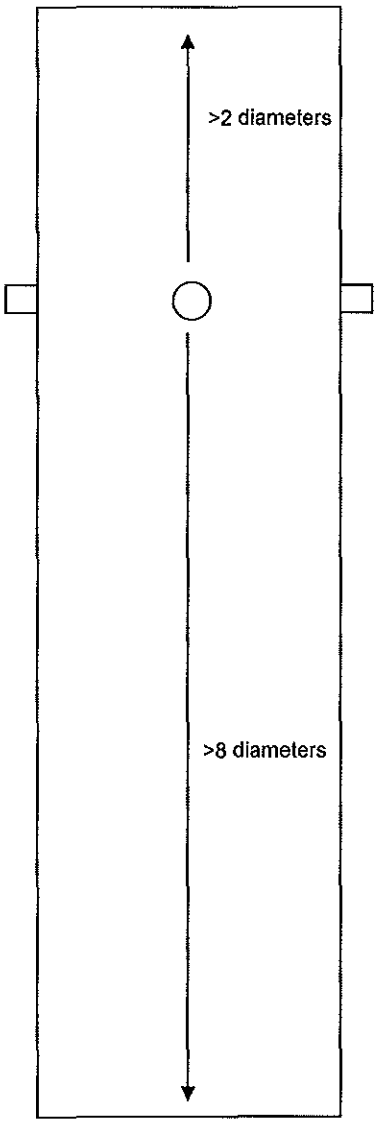
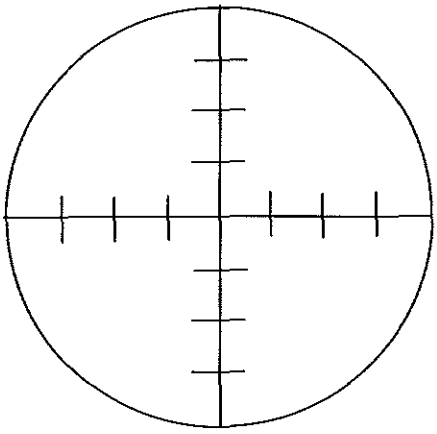
diameter = 20.75





Not to Scale

Points	Distance "
1	0.9
2	3.0
3	6.1
4	14.6
5	17.7
6	19.8

Figure 2

Site:	Sampling Date:	
Warehouse DC (EU-10)	October 1, 2013	BT Environmental Consulting, Inc.
United States Gypsum Company		4949 Fernlee Avenue
River Rouge, Michigan		Royal Oak, Michigan 48073

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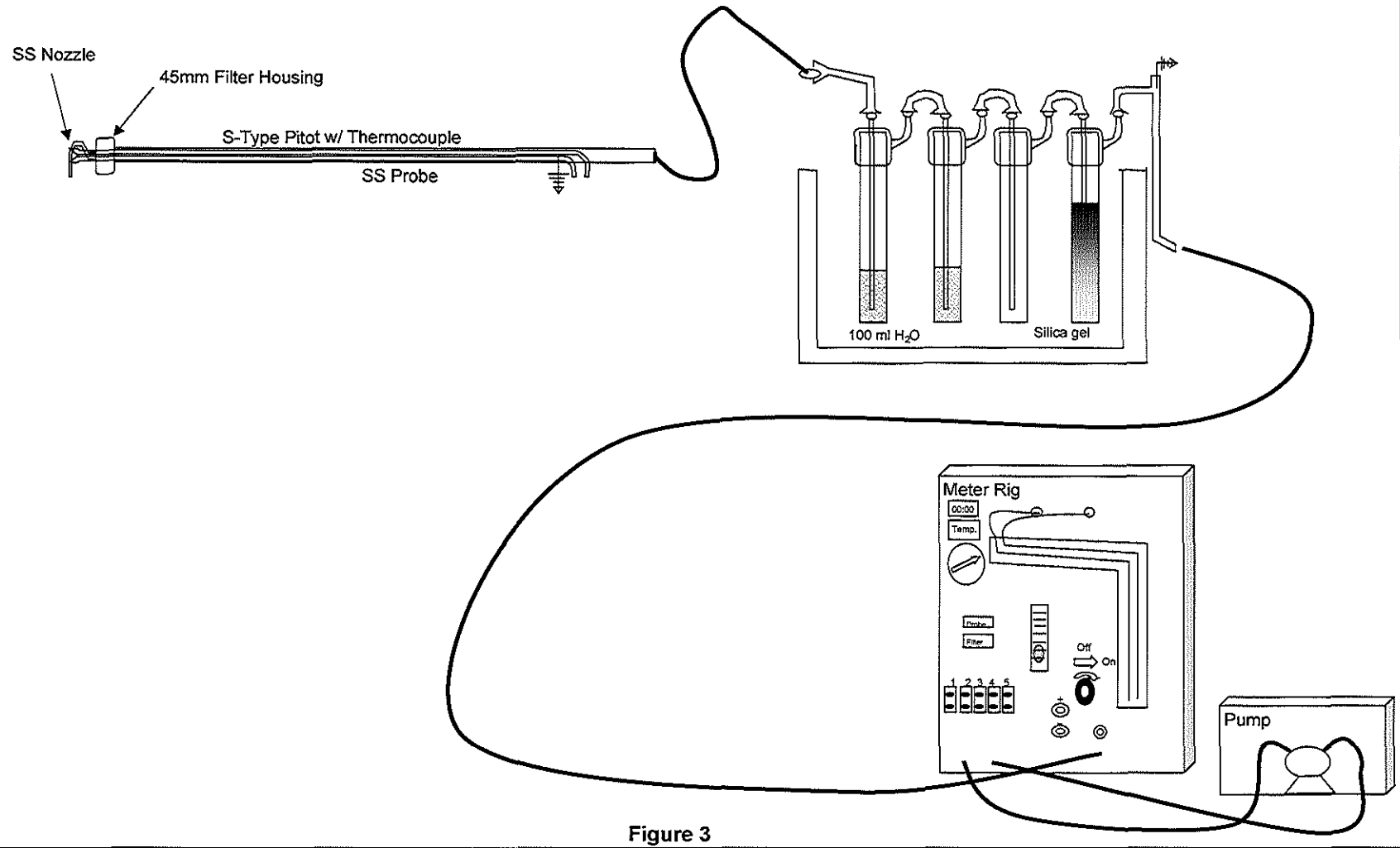

Figure 3

Site: USEPA Method 17 US Gypsum River Rouge, Michigan	Sampling Date: October 1, 2013	BT Environmental Consulting, Inc. 4949 Fernlee Avenue Royal Oak, Michigan 48073