INITIAL COMPLIANCE TEST FOR PARTICULATE EMISSIONS
LUZENAC AMERICA
THREE FORKS MILL
Montana Air Quality Permit #2282-02

MAY 17, 1995

By

Bison Engineering, Inc.
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Report Date: June 15, 1995

EXECUTIVE SUMMARY

Bison Engineering, Inc. (Bison) personnel performed Title 40, Code of Federal Regulations (CFR), Part 60, Appendix A, Methods 1 through 5 and Method 9 visual opacity determinations at the Luzenac America Three Forks talc processing facility. These tests were conducted on May 17, 1995. Testing of the single stationary source conformed to the requirements specified in Permit 2282-02 issued by the Montana Department of Health and Environmental Sciences, Air Quality Division (AQD). Bison filed a Pretest Notification describing the test in detail on August 10, 1994, followed by additional documentation.

Fan #091 (F-091), a dust collector for the rail load-out spout in the load-out crusher facility, was tested for particulate emissions (EPA Method 5) and opacity (EPA Method 9).

Permit 2282-02 refers to specific emission limitations of 0.02 grains per dry standard cubic feet (g/dscf) and 7% opacity. Table 1 summarizes particulate emissions from F-091 conducted on May 17, 1995. Method 9 results reflect the highest 6-minute average during a 1-hour visual observation.

Table 1: Summary of Emissions for F-091

Test Number	Dust Collector Identification	Method 5		Method 9 (6 min. avg.) (%)
		(g/dscf)	(lbs/hour)	
Run 1	#64S-5-20	0.0037	0.06	0.0
Run 2	#64S-5-20	0.0053	0.09	0.0
Run 3	#64S-5-20	0.0042	0.07	0.0
Average		0.0044	0.08	0.0

This report contains detailed notes and test information. Field and laboratory data, calibrations, and supporting data are included in the Appendices. All relevant nomenclature directly follows EPA methodology.

CERTIFICATION OF REPORT INTEGRITY

Bison Engineering, Inc. certifies this report represents the emissions tested on the fan #091 dust collector at the Luzenac America Three Forks mill. Every effort was made to obtain accurate and representative data. The test team complied with the procedures specified in Permit 2282-02.

Team Leader
and Report Author: Mitchell W. Anderson

Title: Staff Engineer

Signature: M W Anderson

Date: 6-19-95

Reviewer: Calvin W. Loomis

Title: Lead Engineer

Signature: Calvin Loomis

Date: 06/19/95

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1.0 INTRODUCTION

1.1 Purpose

Montana Air Quality Permit 2282-02, dated October 16, 1994, regulates the emission of particulates from Luzenac America's Three Forks mill talc processing facility. Section I.A, Permitted Equipment, lists the existing processing equipment regulated at the facility. Section II.A.1, Emission Limitations, specifies the applicable equipment required to meet the emission limits of 0.02 g/dscf and 7% or less opacity.

Bison submitted a pretest protocol on August 10, 1994, followed by additional related correspondence, which summarized the proposed particulate emission testing. This protocol is referenced in Appendix A.

1.2 Emission Source Description

Luzenac America utilizes baghouses for the control of particulate emissions for various talc processes at the Three Forks facility. Fan 091 is a dust collector that captures fugitive particulate from the conveyance of crushed ore into rail cars for shipment.

1.3 Control Equipment Description

Luzenac America utilizes baghouses as its primary means for the control of particulate emissions from the Three Forks mill. A listing of the dust collector tested, manufacturer, and model number can be found in Table 2.

Table 2: Source and Manufacturer Listing

Dust Collector	Equipment Manufacturer	Model Number
F-091	Mikro-Pulsaire	#64S-5-20

1.4 Source Test Dates

Bison personnel arrived on site May 17, 1995 and completed three Method 5 and Method 9 test runs.

1.5 Pollutants Tested

Bison test personnel sampled the F-091 source for total particulate matter (TSP) and conducted visual opacity determinations as well. Particulate matter testing was conducted in accordance with Method 5, "Determination of Particulate Emission from Stationary Sources". Visual opacity was conducted in accordance with Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources".

1.6 Operating Personnel

1.6.1 Bison Engineering, Inc.

Mitchell W. Anderson (Staff Engineer) was the project manager and authored this report. Shawn Bryant (Technician) assisted in both Method 5 and Method 9 test procedures and provided quality assurance support with field and analytical data. Laboratory analysis was accomplished through the efforts of Jessie Holtman (Data Technician) at the Bison laboratory. The final report was reviewed by Calvin W. Loomis, Lead Engineer.

1.6.2 Luzenac America

William R. Kraemer (Environmental Coordinator) was the industry representative. An on-going dialogue between Bison test personnel and Luzenac mill personnel concerning process scheduling and coordination was established and maintained with Phil Hangas (Plant General Supervisor).

1.6.3 Montana Air Quality Division

Jeff Briggs (Environmental Engineer) was regulatory representative with respect to this testing program and was informed of the testing schedule.

2.0 TEST RESULTS SUMMARY

2.1 Emission Results

Section II.A.1 of Montana Air Quality Permit 2282-02 under Emission Limitations regulate particulate emitted from designated dust collectors at the Three Forks mill to 0.02 g/dscf and 7% opacity. The following table summarizes particulate emissions from the Three Forks mill for each test run. Particulate grain loading from Method 5 test data are summarized in units of g/dscf and lbs/hr. Method 9 opacity results reflect the highest average for a 6-minute time period.

Table 3: Test Results from F-091 at the Three Forks Mill

Source Description	Isokinetics (Percent)	Corrected Meter Volume (dscf)	Method 5 (g/dscf)	Method 5 (lbs/hour)	Method 9 (6 min. avg.)
F-091					
Run 1	96.6	89.80	0.0037	0.06	0.0
Run 2	97.5	67.22	0.0053	0.09	0.0
Run 3	98.0	67.84	0.0042	0.07	0.0
Average	**97.3**	-	**0.0044**	**0.07**	0.0

Appendix B contains raw field data and computer generated spreadsheets for each source test run, velocity traverse data, and traverse point calculations.

2.2 Production Data

Prior to each test run, communication with processing personnel was established as to determine whether the source was in operation. The plant processed talc under normal operating conditions during all Method 5 and Method 9 test runs. The Source Test Log in Table 4 displays the times and dates for each particulate and visual opacity test run for the F-091 source. The talc processing rates were obtained from the Three Forks mill and are included in Appendix B.

Table 4: Three Forks Source Test Log and Production Data

Date	Source	Test Run	Start Time	Production (Tons/hour)
May 17, 1995	F-091	One	1050	78
May 17, 1995	F-091	Two	1427	78
May 17, 1995	F-091	Three	1614	78

2.3 Discussion of Deviations

On occasion, talc processing was temporarily terminated during testing while rail cars were repositioned. When production was halted, the sampling train was removed from the portable stack with the meter box turned off. Sampling of the stack gas continued when the talc process was in continuous production. Down times are noted in the right margins of the raw field data sheets in Appendix B.

3.0 SAMPLING AND ANALYSIS

3.1 Sampling Location

For the stationary source at the Three Forks mill, a fabricated portable stack composed of sheet metal was constructed and connected to the outlet of the dust collector with flexible hose. The inside diameter of the circular portable duct is 12 inches with an overall length of 10 feet. Eight total traverse points within the duct were accessible through 2 circular ports cut into the duct's sidewall. The two 4-inch ports were positioned at a distance of two feet from the outlet in order to satisfy the "8 and 2" downstream/upstream disturbance requirements specified by EPA methods. A schematic for the round portable stack is located in Appendix D.

3.2 Sampling Procedures

Bison personnel tested the F-091 source at the Three Forks mill for particulate emissions according to procedures outlined in Method 5 and conducted simultaneous Method 9 visual opacity determinations. Bison tests conformed to EPA Code of Federal Regulations (40 CFR 60, Appendix A). The following EPA methods were employed in the field:

- Sampling Location and Traverse Points: Method 1, "Sample and Velocity Traverses for Stationary Sources".
- Velocity and Volume: Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube).
- Molecular Weight: Method 3, "Gas Analysis for the Determination of Dry Molecular Weight".
- Particulate: Method 5, "Determination of Particulate Emissions From Stationary Sources".
- Visible Opacity: Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources".

EPA Method 4, "Determination of Moisture Content in Stack Gases", is incorporated within Method 5. Particulate test runs for Method 5 consisted of a minimum sampling time of 80 minutes with a collected standard volume of 67 dscf. A total of three Method 5 test runs were conducted for the stationary source.

Visual opacity observations were conducted concurrently during each particulate test run. The Method 9 test runs consisted of a 10-minute continuous monitoring session followed by a 1-minute observation every 10 minutes. The total duration of a Method 9 test was 60 minutes.

The pre-test protocol in Appendix A contains a schematic of the particulate sampling train. A Method 2 velocity traverse was performed before the first Method 5 particulate test run. Method 2 data enables the operator to calculate dwell time at each traverse point, as well as, the sampling rate, average stack temperature, pressure differential, and optimum nozzle size.

An out-of-stack filter assembly in the heated portion of a Method 5 sampling train captures particulate with a diameter greater than 0.3 microns. Particles smaller than 0.3 microns pass through the filter and are entrapped in the condensible impinger water.

Between each test run, an operator disassembled and washed down the probe and filter glassware into a sample bottle. Impinger water was preserved into a second bottle, and silica gel was deposited into a third separate bottle. The quartz fiber filter within the glass filter bell housing was preserved for laboratory analysis.

Stack gas moisture collected from the impingers and silica gel was weighed to within 0.1 grams accuracy in Bison's mobile laboratory. This data, in combination with temperature flow and gas composition measurements taken during the run, allows the operator to determine isokinetics for each traverse point and after a test run.

All samples were subsequently returned to the Bison laboratory in Helena for desiccation and mass analyses.

3.3 Field Notes and Special Circumstances

The sampling meter box, Model 2010, is manufactured by the Nutech Corporation. All glassware including filter assembly, impingers, and connections are also manufactured by Nutech. Appendix A contains sample train schematics.

Appendix B contains the raw field data forms and computer generated spreadsheets and calculations for each Method 5 test run. Visual Method 9 forms are also included in Appendix B.

There were no apparent deviations from the cited EPA Methods. All tests were completed with no problems or difficulty and met the minimum testing requirements.

4.0 CALCULATIONS

4.1 Nomenclature and Formulae

Appendix E contains the nomenclature and formulae used for Method 5 isokinetic stationary source tests.

5.0 QUALITY ASSURANCE

Appendix F contains calibration sheets for the field equipment used during the Three Forks mill test. All field data was returned to Bison's office and lab in Helena for review and analysis.

Bison Engineering's practices conform to the requirements specified in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, published by the U.S. Environmental Protection Agency in August, 1977 as revised and amended (cat. #EPA-600/4-77-027b), and Montana Air Quality Division's Montana Source Test Protocol and Procedures Manual dated July, 1993.

APPENDIX A: PRE-TEST PROTOCOL

SOURCE TEST PROTOCOL

1.0 INTRODUCTION

Facility Name: Montana Talc - Luzenac

Mailing: 28769 Sappington Road
Three Forks, Montana 59752

Office: Phone (406) 285-3286
Fax (406) 285-3530

Contact: Randy Geiger

Permit Number: 1996-01

Location: The Luzenac facility is located in Section 31, Township 1 North, Range 1 West, Gallatin County, Montana.

Emission Sources and Testing Objectives: Bison Engineering intends to test the vacuum system for Total Suspended Particulate (TSP) and Visible Emissions.

2.0 EMISSION SOURCE INFORMATION

2.1 Facility Description

The Montana Talc-Luzenac is a typical talc plant.

2.2 Process Information

The vacuum system runs gas through a cyclone with screen, then to a Mikro-Pulsaire Vac Rated Receiver. The gas is then released to ambient and the particulate is moved to ACM #3 Feed Bin and to Finished Product. The product is talc.

2.3 Emission Source and Control Description

Vacuum system at Montana Talc-Luzenac. The gas is exhausted through a cyclone, baghouse and out a single vertical stack.

3.0 SOURCE TEST PROGRAM DESCRIPTION

3.1 Testing Contractor

Bison Engineering, Inc.
30 South Ewing, 59601
P.O. Box 1703
Helena, MT 59624
(406) 442-5768 Fax (406) 449-6653
Contact: Dave Kinghorn, Senior Project Engineer

3.2 Test Program Organization

BISON

Project Manager:	Dave Kinghorn, Senior Project Engineer
Testing Assistants:	Kelly Holshue, Senior Technician
	Calvin Loomis, Lead Engineer
Project Control:	Dave Kinghorn, Senior Project Engineer

Montana Talc-Luzenac

Contact:	Randy Geiger

MONTANA AIR QUALITY BUREAU

Contact:	Jeff Briggs

3.3 Test Program Objectives

Permit 1996-01, written and finalized July 13, 1994, stipulates that Luzenac America's talc plant (in Three Forks, Montana) is limited to a total suspended particulate (TSP) emission of 0.02 gr/dscf (grains/dry standard cubic feet) of particulate. The plant's visible emissions are limited to 7%.

Bison's objectives are to complete the required testing in accordance with Permit 1996-01. This involves TSP testing (Method 5) and visible observations (Method 9) on the vacuum system.

TEST DATES:

Bison proposes testing September 15, 1994.

Note: Testing is dependent on weather. If inclement weather postpones testing, it shall be conducted as soon as all parties are available.

REPORT DATE:

Bison anticipates report submittal to the Montana AQB no later than November 13, 1994.

4.0 SOURCE TESTING PROCEDURES

4.1 Instrumentation and Equipment Description

Operators will employ sample trains and instrumentation as specified in EPA testing methods. See attachments for sample train schematics.

Method 5 collects solid particulate larger than 0.3 μg diameter on a heated filter.

The chilled impinger water collects condensible particulate.

A stainless steel-lined heated probe with a suitable nozzle will be used. An integral type K thermocouple and type S pitot tube will be used for stack flow rate monitoring.

4.2 Test Methods

Test personnel will employ the following Title 40 CFR 60, Appendix A (EPA reference) methods:

Sampling Location and Traverse Points: Method 1, "Sample and Velocity Traverses for Stationary sources"

Velocity and Volume: Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)."

Molecular Weight: Method 3, "Gas Analysis for the Determination of Dry Molecular Weight." (Fyrites)

Note: Source moisture determination and calculations, Method 4, is incorporated within Method 5.

Particulate: Method 5, "Determination of Particulate Emissions From Stationary Sources".

Note: Method 5 test runs shall consist of a minimum 1 hour and 60 dscf.

Visible Opacity: Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources".

Note: Method 9 opacity observations shall be conducted concurrently with each Method 5 particulate run. Each Method 9 observation will last 60 minutes.

Plant Capacity:

The facility has a maximum operating capacity of 700 cfm and normally operates at 650 cfm. The facility will run at its maximum operating capacity.

4.3 Analytical Methods

The attachments include sample analytical data forms.

Water. Impinger water weight gain indicates stack moisture content. Moisture will be estimated prior to the first particulate run at each source from wet bulb/dry bulb temperature data or historical records. Immediately following each particulate run, operators will weigh the water collected. This data will provide on-site Method 4 moisture analysis and verification of isokinetic sampling rates.

5.0 QUALITY ASSURANCE PROCEDURES

Bison's mobile laboratory trailer or testing van provides controlled, clean environments for sample handling, pre- and post-test operations and paperwork.

Bison Engineering's test, laboratory, reporting, and quality assurance procedures conform to the requirements specified in the Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. III, Stationary Source Specific Methods published by the U.S. Environmental Protection Agency in August, 1977 as revised and amended (cat. # EPA-600/4-77-027b).

5.1 Sample Handling Protocols

Operators shall complete and initial all field data sheets before leaving the site.

The individual test methods specify handling procedures for physical samples (liquids, traps, etc.).

5.2 Data Validation

Bison employs field lap-top computers for immediate data entry. This allows for checks of validity on each run. The data is then passed through Bison's quality control procedure and is validated by an additional person. Bison's Senior Project Engineer is responsible for all procedures being followed.

5.2 Equipment and Instrument Calibration and Maintenance.

Equipment and instruments are calibrated every 60 days. All equipment calibration documentation will be submitted within the formal report.

6.0 SOURCE TEST REPORT

6.1 Report Format

The Source Test Report will follow the general format outlined in the draft Montana Source Test Protocol and Procedures Manual, dated "July 1993."

6.2 Data Reduction

Bison utilizes Quattro Pro, similar to Lotus 123, which has ready-made spreadsheets to allow for quick and accurate mathematical calculations.

7.0 SAFETY CONSIDERATIONS

Personal Safety

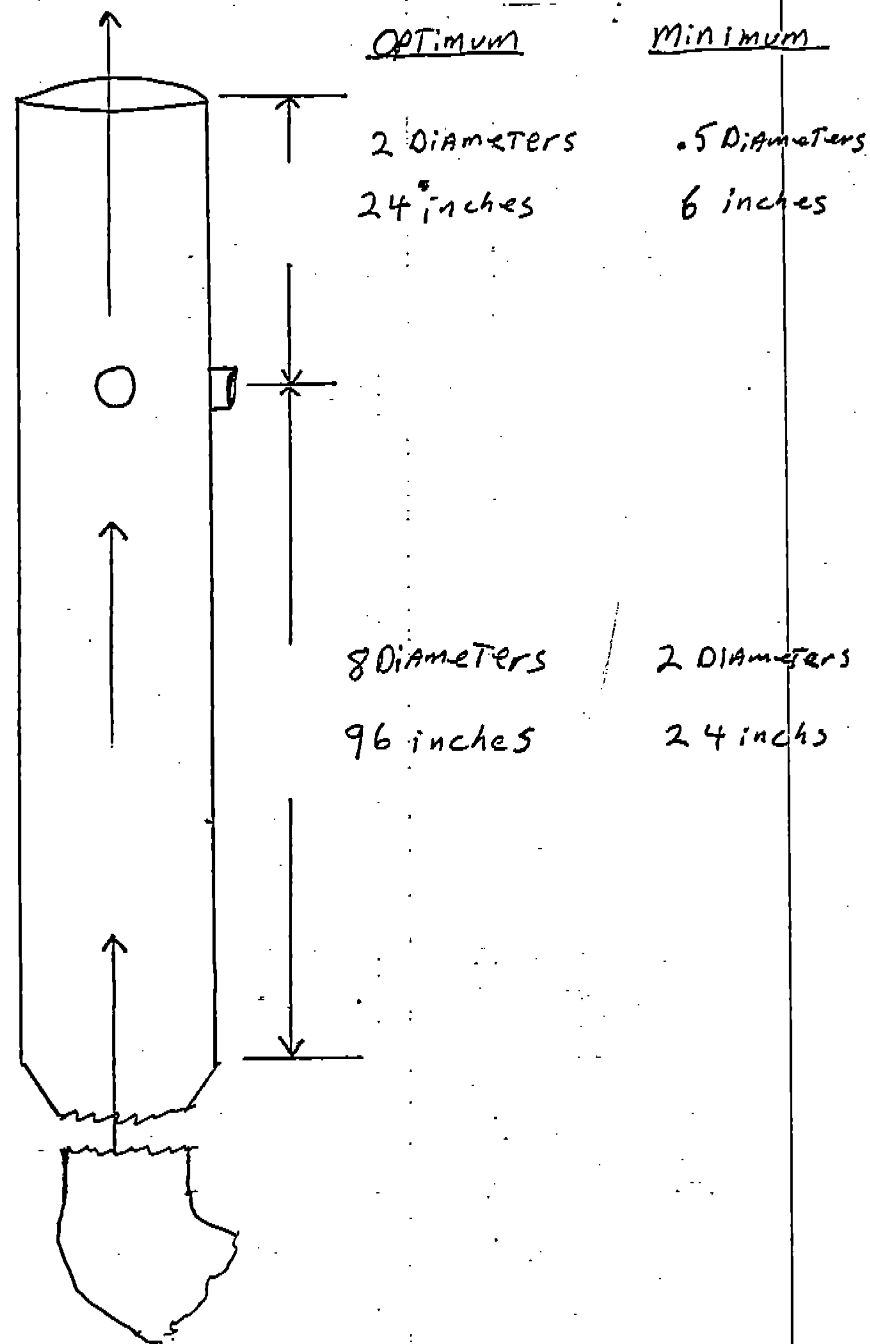
Bison Engineering personnel have available:

A. Hard hat,
B. Long sleeve shirts, coveralls or jacket,
C. Steel-toed boots,
D. Dust masks and goggles as required, and
E. Heat-resistant gloves for handling probe.

Sample Location and Access

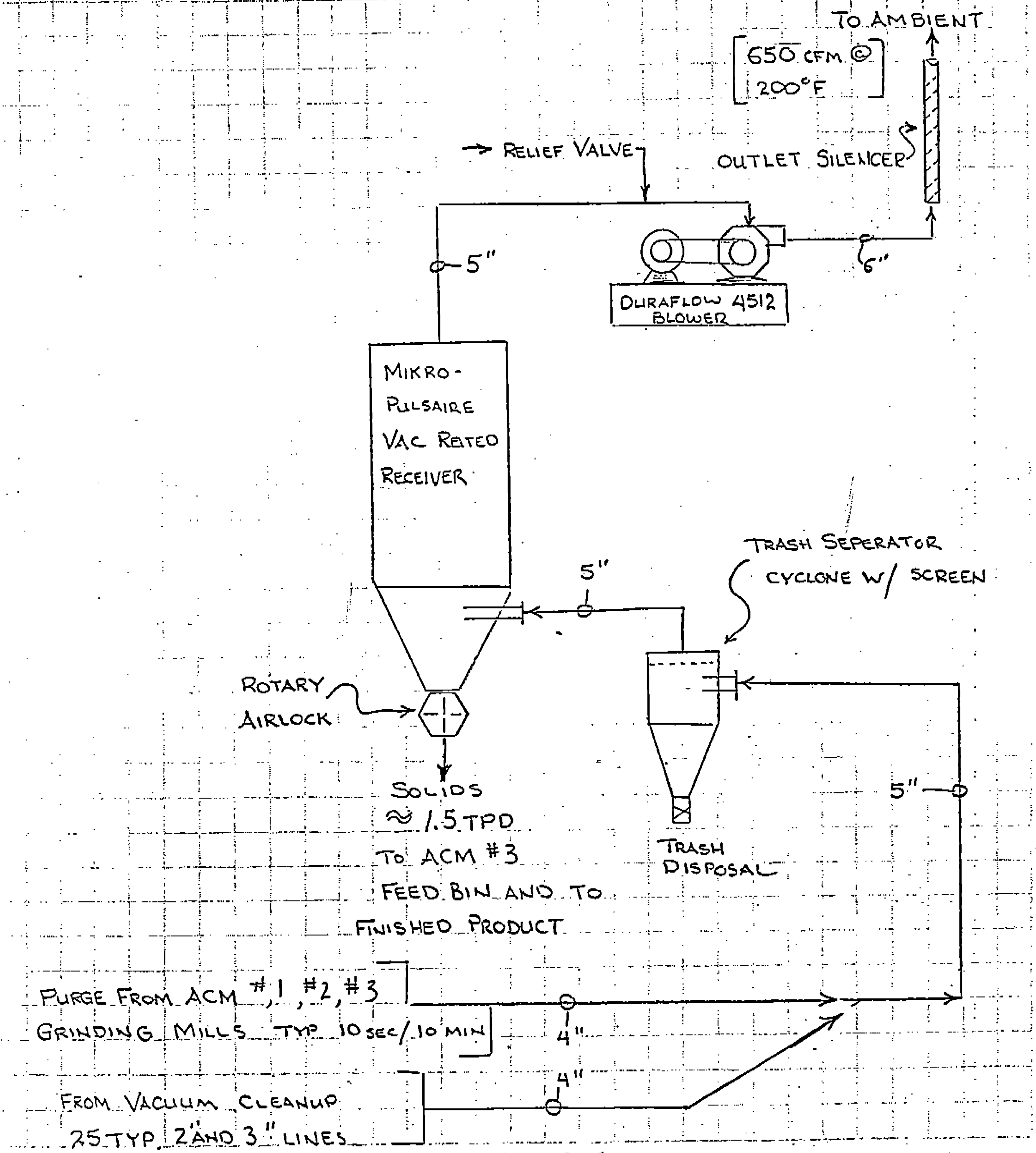
The sample ports are located above a 1 to 12 pitch steel roof that is about 14 feet high.

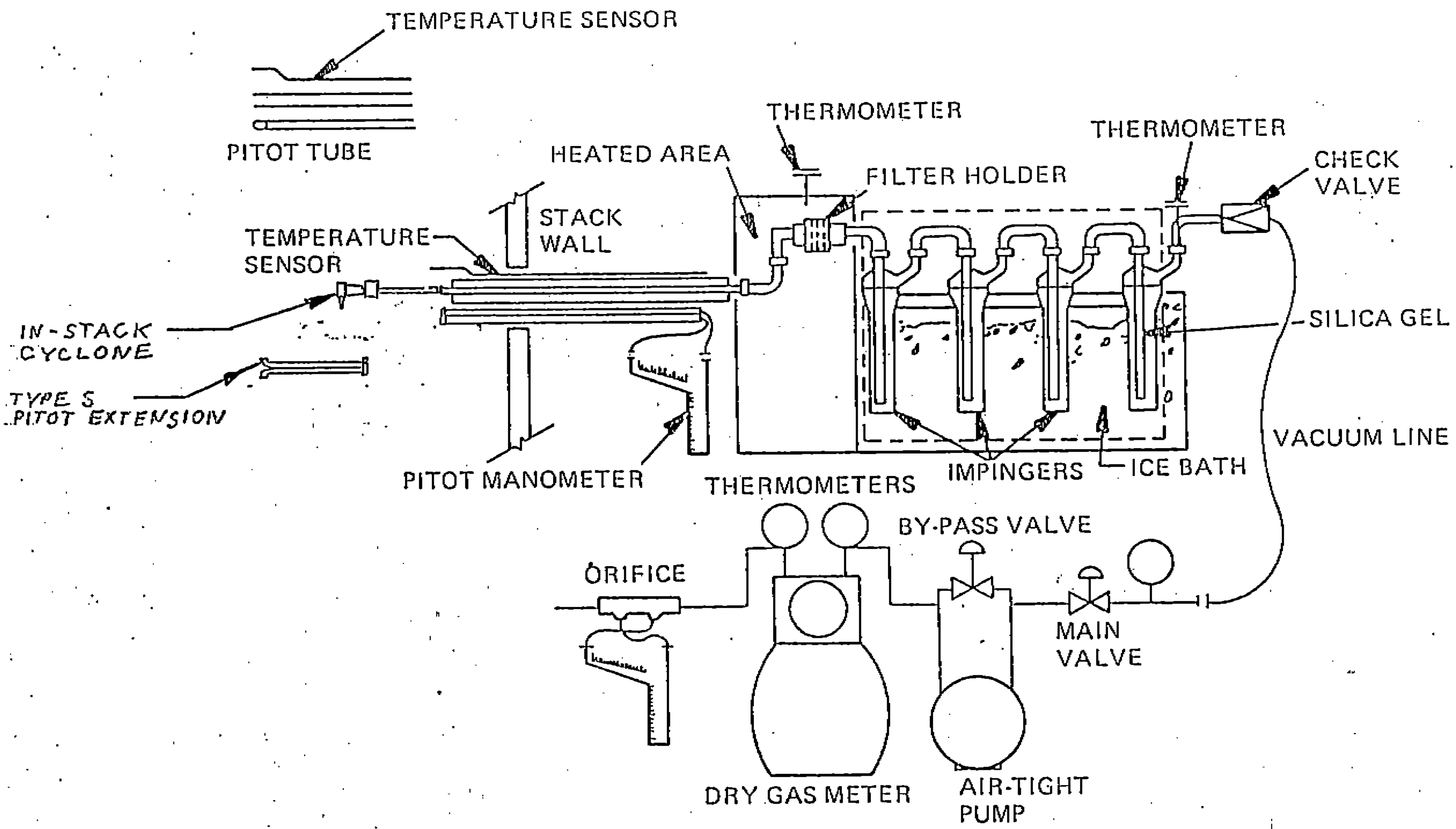
Access will be obtained with a ladder and the equipment will be hoisted with a rope. Yellow caution tape will be placed around access area.



Sketch of Sample port Location.

Date________________ Project________________





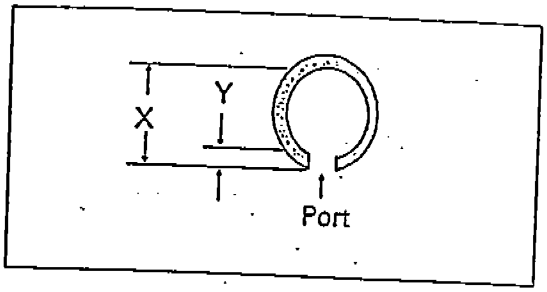
PM_{10} PARTICULATE SAMPLE APPARATUS

APPENDIX B: FIELD DATA

Form #M1-01

TRAVERSE POINT LOCATIONS, CIRCULAR STACKS

Plant Luzenac-America	
Date 5-17-95	By MVA
Sampling Location F091	
Inside of Far Wall to Outside of Port (distance, X)	
Port Depth (distance, Y)	
Stack I.D. (distance X - distance Y) 12"	
Dist. to upstream disturbance ft/in. Diameters 8	Dist. to downstream disturbance ft/in. Diameters 2
No. of Traverse Points Req'd: Total 8	Per Port 4



SCHEMATIC OF SAMPLING LOCATION

1	2	3	4	5	6
Traverse Point Number	Percent of Stack I.D.	Stack I.D. Inches	Product of Columns 2 and 3 (to nearest 1/8 in.)	Distance Y	Traverse Point Location from Outside of Port (sum of columns 4 and 5)
1	6.7	12"	0.804	—	0.804 = 3/4"
2	25	↓	3.00	—	3.00 = 3"
3	75		9.00	—	9.00 = 9"
4	93.3		11.19	—	11.19 = 11 1/4"

SEB

Notes:

Form #M5-03

NOZZLE CALIBRATION DATA FORM

Date 5-17-95 Calibrated by MWA

Nozzle Identification Number	Nozzle Diameter			ΔD,[a] mm (in.)	D_{avg}[b]
	D_1, mm (in.)	D_2, mm (in.)	D_3, mm (in.)		
8-7	0.251	0.249	0.250	0.002	0.250

[a] ΔD = maximum difference between any two diameters, mm (in.), ΔD ≤0.10 mm (0.004 in.)

[b] D_{avg} = average of D_1, D_2, and D_3

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Form #M2-01

GAS VELOCITY AND VOLUME DATA FORM

Plant LUZENAC-AMERICA		Location 3FORKS, MT		Stack ID No. FD91
Date 5-17-95	Time	Operator MA/SEB	Run No. 1	Stack Dimension 12" Portable

Altitude	Alt. Corr.	Ambient Temp. ~65°F
Barometric Reading		Molecular Weight 28.84
Local Barometric Pressure 25.57 "Hg		Method Fyrite
Stack Static Pressure +0.42" H2O		Pitot C_p 0.84

Field Data				
Traverse Point Number	Velocity Head (Δp_s), " H_2O	Stack Temp., °F	Cyclonic Flow Determination: Δp_s at 0° Reference	Cyclonic Flow Determination: Angle (α) Yielding Null Δp
N 1	0.44	69	-0.03	7°
2	0.53	70	-0.03	7°
3	0.73	71	-0.02	2°
4	0.79	72	0.05	1°
E ~~N~~ 1	0.25	78	-0.05	15°
2	0.82	74	0.00	0°
3	0.72	77	-0.04	9°
4	0.70	77	0.00	0°

Average Δp_s	Average Stack Temp.	Average Angle (α)[1]
0.623	73.5°F	~5°
Mean Sqrt Δp_s		
0.778		

[1] Average of α must be <10° to be acceptable.

SEB

Rev. 11/93

Form #M5-01

DO NOT WRITE ABOVE THIS LINE

PARTICULATE FIELD DATA FORM

Plant Luzenac-America	Location Three Forks, MT	Stack ID No. F091	Stack Dimension 12"
Date 5-17-95 Operator MWA/SEB	Run No. 1 Sample Box No. 4	Filter No. 1230	Meter Box No. 2

Altitude ________ Alt. Corr. ________
Barometric Reading ________
Barometric Pres. 25.57 "Hg
Stack Static Pres. 0.42 "H2O

Assumed Moisture 2%
Ambient Temp. ~60°F
Meter ΔH@ 1.84
Meter Calib (Y) 1.032

Nozzle ID No. 8-7 Nozzle Dia. ~~0.245~~ 0.250
Probe ID No. " Probe Length 3'
Liner Material STAINLESS STEEL
Probe Heat Setting NA

Traverse Point Number	Sampling Time (min.)	Clock Time (24 hr.) Start	Gas Sample Volume (cf) Start	Velocity Head (ΔP) ("H2O)	Pressure Differential across Orifice Meter (ΔH) ("H2O)	Vacuum, mm ("Hg)	#1 Stack Temp. (°F)	#3 Filter Temp. (°F)	#4 Temp. of Gas Leaving Condenser or Last Impinger (°F)	#6 Gas Sampler Temp at Dry Gas Meter (°F) Inlet	#7 Gas Sampler Temp at Dry Gas Meter (°F) Outlet	
		1050	679.340									
N-1	13		688.92	0.43	1.80	1	71	254	57	67	65	
2	26		699.36	0.51	2.10	1	70	257	50	71	67	
3	39		712.39	0.77	3.25	2	66	255	52	75	70	
4	52	1152	726.423	0.87	3.75	2.5	66	255	53	80	72	← shut down ~10 min
E-1	65		739.52	0.75	3.15	2.5	74	254	55	80	76	
2	78	1220	753.50	0.84	3.60	2.5	76	255	51	87	79	
3	91	1233	767.49	0.83	3.60	2.5	70	254	54	90	82	
4	104		782.038	0.89	3.85	2.5	72	254	55	93	85	— shutdown 1234 to…
										$(T_i)_{avg}$ = 80.4	$(T_o)_{avg}$ = 74.5	
							$(T_s)_{avg}$ = 70.6					
				$(\sqrt{\Delta p})_{avg}$ = 0.85								
				$(\Delta p)_{avg}$ = 0.74								

PRE-LEAK CHECK: 0.004 cfm @ 16" Hg POST-TEST LEAK: 0.005 cfm @ 4" Hg

FILE: G:\PRJ\95081\F091-1.WB1

Revised: 6-7-95

FACILITY	Luzenac-America
LOCATION	Three Forks, MT
SOURCE	F-091
Test Run	One
DATE	May 17, 1995
START TIME	1050

PRELIMINARY INFO.	
Bp (Pm) (in.Hg)	25.57
Stack Dia.(rnd)or(lngth) in.	12
Stack Width (rect.)	0
Stack Area (sq.ft.)	0.79
Yi	1.032
Delta H@	1.84

PRE TEST INFO	
Assumed moisture %	2.0
Assumed Meter Temp,	70.0
Time per Point	13.00
Nozzle Dia (in.)	0.250
Total Number of Points	8
Pre leak rate / min	0.00

TRAVERSE INFO	
Static (use - if neg.)	0.42
Stack Temp, F	73.5
Aquired avg. delta P	0.62
Oxygen	20.95
Carbon Dioxide	0.00

PRE TEST CALCULATIONS	
Stack press. (Ps)	25.60
Stack Area (sqft. rnd)	0.79
Stack Area (sqft.rect)	0.00
Recommended Nz dia.	0.221
Total Run Time	104.00

POST TEST INFO	
Impinger H2O Gain (g	25.81
Particulate Gain (mg)	21.40
Post leak check / min	0.01
Post leak check vac.	4.00
FILTER No.	1230

POST TEST CALCULATIONS	
Actual % H2O	1.33
Actual Wet Molec. W	28.69
Actual Isokinetic Avg	96.57
Dry STD Meter Vol	89.80
Avg sqrt Del P	0.852
Wet mol. wt. (Ms)	28.69
Dry mol. wt. (Md)	28.84

EMISSIONS	
STD grains/dscf	0.00368
lbs / hour	0.06

EPA Method 5 Isokinetic Spreadsheet

Trav Point	Sample Time	MetrVol 679.340	Vel head delta P	Calc delta H	Run delta H	Stack Temp	Meter Temp In	Meter Temp Out	Point % I	Rolling % I	Exit Temp	Test Vac
N-1	13.0	688.920	0.43	1.77	1.80	71	67	65	96.0	96.0	57	1
2	26.0	699.360	0.51	2.12	2.10	70	71	67	95.5	95.8	50	1
3	39.0	712.390	0.77	3.24	3.25	66	75	70	96.3	95.9	52	2
4	52.0	726.423	0.87	3.69	3.75	66	80	72	97.1	96.2	53	2.5
E-1	65.0	739.520	0.75	3.14	3.15	74	80	76	97.8	96.5	55	2.5
2	78.0	753.500	0.84	3.54	3.60	76	87	79	98.1	96.8	51	2.5
3	91.0	767.490	0.83	3.56	3.60	70	90	82	97.6	96.9	54	2.5
4	104.0	782.038	0.89	3.82	3.85	72	93	85	97.7	97.0	55	2.5
Sample Volume		102.698	avg dP	avg	avg dH	avg Ts		avg Tm				
			0.74	3.110	3.138	70.63		77.44				

STACK

ACTUAL Vel. ft/sec	ACTUAL Flow acfm	STANDARD Vel. dsft/sec	STANDARD Flow dscfm
40.09	1889	33.65	1586
43.62	2055	36.68	1729
53.39	2516	45.24	2132
56.75	2674	48.09	2266
53.09	2502	44.32	2088
56.29	2653	46.81	2206
55.64	2622	46.80	2205
57.73	2720	48.37	2279
ft/sec	acfm	dsft/sec	dscfm
52.07	2454	43.75	2061

VISIBLE EMISSION OBSERVATION FORM Run 1

Source Name	Luzenac
Observation Date	5/17/95
Start Time	10:58
Stop Time	11:57:45
Address	Three Forks
City	Threeforks
State	MT
Zip	59
Phone	
Source ID Number	F091
Process Equipment	Crude ore Loadout
Operating Mode	Full
Control Equipment	Baghouse
Operating Mode	Full
Describe Emission Point	Start 12" Temporary Stack Stop Same
Height above Ground Level	Start 35' Stop 35'
Height Relative to Observer	Start -1' Stop -1'
Distance from Observer	Start 5' Stop 5'
Direction from Observer	Start 240° Stop 240°
Describe Emissions	Start none or clear Stop Same
Emission Color	Start clear Stop same
Plume Type	Continuous ☑ Fugitive ☐ Intermittent ☐
Water Droplets Present?	Yes ☐ No ☑
If Water Droplet Plume	Attached ☐ Detached ☐
Point in the Plume at which Opacity was Determined	Start 1' from Exit Stop Same
Describe Background	Start I-Beam & Handrail Stop Same
Background Color	Start Dusty reddish brown Stop same
Sky Conditions	Start partly cloudy Stop same
Wind Speed	Start None Stop same
Wind Direction	Start N/A Stop
Ambient Temp.	Start 62 Stop same
Wet Bulb Temp.	55
RH Percent	62%

Min	0	15	30	45	Min	0	15	30	45
1	Ø	Ø	Ø	Ø	31	Ø	Ø		
2	Ø	Ø	Ø	Ø	32				
3	Ø	Ø	Ø	Ø	30 33				
4	Ø	Ø	Ø	Ø	34				
5	Ø	Ø	Ø	Ø	35				
6	Ø	Ø	Ø	Ø	36				
7	Ø	Ø	Ø	Ø	37				
8	Ø	Ø	Ø	Ø	38				
9	Ø	Ø	Ø	Ø	39			Ø	Ø
10	Ø	Ø	Ø	Ø	40	Ø	Ø	Ø	Ø
11	Ø	Ø	Ø	Ø	41	Ø	Ø		
12	Ø	Ø	Ø	Ø	42				
10 13					40 43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49		Ø	Ø	Ø
20	Ø	Ø	Ø	Ø	50	Ø	Ø	Ø	Ø
21	Ø	Ø	Ø	Ø	51	Ø	Ø		
22					52				
20 23					50 53				
24					54				
25					55				
26					56				
27					57				
28					58				
29			Ø	Ø	59		Ø	Ø	Ø
30	Ø	Ø	Ø	Ø	60	Ø	Ø	Ø	Ø

Average Opacity for Highest Period: Ø

Number of Readings Above Ø **% Were** Ø

Range of Opacity Readings: Ø Minimum Ø Maximum

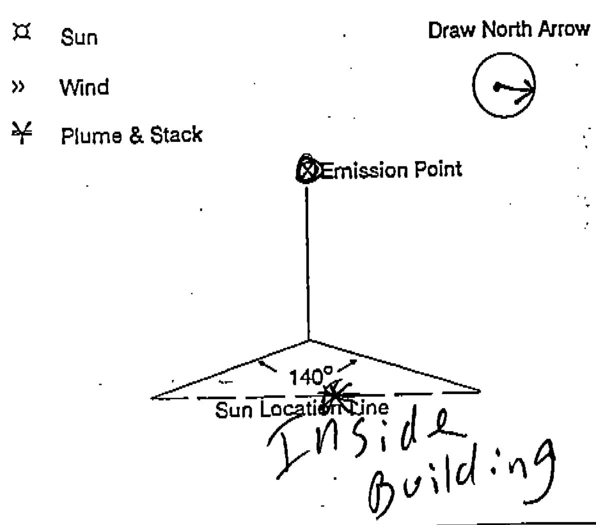
Observer's Name (Print): Shawn Bryant

Observer's Signature: Shawn G. Bryant **Date:** 5/17/95

Organization: Bison Eng.

Comments: Inside Building

Source Layout Sketch



Form #M5-01

DO NOT WRITE ABOVE THIS LINE

Sheet No. 1 of 1

PARTICULATE FIELD DATA FORM

Plant Luzenac-America		Location 3Forks, MT		Stack ID No. F091	Stack Dimension 12" Portable
Date 5-17-95	Operator SEB/MA	Run No. 2	Sample Box No. 2	Filter No. 1210	Meter Box No. 2

Altitude ______ Alt. Corr. ______
Barometric Reading ______
Barometric Pres. 25.57 "Hg
Stack Static Pres. + 0.42 "H2O

Assumed Moisture 2%
Ambient Temp. ~70°F
Meter ΔH@ 1.84
Meter Calib (Y) 1.032

Nozzle ID No. 8-7 Nozzle Dia. 0.250
Probe ID No. ______ Probe Length 3'
Liner Material STAINLESS STEEL
Probe Heat Setting NA

Traverse Point Number	Sampling Time (min.)	Clock Time (24 hr.) Start	Gas Sample Volume (cf) Start	Velocity Head (ΔP) ("H₂O)	Pressure Differential across Orifice Meter (ΔH) ("H₂O)	Vacuum, mm ("Hg)	#1 Stack Temp. (°F)	#3 Filter Temp. (°F)	#4 Temp. of Gas Leaving Condenser or Last Impinger (°F)	#6 Gas Sampler Temp at Dry Gas Meter (°F) Inlet	#7 Outlet	
		1427	783.773									
E 1	10	1437	793.37	0.65	2.80	1.5	82	256	55	88	87	
2	20	1447	803.77	0.78	3.35	2.5	72	258	45	88	87	
3	30	1457	813.79	0.71	3.10	2.5	72	254	46	89	87	
4	40		823.98	0.73	3.10	2.5	70	257	46	92	88	Downtime 1508-1515
N 1	50	1526	834.15	0.73	3.20	2.5	71	255	47	94	88	
2	60		842.53	0.48	2.10	2	74	258	49	91	88	
3	70		852.26	0.66	2.90	2	71	255	47	93	89	
4	80	1600	862.42	0.72	3.20	2	70	254	48	95	90	Downtime 1550-155[illegible]

GFP

PRE-LEAK: 0.010cfm @ 19"Hg POST-TEST LEAK TEST: 0.007cfm @ 3"Hg

Rev. 1/3/92

FILE: G:\PRJ\95081\F091-2.WB1

Revised: 6-7-95

FACILITY
Luzenac-America
LOCATION
Three Forks, MT
SOURCE
Fan #091 (F-091)
Test Run
Two
DATE
May 17, 1995
START TIME
1427

PRELIMINARY INFO.		PRE TEST INFO	
Bp (Pm) (in.Hg)	25.57	Assumed moisture %	2.0
Stack Dia.(rnd)or(lngth) in.	12	Assumed Meter Temp, F	75.0
Stack Width (rect.)	0	Time per Point	10.00
Stack Area (sq.ft.)	0.79	Nozzle Dia (in.)	0.250
Yi	1.032	Total Number of Points	8
Delta H@	1.84	Pre leak rate / min	N/A

TRAVERSE INFO		PRE TEST CALCULATIONS	
Static (use - if neg.)	0.42	Stack press. (Ps)	25.60
Stack Temp, F	73.5	Stack Area (sqft. rnd)	0.79
Aquired avg. delta P	0.62	Stack Area (sqft.rect)	0.00
Oxygen	20.95	Recommended Nz dia.	0.220
Carbon Dioxide	0.00	Total Run Time	80.00

POST TEST INFO	
Impinger H2O Gain (g)	18.60
Particulate Gain (mg)	23.10
Post leak check / min	0.01
Post leak check vac.	3.00
FILTER No.	1210

POST TEST CALCULATIONS	
Actual % H2O	1.29
Actual Wet Molec. W	28.70
Actual Isokinetic Avg	97.47
Dry STD Meter Vol	67.22
Avg sqrt Del P	0.823
Wet mol. wt. (Ms)	28.70
Dry mol. wt. (Md)	28.84

EMISSIONS	
STD grains/dscf	0.00530
lbs / hour	0.09

EPA Method 5 Isokinetic Spreadsheet

Trav Point	Sample Time	MetrVol	Vel head delta P	Calc delta H	Run delta H	Stack Temp	Meter Temp In	Meter Temp Out	Point % I	Rolling % I
		783.773								
1	10.0	793.370	0.65	2.73	2.80	82	88	87	99.0	99.0
2	20.0	803.770	0.78	3.34	3.35	72	88	87	97.2	98.1
3	30.0	813.790	0.71	3.04	3.10	72	89	87	98.0	98.0
4	40.0	823.980	0.71	3.06	3.10	70	92	87	99.2	98.3
5	50.0	834.150	0.73	3.15	3.20	71	94	88	97.5	98.1
6	60.0	842.530	0.48	2.05	2.10	74	91	88	99.3	98.3
7	70.0	852.270	0.66	2.85	2.90	71	93	89	98.1	98.3
8	80.0	862.420	0.72	3.12	3.20	70	95	90	97.6	98.2
Sample Volume		78.647	avg dP	avg	avg dH	avg Ts		avg Tm		
			0.68	2.919	2.969	72.75		89.56		

Exit Temp	Test Vac
55	1.5
45	2.5
46	2.5
46	2.5
47	2.5
49	2
47	2
48	2

STACK

ACTUAL Vel. ft/sec	ACTUAL Flow acfm	STANDARD Vel. dsft/sec	STANDARD Flow dscfm
49.79	2346	40.97	1931
54.04	2547	45.30	2135
51.56	2430	43.22	2037
51.46	2425	43.30	2041
52.23	2461	43.87	2067
42.47	2001	35.47	1672
49.66	2340	41.71	1966
51.82	2442	43.61	2055
ft/sec	acfm	dsft/sec	dscfm
50.38	2374	42.18	1988

VISIBLE EMISSION OBSERVATION FORM Run 2

Source Name: LUZenAC	Observation Date: 5/17/95	Start Time: 2:38 / Stop Time: 3:37:45

Field	Value
Address	Three Forks
City	Three Forks
State	MT
Zip	
Phone	
Source ID Number	
Process Equipment	Crude Ore Load out
Operating Mode	Full
Control Equipment	Baghouse
Operating Mode	Full
Describe Emission Point	Start 12 Temp. Stack / Stop Same
Height above Ground Level	Start 35 / Stop 36
Height Relative to Observer	Start -1' / Stop -1
Distance from Observer	Start 5' / Stop 5'
Direction from Observer	Start 240° / Stop 240°
Describe Emissions	Start Clear / Stop Clear
Emission Color	Start Clear / Stop
Plume Type	Continuous ☑ Fugitive ☐ Intermittent ☐
Water Droplets Present?	Yes ☐ No ☑
If Water Droplet Plume	Attached ☐ Detached ☐
Point in the Plume at which Opacity was Determined	Start 1' from Exit / Stop Same
Describe Background	Start I-Beam & hand Rail / Stop Same
Background Color	Start Dusty Redish Brown / Stop Same
Sky Conditions	Start Partly Cloudy / Stop Same
Wind Speed	Start None / Stop
Wind Direction	Start N/A / Stop
Ambient Temp.	Start 62 / Stop Same
Wet Bulb Temp.	55
RH Percent	62%

Min	0	15	30	45	Min	0	15	30	45
1	ø	ø	ø	ø	31	ø	ø	ø	ø
2	ø	ø	ø	ø	32				
40 3	ø	ø	ø	ø	10 33				
4	ø	ø	ø	ø	34				
5	ø	ø	ø	ø	35				
6	ø	ø	ø	ø	36				
7	ø	ø	ø	ø	37				
8	ø	ø	ø	ø	38				
9	ø	ø	ø	ø	39			ø	ø
10	ø	ø	ø	ø	40	ø	ø	ø	ø
11	ø	ø	ø	ø	41	ø	ø	ø	
12	ø	ø	ø	ø	42				
50 13	ø	ø	ø	ø	20 43				
14					44				
15					45				
16					46				
17					47				
18					48				
19			ø	ø	49	ø	ø	ø	ø
20	ø	ø	ø	ø	50	ø	ø	ø	ø
21	ø	ø	ø		51	ø	ø	ø	
22					52				
60 23					50 53				
24					54				
25					55				
26					56				
27					57				
28					58				
29		ø	ø	ø	59	ø	ø	ø	ø
30	ø	ø	ø	ø	60	ø	ø	ø	ø

Average Opacity for Highest Period: ø

Number of Readings Above ø % Were ø

Range of Opacity Readings: ø Minimum ø Maximum

Observer's Name (Print): Shawn Bryant

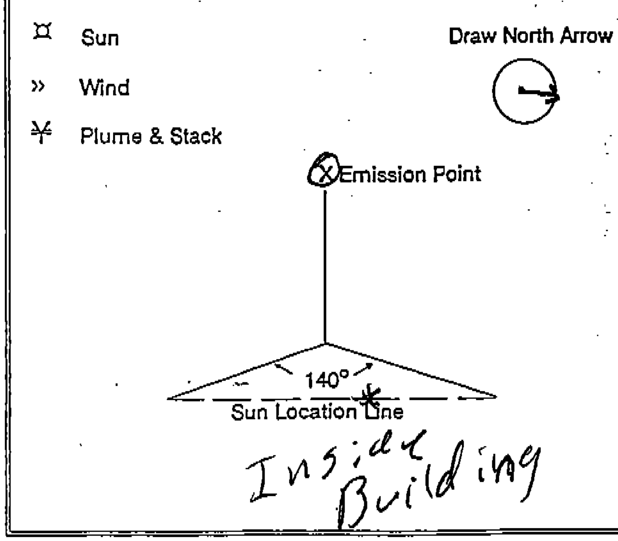
Observer's Signature: Shawn G. Bryant

Date: 5/17/95

Organization: Bison Eng.

Comments: Inside Building

Source Layout Sketch



Form #M5-01

DO NOT WRITE ABOVE THIS LINE

PARTICULATE FIELD DATA FORM

Plant Luzenac-America	Location 3Forks, MT	Stack ID No. F091	Stack Dimension 12" (Portable)
Date 5-17-95 / Operator MA/SEB	Run No. 3 / Sample Box No. 4	Filter No. NC12	Meter Box No. 2

Altitude ______ Alt. Corr. ______
Barometric Reading ______
Barometric Pres. 25.57 "Hg
Stack Static Pres. +0.42 "H2O

Assumed Moisture 2%
Ambient Temp. ~70°F
Meter ΔH@ 1.84
Meter Calib (Y) 1.032

Nozzle ID No. 8-7 Nozzle Dia. 0.250
Probe ID No. " Probe Length 3'
Liner Material STAINLESS STEEL
Probe Heat Setting NA

Traverse Point Number	Sampling Time (min.)	Clock Time (24 hr.) Start	Gas Sample Volume (cf) Start	Velocity Head (ΔP) (" H_2O)	Pressure Differential across Orifice Meter (ΔH) (" H_2O)	Vacuum, mm (" Hg)	#1 Stack Temp. (°F)	#3 Filter Temp. (°F)	#4 Temp. of Gas Leaving Condenser or Last Impinger (°F)	#6 Gas Sampler Temp. at Dry Gas Meter (°F) Inlet	#7 Outlet	
		1614	862.844									
N-1	10		870.91	0.43	1.90	3.5	77	228	50	92	90	~~Downtime~~
2	20		879.49	0.51	2.20	3.5	72	229	52	93	90	
3	30		889.83	0.75	3.30	5	70	249	53	95	91	
4	40	1654	900.40	0.77	3.40	5.5	70	254	51	95	91	
E-1	50		910.99	0.78	3.40	5.5	75	258	52	93	91	Downtime 1700-173[illegible]
2	60		921.35	0.74	3.20	5.5	77	254	46	91	90	
3	70		931.81	0.77	3.30	5.5	80	255	48	94	90	
4	80	1810	942.549	0.81	3.50	5.5	78	254	49	95	91	
	~~90~~											

PRE-TEST LEAKAGE: 0.006 cfm @ 18" Hg POST-TEST LEAKAGE: 0.012 cfm @ 6" Hg

FILE: G:\PRJ\95081\FO91-3.WB1

Revised: 6-7-95

FACILITY	Luzenac-America
LOCATION	Three Forks, MT
SOURCE	Fan #091 (F-091)
Test Run	Three
DATE	May 17, 1995
START TIME	1614

PRELIMINARY INFO.	
Bp (Pm) (in.Hg)	25.57
Stack Dia.(rnd)or(lngth) in.	12
Stack Width (rect.)	0
Stack Area (sq.ft.)	0.79
Yi	1.032
Delta H@	1.84

PRE TEST INFO	
Assumed moisture %	2.0
Assumed Meter Temp,	90.0
Time per Point	10.00
Nozzle Dia (in.)	0.250
Total Number of Points	8
Pre leak rate / min	0.01

TRAVERSE INFO	
Static (use - if neg.)	0.42
Stack Temp, F	73.0
Aquired avg. delta P	0.68
Oxygen	20.95
Carbon Dioxide	0.00

PRE TEST CALCULATIONS	
Stack press. (Ps)	25.60
Stack Area (sqft. rnd)	0.79
Stack Area (sqft.rect)	0.00
Recommended Nz dia.	0.212
Total Run Time	80.00

POST TEST INFO	
Impinger H2O Gain (g	22.17
Particulate Gain (mg)	18.50
Post leak check / min	0.01
Post leak check vac.	6.00
FILTER No.	NC-12

POST TEST CALCULATIONS	
Actual % H2O	1.52
Actual Wet Molec. W	28.67
Actual Isokinetic Avg	98.01
Dry STD Meter Vol	67.84
Avg sqrt Del P	0.829
Wet mol. wt. (Ms)	28.67
Dry mol. wt. (Md)	28.84

EMISSIONS	
STD grains/dscf	0.00421
lbs / hour	0.07

EPA Method 5 Isokinetic Spreadsheet

Trav Point	Sample Time	MetrVol 862.844	Vel head delta P	Calc delta H	Run delta H	Stack Temp	Meter Temp In	Meter Temp Out	Point % I	Rolling % I	Exit Temp	Test Vac
N-1	10.0	870.910	0.43	1.84	1.90	77	92	90	100.9	100.9	50	3.5
2	20.0	879.490	0.51	2.20	2.20	72	93	90	98.1	99.5	52	3.5
3	30.0	889.830	0.75	3.26	3.30	70	95	91	97.3	98.8	53	5
4	40.0	900.400	0.77	3.34	3.40	70	95	91	98.2	98.6	51	5.5
E-1	50.0	910.990	0.78	3.35	3.40	75	93	91	98.4	98.6	52	5.5
2	60.0	921.350	0.74	3.16	3.20	77	91	90	99.2	98.7	46	5.5
3	70.0	931.810	0.77	3.27	3.30	80	94	90	98.3	98.6	48	5.5
4	80.0	942.549	0.81	3.46	3.50	78	95	91	98.1	98.6	49	5.5
Sample Volume		79.705	avg dP	avg	avg dH	avg Ts	avg Tm					
			0.70	2.985	3.025	74.88	92.00					

STACK

ACTUAL Vel. ft/sec	ACTUAL Flow acfm	STANDARD Vel. dsft/sec	STANDARD Flow dscfm
40.31	1900	33.40	1574
43.70	2059	36.55	1722
52.89	2492	44.40	2092
53.59	2525	44.99	2120
54.19	2554	45.07	2124
52.88	2492	43.82	2065
54.10	2549	44.57	2100
55.38	2610	45.80	2158
ft/sec	acfm	dsft/sec	dscfm
50.88	2398	42.33	1995

VISIBLE EMISSION OBSERVATION FORM

Field	Entry
Source Name	Luzenac
Observation Date	5/17/95
Start Time	1620
Stop Time	1719:45
Address	Three Forks
City	Three Forks
State	MT
Zip	
Phone	
Source ID Number	
Process Equipment	Crude Ore Loadout
Operating Mode	Full
Control Equipment	Baghouse
Operating Mode	Full
Describe Emission Point	Start 12" Temp. stack Stop same
Height above Ground Level	Start 35' Stop 35'
Height Relative to Observer	Start -1 Stop -1
Distance from Observer	Start 5' Stop 5'
Direction from Observer	Start 240° Stop 240°
Describe Emissions	Start Clear Stop Clear
Emission Color	Start Clear Stop Clear
Plume Type	Continuous ☑ Fugitive ☐ Intermittent ☐
Water Droplets Present?	Yes ☐ No ☑
If Water Droplet Plume	Attached ☐ Detached ☐
Point in the Plume at which Opacity was Determined	Start 1' from exit Stop same
Describe Background	Start I-Beam & handrail Stop same
Background Color	Start dusty redish brown Stop same
Sky Conditions	Start partly cloudy Stop same
Wind Speed	Start none Stop —
Wind Direction	Start N/A Stop —
Ambient Temp.	Start 62 Stop 62
Wet Bulb Temp.	55
RH Percent	62%

Min	0	15	30	45	Min	0	15	30	45
1	0	0	0	0	31				
2	0	0	0	0	32				
3	0	0	0	0	33				
4	0	0	0	0	34				
5	0	0	0	0	35				
6	0	0	0	0	36				
7	0	0	0	0	37				
8	0	0	0	0	38				
9	0	0	0	0	39				
10 (1630)	0	0	0	0	40 (1740)	0	0	0	0
11	0	0	0	0	41				
12	0	0	0	0	42				
13	0				43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20 (1640)	0	0	0	0	50 (1750)	0	0	0	0
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				
30 (1650)	0	0	0	0	60 (1800)	0	0	0	0

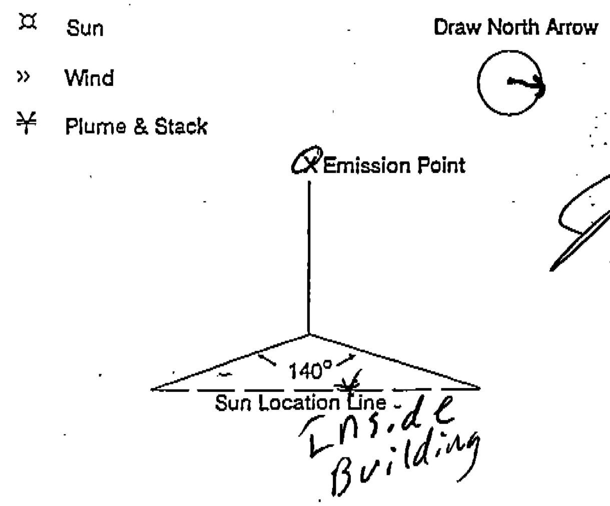
Average Opacity for Highest Period

Number of Readings Above % Were

Range of Opacity Readings

Minimum Maximum

Source Layout Sketch



Observer's Name (Print): MITCHEL W. ANDERSON

Observer's Signature: M W Anderson

Date: 5-17-95

Organization: BISON ENGR.

Comments: Inside Building

Note: Conveyor was shut down for ≈ 30 min.

Luzenac America - Western Operations

FAX

DATE: 6-2-95

TO: Mitch Anderson 406-449-6653

FROM: Bill Kramer

Luzenac America - Western Operations
767 Old Yellowstone Trail
Three Forks, MT 59752

Phone: 406-285-(5312)
Fax: 406-285-3323

Number of pages including cover sheet (2)

REMARKS: ☐ *Urgent* ☐ *For your review* ☐ *Reply ASAP* ☐ *Please Comment*

Mitch – Here are the production rates
The system was running at normal
operating conditions

BK

Source Test Log for Method 5 & 9 of Load Out Conveyor Baghouse

Date	Source Identification	Test Run	Start Time	Duration of Test (min.)	Production (Tons/hour)	
May 17, 1995	F-091	One	1050	104	78/HR	JLK
May 17, 1995	F-091	Two	1427	80	78/HR	JLK
May 17, 1995	F-091	Three	1614	80	78/HR	JLK

Post-it™ Fax Note 7671

Date 5-31-95	# of pages ▶ 1
To Bill Kramer	From Jim Kopp
Co./Dept.	Co.
Phone #	Phone #
Fax #	Fax #

APPENDIX C: LABORATORY DATA

Form #M5-06

BEAKER/FILTER TARES AND FINAL WEIGHTS

NOTE: Report all weights to 0.0001 g. Record sample volumes in Column 3. "Constant Weight" means ≤ 0.0005 g difference between 2 weighings at least 6 hours apart OR 2 ≤ 1% of average total weight less average tare weight.

Plant Luzenac	Location Three Forks
Test Dates 5-17-95	Stack ID FAN 091

ID NO.	SAMPLE DESCRIPTION (filter, probe/nozzle wash, impinger catch, blank, etc.)	DESCRIPTION (Tare 1, Tare 2, Final 1, etc.)					
		TARE #1	TARE #2	FINAL #1	FINAL #2	FINAL #3	
		Date 5/17	Date 5/18	Date 5/18	Date 5/19	Date 5/20	Date
		Time 3:15p	Time 9:25a	Time 3:00p	Time 8:30a	Time 1:45p	Time
		Initial JKH	Initial JKH	Initial JKH	Initial JKH	Initial JKH	Initial
	RUN #1						
1230	FILTER	0.3480	0.3484	0.3559	0.3559		
PRB 1	PROBE	108.3027	108.3024	108.3150	108.3141	108.3153	
IMP 1	IMPINGER	157.8170	157.8165	157.8177	157.8164	157.8180	
~~1210~~	RUN #2						
1210	FILTER	0.3374	0.3372	0.3432	0.3430		
PRB 2	PROBE	101.9970	101.9965	102.0133	102.0124 ~~102.1024~~	102.0135	
IMP 2	IMPINGER	157.3233	157.3232	157.3237	157.3227	157.3242	
	RUN #3						
NC12	FILTER	0.3489	0.3489	0.3558	0.3554		
PRB 3	PROBE	115.1035	115.1031	115.1135	115.1126	115.1138	
IMP 3	IMPINGER	173.9604	173.9604	173.9616	173.9600	173.9620	

Form #M5-07

PARTICULATE DATA WORKSHEET

Plant Luzenac	Location Three Forks		
Test Dates 5-17-95	Initials JKH	Stack ID FAN 091	

Sample Description	ID No.	Average Tare, G	Average Final, G	Net Particulate Gain, G
Filter	1230	0.3482	0.3559	0.0077
Probe	PRB 1	108.3026	108.3152	0.0126
Impinger	IMP 1	157.8168	157.8179	0.0011
Cyclone				~~0.0006~~
Filter	1210	0.3373	0.3431	0.0058
Probe	PRB 2	101.9968	102.0134	0.0166
Impinger	IMP 2	157.3233	157.3240	0.0007
Cyclone				
Filter	NC12	0.3489	0.3556	0.0067
Probe	PRB 3	115.1033	115.1137	0.0104
Impinger	IMP 3	173.9604	173.9618	0.0014
Cyclone				
Water Blank				
Acetone Blank				
Field Filter Blank				
System Filter Blank				

0.0214
~~0.0206~~
Σ=~~0.0214~~

Σ=0.0232

.0231 (correction on spreadsheet)

Σ=0.0185

SFB

Rev. 5/94

Form #M4-02

IMPINGER CATCH AND SAMPLE TRAIN RINSE FORM
(for Pre-Weighed Sample Bottles)

Plant Luzenac	Location Three Forks	Stack ID FAN 091
Project No. 95081	Tested By MWA	Test Dates 5-17-95

Note: All weights in grams

Run No.	Weight	Date	Impinger Catch Bottle	Silica Gel Bottle	Initials
1	Final	5-17-95	239.0g	260.5g	JKH
	Initial	5-11-95	233.12g	240.57g	JKH
		Net Gain	5.88g	19.93g	JKH
			Total Gain 25.81g		JKH
2	Final	5-17-95	238.3g	256.6g	JKH
	Initial	5-11-95	234.41g	241.89g	JKH
		Net Gain	3.89g	14.71g	JKH
			Total Gain 18.60g		JKH
3	Final	5-17-95	240.08g	250.23g	JKH
	Initial	5-11-95	231.06g	237.08g	JKH
		Net Gain	9.02g	13.15g	JKH
			Total Gain 22.17g		JKH

RINSE VOLUMES, ml				
Run No.	Cyclone	Probe/Front Half	Impingers	Other (describe)
1		100 mL	200mL	
2		125 mL	202mL	
3		106mL	213 mL	

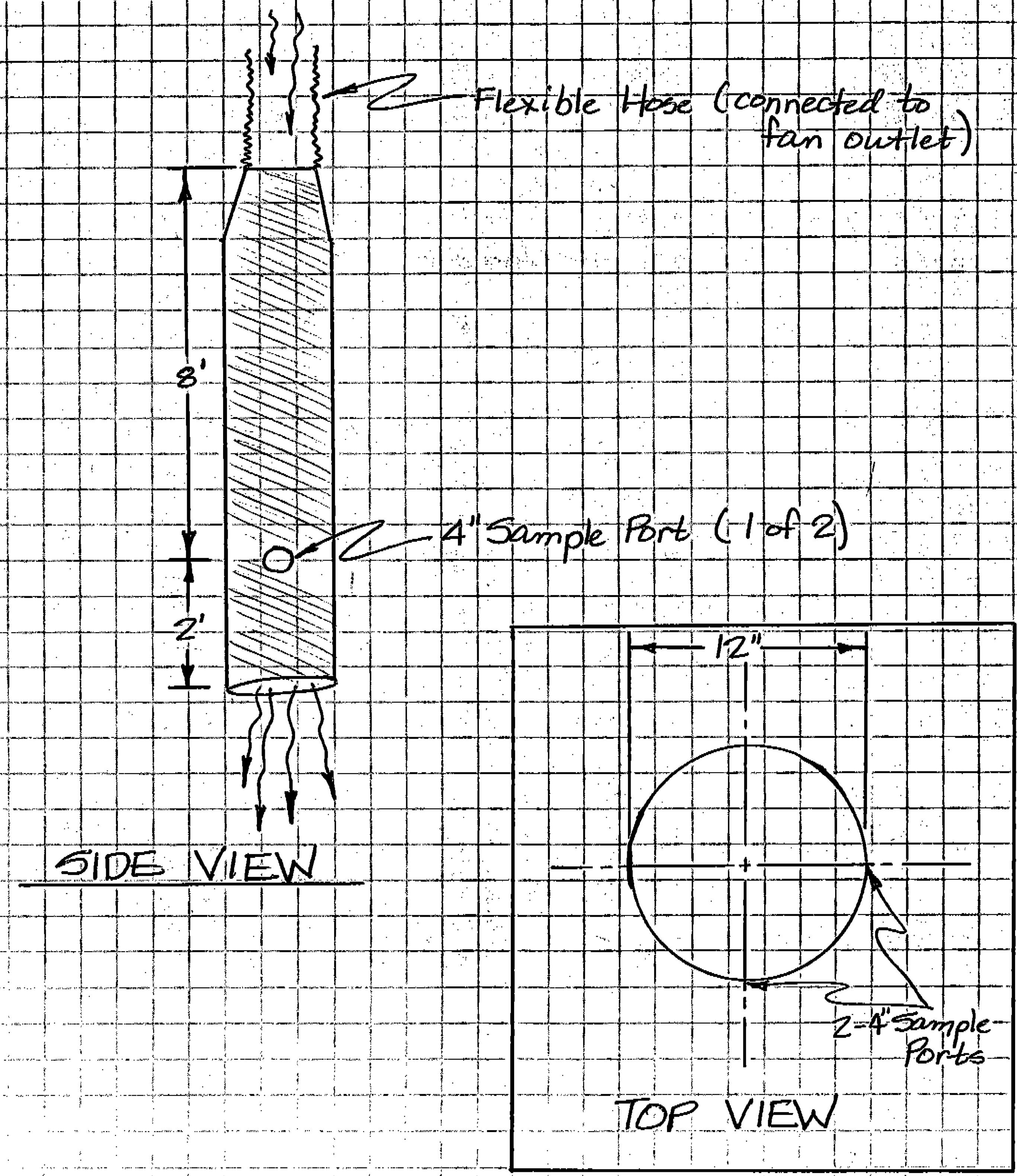
SEB

APPENDIX D: SCHEMATICS

BISON ENGINEERING, INC.
ENGINEERS • SCIENTISTS • PLANNERS

Job Name: Luzenac-America
Location: Three Forks, MT
Proj. No.: 95081 By: MANDERSON
Date: 6-9-95 Sheet: 1 of 1

PORTABLE STACK SKETCH



APPENDIX E: NOMENCLATURE AND FORMULAE

NOMENCLATURE

Stack test standard conditions:
Pressure -- 29.92" Hg
Temperature -- 68°F

A_n	Nozzle cross sectional area; ft^2
A_s	Stack cross sectional area; ft^2
BHP	Brake Horsepower
B_{ws}	Water vapor in the gas stream; volume proportion
C_a	Concentration of acetone blank residue; mg/g
C_p	Pitot tube coefficient; 0.84 for type S pitot tube
C_s	Concentration of stack gas particulates; dry basis corrected to standard conditions; lb/dscf (pounds/dry std. ft^3) or gr/dscf (grains/dry std. cubic foot)
D_{50}	Aerodynamic diameter of particles with 50 percent probability of cyclone penetration; μ
e	Emission rate conversion factor (.002122 for NO; .0020 for CO; .00325 for NO_2)
E	Emission rate grams/BHP-hr
E_{hr}	Emission rate per hour; lb/hr
Fan HP	Actual cooling fan losses
FE	Frame Efficiency (= 1.05). Energy losses due to frame absorption.
I	Percent sampling rate variation, where 100% = ideal isokinetic conditions
K	1.2 = Specific Heat Ratio (C_p/C_v)

K_p	Pitot tube constant; 85.49 $ft/sec\left(\frac{(lb/lbmole)\ ('' Hg)}{R^{\circ}\ ('' H_2O)}\right)$
LF	Loss Factor (= 1.2). Energy losses due to compressor valves, etc.
m_a	Acetone residue weight after evaporation; mg
M_d	Stack gas dry molecular weight, from Fyrite or Orsat analysis; lb/lb-mole
m_f	Filter weight gain; mg
MMCFD	Million cubic feet of gas per day
m_n	Total weight of collected particulate; mg
$m_{n,\ PM10}$	Total weight of collected PM_{10} particulate; mg
M_W	Molecular weight of water; 18.0 lb/lb mole
M_s	Wet molecular weight of stack gas; lb/lb mole
P_{bar}	Barometric station pressure (at sampling site); in. Hg
P_g	Stack static pressure; in. H_2O
P_s	Absolute stack pressure; in. Hg
P_{std}	Absolute pressure @ standard conditions; 29.92" Hg
PPM	Parts per million
Q_s	Average stack gas wet volumetric flow rate; cfm (ft^3/min)
Q_{std}	Average stack gas dry volumetric flow rate, corrected to standard conditions; scfm (dry standard ft^3/min)
T_m	Average dry gas meter temperature, abs.; °R
t_s	Average stack gas temperature, °F
T_s	Suction Temperature (°R)
$T_{s(avg)}$	Average stack gas temperature, abs.; °R

T_{std}	Absolute temperature @ standard conditions; 520°R
R	Ideal gas constant; 21.85 in. hg-ft^3/°R-lb-mole
V_{lc}	Total volumes of water collected in impingers; ml
V_m	Indicated volume of gas sample measured at dry gas meter; dcf (dry ft^3)
$V_{m(std)}$	Volume of gas sample measured at dry gas meter, corrected to standard conditions; dscf (dry standard cubic feet)
v_s	Stack gas velocity from Method 2
$V_{w(std)}$	Volume of water vapor in the gas sample, corrected to standard conditions; scf (standard cubic feet)
W_{lc}	Weight of collected water; g
Y	Dry gas meter calibration factor
Δp	Stack velocity stagnation pressure recorded by the probe's type S pitot tube
ΔH	Average pressure differential across orifice meter at control box
μ_s	Stack gas absolute viscosity; μ poise
ρ_w	Density of water; 0.9982 g/ml (0.0022 lb/ml)
Θ	Total sampling time; min.
13.6	Specific gravity of mercury
60	Seconds per minute

FORMULAE

1. Dry Gas Volume - Corrected to STP (40 CFR 60, App. A, Eq. 5-1)

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m} \right) \left[\frac{P_{bar} + \frac{\overline{\Delta H}}{13.6}}{P_{std}} \right]$$

Y is obtained from post test meter calibrations shown in Appendix F.

2. Water Vapor Volume - Corrected to STP (40 CFR 60, App. A, Eq. 5-2)

$$V_{w(std)} = V_{lc} \left(\frac{\rho_w}{M_w} \right) \left(\frac{RT_{std}}{P_{std}} \right)$$

Note: $W_{lc} = V_{lc}\,\rho_w$

3. Stack Gas Moisture Content (40 CFR 60 App. A, Eq. 5-3, modified)

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}}$$

4. Stack Gas Dry and Wet Molecular Weight (40 CFR 60 App. A, Eq. 3-1, 2-5)

$$M_d = 0.440(\%CO_2) + 0.320\ (\%O_2) + 0.280\ (\%N_2 + \%CO)$$

$$M_s = M_d\ (1 - B_{ws}) + 18.0 B_{ws}$$

5. Average Stack Gas Velocity (40 CFR 60 App. A, Eq. 2-9)

$$v_s = K_p C_p \left(\frac{\sum_{1}^{n} \sqrt{\Delta p}}{n} \right) \sqrt{\frac{T_{s(avg)}}{P_s M_s}}$$

6. Average Stack Gas Wet Volumetric Flow Rate

$$Q_s = 60 v_s A_s$$

7. Average Stack Gas Dry Flow Rate Corrected to Standard Conditions (40 CFR 60 App. A, Eq. 2-10, modified)

$$Q_{std} = Q_s \ (1 - B_{ws}) \frac{T_{std}}{T_{s(avg)}} \ \frac{P_s}{P_{std}}$$

8. TSP Particulate Concentration Corrected to Standard Conditions (40 CFR 60 App. A, Eq. 5-6, modified)

$$c_{s_{lb}} = 2.205 \times 10^{-6} \ \frac{m_n}{V_{m(std)}}$$

$$c_{s_{gr}} = 15.43 \times 10^{-3} \ \frac{m_n}{V_{m(std)}}$$

Note: $C_{s,lb}$ = lb/dscf
$C_{s,gr}$ = grains/dscf

9. TSP Emission Rate per Hour

$$E_{hr} = c_s Q_{std} 60$$

10. Percent Isokinetic Sampling Variation (40 CFR 60 App. A, Eq. 5-8)

$$I\% = \frac{T_{s(avg)} V_{m(std)} P_{std} 100}{T_{std} V_s \Theta A_n P_s 60 (1-B_{ws})}$$

11. Emission Rate Compressor Engines (g/BHP-Hr)

$$E = \frac{(e) \ PPM Q_{STD}}{BHP}$$

12. Brake Horsepower for Compressor Engines

$$43.6 * MMCFD* (T_s/T_{std}) * (K/(K-1)) * (R^{((k-1))/k)} - 1) * LE * FE + Fan\,HP$$

13. Pounds per hour Emission Rate

$$lb/hr = E * BHP * \frac{lb}{453.59\ g}$$

APPENDIX F: CALIBRATION DATA

Form #M5-08

DRY GAS METER CALIBRATION DATA (English Units)
(60-Day Calibration)

Date MARCH 16, 1995 Meter Box Number 2 (80575)

Barometric Pressure, P_b = 25.93 " Hg Calibrated by JKH

Vacuum During Calibration 3 1/2 " Hg (should be at least 2½" Hg)

Orifice Manometer Setting (ΔH), " H_2O	Gas Volume			Temperatures			Time (Θ), min.
	Nom., ft^3	Wet Test Meter (V_w), ft^3	Dry Gas Meter (V_d), ft^3	Wet Test Meter (t_w), °F 5	Dry Gas Meter Inlet (t_{d_i}), °F 6	Dry Gas Meter Outlet (t_{d_i}), °F 7	
0.5	Start Read	292.027	706.539	75°	72°	71°	Ø
	End Read	297.025	711.399	76°	74°	72°	11.3
1.5	Start Read	297.466	711.813	76°	74°	73°	Ø
	End Read	302.465	716.618	76°	76°	73°	7.1
4.0	Start Read	321.640	735.184	78°	79°	77°	Ø
	End Read	326.642	739.924	77°	80°	77°	4.2

γ = 1.032

ΔH@ = 1.84

Rev. 11/93