PARTICULATE EMISSIONS AND VISIBLE OPACITY ROTARY DRYER AND CRUSHER/LOADOUT

Permit 2282

Luzenac America
Yellowstone Trail
Three Forks, MT 59752

February 15 and 16, 1994

By

Bison Engineering, Inc.
P.O. Box 1703
30 S. Ewing
Helena, MT 59601
(406) 442-5768

Report Date: March 22, 1994

EXECUTIVE SUMMARY

Luzenac America (LA) operates a rotary dryer and crusher/loadout system at their Three Forks talc facility. This system operates under Montana Air Quality Permit Number 2282 issued June 4, 1986. The rotary dryer and crusher/loadout system, retain emission limitations cited within Permit 2282.

Bison Engineering, Inc. (Bison) was contacted by LA to conduct source tests on the two systems. A Pretest Notification describing the test in detail was filed on January 11, 1994 with the Air Quality Bureau (AQB). Bison personnel performed Title 40, Code of Federal Regulations (CFR), Part 60, Appendix A, Methods 1 through 3, 5 and 9 tests on the rotary dryer and crusher/loadout systems.

The rotary dryer facility is limited to 0.02 gr/dscf and an opacity limitation of 10%. Table 1 summarizes the resulting emissions.

Table 1
Summary of Rotary Dryer Emissions

	Run 1	Run 2	Run 3	Average
Particulate, gr/dscf	0.0013	0.0010	0.0019	0.0014
Opacity, %	0.0	0.0	0.0	0.0

The crusher/loadout facility is limited to 0.02 gr/dscf and an opacity limitation of 7%. Table 2 summarizes the resulting emissions.

Table 2
Summary of Crusher/Loadout Emissions

	Run 1	Run 2	Run 3	Average
Particulate, gr/dscf	0.0006	0.0011	0.0032	0.0016
Opacity, %	0.0	0.0	0.0	0.0

Note: Contrary to the applicable 40 CFR 60 Subparts, the permit specifies the maximum allowable visible opacity for both units at 20%.

CERTIFICATION OF REPORT INTEGRITY

Bison Engineering, Inc. certifies this report represents the source test emissions results from Luzenac America's, Three Forks, Montana facility, rotary dryer and crusher/ loadout units. These tests were conducted February 15 and 16, 1994. Every effort was made to obtain accurate and representative data. The test followed the required procedures specified in Permit 2282, 40 CFR 60, Subparts UUU and OOO, and the Montana AQB source test protocol.

Team Leader: Calvin W. Loomis

Title: Staff Environmental Engineer

Signature: Calvin Loomis

Date: 03/22/94

Reviewer: David Kinghorn

Title: Senior Project Engineer

Signature: David A Kinghorn

Date: 03/22/94

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1.0 INTRODUCTION

1.1 Purpose

Luzenac America operates a talc refining facility in the town of Three Forks, Montana. Within the facility are rotary dryer and crusher/loadout systems. Both systems are regulated under the guidelines of Air Quality Permit 2282 (Final Permit Date June 4, 1986). The crusher/loadout facility is specifically subject to the particulate and opacity provisions of 40 CFR 60, Subpart OOO. The rotary dryer facility is subject to the provisions of 40 CFR 60, Subpart UUU.

Paragraph 1 of Permit 2282 stipulates particulate emission requirements for the two facilities. Paragraph 2 sets forth opacity requirements. This report discusses the compliance tests and their results. Appendices contain field data, calculations, source test log and schematics, nomenclature and formulae, and calibration data.

Bison Engineering filed a Pretest Notification and Attachments with the Montana Department of Health and Environmental Sciences, Air Quality Bureau on January 11, 1994. Appendix A contains a copy of the protocol and supporting documents (letter of clarification, Harry Keltz, Montana AQB). The testing was conducted and completed on February 15 and 16, 1994.

1.2 Emission Source Description

Luzenac America talc plant is located on the southern perimeter of Three Forks, Montana in Gallatin County. The Luzenac facility is a refined talc manufacturing plant. The facility receives ore via rail or semi trucks, crushes and refines it into a marketable product. The emission sources in question are the rotary dryer and the crusher/loadout facilities.

The raw material is fed by means of a 36-inch covered belt conveyor to a McDermott Brothers 9-foot by 40-foot rotary dryer. This dryer contains a 22 MBTU burner that is natural gas fired. The dry material is conveyed by two 30-inch covered belt conveyors to either a dry storage bay or to the crusher/loading system.

The crusher/loadout system incorporates numerous transfer points and belts, all of which are enclosed for dust control. This enclosed system incorporates negative pressure collection points; the dust-laden air is then routed to a baghouse.

1.3 Control Equipment Description

The rotary dryer exhaust, as well as all transfer point dust, is controlled by a Mikro-Pulsaire baghouse model 380S-10-20. This baghouse employs 380 bags with a Clarage model 229XL exhaust fan providing 22,000 cfm of air flow. The discharge temperature is approximately 150°F. The drying system is designed to dry the raw material at a rate of 50 tons per hour; this rate is partially dependent on ore quality.

The crusher/loadout dust collection is routed to a Mikro-Pulsaire model 100S-10-20, a 100-bag baghouse. The ID fan is a Clarage model 219XL providing 8,300 cfm of airflow. The crushing loading system is designed to load the raw material at a rate of 150 tons per hour; this rate is partially dependent on ore quality.

1.4 Source Test Dates

Bison personnel arrived at the site February 14 to set up equipment and investigate the sources. Bison conducted one test run on each of the two systems February 15 and completed two additional test runs February 16, 1994.

1.5 Pollutants Tested

Bison sampled the source for total particulate matter (TSP) concurrently with opacity observations. 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

1.5.1 Bison Engineering, Inc.

Calvin W. Loomis, Staff Environmental Engineer, was project leader, wrote the source protocol, operated the testing instrumentation and authored this report. William Shaw (Bill), Staff Technician, assisted with the testing and conducted the Method 9 visible opacity readings. Kelly Holshue, Staff Technician, assisted with testing; and Dave Kinghorn, Senior Project Engineer, reviewed the final report.

1.5.2 Luzenac America

William Flynn (Bill) was the plant contact; and Mr. Jason, plant operator, collected production data and baghouse pressure differentials.

1.5.3 Montana Air Quality Bureau

Harry Keltz was the Montana AQB contact.

2.0 TEST RESULTS SUMMARY

2.1 Test and Emission Results

The rotary dryer facility is subject to the provisions of 40 CFR 60, Subpart UUU. These provisions stipulate particulate matter is limited to 0.02 gr/dscf and the opacity to 10%. Table 3 summarizes emissions.

Table 3
Summary of Rotary Dryer Emissions

	Run 1	Run 2	Run 3	Average
Particulate Emissions, gr/dscf	0.0013	0.0010	0.0019	0.0014
Visible Opacity, %	0.0	0.0	0.0	0.0
Method 5 Sample Time, min	168	144	144	NA
Method 5 Sample Volume, dscf	75.82	65.63	67.48	NA
Method 5 Isokinetics, %	99.82	102.47	105.28	102.52

The Method 5 tests must meet the following requirements: a minimum two-hour sampling time, a minimum of 60 dscf collection and isokinetics ± 10% of 100%.

The crusher/loadout facility is subject to the provisions of 40 CFR 60, Subpart OOO. These provisions stipulate particulate matter is limited to 0.02 gr/dscf and opacity at 7%. Table 4 summarizes emissions.

Table 4
Summary of Crusher/Loadout Emissions

	Run 1	Run 2	Run 3	Average
Particulate Emissions, gr/dscf	0.0006	0.0011	0.0032	0.0016
Visible Opacity, %	0.0	0.0	0.0	0.0
Method 5 Sample Time, min	126	126	126	NA
Method 5 Sample Volume, dscf	97.70	87.88	93.20	NA
Method 5 Isokinetics, %	98.83	94.66	97.38	96.96

The Method 5 tests must meet the following requirements: a minimum two-hour sampling time, a minimum of 60 dscf collection and isokinetics ± 10% of 100%.

Appendices C and D contain field data and computer spreadsheet calculations.

2.2 Production Data and Control System Parameters

The facility operator collected plant operating data and baghouse pressure differentials during each test run. Table 5 summarizes the data collected.

Table 5
Control and Production Operating Data

Time	Crusher ΔP	Dryer ΔP	Rate (tons/hr)
February 15, 1994			
13:36	1.9	2.6	114
14:06	1.9	2.8	120
14:36	1.9	2.8	116
15:06	1.9	2.6	110
15:34	2.0	2.8	127

Time	Crusher ΔP	Dryer ΔP	Rate (tons/hr)
February 16, 1994			
09:20	2.0	2.8	107
09:50	1.9	2.6	100
10:20	2.0	2.8	114
10:50	2.0	2.8	125
11:20	2.0	2.8	106
11:45	2.0	2.8	116
13:19	1.9	2.7	123
14:53	1.9	2.8	126
15:37	1.9	2.8	123
16:04	2.0	2.9	137
16:40	2.0	2.8	120

3.0 SAMPLING AND ANALYSIS

3.1 Sampling Location

The rotary dryer incorporates a rectangular stack with outside dimensions of 24 by 28 inches. The stack is made of ¼-inch stainless steel yielding an inside dimension of 23½ by 27½ inches. This yields a stack area of 4.49 cubic feet and an equivalent stack diameter of 25 inches. The nearest upstream disturbance was 60 inches (5 feet) away from the ports, and the nearest downstream disturbance was 114 inches (9½ feet) away. This indicates a 2.4 and 4.6, respectively, up and downstream disturbance ratio. Four ports were installed allowing for 24 sampling points.

The crusher/loadout incorporates a rectangular stack with outside dimensions of 18 by 16 inches. The stack is made of ¼-inch stainless steel yielding an inside dimension of 17½ by 15½ inches. This yields a stack area of 1.88 cubic feet, and an equivalent stack diameter of 16 inches. The nearest upstream disturbance was 87 inches (7¼ feet) from the ports, and the nearest downstream disturbance was 92 inches (8 feet) away. This indicates a 5.4 and 5.7, respectively up and downstream disturbance ratio. Three ports were installed allowing for 18 sampling points.

3.2 Sampling Procedures

Bison test personnel will employed the following Title 40 CFR 60, Appendix A (EPA reference) methods:

Method 1 - Sample and velocity traverses for stationary sources.
Method 2 - Determination of stack gas velocity and volumetric flow rate (Type S pitot tube).
Method 3 - Gas analysis for the determination of dry molecular weight.
Method 5 - Determination of particulate emission from stationary sources.
Method 9 - Visual determination of the opacity of emissions from stationary sources.

All the methods are revised through July 1, 1991; corrected at 57 FR 24550, June 10, 1992 for Title 40 CFR 60 methods only.

Upon arrival at the source, Bison personnel performed the following tests:

- Method 1, "Sample and Velocity Traverses for Stationary Sources". This method incorporates stack dimensions and upstream and downstream disturbances to determine proper sampling points.

- Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)". This method incorporates the results from Method 1 to obtain stack velocities and volumetric flows.

- Method 3, "Gas Analysis for the Determination of Dry Molecular Weight". This test utilizes fyrite analyzers to obtain oxygen and carbon dioxide concentrations of the stack. Using these readings, a source molecular weight can be calculated and employed in the testing.

The results from these preliminary tests are utilized in the mathematical calculations of the following method:

- Method 5, "Determination of Particulate Matter from Stationary Sources". This is the basic EPA sampling method utilizing isokinetic sampling. Particulate matter is collected on a filter media where the gain from its initial weight is calculated with total volume collected to obtain a particulate mass rate.

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

Concurrently with Method 5 sampling, a certified opacity reader was positioned to conduct an hourly visible emissions reading on each source.

Appendix B contains the raw field data forms (chart records, etc.) for each test run. Appendix C provides reduced chart data, manual calculations, and computer spreadsheet results. The Source Test Log appears in Appendix D.

3.3 Field Notes, Special Circumstances, Errors

The Method 5 particulate tests conducted at the Luzenac America facilities followed guidelines outlined in 40 CFR 60, Subparts OOO and UUU. These subparts required a minimum two-hour sampling time and a minimum of 60 dscf collection. These requirements are double the EPA specified methods.

4.0 CALCULATIONS

4.1 Nomenclature and Formulae

Bison has incorporated programmable calculators and computer spreadsheets into their source testing program. Method 5 testing is conducted using computers in which the isokinetic rate equations is preprogrammed. Resulting test conditions are logged into a computer QuattroPro spreadsheet.

Appendix E contains the nomenclature and formulae used in calculations.

4.2 Notes and Deviations

There was no deviation form the cited EPA methods. All tests were completed with no problems or difficulty and met the minimum testing requirements.

5.0 QUALITY ASSURANCE

As shown herein and the Appendices, test runs were satisfactory for span and calibration checks and running time.

Bison Engineering's practices conform to Environmental Protection Agency Quality Assurance Handbook for Air Pollution Measurement Systems, Volume 3, EPA-600/4-77-0276; 1977 as amended.

All data was returned to Bison's office and lab in Helena for review and analysis. Field data was entered into a computer spreadsheet for calculations. Appendix E shows nomenclature and formulae; the detailed test result output appears in Appendix C. Appendix F contains appropriate equipment calibration data.

6.0 CONCLUSION

The source testing Bison conducted on Luzenac America's rotary dryer and crusher/ loadout showed excellent emissions. As in all talc facilities, dust loss is product loss; thus, emission controls are carefully maintained and monitored. All the collected dust is reinjected into the process.

The following tables show resulting emissions found at the facility.

Table 6
Summary of Rotary Dryer Emissions

	Average	Compliance
Particulate, gr/dscf	0.0014	0.02
Opacity, %	0.0	10

Table 7
Summary of Crusher/Loadout Emissions

	Average	Compliance
Particulate, gr/dscf	0.0016	0.02
Opacity, %	0.0	7

APPENDIX A: PRETEST PROTOCOL AND ATTACHMENTS

30 SOUTH EWING

P.O. BOX 1703

HELENA, MT 59624

BISON
ENGINEERING, INC.

PHONE: 406•442•5768

FAX: 406•449•6653

January 11, 1994

Mr. Harry Keltz
MDHES Air Quality Bureau
Cogswell Building
Helena, MT 59620

Re: Luzenac America Source Tests, Permit No. 8828

Dear Harry:

The attached protocol represents Bison's testing program for Luzenac America's rotary dryer and crusher/loadout sources. Luzenac has requested testing as soon as possible. The plant has prepared the sources and plans a double shipment for the coming week of January 17, 1994. Bison can test at this time yet this time frame does not adhere to the 25-day notification period. It is uncertain when Luzenac may have a similar shipment to allow for testing. Please take the issue into consideration and contact me if the AQB will allow testing next week.

The testing consists of a basic Method 5; sampling time will be a minimum of 2 hours and 60 dscf of collection. It is noted that the emission limitations are 0.02 gr/dscf, half of the federal requirement.

Please let me know your decision as soon as possible or if I can provide further information.

Sincerely,

Calvin W. Loomis, EIT
Environmental Engineer

cc: Mr. William E. Flynn, Luzenac America

SOURCE TEST PROTOCOL

1.0 INTRODUCTION

Facility Name: Luzenac America
Western Talc Operations.

Plant: 2150 Bench Road
Three Forks, MT. 59752
Contact: John Close, Mgr.

Office: 767 Old Yellowstone Trail
Three Forks, MT 59752
Phone (406) 285-3271
Fax (406) 285-3323
Contact: William E. Flynn

Permit Number: 2282

Location: Luzenac America talc plant is located on the southern perimeter of Three Forks, Montana in Gallatin County.

Emission Sources and Testing Objectives:

Bison Engineering intends to test the following sources for Total Suspended Particulate (TSP):

1. Rotary (kiln) Dryer.
2. Crusher/loadout unit.

2.0 EMISSION SOURCE INFORMATION

2.1 Facility Description

The Luzenac facility is a refined talc manufacturing plant. Raw ore is crushed and refined into marketable products. The facility receives ore via rail or semi trucks.

2.2 Process Information

Plant process shall be further discussed within the formal report.

2.3 Emission Source and Control Description

Rotary Dryer (kiln). The rotary dryer is fed by means of a 36" covered belt conveyor to a McDermott Brothers 9' x 40' rotary dryer. This dryer contains a 22 MBTU burner that is natural gas fired. The dry material is conveyed by two 30" covered belt conveyors to either a dry storage bay or to the crusher/ loading system.

The rotary dryer exhaust, as well as all the transfer point dust, is controlled by a Mikro-Pulsaire Baghouse model 380S-10-20. This baghouse employs 380 bags with a Clarage model 229XL exhaust fan providing 22,000 cfm of air flow. The discharge temperature is approximately 200°F. The drying system is designed to dry the crude talc at a rate of 50 tons per hour.

Crusher/loadout. The crusher/loadout system incorporates numerous transfer points and belts, all of which are considered as a contained system. Dust collection points are located throughout this system and routed to a Mikro-Pulsaire model 100S-10-20. This is a 100-bag Baghouse. The ID fan is a Clarage model 219XL providing 8,300 cfm of airflow. The crushing loading system is designed to load the crude talc at a rate of 150 tons per hour.

See the Attachments for stack schematics.

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: Calvin W. Loomis, EIT

3.2 Test Program Organizations & Personnel

BISON

Project Manager:	Calvin W. Loomis, Environmental Engineer
Testing Assistants:	Kelly Holshue, Senior Technician
	Bill Shaw , Technician
Project Control:	Dave Kinghorn, Senior Project Engineer

Personnel Safety. Test personnel shall utilize the following safety equipment when applicable:

1. Hard hat.
2. Protective clothing and/or coveralls.
3. Work boots.
4. Goggles as required.
5. Hearing protection.
6. Work gloves.
7. Appropriate respirators.

LUZENAC AMERICA

William E. Flynn (Bill), Senior Project Engineer.
John Close, Plant Manager.

MONTANA Air Quality Bureau

Harry Keltz and Brian Hohn are the State AQB representatives with respect to this testing program.

3.3 Test Program Objectives

Permit No. 2282, written and finalized June 4, 1986, stipulated that Luzenac America was to perform compliance source testing on the crusher/loadout and rotary dryer stacks within one year of permit issuance.

Bison's testing objectives are to complete the required testing in accordance with Permit 2282. This involves TSP testing (Method 5) on the crusher/loadout and the rotary dryer.

The Rotary Dryer is regulated under 40 CFR 60, Subpart UUU. The crusher/loadout unit is regulated under 40 CFR 60, Subpart OOO.

Permit 2282 stipulates both the crusher/loadout and rotary dryer are limited to 0.02 gr/dscf. This limitation is more stringent than the federal limitation which is quoted below:

> The Code of Federal Regulations, Part 40, Subpart UUU, Standards of Performance for Calciners and Dryers in Mineral Industries, section 60.732, Standards for Particulate Matter, (a) states an emission limitation of 0.04 gr/dscf.

TEST DATES:

Bison proposes testing February 15, 1994.

Note: Testing may be conducted prior to this date with State AQB approval

REPORT DATE:

Bison anticipates report submittal to the State AQB, no later than April 14, 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.

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)"

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

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

Method 5, "Determination of Particulate Matter in Stationary Sources".

Note: Method 5 test runs shall consist of a minimum 2 hours and 60 dscf.

Plant Capacity:

The units and facilities shall be operated greater than 90% maximum capacity if applicable.

All the methods above are revised through July 1, 1991; corrected at 57 FR 24550, June 10, 1992.

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 test 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.

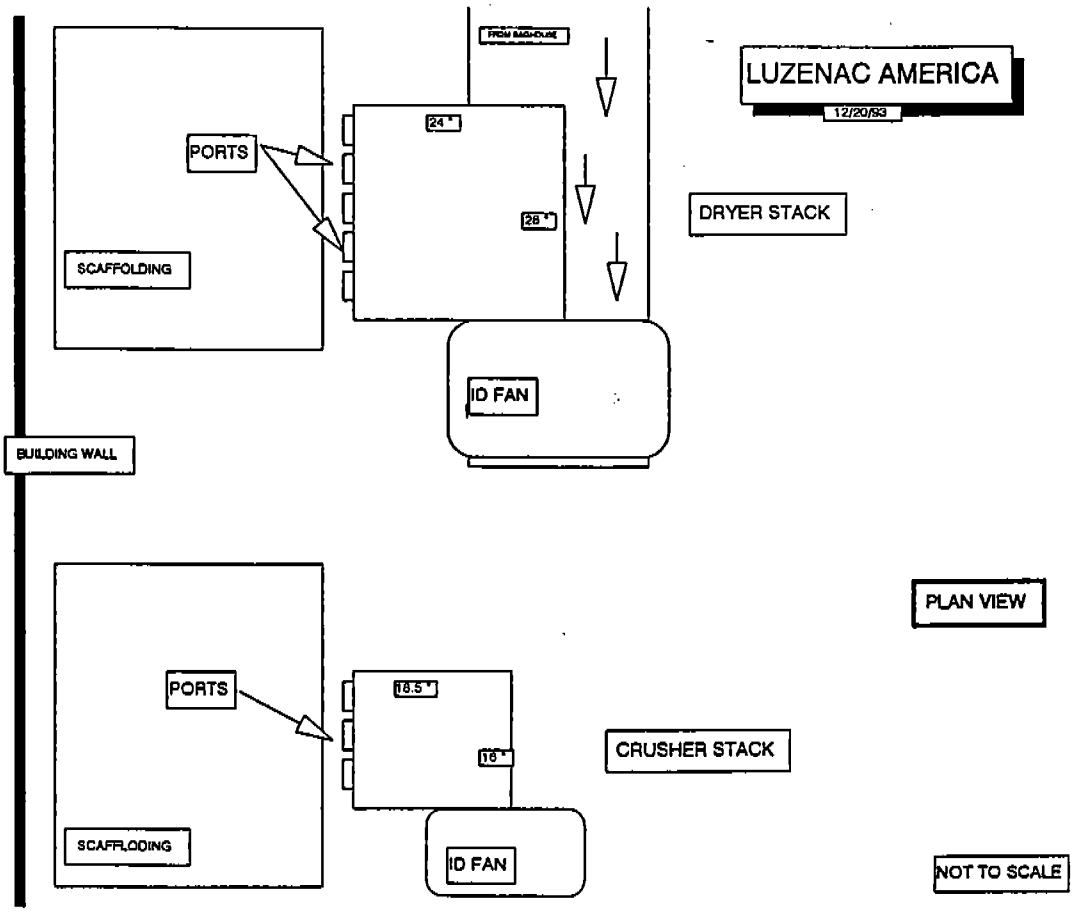
6.0 SOURCE TEST REPORT

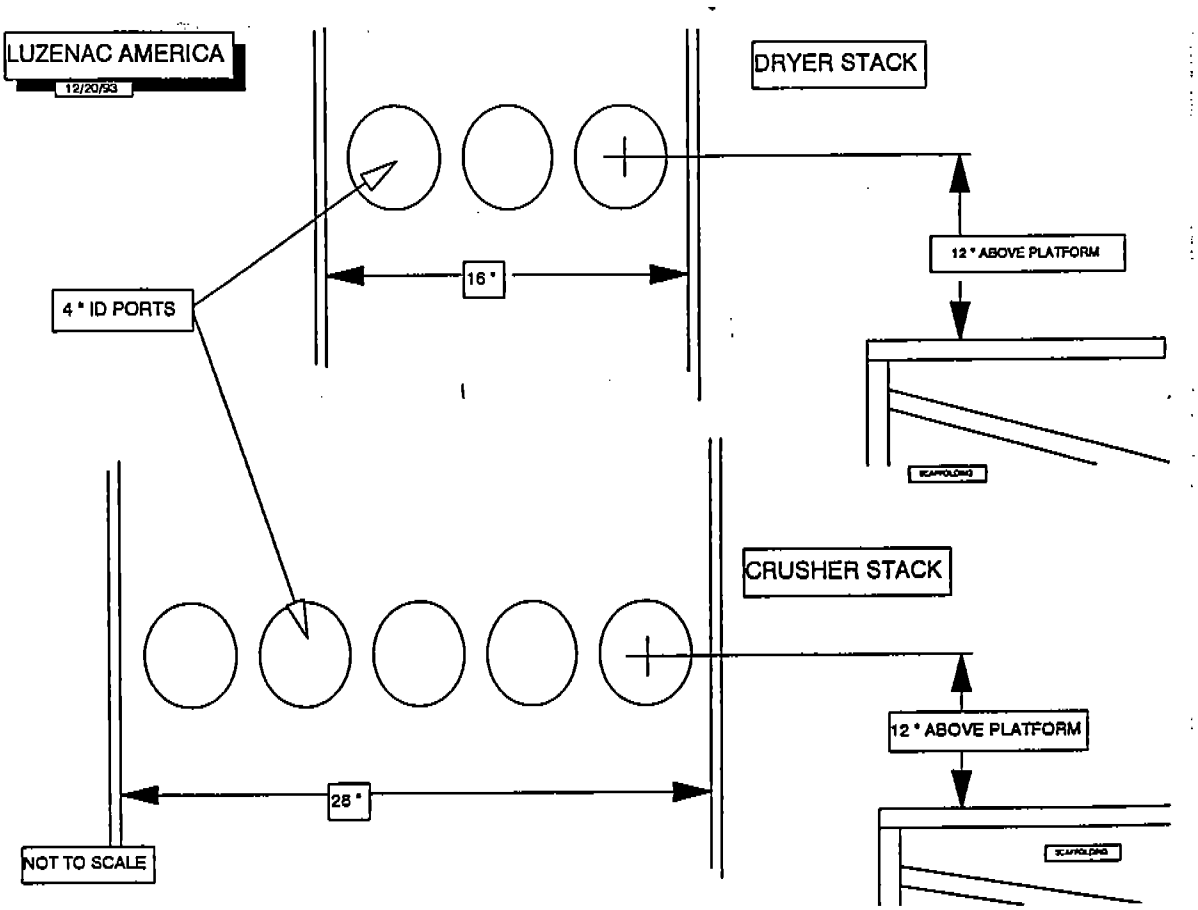
6.1 Report Format

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

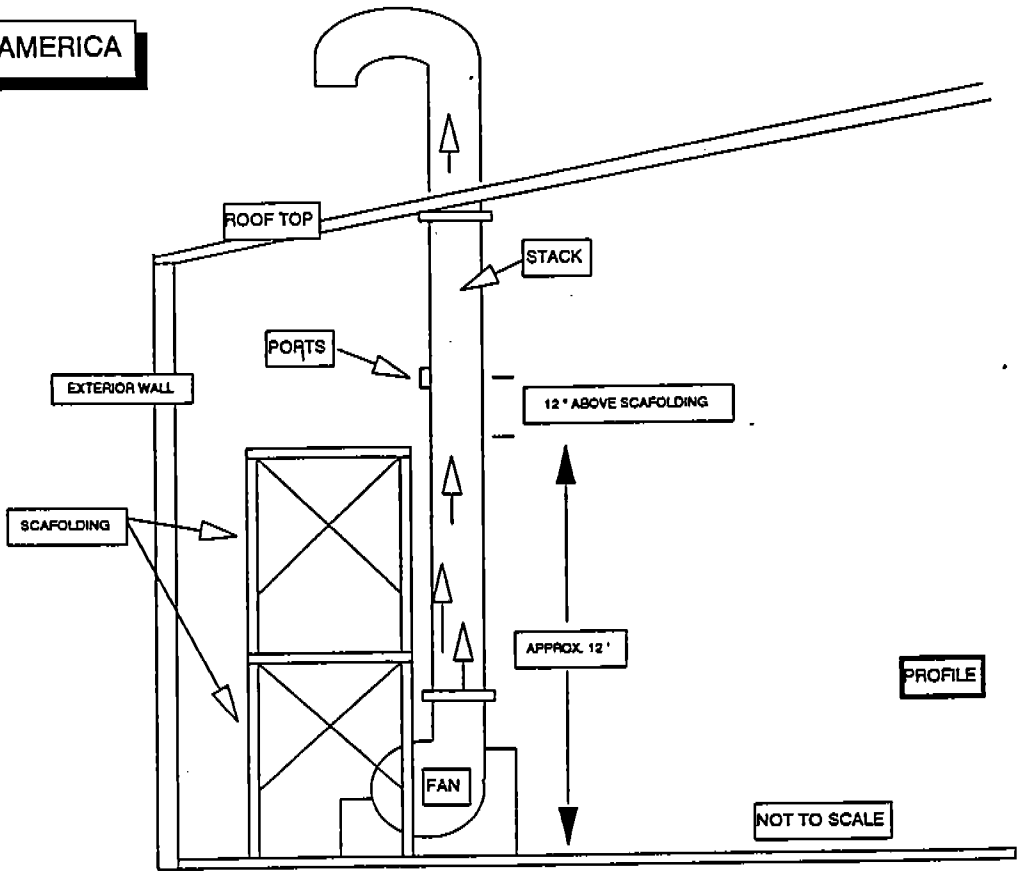
Bison utilizes Quattro Pro, similar to Lotus 123, which has ready-made spreadsheets to allow for quick and accurate mathematical calculations.


LUZENAC AMERICA
12/20/93
PORTS
24"
28"
DRYER STACK
SCAFFOLDING
ID FAN
BUILDING WALL
PLAN VIEW
PORTS
18.5"
16"
CRUSHER STACK
SCAFFOLDING
ID FAN
NOT TO SCALE

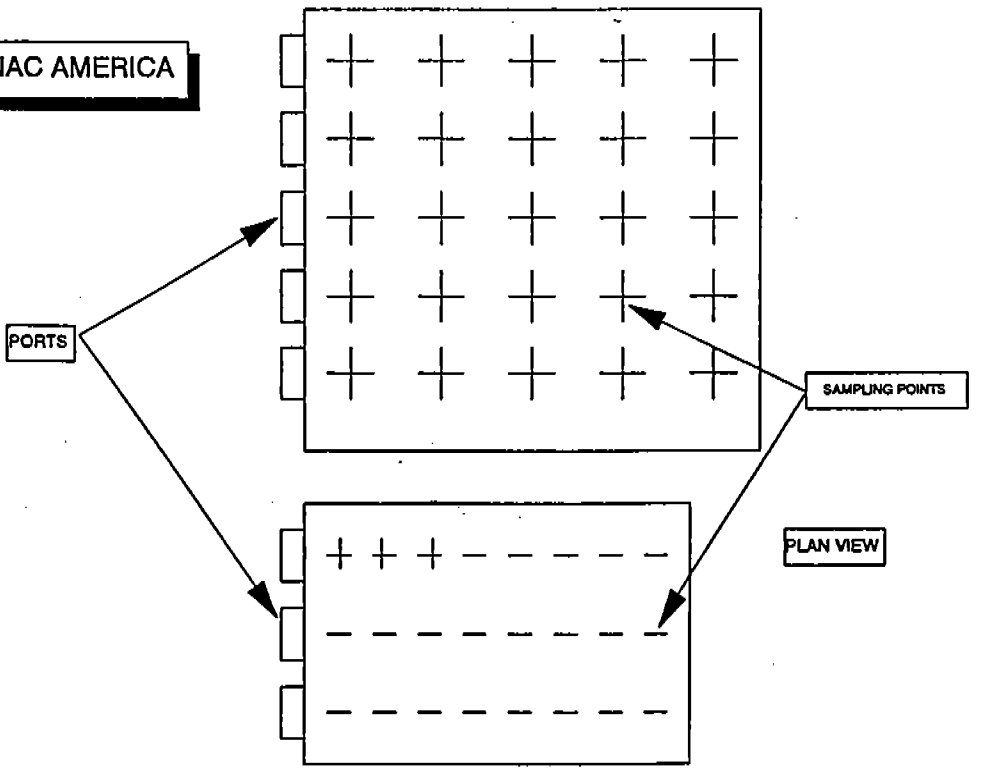

LUZENAC AMERICA
12/20/93
DRYER STACK
16 "
12 " ABOVE PLATFORM
4 " ID PORTS
CRUSHER STACK
12 " ABOVE PLATFORM
28 "
NOT TO SCALE

LUZENAC AMERICA

12/20/93



LUZENAC AMERICA



NOT TO SCALE

DEPARTMENT OF
HEALTH AND ENVIRONMENTAL SCIENCES
AIR QUALITY BUREAU

COGSWELL BUILDING
1400 BROADWAY

STATE OF MONTANA

(406) 444-3454
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PO BOX 200901
HELENA, MONTANA 59620-0901

January 31, 1994

RECEIVED
FEB - 2 1994
BISON

Calvin W. Loomis, E.I.T.
Environmental Engineer
Bison Engineering, Inc.
P.O. Box 1703
Helena, MT 59624

Dear Mr. Loomis:

The Air Quality Bureau has completed review of the protocol submitted on behalf of the Luzenac America's talc facility located at Three Forks, Montana.

There are a few things that need to be clarified and addressed.

1. The crusher/loader facility is subject to the particulate and opacity provisions of 40 CFR Part 60, Subpart OOO. These provisions are:

   a. Particulate matter concentrations are limited to 0.05 g/dscm (0,.02 gr/dscf) which is the same as the state limitation dictated by permit #2282.

      Method 5 or 17 may be utilized to determine particulate concentration. The minimum sample time and volume are 120 minutes and 60 dscf, respectively for each test run and 3 runs shall constitute a complete test.

   b. The opacity limitation is seven (7) percent and shall be conducted via the procedures of 40 CFR Part 60.11 which requires a minimum of three (3) hours of Method 9 visual documentation. These observations shall be conducted concurrently with the particulate matter tests.

2. The dryer facility is subject to the provisions of 40 CFR Part 60, Subpart UUU. These provisions are:

   a. Particulate matter is limited to the permit limit of 0.02 gr/dscf which is more stringent than the federal limit of 0.025 gr/dscf (0.05 g/dscm). The 0.04 value mentioned in your 1/11/94 letter is applicable to calciners or calciners and dryers in series. The sampling time and volume are the same as those specified above for crushers. Method 5 is the specified test method according to 60.736 b(1).

b. The opacity limit is ten (10) percent and testing shall be conducted according to the procedures of 40 CFR Part 60.11 which requires three (3) hours of Method 9 visual documentation and shall be conducted concurrently with the particulate matter tests.

Your letter of January 11, 1994 did not mention the required opacity tests and the January 24, 1994 followup letter did not specify that Method 9 observations would be conducted on both facilities although I assume that is what was intended.

As a final note, the number of sampling ports for each facility is confusing. For example, one drawing indicates the dryer has five ports and the crusher three. On the next page it is the opposite, the dryer has three ports and the crusher five. Also, there is only one dimension for each stack. In your final report, please specify the number of ports for each stack and the dimension of each stack. One stack appears to be square and the other rectangular, but I can't tell exactly, since only one value is given for each stack.

Other than the above comments, the protocol appears to have the necessary ingredients for a successful test.

If there are any questions, please call.

Very truly yours,

Harry Keltz

Harry Keltz
Compliance & Enforcement Section

HK:tjl

APPENDIX B: FIELD DATA

BISON ENGINEERING, INC.

ENGINEERS • SCIENTISTS • PLANNERS

Visible Emission Observation Form

SOURCE NAME: Luzenac America	OBSERVATION DATE: 2-16-94	START TIME: 14:40
ADDRESS:		STOP TIME: 15:40
CITY: Three Forks / STATE: MT / ZIP:		
PHONE: / SOURCE ID NUMBER:		
PROCESS EQUIPMENT: Dryer / OPERATING MODE: normal		
CONTROL EQUIPMENT: baghouse / OPERATING MODE: normal		
DESCRIBE EMISSION POINT: START Vertical, rectangular stack w/ curved outlet STOP		
HEIGHT ABOVE GROUND LEVEL: START ~50' STOP / HEIGHT RELATIVE TO OBSERVER: START ~50' STOP		
DISTANCE FROM OBSERVER: START ~600' STOP / DIRECTION FROM OBSERVER: START NW STOP		
DESCRIBE EMISSIONS: START none visible STOP		
EMISSION COLOR: START STOP / PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐		
WATER DROPLETS PRESENT: NO ☒ YES ☐ / IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐		
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START 0'-5' from outlet STOP		
DESCRIBE BACKGROUND: START sky STOP		
BACKGROUND COLOR: START lt. blue STOP / SKY CONDITIONS: START ~35% high overcast STOP		
WIND SPEED: START 3-5 mph STOP 5-10 / WIND DIRECTION: START SW STOP		
AMBIENT TEMP.: START STOP / WET BULB TEMP. / RH.percent		

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

AVERAGE OPACITY FOR HIGHEST PERIOD: 0 / NUMBER OF READINGS ABOVE 0 % WERE 0

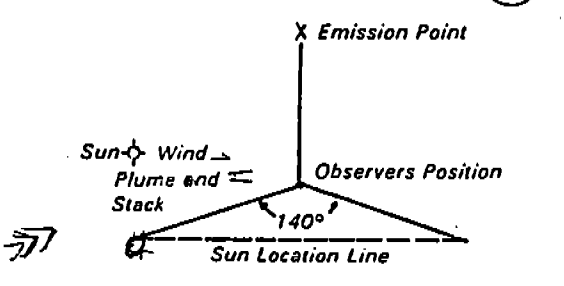
RANGE OF OPACITY READINGS: 0 MINIMUM / 0 MAXIMUM

OBSERVER'S NAME (PRINT): Bill Snow

OBSERVER'S SIGNATURE: B. Snow / DATE: 2-16-94

ORGANIZATION: Bison Engineering

Source Layout Sketch — Draw North Arrow



COMMENTS:

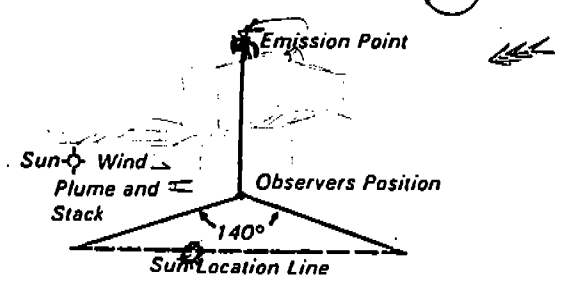
BISON ENGINEERING, INC.

ENGINEERS • SCIENTISTS • PLANNERS

Visible Emission Observation Form

SOURCE NAME	Luzenac America
ADDRESS	
CITY	Three Forks
STATE	MT
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	dryer
OPERATING MODE	normal
CONTROL EQUIPMENT	baghouse
OPERATING MODE	normal
DESCRIBE EMISSION POINT START	Vertical, rectangular stack w/ curved outlet
DESCRIBE EMISSION POINT STOP	
HEIGHT ABOVE GROUND LEVEL START	~50'
HEIGHT ABOVE GROUND LEVEL STOP	
HEIGHT RELATIVE TO OBSERVER START	~50'
HEIGHT RELATIVE TO OBSERVER STOP	
DISTANCE FROM OBSERVER START	~500'
DISTANCE FROM OBSERVER STOP	
DIRECTION FROM OBSERVER START	NW
DIRECTION FROM OBSERVER STOP	
DESCRIBE EMISSIONS START	none visible
DESCRIBE EMISSIONS STOP	
EMISSION COLOR START	
EMISSION COLOR STOP	
PLUME TYPE: CONTINUOUS ☒	FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: NO ☒ YES ☐	
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	0-5' from outlet
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	
DESCRIBE BACKGROUND START	sky
DESCRIBE BACKGROUND STOP	
BACKGROUND COLOR START	lt. blue
BACKGROUND COLOR STOP	
SKY CONDITIONS START	~50% high overcast
SKY CONDITIONS STOP	
WIND SPEED START	0-2 mph
WIND SPEED STOP	
WIND DIRECTION START	NNE
WIND DIRECTION STOP	
AMBIENT TEMP. START	
AMBIENT TEMP. STOP	
WET BULB TEMP.	
RH, percent	

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	2-16-94	START TIME	10:45	STOP TIME	11:45

MIN \ SEC	0	15	30	45
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0

MIN \ SEC	0	15	30	45
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0
60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD	0
NUMBER OF READINGS ABOVE	0 % WERE 0
RANGE OF OPACITY READINGS	0 MINIMUM 0 MAXIMUM
OBSERVER'S NAME (PRINT)	BILL SHAW
OBSERVER'S SIGNATURE	B. Shaw
DATE	2-16-94
ORGANIZATION	BISON ENGINEERING
COMMENTS	

Tower Hill Engineering Building • 30 South Ewing • P.O. Box 1703 • Helena, MT 59624 406/442-5768

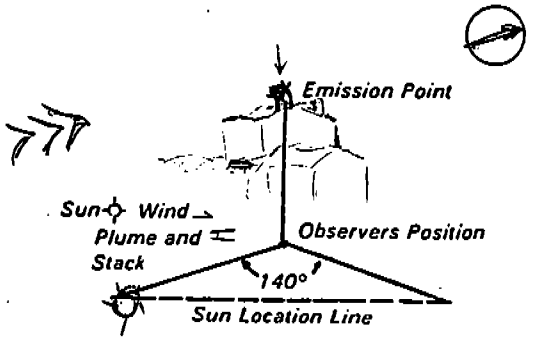
BISON ENGINEERING, INC.

ENGINEERS • SCIENTISTS • PLANNERS

Visible Emission Observation Form

SOURCE NAME	Luzenac America
ADDRESS	
CITY	Three Forks
STATE	MT
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Dryer
OPERATING MODE	normal
CONTROL EQUIPMENT	baghouse
OPERATING MODE	normal
DESCRIBE EMISSION POINT START	vertical rectangular stack, curved @ outlet
STOP	
HEIGHT ABOVE GROUND LEVEL START	~50'
STOP	
HEIGHT RELATIVE TO OBSERVER START	~50'
STOP	
DISTANCE FROM OBSERVER START	~500'
STOP	
DIRECTION FROM OBSERVER START	WNW
STOP	
DESCRIBE EMISSIONS START	none visible
STOP	
EMISSION COLOR START	—
STOP	
PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☒ YES ☐	
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	0-5' from outlet
STOP	
DESCRIBE BACKGROUND START	sky
STOP	
BACKGROUND COLOR START	lt. blue & white
STOP	
SKY CONDITIONS START	80% high cloud cover
STOP	
WIND SPEED START	15-25 mph
STOP	
WIND DIRECTION START	S
STOP	
AMBIENT TEMP. START	
STOP	
WET BULB TEMP.	
RH.percent	

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	START TIME	STOP TIME
2-15-94	13:45	14:45

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

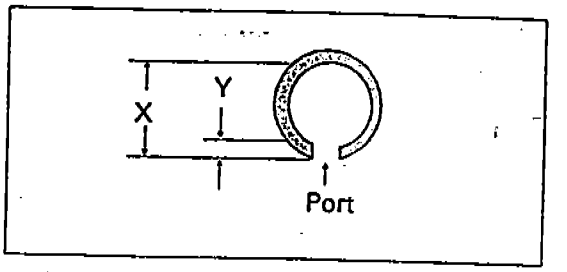
AVERAGE OPACITY FOR HIGHEST PERIOD	0
NUMBER OF READINGS ABOVE 0 % WERE	0
RANGE OF OPACITY READINGS MINIMUM	0
MAXIMUM	
OBSERVER'S NAME (PRINT)	Bill Shaw
OBSERVER'S SIGNATURE	B. Shaw
DATE	2-15-94
ORGANIZATION	Bison Engineering
COMMENTS	

Tower Hill Engineering Building • 30 South Ewing • P.O. Box 1703 • Helena, MT 59624 • 406/442-5768

Form #M1-01

TRAVERSE POINT LOCATIONS, CIRCULAR STACKS

Plant	Lufkin America
Date 2/15/94	By CWL
Sampling Location	Crusher
Inside of Far Wall to Outside of Port (distance, X)	20
Port Depth (distance, Y)	2
Stack I.D. (distance X - distance Y)	18
Dist. to upstream disturbance ft/in. 87 Diameters 5.1	Dist. to downstream disturbance ft/in. 92 Diameters 5.4
No. of Traverse Points Req'd: Total 18	Per Port 6



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	NA	18	NA	1 1/2	3 1/2
2				4 1/2	6 1/2
3				7 1/2	9 1/2
4				10 1/2	12 1/2
5				13 1/2	15 1/2
6				16 1/2	18 1/2

Notes: _____

Form #M3-02

GAS ANALYSIS DATA FORM - FYRITE

Plant Luzenac Sample Location Crusher

Date 2-15-94 By B. Slaw Ambient Temp. 36°F

Sample Method (Bulb Pump, Integrated Bag, etc.)

Run	Clock Time	FYRITE READINGS % CO_2	% O_2	(N_2 + CO) = 100 Minus Σ (CO_2, O_2)	
1 a		0	21	79	
b		0	21	79	
c		0	21	79	
Averages					
		x 44/100	x 32/100	x 28/100	
Dry Molecular Weight (M_d)					Total 28.84
2 a					
b					
c					
Averages					
		x 44/100	x 32/100	x 28/100	
Dry Molecular Weight (M_d)					Total
3 a					
b					
c					
Averages					
		x 44/100	x 32/100	x 28/100	
Dry Molecular Weight (M_d)					Total

Rev. 7/92

Form #M2-01

GAS VELOCITY AND VOLUME DATA FORM

Plant		Location	Stack ID No.
Luzenac		Crusher	
Date	**Time**	**Operator**	**Run No.**	**Stack Dimension**
2/15/94	1:30	KDH	Initial	18½ X 16"

Altitude ~4000	Alt. Corr.	Ambient Temp.	36°F
Barometric Reading		Molecular Weight	28.84
Local Barometric Pressure	25.8 "Hg	Method	F-3, 1-2
Stack Static Pressure	+.56	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	Angle (α) Yielding Null Δp
A 1	.33	53		
2	.43	53		
3	.55	53		
4	.68	53		
5	.77	53		
6	.85	53		
B 1	.42	53		
2	.44	53		
3	.54	53		
4	.69	53		
5	.82	53		
6	.89	53		
C 1	.45 / 5 .85	53 / 53		
2	.64 / 6 .87	53 / 53		
3	.74	53		
4	.81	53		
Average Δp_s		Average Stack Temp.	Average Angle (α)[1]	
Mean Sqrt Δp_s		53°		
5.3259				

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

Rev. 11/93

Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 1 of 2

PARTICULATE FIELD DATA FORM

Plant Lonza America		Location Three Rocks			Stack ID No. Crusher	Stack Dimension 18½ x 16"	
Date 02 15 94	Operator MWL	Run No. 1	Sample Box No. 1		Filter No. 998	Meter Box No. 2	

Altitude ~4000	Alt. Corr. 1	Assumed Moisture 1%		Nozzle ID No. S-3	Nozzle Dia. .236
Barometric Reading		Ambient Temp. 36°F		Probe ID No. 1'	Probe Length 3'
Barometric Pres. 26.8		Meter ΔH@ 1.88		Liner Material SS	
Stack Static Pres. +.56		Meter Calib (Y) .996		Probe Heat Setting 250	

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 Gas Sampler Temp at Dry Gas Meter (°F) Outlet	
		12:03	194.39									
S 1	7		/	.3	1.0	1	64	249	41	56	51	
2	14		/	.47	1.6	1	65			57	52	
3	21		208.81	.63	2.08	2	64	251	47	60	53	
4	28		215.04	.76	2.54	2	65			62	55	
5	35		222.16	.92	3.08	3	65	259	48	63	56	
6	42		228.38	.88	2.95	2	66	252		62	55	
M 7	49		233.33	.43	1.44	1	66	251	54	64	61	3.39
8	56		238.29	.43	1.44	1	67	250	57	66	62	
9	63		243.64	.52	1.76	1	68	247	51	68	64	
10	70		249.73	.65	2.20	2	67	250	50	70	65	
11	77		256.78	.87	2.95	2	67	252	49	73	66	
12	84		264.16	.97	3.28	3	70	250	49	74	67	
N 13	91		269.77	.54	1.83	1	68	254	49	76	68	3.977
14	98		276.33	.63	2.51	3	69	250	50	76	69	
15	105		283.39	.73	2.9	3	69	250	50	78	70	
16	112		290.92	.98	3.5		70	250	51	78	70	

Rev. 12/92

Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 2 of 2

PARTICULATE FIELD DATA FORM

Plant Luzenac America		Location Three forks		Stack ID No. Crusher	Stack Dimension
Date 02 15 94	Operator CWL	Run No. 1	Sample Box No. 1	Filter No. 998	Meter Box No. 2

Altitude _____ Alt. Corr. _____	Assumed Moisture _____	Nozzle ID No. _____ Nozzle Dia. _____
Barometric Reading _____	Ambient Temp. _____	Probe ID No. _____ Probe Length _____
Barometric Pres. _____	Meter ΔH@ _____	Liner Material _____
Stack Static Pres. _____	Meter Calib (Y) _____	Probe Heat Setting _____

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
		13:03	290.92								
17	119		/	.93	3.7	3	71	250	54	81	72
18	126		306.88	.98	3.9	3½	71	251	54	81	72
			Vol 112.49	$\overline{\sqrt{\Delta P}}$ .824	$\overline{\Delta H}$ 2.48		$\overline{T_s}$ 67.3			$\overline{T_m}$ 65.9	

Rev. 12/92

Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 1 of 2

PARTICULATE FIELD DATA FORM

Plant	Lucemac America		Location	Three Forks		Stack ID No.	Crusher	Stack Dimension	18x16
Date	02 16 94	Operator	CWL	Run No.	2	Sample Box No.	1	Filter No.	996	Meter Box No.	2

Altitude	~4000	Alt. Corr.		Nozzle ID No.	8-3	Nozzle Dia.	.236
Barometric Reading	915 mb			Probe ID No.		Probe Length	3'
Barometric Pres.	27.01			Liner Material		SS	
Stack Static Pres.	+.56			Probe Heat Setting		250	

Assumed Moisture	1%
Ambient Temp.	36°F
Meter ΔH@	1.88
Meter Calib (Y)	.996

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 Gas Sampler Temp at Dry Gas Meter (°F) Outlet	
		0921	306.93									
L 1	7		309.98	.16	.53	0	50	252	40	42	39	3.341
2	14		313.49	.22	.74	0	51	252	41	42	40	
3	21		317.36	.25	.84	0	51	251		44	42	
4	28		321.08	.27	.90	0	53			46	44	
5	35		325.38	~~.88~~	2.94	1	52	251	47	48	46	
6	42		/	.95	3.17	1	53			50	47	
M 1	49		337.46	.41	1.37	1	53	250	54	53	48	
2	56		342.50	.49	1.64	1	54			56	49	
3	63		348.16	.6	2.0	1	55	251	57	59	50	
4	70		354.54	.73	2.44	1	56			60	51	
5	77		361.52	.88	2.94	1	57	250	56	62	52	
6	84		368.99	.97	3.24	1	57			64	53	
R 1	91		374.63	.56	1.93	1	58	250	53	66	55	3.44467
2	98		380.88	.67	2.3	1	58			68	57	
3	105		387.68	.74	2.55	1	59	252	50	70	60	
4	112		394.45	.82	2.83							

Rev. 12/92

Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 2 of 2

PARTICULATE FIELD DATA FORM

Plant LA		Location Three forks		Stack ID No. Crusher	Stack Dimension 18x16
Date 02 16 94	Operator CWL	Run No. 2	Sample Box No. 1	Filter No. 996	Meter Box No. 2

Altitude ____ Alt. Corr. ____	Assumed Moisture ____	Nozzle ID No. ____ Nozzle Dia. ____
Barometric Reading ____	Ambient Temp. ____	Probe ID No. ____ Probe Length ____
Barometric Pres. ____	Meter ΔH@ ____	Liner Material ____
Stack Static Pres. ____	Meter Calib (Y) ____	Probe Heat Setting ____

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
			394.45								
5	119		401.78	.92	3.17	1	60	234		73	63
6	126		409.12	.95	3.27		60			73	63
			V_{a1} 102.19	$\overline{\sqrt{\Delta P}}$ .78	$\overline{\Delta H}$ 2.16		$\overline{T_s}$ 55.33			$\overline{T_m}$ 54.5	

Rev. 12/92

Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 1 of 2

PARTICULATE FIELD DATA FORM

Plant	Luzenac America		Location	Three forks		Stack ID No.	Crusher
Stack Dimension	18 x 16						
Date	02 16 94	Operator	CWL	Run No.	3	Sample Box No.	4
Filter No.	993	Meter Box No.	2				

Altitude	~4000	Alt. Corr.	
Barometric Reading			
Barometric Pres.	25.01		
Stack Static Pres.	+.56		

Assumed Moisture	1%
Ambient Temp.	36
Meter ΔH@	1.88
Meter Calib (Y)	.996

Nozzle ID No.	8-4	Nozzle Dia.	.238
Probe ID No.	"	Probe Length	2'
Liner Material	SS		
Probe Heat Setting	250		

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	
		13:10	409.26									
C 1	7		413.77	.35	1.23	0	64	250	45	63	62	3.524
2	14		418.79	.44	1.55	1	66			64	62	
3	21		424.44	.58	2.0	1	68	248	46	66	63	
4	28	14:39	430.91	.71	2.5	1	68			68	66	
5	35		437.84	.79	2.78	2	68	250	54	69	67	
6	42		445.00	.86	3.0	2	69			69	67	
M 1	49		450.22	.39	1.37	1	70	250	57	72	68	
2	56	15:21	455.25	.43	1.52	1	70			75	69	
3	63		461.14	.59	2.08	2	70	248	58	76	70	
4	70		467.81	.72	2.54	2	70			77	72	3.557
5	77		474.91	.81	2.88	2	71	249	60	80	72	
6	84		482.13	.87	3.09	2	72			81	73	
R 1	91		487.52	.44	1.57	2	71	253	61	82	75	
2	98		493.41	.56	1.99	2	70			82	75	
3	105		500.00	.69	2.45	2	70	248	61	82	76	
4	112		506.99	.80	2.85	2	70			83	76	

Rev. 12/92

Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 2 of 2

PARTICULATE FIELD DATA FORM

Plant	Lozenoa America		Location	Three Forks		Stack ID No.	Crusher
Date	02 16 94	Operator	CWC	Run No.	3	Sample Box No.	4

Stack Dimension	18x18						
Filter No.	993	Meter Box No.	2				

Altitude		Alt. Corr.	
Barometric Reading			
Barometric Pres.			
Stack Static Pres.			

Assumed Moisture	
Ambient Temp.	
Meter ΔH@	
Meter Calib (Y)	

Nozzle ID No.		Nozzle Dia.	
Probe ID No.		Probe Length	
Liner Material			
Probe Heat Setting			

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
			506.99								
5	119		514.23	.86	3.06	1	70	249	62	83	76
6	126		521.44	.91	3.24	1	70			84	77
						1	70	251	64	84	77
			Vol 112.18	$\overline{\sqrt{\Delta P}}$ .80	$\overline{\Delta H}$ 2.32		$\overline{T_s}$ 69.3			$\overline{T_m}$ 728	3

Rev. 12/92

BISON ENGINEERING, INC.

ENGINEERS • SCIENTISTS • PLANNERS

Visible Emission Observation Form

SOURCE NAME: Lutznac America	OBSERVATION DATE: 2-15-94	START TIME: 13:45
ADDRESS:		STOP TIME: 14:45
CITY: Three Forks / STATE: MT / ZIP:		
PHONE: / SOURCE ID NUMBER:		
PROCESS EQUIPMENT: Crusher / OPERATING MODE: normal		
CONTROL EQUIPMENT: baghouse / OPERATING MODE: normal		
DESCRIBE EMISSION POINT: START Vertical rectangular stack, curved @ outlet STOP		
HEIGHT ABOVE GROUND LEVEL: START ~50' STOP / HEIGHT RELATIVE TO OBSERVER: START ~50' STOP		
DISTANCE FROM OBSERVER: START ~500' STOP / DIRECTION FROM OBSERVER: START WNW STOP		
DESCRIBE EMISSIONS: START none visible STOP		
EMISSION COLOR: START STOP / PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐		
WATER DROPLETS PRESENT: NO ☒ YES ☐ / IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐		
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START 0'-5' from outlet STOP		
DESCRIBE BACKGROUND: START sky STOP		
BACKGROUND COLOR: START lt. blue & white STOP / SKY CONDITIONS: START ~80% high cloud cover STOP		
WIND SPEED: START 15-25 mph STOP / WIND DIRECTION: START S STOP		
AMBIENT TEMP.: START STOP / WET BULB TEMP. / RH.percent		

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

AVERAGE OPACITY FOR HIGHEST PERIOD: 0 / NUMBER OF READINGS ABOVE 0 % WERE 0

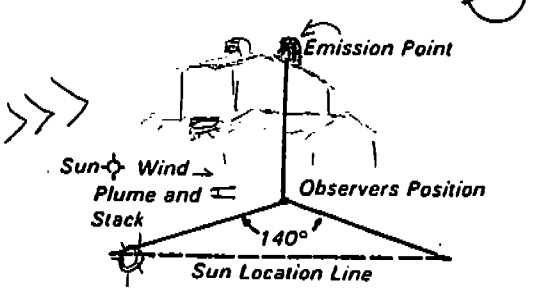
RANGE OF OPACITY READINGS: 0 MINIMUM / 0 MAXIMUM

OBSERVER'S NAME (PRINT): Bill Shaw

OBSERVER'S SIGNATURE: B Shaw / DATE: 2-15-94

ORGANIZATION: Bison Engineering

Source Layout Sketch — *Draw North Arrow*



COMMENTS:

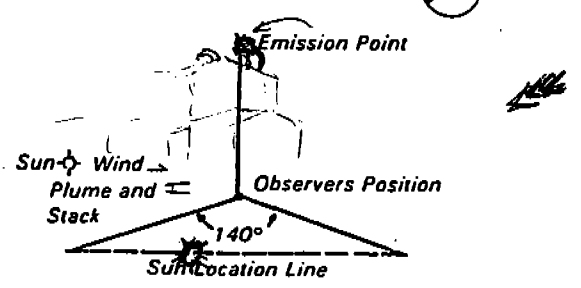
BISON ENGINEERING, INC.

ENGINEERS • SCIENTISTS • PLANNERS

Visible Emission Observation Form

SOURCE NAME	Luzenac America
ADDRESS	
CITY	Three Forks
STATE	MT
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Crusher
OPERATING MODE	normal
CONTROL EQUIPMENT	baghouse
OPERATING MODE	normal
DESCRIBE EMISSION POINT START	Vertical, rectangular stack, curved @ outlet STOP
HEIGHT ABOVE GROUND LEVEL START	~50' STOP
HEIGHT RELATIVE TO OBSERVER START	~50' STOP
DISTANCE FROM OBSERVER START	~500' STOP
DIRECTION FROM OBSERVER START	NW STOP
DESCRIBE EMISSIONS START	none visible STOP
EMISSION COLOR START	— STOP
PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☒ YES ☐	
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	0'-5' from outlet STOP
DESCRIBE BACKGROUND START	sky STOP
BACKGROUND COLOR START	H. blue STOP
SKY CONDITIONS START	50% high overcast STOP
WIND SPEED START	0-2 mph STOP
WIND DIRECTION START	NNE STOP
AMBIENT TEMP. START	STOP
WET BULB TEMP.	
RH, percent	

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	START TIME	STOP TIME
2-16-94	10:45	11:45

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

AVERAGE OPACITY FOR HIGHEST PERIOD	0
NUMBER OF READINGS ABOVE	0 % WERE 0
RANGE OF OPACITY READINGS	0 MINIMUM 0 MAXIMUM
OBSERVER'S NAME (PRINT)	Bill Shaw
OBSERVER'S SIGNATURE	B. Shaw
DATE	2-16-94
ORGANIZATION	Bison Engineering
COMMENTS	

Tower Hill Engineering Building • 30 South Ewing • P.O. Box 1703 Helena, MT 59624 406/442-5768

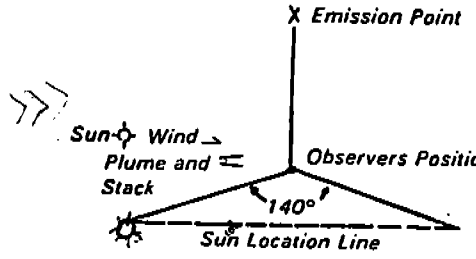
BISON ENGINEERING, INC.

ENGINEERS • SCIENTISTS • PLANNERS

Visible Emission Observation Form

SOURCE NAME	Luzenac America
ADDRESS	
CITY	Three Forks
STATE	MT
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Crusher
OPERATING MODE	normal
CONTROL EQUIPMENT	baghouse
OPERATING MODE	normal
DESCRIBE EMISSION POINT START	vertical, rectangular stack w/ curved outlet
DESCRIBE EMISSION POINT STOP	
HEIGHT ABOVE GROUND LEVEL START	~50'
HEIGHT ABOVE GROUND LEVEL STOP	
HEIGHT RELATIVE TO OBSERVER START	~50'
HEIGHT RELATIVE TO OBSERVER STOP	
DISTANCE FROM OBSERVER START	~600'
DISTANCE FROM OBSERVER STOP	
DIRECTION FROM OBSERVER START	NW
DIRECTION FROM OBSERVER STOP	
DESCRIBE EMISSIONS START	none visible
DESCRIBE EMISSIONS STOP	
EMISSION COLOR START	
EMISSION COLOR STOP	
PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☒ YES ☐	
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	0'-5' from outlet
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	
DESCRIBE BACKGROUND START	sky
DESCRIBE BACKGROUND STOP	
BACKGROUND COLOR START	lt. blue
BACKGROUND COLOR STOP	
SKY CONDITIONS START	~35% high overcast
SKY CONDITIONS STOP	
WIND SPEED START	3-5 mph
WIND SPEED STOP	5-10
WIND DIRECTION START	SW
WIND DIRECTION STOP	
AMBIENT TEMP. START	
AMBIENT TEMP. STOP	
WET BULB TEMP.	
RH.percent	

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	START TIME	STOP TIME
2-16-94	14:40	15:40

MIN \ SEC	0	15	30	45
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0

MIN \ SEC	0	15	30	45
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0
60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD	0
NUMBER OF READINGS ABOVE	0 % WERE 0
RANGE OF OPACITY READINGS	0 MINIMUM 0 MAXIMUM
OBSERVER'S NAME (PRINT)	Bill Snow
OBSERVER'S SIGNATURE	Bill Snow
DATE	2-16-94
ORGANIZATION	Bison Engineering
COMMENTS	

Form #M4-01

IMPINGER WATER CAPTURE FORM

Date Out 2/14/94 Initials CWL

Date In 2/15/94 Initials KDH

Company Lozenge America Location Three Forks

Stack Name Crusher

Run No. 1 Box No. 1 Filter No. 998

	Impinger 1 Std.	Impinger 2 Midg.	Impinger 3 Dry	Impinger 4 Silica
Final Weight	250.9			264.2
Initial Weight	273.7			242.85
Net Gain	-22.8			21.35
Total Gain (g): -1.45				

Units = Grams (milliliters)

COMMENTS: (Note: Weigh impingers without u-tubes, caps, or washers but with orifice tubes in place)

Rev. 6/92

Form #M4-01

IMPINGER WATER CAPTURE FORM

Date Out 2/14/94 Initials CWL

Date In 2/16/94 Initials KDH

Company Lozenac America Location Three Parks

Stack Name Crusher

Run No. 2 Box No. 1 Filter No. 996

	Impinger 1 Std.	Impinger 2 Midg.	Impinger 3 Dry	Impinger 4 Silica
Final Weight	254.5			252.9
Initial Weight	267.1			232.75
Net Gain	-12.6			20.15
Total Gain (g): 7.55				

Units = Grams (milliliters)

COMMENTS: (Note: Weigh impingers without u-tubes, caps, or washers but with orifice tubes in place)

Rev. 6/92

Form #M4-01

IMPINGER WATER CAPTURE FORM

Date Out 2/14/94 Initials CWC

Date In 2/16/94 Initials KDH

Company Lozenac America Location Thiebacks

Stack Name Crusher

Run No. 3 Box No. 4 Filter No. 993

	Impinger 1 Std.	Impinger 2 Midg.	Impinger 3 Dry	Impinger 4 Silica
Final Weight	219.8			271.8
Initial Weight	237.05			250.3
Net Gain	-17.25			21.5
Total Gain (g): 4.25				

Units = Grams (milliliters)

COMMENTS: (Note: Weigh impingers without u-tubes, caps, or washers but with orifice tubes in place)

Rev. 6/92

Production Rate Luzenac America

2-15-94

Time	Crusher ΔP	Dryer ΔP	Rate	Int.
13:36	1.9	2.6	114/hr.	CWC
14:06	1.9	2.8	120/hr.	JEC
14:36	1.9	2.8	116/hr.	JEC
15:06	1.9	2.6	110/hr.	JEC.
15:34	2.0	2.8	127/hr.	JEC

2-16-94

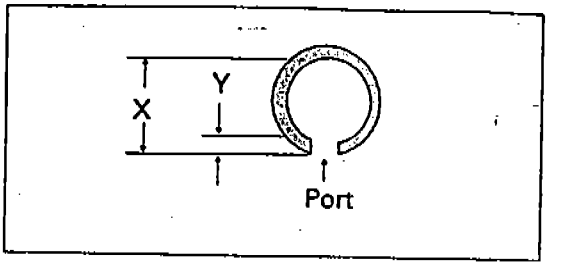
9:20	2.0	2.8	107/hr	JEC
9:50	1.9	2.6	100/hr.	JEC
10:20	2.0	2.8	114/hr	JEC
10:50	2.0	2.8	125/hr	JEC
11:20	2.0	2.8	106/hr.	JEC
11:45	2.0	2.8	116/hr	JEC
13:19	1.9	2.7	123/hr.	JEC
14:53	1.9	2.8	126/hr	JEC
15:37	1.9	2.8	123/hr.	JEC
16:04	2.0	2.9	137/hr.	JEC
16:40	2.0	2.8	120/hr.	JEC

#	Tare	1st	Tst	Date
990	2955	.2951	D 1	15
992	2848	.2832	D 2	16
994	2812	.2800	D 3	16
998	2921	.2905	C 1	15
996	2920	.2909	C 2	16
993	2819	.2805	C 3	16

Form #M1-01

TRAVERSE POINT LOCATIONS, CIRCULAR STACKS

Plant	Luzenac America
Date	2/15/94 By CVL
Sampling Location	Dryer
Inside of Far Wall to Outside of Port (distance, X)	29
Port Depth (distance, Y)	2"
Stack I.D. (distance X - distance Y)	27"
Dist. to upstream disturbance ft/in. 60" Diameters 2.4	Dist. to downstream disturbance ft/in. 114+ Diameters 4.5
No. of Traverse Points Req'd:	Total 24 Per Port 6



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	N/A	27"	27"	2 1/4	4 1/4
2				6 3/4	8 3/4
3				11 1/4	13 1/4
4				15 3/4	17 3/4
5				20 1/4	22 1/4
6				24 3/4	26 3/4

Notes: _____

Form #M2-01

1/2

GAS VELOCITY AND VOLUME DATA FORM

Plant			Location	Stack ID No.
Lizenar			Dryer	
Date	**Time**	**Operator**	**Run No.**	**Stack Dimension**
2-15-94	11:15	B. S	Initial	24 X 28

Altitude ~4000	Alt. Corr.	Ambient Temp.	36°F
Barometric Reading		Molecular Weight	28.84
Local Barometric Pressure	25.8 in Hg	Method	Equate
Stack Static Pressure	+2.5	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	Angle (α) Yielding Null Δp
1	0.1			
2	0.78	106		
3	2.6	106		
4	4.9	108		
5/6	5.0/4.3	109/109		
1	0.17	104		
2	1.1	106		
3	3.6	107		
4	5.1	108		
5/6	5.0/4.5	109/110		
1	0.41	106		
2	1.9	110		
3	4.0	113		
4	4.8	114		
5	4.4	114		
6	4.1	115		
Average Δp_s			Average Stack Temp.	Average Angle (α)[1]
Mean Sqrt Δp_s				
[illegible]			[illegible]	

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

Rev. 11/93

Form #M2-01

GAS VELOCITY AND VOLUME DATA FORM

Plant			Location	Stack ID No.
Luzenac			Dry 512	
Date	**Time**	**Operator**	**Run No.**	**Stack Dimension**
2-15-94	11:15	B. Shaw		24 x 28

Altitude	Alt. Corr.	Ambient Temp.
Barometric Reading		Molecular Weight
Local Barometric Pressure		Method Cyclonic
Stack Static Pressure + 2.5		Pitot C_p 0.84

Pt 4

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
1	0.41	109		
2	2.1	111		
3	3.6	113		
4	4.0	114		
5	3.8	115		
6	3.8	115		
Average Δp_s		Average Stack Temp.	Average Angle (α)[1]	
Mean Sqrt Δp_s		109.6		
1.64696				

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

Form #M3-02

GAS ANALYSIS DATA FORM - FYRITE

Plant Louisiana Pacific Sample Location Dryer

Date 2/15/94 By KDH Ambient Temp. 36°F

Sample Method (Bulb Pump, Integrated Bag, etc.) _____

Run	Clock Time	FYRITE READINGS % CO_2	% O_2	(N_2 + CO) = 100 Minus Σ (CO_2, O_2)	
1 a	10:57	~~50~~	~~20.5~~ 21	79	
b		0	21	79	
c		0	21	79	
Averages		0	21	79	
		x 44/100	x 32/100	x 28/100	
Dry Molecular Weight (M_d)		0			Total 28.84
2 a					
b					
c					
Averages					
		x 44/100	x 32/100	x 28/100	
Dry Molecular Weight (M_d)					Total
3 a					
b					
c					
Averages					
		x 44/100	x 32/100	x 28/100	
Dry Molecular Weight (M_d)					Total

Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 1 of 2

PARTICULATE FIELD DATA FORM

Plant LA		Location Three Forks		Stack ID No. Dryer	Stack Dimension 24x28
Date 02 15 94	Operator CWL	Run No. 1	Sample Box No. 3	Filter No. 990	Meter Box No. 3

Altitude ~4000	Alt. Corr. /	
Barometric Reading ~~24.96~~		
Barometric Pres. ~~23.78~~	25.01	
Stack Static Pres. ~~-56~~	+2.5	

Assumed Moisture	2%
Ambient Temp.	36°F
Meter ΔH@	1.91
Meter Calib (Y)	1.011

Nozzle ID No.		Nozzle Dia.	.125
Probe ID No.	"	Probe Length	
Liner Material	SS		
Probe Heat Setting	250		

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	
		11:43	393.25									
S-1	7		397.86	5.6	1.4	7	109	248	37	51	46	.246
2	14		402.53	5.7	1.4		109			54	46	
3	21		407.15	5.5	1.35	7	110	246	47	57	48	
4	28		411.47	2.7	.66	4	109			60	50	
5	35		413.53	.88	.22	1	110	247	50	62	52	
6	42		415.43	~~.02~~	/	1	112			64	55	
7	49		416.69	.12	.02	1	107	249	53	66	57	
8	56		420.69	5.1	1.25		114	249		67	60	
2-9	63		425.07	4.9	1.2	7	118	248	54	60	59	
10	70		429.88	5.1	1.25	7	122			65	60	.2455
11	77		434.31	5.2	1.28	7	124	242	52	70	62	.238
12	84		438.15	3.2	.78	2	127			71	63	
13	91		440.53	1.1	.26	1	130		48	72	64	
14	98		441.86	.28	.07	1	129	263	48	73	65	
15	105		445.72	4.6	1.10	5½	126	234		74	66	
16	112		450.05	4.5	1.07	5½	124	258		75	67	.2458

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Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 2 of 2

PARTICULATE FIELD DATA FORM

Plant Luzenac America		Location Three Forks		Stack ID No. Dryer	Stack Dimension 24x28
Date 02 15 94	Operator CWL	Run No. 1	Sample Box No. 3	Filter No. 990	Meter Box No. 3

Altitude _____ Alt. Corr. _____	Assumed Moisture _____	Nozzle ID No. _____ Nozzle Dia. _____
Barometric Reading _____	Ambient Temp. _____	Probe ID No. _____ Probe Length _____
Barometric Pres. _____	Meter ΔH@ _____	Liner Material _____
Stack Static Pres. _____	Meter Calib (Y) _____	Probe Heat Setting _____

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
		14:41	450.05								
17	119		454.54	4.9	1.2	7	124	248	58	78	69
18	126		458.87	4.1	1.0	6	121	243	58	78	69
3- 19	133		462.07	2.1	.52	4	128	250	57	78	70
20	140		463.75	.55	.14	2	122	249	57	77	70
21	147		/	3.9	.94	6	122	248	58	77	71
22	154		471.48	3.8	.94	6	121	253	58	77	71
23	161		475.62	4.1	1.0	5½	120	250	58	78	73
24	168		479.63	3.9	.95	5	121	249	58	78	73
			Vol 86.38	$\overline{\sqrt{\Delta P}}$ 1.78	$\overline{\Delta H}$ .87		$\overline{T_s}$ 119.13			$\overline{T_M}$ 65.8	

.243

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Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 1 of 2

PARTICULATE FIELD DATA FORM

Plant Luzenac America		Location Threeforks		Stack ID No. Dryer	Stack Dimension 28 x 24
Date 02 16 94	Operator CWL	Run No. 2	Sample Box No. 3	Filter No. 992	Meter Box No. 3

Altitude ~4000	Alt. Corr.	
Barometric Reading		
Barometric Pres.	Xxxx	25.01
Stack Static Pres.	+2.5	

Assumed Moisture	1%
Ambient Temp.	36°F
Meter ΔH@	1.91
Meter Calib (Y)	1.011

Nozzle ID No.		Nozzle Dia.	.126
Probe ID No.	"	Probe Length	2'
Liner Material		SS	
Probe Heat Setting		250	

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	
		09:25	481.00									
L-1	6		484.93	5.2	1.29	5	105	254	41	40	36	.2537/.253
2	12		488.88	5.6	1.39	6	106	254		41	37	.249
3	18		492.82	5.5	1.37	6	110			45	39	
4	24		496.04	3.1	.77	3	112	249	54	50	41	.2571
5	30		498.00	1.1	.28	2	109	"		50	42	
6	36		499.17	.14	.04	0	104	251	56	49	43	.252
2-7	42		502.45	4.9	1.23	5	107			54	45	
8	48		506.35	5.0	1.26	5	110	249	58	58	47	
9	54		510.27	5.3	1.33	5½	113			60	49	
10	60		513.76	3.9	.98	3	112	249	57	60	50	
11	66		516.05	1.4	.35	2	111			60	51	
12	72		517.25	.28	.07	0	110	251	57	62	52	
3-13	78		/	4.6	1.15	5	112			64	54	.2552
14	84		/	4.5	1.15	5	116	249		64	54	
15	90		528.74	5.0	1.28	5½				66		
16	96		532.40	4.3	1.10	5	115					

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Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 2 of 2

PARTICULATE FIELD DATA FORM

Plant LA		Location Three Forks		Stack ID No. Dryer	Stack Dimension 24x24 =
Date 02 16 94	Operator CWL	Run No. 2	Sample Box No. 3	Filter No. 992	Meter Box No. 3

Altitude ____ Alt. Corr. ____	Assumed Moisture ____	Nozzle ID No. ____ Nozzle Dia. ____
Barometric Reading ____	Ambient Temp. ____	Probe ID No. ____ Probe Length ____
Barometric Pres. ____	Meter ΔH@ ____	Liner Material ____
Stack Static Pres. ____	Meter Calib (Y) ____	Probe Heat Setting ____

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
			532.40								
17	102		535.25	~~.56~~	2.2 ~~.22~~	3	114	249	50	67	58
18	108		536.86	.38	.10	0	112			67	59
4-19	114		/	4.0	1.02	5	110	249	52	67	59
20	120		544.04	4.1	1.05	5	114			69	61
21	126		/	4.5	1.15	5½	116	250	53	71	62
22	132		551	4.4	1.12	5	115			70	63
23	138		554.68	2.2	.56	3½	115	250	55	70	64
24	144		556.65	.88	.22 ~~.88~~		115			70	65
			Vol 75.65	$\sqrt{\Delta p}$ 1.77	ΔH .93		$\bar{T}_s$ 111.8			$\bar{T}_m$ 55.8	

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Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 1 of 2

PARTICULATE FIELD DATA FORM

Plant Luzenac America		Location Three Forks			Stack ID No. Dryer	Stack Dimension 24x23 =
Date 02 16 94	Operator CWL	Run No. 3	Sample Box No. 3		Filter No. 991	Meter Box No. 3

Altitude -4000	Alt. Corr.	
Barometric Reading		
Barometric Pres. ~~27.80~~ 25.01		
Stack Static Pres. 2.5		

Assumed Moisture	1%
Ambient Temp.	36°F
Meter ΔH@	1.91
Meter Calib (Y)	1.011

Nozzle ID No.		Nozzle Dia.	.126
Probe ID No.	"	Probe Length	2'
Liner Material	SS		
Probe Heat Setting	250		

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 Gas Sampler Temp at Dry Gas Meter (°F) Outlet	
		13:12	556.78									
1 - 1	6		560.90	5.1	1.32	3½	135	265	45	61	60	.259
2	12		564.95	5.4	1.33	3½	136			65	61	.242
3	18		568.91	5.1	1.26	3	137	249	45	67	61	
4	24	14:38	572.20	3.2	.79	2	107			65	64	
5	30		574.32	.94	.23	0	107	247	48	65	64	
6	36		575.22	.08	.02	0	101			68	65	
2 - 1	42		579.29	5.2	1.36	3½	96	252	50	68	65	.262
2	48		583.39	4.9	1.28	3	106			70	66	
3	54	15:21	587.34	5.4	1.41	3	117	246	52	70	66	
4	60		591.52	5.2	1.36	3½	122			74	70	
5	66		595.13	3.8	1.0	0	121	253	56	78	71	.2585
6	72		597.52	1.3	0.34	0	122			78	71	
3 - 1	78		598.55	.13	.03	0	122	251	58	78	72	
2	84		602.47	4.5	1.16	3	121			78	73	
3	90		606.18	4.4	1.14	3	120	248	59	78	73	
4	96		610.15	4.9	1.27		120			81	74	

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Form #M5-01 DO NOT WRITE ABOVE THIS LINE Sheet No. 2 of 2

PARTICULATE FIELD DATA FORM

Plant Lozenac America		Location Three forks		Stack ID No. Dryer	Stack Dimension 24x28
Date 02 16 94	Operator CWL	Run No. 3	Sample Box No. 3	Filter No. 991	Meter Box No. 3

Altitude ____ Alt. Corr. ____	Assumed Moisture ____	Nozzle ID No. ____ Nozzle Dia. ____
Barometric Reading ____	Ambient Temp. ____	Probe ID No. ____ Probe Length ____
Barometric Pres. ____	Meter ΔH@ ____	Liner Material ____
Stack Static Pres. ____	Meter Calib (Y) ____	Probe Heat Setting ____

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
			610.15								
5	102		613.85	4.0	1.03	3	103	251	61	82	76
6	108		616.40	1.7	.44	0	103			82	76
1	114		/	4.1	1.06	3	102	249	62	82	76
2	120		/	4.1	1.06	3	114			84	77
3	126		627.56	4.4	1.14	3	117	249	62	84	77
4	132		631.30	4.2	1.09	3	117			84	77
5	138		634.30	2.4	.62	2	117	250	64	84	77
6	144		637.14	.65	.17	2	117			84	77
			Vol 11226	$\overline{\sqrt{\Delta P}}$ 1.78	$\overline{\Delta H}$ .91		$\overline{T_s}$ 115.8			$\overline{T_M}$	72.9
			80.36								

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Form #M4-01

IMPINGER WATER CAPTURE FORM

Date Out 2/14/94 Initials CWC

Date In 2/16/94 Initials KDH

Company Lonza America Location Three Rocks

Stack Name Dryer

Run No. 1 Box No. 3 Filter No. _____

	Impinger 1 Std.	Impinger 2 Midg.	Impinger 3 Dry	Impinger 4 Silica
Final Weight	251.2			250.2
Initial Weight	253.15			237.15
Net Gain	-1.95			13.05
Total Gain (g): 11.1				

Units = Grams (milliliters)

COMMENTS: (Note: Weigh impingers without u-tubes, caps, or washers but with orifice tubes in place)

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Form #M4-01

IMPINGER WATER CAPTURE FORM

Date Out 2/14/94 Initials CWL

Date In 2/16/94 Initials KDH

Company Lonza America Location Three Forks

Stack Name Dryer

Run No. 2 Box No. 3 Filter No. 992

	Impinger 1 Std.	Impinger 2 Midg.	Impinger 3 Dry	Impinger 4 Silica
Final Weight	232.1			262.9
Initial Weight	236.7			245.8
Net Gain	-4.6			17.1
Total Gain (g): 12.5				

Units = Grams (milliliters)

COMMENTS: (Note: Weigh impingers without u-tubes, caps, or washers but with orifice tubes in place)

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Form #M4-01

IMPINGER WATER CAPTURE FORM

Date Out 2/14/94 Initials CWL

Date In 2/15/94 Initials KDH

Company Lonza America Location Three Rivers

Stack Name Dryer

Run No. 3 Box No. 2 Filter No. 994

	Impinger 1 Std.	Impinger 2 Midg.	Impinger 3 Dry	Impinger 4 Silica
Final Weight	220.9	/	/	245.3
Initial Weight	219.7	/	/	231.05
Net Gain	1.2	/	/	14.25
Total Gain (g): 15.45				

Units = Grams (milliliters)

COMMENTS: (Note: Weigh impingers without u-tubes, caps, or washers but with orifice tubes in place)

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APPENDIX C: LABORATORY DATA

Company:	Luzenac America	Source:	Dryer
Location:	Three Forks, MT	Operators:	CWL,
Date:	02/15-16/94	Results:	TSP, front half

Spreadsheet updated	03/22/94			
Run Input:	1	2	3	
BP Meter (" Hg)	25.80	25.01	25.01	
Run Time (min)	168.00	144.00	144.00	
Filter Number	990	992	994	
Test Date	02/15/94	02/16/94	02/16/94	
METER DATA & RESULTS				
Meter Air Vol (ft^3)	86.38	75.65	80.36	
Meter Vol. (std ft3)	75.82	65.63	67.48	
Meter Mean Delta H	0.87	0.93	0.91	
Meter Temp (F)	65.80	55.80	72.90	
Meter Temp (R)	525.80	515.80	532.90	
Nozzle Dia. (in)	0.125	0.125	0.125	
Nozzle Area (ft^2)	8.522E-05	8.522E-05	8.522E-05	
STACK DATA				
Stack Area (ft^2)	4.49	4.49	4.49	Averages
Stack Temp (F)	119.13	111.80	115.80	115.58
Stack Temp (R)	579.13	571.80	575.80	575.58
Stack Viscosity	na	na	na	0.00
Stack Pressure Gain	2.50	2.50	2.50	2.50
Stack Press. Abs.	25.98	25.19	25.19	25.46
Stack mean Sqrt Delta P	1.78	1.77	1.78	1.78
Stack mol. Wt (lb/lb-mol)	28.84	28.84	28.84	28.84
Stack Wet Molecular Wt	28.77	28.74	28.72	28.74
Stack Vel. (ft/sec)	112.52	112.95	114.02	113.16
Stack Flow (ft3/min)	30,312	30,428	30,717	30485
Stack Flow std-dry	23,836	23,449	23,465	23583
Stack Water Vol (std)	0.52	0.59	0.73	0.61
Stack % H2O	0.68	0.89	1.07	0.88
TEST DATA & RESULTS				
Impinger H2O (grams)	11.10	12.50	15.45	13.02
Part. Catch (mg)	6.4	4.3	8.4	6.33
Isokinetic %	99.82	102.47	105.28	102.52
Actual cyclone flow	na	na	na	0.00
D50 cut rate	na	na	na	0.00
lb / dscf STD	1.861E-07	1.428E-07	2.729E-07	2.01E-07
grains / dscf STD	1.30E-03	9.99E-04	1.91E-03	1.40E-03
lb / hour STD	0.266	0.201	0.384	0.284
lb / ft^3 Act.	1.464E-07	1.100E-07	2.084E-07	1.55E-07
grains / ft^3 Act.	1.02E-03	7.70E-04	1.46E-03	1.08E-03

Company:	Luzenac America	Source:	Crusher
Location:	Three Forks, MT	Operators:	CWL,
Date:	02/15-16/94	Results:	TSP, front half

Spreadsheet updated	03/15/94			
Run Input:	1	2	3	
BP Meter (" Hg)	25.80	25.01	25.01	
Run Time (min)	126.00	126.00	126.00	
Filter Number	998	996	993	
Test Date	02/15/94	02/16/94	02/16/94	
METER DATA & RESULTS				
Meter Air Vol (ft^3)	112.49	102.19	112.18	
Meter Vol. (std ft3)	97.70	87.88	93.20	
Meter Mean Delta H	2.48	2.16	2.32	
Meter Temp (F)	65.90	54.50	72.83	
Meter Temp (R)	525.90	514.50	532.83	
Nozzle Dia. (in)	0.236	0.236	0.238	
Nozzle Area (ft^2)	3.038E-04	3.038E-04	3.089E-04	
STACK DATA				
Stack Area (ft^2)	1.88	1.88	1.88	Averages
Stack Temp (F)	67.30	55.33	69.30	63.98
Stack Temp (R)	527.30	515.33	529.30	523.98
Stack Viscosity	na	na	na	0.00
Stack Pressure Gain	0.56	0.56	0.56	0.56
Stack Press. Abs.	25.84	25.05	25.05	25.31
Stack mean Sqrt Delta P	0.82	0.78	0.80	0.80
Stack mol. Wt (lb/lb-mol)	28.84	28.84	28.84	28.84
Stack Wet Molecular Wt	28.85	28.80	28.82	28.82
Stack Vel. (ft/sec)	49.77	47.34	49.19	48.77
Stack Flow (ft3/min)	5,614	5,340	5,549	5501
Stack Flow std-dry	4,858	4,563	4,625	4682
Stack Water Vol (std)	-0.07	0.36	0.20	0.16
Stack % H2O	-0.07	0.40	0.21	0.18
TEST DATA & RESULTS				
Impinger H2O (grams)	-1.45	7.55	4.25	3.45
Part. Catch (mg)	3.6	6.1	19.0	9.55
Isokinetic %	98.83	94.66	97.38	96.96
Actual cyclone flow	na	na	na	na
D50 cut rate	na	na	na	na
lb / dscf STD	8.125E-08	1.518E-07	4.495E-07	2.28E-07
grains / dscf STD	5.69E-04	1.06E-03	3.15E-03	1.59E-03
lb / hour STD	0.024	0.042	0.125	0.063
lb / ft^3 Act.	7.032E-08	1.297E-07	3.747E-07	1.92E-07
grains / ft^3 Act.	4.92E-04	9.08E-04	2.62E-03	1.34E-03

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** ≤ 1% of average total weight less average tare weight.

Plant LUZENAC - AMERICA	Location Three Forks
Test Dates 2/15-16/94	Stack ID DRYER

ID NO.	SAMPLE DESCRIPTION (filter, probe/nozzle wash, impinger catch, blank, etc.)	DESCRIPTION (Tare 1, Tare 2, Final 1, etc.)							
		INITIAL 1 + 2		INITIAL 3 + 4		Sample Volume	FINAL #1	FINAL #2	FINAL #3
		3/9 Date	3/15	3/16 Date	3/16	Date 3/16	Date 3/20	Date 3/21	Date 3/21
		10:30a Time	1:15p	8:30a Time	2:30p	Time 2:45p	Time 3:00p	Time 9:25a	Time 3:30p
		Initial	GKH	Initial	GKH	Initial GKH	Initial GKH	Initial GKH	Initial GKH
	RUN 1								
DI1	IMPINGER		173.6074		173.4955	225 mL	173.6152		173.6149
DP1	PROBE		110.9437		110.9129	50mL		110.9196	110.9191
990	FILTER		0.2955		0.2851		0.2952	0.2951	
	RUN 2								
DI2	Impinger	161.7340			161.7335	230mL		161.7346	161.7345
DP2	Probe		108.3037		108.3034	125.mL	108.3077	108.3080	
992	Filter		0.2837				0.2832	0.2831	
	RUN 3								
DI3	Impinger		156.9885		156.9776	210mL	156.9543	156.9544	
DP3	Probe	115.1045		115.1045		75mL	115.1127		115.1125
994	Filter		0.2857				0.2802	0.2803	

Form #M5-07

PARTICULATE DATA WORKSHEET

Plant LUZENAC - AMERICA	Location Three Forks
Test Dates 2/15-16/94	Stack ID DRYER

Sample Description	ID No.	Average Tare, G	Average Final, G	Net Particulate Gain, G	
Probe	DP1	110.9128	110.91935	0.00655	0.0064
Filter	990	0.2953	0.29515	-0.00015	
Impinger	DI1	173.60935	173.61505	0.0057	
Cyclone					
Probe	DP2	108.30355	108.30785	0.0043	0.00425
Filter	992	0.2832	0.28315	-0.00005	
Impinger	DI2	161.73375	161.73455	0.0008	
Cyclone					
Probe	DP3	115.1045	115.1126	0.0081	0.00835
Filter	994	0.2800	0.28025	0.00025	
Impinger	DI3	156.9478	156.95435	0.00655	
Cyclone					
Probe					
Filter					
Impinger					
Cyclone					
Water Blank					
Acetone Blank					
Field Filter Blank					
System Filter Blank					

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** ≤ 1% of average total weight less average tare weight.

Plant LUZENAC -AMERICA	Location Three Forks
Test Dates 2/15-16/94	Stack ID CRUSHER

ID NO.	SAMPLE DESCRIPTION (filter, probe/nozzle wash, impinger catch, blank, etc.)	DESCRIPTION (Tare 1, Tare 2, Final 1, etc.)							
		INITIAL #1	INITIAL #2	Sample Volume	FINAL #1	FINAL #2	FINAL #3	FINAL #4	FINAL #5
		Date 3/2	Date 3/3	Date 3/3	Date 3/4	Date 3/7	Date 3/9	3/8	3/10
		Time 2:30p	Time 9:45a.	Time 10:00a.	Time 10:20a	Time 3:45p	Time 10:00a	3:35p	3:00p
		Initial JKH	Initial JKH	Initial JKH	Initial JKH	Initial JKH	Initial JKH	JKH	JKH
	RUN 1								
CI-1	Impinger	155.6981	155.6983	200mL		155.6993	155.6990		
CP-1	Probe	97.2259	97.2261	70mL		97.2293	97.2293		
998	Filter	0.2905			0.2907	0.2909			
	RUN 2								
CI-2	Impinger	174.4509	174.4508	275mL	174.4532		174.4530		
CP-2	Probe	98.2245	98.2246	75mL	98.2308		98.2303		
996	Filter	0.2909			0.2909	0.2908			
	RUN 3								
CI3	Impinger	162.1509	162.1504	220mL		162.1629		162.1634	
CP-3	Probe	113.2544	113.2543	90 mL				113.2733	113.27
993	Filter	0.2805			0.2806	0.2806			

Form #M5-07

PARTICULATE DATA WORKSHEET

Plant LUZENAC AMERICA	Location Three Forks
Test Dates 2/15-16/94	Stack ID CRUSHER

Sample Description	ID No.	Average Tare, G	Average Final, G	Net Particulate Gain, G	
Probe	CP1	97.2260	97.2293	0.0033	.0036
Filter	998	0.2905	0.2908	0.0003	
Impinger	CI1	155.6982	155.69915	0.00095	
Cyclone					
Probe	CP2	98.22455	98.23055	0.006	.00605
Filter	996	0.2909	0.29085	-0.00005	
Impinger	CI2	174.45085	174.4531	0.0025	
Cyclone					
Probe	CP3	113.25435	113.27325	0.0189	.019
Filter	993	0.2805	0.2806	0.0001	
Impinger	CI3	162.15065	162.16315	0.0125	
Cyclone					
Probe					
Filter					
Impinger					
Cyclone					
Water Blank					
Acetone Blank					
Field Filter Blank					
System Filter Blank					

APPENDIX D: SOURCE TEST LOG AND SCHEMATICS

SOURCE TEST LOG

LUZENAC AMERICA ROTARY DRYER AND CRUSHER/LOADOUT

Date: 02/14/94

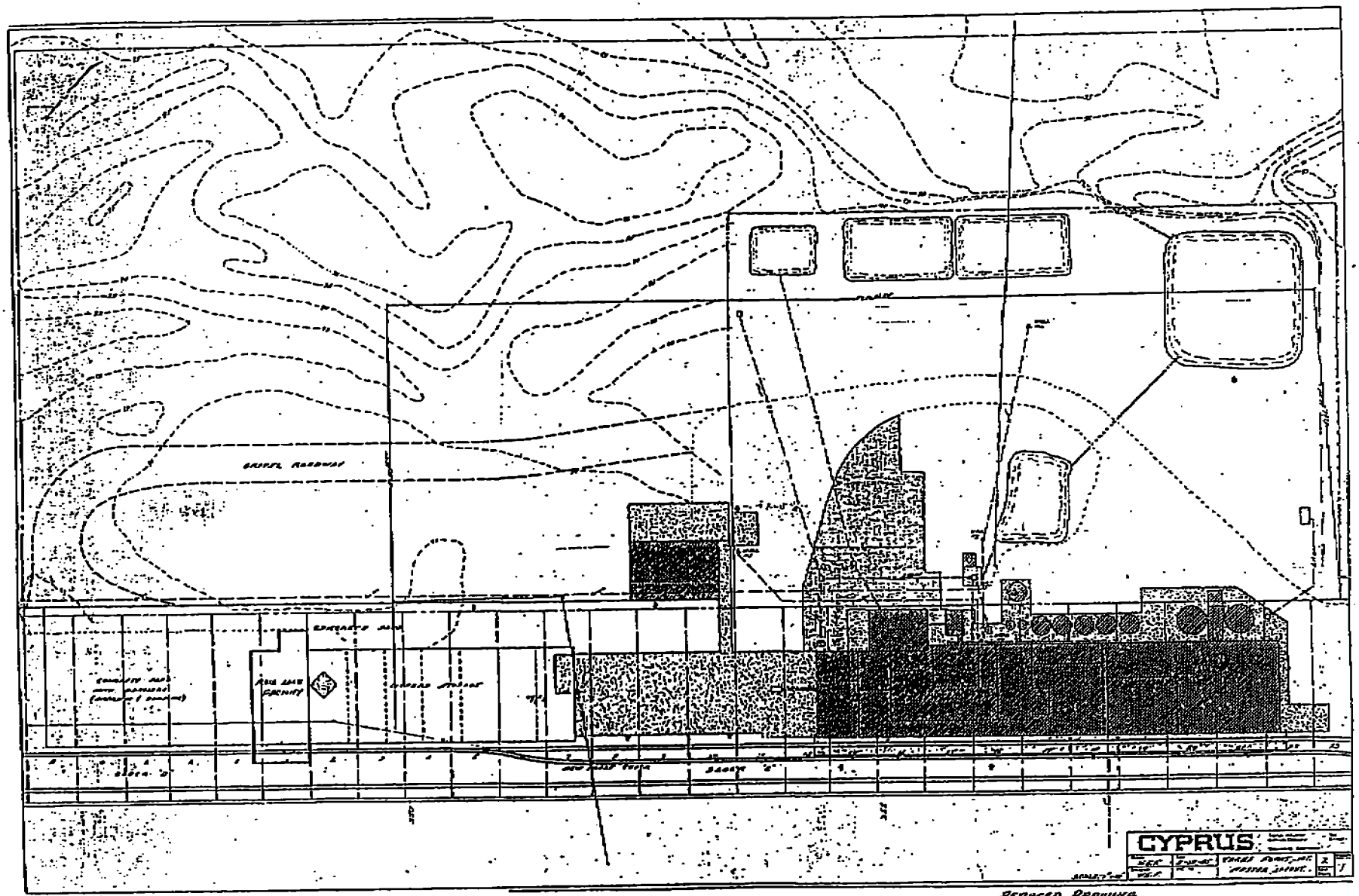
TIME	DESCRIPTION
14:00	Arrive at site
	Set up equipment
17:00	Leave site

Date: 02/15/94

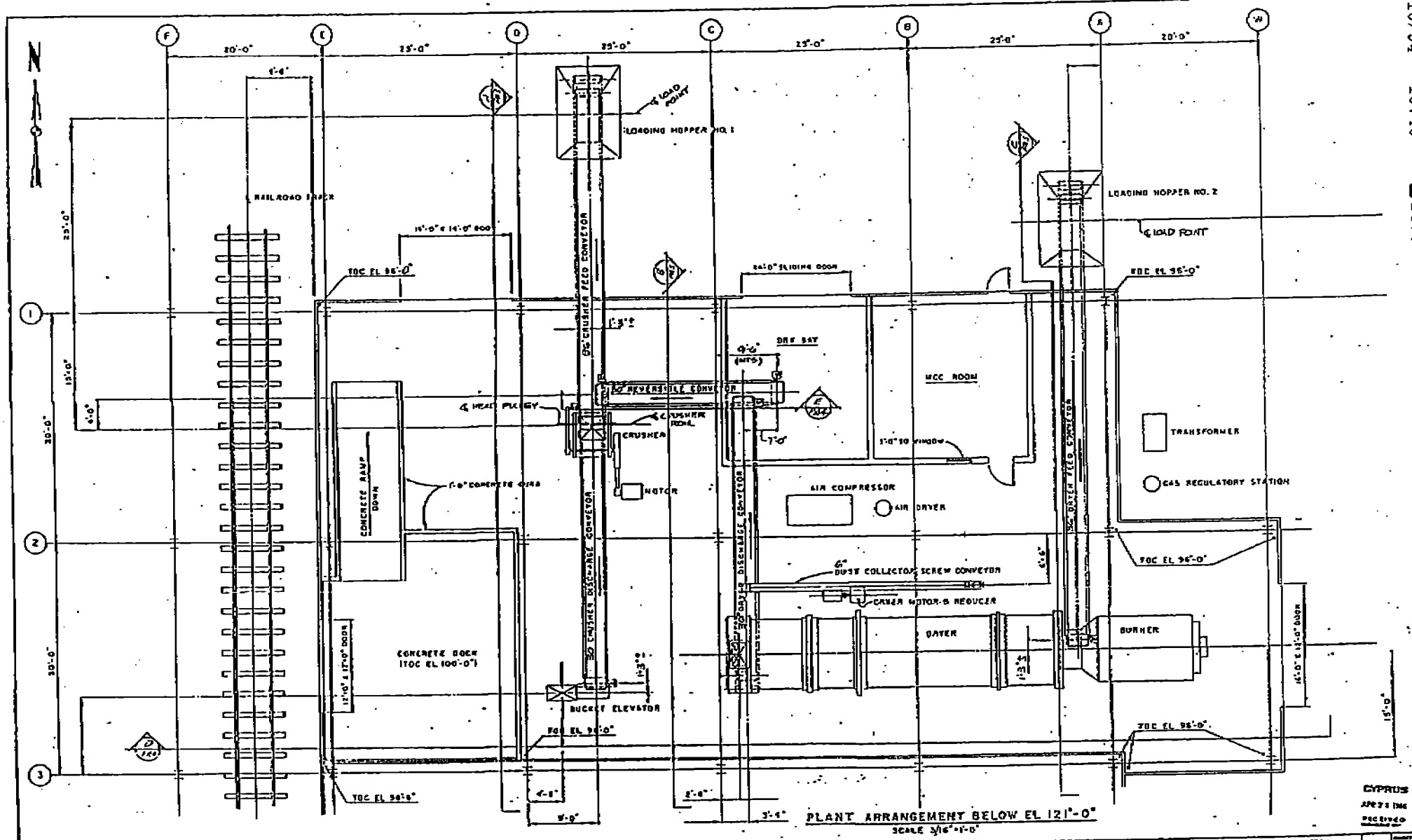
TIME	DESCRIPTION
09:00	Arrive at site
10:15	Conducted Method 2 and Method 3
11:30	Start test run #1
15:30	End test run #1
16:30	Leave site

Date: 02/16/94

TIME	DESCRIPTION
08:30	Arrive at site
09:20	Start test run #2
12:00	End test run #2
13:20	Start test run #3
16:30	End test run #3
17:30	Leave site



REDUCED DRAWING
SCALE: 1" = 100'

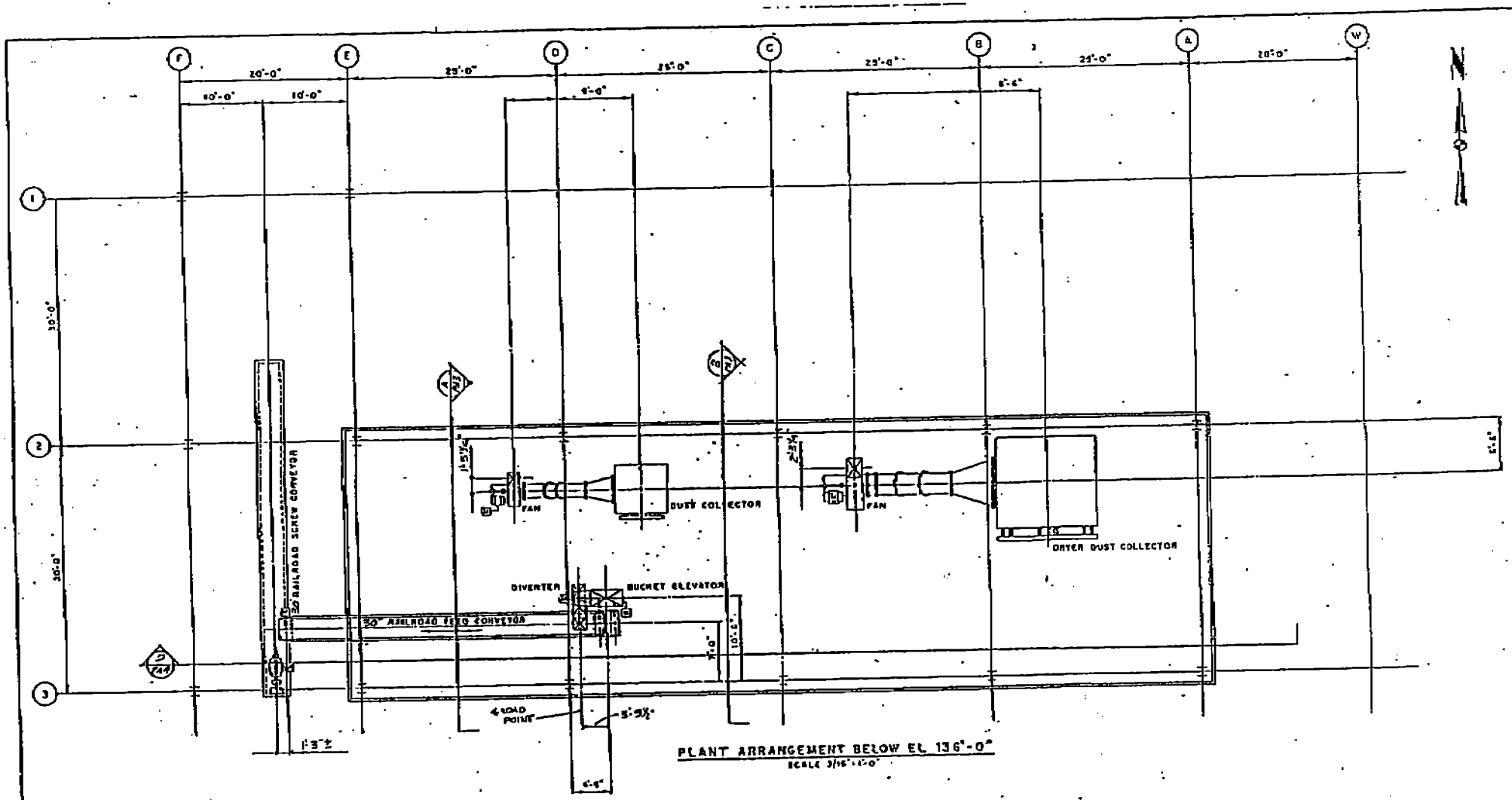


THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS

CYPRUS INDUSTRIAL MINERALS CO.
THREE FORKS, MONTANA

R.R. BULK LOADING FACILITY
PLANT ARRANGEMENT BELOW EL. 121'-0"

APR 21 1986
RECEIVED



PLANT ARRANGEMENT BELOW EL 136'-0"

SCALE 3/16"=1'-0"

CYPRUS

APR 21 1986

RECEIVED

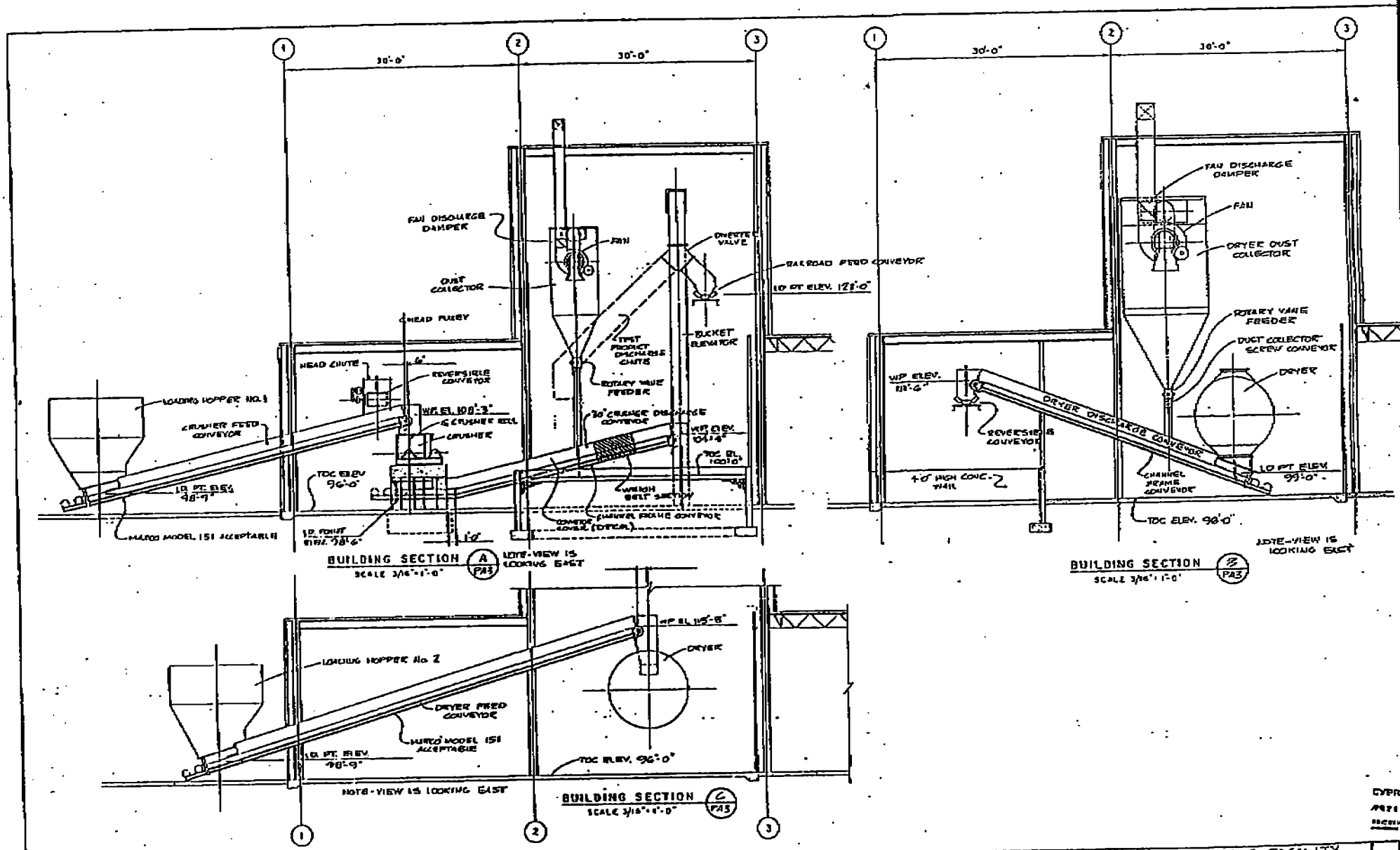
REVISIONS					
NO.	DATE	BY	NO.	DATE	BY

APRIL 1986 | CHK'D | 16-86 | A-3 NOTED | LAR

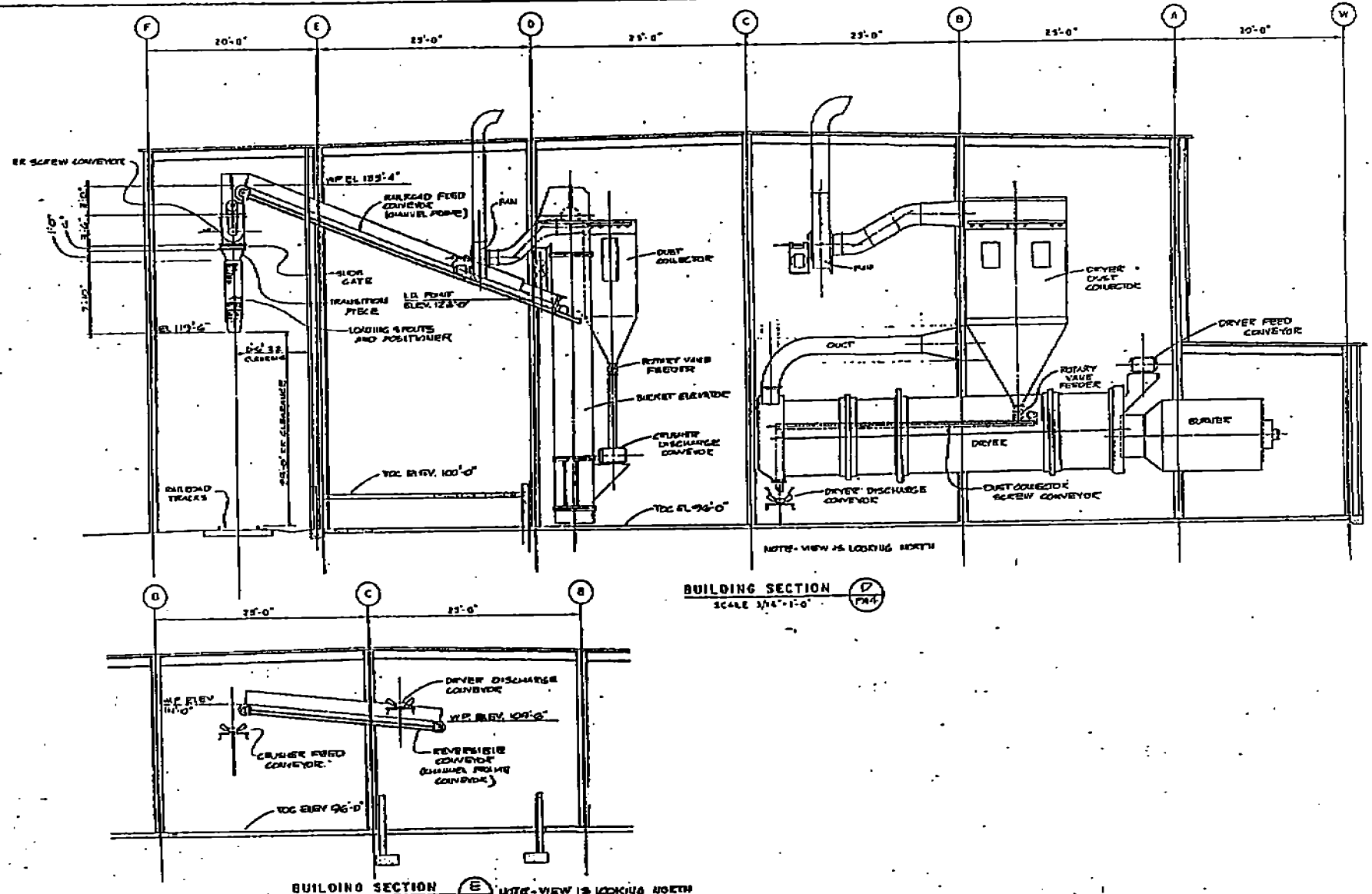
THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS, MONTANA

CYPRUS INDUSTRIAL MINERALS CO.
THREE FORKS, MONTANA

R.R. BULK LOADING FACILITY
PLANT ARRANGEMENT BELOW EL. 136'-0"



REVISIONS		THOMAS, DEAN & HOSKINS INC ENGINEERING CONSULTANTS	CYPRUS INDUSTRIAL MINERALS CO. THREE FORKS, MONTANA	R.R. BULK LOADING FACILITY



REVISIONS	TDH THOMAS, DEAN & HOSKINS INC. ENGINEERING CONSULTANTS	CYPRUS INDUSTRIAL MINERALS CO. THREE FORKS, MONTANA	R.R. BULK LOADING FACILITY

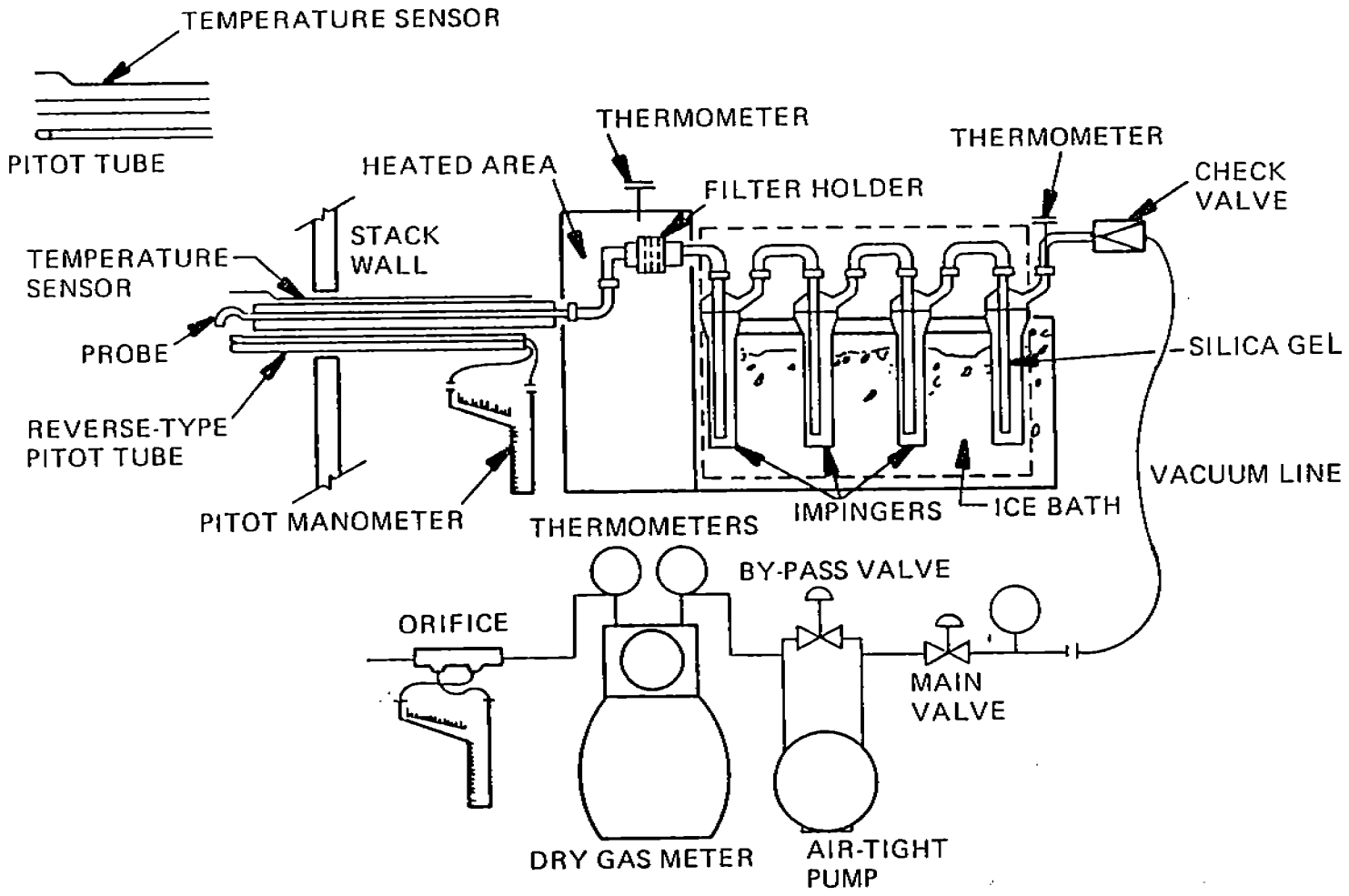
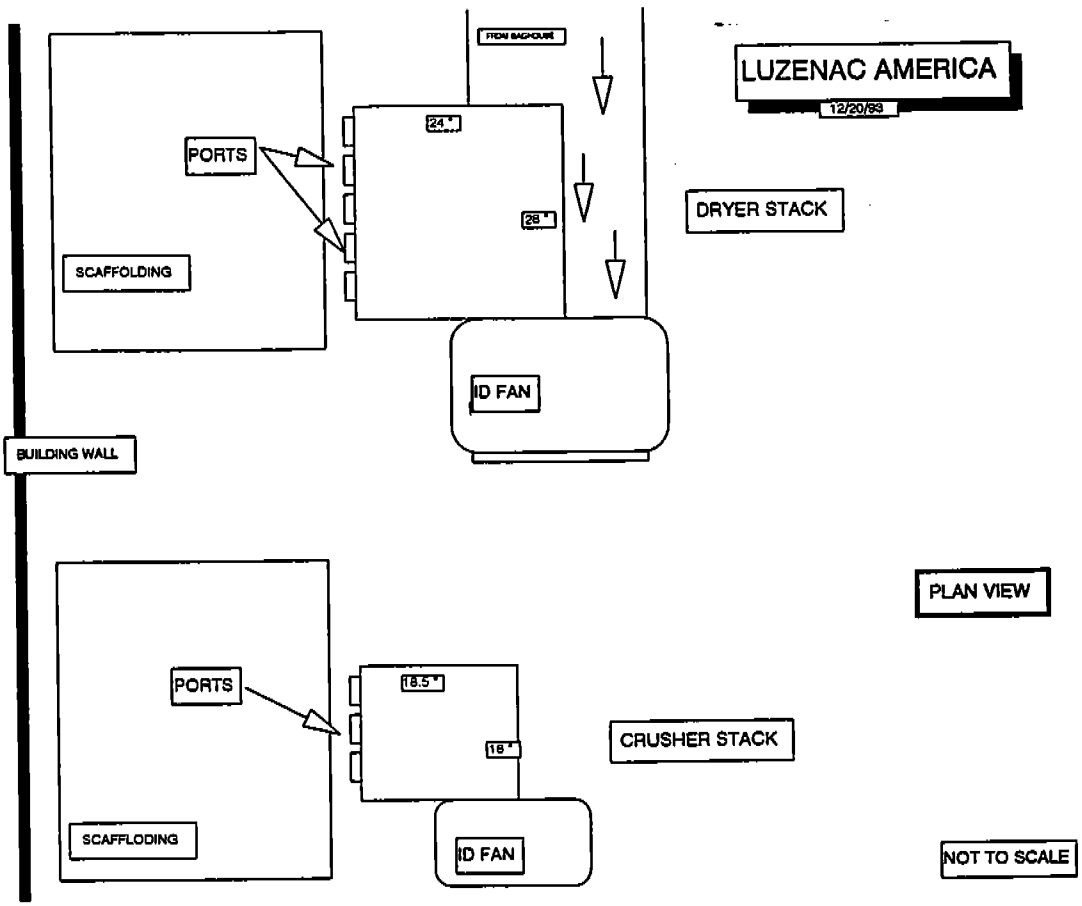
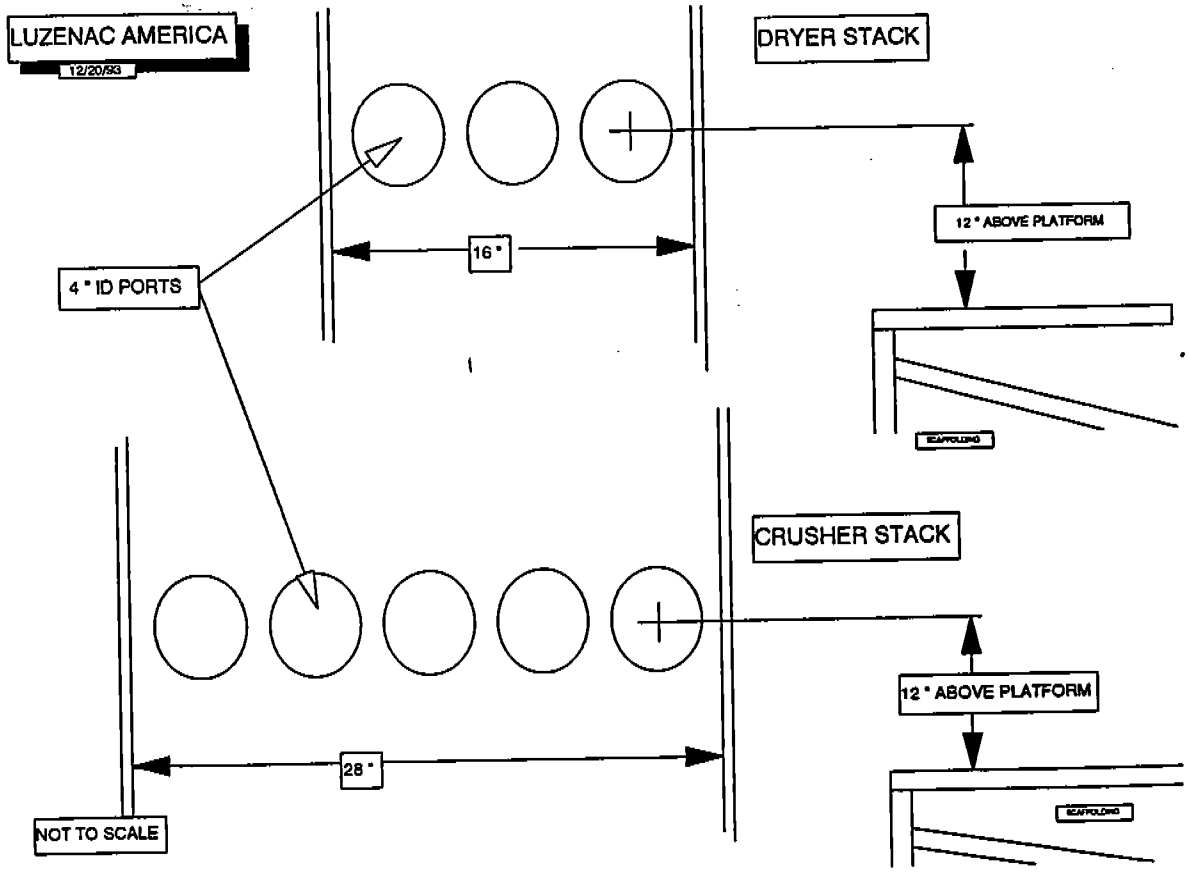


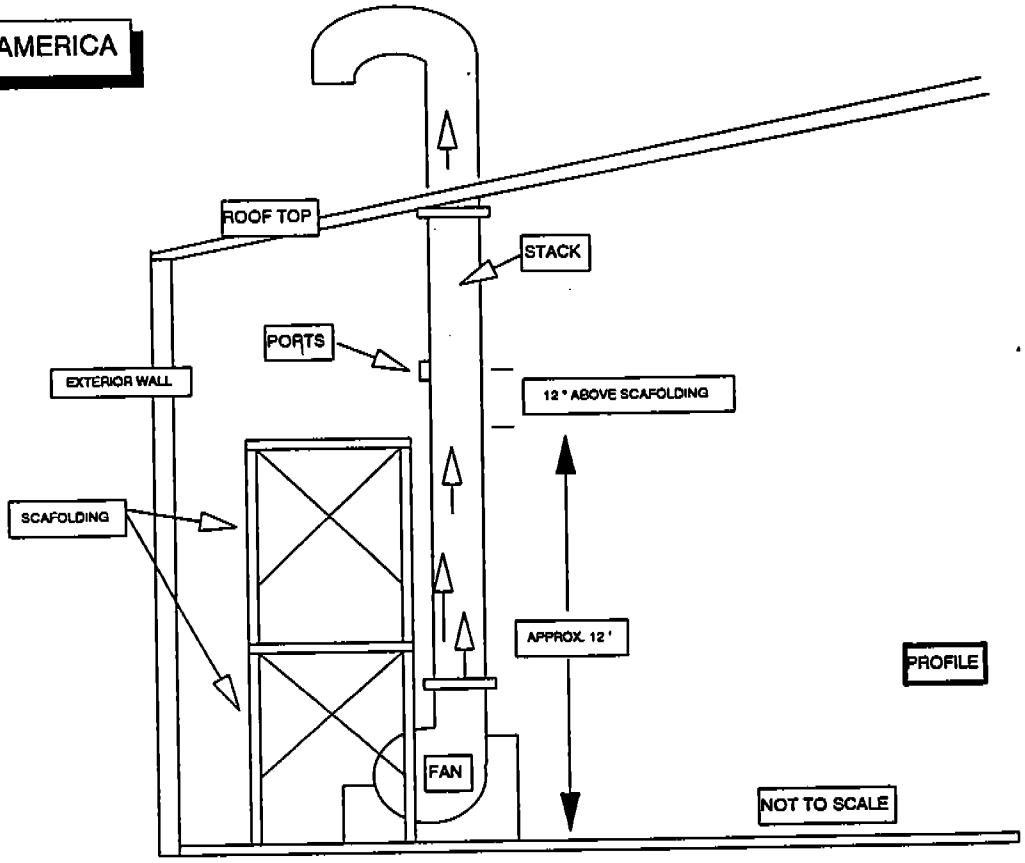
FIGURE 1
EPA METHOD 5 PARTICULATE SAMPLE APPARATUS


FROM BAGHOUSE
LUZENAC AMERICA
12/20/93
24"
28"
PORTS
DRYER STACK
SCAFFOLDING
ID FAN
BUILDING WALL
PLAN VIEW
18.5"
18"
PORTS
CRUSHER STACK
SCAFFLODING
ID FAN
NOT TO SCALE

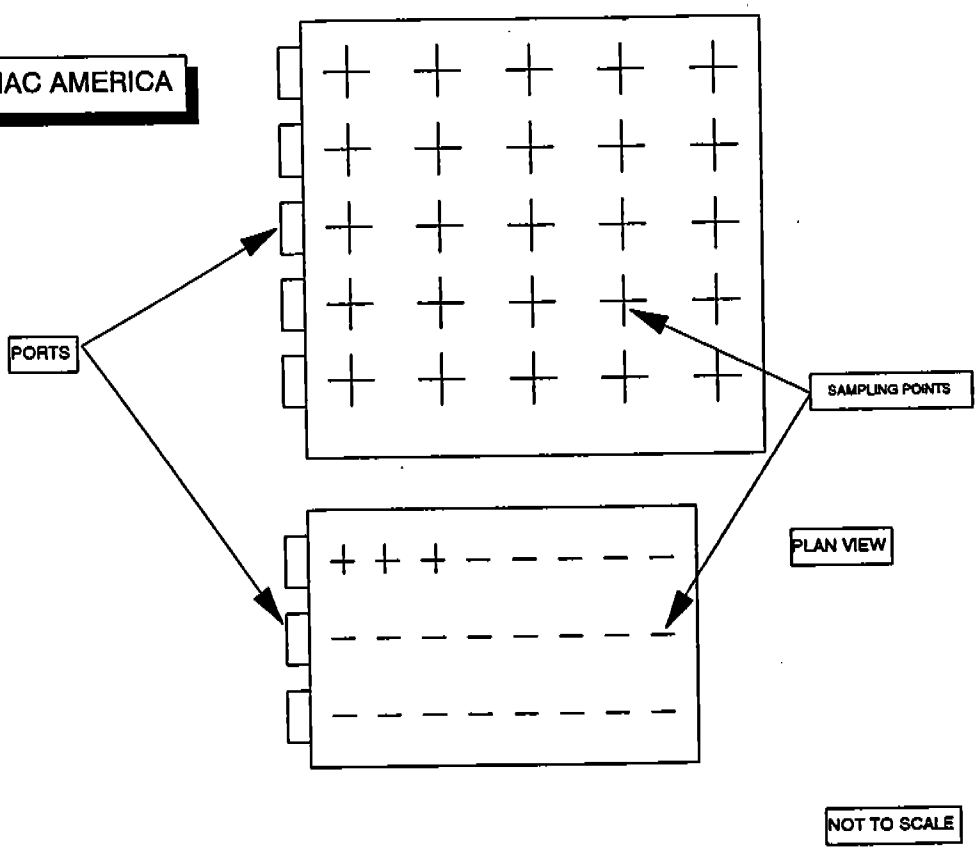

LUZENAC AMERICA
12/20/93
DRYER STACK
12 " ABOVE PLATFORM
16 "
4 " ID PORTS
SCAFFOLDING
CRUSHER STACK
12 " ABOVE PLATFORM
28 "
SCAFFOLDING
NOT TO SCALE

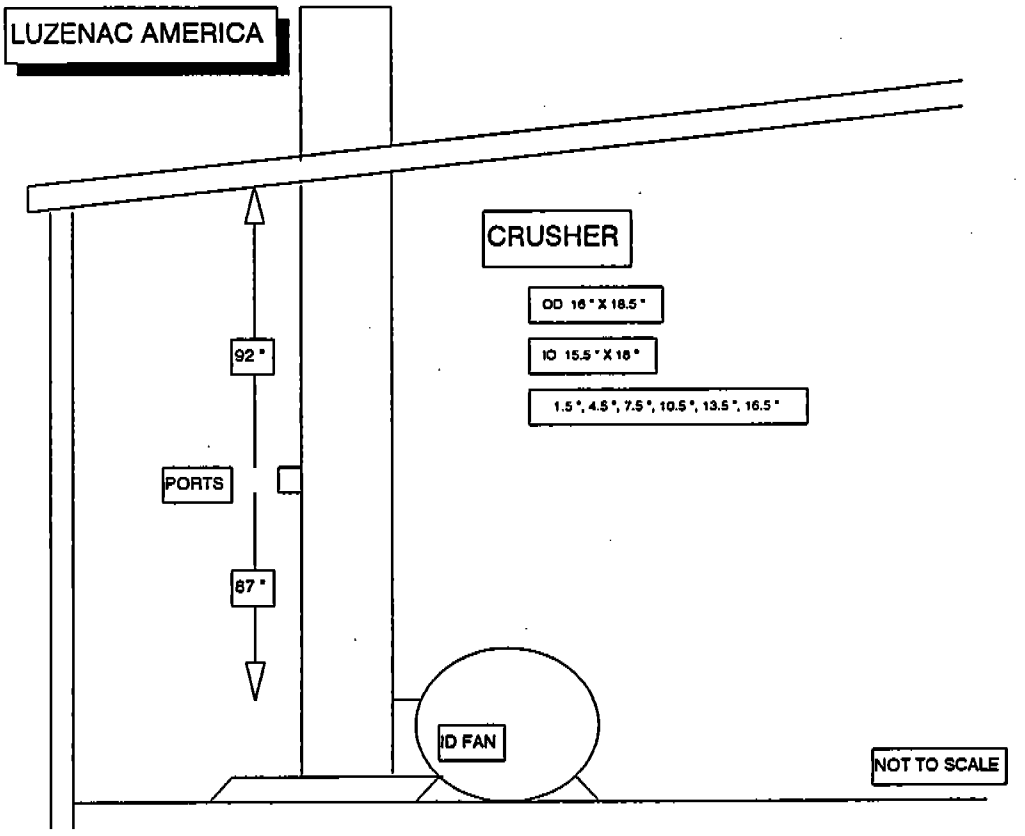
LUZENAC AMERICA

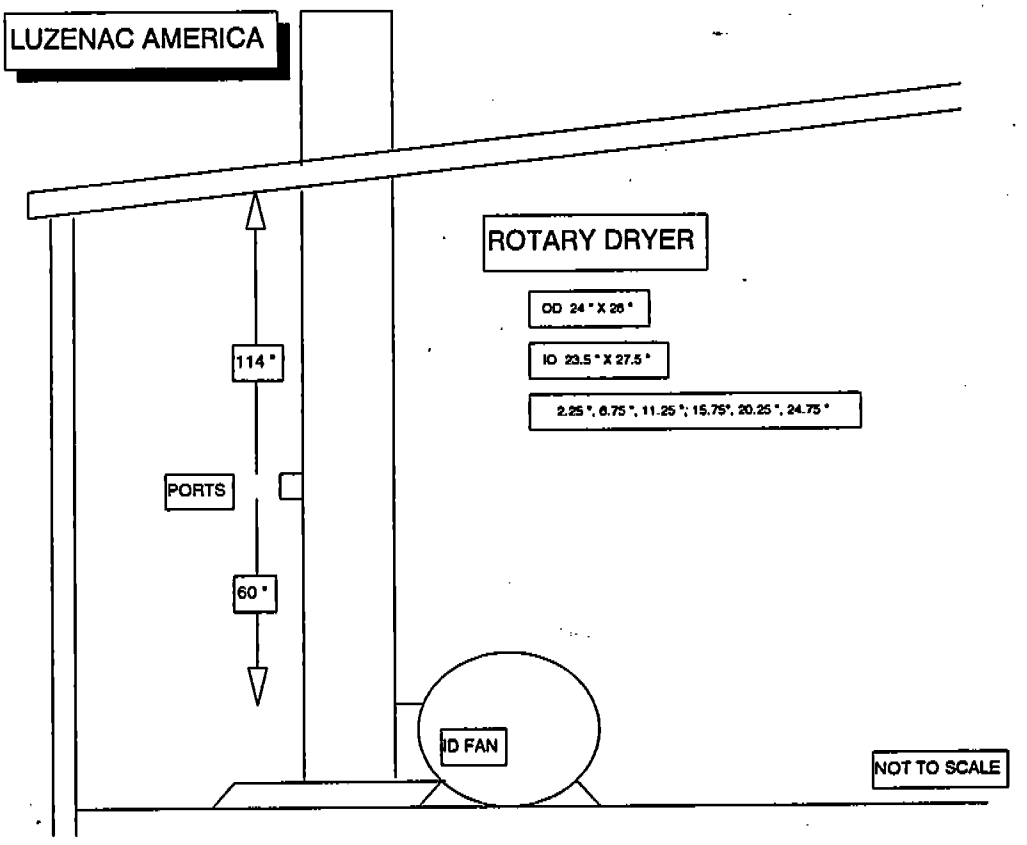
12/20/93



LUZENAC AMERICA




LUZENAC AMERICA
CRUSHER
OD 16" X 18.5"
ID 15.5" X 18"
1.5", 4.5", 7.5", 10.5", 13.5", 16.5"
92"
PORTS
87"
ID FAN
NOT TO SCALE


LUZENAC AMERICA
ROTARY DRYER
OD 24 " X 26 "
ID 23.5 " X 27.5 "
2.25 ", 6.75 ", 11.25 ", 15.75", 20.25 ", 24.75 "
114 "
PORTS
60 "
ID FAN
NOT TO SCALE

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
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_{hr}	Emission rate per hour; lb/hr
I	Percent sampling rate variation, where 100% = ideal isokinetic conditions
K_p	Pitot tube constant; 85.49 $ft/\sec\left(\frac{(lb/lbmole)\ (''Hg)}{R^\circ\ (''H_2O)}\right)$
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
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
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
$T_{s(avg)}$	Average stack gas temperature, abs.; °R
T_{std}	Absolute temperature @ standard conditions; 528°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)

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

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

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
m_n = mg

9. TSP Emission Rate pe

10. Percent Isokinetic Sar

11. Emission Rate: Oxyge

Where: F_d = 96(
= 924

12. Emission Rate: Carbor
Eq. 19-6)

Where: F_c = 19
= 183

APPENDIX F: CALIBRATION DATA

Form #M5-03

NOZZLE CALIBRATION DATA FORM

Date 02 15 94 Calibrated by Carl

Nozzle Identification Number	Nozzle Diameter			ΔD,[a] mm (in.)	D_{avg}[b]
	D_1, mm (in.)	D_2, mm (in.)	D_3, mm (in.)		
8-3	.236	.234	.236		.236
4-2	.125	.125	.126		
6-2	.187	.187	.186		
1-9	.178	.176	.176		
8-4	.238	.238	.239		.238

[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

Form #M5-08

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

Date February 28, 1994 Meter Box Number 80575 (2)

Barometric Pressure, P_b = 25.78 " Hg Calibrated by JKH

Vacuum During Calibration 2.5 " 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	Dry Gas Meter Inlet (t_{d_i}), °F	Dry Gas Meter Outlet (t_{d_i}), °F	
0.5	Start Read	56.350	523.244	75°	75°	75°	Ø
	End Read	61.350	528.270	75°	76°	75°	10.95
1.5	Start Read	61.688	528.619	76°	77°	75°	Ø
	End Read	66.690	533.637	76°	79°	76°	7.0
4.0	Start Read	67.214	534.149	77°	80°	76°	Ø
	End Read	72.219	539.132	77°	83°	77°	4.2

Y = 0.995

ΔH@ = 1.79

Rev. 11/93

Form #M5-08

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

Date 2/18/94 Meter Box Number 80709 (3)

Barometric Pressure, P_b = 25.80 " Hg Calibrated by JKH

Vacuum During Calibration 2.5 " 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	Dry Gas Meter Inlet (t_{d_i}), °F	Dry Gas Meter Outlet (t_{d_i}), °F	
0.5	Start Read	38.249	638.168	71°	69°	68°	0
	End Read	43.244	643.196	71°	70°	68°	11.8
1.5	Start Read	43.590	643.336	70°	70°	68°	0
	End Read	48.588	648.364	71°	73°	69°	7.0
4.0	Start Read	49.266	649.039	71°	73°	69°	0
	End Read	54.273	653.944	71°	75°	70°	4.2

Y = 0.996

ΔH@ = 1.90

Rev. 11/93