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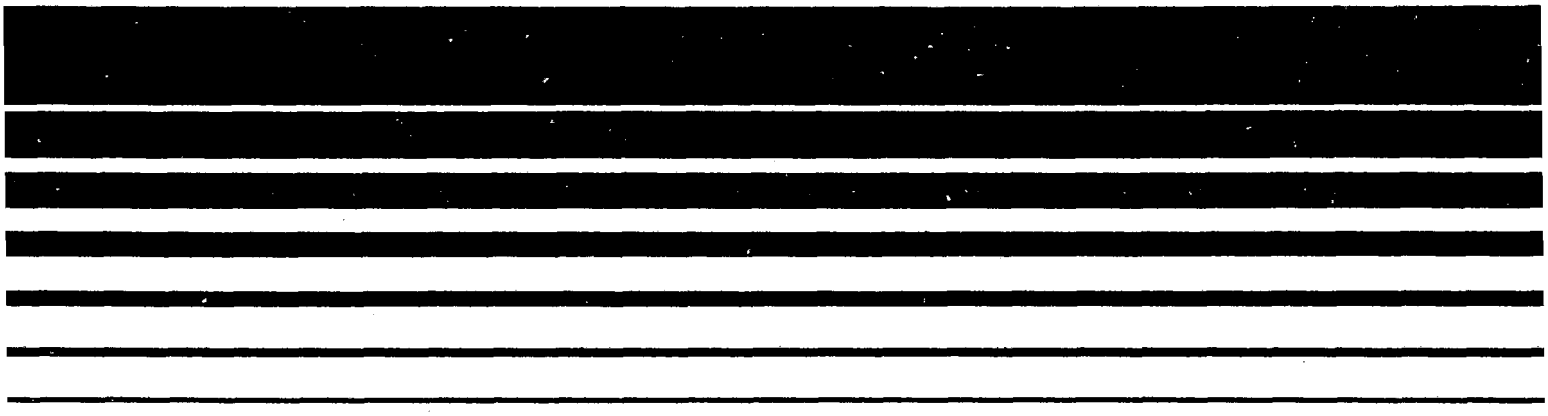
Air

EPA

Gypsum Industry

Emission Test Report
U.S. Gypsum Company
Shoals, Indiana



WESTON
DESIGNERS CONSULTANTS

SOURCE EMISSION TEST REPORT
United States Gypsum Company
Shoals, Indiana

- No. 4 Kettle Calciner Baghouse
- Rock Dryer Baghouse
- Board End Sawing Baghouse
- Other Process Emission Test Points

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SUMMARY

The Emission Measurement Branch of the U.S. Environmental Protection Agency contracted Roy F. Weston, Inc. (WESTON) to conduct a source testing and analysis program at United States Gypsum Company's Shoals, Indiana plant.

The program was designed to quantify selected process emissions and to determine collector performance. The locations tested, plus the number and types of tests performed at each site, are indicated below:

	Number of Test Repetitions by Type			
Source Description	Particulate	Particle Size Distribution	Visible Emission	Fugitive Emission
No. 4 Kettle Calciner Baghouse Inlet Duct	3	-	-	-
No. 4 Kettle Calciner Baghouse Discharge Stack	3	-	3	-
Rock Dryer Baghouse Inlet Duct	3	3	-	-
Rock Dryer Baghouse Discharge Stack	3	1	3	-
Board End Sawing Baghouse Discharge Stack	3	1	3	-
Scoring/Chamfering Operation (Station No. 5 and Cyclone Discharge Stack)	-	-	3	3
Surge Bin Baghouse Discharge Stack	-	-	3	-
Packer Baghouse Discharge Stack	-	-	3	3
Board End Sawing Station	-	-	-	3
No. 5 Upper Mixer Station	-	-	-	3
No. 5 Lower Mixer Station	-	-	-	3

The following test protocol was used during the survey:

Parameter	Test Method
Particulate	EPA 5[1]
Particle Size Distribution	Andersen 2000, Inc.[2]
Visible Emission	EPA 9[3]
Fugitive Emission	EPA 22[4]

Particulate matter concentration and mass rate results are summarized below:

No. 4 Kettle Calciner Baghouse Inlet Duct

Test Number	Date	Particulate Concentration Grains/DSCF	Particulate Mass Rate Pounds/Hour
1	6-3-80	96.7	467.
2	6-3-80	113.	507.
3	6-4-80	119.	515.
Series Average		-	497.

No. 4 Kettle Calciner Baghouse Discharge Stack

Test Number	Date	Particulate Concentration Grains/DSCF	Particulate Mass Rate Pounds/Hour
1	6-3-80	0.020	0.093
2	6-3-80	0.006	0.028
3	6-4-80	0.011	0.050
Series Average		-	0.057

Average collector efficiency = 99.99%.

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[1]Code of Federal Regulations, Title 40, Part 60, Appendix A, "Standards of Performance for New Stationary Sources," August 18,1977.

[2]Operating Manual for Andersen 2000, Inc., "Mark III Particle Sizing Stack Samplers," Andersen 2000, Inc., P.O. Box 20769, Atlanta, Georgia.

[3]Federal Register, Vol. 39, No. 219, November 12, 1974.

[4]Draft method, revised July 28, 1978.

Rock Dryer Inlet Duct

Test Number	Date	Particulate Concentration Grains/DSCF	Particulate Mass Rate Pounds/Hour
1	6-5-80	3.24	208.
2	6-6-80	4.18	257.
3	6-6-80	4.13	253.
Series Average		-	239.

Rock Dryer Discharge Stack

Test Number	Date	Particulate Concentration Grains/DSCF	Particulate Mass Rate Pounds/Hour
1	6-5-80	0.004	0.302
2	6-6-80	0.004	0.275
3	6-6-80	0.005	0.341
Series Average		-	0.306

Average collector efficiency = 99.87%.

Board End Sawing Baghouse Discharge Stack

Test Number	Date	Particulate Concentration Grains/DSCF	Particulate Mass Rate Pounds/Hour
1	6-5-80	0.002	0.066
2	6-5-80	0.007	0.197
3	6-5-80	0.010	0.307
Series Average		-	0.190

Average collector efficiency = 99.91%.

This efficiency was calculated based on an estimate of uncontrolled emissions from the plant's board end sawing operation. See Appendix C, Sample Calculations, for estimate workup. Note that the board end sawing baghouse inlet duct was not sampled due to the presence of large particulate (up to 6" long by 1/2" wide) which could not be collected representatively using a standard Method 5 train.

Detailed particulate, particle size distribution, visible and fugitive emission test data and test results are presented in the Test Results and Discussion Section.

INTRODUCTION

The Emission Measurement Branch of the U.S. Environmental Protection Agency contracted Roy F. Weston, Inc. (WESTON) to conduct a source testing and analysis program at the United States Gypsum Company's Shoals, Indiana facility. The objective of the testing program was to measure emission parameters relating to the gypsum ore processing operations at the plant.

The locations tested, plus the number and types of tests performed at each site, are listed below:

1. No. 4 Kettle Calciner Baghouse Inlet Duct

   a. Three particulate tests by EPA Method 5.

2. No. 4 Kettle Calciner Baghouse Discharge Stack

   a. Three particulate tests by EPA Method 5.

   b. Three opacity tests by EPA Method 9 simultaneously with the three particulate tests.

3. Rock Dryer Inlet Duct

   a. Three particulate tests by EPA Method 5.

   b. Three particle size distribution tests by cascade impaction (Andersen).

4. Rock Dryer Discharge Stack

   a. Three particulate tests by EPA Method 5.

   b. One particle size distribution test by cascade impaction (Andersen).

   c. Three opacity tests by EPA Method 9 simultaneously with the three particulate tests.

5. Board End Sawing Baghouse Discharge Stack

   a. Three particulate tests by EPA Method 5.

   b. One particle size distribution test by cascade impaction (Andersen).

   c. Three opacity tests by EPA Method 9 simultaneously with the three particulate tests.

6. Board End Sawing Station

   a. Three fugitive tests by EPA Method 22.

7. Scoring/Chamfering Operation

   a. Three opacity tests by EPA Method 9 on cyclone stack discharge.

   b. Three fugitive tests by EPA Method 22 on Station No. 5.

8. Surge Bin Baghouse Discharge Stack

   a. Three opacity tests by EPA Method 9.

9. Packer Baghouse Discharge Stack

   a. Three opacity tests by EPA Method 9.

   b. Three fugitive tests by EPA Method 22.

10. No. 5 Upper Mixer Station

    a. Three fugitive tests by EPA Method 22.

11. No. 5 Lower Mixer Station

    a. Three fugitive tests by EPA Method 22.

PROCESS DESCRIPTION AND OPERATION

PLANT DESCRIPTION

The United States Gypsum, Shoals, Indiana plant produces wallboard and plaster products from gypsum ore mined about one mile from the plant. A simplified flow diagram for the process used at the Shoals plant is shown in Figure 1. Ore stockpiled at the plant is crushed to about minus 5 cm (2 inches) and then dried to remove surface moisture. The dry ore is further ground to about 90 percent minus 100 mesh in a grinding mill. The ground crude gypsum, primarily calcium sulfate dihydrate ($CaSO_4 \cdot 2H_2O$), is heated to around 571K (300°F) to remove 75 percent of its water of hydration and thus form calcium sulfate hemihydrate ($CaSO_4 \cdot 1/2H_2O$). This process is known as calcining. The calcined gypsum or stucco is mixed with starch, water, and other additives to form a slurry. The slurry is spread between two paper sheets and formed into wet wallboard. The wallboard is subsequently dried in a multi-deck kiln, trimmed to the correct size, and shipped to distributors.

PROCESS EQUIPMENT TESTED

The emission tests conducted at the Shoals plant are shown in Table 1. A brief description of the major processing equipment tested at the plant is provided in the following sections.

Rock Dryer

The rock dryer employed at the Shoals plant is a direct-fired, co-current rotary dryer. As crushed wet gypsum is passed through the dryer, surface moisture is evaporated by hot combustion gases. A schematic diagram of this type of dryer is shown in Figure 2.

Kettle Calciner

The calciner used at the Shoals plant is a continuous kettle calciner. As finely ground gypsum is fed to the kettle, hot combustion gases are passed through flues inside the kettle to provide an indirect transfer of heat to the ore. The heating of the ore causes the chemical reaction which produces stucco. A schematic diagram of the calcining kettle is shown in Figure 3.

Table 1 Emission Tests Conducted at USG, Shoals, Indiana Plant

Process Tested	Date	Control Method	Test Type	Inlet[a] Test	Outlet[a] Test
Continuous Kettle Calciner	6/3/80 6/4/80	Baghouse	Particulate Loading Particle Size Visible Emissions	EPA-5(3) Bahco(1) N/A	EPA-5(3) Bahco(1) EPA-9
Rock Dryer	6/5/80 6/6/80	Baghouse	Particulate Loading Particle Size Visible Emissions	EPA-5(3) Andersen(3) N/A	EPA-5(3) Andersen(1) EPA-9
Board End Sawing	6/5/80	Baghouse	Particulate Loading Particle Size Visible Emissions	- - -	EPA-5(3) Andersen(1) EPA-9
Board End Sawing	6/6/80	Capture Hood	Visible Emissions	EPA-22	EPA-22
Paper Scoring	6/2/80 6/3/80	Capture Device/ Cyclone	Visible Emissions	EPA-22	EPA-9
Plaster Mixing and Bagging	6/3/80 6/4/80	Capture Device/ Baghouse	Visible Emissions	EPA-22	EPA-9
Stucco Storage and Transfer	6/10/80	Baghouse	Visible Emissions	-	EPA-9
#1 Pin Mixer	6/3/80	Capture Device	Visible Emissions	EPA-22	-
#2 Pin Mixer	6/4/80	Capture Device	Visible Emissions	EPA-22	-

[a]Numbers in parenthesis represent the number of individual tests performed at the site.

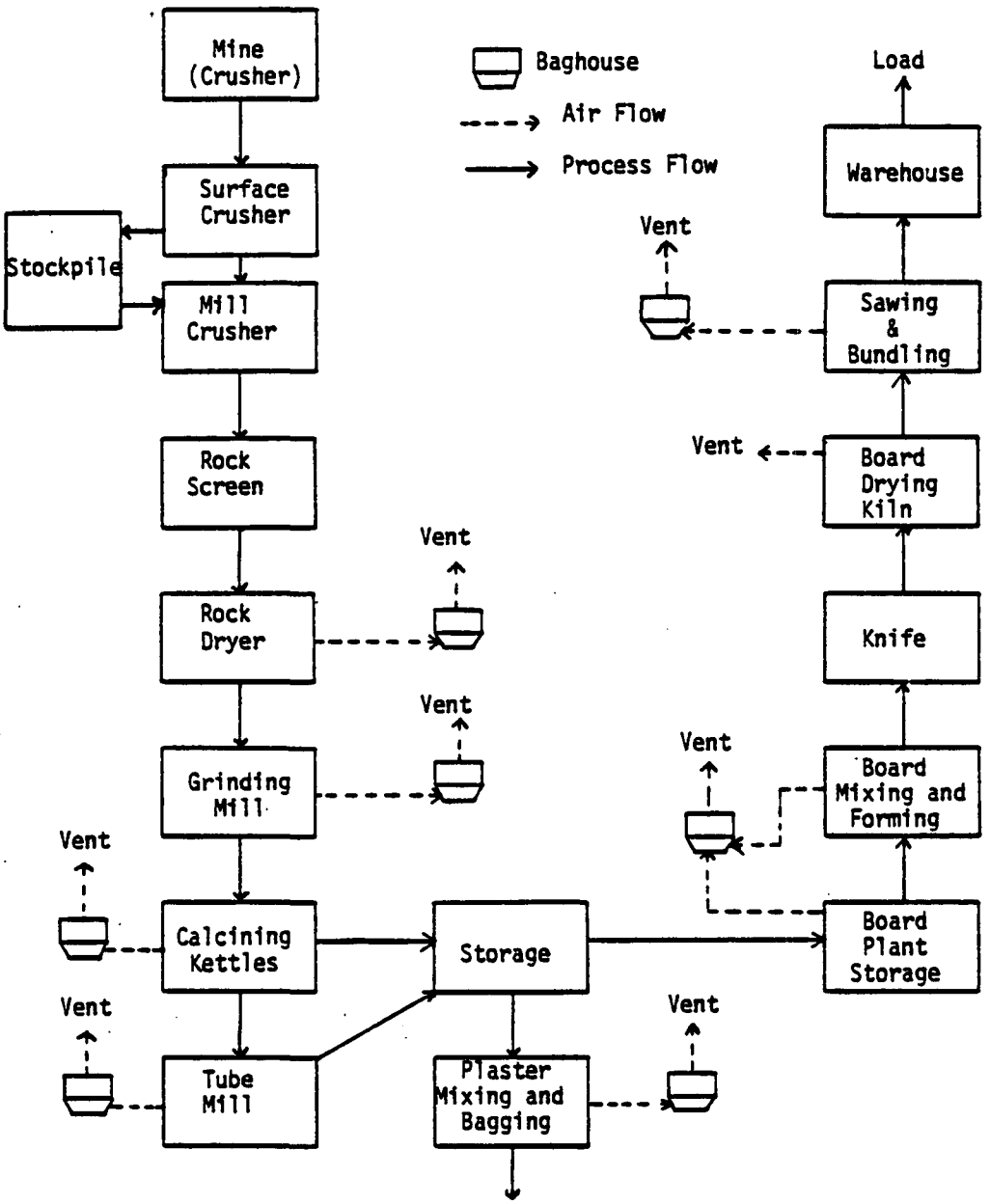


FIGURE 1 BLOCK FLOW DIAGRAM FOR SHOALS BOARD PLANT

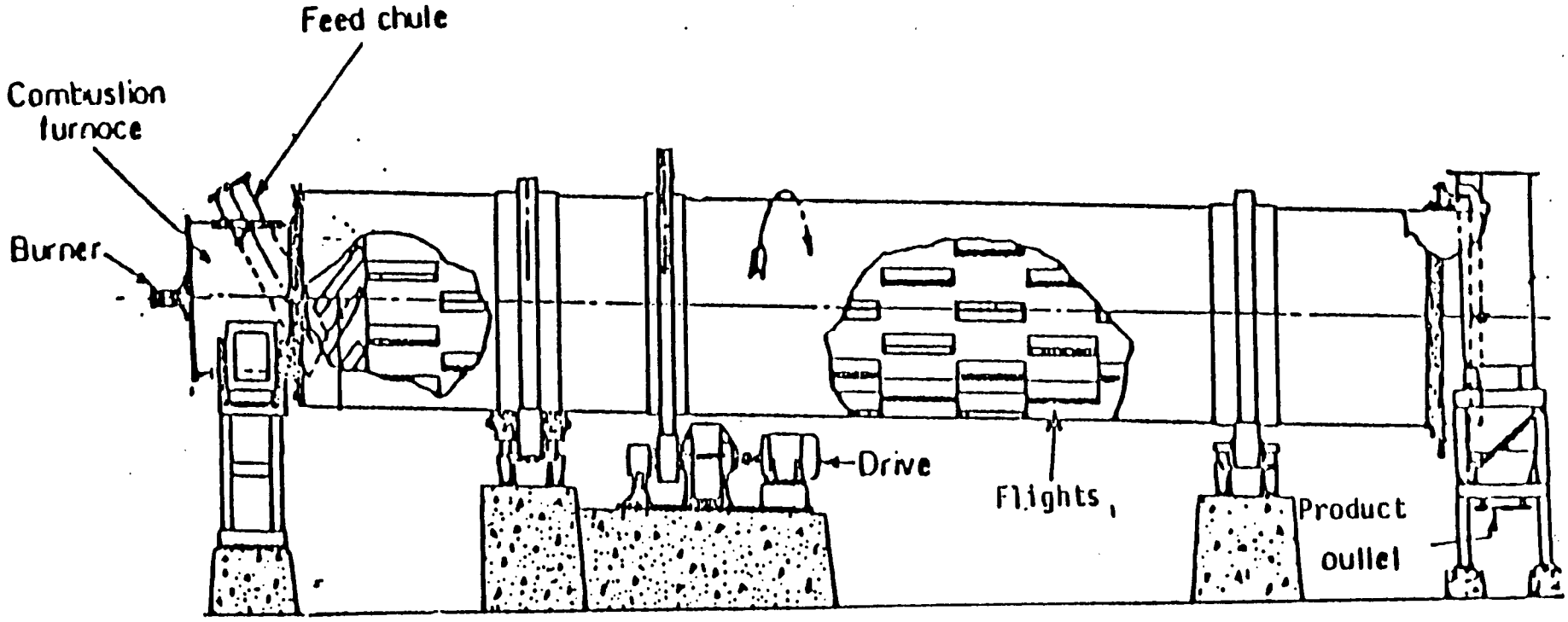
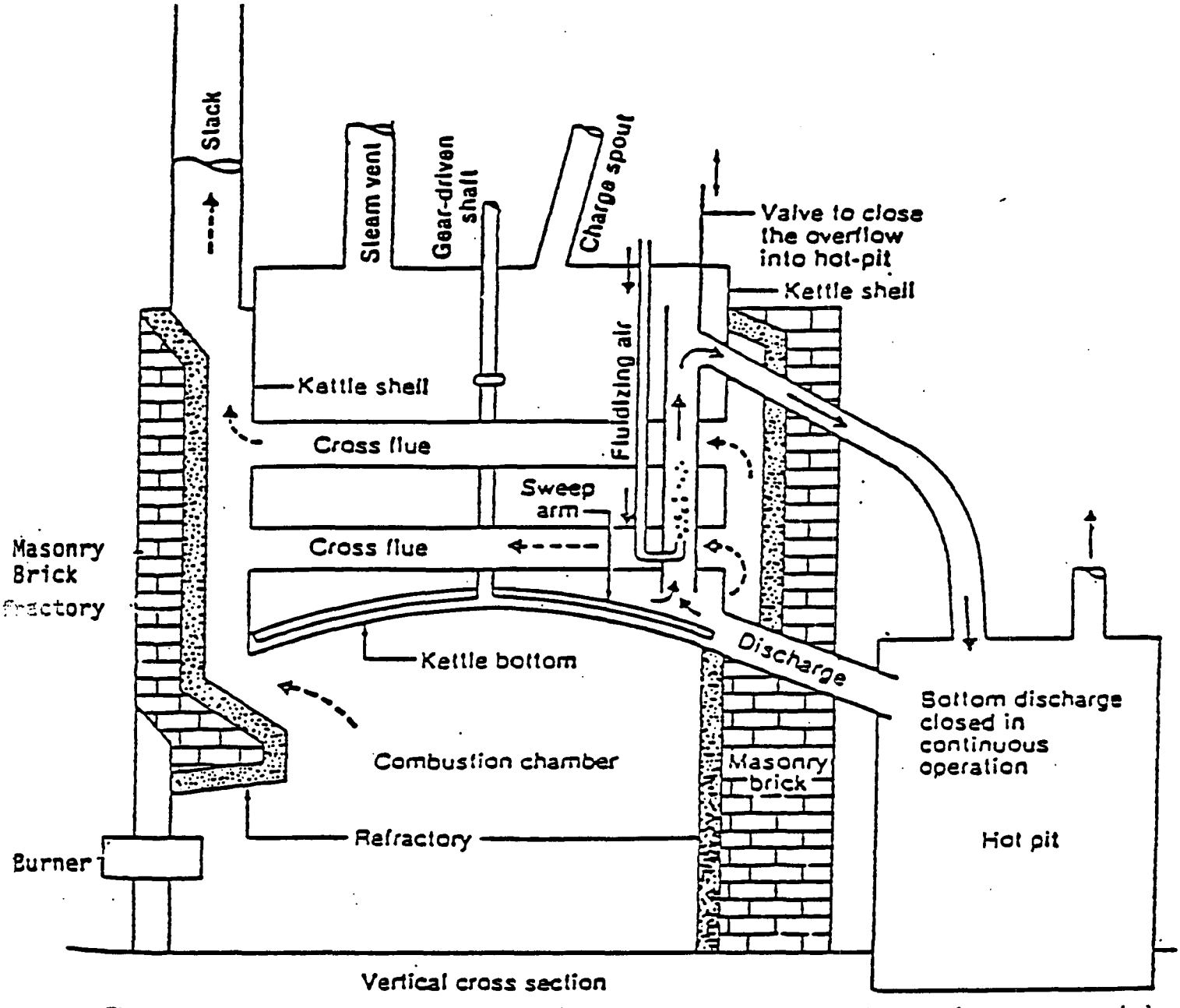


FIGURE 2 DIRECT FIRED, CO-CURRENT, ROTARY DRYER[1]



The continuous calcining kettle. Stucco is discharged continuously by introducing compressed air into an overflow channel inside (solid arrows). Heat flows from the firebox, around baffles, through the flues and out the stack (broken arrows).

FIGURE 3 DIAGRAM OF CALCINING KETTLE (MODIFIED FOR CONTINUOUS OPERATION) [2]

Stucco Storage and Transfer

The stucco storage and transfer system tested at the plant employs an air conveyor to transfer stucco from a conveyor belt to a 27.2 Mg (30 ton) surge bin and conventional screw conveyors to transfer the stucco from the bin to the board forming line.

Board Forming Line

The two boardlines tested at the Shoals plant are of average size and together are capable of producing about 51 million square meters (550 million square feet) of wallboard per year on a half-inch basis. The process operations tested on the boardlines, which include board end sawing, paper scoring, and pin mixing, are typical of those used throughout the gypsum industry.

Plaster Mixing and Bagging

The plaster mixing and bagging unit at the Shoals plant is typical of those used throughout the gypsum industry.

EMISSION CONTROLS

Fabric filter dust collectors are used at the Shoals plant to control gypsum particulate emissions. Dust-laden gases exiting the rock dryer and the kettle calciner are vented to separate baghouses. The dryer has four Buell cyclones upstream of the baghouse. Emissions from conveyors, bucket elevators, and storage bins are vented to fabric filter dust collectors. Boardline emissions from dry mixing, and board end sawing, are also controlled by baghouses. Paper scoring and pin mixing emissions from one of the boardlines are controlled by a cyclone only. Pin mixing on the other boardline is vented to a baghouse. Emissions from the plaster mixing and bagging operation are vented to a separate baghouse.

Design and operating parameters for the baghouses tested at the Shoals plant are given in Table 2. Estimated operating capacities for the process units vented to the stucco storage and transfer baghouse are given in Table 3.

Normal replacement frequencies and most recent replacement dates for bags in the dust collectors tested are shown in Table 4.

Table 2 Control Equipment Parameters

Process Unit Name	Baghouse Manufacturer (Cleaning Type)	Number of bags	Bag Dimensions (diam.x length in inches)	Cloth Area (square ft.)	Fabric Type	Design Air Flow (m^3/sec)	Design Air Flow (ACFM)	Air to Cloth Ratio (feet/min.)	Duration of Cleaning Cycle (sec.)	Frequency of Cleaning	Pressure of pulse (psig)
Continuous calciner kettle	Flex Kleen (reverse pulse)	80	6 x 84	800	Orlon Felt	1.89	4,000	5:1	0.1	10 sec	90
Rock dryer	Flex Kleen (reverse pulse)	160	6 x 84	1,600	Orlon Felt	4.72	10,000	6.25:1	0.1	10 sec	90
Board end sawing	Dracco (shaker)	80	25 x 117	4,560	Dacron	2.83	6,000	1.3:1	60	15 min	N/A
Mixing and bagging	Flex Kleen (reverse pulse)	144	5 x 112	1,584	(suited to 300°F)	1.42	3,000	2:1	0.1	10 sec	90
Stucco	Wheelabrator	144	5 x 112	1,584	Dacron	1.42	3,000	2:1	60	15 min	N/A

Table 3 Stucco Storage and Transfer System

Process Unit Name	Estimated Operating Capacity[a]
Storage Bin	27.2 Mg (30 Tons)
Air Conveyor (transfers stucco to storage bin)	24.5 Mg/hr (27 TPH)
Screw conveyor (stucco to admix)	24.5 Mg/hr (27 TPH)
Admix conveyor	27.2 Mg (30 TPH[b])
Pin mixer[b]	48.1 Mg (53 TPH)

[a]TPH = Tons per hour

[b]Operating capacity includes stucco plus additives.

Table 4 Bag Replacement Schedules

Process Unit Name	Last Date of Bag Replacement	Normal Replacement Frequency[a] (months)
Continuous kettle	2/29/80	10-12
Rock dryer	1/26/80	10-12
Board end sawing	3/23/80	12
Stucco transfer and storage	4/21/79	12
Mixing and bagging	5/28/80 (20 new bags)	12

[a]These values are estimates.

PROCESS CONDITIONS DURING TESTING

In order to ensure that the ore dryer, calciner, boardline, and plaster operations were operating at representative steady-state conditions during the testing, various process parameters were monitored.

All processes operated normally during the emission testing. The operating condition of each of the processes is discussed in the following sections.

Continuous Kettle Calciner

During the emission testing of the continuous kettle calciner, the calciner was operating at full capacity, producing 11.5 tons of calcined gypsum or stucco per hour. The average heat usage of the unit during the testing was 0.85 KJ/g (0.73 million Btu/ton) of product. The unit was burning natural gas. The stucco product from the kettle contained combined moisture of 5.7 percent during the testing. Process data collected during each of the three EPA Method 5 test runs on the continuous kettle are shown in Tables 5, 6, and 7, respectively. The kettle operated normally during all three test runs.

Rock Dryer

During the emission testing, the rock dryer was operating at 92 percent of design capacity, producing 70 tons of dry rock per hour. Process data collected during the EPA Method 5 test runs is shown in Tables 8, 9, and 10, respectively. The average heat usage of the dryer during the testing was 0.08 KJ/g (0.07 million Btu/ton) of dried rock. The dryer was burning natural gas. The free moisture content of the ore entering the dryer was 1 to 1.5 percent, and the free moisture content of the exiting rock was less than 0.5 percent.

Some fluctuation in the dryer temperature was observed throughout the testing of the dryer. These fluctuations were due to the fact that the automatic controller on the dryer was out of service and the fuel firing rate was under manual control. Changes in the free moisture content of the gypsum feed would require a different firing rate. Manual changes in the firing rate were made whenever the dryer operating temperature varied significantly from a desired value. The length of time required for restabilization of the temperature, which ranged from 10 to 30 minutes, was dependent on the extent of the deviation from the desired temperature at the time the firing rate was reset.

Table 5 Process Data From Continuous Kettle: Run No. 1

Plant: USG
Location: Shoals, Indiana
Date: 6/3/80

Local Time	Flue Gas[a] Temperature K (°F)	Stucco[b] Temperature K (°F)	Process Gas[c] Stack Draft (inches H_2O)	Fabric Filter Pressure Drop (inches H_2O)
9:05 a.m.	416 (290)	377 (220)	-1.1	2.5
9:19	415 (288)	377 (220)	-1.2	-
9:25	414 (285)	377 (220)	-0.9	-
9:34	415 (287)	377 (220)	-1.0	2.5
9:48	414 (285)	377 (220)	-0.9	-
10:30	415 (287)	377 (220)	-1.1	2.5
10:55	414 (286)	377 (220)	-1.1	-
11:20	414 (285)	377 (220)	-1.1	2.8
11:30	414 (285)	377 (220)	-1.1	2.8
12:25	414 (285)	377 (220)	-1.2	-

[a]Measured at point where flue gas leaves the kettle.

[b]Same as process gas exit temperature.

[c]Static pressure at point where process gas leaves kettle.

Table 6 Process Data From Continuous Kettle: Run No. 2

Plant: USG
Location: Shoals, Indiana
Date: 6/3/80

Local Time	Flue Gas[a] Temperature K (°F)	Stucco[b] Temperature K (°F)	Process Gas[c] Stack Draft (inches H_2O)	Fabric Filter Pressure Drop (inches H_2O)
1:25 p.m.	414 (285)	377 (220)	-1.1	2.7
2:00	414 (285)	377 (220)	-1.0	2.7
2:25	414 (285)	377 (220)	-1.1	2.7
2:54	414 (285)	377 (220)	-1.1	2.6
3:13	414 (285)	377 (220)	-1.1	-
3:26	414 (285)	377 (220)	-1.1	-
3:40	413 (284)	377 (220)	-1.1	2.6
4:07	414 (285)	377 (220)	-1.1	-

[a]Measured at point where flue gas leaves the kettle.

[b]Same as process gas exit temperature.

[c]Static pressure at point where process gas leaves kettle.

Table 7 Process Data From Continuous Kettle: Run No. 3

Plant: USG
Location: Shoals, Indiana
Date: 6/4/80

Local Time	Flue Gas[a] Temperature K (°F)	Stucco[b] Temperature K (°F)	Process Gas[c] Stack Draft (inches H_2O)	Fabric Filter Pressure Drop (inches H_2O)
8:35 a.m.	414 (285)	377 (220)	-1.1	2.5
9:02	414 (285)	377 (220)	-1.1	-
9:17	414 (285)	377 (220)	-1.2	2.5
9:28	413 (284)	377 (220)	-1.2	-
9:58	413 (284)	377 (220)	-1.1	2.5
10:23	413 (284)	377 (220)	-1.2	-

[a]Measured at point where flue gas leaves the kettle.

[b]Same as process gas exit temperature.

[c]Static pressure at point where process gas leaves kettle.

Table 8 Process Data From Rock Dryer: Run No. 1

Plant: USG
Location: Shoals, Indiana
Date: 6/5/80

Local Time	Rock[a] Temperature K (°F)	Dryer Temperature K (°F)	Fabric Filter Pressure Drop (inches H_2O)
6:06 p.m.	322 (120)	333 (140)	2.1
6:32	324 (124)	337 (147)	2.1
6:45	325 (126)	335 (144)	2.2
6:55	326 (127)	335 (143)	2.1
7:10	326 (127)	335 (143)	2.1
7:30	326 (127)	335 (144)	2.1

[a]Measured at point where rock exits dryer.

Table 9 Process Data From Rock Dryer: Run No. 2

Plant: USG
Location: Shoals, Indiana
Date: 6/6/80

Local Time	Rock[a] Temperature K (°F)	Dryer Temperature K (°F)	Fabric Filter Pressure Drop (inches H_2O)
7:56 a.m.	327 (130)	340 (152)	2.4
8:11	327 (127)	334 (142)	2.4
8:20	325 (125)	333 (140)	2.4
8:30	325 (126)	334 (142)	2.4
8:49	325 (126)	335 (143)	2.4
9:33	326 (127)	336 (146)	2.4
9:40	326 (127)	337 (148)	-
9:53	326 (128)	337 (148)	2.5
10:20	326 (128)	337 (148)	2.5
10:35	327 (129)	337 (148)	-
10:53	326 (128)	336 (146)	2.6

[a]Measured at point where rock exits dryer.

Table 10 Process Data From Rock Dryer: Run No. 3

Plant: USG
Location: Shoals, Indiana
Date: 6/6/80

Local Time	Rock[a] Temperature K (°F)	Dryer Temperature K (°F)	Fabric Filter Pressure Drop (inches H_2O)
11:36 a.m.	326 (128)	337 (147)	2.6
11:50	327 (129)	338 (149)	2.6
11:58	327 (130)	338 (149)	2.6
12:06	327 (130)	339 (150)	2.6
12:15	327 (130)	339 (150)	2.6
12:25	328 (131)	340 (152)	2.6
12:38	329 (132)	341 (154)	2.6
12:45	329 (132)	341 (154)	2.6
12:55	329 (132)	340 (152)	2.6
1:00	329 (132)	340 (152)	2.6
1:15	329 (132)	341 (154)	-
1:25	329 (132)	341 (154)	2.6

[a]Measured at point where rock exits dryer.

Estimates of the effect of the temperature fluctuations on the air flow rate through the dryer show that the maximum variation in the flow rate during all three test runs should be no greater than two percent.

The dryer at the Shoals plant has a small heater downstream of the four small Buell cyclones which are at the outlet of the dryer. The emission tests performed on the inlet to the collector were performed downstream of the heater. The purpose of the heater is to heat the process gases entering the baghouse. Heating these gases reduces the risk that wet particulate matter will enter the baghouse and blind the filter bags. The burner on the heater is rated at 440 KJ/sec (1.5 million Btu/hour). The instrumentation used to measure the natural gas usage of the rock dryer measured the sum of the main dryer burner and the heater. Between the first and second test runs, the heater was inadvertently left off. Some difference in the temperature of the gas stream entering the baghouse may be observed between the first and second test runs because the temperature set-point on the heater controller was moved by maintenance and operation personnel.

Stucco Storage and Transfer

The storage and transfer system was operating at normal capacity during the emission testing.

Board End Sawing

During the board end sawing testing, the No. 2 boardline was running regular, one half inch board, 12 feet in length. The line was operating at a rate of 47.9 meters per minute (157 feet per minute).

Mixing and Bagging

The plaster mixing and bagging operation was operated by a single operator during the testing. Generally, the process is operated by two operators, one person working the batch mixer and a second working the bagging machine. During the testing, the operator would mix a single batch of plaster, about 1,453 Kg (3,200 pounds), and then return to the bagging machine. Although operation with a single operator is somewhat abnormal for this plant, the test data should still be representative since both emission sources, mixing and bagging, were in continuous operation. During most of the testing, the plant was bagging normal plaster which is about 99-percent stucco; during the remainder of the testing, the plant was bagging a special plaster

containing 13-percent perlite. The plaster was being put in 50-lb bags at the rate of 500 bags per hour.

Other Process Operations

The remaining processes tested, which include paper scoring and pin mixing, were tested under normal operating conditions.

PROCESS DECRIPTION REFERENCES

1. U.S. Environmental Protection Agency. Sodium Carbonate Industry - Background Information for Proposed Standards. Research Triangle Park, North Carolina. EPA-450/3-80-029a. p. 3-30.

2. Permit Application for Construction at Sweetwater, Texas plant. United States Gypsum Company. Texas Air Control Board, Austin, Texas. 19 June 1979.

DESCRIPTION OF PARTICULATE TEST LOCATIONS

NO. 4 KETTLE CALCINER BAGHOUSE INLET DUCT

Three 3 1/2" I.D. test ports, one inch apart, were placed on a straight section of the 11 3/4" x 17 1/2" metal duct at a location 8.2 diameters (10') downstream and 6.6 diameters (8') upstream from the nearest flow disturbances. EPA Method 1 criteria for this test location required a minimum of 9 traverse points. See Figure 4 for port and sampling point locations.

NO. 4 KETTLE CALCINER BAGHOUSE DISCHARGE STACK

Two 3 1/2" I.D. test ports, 90° apart, were placed on a straight section of the 12" I.D. metal stack at a location $>$ eight diameters ($>$ 8') downstream and three diameters upstream from the nearest flow disturbances. Eight sampling points (4 per port) were required for testing. See Figure 5 for port and sampling point locations.

ROCK DRYER BAGHOUSE INLET DUCT

Two 3 1/2" I.D. test ports were placed at right angles on the 23 1/4" I.D. metal stack, less than 1 diameter from both upstream and downstream flow disturbances. The test site required a minimum of 32 traverse points (16 per port). Figure 6 illustrates port and sampling point locations.

ROCK DRYER BAGHOUSE DISCHARGE STACK

Two 3 1/2" I.D. test ports were placed 90° apart on the 23 3/4" I.D. metal duct leading from the Rock Dryer Baghouse. The ports were placed 12.6 diameters (25') downstream and 6.1 diameters (12') upstream from the nearest gas stream flow disturbances. EPA Method 1 required a minimum of 8 traverse points (4 per port) for this test location. See Figure 7 for port and sampling point locations.

BOARD END SAWING BAGHOUSE DISCHARGE STACK

Two 3 1/2" I.D. test ports were placed at right angles on the 11 1/2" I.D. metal stack 15.6 diameters downstream and 5.2 diameters upstream from the nearest flow disturbances. The test site required a minimum of 8 traverse points (4 per port). Figure 8 illustrates port and sampling point locations.

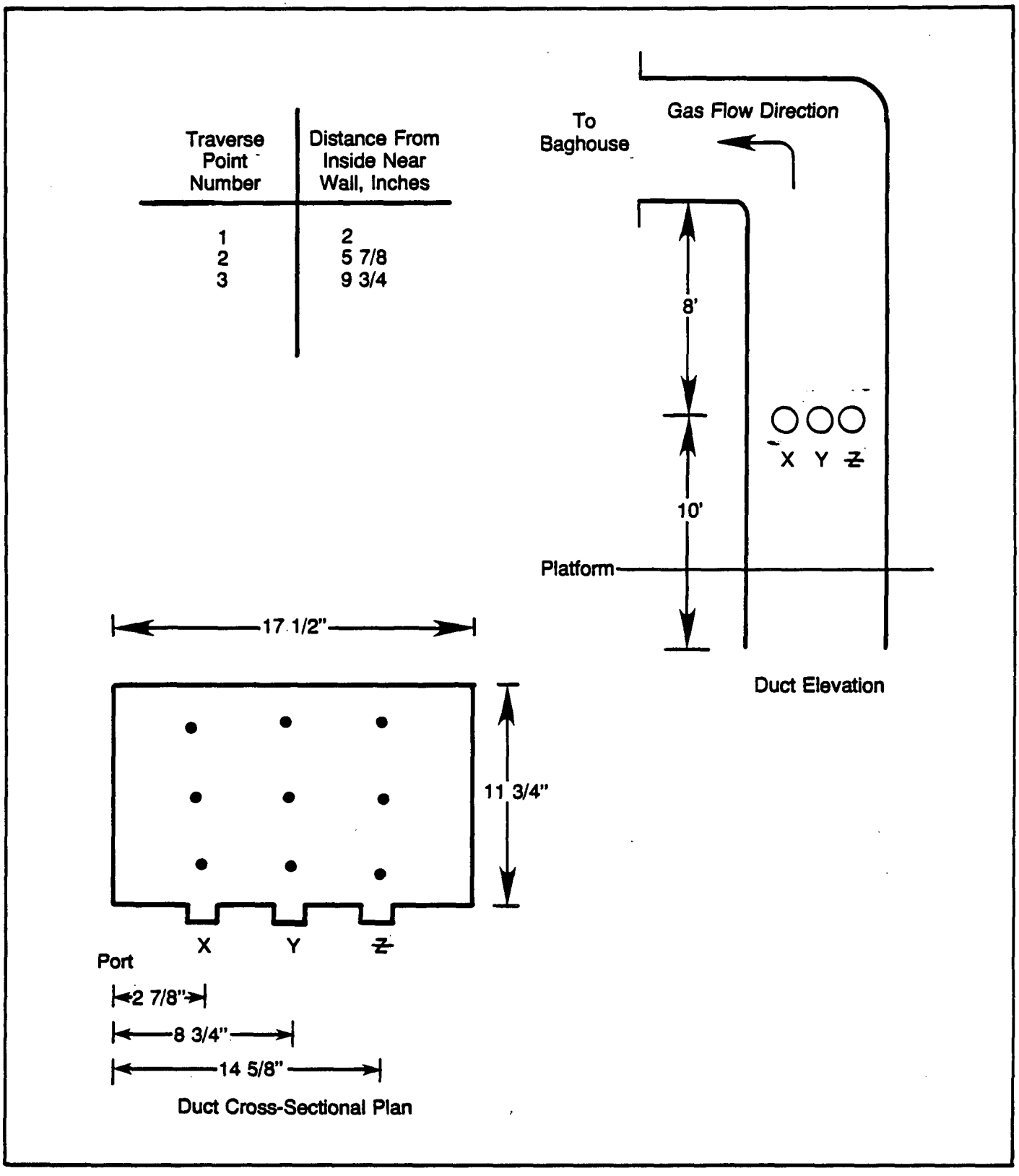


FIGURE 4 PORT AND SAMPLING POINT LOCATIONS – NO. 4 KETTLE CALCINER BAGHOUSE INLET DUCT

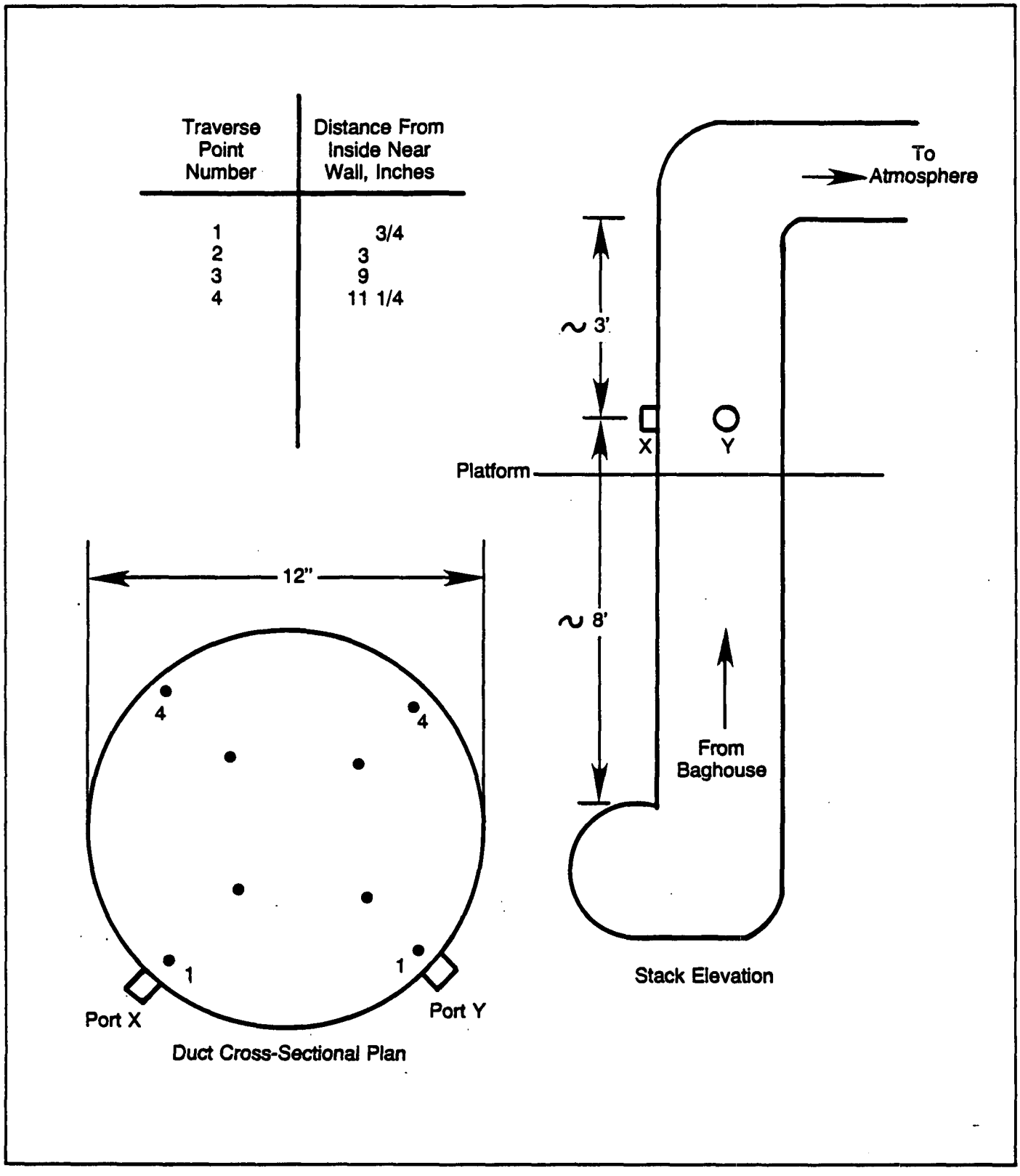
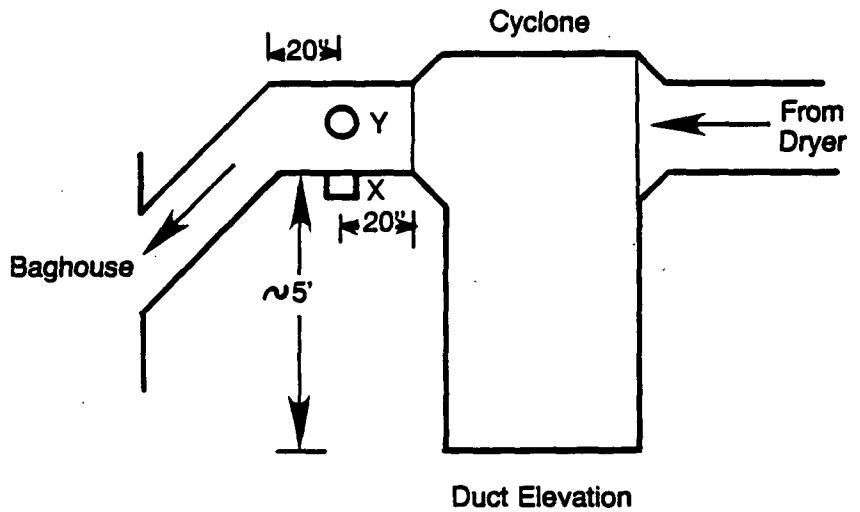
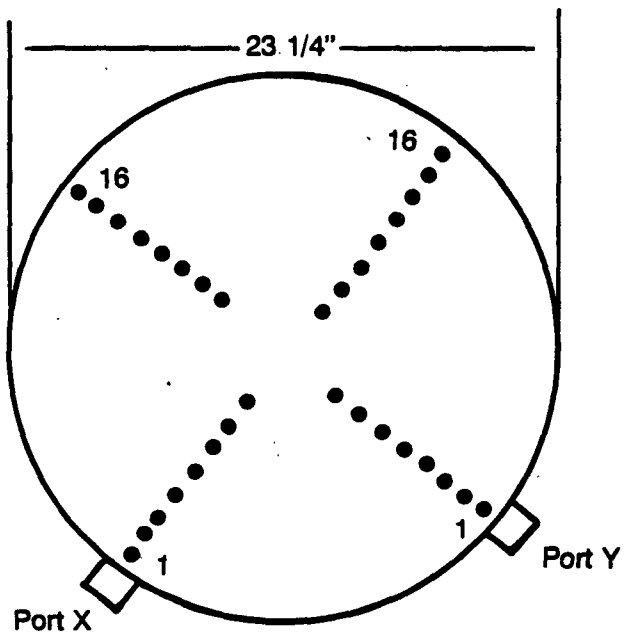


FIGURE 5 PORT AND SAMPLING POINT LOCATIONS -- NO. 4 KETTLE CALCINER BAGHOUSE DISCHARGE STACK

Traverse Point Number	Distance From Inside Near Wall, Inches
1	3/8
2	1 1/8
3	2
4	2 7/8
5	3 7/8
6	5 1/8
7	6 5/8
8	8 3/4
9	14 1/2
10	16 5/8
11	18 1/8
12	19 3/8
13	20 3/8
14	21 1/4
15	22 1/8
16	22 7/8



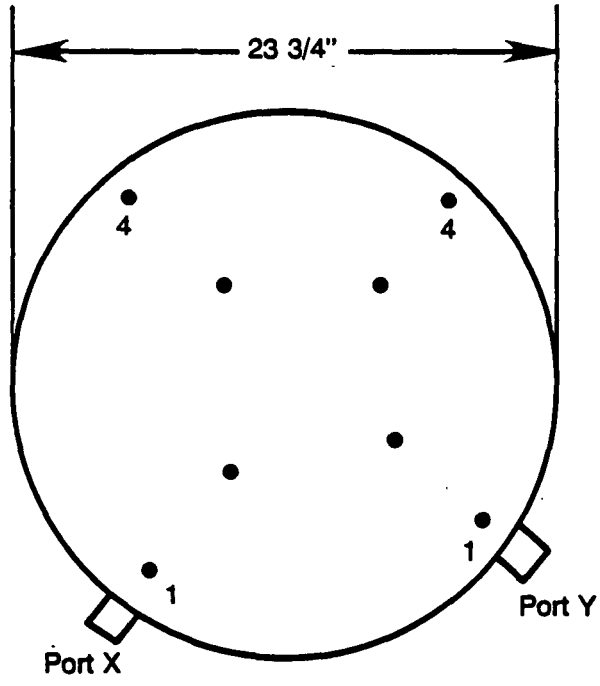
Duct Elevation



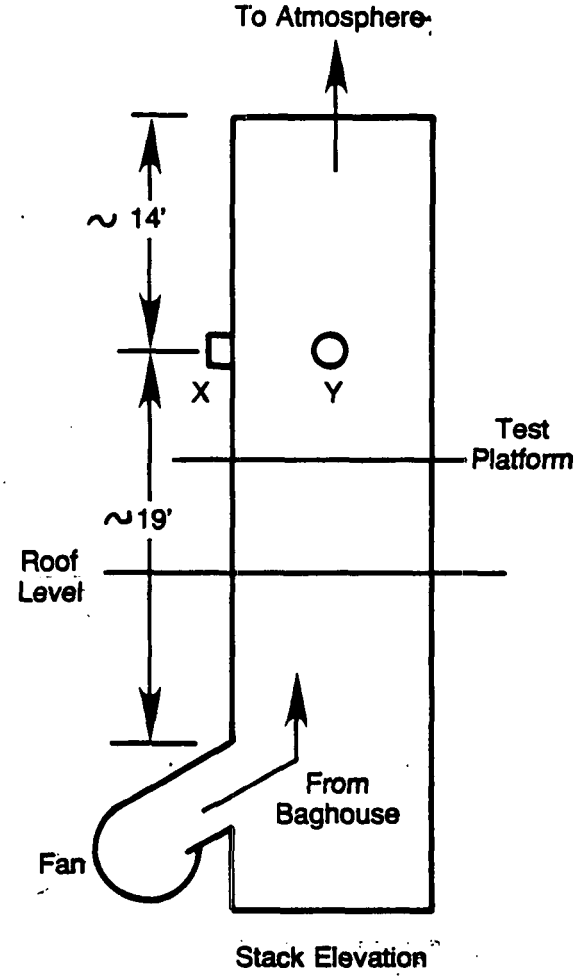
Duct Cross-Sectional Plan

FIGURE 6 PORT AND SAMPLING POINT LOCATIONS – ROCK DRYER BAGHOUSE INLET DUCT

Traverse Point Number	Distance From Inside Near Wall, Inches
1	1 5/8
2	5 7/8
3	17 3/4
4	22 1/8

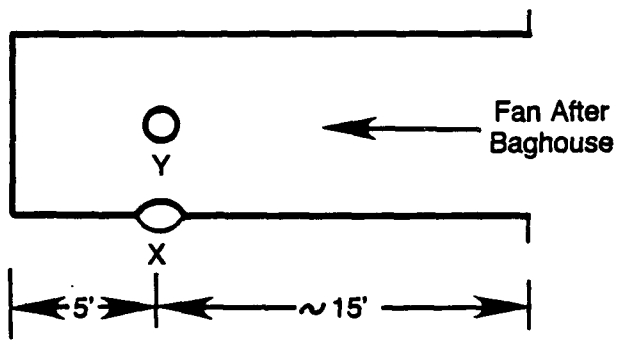


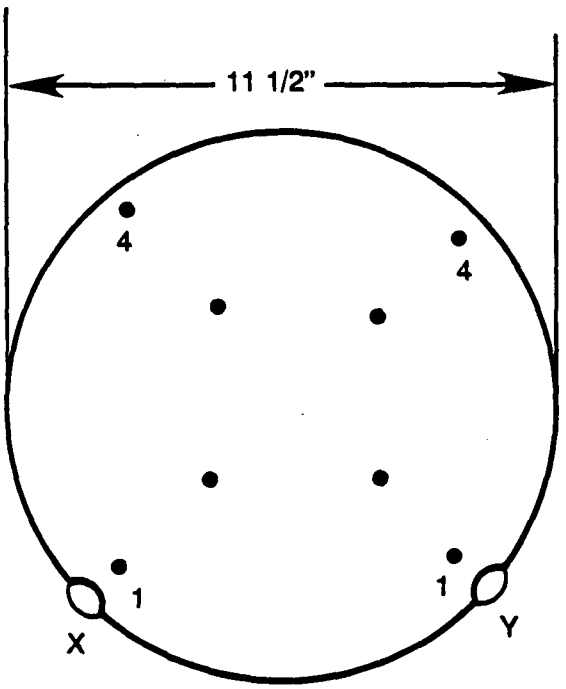
Stack Cross-Sectional Plan



Stack Elevation

FIGURE 7 PORT AND SAMPLING POINT LOCATIONS – ROCK DRYER BAGHOUSE DISCHARGE STACK





Duct Cross-Sectional Plan

Traverse Point Number	Distance From Inside Near Wall, Inches
1	3/4
2	2 7/8
3	8 5/8
4	10 3/4

FIGURE 8 PORT AND SAMPLING POINT LOCATIONS – BOARD END SAWING BAGHOUSE DISCHARGE STACK

DESCRIPTION OF SAMPLING TRAINS

PARTICULATE SAMPLING TRAINS

The test train utilized for particulate sampling at the Board End Sawing Baghouse Discharge Stack was the standard EPA Method 5 train (see Figure 9).

A stainless steel nozzle was attached to a heated (~250°F) borosilicate glass probe which was connected directly to a borosilicate filter holder containing a 9-cm Reeve Angel 900 AF glass fiber filter. The filter holder was maintained at approximately 250°F in a heated chamber, and was connected by vacuum tubing to the first of four Greenburg-Smith impingers which were included in the train to condense the moisture in the gas stream. Each of the first two impingers contained 100 ml of distilled water, the third was dry and the final impinger contained 200 grams of dry pre-weighed silica gel. The first, third, and fourth impingers were modified Greenburg-Smith types; the second was a standard Greenburg-Smith impinger. All impingers were maintained in a crushed ice bath. A RAC control console with vacuum pump, dry gas meter, a calibrated orifice, and inclined manometers completed the sampling train.

Flue gas temperature was measured by means of a calibrated Type K thermocouple which was connected to a direct readout pyrometer. The thermocouple sensor was positioned adjacent to the sampling nozzle.

Gas velocity was measured using a calibrated S-type pitot tube provided with extensions and fastened alongside the sampling probe. Gas stream composition (carbon dioxide, oxygen, and carbon monoxide content) was determined utilizing Orsat apparatus to analyze stack gas samples. Gas stream composition proved to be ambient air with the exception of the Rock Dryer inlet and outlet test sites which contained products of combustion.

Figure 10 shows the EPA Method 5 train utilized at the No. 4 Kettle Calciner Baghouse and at the Rock Dryer Baghouse locations. The test train shown is identical to the one described above, except a rigid glass connection is used between the back half of the filter holder and the first impinger, rather than the flexible vacuum tubing.

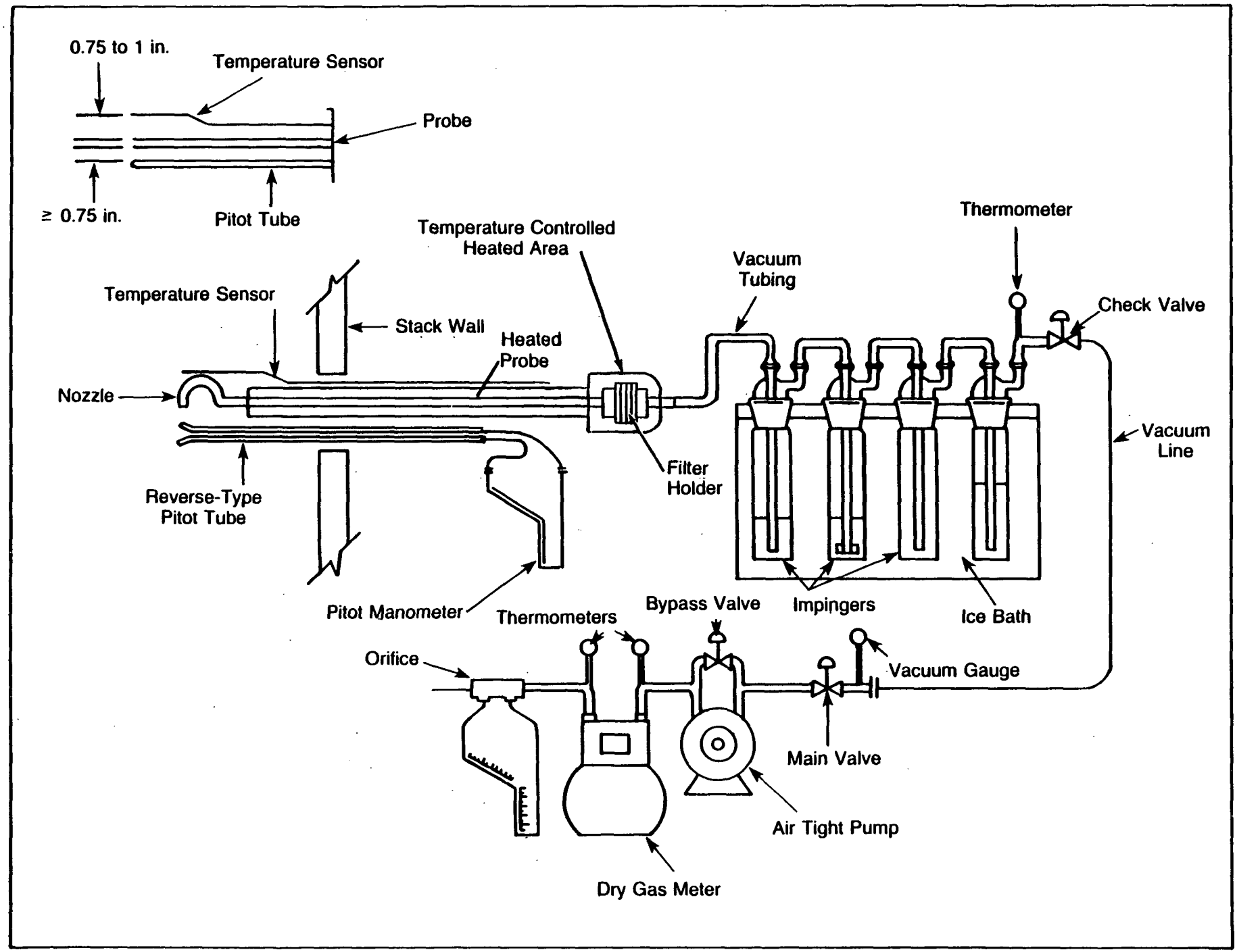


FIGURE 9 PARTICULATE SAMPLING TRAIN -- EPA METHOD 5

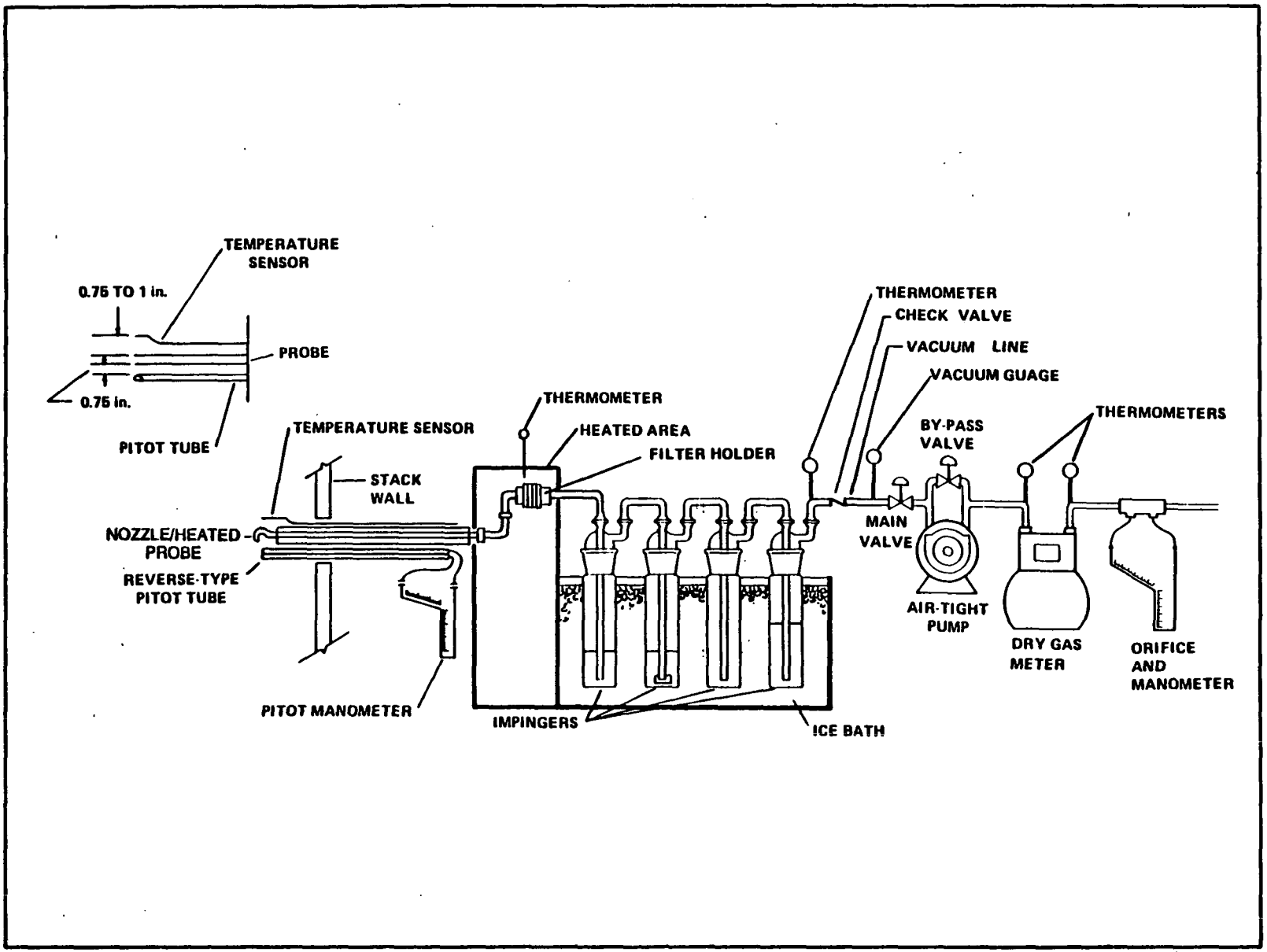


FIGURE 10 PARTICULATE SAMPLING TRAIN–EPA METHOD 5

PARTICLE SIZE DISTRIBUTION SAMPLING APPARATUS

A stainless steel nozzle was connected directly to an 8-stage Andersen cascade impaction device which separated the particles according to their effective aerodynamic particle diameters. A solid glass fiber filter was used to capture any particles that passed through the impactor substrates to permit the measurement of total particulate. The filter holder was maintained at stack temperature and was connected by vacuum tubing to the first of four Greenburg-Smith impingers which were included in the train to condense the moisture in the gas stream. All impingers were maintained in a crushed ice bath. A RAC control console with vacuum pump, dry gas meter, calibrated orifice, and inclined manometers completed the sampling train (Figure 11).

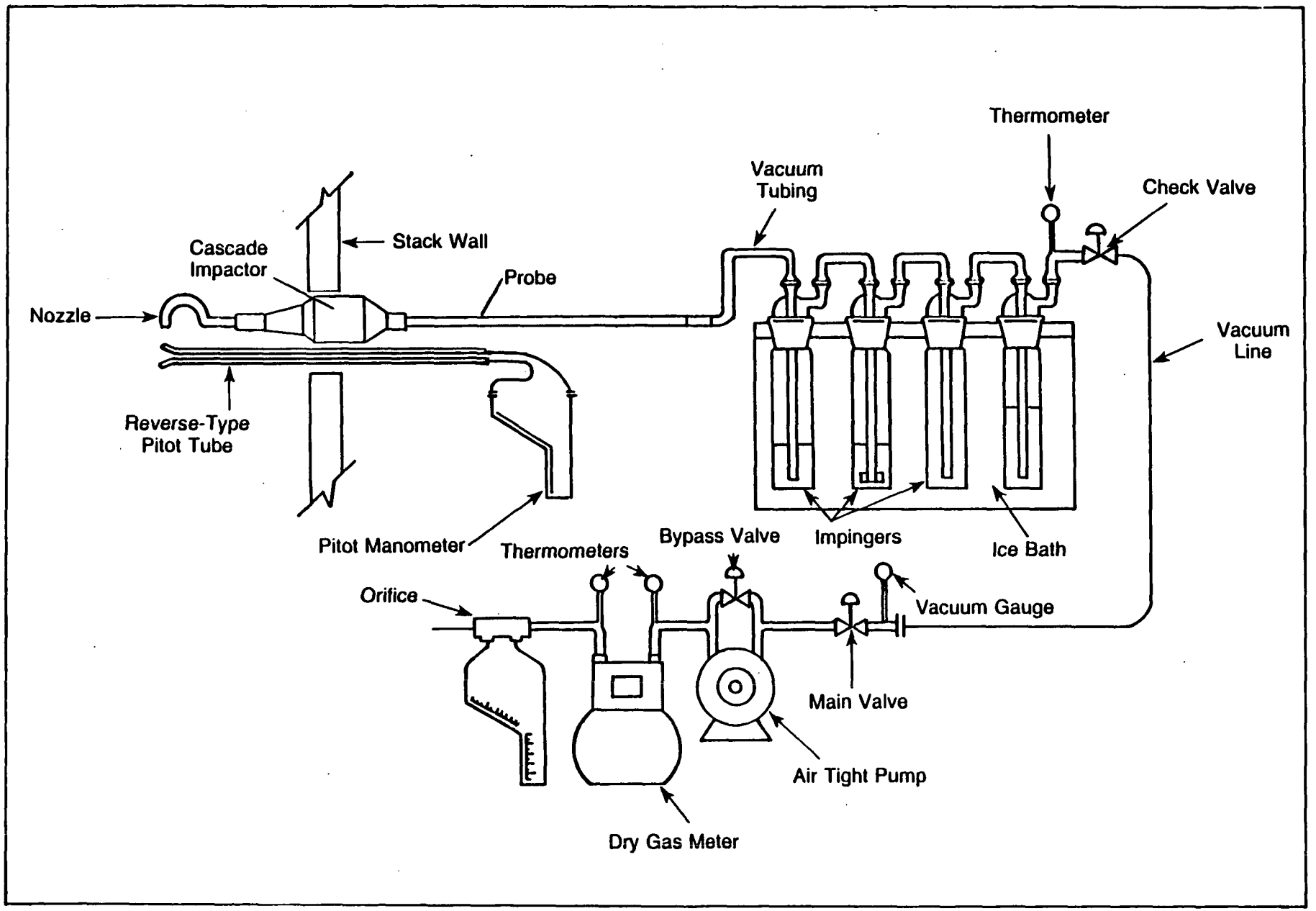


FIGURE 11 PARTICLE SIZE DISTRIBUTION SAMPLING APPARATUS --
ANDERSEN 2000, INC.

TEST PROCEDURES

PRELIMINARY TESTS

Preliminary test data was obtained at each sampling location. Stack geometry measurements were recorded and sampling point distances calculated. A preliminary velocity traverse was performed at each test location utilizing a calibrated S-type pitot tube and a Dwyer inclined manometer to determine velocity profiles. A check for the presence or absence of cyclonic flow was conducted at each test location prior to formal testing. Stack gas temperatures were observed with a direct readout pyrometer equipped with a chromel-alumel thermocouple.

Preliminary test data was used for nozzle sizing and nomagraph set-up for isokinetic sampling procedures.

Calibration of the probe nozzles, pitot tubes, metering systems, probe heaters, temperature gauges and barometer were performed as specified in Section 5 of EPA Method 5 test procedures. See Appendix D for calibration data.

FORMAL TESTS

No. 4 Kettle Calciner Baghouse Inlet Duct

A series of three tests were conducted at the No. 4 Kettle Calciner Baghouse Inlet Duct to measure the concentration and mass rate of particulate matter emissions. Nine traverse points (3 per port axis) were sampled for 3 minutes each resulting in a total test time of 27 minutes. The Technical Manager approved the reduced sampling interval due to the high grain loading (~110 gr/DSCF) encountered.

During particulate sampling, gas stream velocities were measured by inserting a calibrated S-type pitot tube into the stream adjacent to the sampling nozzle. The velocity pressure differential was observed immediately after positioning the nozzle at each point, and sampling rates were adjusted to maintain isokinetic sampling. Stack gas temperatures were also monitored at each point with the pyrometer and thermocouple. Additional temperature measurements were made at the final impinger and at the inlet and outlet of the dry gas meter.

Test data were recorded at each traverse point during all test periods. Leak checks were performed according to EPA Method 5

instructions prior to and after each run and/or component change. Tables 11 and 12 present a summary of test data for each of the three runs. Test result summarization appears in Tables 21 and 22.

Condensation problems precluded the use of the cascade impactor for particle sizing. Particle size distribution analyses were conducted on the combined filter and cyclone particulate catches. See Appendix B for results.

No. 4 Kettle Calciner Baghouse Discharge Stack

Three Method 5 tests were performed on the No. 4 Kettle Calciner Baghouse Discharge Stack. Eight points were traversed (4 per port) for 12 minutes, each yielding a test period of 96 minutes.

Procedures for isokinetic sampling were identical to those described for the No. 4 Kettle Calciner Baghouse Inlet Duct.

See Tables 13 and 14 for test data and Tables 23 and 24 for test result summaries, respectively.

Visual determinations of plume opacity were performed by a certified observer according to Method 9 procedures during all three test runs. A summary of results is presented in Table 36. No particle size distribution tests were conducted at this test point due to moisture condensation problems.

Rock Dryer Baghouse Inlet Duct

Three 64 minute Method 5 test runs were performed at the Rock Dryer Inlet Duct. A total of 32 points were sampled for two minutes each per test.

Isokinetic sampling procedures were identical to those previously described. Tables 15 and 16 show test data summarization and Tables 25 and 26 present test results.

One sampling point located at a site of average velocity was selected from particulate traverse data for particle size distribution testing. The gas stream was sampled isokinetically at that point for 4 minutes for Test Runs 1 and 2, and for 3 minutes for Test Run 3. This permitted collection of sufficient sample for analysis without overloading the filter substrates. Sample volume, temperature, and pressure data were recorded. See Tables 31 through 33 for distribution results.

Rock Dryer Baghouse Discharge Stack

Three Method 5 test runs were conducted on the Rock Dryer Discharge Stack. Eight sampling points (4 per axis) were sampled for eight minutes each, yielding a test period of 64 minutes.

Sampling procedures were identical to those previously described. See Tables 17 and 18 for test data and Tables 27 and 28 for test result summaries, respectively.

One particle size distribution test was completed at an average point of velocity. Total test time was 120 minutes with readings taken every 5 minutes. See Table 34 for particle size distribution results.

Visual determinations of plume opacity were performed by a certified observer according to Method 9 procedures during all three particulate test runs. A summary of results is presented in Table 37.

Board End Sawing Baghouse Discharge Stack

Three 64 minute Method 5 test runs were conducted at the Board End Sawing Baghouse Discharge Stack. A total of eight points (4 per port) were sampled for eight minutes each per test.

Isokinetic sampling procedures were identical to these previously described. Tables 19 and 20 show test data summarization and Tables 29 and 30 present test results.

One particle size distribution test was completed at an average point of velocity. Total test time was 120 minutes with readings taken every 5 minutes. See Table 35 for particle size distribution plot.

Three Method 9 plume opacity determinations were performed by a certified observer during the three particulate test runs. A summary of results is presented in Table 38.

Other Test Points

The visible and fugitive emission tests conducted at the remaining test points were 1 hour in duration each.

ANALYTICAL PROCEDURES

PARTICULATE SAMPLE RECOVERY

At the conclusion of each test, the sampling trains were dismantled, openings sealed, and the components transported to the field laboratory. Sample integrity was assured by maintaining chain-of-custody records, which will be supplied upon request.

A consistent procedure was employed for sample recovery.

The glass fiber filter(s) was removed from its holder with tweezers and placed in its original container (petri dish), along with any loose particulate and filter fragments (Sample Type 1).

The probe and nozzle were separated, and the internal particulate rinsed with acetone into a borosilicate container while brushing a minimum of three times until no visible particles remained. Particulate adhering to the brush was rinsed with acetone into the same container. The front half of the filter holder was rinsed with acetone while brushing a minimum of three times. The rinses were combined (Sample Type 2) and the container sealed with a Teflon-lined closure. Fluid levels were marked to determine whether or not leakage occurred during transport. The container was labeled to clearly identify its contents. The total liquid in impingers one, two and three was measured, the value recorded, and the liquid discarded.

The silica gel was removed from the last impinger and immediately weighed.

An acetone sample was retained for blank analysis.

PARTICULATE ANALYSES

The filters (Sample Type 1) and any loose fragments were desiccated for 24 hours and weighed to the nearest 0.1 milligram to a constant weight.

The acetone wash samples (Sample Type 2) were evaporated at ambient temperature and pressure in tared beakers, and desiccated to constant weight. All sample residue weights were adjusted by the acetone blank value.

The weight of the material collected on the glass fiber filter(s) plus the weight of the residue of the acetone nozzle/probe/front-half filter holder washes represents the total EPA Method 5 catch. Complete laboratory results are presented in Appendix B of this report.

PARTICLE SIZE SAMPLE RECOVERY AND ANALYSES

The cascade impactor substrates and any loose fragments were carefully removed from their support plates with tweezers and placed in individual containers (petri dishes) for shipment to WESTON's laboratory.

Each cascade impactor filter was fired at 525°C and preweighed to the nearest 0.1 milligram to constant weight at WESTON's laboratory prior to on-site application. Subsequent to emissions exposure, the cascade impactor substrates, back-up filters, and any loose fragments were desiccated for 24 hours in the laboratory, and weighed to the nearest 0.1 milligram to constant weight.

TEST RESULTS AND DISCUSSION

Particulate test data and test result summaries are presented in Tables 11 through 30 of this section. Tables 31 through 35 list the particle size distribution of the particulate matter for all locations. Visible emission test data summaries are shown in Tables 36 through 41. See Tables 42 and 43 for fugitive emission test result summaries.

No unusual process operating problems were encountered during the test periods. However, a visible plume of 20 percent opacity emanating from the Surge Bin Baghouse (indicating leaking bags) prohibited the conduct of Method 9 tests on the source until repairs were effected. A WESTON observer returned to the plant site on 10 June 1980 to perform the visible emission tests following the completion of collector maintenance.

The following sampling difficulties occurred during the survey:

1. No Andersen particle size distribution tests were performed at the No. 4 Kettle Calciner Baghouse test points. Gas stream moisture content of ~70 percent caused condensation problems on the filter substrates precluding the use of this technique. At the inlet test point, the dry filter and cyclone catches were combined and the resultant sample submitted for sedigraph particle size distribution analysis. No particle sizing was conducted at the outlet test point.

2. Test period length for the particulate tests performed at No. 4 Kettle Calciner Baghouse Inlet Duct was reduced for practical sampling considerations (particulate loadings of ~110 grains/DSCF) to 27 minutes as approved by the EPA Technical Manager.

The quantity of particulate matter discharged to the atmosphere from the No. 4 Kettle Calciner Baghouse Discharge Stack was $\leq$0.020 grains/DSCF and $\leq$0.093 pounds/hour. The certified visible emission observer recorded plume opacities of $\leq$5 percent for this source.

The particulate matter discharged from the Rock Dryer Discharge Duct was $\leq$0.005 grains/DSCF and $\leq$0.341 pounds/hour. The opacity readings recorded by the certified observer were $\leq$5 percent.

The particulate matter discharged from the Board End Sawing Baghouse Discharge Duct was ≤ 0.010 grains/DSCF and ≤ 0.307 pounds/hour. The opacity readings recorded by the certified observer were ≤ 5 percent.

The particulate removal efficiency of the No. 4 Kettle Calciner Baghouse averaged 99.99 percent for the three tests; the efficiency of the Rock Dryer Dust Collector averaged 99.87 percent; the efficiency of the Board End Sawing Baghouse averaged 99.91 percent.

Note that the collection efficiency of the Board End Sawing Baghouse was calculated based on an estimate of uncontrolled emissions (see Appendix C for estimate workup). The inlet duct was not sampled due to the presence of large particulate (up to 6" long by 1/2" wide) which could not be collected representatively using a standard Method 5 train.

ANALYTICAL DATA SUMMARY

Sample: U.S. Gypsum
Shoals, Indiana
No. 4 Kettle Calcium Baghouse Inlet

Run 1

Specific Gravity:	1)	2.4633 g/cc
	2)	2.4852 g/cc
	Average	2.4742 g/cc
Median Particle Size:		6.6 micrometers
% > 104 μm:		0.23

Run 2

Specific Gravity:	1)	2.3511 g/cc
	2)	2.4261 g/cc
	Average	2.3886 g/cc
Median Particle Size:		7.5 micrometers
% > 104 μm:		0.35

Run 3

Specific Gravity:	1)	2.3796 g/cc
	2)	2.3981 g/cc
	Average	2.3888 g/cc
Median Particle Size:		10.7 micrometers
% > 104 μm:		0.46

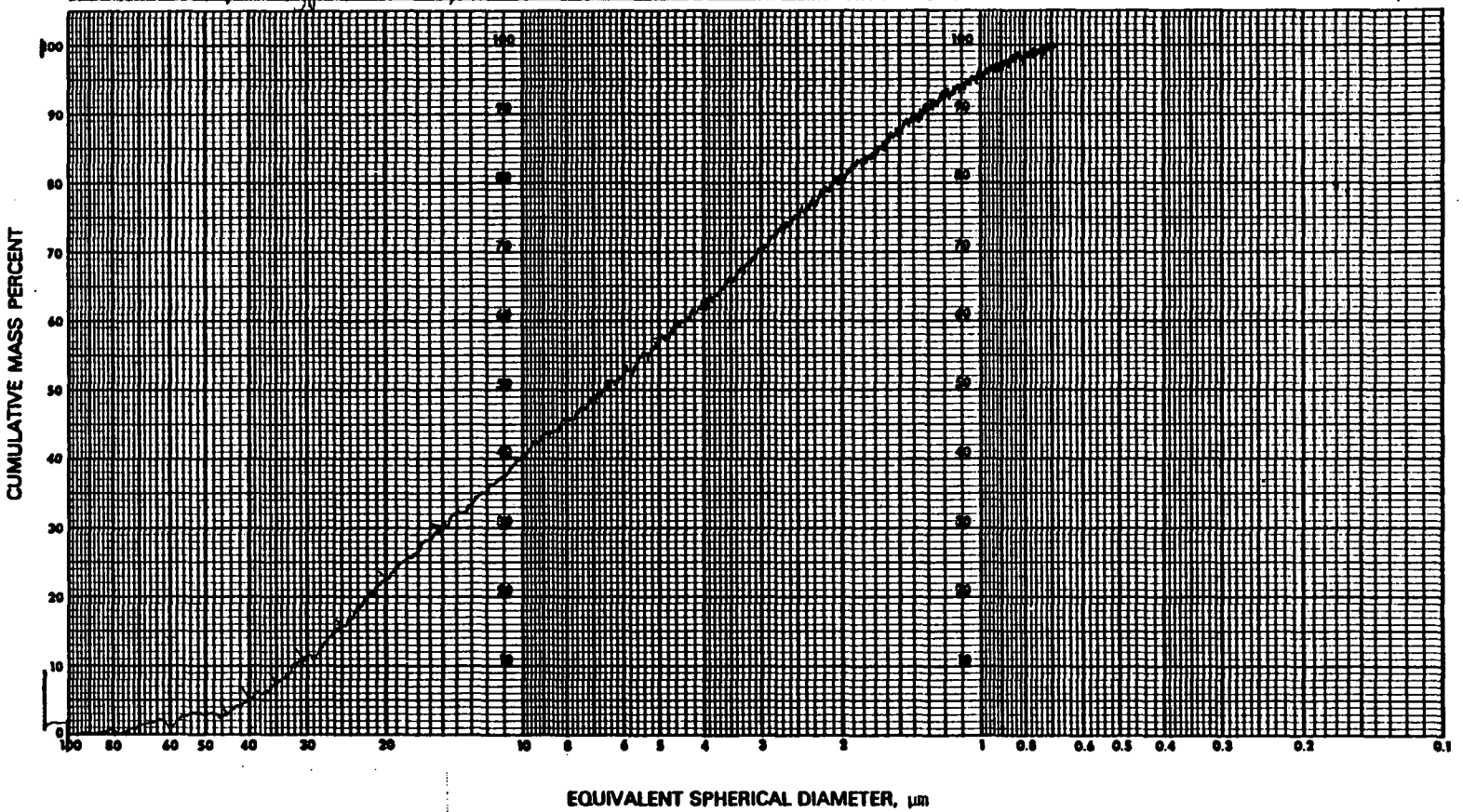
PARTICLE SIZE DISTRIBUTION

SAMPLE IDENTIFICATION Weston Consultants L5992 27127/RP 8437 DATE 20 Aug 80

Density 2.477 g/cc LIQUID Sedisperse A-12 Density 0.808 g/cc Viscosity 3.493 cp BY W. Mills

Preparation 0.7237g <10µm Sample dispersed in 25ml liquid 0.8% 10µm Graph standard 1.0% TEMPERATURE 28 °C

101 01007 1of3 US Gypsum Shoals, Indiana #4 Kettle calciner Inlet Run 1 RATE 410 START DIA. 100 µm



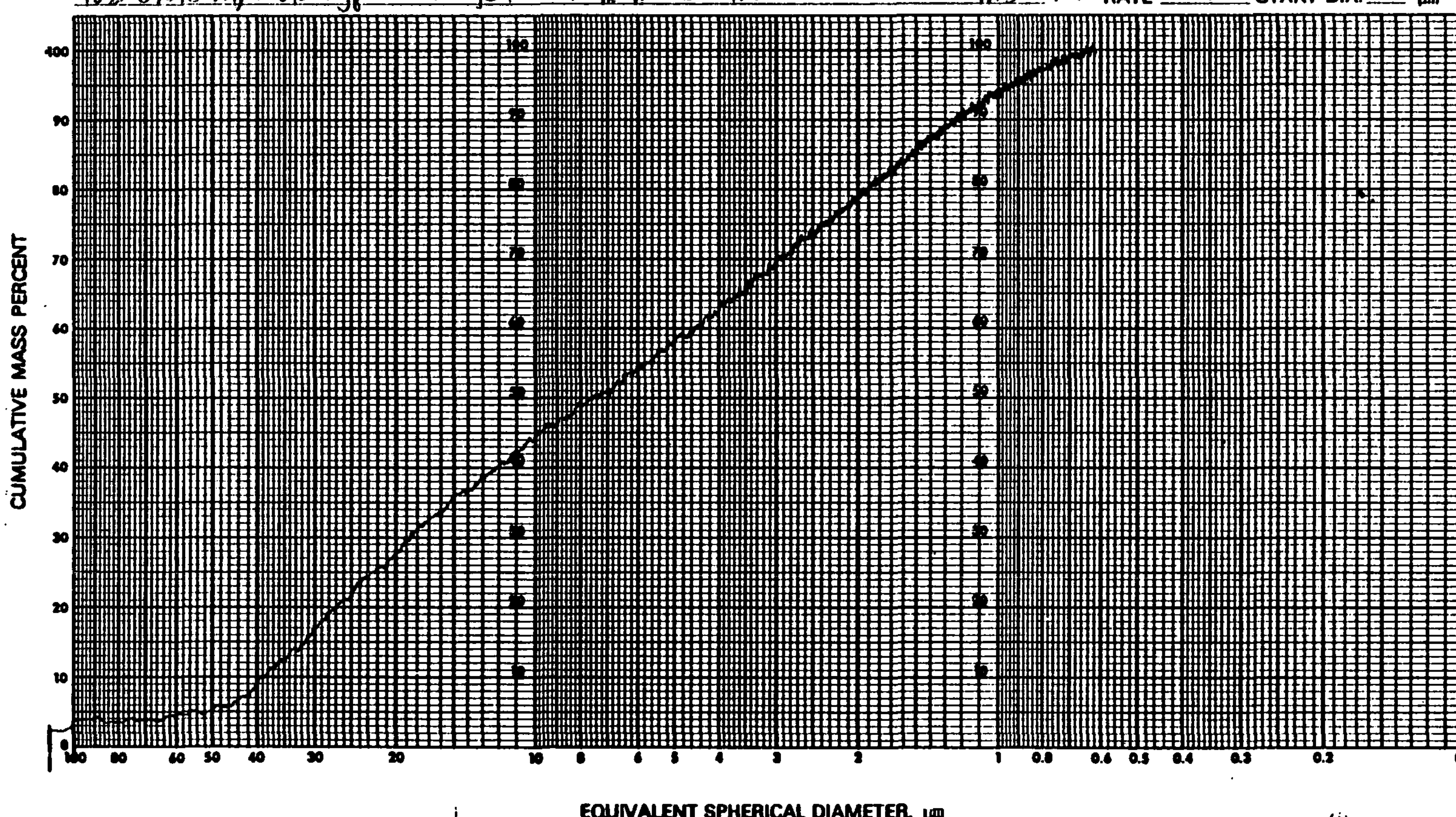
PARTICLE SIZE DISTRIBUTION

SAMPLE IDENTIFICATION Weston Consultants LS992 27127/RP8527 — DATE 20 Aug 80

Density 2.327 g/cc — LIQUID Sedisperse A-12 — Density 0.807 g/cc — Viscosity 3.363 cp — BY W. Mills

Preparation 0.7126 g <10 µm sample dispersed in 25 ml liquid 0.35% >10 µm Graph started at 0% — TEMPERATURE 29 °C

ID: 01012 lab # US Gypsum Shoals, Indiana #4 Kettle calciner B.H. Inlet Run 2 E/A 5 Part. — RATE 399 — START DIA. 100 µm



WESTON DESIGNERS CONSULTANTS

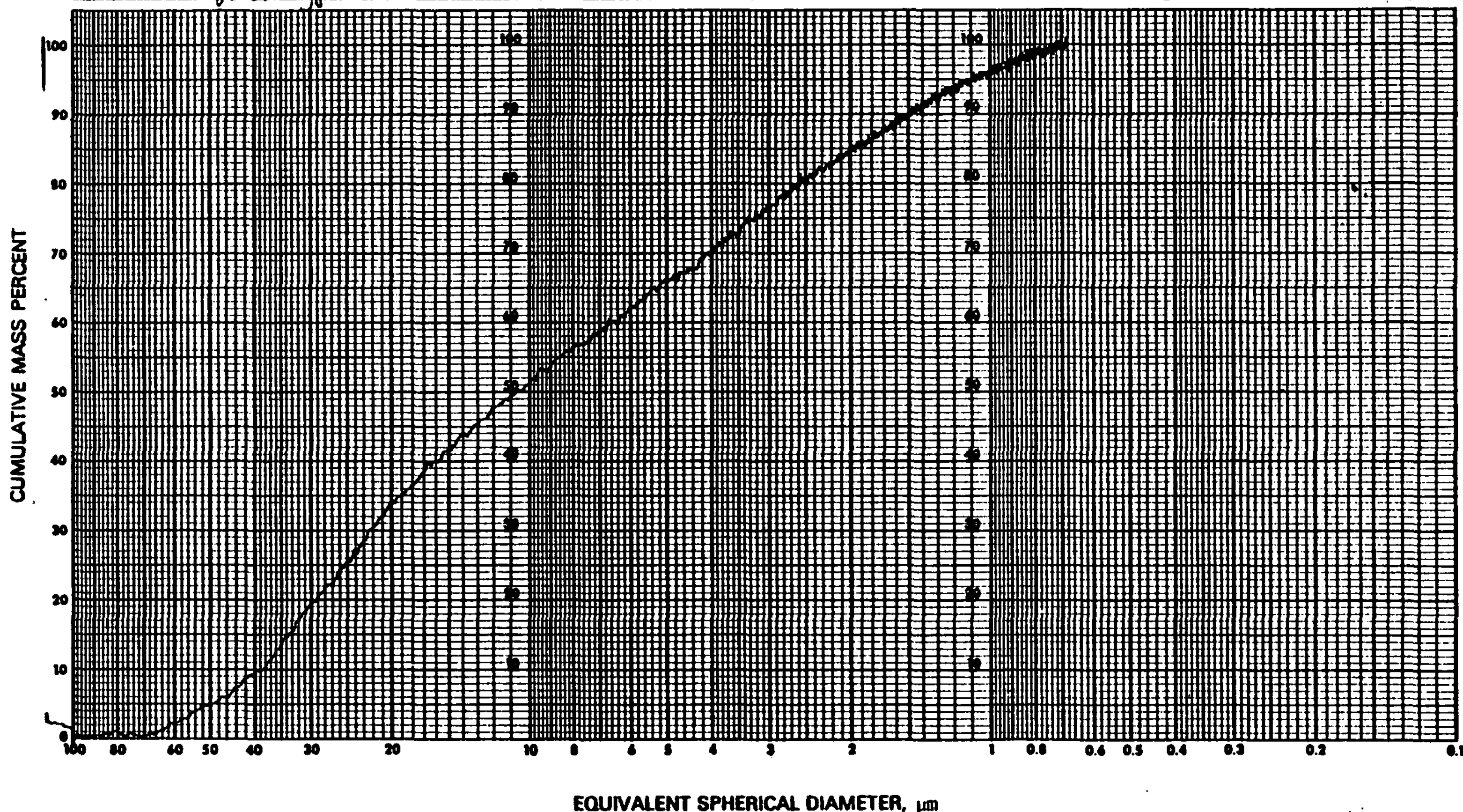
PARTICLE SIZE DISTRIBUTION

SAMPLE IDENTIFICATION Weston Consultants LS992 27127/RP8527 DATE 20 Aug 80

Density 2.389 g/cc LIQUID Sedisperse A-12 Density 0.807 g/cc Viscosity 3.363 cp BY W. Mills

Preparation 0.7372 g <104 μm Sample dispersed in 25 ml liquid 0.46% >104 μm Graph shifted + 0% TEMPERATURE 29 °C

103 010211 lab# [illegible] Gypsum shoals #4 Kettle Calciner B.H. Inlet Run #3 RATE 399 START DIA. 100 μm



WESTON DESIGNERS CONSULTANTS

Table 11

No. 4 Kettle Calciner Baghouse Inlet Duct
Summary of Test Data
(English Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-3-80	6-3-80	6-4-80
Test Period	0932-1110	1402-1528	0838-0959
Sampling Data			
Sampling Duration, minutes	27.0	27.0	27.0
Nozzle Diameter, inches	0.375	0.375	0.375
Barometric Pressure, inches mercury	29.7	29.7	29.8
Average Orifice Pressure Differential, inches water	0.34	0.34	0.34
Average Dry Gas Temperature at Meter, ^{o}F	117.	120.	100.
Total Water Collected by Train, ml	421.2	425.0	421.1
Standard Volume of Water Vapor Collected, cubic feet	19.8	20.2	19.8
Dry Gas Meter Calibration Factor, dimensionless	1.01	1.01	1.01
Sample Volume at Meter Conditions, cubic feet	9.36	8.54	7.57
Sample Volume at Standard Conditions, cubic feet[1]	8.58	7.80	7.18
Gas Stream Composition			
CO_2, percent by volume	0.0	0.0	0.0
O_2, percent by volume	20.9	20.9	20.9
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	79.1	79.1	79.1
Moisture in Gas Stream, percent by volume	69.8	72.2	73.4
Mole Fraction of Dry Gas	0.302	0.278	0.266
Molecular Weight of Dry Gas	29.0	29.0	29.0
Molecular Weight of Wet Gas	21.3	21.1	20.9
Gas Stream Velocity and Volumetric Flow			
Static Pressure, inches water	-0.83	-0.82	-0.83
Absolute Pressure, inches mercury	29.6	29.6	29.7
Average Temperature, ^{o}F	264.	264.	259.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	9.0	9.0	9.0
Velocity at Actual Conditions, feet/second	30.2	30.3	30.4
Stack/duct Cross-Sectional Area, square feet	1.43	1.43	1.43
Volumetric Flow, wet actual cubic feet/minute	2,590.	2,600.	2,610.
Volumetric Flow, dry standard cubic feet/minute	564.	522.	505.
Percent Isokinetic	104.9	103.0	97.9
Unit/Process Operations Data	Monitored by Radian Corporation personnel		

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 12

No. 4 Kettle Calciner Baghouse Inlet Duct
Summary of Test Data
(Metric Units)

	1	2	3
Test Data			
Test Run Number	1	2	3
Test Date	6-3-80	6-3-80	6-4-80
Test Period	0932-1110	1402-1528	0838-0959
Sampling Data			
Sampling Duration, minutes	27.0	27.0	27.0
Nozzle Diameter, centimeters	0.953	0.953	0.953
Barometric Pressure, millimeters mercury	754.4	754.4	756.9
Average Orifice Pressure Differential, millimeters water	8.6	8.6	8.6
Average Dry Gas Temperature at Meter, °C	47.	49.	38.
Total Water Collected by Train, ml	421.2	425.0	421.1
Volume of Water Vapor Collected, Standard Cubic Meters	0.561	0.572	0.561
Dry Gas Meter Calibration Factor, dimensionless	1.01	1.01	1.01
Sample Volume at Meter Conditions, cubic meters	0.265	0.242	0.214
Sample Volume at Standard Conditions, cubic meters[1]	0.243	0.221	0.203
Gas Stream Composition			
CO_2, percent by volume	0.0	0.0	0.0
O_2, percent by volume	20.9	20.9	20.9
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	79.1	79.1	79.1
Moisture in Gas Stream, percent by volume	69.8	72.2	73.4
Mole Fraction of Dry Gas	0.302	0.278	0.266
Molecular Weight of Dry Gas	29.0	29.0	29.0
Molecular Weight of Wet Gas	21.3	21.1	20.9
Gas Stream Velocity and Volumetric Flow			
Static Pressure, millimeters water	-21.1	-20.8	-21.1
Absolute Pressure, millimeters mercury	751.8	751.8	754.4
Average Temperature, °C	129.	129.	126.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	9.0	9.0	9.0
Velocity at Actual Conditions, meters/second	9.21	9.24	9.27
Stack/duct Cross-Sectional Area, square meters	0.133	0.133	0.133
Volumetric Flow, Wet Actual Conditions, cubic meters/minute	73.3.	73.6	73.9
Volumetric Flow, Dry Standard Conditions, cubic meters/minute	16.0	14.8	14.3
Percent Isokinetic	104.9	103.0	97.9
Unit/Process Operations Data	Monitored by Radian Corporation personnel		

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 13

No. 4 Kettle Calciner Baghouse Discharge Stack
Summary of Test Data
(English Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-3-80	6-3-80	6-4-80
Test Period	0932-1150	1400-1610	0837-1030
Sampling Data			
Sampling Duration, minutes	96.0	96.0	96.0
Nozzle Diameter, inches	0.300	0.300	0.300
Barometric Pressure, inches mercury	29.7	29.7	29.7
Average Orifice Pressure Differential, inches water	0.44	0.46	0.46
Average Dry Gas Temperature at Meter, ^{o}F	118.	121.	103.
Total Water Collected by Train, ml	1,606.3	1,590.8	1,722.2
Standard Volume of Water Vapor Collected, cubic feet	75.6	74.9	81.1
Dry Gas Meter Calibration Factor, dimensionless	0.990	0.990	0.990
Sample Volume at Meter Conditions, cubic feet	37.9	37.5	37.8
Sample Volume at Standard Conditions, cubic feet[1]	34.1	33.5	34.9
Gas Stream Composition			
CO_2, percent by volume	0.0	0.0	0.0
O_2, percent by volume	20.9	20.9	20.9
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	79.1	79.1	79.1
Moisture in Gas Stream, percent by volume	68.9	69.1	69.9
Mole Fraction of Dry Gas	0.311	0.309	0.301
Molecular Weight of Dry Gas	29.0	29.0	29.0
Molecular Weight of Wet Gas	21.4	21.4	21.3
Gas Stream Velocity and Volumetric Flow			
Static Pressure, inches water	0.91	0.89	0.95
Absolute Pressure, inches mercury	29.7	29.7	29.8
Average Temperature, ^{o}F	245.	248.	238.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	8.0	8.0	8.0
Velocity at Actual Conditions, feet/second	49.7	50.0	50.3
Stack/duct Cross-Sectional Area, square feet	0.785	0.785	0.785
Volumetric Flow, wet actual cubic feet/minute	2,340.	2,360.	2,370.
Volumetric Flow, dry standard cubic feet/minute	542.	540.	538.
Percent Isokinetic	104.9	103.3	108.2
Unit/Process Operations Data	Monitored by Radian Corporation personnel		

[1]Standard Conditions = 68^{o}F (20^{o}C) and 29.92 inches (760 mm) mercury, dry basis.

Table 14

No. 4 Kettle Calciner Baghouse Discharge Stack
Summary of Test Data
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-3-80	6-3-80	6-4-80
Test Period	0932-1150	1400-1610	0837-1030
Sampling Data			
Sampling Duration, minutes	96.0	96.0	96.0
Nozzle Diameter, centimeters	0.762	0.762	0.762
Barometric Pressure, millimeters mercury	754.4	754.4	754.4
Average Orifice Pressure Differential, millimeters water	11.2	11.7	11.7
Average Dry Gas Temperature at Meter, °C	48.	49.	39.
Total Water Collected by Train, ml	1,606.3	1,590.8	1,722.2
Volume of Water Vapor Collected, Standard Cubic Meters	2.141	2.121	2.297
Dry Gas Meter Calibration Factor, dimensionless	0.990	0.990	0.990
Sample Volume at Meter Conditions, cubic meters	1.073	1.062	1.070
Sample Volume at Standard Conditions, cubic meters[1]	0.966	0.949	0.988
Gas Stream Composition			
CO_2, percent by volume	0.0	0.0	0.0
O_2, percent by volume	20.9	20.9	20.9
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	79.1	79.1	79.1
Moisture in Gas Stream, percent by volume	68.9	69.1	69.9
Mole Fraction of Dry Gas	0.311	0.309	0.301
Molecular Weight of Dry Gas	29.0	29.0	29.0
Molecular Weight of Wet Gas	21.4	21.4	21.3
Gas Stream Velocity and Volumetric Flow			
Static Pressure, millimeters water	23.1	22.6	24.1
Absolute Pressure, millimeters mercury	754.4	754.4	756.9
Average Temperature, °C	118.	120.	114.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	8.0	8.0	8.0
Velocity at Actual Conditions, meters/second	15.1	15.2	15.3
Stack/duct Cross-Sectional Area, square meters	0.073	0.073	0.073
Volumetric Flow, Wet Actual Conditions, cubic meters/minute	66.3	66.8	67.1
Volumetric Flow, Dry Standard Conditions, cubic meters/minute	15.3	15.3	15.2
Percent Isokinetic	104.9	103.3	108.2
Unit/Process Operations Data	Monitored by Radian Corporation personnel		

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 15

Rock Dryer Baghouse Inlet Duct
Summary of Test Data
(English Units)

	1	2	3
Test Data			
Test Run Number	1	2	3
Test Date	6-5-80	6-6-80	6-6-80
Test Period	1809-1933	0934-1056	1150-1311
Sampling Data			
Sampling Duration, minutes	64.0	64.0	64.0
Nozzle Diameter, inches	0.188	0.188	0.188
Barometric Pressure, inches mercury	30.0	29.8	29.8
Average Orifice Pressure Differential, inches water	0.92	0.88	0.88
Average Dry Gas Temperature at Meter, ^{o}F	105.	110.	110.
Total Water Collected by Train, ml	71.2	68.	68.4
Standard Volume of Water Vapor Collected, cubic feet	3.4	3.2	3.2
Dry Gas Meter Calibration Factor, dimensionless	1.01	1.01	1.01
Sample Volume at Meter Conditions, cubic feet	35.4	34.9	35.0
Sample Volume at Standard Conditions, cubic feet[1]	33.6	32.6	32.7
Gas Stream Composition			
CO_2, percent by volume	1.3	1.1	1.2
O_2, percent by volume	17.2	18.5	18.2
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	81.6	80.4	80.6
Moisture in Gas Stream, percent by volume	9.1	8.9	9.0
Mole Fraction of Dry Gas	0.909	0.911	0.910
Molecular Weight of Dry Gas	28.9	28.9	28.9
Molecular Weight of Wet Gas	27.9	27.9	27.9
Gas Stream Velocity and Volumetric Flow			
Static Pressure, inches water	-3.2	-3.1	-3.15
Absolute Pressure, inches mercury	29.7	29.5	29.5
Average Temperature, ^{o}F	174.	173.	178.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	32.0	32.0	32.0
Velocity at Actual Conditions, feet/second	56.3	53.9	54.3
Stack/duct Cross-Sectional Area, square feet	2.95	2.95	2.95
Volumetric Flow, wet actual cubic feet/minute	9,950.	9,550.	9,600.
Volumetric Flow, dry standard cubic feet/minute	7,500.	7,150.	7,150.
Percent Isokinetic	107.0	108.9	109.3
Unit/Process Operations Data	Monitored by Radian Corporation personnel		

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 16

Rock Dryer Baghouse Inlet Duct
Summary of Test Data
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-5-80	6-6-80	6-6-80
Test Period	1809-1933	0934-1056	1150-1311
Sampling Data			
Sampling Duration, minutes	64.0	64.0	64.0
Nozzle Diameter, centimeters	0.478	0.478	0.478
Barometric Pressure, millimeters mercury	762.0	756.9	756.9
Average Orifice Pressure Differential, millimeters water	23.4	22.4	22.4
Average Dry Gas Temperature at Meter, °C	41.	43.	43.
Total Water Collected by Train, ml	71.2	68.0	68.4
Volume of Water Vapor Collected, Standard Cubic Meters	0.096	0.091	0.091
Dry Gas Meter Calibration Factor, dimensionless	1.01	1.01	1.01
Sample Volume at Meter Conditions, cubic meters	1.002	0.988	0.991
Sample Volume at Standard Conditions, cubic meters[1]	0.951	0.923	0.926
Gas Stream Composition			
CO_2, percent by volume	1.3	1.1	1.2
O_2, percent by volume	17.2	18.5	18.2
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	81.6	80.4	80.6
Moisture in Gas Stream, percent by volume	9.1	8.9	9.0
Mole Fraction of Dry Gas	0.909	0.911	0.910
Molecular Weight of Dry Gas	28.9	28.9	28.9
Molecular Weight of Wet Gas	27.9	27.9	27.9
Gas Stream Velocity and Volumetric Flow			
Static Pressure, millimeters water	-81.28	-78.74	-80.01
Absolute Pressure, millimeters mercury	754.4	749.3	749.3
Average Temperature, °C	79.	78.	81.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	32.0	32.0	32.0
Velocity at Actual Conditions, meters/second	17.2	16.4	16.6
Stack/duct Cross-Sectional Area, square meters	0.274	0.274	0.274
Volumetric Flow, Wet Actual Conditions, cubic meters/minute	282.	270.	272.
Volumetric Flow, Dry Standard Conditions, cubic meters/minute	212.	203.	203.
Percent Isokinetic	107.0	108.9	109.3
Unit/Process Operations Data	Monitored by Radian Corporation personnel		

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 17

Rock Dryer Baghouse Discharge Duct
Summary of Test Data
(English Units)

	1	2	3
Test Data			
Test Run Number	1	2	3
Test Date	6-5-80	6-6-80	6-6-80
Test Period	1810-1935	0823-1100	1150-1311
Sampling Data			
Sampling Duration, minutes	64.0	64.0	64.0
Nozzle Diameter, inches	0.195	0.195	0.195
Barometric Pressure, inches mercury	30.0	29.8	29.8
Average Orifice Pressure Differential, inches water	1.14	1.12	1.04
Average Dry Gas Temperature at Meter, ^{o}F	103.	101.	109.
Total Water Collected by Train, ml	75.5	75.2	78.1
Standard Volume of Water Vapor Collected, cubic feet	3.6	3.5	3.7
Dry Gas Meter Calibration Factor, dimensionless	0.990	0.990	0.990
Sample Volume at Meter Conditions, cubic feet	38.6	37.6	38.7
Sample Volume at Standard Conditions, cubic feet[1]	36.0	35.0	35.5
Gas Stream Composition			
CO_2, percent by volume	0.9	1.1	1.2
O_2, percent by volume	17.5	18.1	18.1
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	81.6	80.8	80.7
Moisture in Gas Stream, percent by volume	9.0	9.2	9.4
Mole Fraction of Dry Gas	0.910	0.908	0.906
Molecular Weight of Dry Gas	28.8	28.9	28.9
Molecular Weight of Wet Gas	27.9	27.9	27.9
Gas Stream Velocity and Volumetric Flow			
Static Pressure, inches water	0.78	0.61	0.57
Absolute Pressure, inches mercury	30.0	29.8	29.8
Average Temperature, ^{o}F	172.	169.	174.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	8.0	8.0	8.0
Velocity at Actual Conditions, feet/second	56.0	55.8	54.0
Stack/duct Cross-Sectional Area, square feet	3.08	3.08	3.08
Volumetric Flow, wet actual cubic feet/minute	10,350.	10,300.	9,950.
Volumetric Flow, dry standard cubic feet/minute	7,900.	7,850.	7,500.
Percent Isokinetic	105.7	103.6	109.6
Unit/Process Operations Data	Monitored by Radian Corporation personnel		

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 18

Rock Dryer Baghouse Discharge Duct
Summary of Test Data
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-5-80	6-6-80	6-6-80
Test Period	1810-1935	0823-1100	1150-1311
Sampling Data			
Sampling Duration, minutes	64.0	64.0	64.0
Nozzle Diameter, centimeters	0.495	0.495	0.495
Barometric Pressure, millimeters mercury	762.0	756.9	756.9
Average Orifice Pressure Differential, millimeters water	29.0	28.4	26.4
Average Dry Gas Temperature at Meter, °C	39.	38.	43.
Total Water Collected by Train, ml	75.5	75.2	78.1
Volume of Water Vapor Collected, Standard Cubic Meters	0.102	0.099	0.105
Dry Gas Meter Calibration Factor, dimensionless	0.990	0.990	0.990
Sample Volume at Meter Conditions, cubic meters	1.093	1.065	1.096
Sample Volume at Standard Conditions, cubic feet[1]	1.019	0.991	1.005
Gas Stream Composition			
CO_2, percent by volume	0.9	1.1	1.2
O_2, percent by volume	17.5	18.1	18.1
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	81.6	80.8	80.7
Moisture in Gas Stream, percent by volume	9.0	9.2	9.4
Mole Fraction of Dry Gas	0.910	0.908	0.906
Molecular Weight of Dry Gas	28.8	28.9	28.9
Molecular Weight of Wet Gas	27.9	27.9	27.9
Gas Stream Velocity and Volumetric Flow			
Static Pressure, millimeters water	19.812	15.494	14.478
Absolute Pressure, millimeters mercury	762.0	756.9	756.9
Average Temperature, °C	78.	76.	79.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	8.0	8.0	8.0
Velocity at Actual Conditions, meters/second	17.1	17.0	16.5
Stack/duct Cross-Sectional Area, square meters	0.286	0.286	0.286
Volumetric Flow, Wet Actual Conditions, cubic meters/minute	293.	292.	282.
Volumetric Flow, Dry Standard Conditions, cubic meters/minute	224.	222.	212.
Percent Isokinetic	105.7	103.6	109.6
Unit/Process Operations Data	Monitored by Radian Corporation personnel		

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 19

Board End Sawing Discharge Duct
Summary of Test Data
(English Units)

	1	2	3
Test Data			
Test Run Number	1	2	3
Test Date	6-5-80	6-5-80	6-5-80
Test Period	1215-1329	1418-1529	1545-1707
Sampling Data			
Sampling Duration, minutes	64.0	64.0	64.0
Nozzle Diameter, inches	0.171	0.171	0.171
Barometric Pressure, inches mercury	30.0	30.0	30.0
Average Orifice Pressure Differential, inches water	2.43	2.32	2.49
Average Dry Gas Temperature at Meter, ^{o}F	103.	107.	100.
Total Water Collected by Train, ml	17.	17.6	16.1
Standard Volume of Water Vapor Collected, cubic feet	0.8	0.8	0.8
Dry Gas Meter Calibration Factor, dimensionless	0.99	0.99	0.99
Sample Volume at Meter Conditions, cubic feet	53.7	52.4	55.1
Sample Volume at Standard Conditions, cubic feet[1]	50.2	48.6	51.8
Gas Stream Composition			
CO_2, percent by volume	0.0	0.0	0.0
O_2, percent by volume	20.9	20.9	20.9
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	79.1	79.1	79.1
Moisture in Gas Stream, percent by volume	1.6	1.7	1.4
Mole Fraction of Dry Gas	0.984	0.983	0.986
Molecular Weight of Dry Gas	28.97	28.97	28.97
Molecular Weight of Wet Gas	28.80	28.79	28.81
Gas Stream Velocity and Volumetric Flow			
Static Pressure, inches water	0.64	0.59	0.63
Absolute Pressure, inches mercury	30.0	30.0	30.0
Average Temperature, ^{o}F	92.	95.	90.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	8.0	8.0	8.0
Velocity at Actual Conditions, feet/second	83.1	81.4	86.0
Stack/duct Cross-Sectional Area, square feet	0.72	0.72	0.72
Volumetric Flow, wet actual cubic feet/minute	3,600.	3,500.	3,700.
Volumetric Flow, dry standard cubic feet/minute	3,400.	3,300.	3,550.
Percent Isokinetic	104.4	103.8	103.7
Unit/Process Operations Data	Monitored by Radian Corporation personnel		

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 20

Board End Sawing Discharge Duct
Summary of Test Data
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-5-80	6-5-80	6-5-80
Test Period	1215-1329	1418-1529	1545-1707
Sampling Data			
Sampling Duration, minutes	64.0	64.0	64.0
Nozzle Diameter, centimeters	0.434	0.434	0.434
Barometric Pressure, millimeters mercury	762.0	762.0	762.0
Average Orifice Pressure Differential, millimeters water	61.7	58.9	63.2
Average Dry Gas Temperature at Meter, °C	39.	42.	38.
Total Water Collected by Train, ml	17.0	17.6	16.1
Volume of Water Vapor Collected, Standard Cubic Meters	0.023	0.023	0.023
Dry Gas Meter Calibration Factor, dimensionless	0.99	0.99	0.99
Sample Volume at Meter Conditions, cubic meters	1.521	1.484	1.560
Sample Volume at Standard Conditions, cubic meters[1]	1.422	1.376	1.467
Gas Stream Composition			
CO_2, percent by volume	0.0	0.0	0.0
O_2, percent by volume	20.9	20.9	20.9
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	79.1	79.1	79.1
Moisture in Gas Stream, percent by volume	1.6	1.7	1.4
Mole Fraction of Dry Gas	0.984	0.983	0.986
Molecular Weight of Dry Gas	28.97	28.97	28.97
Molecular Weight of Wet Gas	28.80	28.79	28.81
Gas Stream Velocity and Volumetric Flow			
Static Pressure, millimeters water	16.256	14.986	16.002
Absolute Pressure, millimeters mercury	762.0	762.0	762.0
Average Temperature, °C	33.	35.	32.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	8.0	8.0	8.0
Velocity at Actual Conditions, meters/second	25.329	24.811	26.213
Stack/duct Cross-Sectional Area, square meters	0.067	0.067	0.067
Volumetric Flow, Wet Actual Conditions, cubic meters/minute	102.	99.1	105.
Volumetric Flow, Dry Standard Conditions, cubic meters/minute	96.3	93.4	101.
Percent Isokinetic	104.4	103.8	103.7
Unit/Process Operations Data	Monitored by Radian Corporation personnel		

[1] *Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.*

Table 21

No. 4 Kettle Calciner Baghouse Inlet Duct
Summary of Test Results
(English Units)

Test Data			
Test Number	1	2	3
Test Date	6-3-80	6-3-80	6-4-80
Test Time	0932-1110	1402-1528	0838-0959
Gas Stream Volumetric Flow			
Actual cubic feet/minute, wet	2,590.	2,600.	2,610.
Standard cubic feet/minute, dry[1]	564.	522.	505.
Particulate Lab Results			
Front-Half Wash Residue Fraction, g	50.8266	56.5370	52.8880
Filter Catch Fraction, g	2.9199	0.7599	2.4638
Total Particulate Catch Weight, g	53.7465	52.2969	55.3438
Particulate Emission Results[2]			
Grains/Dry Standard cubic foot	96.7	113.	119.
Pounds/hour	467.	507.	515.

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury.
[2]Calculated based Total Particulate Catch Weight.

Table 22

No. 4 Kettle Calciner Baghouse Inlet Duct
Summary of Test Results
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-3-80	6-3-80	6-4-80
Test Period	0932-1110	1402-1528	0838-0959
Gas Stream Volumetric Flow Rates			
Dry standard cubic meters/minute[1]	16.0	14.8	14.3
Wet actual cubic meters/minute	73.3	73.6	73.9
Particulate Laboratory Results			
Front-half Wash Residue Fraction, g	50.8266	56.5370	52.8880
Filter Catch Fraction, g	2.9199	0.7599	2.4638
Total Particulate Catch Weight, g	53.7465	52.2969	55.3438
Particulate Emission Results			
Grams/dry standard cubic meter	221.	259.	272.
Kilograms/hour	212.	230.	234.

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 23

No. 4 Kettle Calciner Baghouse Discharge Duct
Summary of Test Results
(English Units)

	1	2	3
Test Data			
Test Number	1	2	3
Test Date	6-3-80	6-3-80	6-4-80
Test Time	0932-1150	1400-1610	0837-1030
Gas Stream Volumetric Flow			
Actual cubic feet/minute, wet	2,340.	2,360.	2,370.
Standard cubic feet/minute, dry[1]	542.	540.	538.
Particulate Lab Results			
Front-Half Wash Residue Fraction, g	0.0389	0.0091	0.0212
Filter Catch Fraction, g	0.0053	0.0041	0.0031
Total Particulate Catch Weight, g	0.0442	0.0132	0.0243
Particulate Emission Results[2]			
Grains/Dry Standard cubic foot	0.020	0.006	0.010
Pounds/hour	0.093	0.028	0.050
Baghouse Collector Performance			
Efficiency, percent	99.98	99.99	99.99

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury.
[2]Calculated based Total Particulate Catch Weight.

Table 24

No. 4 Kettle Calciner Baghouse Discharge Duct
Summary of Test Results
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-3-80	6-3-80	6-4-80
Test Period	0932-1150	1400-1610	0837-1030
Gas Stream Volumetric Flow Rates			
Dry standard cubic meters/minute[1]	15.3	15.3	15.2
Wet actual cubic meters/minute	66.3	66.8	67.1
Particulate Laboratory Results			
Front-Half Wash Residue Fraction, g	0.0389	0.0091	0.0212
Filter Catch Fraction, g	0.0053	0.0041	0.0031
Total Particulate Catch Weight, g	0.0442	0.0132	0.0243
Particulate Emission Results			
Grams/dry standard cubic meter	0.046	0.014	0.023
Kilograms/hour	0.042	0.013	0.023

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 25

Rock Dryer Baghouse Inlet Duct
Summary of Test Results
(English Units)

	1	2	3
Test Data			
Test Number	1	2	3
Test Date	6-5-80	6-6-80	6-6-80
Test Time	1809-1933	0934-1056	1150-1311
Gas Stream Volumetric Flow			
Actual cubic feet/minute, wet	9,950.	9,550.	9,600.
Standard cubic feet/minute, dry[1]	7,500.	7,150.	7,150.
Particulate Lab Results			
Front-Half Wash Residue Fraction, g	6.3531	5.0688	4.7256
Filter Catch Fraction, g	0.6837	3.7674	4.0165
Total Particulate Catch Weight, g	7.0368	8.8362	8.7421
Particulate Emission Rate[2]			
Grains/Dry Standard cubic foot	3.23	4.18	4.13
Pounds/hour	208.	257.	253.

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury.
[2]Calculated based Total Particulate Catch Weight.

Table 26

Rock Dryer Baghouse Inlet Duct
Summary of Test Results
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-5-80	6-6-80	6-6-80
Test Period	1809-1933	0934-1056	1150-1311
Gas Stream Volumetric Flow Rates			
Dry standard cubic meters/minute[1]	212.	203.	203.
Wet actual cubic meters/minute	282.	270.	272.
Particulate Laboratory Results			
Front-Half Wash Residue Fraction, g	6.3531	5.0688	4.7256
Filter Catch Fraction, g	0.6837	3.7674	4.0165
Total Particulate Catch Weight, g	7.0368	8.8362	8.7421
Particulate Emission Results			
Grams/dry standard cubic meters	7.39	9.56	9.45
Kilograms/hour	94.3	117.	115.

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 27

Rock Dryer Baghouse Discharge Duct
Summary of Test Results
(English Units)

Test Data			
Test Number	1	2	3
Test Date	6-5-80	6-6-80	6-4-80
Test Time	1810-1935	0823-1100	1150-1311
Gas Stream Volumetric Flow			
Actual cubic feet/minute, wet	10,350.	10,300.	9,950.
Standard cubic feet/minute, dry[1]	7,900.	7,850.	7,500.
Particulate Lab Results			
Front-Half Wash Residue Fraction, g	0.0035	0.0027	0.0050
Filter Catch Fraction, g	0.0069	0.0066	0.0072
Total Particulate Catch Weight, g	0.0104	0.0093	0.0122
Particulate Emission Results[2]			
Grains/Dry Standard cubic foot	0.004	0.004	0.005
Pounds/hour	0.302	0.275	0.341
Baghouse Collector Performance			
Efficiency, percent	99.85	99.89	99.87

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury.
[2]Calculated based Total Particulate Catch Weight.

Table 28

Rock Dryer Baghouse Discharge Duct
Summary of Test Results
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-5-80	6-6-80	6-4-80
Test Period	1810-1935	0823-1100	1150-1311
Gas Stream Volumetric Flow Rates			
Dry standard cubic meters/minute[1]	224.	222.	212.
Wet actual cubic meters/minute	293.	292.	282.
Particulate Laboratory Results			
Front-Half Wash Residue Fraction, g	0.0035	0.0027	0.0050
Filter Catch Fraction, g	0.0069	0.0066	0.0072
Total Particulate Catch Weight, g	0.0104	0.0093	0.0122
Particulate Emission Results			
Grams/dry standard cubic meter	0.009	0.009	0.011
Kilograms/hour	0.137	0.125	0.155

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 29

Board End Sawing Discharge Duct
Summary of Test Results
(English Units)

Test Data			
Test Number	1	2	3
Test Date	6-5-80	6-5-80	6-5-80
Test Time	1215-1329	1418-1529	1545-1707
Gas Stream Volumetric Flow			
Actual cubic feet/minute, wet	3,600.	3,500.	3,700.
Standard cubic feet/minute, dry[1]	3,400.	3,300.	3,550.
Particulate Lab Results			
Front-Half Wash Residue Fraction, g	0.0026	0.0058	0.0101
Filter Catch Fraction, g	0.0048	0.0161	0.0240
Total Particulates Catch Weight, g	0.0074	0.0219	0.0341
Particulate Emission Results[2]			
Grains/Dry Standard cubic foot	0.002	0.007	0.010
Pounds/hour	0.066	0.197	0.307

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury.
[2]Calculated based Total Particulate Catch Weight.

Table 30

Board End Sawing Discharge Duct
Summary of Test Results
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	6-5-80	6-5-80	6-5-80
Test Period	1215-1329	1418-1529	1545-1707
Gas Stream Volumetric Flow Rates			
Dry standard cubic meters/minute[1]	96.3	93.4	101.
Wet actual cubic meters/minute	102.	99.1	105.
Particulate Laboratory Results			
Front-Half Wash Residue Fraction, g	0.0026	0.0058	0.0101
Filter Catch Fraction, g	0.0048	0.0161	0.0240
Total Particulates Catch Weight, g	0.0074	0.0219	0.0341
Particulate Emission Results			
Grams/dry standard cubic meters	0.005	0.016	0.023
Kilograms/hour	0.030	0.089	0.139

[1]Standard Conditions = 68°F (20°C) and 29.92 inches (760 mm) mercury, dry basis.

Table 31

Particle Size Distribution

Run: 1

Date: 6-6-80

Location: U.S. Gypsum

Sampling Location: Rock Dryer Inlet

Traverse Point No. Sampled: Y-13

P_{bar} (in. Hg) 29.97

Stack Temp (^{o}F) 172

Sample Time (min.) 4.0

Sample Volume (cf) 1.794

Moisture (% H_2O) 9.0

Meter Temp (^{o}F) 109

Flow Setting, ΔH (in. H_2O) 0.59

Nozzle Diameter (in.) 0.171

Sample Flow Rate (at stack conditions): 0.46 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	346.2	61.1	100.0	15.0
2	25.9	4.6	38.9	9.6
3	31.3	5.5	34.3	6.3
4	44.0	7.8	28.8	4.5
5	73.7	13.0	21.0	2.8
6	36.1	6.4	8.0	1.4
7	5.9	1.0	1.6	0.90
8	1.3	0.23	0.6	0.60
Backup Filter	1.7	0.37	0.37	----
TOTAL	566.1	100.0		

FIGURE 12

Run No. 1 Rock Dryer Inlet

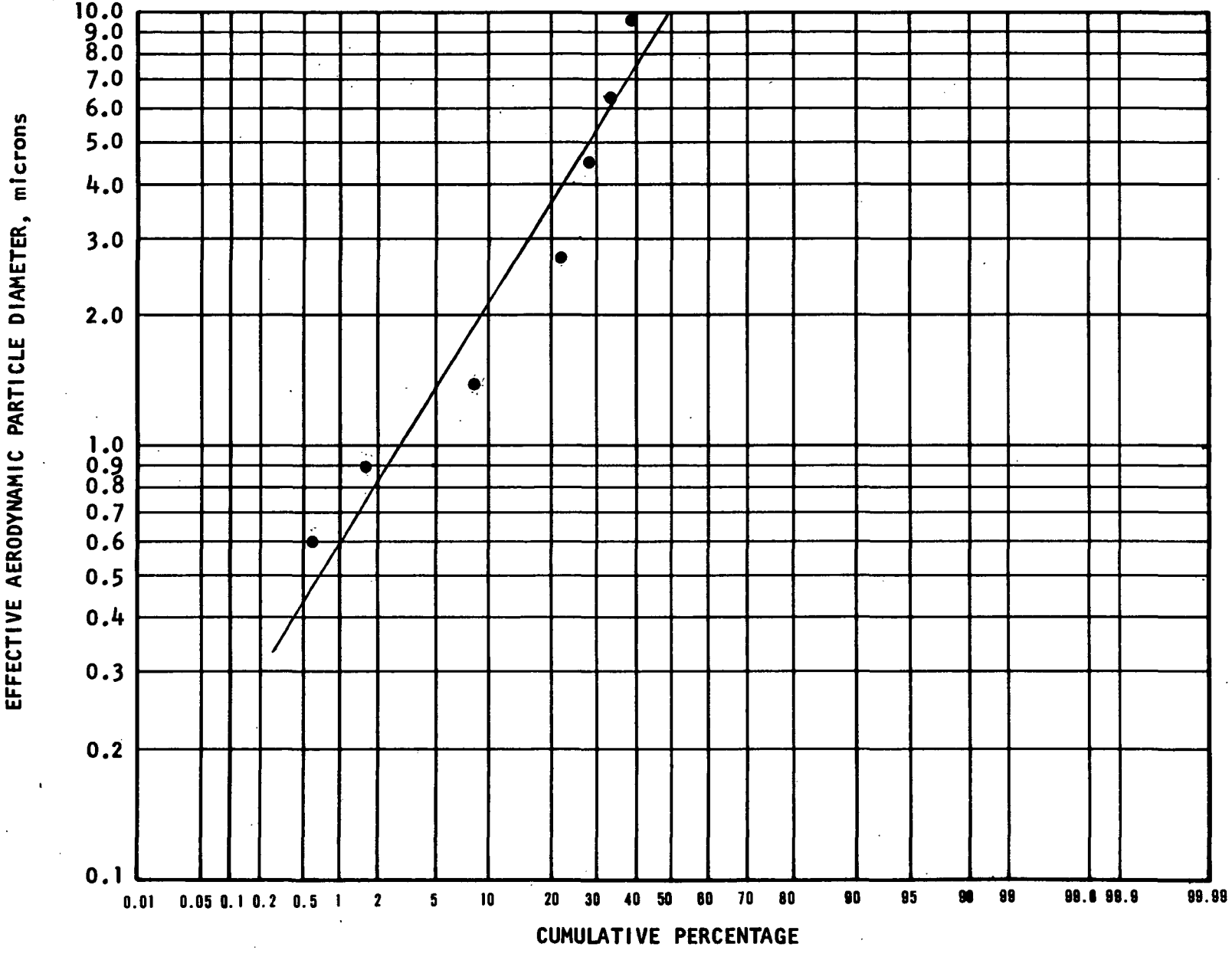


Table 32

Particle Size Distribution

Run:	2	P_{bar} (in. Hg)	29.77
Date:	6-6-80	Stack Temp (^{o}F)	172
Location:	U.S. Gypsum	Sample Time (min.)	4.0
Sampling Location:	Rock Dryer Inlet	Sample Volume (cf)	1.796
Traverse Point No. Sampled:	Y-13	Moisture (% H_2O)	9.0
		Meter Temp (^{o}F)	108
		Flow Setting, ΔH (in. H_2O)	0.59
		Nozzle Diameter (in.)	0.171

Sample Flow Rate (at stack conditions): 0.46 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	271.8	54.6	100.0	15.0
2	38.7	7.8	45.4	9.6
3	31.3	6.3	37.6	6.3
4	78.7	15.8	31.3	4.5
5	41.2	8.3	15.5	2.8
6	26.3	5.3	7.2	1.4
7	6.0	1.1	1.9	0.90
8	1.9	0.38	0.8	0.60
Backup Filter	2.2	0.42	0.42	----
TOTAL	498.1	100.0		

FIGURE 13

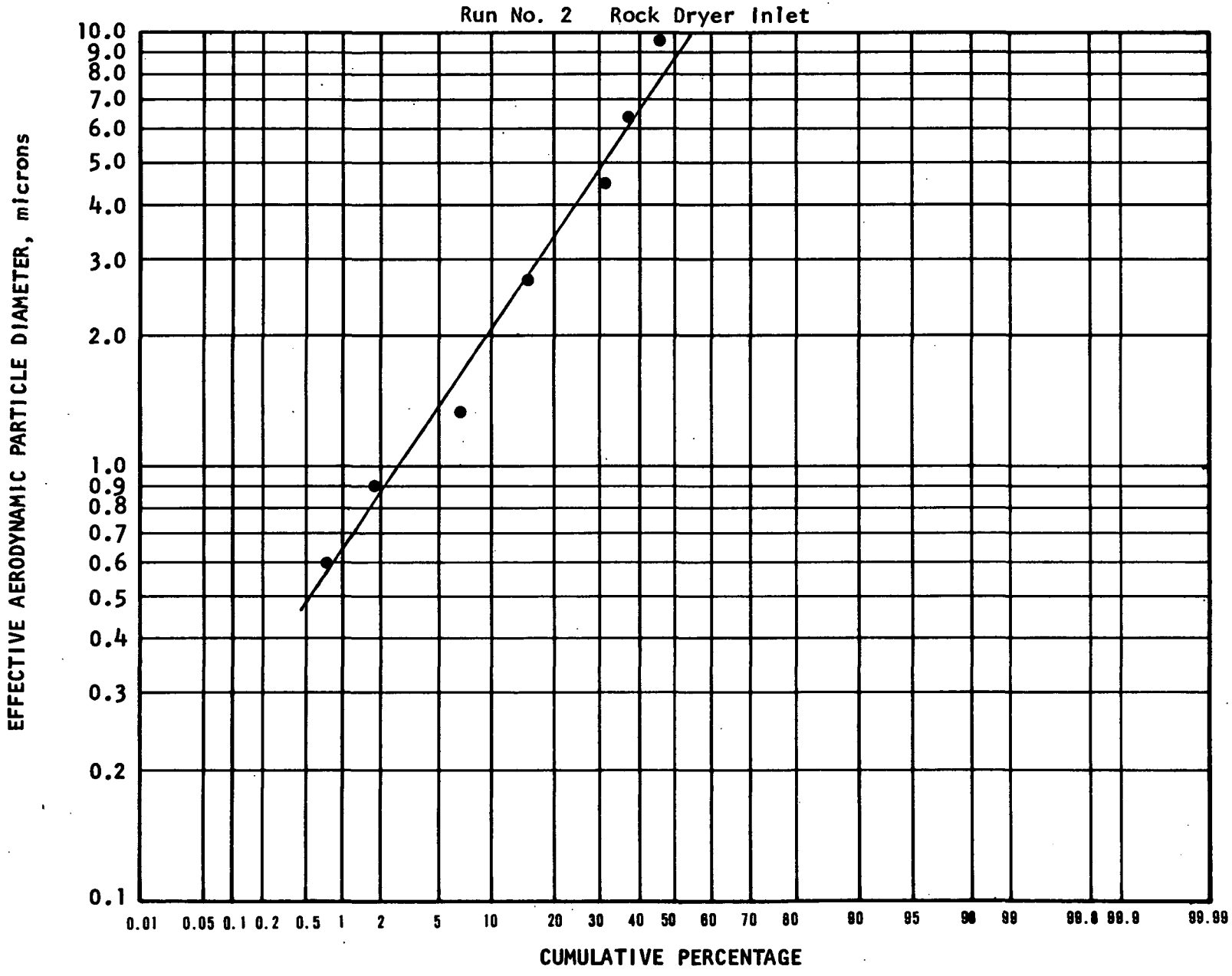

Run No. 2 Rock Dryer Inlet
EFFECTIVE AERODYNAMIC PARTICLE DIAMETER, microns
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99
CUMULATIVE PERCENTAGE

Table 33

Particle Size Distribution

Run: 3

Date: 6-6-80

Location: U.S. Gypsum

Sampling Location: Rock Dryer Inlet

Traverse Point No. Sampled: Y-13

P_{bar} (in. Hg)	29.77
Stack Temp (^{o}F)	172
Sample Time (min.)	3.0
Sample Volume (cf)	1.353
Moisture (% H_2O)	9.0
Meter Temp (^{o}F)	110
Flow Setting, ΔH (in. H_2O)	0.59
Nozzle Diameter (in.)	0.171

Sample Flow Rate (at stack conditions): 0.46 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	149.2	47.8	100.0	15.0
2	32.3	10.3	52.2	9.6
3	36.2	11.6	41.9	6.3
4	28.3	9.1	30.3	4.5
5	55.6	17.8	21.2	2.8
6	5.7	1.8	3.4	1.4
7	2.8	0.9	1.6	0.90
8	0.9	0.3	0.7	0.60
Backup Filter	1.1	0.4	0.4	----
TOTAL	312.1	100.0		

FIGURE 14

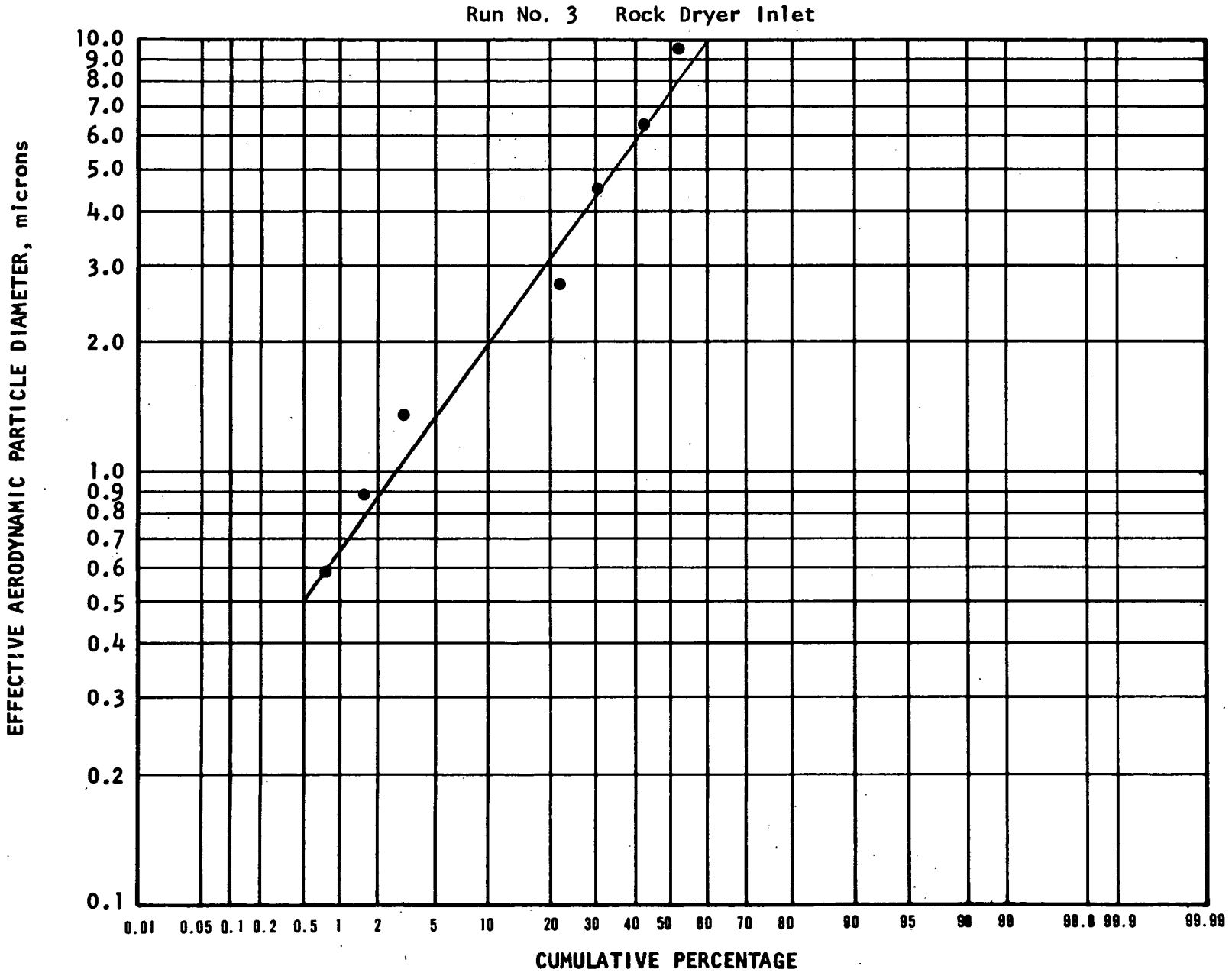

Run No. 3 Rock Dryer Inlet
EFFECTIVE AERODYNAMIC PARTICLE DIAMETER, microns
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99
CUMULATIVE PERCENTAGE

Table 34

Particle Size Distribution

Run: 1

Date: 6-3-80

Location: U.S. Gypsum

Sampling Location: Rock Dryer Outlet

Traverse Point No. Sampled: X-2

P_{bar} (in. Hg)	29.67
Stack Temp (^{o}F)	184
Sample Time (min.)	120
Sample Volume (cf)	72.660
Moisture (% H_2O)	9.0
Meter Temp (^{o}F)	108
Flow Setting, ΔH (in. H_2O)	1.15
Nozzle Diameter (in.)	0.230

Sample Flow Rate (at stack conditions): 0.55 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	7.1	51.8	100.0	4.1
2	0.2	1.5	48.2	2.7
3	0.2	1.5	46.7	1.8
4	0.7	5.1	45.2	1.2
5	1.1	8.0	40.1	0.77
6	1.0	7.3	32.1	0.39
7	1.3	9.5	24.8	0.23
8	0.7	5.1	15.3	0.14
Backup Filter	1.4	10.2	10.2	----
TOTAL	13.7	100.0		

FIGURE 15

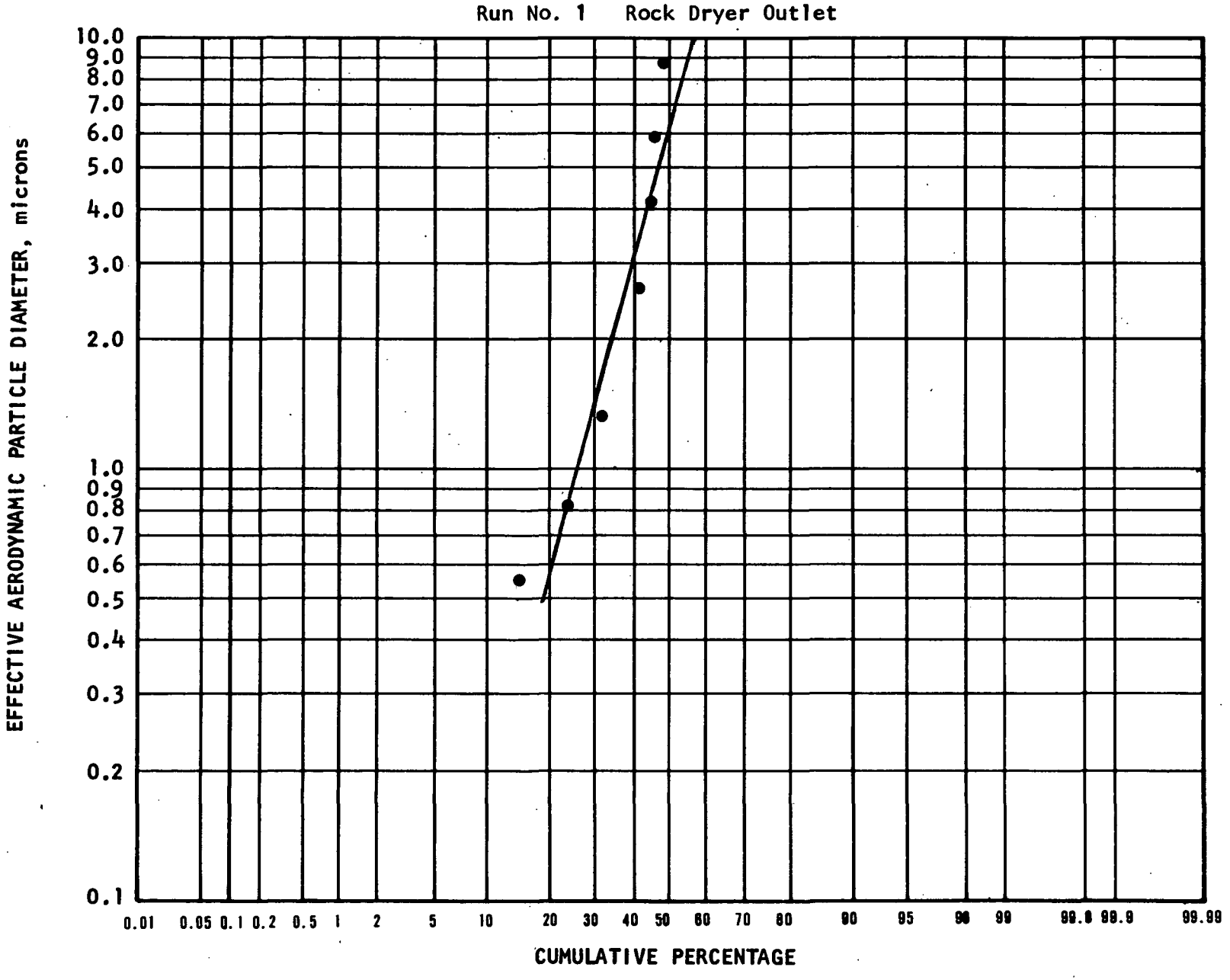

Run No. 1 Rock Dryer Outlet
EFFECTIVE AERODYNAMIC PARTICLE DIAMETER, microns
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99
CUMULATIVE PERCENTAGE

Table 35

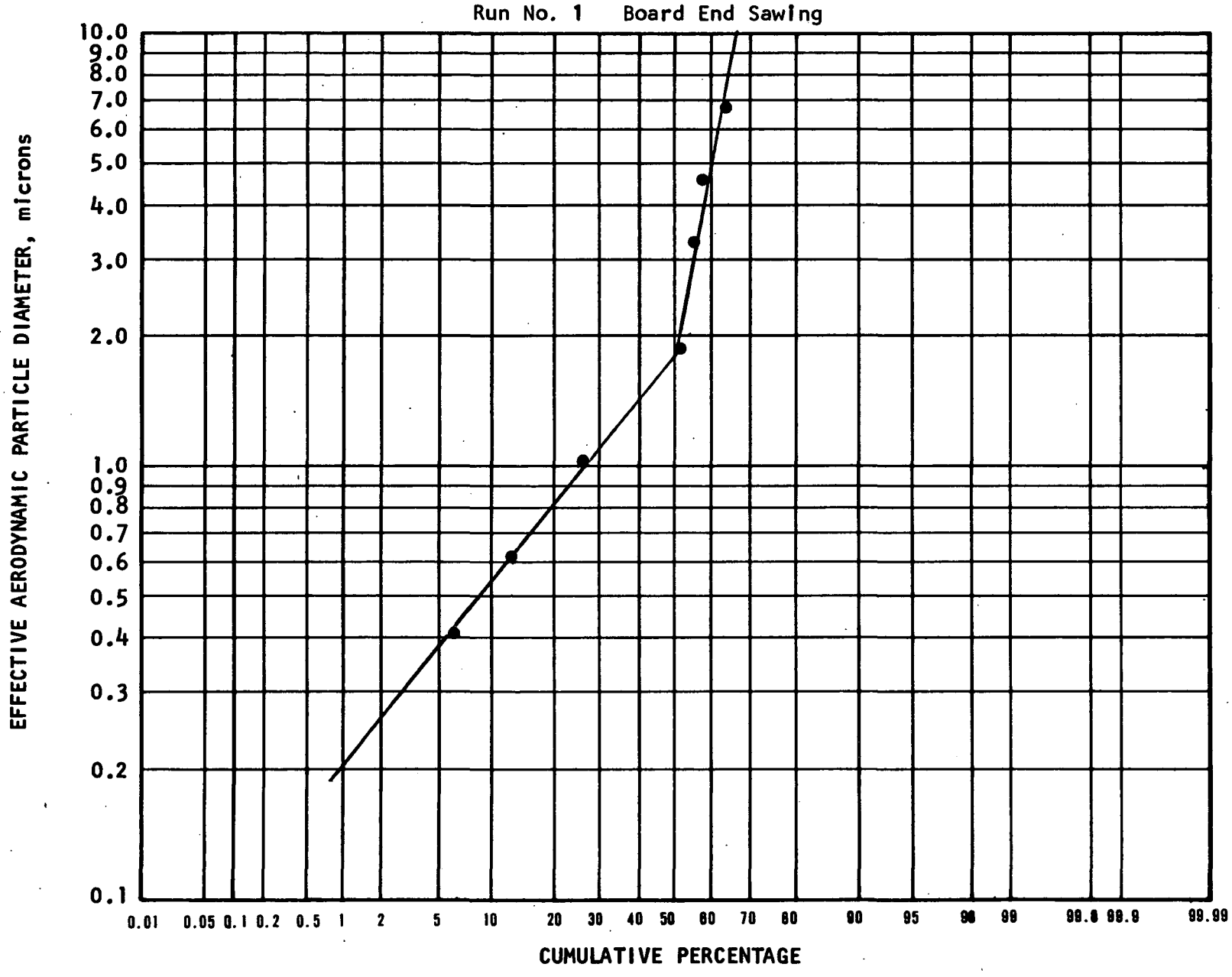
Particle Size Distribution

Run:	1	P_{bar} (in. Hg)	29.97
Date:	6-5-80	Stack Temp (^{o}F)	85
Location:	U.S. Gypsum	Sample Time (min.)	120
Sampling Location:	Brd. End Sawing Outlet	Sample Volume (cf)	100.732
Traverse Point No. Sampled:	X-1	Moisture (% H_2O)	1.5
		Meter Temp (^{o}F)	113
		Flow Setting, ΔH (in. H_2O)	2.4
		Nozzle Diameter (in.)	0.171

Sample Flow Rate (at stack conditions): 0.82 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	8.5	36.9	100.0	11.7
2	1.2	5.2	63.1	6.8
3	0.5	2.2	57.9	4.7
4	0.9	4.0	55.7	3.3
5	5.7	24.8	51.7	1.9
6	3.2	13.9	26.9	1.0
7	1.5	6.5	13.0	0.62
8	0.7	3.0	6.5	0.42
Backup Filter	0.8	3.5	3.5	----
TOTAL	23.0	100.0		

FIGURE 16


Run No. 1 Board End Sawing
EFFECTIVE AERODYNAMIC PARTICLE DIAMETER, microns
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99
CUMULATIVE PERCENTAGE

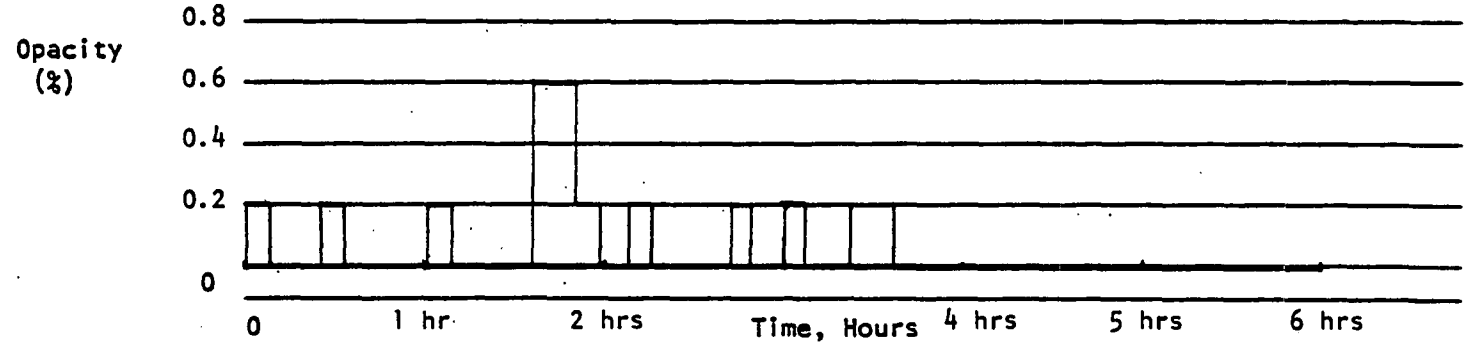
SUMMARY OF VISIBLE EMISSIONS
TABLE 36

Date: June 3, 1980
Type of Plant: Dry Well Board Plant
Type of Discharge: Stack
Location of Discharge: No. 4 Kettle Calciner Exh
Height of Point of Discharge: 2nd level + 50 ft
Description of Sky: Partly cloudy
Wind Direction: West
Wind Velocity: 5 mph
Color of Plume: White
Detached Plume: Yes
Observer No.: N/A
Duration of Observation: 5 hrs 48 minutes
Distance from Observer to Discharge Point: 100 feet
Direction of Observer from Discharge Point: Southwest of Stack
Height of Observation Point: Ground Level
Description of Background: Blue Sky

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	0925	0930	5	0.2	21	1124	1130	0	0.0
2	0930	0936	0	0.0	22	1400	1406	0	0.0
3	0936	0942	5	0.2	23	1406	1412	5	0.2
4	0942	0948	0	0.0	24	1412	1418	0	0.0
5	0948	0954	0	0.0	25	1418	1424	0	0.0
6	0954	1000	5	0.2	26	1424	1430	0	0.0
7	1000	1006	0	0.0	27	1430	1436	0	0.0
8	1006	1012	0	0.0	28	1436	1442	0	0.0
9	1012	1018	0	0.0	29	1442	1448	5	0.2
10	1018	1024	0	0.0	30	1448	1454	0	0.0
11	1024	1030	0	0.0	31	1454	1500	0	0.0
12	1030	1036	5	0.2	32	1500	1506	5	0.2
13	1036	1042	0	0.0	33	1506	1512	0	0.0
14	1042	1048	0	0.0	34	1512	1518	5	0.2
15	1048	1054	0	0.0	35	1518	1524	5	0.2
16	1054	1100	0	0.0	36	1524	1530	0	0.0
17	1100	1106	0	0.0	37	1530	1536	0	0.0
18	1106	1112	15	0.6	38	1536	1542	0	0.0
19	1112	1118	15	0.6	39	0830	0836	0	0.0
20	1118	1124	5	0.2	40	0836	0842	0	0.0

Sketch Showing How Opacity Varied with Time:



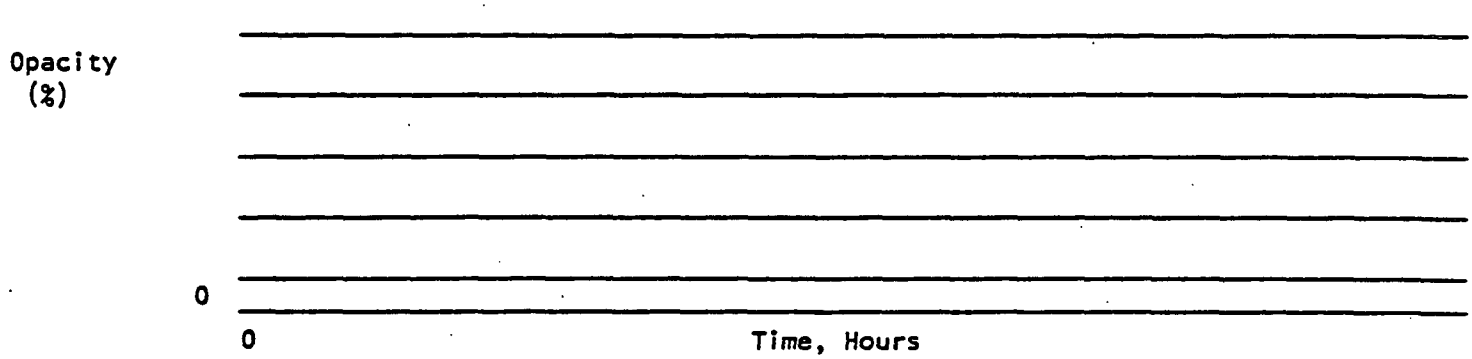
SUMMARY OF VISIBLE EMISSIONS
TABLE 36 continued

Date: June 3, 1980
Type of Plant: Dry Wall Board Plant
Type of Discharge: Stack
Location of Discharge: No. 4 Kettle Calciner Exh
Height of Point of Discharge: 2nd level + 50'
Description of Sky: Partly Cloudy
Wind Direction: West
Wind Velocity: 5 mph
Color of Plume: White
Detached Plume: Yes
Observer No.: N/A
Duration of Observation: 5 hrs 48 minutes
Distance from Observer to Discharge Point: 100 feet
Direction of Observer from Discharge Point: Southwest of Stack
Height of Observation Point: Ground Level
Description of Background: Blue Sky

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	0842	0848	0	0.0	21				
2	0848	0854	0	0.0	22				
3	0854	0900	0	0.0	23				
4	0900	0906	0	0.0	24				
5	0906	0912	0	0.0	25				
6	0912	0918	0	0.0	26				
7	0918	0924	0	0.0	27				
8	0924	0930	0	0.0	28				
9	0930	0936	0	0.0	29				
10	0936	0942	0	0.0	30				
11	0942	0948	0	0.0	31				
12	0948	0954	0	0.0	32				
13	0954	1000	0	0.0	33				
14	1000	1006	0	0.0	34				
15	1006	1012	0	0.0	35				
16	1012	1018	0	0.0	36				
17	1018	1024	0	0.0	37				
18	1024	1030	0	0.0	38				
19					39				
20					40				

Sketch Showing How Opacity Varied with Time:



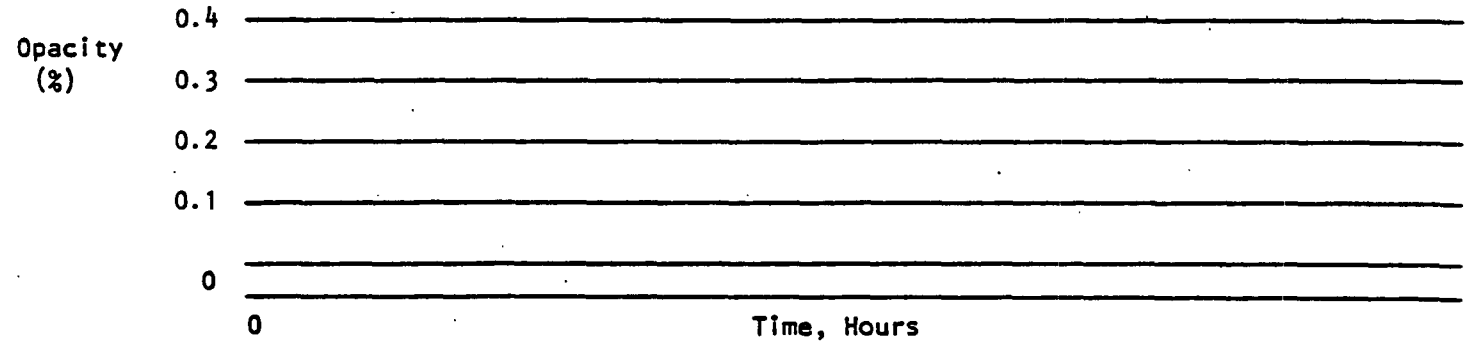
SUMMARY OF VISIBLE EMISSIONS
TABLE 37

Date: June 5-6, 1980
Type of Plant: Dry Wall Board Plant
Type of Discharge: Stack
Location of Discharge: Rock Dryer
Height of Point of Discharge: 2nd level + 20'
Description of Sky: Partly Cloudy
Wind Direction: West
Wind Velocity: 3-5 mph
Color of Plume: White
Detached Plume: Yes
Observer No.: N/A
Duration of Observation: 4 hrs 15 minutes
Distance from Observer to Discharge Point: 15 feet
Direction of Observer from Discharge Point: West
Height of Observation Point: 10 feet below stack
Description of Background: Gray building

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	1810	1815	0	0.0	21	1005	1011	5	0.2
2	1815	1821	5	0.2	22	1011	1017	0	0.0
3	1821	1827	0	0.0	23	1017	1023	0	0.0
4	1827	1833	0	0.0	24	1023	1029	0	0.0
5	1833	1839	5	0.2	25	1029	1035	0	0.0
6	1839	1845	0	0.0	26	1035	1041	0	0.0
7	1845	1851	0	0.0	27	1041	1047	0	0.0
8	1851	1857	0	0.0	28	1047	1053	5	0.2
9	1857	1903	0	0.0	29	1053	1055	0	0.0
10	1903	1909	0	0.0	30	1150	1156	0	0.0
11	1909	1915	5	0.2	31	1156	1202	0	0.0
12	1915	1921	0	0.0	32	1202	1208	5	0.2
13	1921	1927	0	0.0	33	1208	1214	0	0.0
14	1927	1930	0	0.0	34	1214	1220	5	0.2
15	0930	0935	0	0.0	35	1220	1226	0	0.0
16	0935	0941	0	0.0	36	1226	1232	0	0.0
17	0941	0947	5	0.2	37	1232	1238	10	0.4
18	0947	0953	0	0.0	38	1238	1244	0	0.0
19	0953	0959	5	0.2	39	1244	1250	0	0.0
20	0959	1005	0	0.0	40	1250	1256	0	0.0

Sketch Showing How Opacity Varied with Time:



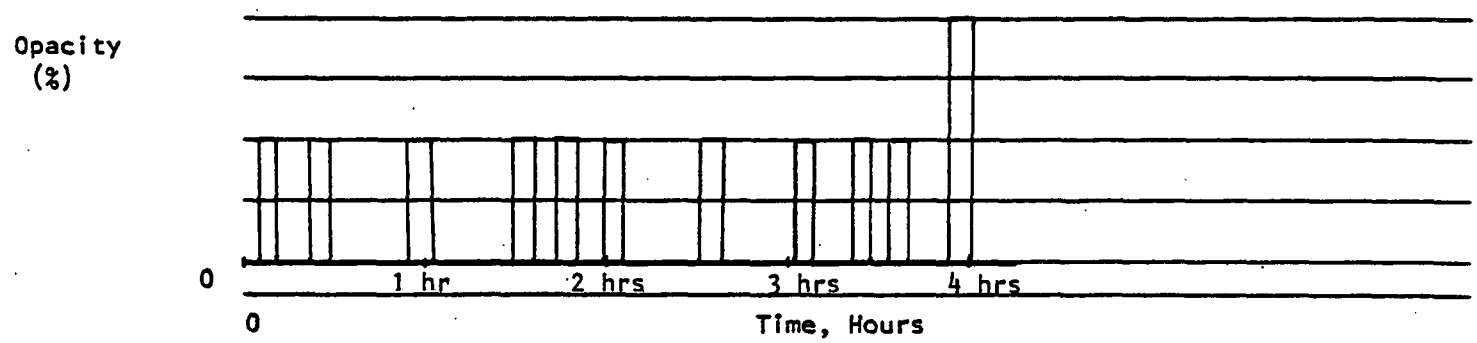
SUMMARY OF VISIBLE EMISSIONS
TABLE 37 continued

Date: June 5-6, 1980
Type of Plant: Dry Wall Board Plant
Type of Discharge: Stack
Location of Discharge: Rock Dryer
Height of Point of Discharge: 2nd level + 20'
Description of Sky: Partly Cloudy
Wind Direction: West
Wind Velocity: 3-5 mph
Color of Plume: White
Detached Plume: Yes
Observer No.: N/A
Duration of Observation: 4 hrs 15 minutes
Distance from Observer to Discharge Point: 15 feet
Direction of Observer from Discharge Point: West
Height of Observation Point: 10 ft. below stack
Description of Background: Gray Building

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	1256	1302	0	0.0	21				
2	1302	1308	0	0.0	22				
3	1308	1314	0	0.0	23				
4	1314	1320	5	0.2	24				
5					25				
6					26				
7					27				
8					28				
9					29				
10					30				
11					31				
12					32				
13					33				
14					34				
15					35				
16					36				
17					37				
18					38				
19					39				
20					40				

Sketch Showing How Opacity Varied with Time:



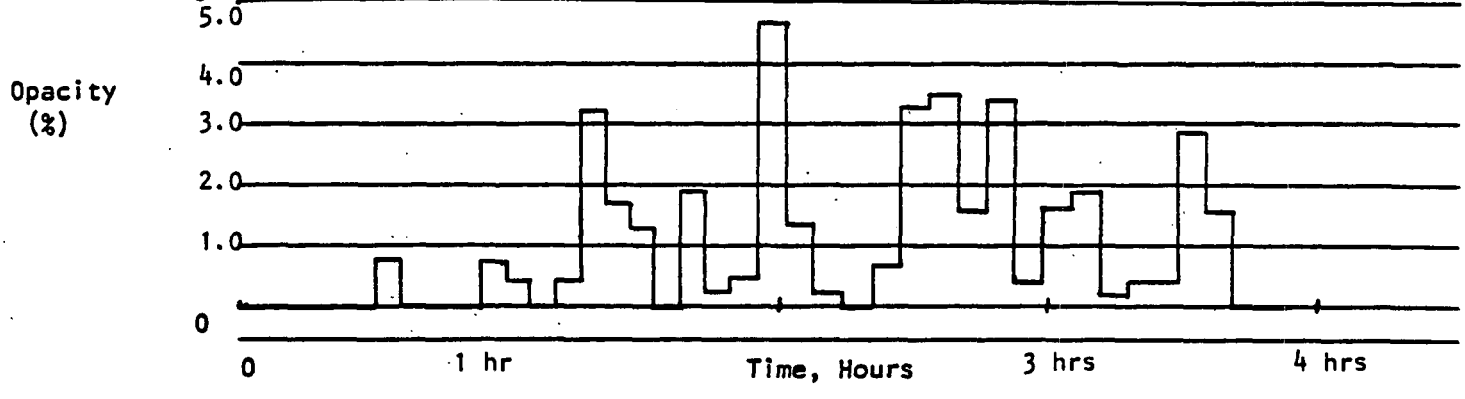
SUMMARY OF VISIBLE EMISSIONS
TABLE 38

Date: June 5, 1980
Type of Plant: Dry Wall Board Plant
Type of Discharge: Stack
Location of Discharge: Board End Sawing
Height of Point of Discharge: 2nd level
Description of Sky: Clear
Wind Direction: West
Wind Velocity: 3 mph
Color of Plume: White
Detached Plume: Yes
Observer No.: N/A
Duration of Observation: 3 hrs 50 minutes
Distance from Observer to Discharge Point: 90 feet
Direction of Observer from Discharge Point: Northeast
Height of Observation Point: 2nd Level
Description of Background: Green trees

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	1200	1205	0	0.0	21	1439	1445	110	4.6
2	1205	1211	0	0.0	22	1445	1451	30	1.3
3	1211	1217	0	0.0	23	1451	1457	5	0.2
4	1217	1223	0	0.0	24	1457	1503	0	0.0
5	1223	1229	0	0.0	25	1503	1509	15	0.6
6	1229	1235	20	0.8	26	1509	1515	75	3.1
7	1235	1241	0	0.0	27	1515	1520	85	3.5
8	1241	1247	0	0.0	28	1600	1605	40	1.7
9	1247	1253	0	0.0	29	1605	1611	80	3.3
10	1253	1259	20	0.8	30	1611	1617	10	0.4
11	1259	1305	10	0.4	31	1617	1623	40	1.7
12	1305	1311	0	0.0	32	1623	1629	45	1.9
13	1311	1317	10	0.4	33	1629	1635	5	0.2
14	1317	1323	75	3.1	34	1635	1641	10	0.4
15	1323	1329	40	1.7	35	1641	1647	10	0.4
16	1410	1415	30	1.3	36	1647	1653	70	2.9
17	1415	1421	0	0.0	37	1653	1659	40	1.7
18	1421	1427	45	1.9	38	1659	1705	0	0.0
19	1427	1433	5	0.2	39	1705	1711	0	0.0
20	1433	1439	10	0.4	40				

Sketch Showing How Opacity Varied with Time:



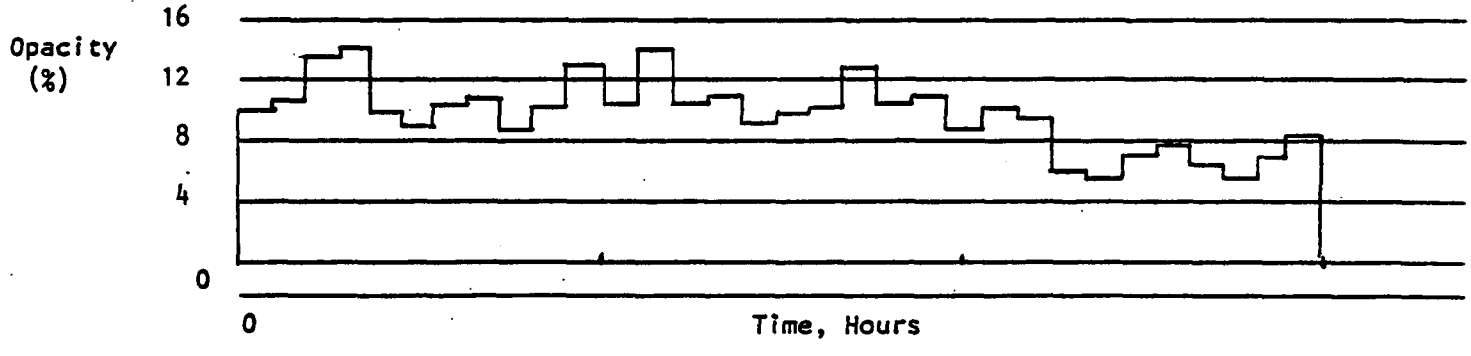
SUMMARY OF VISIBLE EMISSIONS
TABLE 39

Date: June 3, 1980
Type of Plant: Dry Wall Board Plant
Type of Discharge: Stack
Location of Discharge: Scoring & Chambering
Height of Point of Discharge: 2nd level + 30'
Description of Sky: Partly Cloudy
Wind Direction: West
Wind Velocity: 5 mph
Color of Plume: White
Detached Plume: Yes
Observer No.: N/A
Duration of Observation: 3 hours
Distance from Observer to Discharge Point: 50 feet
Direction of Observer from Discharge Point: South of stack
Height of Observation Point: 11 ft. below stack
Description of Background: Forest

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	0830	0835	240	10.0	21	1308	1314	260	10.8
2	0835	0841	260	10.8	22	1314	1315	35	8.8
3	0841	0847	315	13.1	23	1550	1555	230	9.6
4	0847	0853	340	14.2	24	1555	1601	220	9.2
5	0853	0859	235	9.8	25	1601	1607	155	6.5
6	0859	0905	215	9.0	26	1607	1613	150	6.3
7	0905	0911	240	10.0	27	1613	1619	175	7.3
8	0911	0917	250	10.4	28	1619	1625	185	7.7
9	0917	0922	140	8.8	29	1625	1631	170	7.1
10	1200	1205	230	9.6	30	1631	1637	160	6.7
11	1205	1208	150	12.5	31	1637	1643	180	7.5
12	1215	1220	265	11.0	32	1643	1649	195	8.1
13	1220	1226	340	14.2	33	1649	1650	25	1.0
14	1226	1232	265	11.0	34				
15	1232	1238	280	11.7	35				
16	1238	1244	235	9.8	36				
17	1244	1250	245	10.2	37				
18	1250	1256	250	10.4	38				
19	1256	1302	300	12.5	39				
20	1302	1308	255	10.6	40				

Sketch Showing How Opacity Varied with Time:



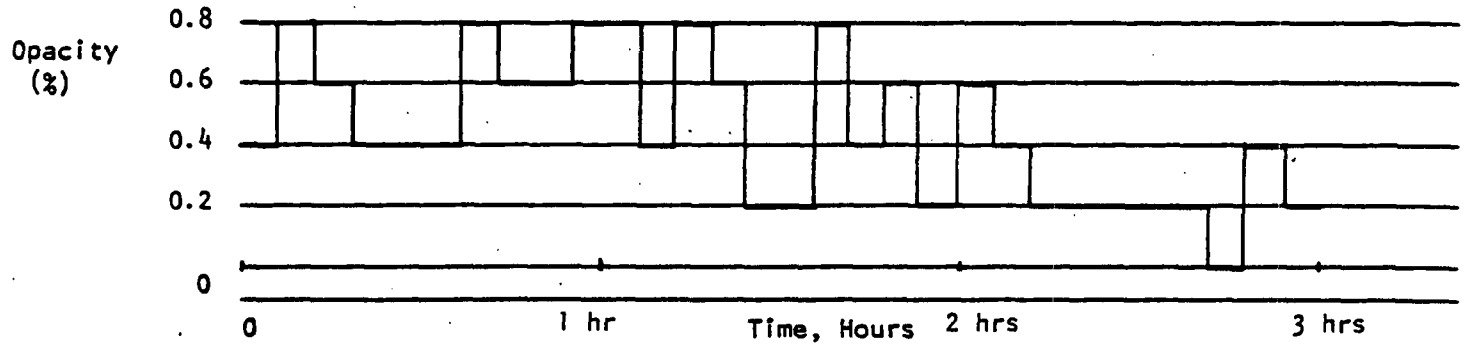
SUMMARY OF VISIBLE EMISSIONS
TABLE 40

Date: June 10, 1980
Type of Plant: Dry Wall Board Plant
Type of Discharge: Stack
Location of Discharge: Surge Bin
Height of Point of Discharge: 2nd level + 20'
Description of Sky: Clear
Wind Direction: East
Wind Velocity: 2 mph
Color of Plume: White
Detached Plume: Yes
Observer No.: N/A
Duration of Observation: 3 hrs
Distance from Observer to Discharge Point: 20 feet
Direction of Observer from Discharge Point: East of stack
Height of Observation Point: 20 ft below stack
Description of Background: Forest

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	1245	1250	10	0.4	21	1450	1455	15	0.6
2	1250	1256	20	0.8	22	1455	1501	10	0.4
3	1256	1302	15	0.6	23	1501	1507	5	0.2
4	1302	1308	10	0.4	24	1507	1513	5	0.2
5	1308	1314	10	0.4	25	1513	1519	5	0.2
6	1314	1320	10	0.4	26	1519	1525	5	0.2
7	1320	1326	20	0.8	27	1525	1531	5	0.2
8	1326	1332	15	0.6	28	1531	1537	0	0.0
9	1332	1338	15	0.6	29	1537	1543	10	0.4
10	1338	1344	20	0.8	30	1543	1549	5	0.2
11	1348	1353	20	0.8	31				
12	1353	1359	10	0.4	32				
13	1359	1405	20	0.8	33				
14	1405	1411	15	0.6	34				
15	1411	1417	5	0.2	35				
16	1417	1423	5	0.2	36				
17	1423	1429	20	0.8	37				
18	1429	1435	10	0.4	38				
19	1435	1441	15	0.6	39				
20	1441	1447	5	0.2	40				

Sketch Showing How Opacity Varied with Time:



SUMMARY OF VISIBLE EMISSIONS
TABLE 41

Date: June 4-5, 1980
Type of Plant: Dry Wall Board Plant
Type of Discharge: Stack
Location of Discharge: Baggage & Packing
Height of Point of Discharge: 2nd level + 25'
Description of Sky: Partly Cloudy
Wind Direction: N/A
Wind Velocity: 3 mph
Color of Plume: White
Detached Plume: No
Observer No.: N/A
Duration of Observation: 3 hours
Distance from Observer to Discharge Point: 15 feet
Direction of Observer from Discharge Point: Northeast of stack
Height of Observation Point: 2nd level + 25 ft.
Description of Background: Gray Building

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	0900	0905	0	0.0	21	0830	0835	0	0.0
2	0905	0911	0	0.0	22	0835	0841	0	0.0
3	0911	0917	0	0.0	23	0841	0847	0	0.0
4	0917	0923	0	0.0	24	0847	0853	0	0.0
5	0923	0929	0	0.0	25	0853	0859	0	0.0
6	0929	0935	0	0.0	26	0859	0905	0	0.0
7	0935	0941	0	0.0	27	1338	1343	0	0.0
8	0941	0947	0	0.0	28	1343	1349	0	0.0
9	0947	0953	0	0.0	29	1349	1355	0	0.0
10	0953	0959	0	0.0	30	1355	1401	0	0.0
11	1130	1135	0	0.0	31	1401	1403	0	0.0
12	1135	1141	0	0.0	32				
13	1141	1147	0	0.0	33				
14	1147	1153	0	0.0	34				
15	1153	1159	0	0.0	35				
16	1300	1305	0	0.0	36				
17	1305	1311	0	0.0	37				
18	1311	1317	0	0.0	38				
19	1317	1323	0	0.0	39				
20	1323	1329	0	0.0	40				

Sketch Showing How Opacity Varied with Time:

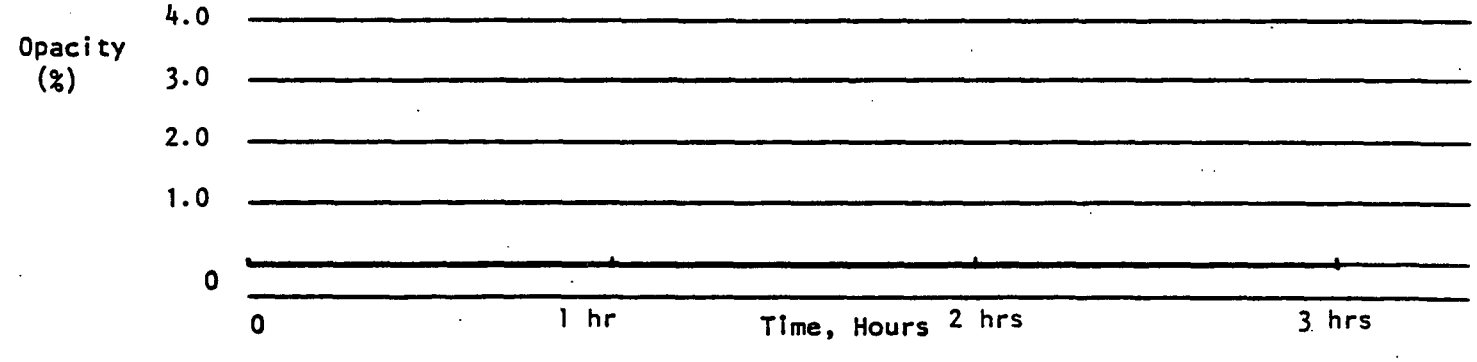


Table 42

No. 5 Upper and Lower Mixer Stations

Mean fugitive emission values (percent frequency emission) for three tests at each location are presented.

No. 5 Upper Mixer Station

	Test Mean
Test 1	0.0
Test 2	0.0
Test 3	0.0
Site Mean	0.0

No. 5 Lower Mixer Station

	Test Mean
Test 1	0.0
Test 2	8.06
Test 3	28.81
Site Mean	12.29

Table 43

Scoring/Chamfering Operation Station 5

	Test Mean
Test 1	0.0
Test 2	0.0
Test 3	0.0
Site Mean	0.0

Packer Baghouse Discharge Station (Bagging Unit)

	Test Mean
Test 1	42.50
Test 2	54.31
Test 3	30.56
Site Mean	42.45

Board End Sawing Baghouse Inlet Station

	Test Mean
Test 1	0.0
Test 2	1.25
Test 3	0.0
Site Mean	0.42