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Air

EPA

Gypsum Industry

Emission Test Report Gold Bond Building Products Wilmington, North Carolina

SOURCE EMISSIONS TEST REPORT

GOLD BOND BUILDING PRODUCTS
Wilmington, North Carolina

No. 2 Calcidyne Baghouse and
Rock Dryer Baghouse

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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 Gold Bond Building Products' Wilmington, North Carolina gypsum processing facility.

The primary objectives of the testing program were to determine collector particulate removal efficiencies, and to quantify particulate emissions to the atmosphere from two baghouse-controlled sources at the plant (No. 2 calcidyne and rock dryer). This objective was achieved by performing a series of three particulate tests utilizing EPA Method 5[1] procedures at each baghouse inlet duct and outlet stack location. In addition, visual determinations of plume opacities were made simultaneously with each particulate test at the two source discharge points according to EPA Method 9[2] protocol. A singular Anderson® cascade impactor[3] test was performed at each stack exhaust location and three Anderson® cascade impactor tests were conducted at each of the baghouse inlet locations. In addition, frequency of fugitive emissions (by EPA Method 22[4]) was monitored at several points in the processing operation.

Particulate matter and visible emissions results are summaried as follows:

No. 2 Calcidyne Baghouse Inlet Duct

Test Number	Date	Particulate Concentration Grains/DSCF	Particulate Emission Rate Pounds/Hour
1	5-19-80	22.0	288.
2	5-20-80	21.6	284.
3	5-20-80	21.2	269.
Series Average		-	280.

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[1]"Standards of Performance for New Stationary Sources," Code of Federal Regulations, Title 40, Part 60, Appendix A, 18 August 1977.
[2]Federal Register, Vol. 39, No. 219, 12 November 1974.
[3]Operating Manual for Anderson 2000, Inc., "Mark III Particle Sizing Stack Samplers," Anderson 2000, Inc., P.O. Box 20769, Atlanta, Georgia.
[4]Draft Method, Revised 28 July 1978.

No. 2 Calcidyne Baghouse Outlet Stack

Test Number	Date	Particulate Concentration Grains/DSCF	Particulate Emission Rate Pounds/Hour	Maximum Recorded Opacity Percent
1	5-19-80	0.021	0.282	5
2	5-20-80	0.024	0.325	5
3	5-20-80	0.026	0.335	5
Series Average		-	0.314	-

Rock Dryer Baghouse Inlet Duct

Test Number	Date	Particulate Concentration Grains/DSCF	Particulate Emission Rate Pounds/Hour
1	5-21-80	50.7	4,900.
2	5-22-80	51.9	5,070.
3	5-22-80	51.2	5,180.
Series Average		-	5,050.

Rock Dryer Baghouse Outlet Stack

Test Number	Date	Particulate Concentration Grains/DSCF	Particulate Emission Rate Pounds/Hour	Maximum Recorded Opacity Percent
1	5-21-80	0.027	2.69	5
2	5-22-80	0.019	1.83	5
3	5-22-80	0.018	1.77	0
Series Average		-	2.10	-

Stucco Baghouse Outlet Stack

Test Number	Date	Maximum Recorded Opacity Percent
1	5-27-80	15
2	5-27-80	10
3	5-27-80	5

The average measured particulate removal efficiency of the No. 2 Calcidyne Baghouse was 99.89%; that of the Rock Dryer Baghouse was 99.96%.

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

INTRODUCTION

The Emission Measurement Branch of the U.S. Environmental Protection Agency contracted Weston to conduct a source testing and analysis program at Gold Bond Building Products' Wilmington, North Carolina gypsum processing facility. The objective of the testing program was to measure various emission parameters relating to milling, drying, and packaging operations at the plant.

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

1. No. 2 Calcidyne Baghouse Inlet Duct
   a. Three particulate tests by EPA Method 5.
   b. Three particle size distribution tests by cascade impaction (Anderson®).
2. No. 2 Calcidyne Baghouse Outlet Stack
   a. Three particulate tests by EPA Method 5.
   b. One particle size distribution test by cascade impaction (Anderson®).
   c. Three opacity tests by EPA Method 9 simultaneous with particulate tests.
3. Rock Dryer Baghouse Inlet Duct
   a. Three particulate tests by EPA Method 5.
   b. Three particle size distribution tests by cascade impaction (Anderson®).
4. Rock Dryer Baghouse Outlet Stack
   a. Three particulate tests by EPA Method 5.
   b. One particle size distribution test by cascade impaction (Anderson®).

c. Three opacity tests by EPA Method 9 performed concurrently with particulate tests.

5. Board End Sawing

   a. Three EPA Method 22 fugitive emission tests.

6. Score Wheel

   a. Three EPA Method 22 fugitive emission tests.

7. Admix Conveyor

   a. Three EPA Method 22 fugitive emission tests.

8. Fiberglass Shredder

   a. Three EPA Method 22 fugitive emission tests.

9. Vermiculite Addition Process

   a. One EPA Method 22 fugitive emission test.

10. Stucco Baghouse Outlet Stack

    a. Three opacity tests by EPA Method 9.

All tests were conducted during the period 19 through 27 May 1980 by Weston personnel, and were observed by Mr. Dennis P. Holzschuh, EPA Technical Manager.

Test data and test result summaries are presented in Tables 8 through 23 of this report. Particle size distribution results are shown in Tables 24 through 31. Also included in this report are descriptions of the test locations, test equipment, test procedures, and sample recovery and analytical methods used during the test program. Raw test data, laboratory reports, sample calculations, equipment calibration records, and a list of project participants are provided in Appendices A through E, respectively.

PROCESS DESCRIPTION AND OPERATION

PLANT DESCRIPTION

The Gold Bond Building Products Wilmington, North Caroline plant produces wallboard from gypsum ore mined in Halifax, Nova Scotia. The ore is shipped to the plant by ocean-going freighter. A simplified flow diagram for the process used at the Wilmington 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 571°K (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 Wilmington 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 Wilmington 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.

Calcidyne Unit

The calciner used at the Wilmington plant is a direct-contact flash calciner of National Gypsum's own patented design. The Calcidyne unit is a continuous calciner in which gypsum is calcined through direct contact with hot gases. A schematic diagram of the unit is shown in Figure 3.

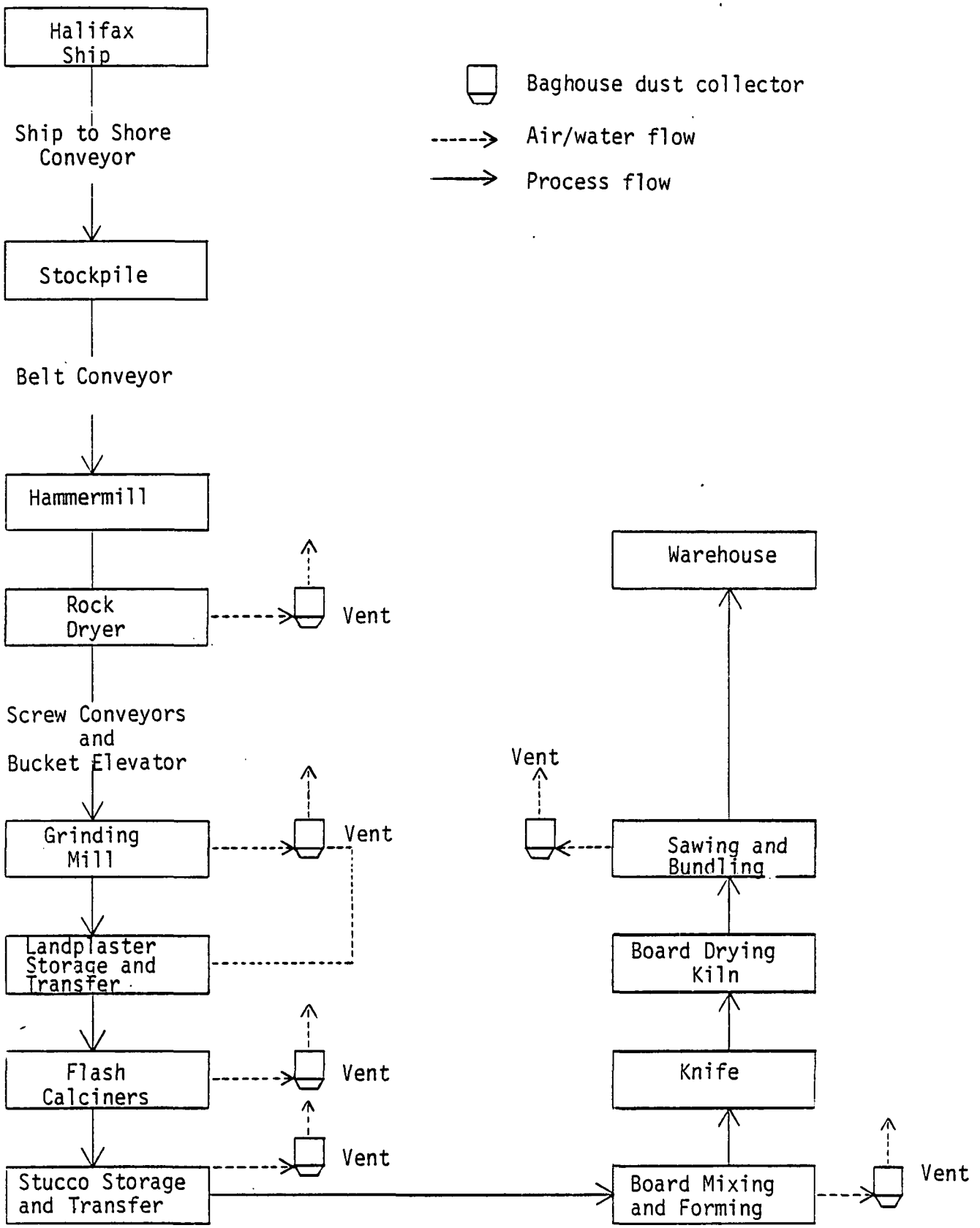


Figure 1. Block Flow Diagram for Wilmington Board Plant

TABLE 1. EMISSION TESTS CONDUCTED AT GOLD BOND, WILMINGTON, N.C. PLANT

PROCESS TESTED	DATE	CONTROL METHOD	TEST TYPE	INLET TEST	OUTLET TEST
Direct contact calciner	5/19/80	Fabric Filter	Particulate loading Particle size Visible Emission	3 EPA-5 3 Andersen N/A	3 EPA-5 1 Andersen EPA-9
Rock Dryer	5/21/80	Fabric Filter	Particulate loading Particle size Visible emission	3 EPA-5 3 Andersen N/A	3 EPA-5 1 Andersen EPA-9
Stucco Storage and Transfer (2 storage bins, 5 screw conveyors, 2 bucket elevators, admix conveyor, and air conveyor)	5/27/80	Fabric Filter	Visible emission	--	EPA-9
Board end-sawing	5/19/80 5/20/80	Capture Hood/ Fabric Filer	Visible emission	--	EPA-22
Paper scoring	5/20/80 5/21/80	Capture Hood/ Fabric Filter	Visible emission	--	EPA-22
Accelerator addition	5/21/80	Capture Hood/ Fabric Filter	Visible emission	--	EPA-22
Fiberglass Shredder	5/21/80 5/22/80	Capture Hood/ Fabric Filter	Visible emissions	--	EPA-22
Vermiculite Addition	5/22/80	Capture Hood/ Fabric Filter	Visible emissions	--	EPA-22

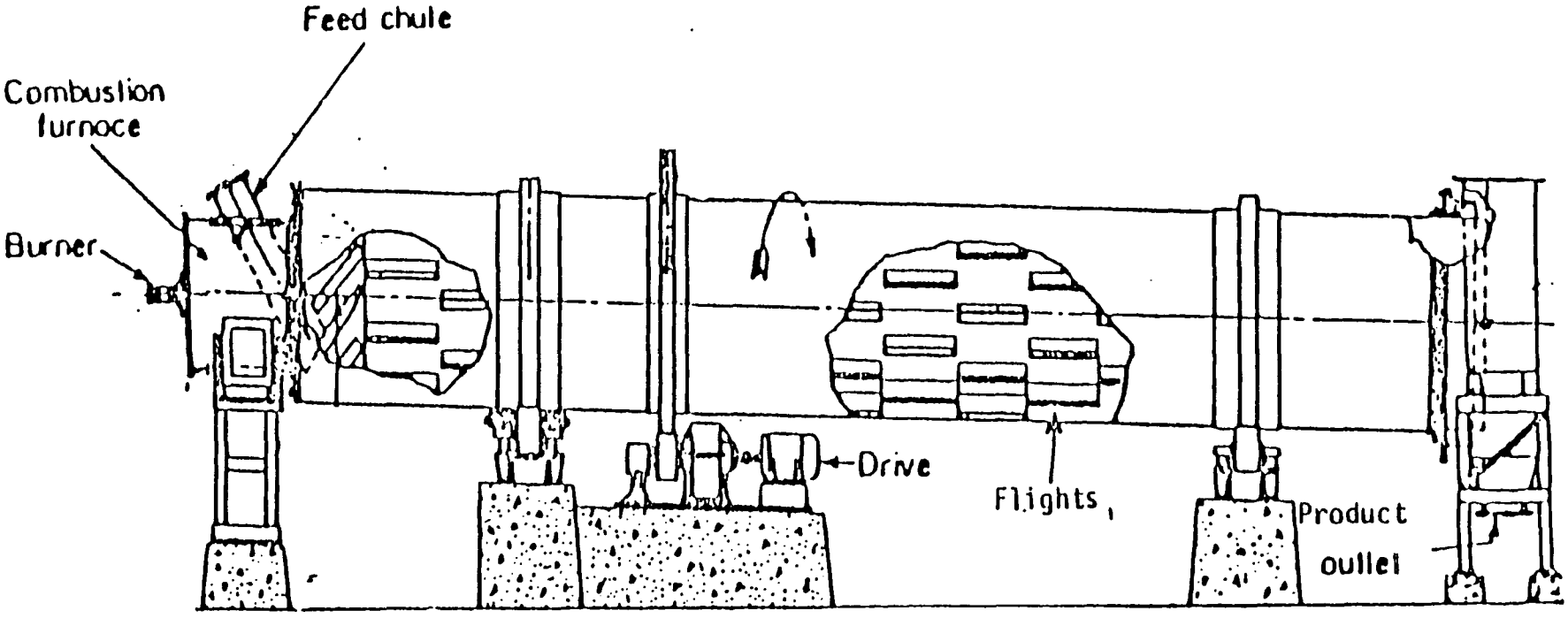


Figure 2 Direct-Fired, Co-Current, Rotary Dryer

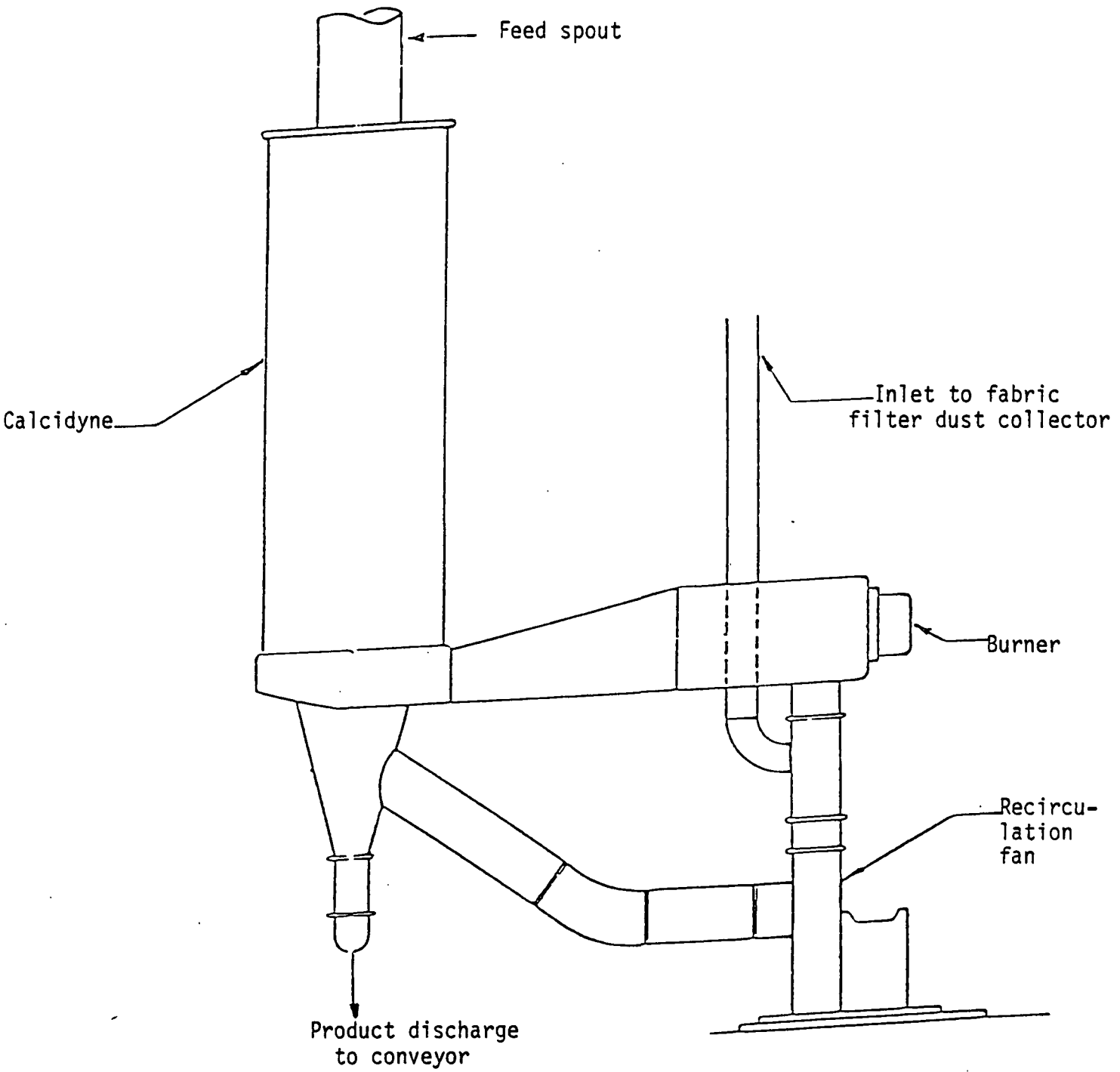


Figure 3 Calcidyne Flash Calciner

Stucco Storage and Transfer

The stucco storage and transfer system used at the plant employs conventional screw conveyors and bucket elevators to transfer stucco from the Calcidyne units to two 150-ton storage bins and from the storage bins to the board forming line.

Board Forming Line

The boardline tested at the Wilmington plant is of average size, capable of producing about 23 million square meters (250 million square feet) of wallboard per year on a half-inch basis. The process operations tested on the boardline, which include board end sawing, paper scoring, accelerator addition, fiberglass shredding, and vermiculite addition, are typical of those used throughout the gypsum industry.

EMISSION CONTROLS

Fabric filter dust collectors are used at the Wilmington plant to control gypsum particulate emissions. Dust-laden gases exiting the rock dryer and the direct contact calciner are vented to separate baghouses. Emissions from screw conveyors, bucket elevators, and storage bins are vented to two fabric filter dust collectors: one collector for transfer and storage of dried gypsum or landplaster, and a second collector for transfer and storage of calcined gypsum or stucco. Boardline emissions, which include emissions from mixing, paper scoring, fiberglass shredding, accelerator addition, and board end sawing, are also controlled by baghouses.

Design and operating parameters for the baghouses tested at the Wilmington plant are given in Table 2. Design parameters for the process units vented to the stucco storage and transfer baghouse are given in Table 3. The values for process rate and air flow given in Table 3 are design values and only approximate actual values.

Normal replacement frequencies and the most-recent replacement dates for bags in the dust collectors tested are shown in Table 4. Inspections of the rock dryer baghouse and the stucco transfer baghouse on May 17 and May 24, respectively, indicated that the filter bags were in need of replacement.

TABLE 2. CONTROL EQUIPMENT PARAMETERS

Process Unit Name	Baghouse Manufacturer	Number of Bags	Bag Dimensions (diam X length in inches)	Cloth Area (square feet)	Fabric Type	Design Air Flow (ACFM)	Duration of pulse[a] (sec)	Frequency of pulse[a] (sec)	Pressure of pulse (psig)
Direct Contact Calciner	Flex-Kleen (reverse pulse)	96	6 X 84	960	Nomex	4100	0.1	10	90
Rock Dryer	Ray Jet (reverse pulse)	192	6 X 108	2080	Nomex	14800	0.1	10	90
Stucco Transfer	Ray Jet (reverse pulse)	120	6 X 108	1800	Dacron	9030	0.1	10	90

[a]These values are approximate; they are varied automatically to maintain a set pressure drop across the filter.

TABLE 3. STUCCO TRANSFER AND STORAGE SYSTEM

Process Unit Description	Design Capacity [a]	Air Flow (ACFM)[a]
Two storage bins	150 tons each	390 (each)
Admix screw conveyor	25 TPH [b]	390
Bucket elevator feeding storage bins by way of screw conveyors	55 TPH	990
Bucket elevator feeding board plant screw conveyors	35 TPH	990
2 screw conveyors feeding bins from bucket elevator	55 TPH each	780 (each)
Air conveyor	30 TPH	220
Screw conveyor for stucco recycle from 3 calciner baghouses	10 TPH	390
Main stucco conveyor to board plant pin mixer	25 TPH	390
Main stucco conveyor from calciners	25 TPH	1220
Paper scoring	N/A [c]	2100

[a] Note should be made that these values are the design values and only approximate actual operating values.

[b] TPH=Tons per hour

[c] N/A=Not applicable

Table 4

Bag Replacement Schedules

Process Unit Name	Last Date of Bag Replacement	Normal Replacement Frequency (Months)
Direct Contact Calciner	1/20/80	4-6
Rock Dryer	5/17/80	9
Stucco Transfer	5/24/80	12

Process Conditions During Testing

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

All processes and emission control equipment were operated at normal conditions during the emission testing except for the stucco storage and transfer baghouse. The operating conditions of each of the processes tested are discussed separately in the following sections.

Rock Dryer

During the emission testing, the rock dryer at the Wilmington plant was running at its normal operating rate, producing 30 tons of dry rock per hour. This operating rate is 60 percent of the design capacity of the dryer. Process data collected during the EPA Method 5 test runs is shown in Tables 5 and 6. The average heat usage of the dryer during the testing was 0.20 million Btu/ton of dried rock. The dryer was burning high sulfur No. 6 fuel oil with a heating value of 149,100 Btu/gallon. The temperature of the rock exiting the dryer was approximately 155 to 160^{o}F. The results of measurements of the free moisture content of the ore entering and exiting the dryer are shown in Table 7. Due to a rainstorm that occurred on the evening of 20 May 1980, the ore may have been slightly wetter than normal during the emission tests on the dryer. This additional moisture should not affect the test results. The pressure drop through the fabric filter was constant at 2.5 inches of water.

Direct Contact Calciner

During the emission testing of the direct contact calciner, or Calcidyne unit, the calciner was operated at full capacity, reported as 7.0 tons per hour of calcined gypsum or stucco by plant personnel. Various process parameters were monitored during each of the three EPA Method 5 test runs on the direct contact calciner. The data show a seven-percent increase in the fuel usage rate between the first and second test runs. This increase in fuel usage is probably the result of a slight change in the operating rate of the unit. Wilmington plant personnel indicated, however, that the unit was producing approximately seven tons per hour during the entire test. Other process parameters monitored indicate that the calciner was operating at steady-state conditions throughout the testing. The pressure drop through the fabric filter dust collector was constant throughout the test at a value of 3.4 inches of water.

Table 5

Process Data from the Rock Dryer: Run No. 1

Plant: Gold Bond
Location: Wilmington, N.C.
Date: 5/21/80

Local Time	Dryer Temperature °C (°F)	Fuel Usage m^3/hr (gal/min)
10:16 AM	104 (220)	0.16 (0.69)
11:06	104 (220)	0.15 (0.66)
11:45	104 (220)	0.15 (0.65)
12:00 PM	104 (220)	0.14 (0.62)
12:45	104 (220)	0.13 (0.59)
1:00	104 (220)	0.16 (0.69)
1:33	104 (220)	0.15 (0.66)

Table 6

Process Data from the Rock Dryer: Runs No. 2 and 3

Plant: Gold Bond
Location: Wilmington, N.C.
Date: 5/22/80

Local Time	Dryer Temperature °C (°F)	Fuel Usage m^3/hr	(gal/min)
8:41	104 (220)	0.17	(0.76)
10:00	104 (220)	0.15	(0.65)
11:35	104 (220)	0.15	(0.67)
12:39	104 (220)	0.14	(0.63)
1:15 PM	104 (220)	0.15	(0.68)
2:10	104 (220)	0.15	(0.67)
2:33	104 (220)	0.14	(0.63)

Table 7

Free Moisture of Gypsum Rock[a]

Date	Wet Rock (Weight percent free water)	Dry Rock (Weight percent free water)
5/21/80	6.0%	1.0%
5/22/80	7.6%	<0.5%

[a]Free moisture is measured by drying ore sample for one hour at 160°F.

Stucco Transfer and Storage

The transfer and storage system was operating at normal capacity during the emission testing. One of the storage bins was three-fourths full, and the other was one-half full.

An inspection for fugitive emissions from each of the sources vented to the stucco transfer baghouse was performed. No visible emissions were observed from any of the sources during the inspection.

Test data from the stucco transfer and storage baghouse show higher-opacity readings than expected because the fabric filter bags had been changed on May 24 and were in operation only several hours prior to the testing. The EPA-Method 9 test on the stucco storage and transfer baghouse is not representative of normal fabric filter operation. The filter bags were not in operation long enough to allow a filter cake to form on the bags and, therefore, were not operating at maximum efficiency.

Board End Sawing

During the board end sawing testing, the board line was running regular, one-half inch board, eight feet in length for two-thirds of the testing, and regular, one-half inch board, twelve feet in length for the remainer of the testing. The board line was operating at normal speed during the testing.

Other Process Operations

The remaining processes tested, which include paper scoring, accelerator addition, fiberglass shredding, and vermiculite addition, were all tested under normal operating conditions.

PROCESS DESCRIPTION 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.

DESCRIPTION OF PARTICULATE TEST LOCATIONS

NO. 2 CALCIDYNE BAGHOUSE INLET DUCT

Two 4-inch I.D. test ports, 90° apart, were installed on a staight section of the 12-inch I.D. metal stack at a location that was 12 diameters (12 feet) downstream and 6 diameters (6 feet) upstream from the nearest flow disturbance. EPA Method 1 criteria for this test location required a minimum of 12 traverse points. See Figure 4 for port and sampling point locations.

NO. 2 CALCIDYNE BAGHOUSE OUTLET STACK

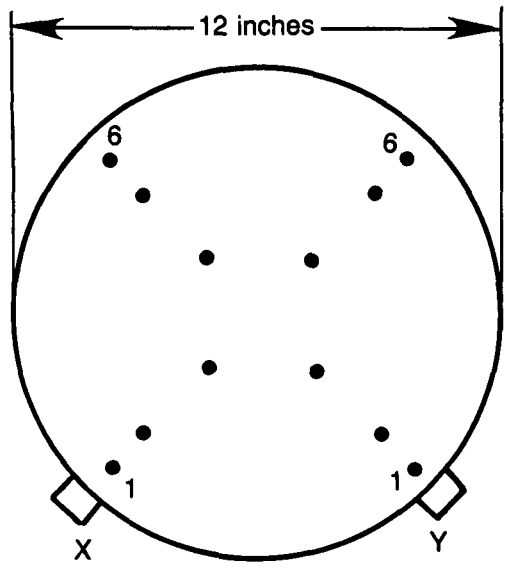
Two 4-inch I.D. test ports were placed at right angles on a straight section of the 11 1/4-inch I.D. metal stack serving the baghouse outlet. The ports were located 5.2 diameters downstream and 2 diameters upstream from the nearest flow disturbance. Stack geometry required the use of 20 sampling points (10 per axis). Figure 5 illustrates port and sampling point locations.

ROCK DRYER BAGHOUSE INLET DUCT

Two 4-inch test ports were placed, 90° apart, on the 25 1/2 -inch I.D. duct at a location which was 1.0 diameter downstream and 1.0 diameter upstream from the nearest gas stream flow disturbance. Forty-eight sampling points (24 per axis) were required for testing. See Figure 6 for port and sampling point locations.

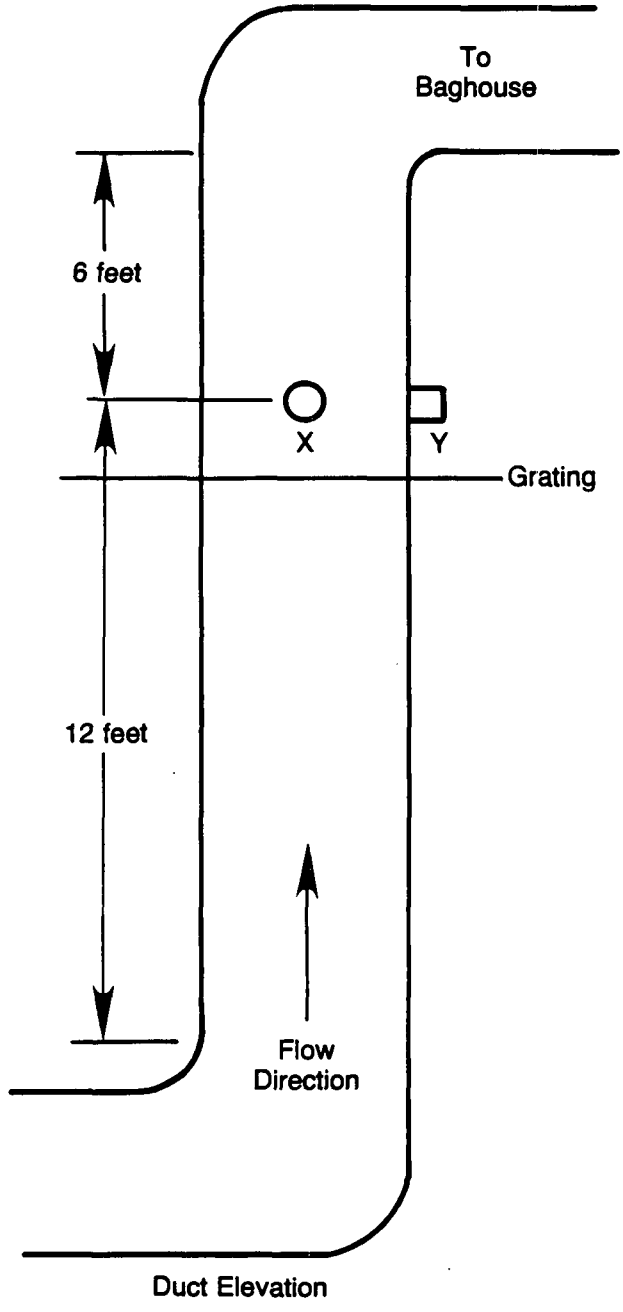
ROCK DRYER BAGHOUSE OUTLET STACK

Two 4-inch I.D. test ports were installed, 90° apart, on a straight section of the 27 1/2-inch I.D. metal stack. The ports were placed 5.2 diameters (143 inches) downstream and 1.3 diameters (35 inches) upstream from the nearest flow disturbance. EPA Method 1 required a minimum of 32 traverse points (16 per axis) for particulate sampling at this location. See Figure 7 for port and sampling point locations.



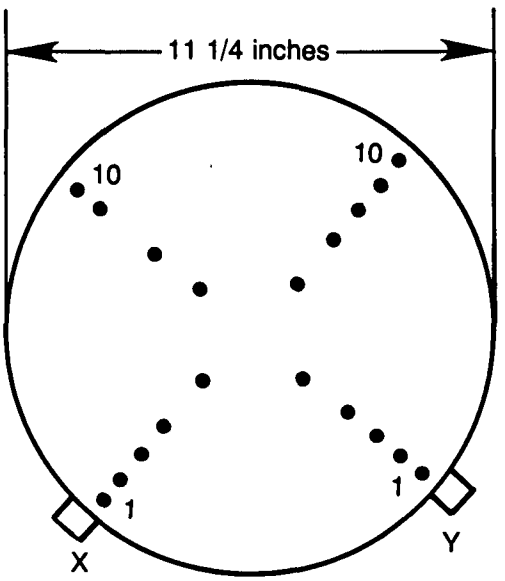
Duct Cross-Sectional Plan

Traverse Point Number	Distance From Inside Near Wall Inches
1	1/2
2	1 3/4
3	3 1/2
4	8 1/2
5	10 1/2
6	11 1/2



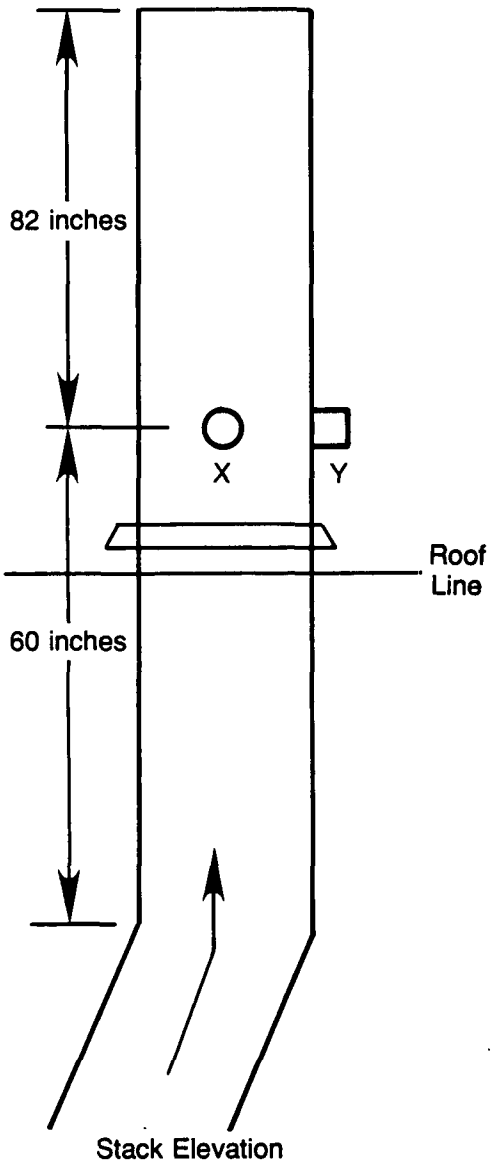
Duct Elevation

Figure 4 No. 2 Calcidyne Baghouse Inlet Duct Port and Sampling Point Locations



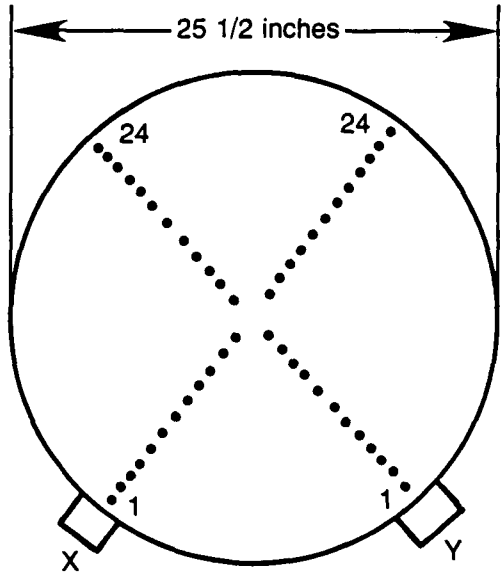
Stack Cross-Sectional Plan

Traverse Point Number	Inside Near Wall Inches
1	1/2
2	7/8
3	1 5/8
4	2 1/2
5	3 7/8
6	7 3/8
7	8 3/4
8	9 5/8
9	10 3/8
10	10 3/4



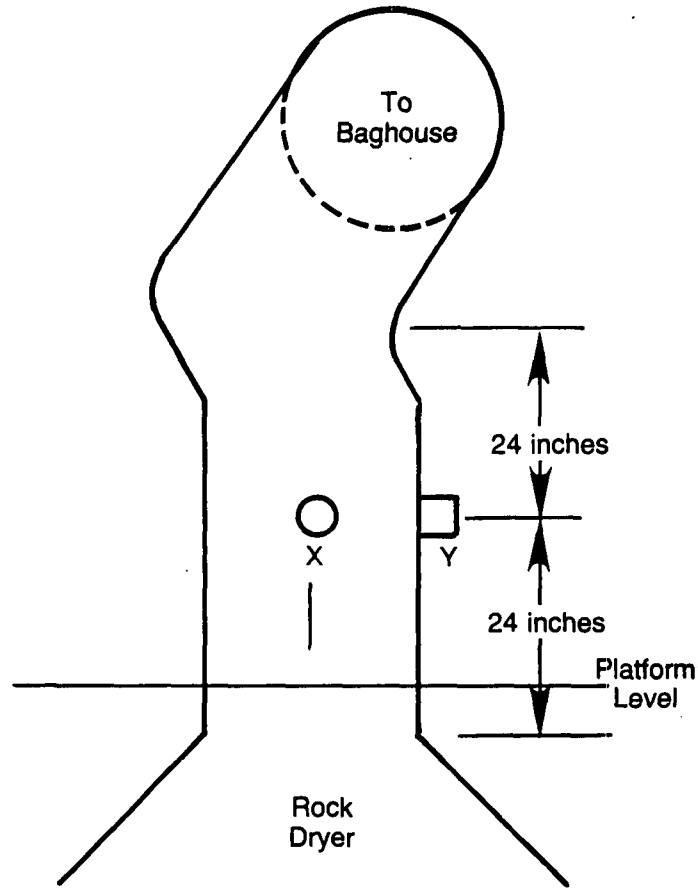
Stack Elevation

Figure 5 No. 2 Calcidyne Baghouse Outlet Stack Port and Sampling Point Locations



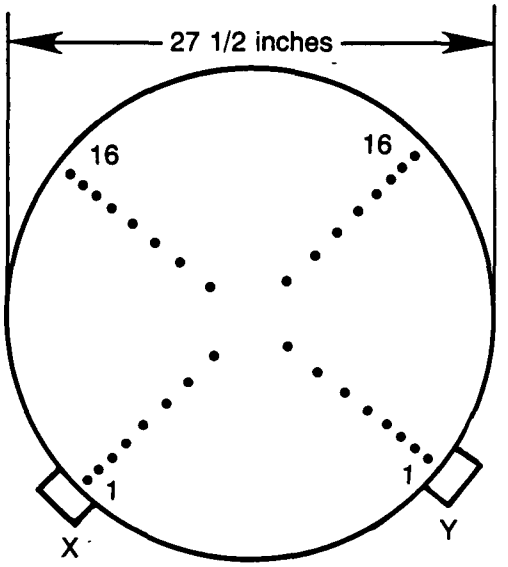
Duct Cross-Sectional View

Traverse Point Number	Distance From Inside Near Wall Inches
1	1/2
2	3/4
3	1 3/8
4	2
5	2 5/8
6	3 3/8
7	4 1/8
8	5
9	5 7/8
10	6 7/8
11	8 1/4
12	10 1/8
13	15 3/8
14	17 1/4
15	18 1/2
16	19 5/8
17	20 1/2
18	21 3/8
19	22 1/8
20	22 3/4
21	23 1/2
22	24 1/8
23	24 5/8
24	25



Duct Elevation

Figure 6 Rock Dryer Baghouse Inlet Duct Port and Sampling Point Locations



Duct Cross-Sectional Plan

Traverse Point Number	Distance From Inside Near Wall Inches
1	1/2
2	1 3/8
3	2 3/8
4	3 3/8
5	4 5/8
6	6
7	7 3/4
8	10 1/4
9	17 1/8
10	19 3/4
11	21 1/2
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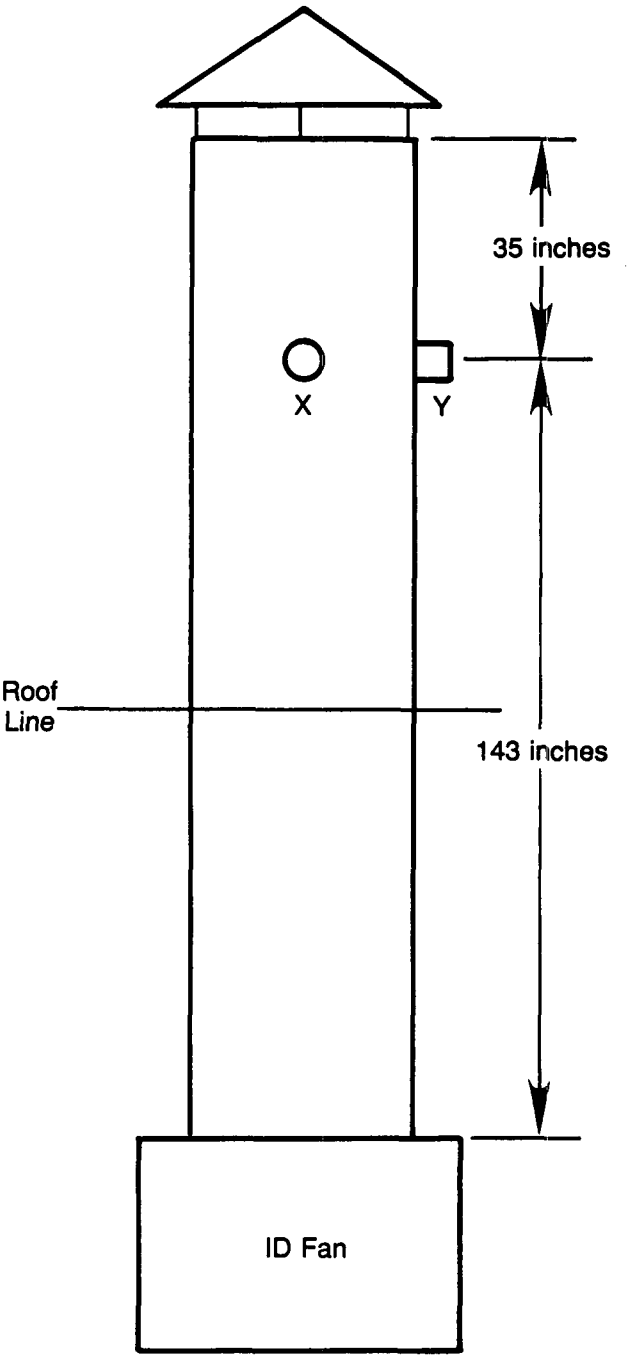
13	24 1/8
14	25 1/8
15	26 1/8
16	27



Stack Elevation

Figure 7 Rock Dryer Baghouse Outlet Stack Port and Sampling Point Locations

DESCRIPTION OF SAMPLING TRAINS

PARTICULATE SAMPLING TRAINS

The test train utilized for particulate sampling at the outlet locations was the standard EPA Method 5 train (see Figure 8).

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 preweighed silica gel. The first, third, and fourth impingers were modified Greenburg-Smith types; the second was a standard Greensburg-Smith impinger. All impingers were maintained in a crushed ice bath. An 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.

Figure 9 shows the EPA Method 5 train utilized at the No. 2 Calcidyne and Rock Dryer Baghouse inlet sites. The test train shown is identical to the one just described, 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.

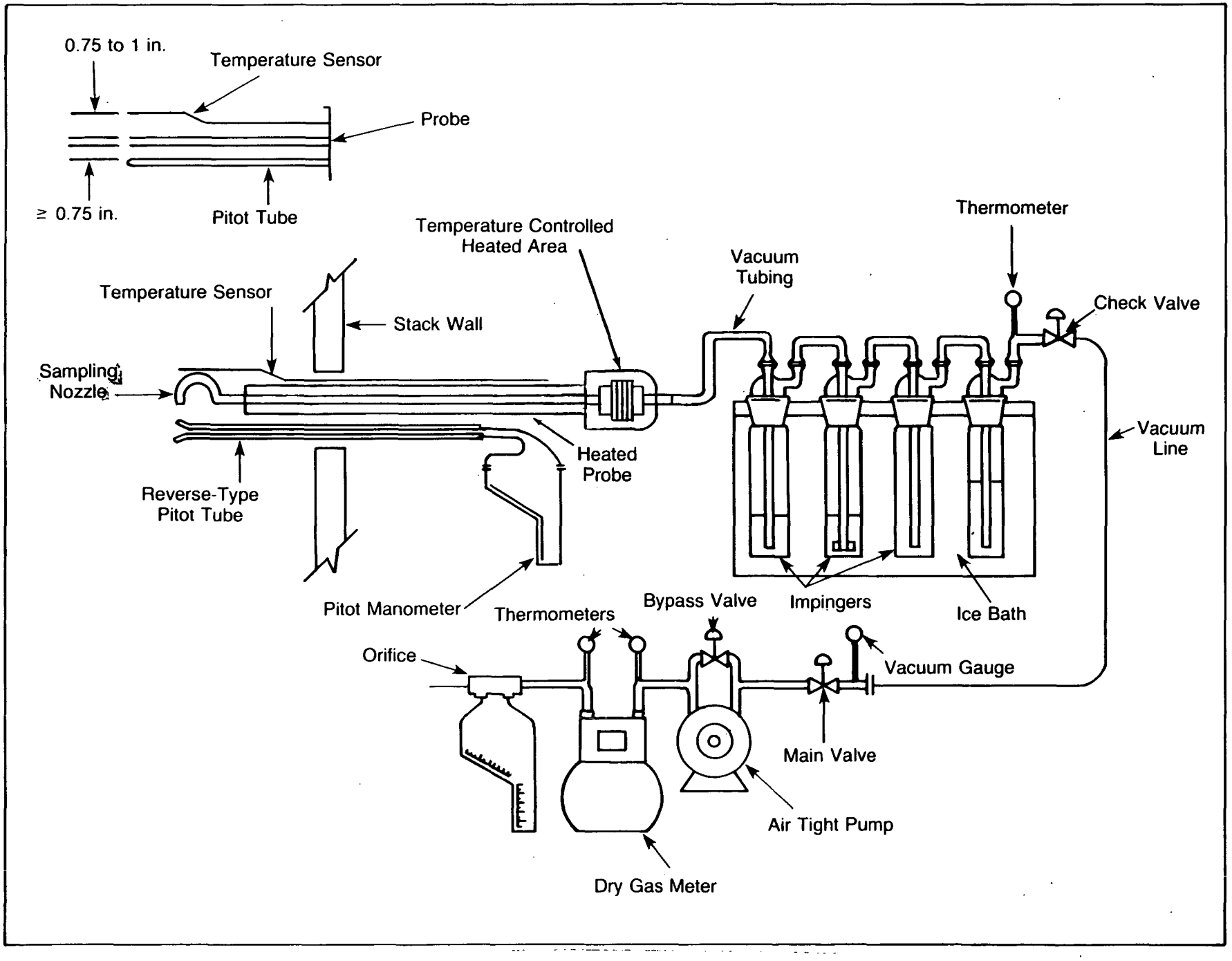


Figure 8 Particulate Sampling Train -EPA Method 5

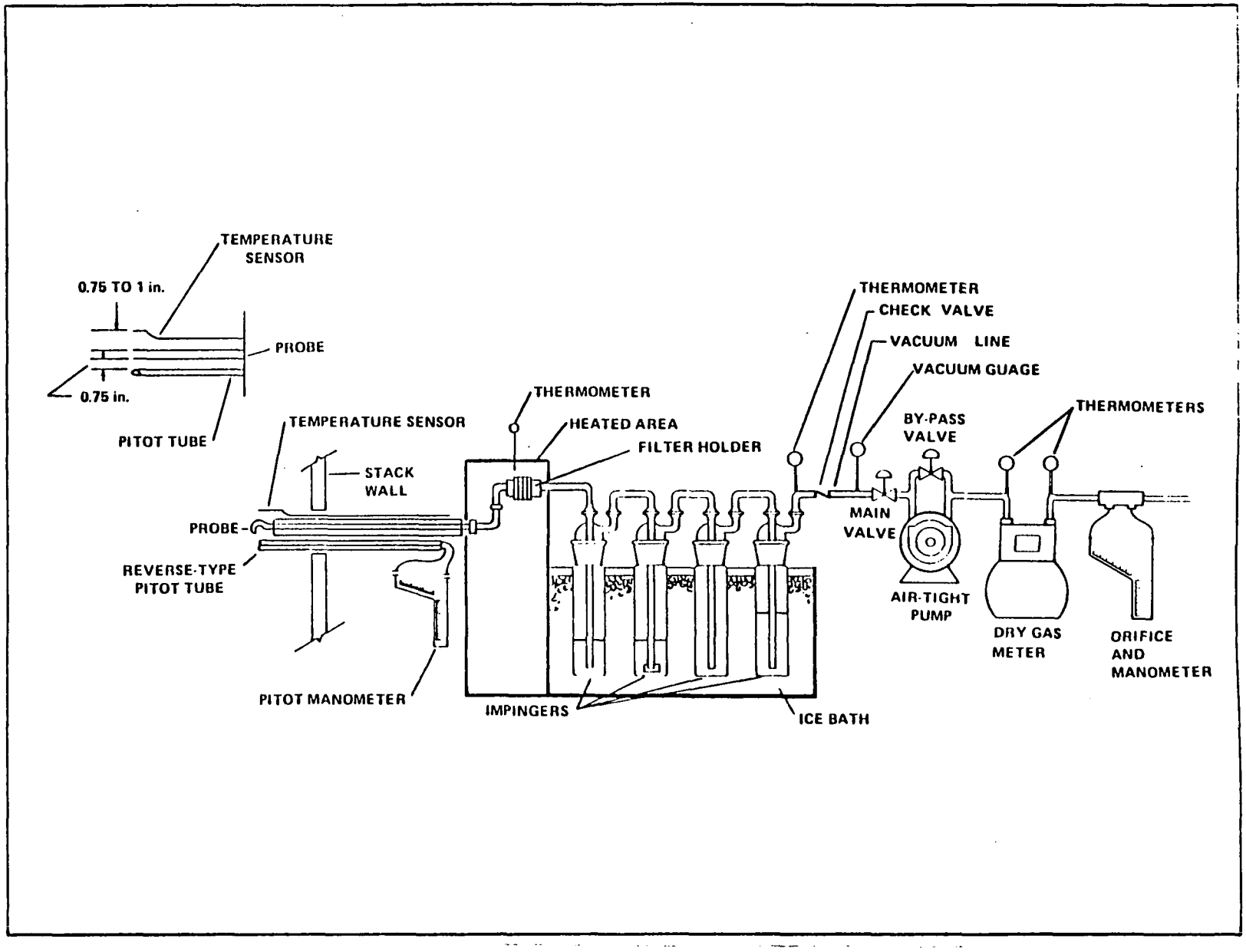


Figure 9 Particulate Sampling Train - EPA Method 5

PARTICULATE SIZE DISTRIBUTION SAMPLING APPARATUS

A stainless steel nozzle was connected directly to an 8-stage Anderson® cascade impaction device which separated the particles according to their effective aerodynamic particle diameters. A glass fiber filter was used to capture any particles that passed through the impactor substrates to permit the measurement of total particulates. 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. An RAC control console with vacuum pump, dry gas meter, a calibrated orifice, and inclined manometers completed the sampling train (Figure 10).

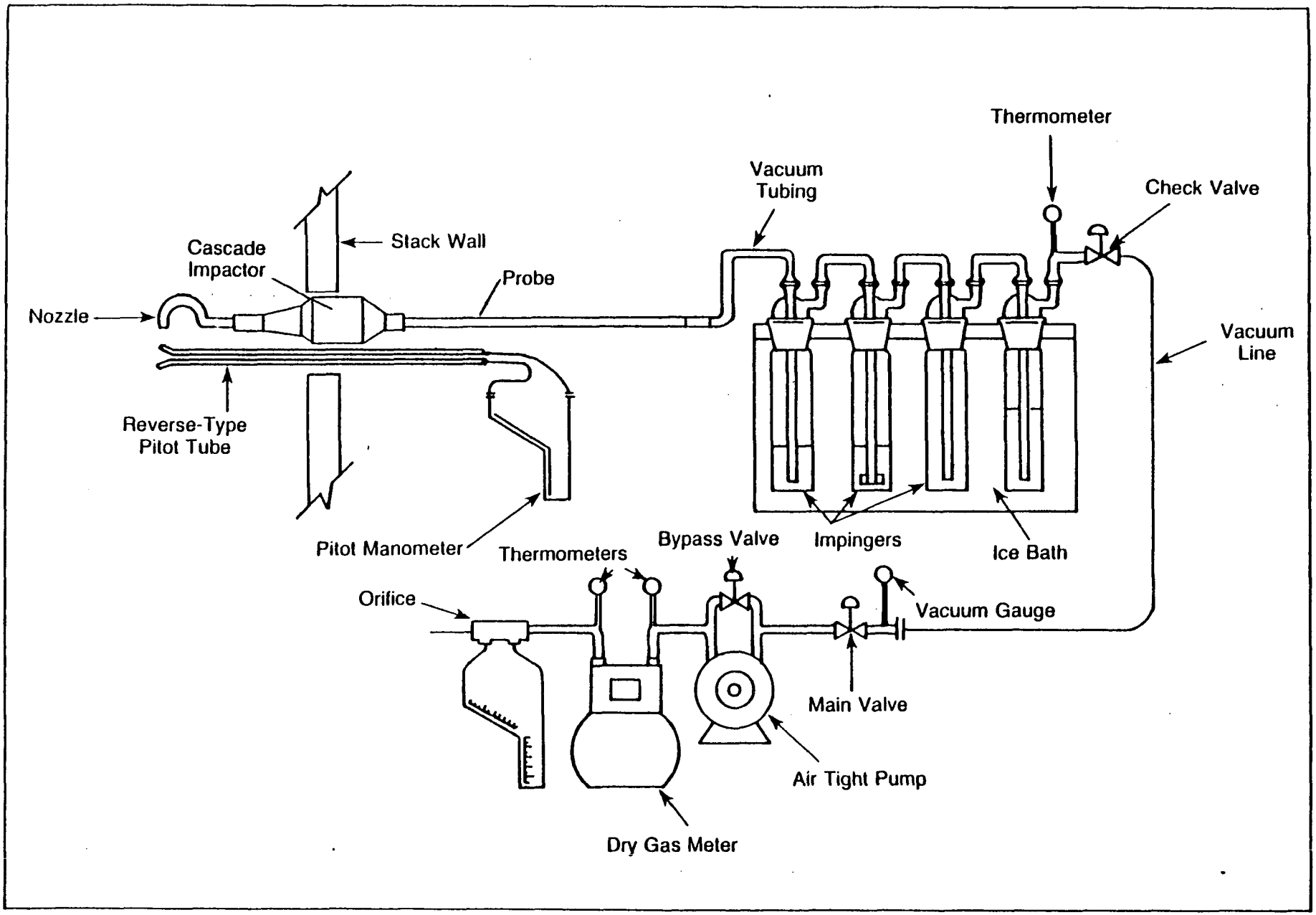


Figure 10 Particle Size Distribution Sampling Apparatus

WESTON

TEST PROCEDURES

PRELIMINARY TESTS

Preliminary test data were 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 records).

FORMAL TESTS

No. 2 Calcidyne Baghouse Inlet Duct

A series of three tests was conducted at the No. 2 Calcidyne Baghouse inlet duct to measure the concentration and mass rate of particulate matter entering the baghouse. Twelve traverse points (six per port axis) were sampled for 5 minutes each, resulting in a total test time of 60 minutes.

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 8 and 9 present a summary of test data for each of the three runs. Test result summarization appears in Tables 16 and 17.

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 20 seconds which permitted collection of sufficient samples for analysis without overloading the filter substrates. Sample volume, temperature, and pressure data were recorded during sampling. See Tables 24 through 26 for distribution plots.

No. 2 Calcidyne Baghouse Outlet Stack

Three Method 5 tests were performed at the baghouse outlet stack. Forty traverse points (20 per axis) were sampled for 3 minutes each, yielding a 120-minute test period for the first test run; for test runs two and three, 20 traverse points (10 per axis) were sampled for 5 minutes each, yielding a 100-minute test period. With the permission of the Administrator, the nozzle size was increased from 0.195 inch to 0.225 inch during test runs two and three. The larger nozzle ensures sufficient sample collection, but allows for a reduction in test time from 120 minutes for the first test to 100 minutes for the second and third tests.

Sampling procedures were identical to those previously described. Tables 10 and 11 show the test data summaries, and Tables 18 and 19 present test results.

One particle size distribution sample was collected isokinetically at a point of average velocity over a 60-minute period. Sample volume, temperature, and pressure data were recorded every 5 minutes during sampling. See Table 27 for particle distribution results.

Visual determinations of plume opacity were performed by a certified observer according to EPA Method 9 procedures during the three particulate test runs. Summaries of results are presented in Tables 32 and 33.

Rock Dryer Baghouse Inlet Duct

Three test runs were conducted by EPA Method 5 procedures at the inlet to the Rock Dryer Baghouse. A total of 48 traverse points (24 per axis) were sampled for 2 minutes each, resulting in a total test time of 96 minutes per run. Tables 12 and 13 show test data, and Tables 20 and 21 show test result summaries.

Three particle size distribution tests were performed at a point of average velocity. Total sample time for each run was 20 seconds. Tables 28 through 30 show particle size distribution results.

Rock Dryer Baghouse Outlet Stack

Three 96-minute Method 5 test runs were performed at the baghouse outlet stack. Thirty-two traverse points (16 per axis) were sampled for 3 minutes each. Tables 14 and 15 show test data, and Tables 22 and 23 present test result summaries.

One particle size distribution test was performed at a point of average velocity over a 60-minute period. Readings were recorded at 5-minute intervals. Table 31 presents the particle size distribution plot.

Visual determinations of plume opacity were performed by a certified observer in conjunction with the particulate tests. Summaries of test results are presented in Tables 34 and 35.

OTHER TEST POINTS

The visible and fugitive emission tests conducted at the remaining test points were one 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.

1. 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).

2. 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.

3. The total liquid in impingers 1, 2, and 3 was measured, the value recorded, and the liquid discarded.

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

5. 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 a 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.

PARTICULATE 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 pre-weighed to the nearest 0.1 milligram to constant weight at Weston's laboratory prior to on-site application. Subsequent to Weston's 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 1 through 8 of this report. Tables 24 through 31 list the particle size distribution results for all locations.

No unusual sampling difficulties or process operating problems were encountered during any of the test periods, except for the Stucco Baghouse which needed rebagging. A Weston Method 9 observer returned to the plant site on 27 May 1980 to conduct the visible emission tests on the baghouse stack following completion of collector maintenance.

The amount of particulate matter discharged to the atmosphere from the No. 2 Calcidyne Baghouse outlet was $\leq$ 0.026 grains/DSCF and $\leq$ 0.34 pounds/hour. Baghouse particulate collection efficiency averaged 99.89%. No visible emission readings above 5 percent were recorded during any of the test periods.

The average Rock Dryer Baghouse particulate collection efficiency was 99.96%. The particulate matter discharged to the atmosphere was $\leq$0.027 grains/DSCF and $\leq$2.69 pounds/hour. All visible emission readings were 5% or lower.

At the Stucco Baghouse, the highest opacity reading noted during the first test was 15% (one reading). The highest opacity reading recorded during run 2 was 10% (one reading). All readings during run 3 were $\leq$5%. Readings >5% were likely due to the newly installed bags which, upon start-up, had an inadequate filter dust cake to assist in filtration.

Table 8

No. 2 Calcidyne Baghouse Inlet Duct

SUMMARY OF TEST DATA
(English Units)

	1	2	3
Test Data			
Test Run Number	1	2	3
Test Date	5-19-80	5-20-80	5-20-80
Test Period	1358-1532	0917-1030	1315-1436
Sampling Data			
Sampling Duration, minutes	60.0	60.0	60.0
Nozzle Diameter, inches	0.224	0.195	0.195
Barometric Pressure, inches mercury	30.1	30.0	30.0
Average Orifice Pressure Differential, inches water	1.3	0.67	0.60
Average Dry Gas Temperature at Meter, ^{o}F	117.	107.	112.
Total Water Collected by Train, ml	469.0	380.0	389.7
Standard Volume of Water Vapor Collected, cubic feet	22.1	17.9	18.3
Dry Gas Meter Calibration Factor, dimensionless	0.989	0.989	0.989
Sample Volume at Meter Conditions, cubic feet	37.9	28.0	26.5
Sample Volume at Standard Conditions, cubic feet[1]	34.6	25.9	24.3
Gas Stream Composition			
CO_2, percent by volume	7.7	8.2	8.6
O_2, percent by volume	9.3	9.5	8.3
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	83.0	82.2	83.1
Moisture in Gas Stream, percent by volume	38.9	40.9	43.0
Mole Fraction of Dry Gas	0.611	0.591	0.570
Molecular Weight of Dry Gas	29.6	29.7	29.7
Molecular Weight of Wet Gas	25.1	24.9	24.7
Gas Stream Velocity and Volumetric Flow			
Static Pressure, inches water	-2.3	-2.2	-2.5
Absolute Pressure, inches mercury	29.9	29.8	29.8
Average Temperature, ^{o}F	370.	373.	369.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	12.0	12.0	12.0
Velocity at Actual Conditions, feet/second	83.3	87.2	87.0
Stack/duct Cross-Sectional Area, square feet	0.785	0.785	0.785
Volumetric Flow at Actual Conditions, cubic feet/minute	3920.	4110.	4100.
Volumetric Flow at Standard Conditions, cubic feet/minute	1520.	1530.	1480.
Percent Isokinetic	108.6	106.5	103.5
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 9

No. 2 Calcidyne Baghouse Inlet Duct

SUMMARY OF TEST DATA
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-19-80	5-20-80	5-20-80
Test Period	1358-1532	0917-1030	1315-1436
Sampling Data			
Sampling Duration, minutes	60.0	60.0	60.0
Nozzle Diameter, centimeters	0.569	0.495	0.495
Barometric Pressure, millimeters mercury	764.54	762.0	762.0
Average Orifice Pressure Differential, millimeters water	33.02	17.02	15.24
Average Dry Gas Temperature at Meter, ^{o}C	47.	47.	44.
Total Water Collected by Train, ml	469.0	380.0	389.7
Volume of Water Vapor Collected, standard cubic meters	0.626	0.507	0.518
Dry Gas Meter Calibration Factor, dimensionless	0.989	0.989	0.989
Sample Volume at Meter Conditions, cubic feet	1.073	0.793	0.750
Sample Volume at Standard Conditions, cubic meters[1]	0.980	0.733	0.688
Gas Stream Composition			
CO_2, percent by volume	7.7	8.2	8.6
O_2, percent by volume	9.3	9.5	8.3
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	83.0	82.2	83.1
Moisture in Gas Stream, percent by volume	38.9	40.9	43.0
Mole Fraction of Dry Gas	0.661	0.591	0.570
Molecular Weight of Dry Gas	29.6	29.7	29.7
Molecular Weight of Wet Gas	25.1	24.9	24.7
Gas Stream Velocity and Volumetric Flow			
Static Pressure, millimeters water	-58.42	-55.88	-63.50
Absolute Pressure, millimeters mercury	759.46	756.92	756.92
Average Temperature, ^{o}C	188.	189.	187.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	12.0	12.0	12.0
Velocity at Actual Conditions, meters/second	25.39	26.58	26.52
Stack/Duct Cross-Sectional Area, square meters	0.073	0.073	0.073
Volumetric Flow, Wet Actual Conditions, cubic meters/minute	111.	116.	116.
Volumetric Flow, Dry Standard Conditions, cubic meters/minute	43.	43.	42.
Percent Isokinetic	108.6	106.5	103.5
Unit Operations Data	Monitored by Radian Corporation Personnel		

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

Table 10

No. 2 Calcidyne Baghouse Outlet Stack

SUMMARY OF TEST DATA

(English Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-19-80	5-20-80	5-20-80
Test Period	1400-1630	0930-1110	1340-1530
Sampling Data			
Sampling Duration, minutes	120.0	100.0	100.0
Nozzle Diameter, inches	0.195	0.225	0.225
Barometric Pressure, inches mercury	30.1	30.0	30.0
Average Orifice Pressure Differential, inches water	0.99	1.7	1.6
Average Dry Gas Temperature at Meter, ^{o}F	93.	95.	95.
Total Water Collected by Train, ml	822.0	964.3	989.3
Standard Volume of Water Vapor Collected, cubic feet	38.7	45.4	46.5
Dry Gas Meter Calibration Factor, dimensionless	0.999	1.005	1.005
Sample Volume at Meter Conditions, cubic feet	65.3	66.5	65.5
Sample Volume at Standard Conditions, cubic feet[1]	62.8	64.0	63.0
Gas Stream Composition			
CO_2, percent by volume	7.5	8.1	8.2
O_2, percent by volume	10.1	9.8	9.9
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	82.4	82.1	81.9
Moisture in Gas Stream, percent by volume	31.8	41.5	42.5
Mole Fraction of Dry Gas	0.619	0.585	0.575
Molecular Weight of Dry Gas	29.6	29.7	29.7
Molecular Weight of Wet Gas	25.2	24.8	24.7
Gas Stream Velocity and Volumetric Flow			
Static Pressure, inches water	0.50	0.45	0.45
Absolute Pressure, inches mercury	30.1	30.0	30.0
Average Temperature, ^{o}F	341.	340.	341.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	20.0	20.0	20.0
Velocity at Actual Conditions, feet/second	94.4	98.4	96.8
Stack/duct Cross-Sectional Area, square feet	0.690	0.690	0.690
Volumetric Flow at Actual Conditions, cubic feet/minute	3910.	4070.	4010.
Volumetric Flow at Standard Conditions, cubic feet/minute	1610.	1580.	1530.
Percent Isokinetic	108.5	101.4	103.3
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 11

No. 2 Calcidyne Baghouse Outlet Stack
SUMMARY OF TEST DATA
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-19-80	5-20-80	5-20-80
Test Period	1400-1630	0930-1110	1340-1530
Sampling Data			
Sampling Duration, minutes	120.0	100.0	100.0
Nozzle Diameter, centimeters	0.495	0.572	0.572
Barometric Pressure, millimeters mercury	764.54	762.0	762.0
Average Orifice Pressure Differential, millimeters water	25.15	43.18	40.64
Average Dry Gas Temperature at Meter, ^{o}C	34.	35.	35.
Total Water Collected by Train, ml	822.0	964.3	989.3
Volume of Water Vapor Collected, standard cubic meters	1.096	1.286	1.317
Dry Gas Meter Calibration Factor, dimensionless	0.999	1.005	1.005
Sample Volume at Meter Conditions, cubic feet	1.849	1.883	1.855
Sample Volume at Standard Conditions, cubic meters[1]	1.778	1.812	1.784
Gas Stream Composition			
CO_2, percent by volume	7.5	8.1	8.2
O_2, percent by volume	10.1	9.8	9.9
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	82.4	82.1	81.9
Moisture in Gas Stream, percent by volume	31.8	41.5	42.5
Mole Fraction of Dry Gas	0.619	0.585	0.575
Molecular Weight of Dry Gas	29.6	29.7	29.7
Molecular Weight of Wet Gas	25.2	24.8	24.7
Gas Stream Velocity and Volumetric Flow			
Static Pressure, millimeters water	12.7	11.43	11.43
Absolute Pressure, millimeters mercury	764.54	762.0	762.0
Average Temperature, ^{o}C	172.	171.	172.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	40.0	20.0	20.0
Velocity at Actual Conditions, meters/second	28.77	29.99	29.50
Stack/Duct Cross-Sectional Area, square meters	0.064	0.064	0.064
Volumetric Flow, Wet Actual Conditions, cubic meters/minute	111.	115.	114.
Volumetric Flow, Dry Standard Conditions, cubic meters/minute	46.	45.	43.
Percent Isokinetic	108.5	101.4	103.3
Unit 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

Rock Dryer Baghouse Inlet Duct

SUMMARY OF TEST DATA

(English Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-21-80	5-22-80	5-22-80
Test Period	1145-1343	0845-1037	1235-1450
Sampling Data			
Sampling Duration, minutes	96.0	96.0	96.0
Nozzle Diameter, inches	0.175	0.175	0.175
Barometric Pressure, inches mercury	30.2	30.1	30.1
Average Orifice Pressure Differential, inches water	1.1	1.1	1.1
Average Dry Gas Temperature at Meter, ^{o}F	115.	110.	120.
Total Water Collected by Train, ml	100.8	105.2	82.0
Standard Volume of Water Vapor Collected, cubic feet	4.75	4.95	3.86
Dry Gas Meter Calibration Factor, dimensionless	0.989	0.989	0.989
Sample Volume at Meter Conditions, cubic feet	55.5	55.1	56.3
Sample Volume at Standard Conditions, cubic feet[1]	50.9	51.0	51.2
Gas Stream Composition			
CO_2, percent by volume	1.9	1.7	1.5
O_2, percent by volume	17.8	17.5	18.3
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	80.3	80.8	80.2
Moisture in Gas Stream, percent by volume	8.5	8.9	7.0
Mole Fraction of Dry Gas	0.915	0.911	0.930
Molecular Weight of Dry Gas	29.0	29.0	29.0
Molecular Weight of Wet Gas	28.1	28.0	28.2
Gas Stream Velocity and Volumetric Flow			
Static Pressure, inches water	-1.9	-1.7	-1.8
Absolute Pressure, inches mercury	30.0	30.0	30.0
Average Temperature, ^{o}F	215.	216.	215.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	48.0	48.0	48.0
Velocity at Actual Conditions, feet/second	73.8	75.0	76.0
Stack/duct Cross-Sectional Area, square feet	3.55	3.55	3.55
Volumetric Flow at Actual Conditions, cubic feet/minute	15,700.	16,000.	16,200.
Volumetric Flow at Standard Conditions, cubic feet/minute	11,300.	11,400.	11,800.
Percent Isokinetic	99.8	98.9	95.9
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

Rock Dryer Baghouse Inlet Duct

SUMMARY OF TEST DATA

(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-21-80	5-22-80	5-22-80
Test Period	1145-1343	0845-1037	1235-1450
Sampling Data			
Sampling Duration, minutes	96.0	96.0	96.0
Nozzle Diameter, centimeters	0.445	0.445	0.445
Barometric Pressure, millimeters mercury	767.08	764.54	764.54
Average Orifice Pressure Differential, millimeters water	27.94	27.94	27.94
Average Dry Gas Temperature at Meter, ^{o}C	46.	43.	49.
Total Water Collected by Train, ml	100.8	105.2	82.0
Volume of Water Vapor Collected, standard cubic meters	0.135	0.140	0.109
Dry Gas Meter Calibration Factor, dimensionless	0.989	0.989	0.989
Sample Volume at Meter Conditions, cubic feet	1.572	1.560	1.594
Sample Volume at Standard Conditions, cubic meters[1]	1.441	1.444	1.450
Gas Stream Composition			
CO_2, percent by volume	1.9	1.7	1.5
O_2, percent by volume	17.8	17.5	18.3
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	80.3	80.8	80.2
Moisture in Gas Stream, percent by volume	8.5	8.9	7.0
Mole Fraction of Dry Gas	0.915	0.911	0.930
Molecular Weight of Dry Gas	29.0	29.0	29.0
Molecular Weight of Wet Gas	28.1	28.0	28.2
Gas Stream Velocity and Volumetric Flow			
Static Pressure, millimeters water	-48.26	-43.18	-45.72
Absolute Pressure, millimeters mercury	762.0	762.0	762.0
Average Temperature, ^{o}C	102.	102.	102.
Pitot Tube Calibration Coefficient, dimensionless	0.84	0.84	0.84
Total Number of Traverse Points	48.0	48.0	48.0
Velocity at Actual Conditions, meters/second	22.49	22.86	23.16
Stack/Duct Cross-Sectional Area, square meters	0.330	0.330	0.330
Volumetric Flow, Wet Actual Conditions, cubic meters/minute	445.	453.	459.
Volumetric Flow, Dry Standard Conditions, cubic meters/minute	320.	323.	334.
Percent Isokinetic	99.8	98.9	95.9
Unit Operations Data	Monitored by Radian Corporation Personnel		

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

Table 14

Rock Dryer Baghouse Outlet Stack

SUMMARY OF TEST DATA

(English Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-21-80	5-22-80	5-22-80
Test Period	1145-1340	0845-1035	1235-1415
Sampling Data			
Sampling Duration, minutes	96.0	96.0	96.0
Nozzle Diameter, inches	0.190	0.190	0.190
Barometric Pressure, inches mercury	30.2	30.1	30.1
Average Orifice Pressure Differential, inches water	1.3	1.2	1.3
Average Dry Gas Temperature at Meter, ^{o}F	95.	91.	92.
Total Water Collected by Train, ml	104.0	120.5	114.3
Standard Volume of Water Vapor Collected, cubic feet	4.90	5.67	5.38
Dry Gas Meter Calibration Factor, dimensionless	1.005	1.005	1.005
Sample Volume at Meter Conditions, cubic feet	55.9	55.8	56.3
Sample Volume at Standard Conditions, cubic feet[1]	54.1	54.3	54.6
Gas Stream Composition			
CO_2, percent by volume	1.1	1.1	1.1
O_2, percent by volume	19.3	19.3	19.1
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	79.6	79.6	79.8
Moisture in Gas Stream, percent by volume	8.3	9.5	9.0
Mole Fraction of Dry Gas	0.917	0.905	0.910
Molecular Weight of Dry Gas	29.0	29.0	28.9
Molecular Weight of Wet Gas	28.0	27.9	28.0
Gas Stream Velocity and Volumetric Flow			
Static Pressure, inches water	0.78	0.49	0.76
Absolute Pressure, inches mercury	30.2	30.2	30.2
Average Temperature, ^{o}F	200.	202.	203.
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	64.6	63.5	65.3
Stack/duct Cross-Sectional Area, square feet	4.12	4.12	4.12
Volumetric Flow at Actual Conditions, cubic feet/minute	16,000.	15,700.	16,200.
Volumetric Flow at Standard Conditions, cubic feet/minute	11,800.	11,400.	11,800.
Percent Isokinetic	99.6	103.6	100.9
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 15

Rock Dryer Baghouse Outlet Stack

SUMMARY OF TEST DATA

(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-21-80	5-22-80	5-22-80
Test Period	1145-1340	0845-1035	1235-1415
Sampling Data			
Sampling Duration, minutes	96.0	96.0	96.0
Nozzle Diameter, centimeters	0.483	0.483	0.483
Barometric Pressure, millimeters mercury	767.08	764.54	764.54
Average Orifice Pressure Differential, millimeters water	33.02	30.48	33.02
Average Dry Gas Temperature at Meter, ^{o}C	35.	33.	33.
Total Water Collected by Train, ml	104.0	120.5	114.3
Volume of Water Vapor Collected, standard cubic meters	0.139	0.161	0.152
Dry Gas Meter Calibration Factor, dimensionless	1.005	1.005	1.005
Sample Volume at Meter Conditions, cubic feet	1.583	1.580	1.594
Sample Volume at Standard Conditions, cubic meters[1]	1.532	1.538	1.546
Gas Stream Composition			
CO_2, percent by volume	1.1	1.1	1.1
O_2, percent by volume	19.3	19.3	19.1
CO, percent by volume	0.0	0.0	0.0
N_2, percent by volume	79.6	79.6	79.8
Moisture in Gas Stream, percent by volume	8.3	9.5	9.0
Mole Fraction of Dry Gas	0.917	0.905	0.910
Molecular Weight of Dry Gas	29.0	29.0	28.9
Molecular Weight of Wet Gas	28.0	27.9	28.0
Gas Stream Velocity and Volumetric Flow			
Static Pressure, millimeters water	19.81	12.45	19.30
Absolute Pressure, millimeters mercury	767.08	767.08	767.08
Average Temperature, ^{o}C	93.	94.	95.
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	19.69	19.35	19.90
Stack/Duct Cross-Sectional Area, square meters	0.383	0.383	0.383
Volumetric Flow, Wet Actual Conditions, cubic meters/minute	453.	445.	459.
Volumetric Flow, Dry Standard Conditions, cubic meters/minute	334.	323.	334.
Percent Isokinetic	99.6	103.6	100.9
Unit 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

No. 2 Calcidyne Baghouse Inlet Duct

SUMMARY OF TEST RESULTS

(English Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-19-80	5-20-80	5-20-80
Test Time	1358-1532	0917-1030	1315-1436
Gas Flow			
Standard Cubic Feet/Minute, dry	1,520.	1,530.	1,480.
Actual Cubic Feet/Minute, wet	3,920.	4,110.	4,100.
Particulates			
Front-Half Wash Residue Catch Fraction, g	34.9505	27.7273	21.6266
Filter Catch Fraction, g	14.4848	8.4989	11.7345
Total Particulates, g	49.4353	36.2262	33.3611
Particulate Emissions[1]			
Grains/Dry Standard Cubic Foot[2]	22.0	21.6	21.2
Pounds/Hour	288.	284.	269.

[1]Based on Total Particulates captured by train.
[2]Standard Conditions = 68°F and 29.92 inches Hg.

Table 17

No. 2 Calcidyne Baghouse Inlet Duct

SUMMARY OF TEST RESULTS
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-19-80	5-20-80	5-20-80
Test Period	1358-1532	0917-1030	1315-1436
Gas Stream Volumetric Flow Rates			
Dry standard cubic meters/minute[1]	43.	43.	42.
Wet actual cubic meters/minute	111.	116.	116.
Particulate Laboratory Results			
Front-half Wash Residue Fraction, g	34.9505	27.7273	21.6266
Filter Catch Fraction, g	14.4848	8.4989	11.7345
Total Particulate Catch Weight, g	49.4353	36.2262	33.3611
Particulate Emission Results			
Grams/dry standard cubic meter	50.3	49.4	48.5
Kilograms/hour	131.	129.	122.

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

Table 18

No. 2 Calcidyne Baghouse Outlet Stack

SUMMARY OF TEST RESULTS

(English Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-19-80	5-20-80	5-20-80
Test Time	1400-1630	0930-1110	1340-1530
Gas Flow			
Standard Cubic Feet/Minute, dry	1,610.	1,580.	1,530.
Actual Cubic Feet/Minute, wet	3,910.	4,070.	4,010.
Particulates			
Front-Half Wash Residue Catch Fraction, g	0.0346	0.0422	0.0267
Filter Catch Fraction, g	0.0489	0.0574	0.0780
Total Particulates, g	0.0835	0.0996	0.1047
Particulate Emissions[1]			
Grains/Dry Standard Cubic Foot[2]	0.021	0.024	0.026
Pounds/Hour	0.282	0.325	0.335
Baghouse Particulate Removal Efficiency, percent	99.90	99.89	99.88
Visible Emissions[3]			
≥10 percent opacity, minutes observed	0	0	0
5 percent opacity, minutes observed	6 3/4	27 1/4	33
0 percent opacity, minutes observed	113 1/4	72 3/4	67
Observation Period, minutes	120	100	100

[1]Based on Total Particulates captured by train.
[2]Standard Conditions = 68°F and 29.92 inches Hg.
[3]Opacity results listed are in minutes of the observed reading during the test period.

Table 19

No. 2 Calcidyne Baghouse Outlet Stack

SUMMARY OF TEST RESULTS
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-19-80	5-20-80	5-20-80
Test Period	1400-1630	0930-1110	1340-1530
Gas Stream Volumetric Flow Rates			
Dry standard cubic meters/minute[1]	46.	45.	43.
Wet actual cubic meters/minute	111.	115.	114.
Particulate Laboratory Results			
Front-half Wash Residue Fraction, g	0.0346	0.0422	0.0267
Filter Catch Fraction, g	0.0489	0.0574	0.0780
Total Particulate Catch Weight, g	0.0835	0.0996	0.1047
Particulate Emission Results			
Grams/dry standard cubic meter	0.048	0.055	0.059
Kilograms/hour	0.128	0.147	0.152
Baghouse Particulate Removal Efficiency, percent	99.90	99.89	99.88

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

Table 20

Rock Dryer Baghouse Inlet Duct

SUMMARY OF TEST RESULTS

(English Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-21-80	5-22-80	5-22-80
Test Time	1145-1343	0845-1037	1235-1450
Gas Flow			
Standard Cubic Feet/Minute, dry	11,300.	11,400.	11,800.
Actual Cubic Feet/Minute, wet	15,700.	16,000.	16,200.
Particulates			
Front-Half Wash Residue Catch Fraction, g	151.2811	155.7670	156.2056
Filter Catch Fraction, g	15.8951	15.5035	13.5177
Total Particulates, g	167.1762	171.2705	169.7233
Particulate Emissions[1]			
Grains/Dry Standard Cubic Foot[2]	50.7	51.9	51.2
Pounds/Hour	4900.	5070.	5180.

[1]Based on Total Particulates captured by train.
[2]Standard Conditions = 68°F and 29.92 inches Hg.

Table 21

Rock Dryer Baghouse Inlet Duct

SUMMARY OF TEST RESULTS
(Metric Units)

	1	2	3
Test Data			
Test Run Number			
Test Date	5-21-80	5-22-80	5-22-80
Test Period	1145-1343	0845-1037	1235-1450
Gas Stream Volumetric Flow Rates			
Dry standard cubic meters/minute[1]	320.	323.	334.
Wet actual cubic meters/minute	445.	453.	459.
Particulate Laboratory Results			
Front-half Wash Residue Fraction, g	151.2811	155.7670	156.2056
Filter Catch Fraction, g	15.8951	15.5035	13.5177
Total Particulate Catch Weight, g	167.1762	171.2705	169.7233
Particulate Emission Results			
Grams/dry standard cubic meter	116.	119.	117.
Kilograms/hour	2223.	2300.	2350.

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

Table 22

Rock Dryer Baghouse Outlet Stack

SUMMARY OF TEST RESULTS

(English Units)

Test Data	1	2	3
Test Run Number	1	2	3
Test Date	5-21-80	5-22-80	5-22-80
Test Time	1145-1340	0845-1035	1235-1415
Gas Flow			
Standard Cubic Feet/Minute, dry	11,800.	11,400.	11,800.
Actual Cubic Feet/Minute, wet	16,000.	15,700.	16,200.
Particulates			
Front-Half Wash Residue Catch Fraction, g	0.0307	0.0222	0.0149
Filter Catch Fraction, g	0.0620	0.0434	0.0470
Total Particulates, g	0.0927	0.0656	0.0619
Particulate Emissions[1]			
Grains/Dry Standard Cubic Foot[2]	0.027	0.019	0.018
Pounds/Hour	2.69	1.83	1.77
Baghouse Particulate Removal Efficiency, percent	99.95	99.96	99.97
Visible Emissions[3]			
≥10 percent opacity, minutes observed	0	0	0
5 percent opacity, minutes observed	22 1/4	3 3/4	0
0 percent opacity, minutes observed	73 3/4	96 1/4	117
Observation Period, minutes	96	100	117

[1]Based on Total Particulates captured by train.
[2]Standard Conditions = 68°F and 29.92 inches Hg.
[3]Opacity results listed are in minutes of the observed reading during the test period.

Table 23

Rock Dryer Baghouse Outlet Stack

SUMMARY OF TEST RESULTS
(Metric Units)

Test Data			
Test Run Number	1	2	3
Test Date	5-21-80	5-22-80	5-22-80
Test Period	1145-1340	0845-1035	1235-1415
Gas Stream Volumetric Flow Rates			
Dry standard cubic meters/minute[1]	334.	323.	335.
Wet actual cubic meters/minute	453.	445.	459.
Particulate Laboratory Results			
Front-half Wash Residue Fraction, g	0.0307	0.0222	0.0149
Filter Catch Fraction, g	0.0620	0.0434	0.0470
Total Particulate Catch Weight, g	0.0927	0.0656	0.0619
Particulate Emission Results			
Grams/dry standard cubic meter	0.062	0.043	0.041
Kilograms/hour	1.22	0.83	0.80
Baghouse Particulate Removal Efficiency, percent	99.95	99.96	99.97

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

Table 24

Particle Size Distribution

Run: 1

Date: 5-19-80

Location: Gold Bond Building Products

Sampling Location: No. 2 Calcidyne Inlet

Traverse Point No. Sampled: X-3

P_{bar} (in. Hg) 30.1

Stack Temp (^{o}F) 370

Sample Time (min.) 0.333

Sample Volume (cf) 0.254

Moisture (% H_2O) 38.9

Meter Temp (^{o}F) 119.

Flow Setting, ΔH (in. H_2O) 2.0

Nozzle Diameter (in.) 0.252

Sample Flow Rate (at stack conditions): 1.14 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	324.9	83.9	100.0	10.7
2	12.4	3.2	16.2	6.8
3	19.5	5.0	13.0	4.5
4	16.8	4.3	7.9	3.2
5	7.2	1.9	3.6	2.0
6	2.4	0.6	1.7	1.0
7	0.0	0.0	1.1	0.6
8	0.7	0.1	1.1	0.4
Backup Filter	4.1	1.0	1.0	----
TOTAL	387.5	100.0		

No. 2 Calcidyne Baghouse Inlet Duct
Run 1

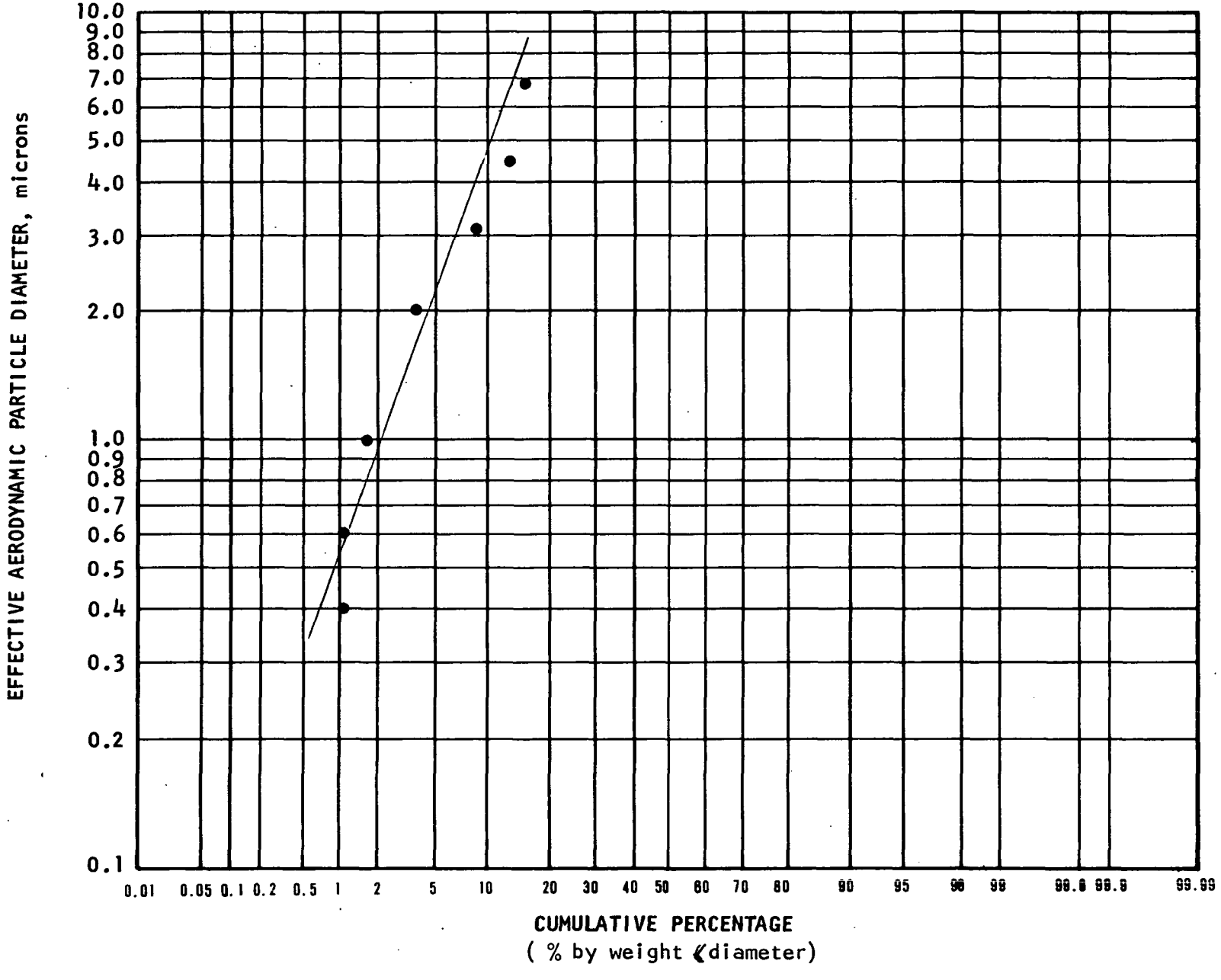


Table 25

Particle Size Distribution

Run: 2

Date: 5-20-80

Location: Gold Bond Building Products

Sampling Location: No. 2 Calcidyne Inlet

Traverse Point No. Sampled: X-4

P_{bar} (in. Hg) 30.0

Stack Temp (^{o}F) 373.

Sample Time (min.) 0.33

Sample Volume (cf) 0.244

Moisture (% H_2O) 40.9

Meter Temp (^{o}F) 105.

Flow Setting, ΔH (in. H_2O) 2.2

Nozzle Diameter (in.) 0.252

Sample Flow Rate (at stack conditions): 1.15 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	540.0	87.0	100.0	10.7
2	16.8	2.7	13.0	6.8
3	24.3	3.9	10.3	4.5
4	26.0	4.2	6.4	3.2
5	11.4	1.8	2.2	2.0
6	0.9	0.2	0.4	1.0
7	0.6	0.1	0.2	0.6
8	0.4	0.06	0.1	0.4
Backup Filter	0.1	0.04	0.04	----
TOTAL	620.5	100.0		

No. 2 Calcidyne Baghouse Inlet Duct
Run 2

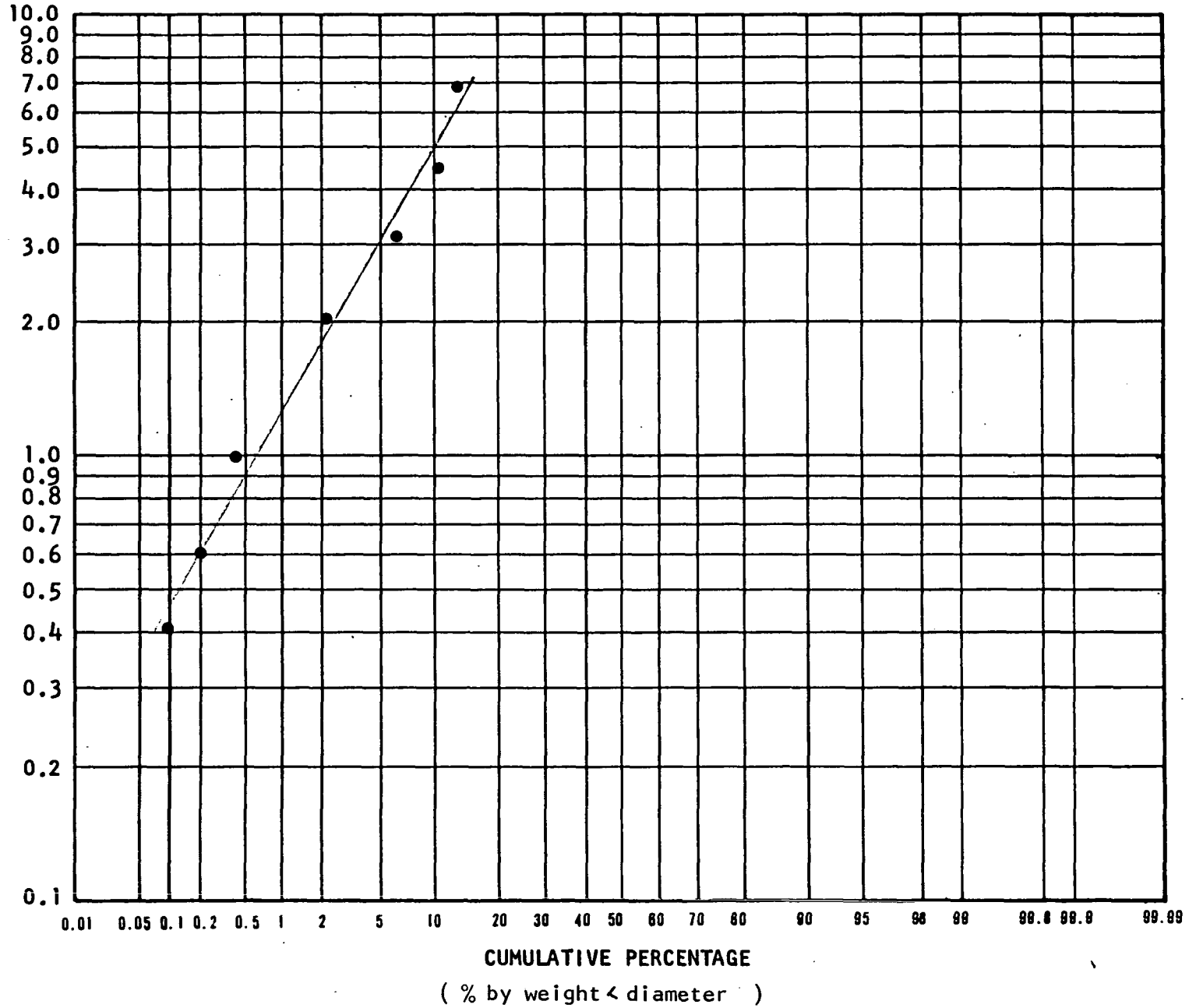


Table 26

Particle Size Distribution

Run: 3

Date: 5-20-80

Location: Gold Bond Building Products

Sampling Location: No. 2 Calcidyne Inlet

Traverse Point No. Sampled: Y-3

P_{bar} (in. Hg) 30.0

Stack Temp (^{o}F) 369.

Sample Time (min.) 0.333

Sample Volume (cf) 0.251

Moisture (% H_2O) 43.0

Meter Temp (^{o}F) 115.

Flow Setting, ΔH (in. H_2O) 2.2

Nozzle Diameter (in.) 0.252

Sample Flow Rate (at stack conditions): 1.21 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	314.5	78.88	100.0	10.7
2	17.5	4.39	21.1	6.6
3	21.2	5.32	16.7	4.5
4	21.8	5.47	11.4	3.1
5	15.0	3.76	5.9	1.9
6	5.8	1.45	2.2	1.0
7	0.6	0.15	0.7	0.6
8	2.2	0.55	0.6	0.4
Backup Filter	0.1	0.03	0.03	----
TOTAL	398.7	100.0		

No. 2 Calcidyne Baghouse Inlet Duct
Run 3

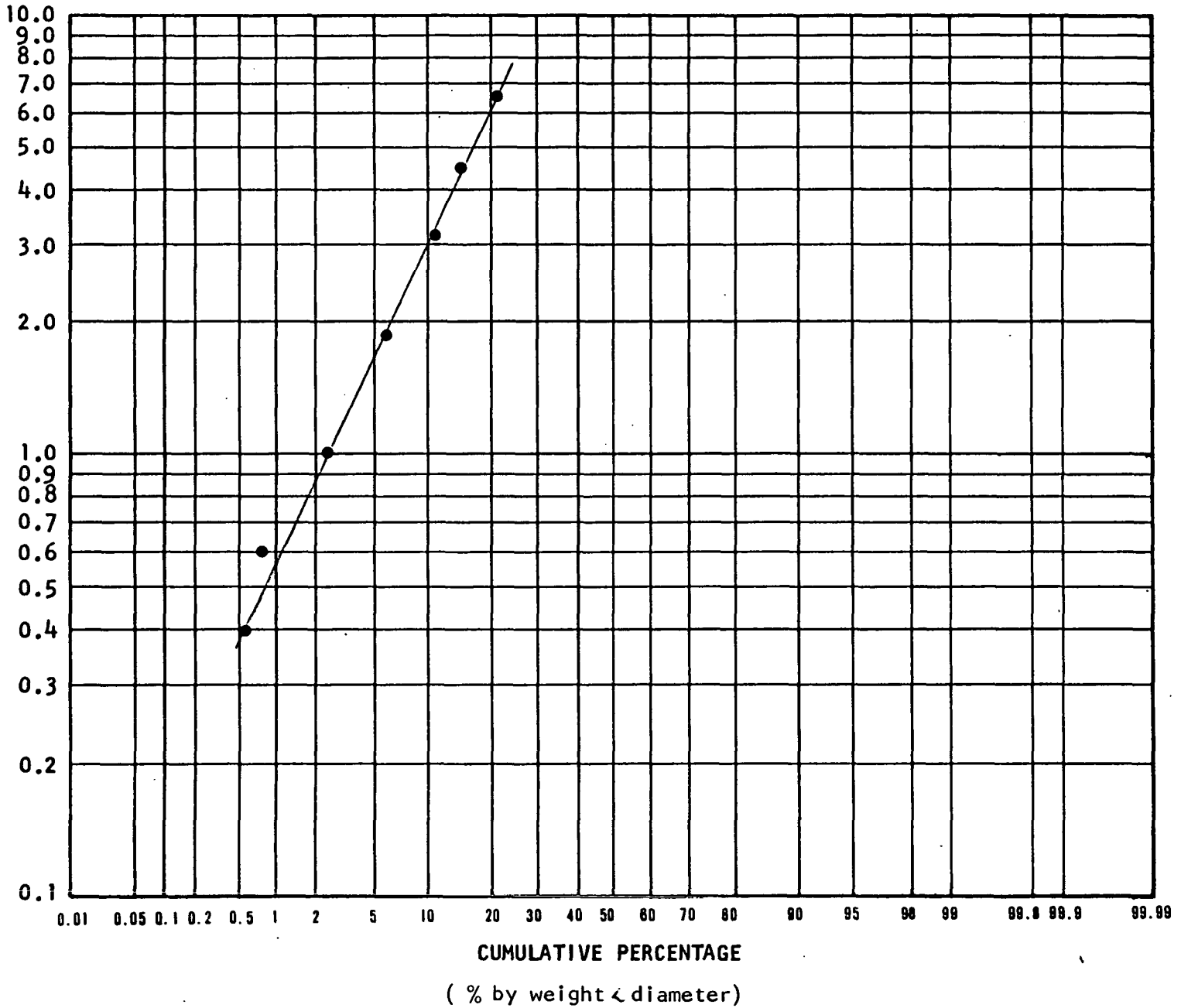


Table 27

Particle Size Distribution

Run:	1 of 1	P_{bar} (in. Hg)	30.0
Date:	5-20-80	Stack Temp (^{o}F)	340.
Location:	Gold Bond Building Products	Sample Time (min.)	60.0
Sampling Location:	No. 2 Calcidyne Outlet	Sample Volume (cf)	28.3
Traverse Point No. Sampled:	X-7	Moisture (% H_2O)	45.4
		Meter Temp (^{o}F)	92.
		Flow Setting, ΔH (in. H_2O)	0.74
		Nozzle Diameter (in.)	0.181

Sample Flow Rate (at stack conditions): 0.78 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	8.1	27.46	100.0	13.0
2	1.6	5.42	72.5	8.0
3	2.8	9.49	67.1	5.4
4	2.5	8.47	57.6	3.8
5	3.6	12.2	49.2	2.4
6	3.7	12.54	37.0	1.2
7	0.4	1.36	24.4	0.7
8	0.8	2.71	23.1	0.5
Backup Filter	6.0	20.35	20.4	----
TOTAL	29.5	100.0		

No. 2 Calcidyne Baghouse Outlet Stack
Run 1

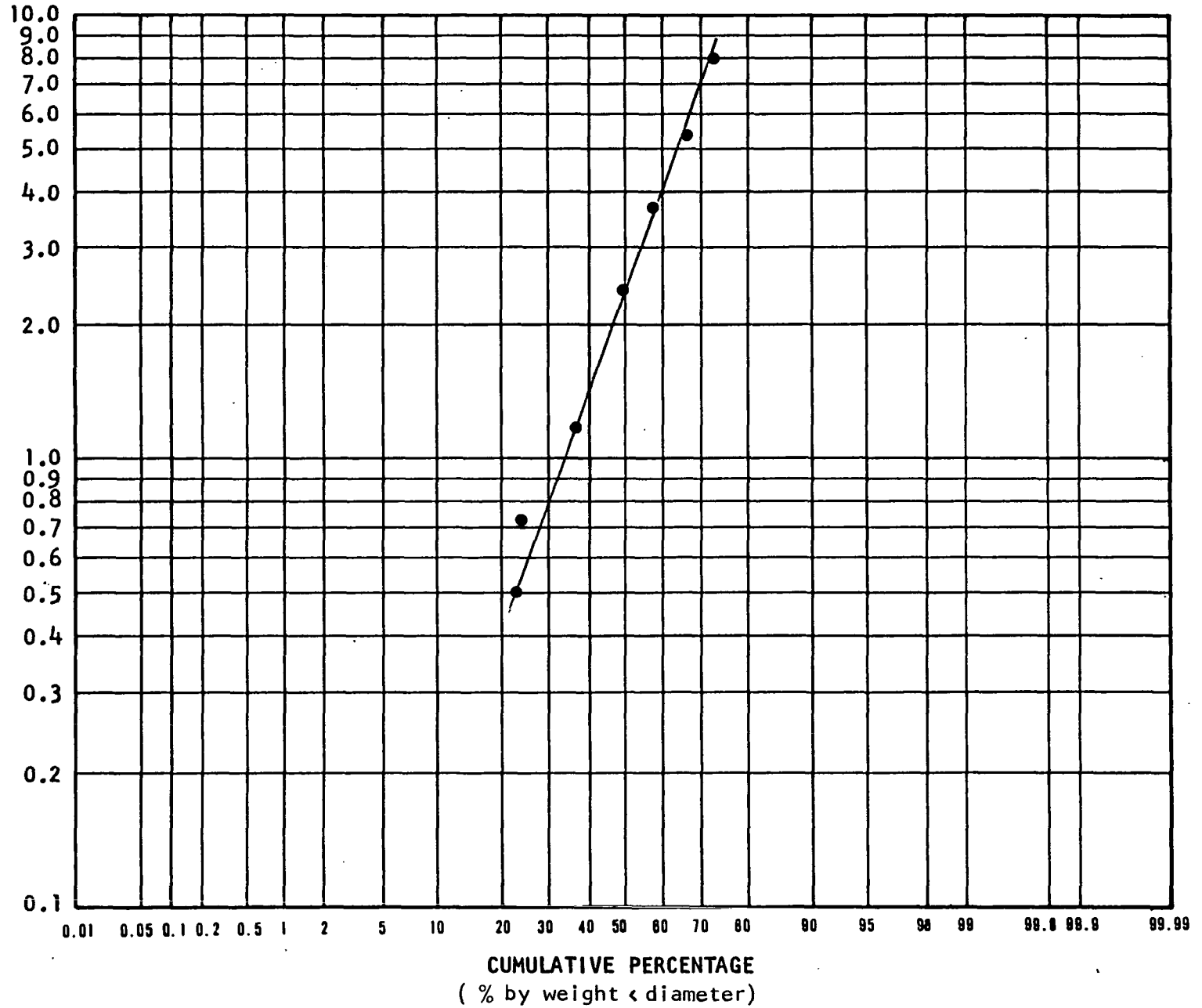


Table 28

Particle Size Distribution

Run: 1

Date: 5-21-80

Location: Gold Bond Building Products

Sampling Location: Rock Dryer Inlet

Traverse Point No. Sampled: X-10

P_{bar} (in. Hg)	30.2
Stack Temp (^{o}F)	215.
Sample Time (min.)	0.333
Sample Volume (cf)	0.305
Moisture (% H_2O)	8.5
Meter Temp (^{o}F)	112.
Flow Setting, ΔH (in. H_2O)	2.6
Nozzle Diameter (in.)	0.224

Sample Flow Rate (at stack conditions): 0.93 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	615.3	89.32	100.0	11.0
2	24.8	3.60	10.7	6.9
3	18.3	2.66	7.1	4.7
4	14.3	2.08	4.4	3.1
5	10.0	1.45	2.3	2.0
6	3.2	0.46	0.9	1.0
7	0.5	0.07	0.4	0.6
8	1.5	0.22	0.4	0.4
Backup Filter	1.9	0.14	0.14	----
TOTAL	688.9	100.0		

Rock Dryer Baghouse Inlet Duct
Run 1

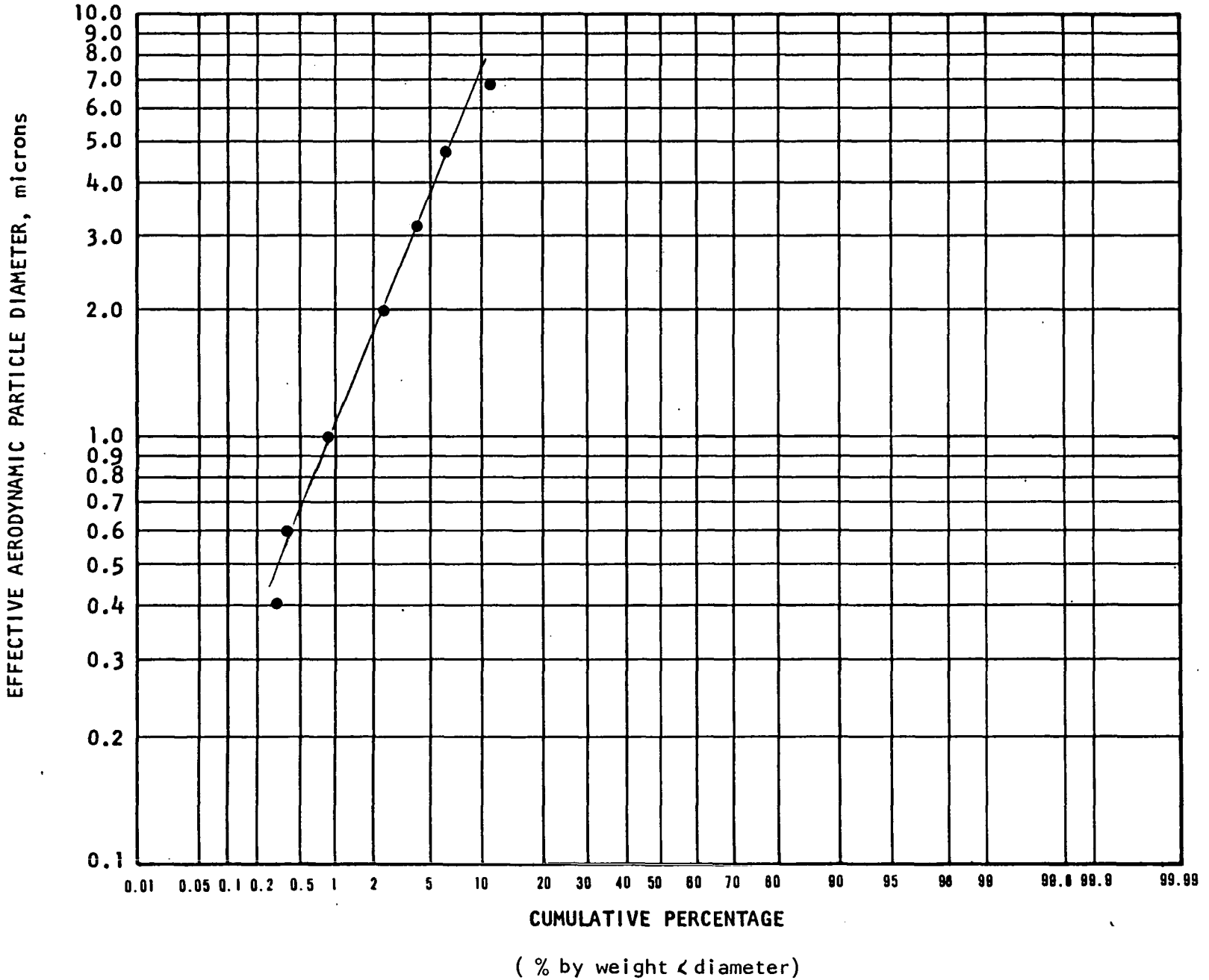


Table 29

Particle Size Distribution

Run: 2

Date: 5-22-80

Location: Gold Bond Building Products

Sampling Location: Rock Dryer Inlet

Traverse Point No. Sampled: X-7

P_{bar} (in. Hg) 30.1

Stack Temp (^{o}F) 216.

Sample Time (min.) 0.333

Sample Volume (cf) 0.377

Moisture (% H_2O) 8.9

Meter Temp (^{o}F) 111.

Flow Setting, ΔH (in. H_2O) 3.0

Nozzle Diameter (in.) 0.224

Sample Flow Rate (at stack conditions): 1.16 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	4,900.5	97.53	100.0	9.9
2	50.8	1.01	2.5	6.2
3	30.0	0.60	1.5	4.1
4	24.0	0.48	0.9	2.9
5	13.2	0.26	0.4	1.8
6	3.4	0.07	0.1	0.9
7	1.0	0.02	0.05	0.6
8	0.7	0.00	0.03	0.4
Backup Filter	0.7	0.03	0.03	----
TOTAL	5,024.6	100.0		

Rock Dryer Baghouse Inlet Duct
Run 2

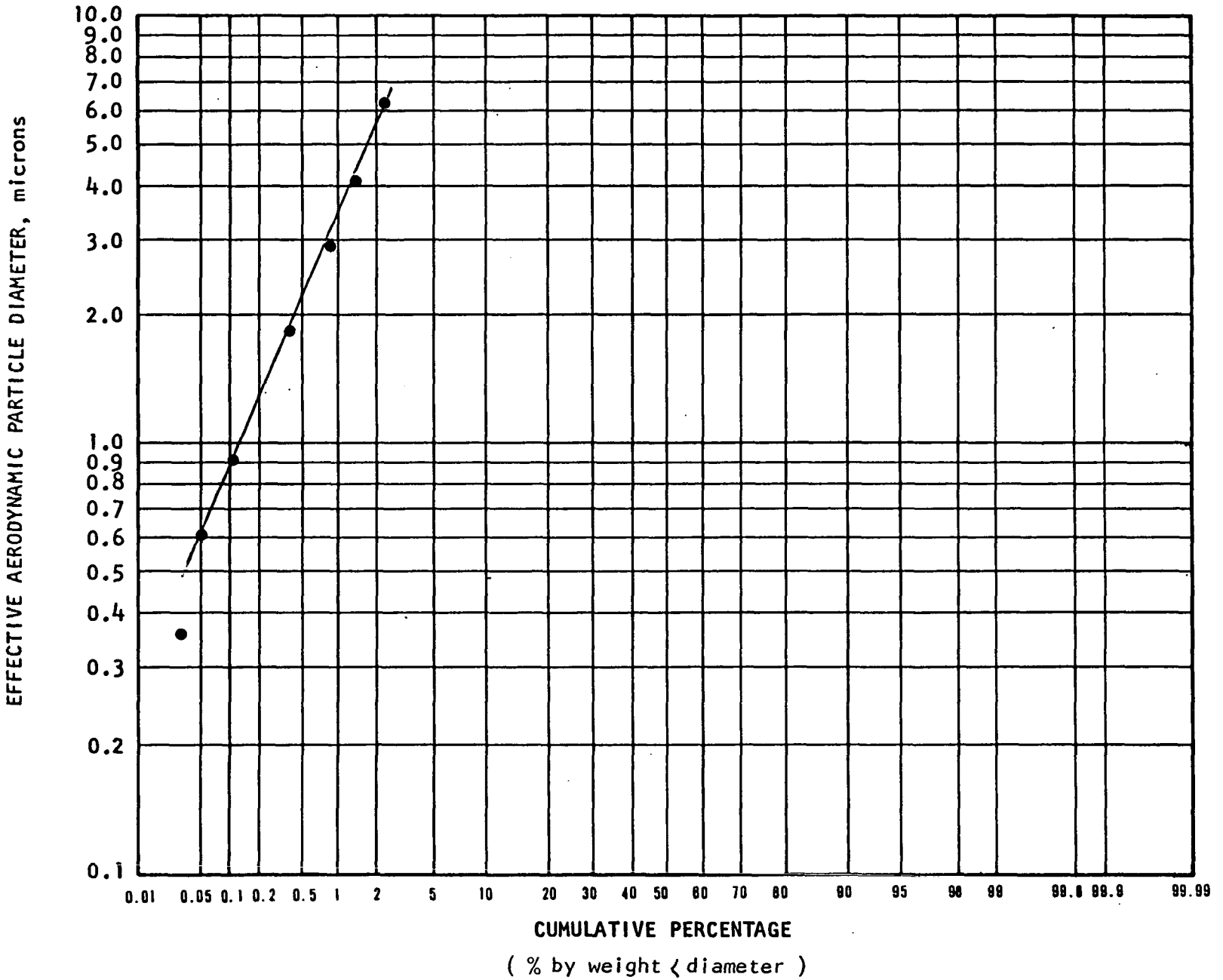


Table 30

Particle Size Distribution

Run:	3	P_{bar} (in. Hg)	30.1
Date:	5-22-80	Stack Temp (^{o}F)	215.
Location:	Gold Bond Building Products	Sample Time (min.)	0.333
Sampling Location:	Rock Dryer Inlet	Sample Volume (cf)	0.383
Traverse Point No. Sampled:	X-7	Moisture (% H_2O)	7.0
		Meter Temp (^{o}F)	111.
		Flow Setting, ΔH (in. H_2O)	3.0
		Nozzle Diameter (in.)	0.224

Sample Flow Rate (at stack conditions): 1.15 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	1,928.7	97.30	100.0	9.9
2	15.0	0.76	2.7	6.2
3	16.0	0.81	1.9	4.1
4	9.0	0.45	1.1	2.9
5	6.1	0.31	0.7	1.8
6	3.0	0.15	0.4	0.9
7	1.9	0.10	0.22	0.6
8	2.0	0.10	0.12	0.36
Backup Filter	0.6	0.02	0.02	----
TOTAL	1,982.3	100.0		

Rock Dryer Baghouse Inlet Duct
Run 3

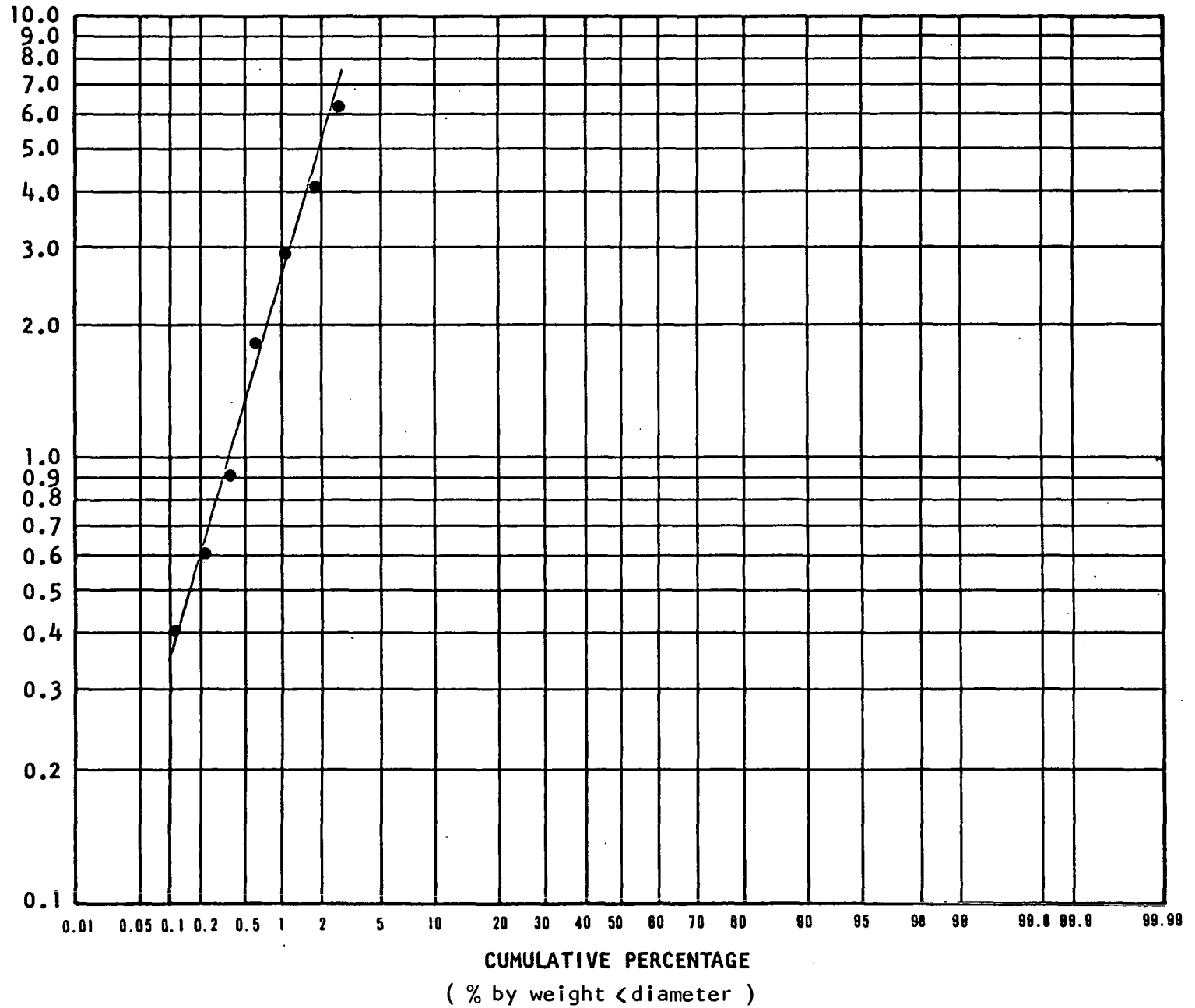


Table 31

Particle Size Distribution

Run: 1 of 1

Date: 5-21-80

Location: Gold Bond Building Products

Sampling Location: Rock Dryer Outlet

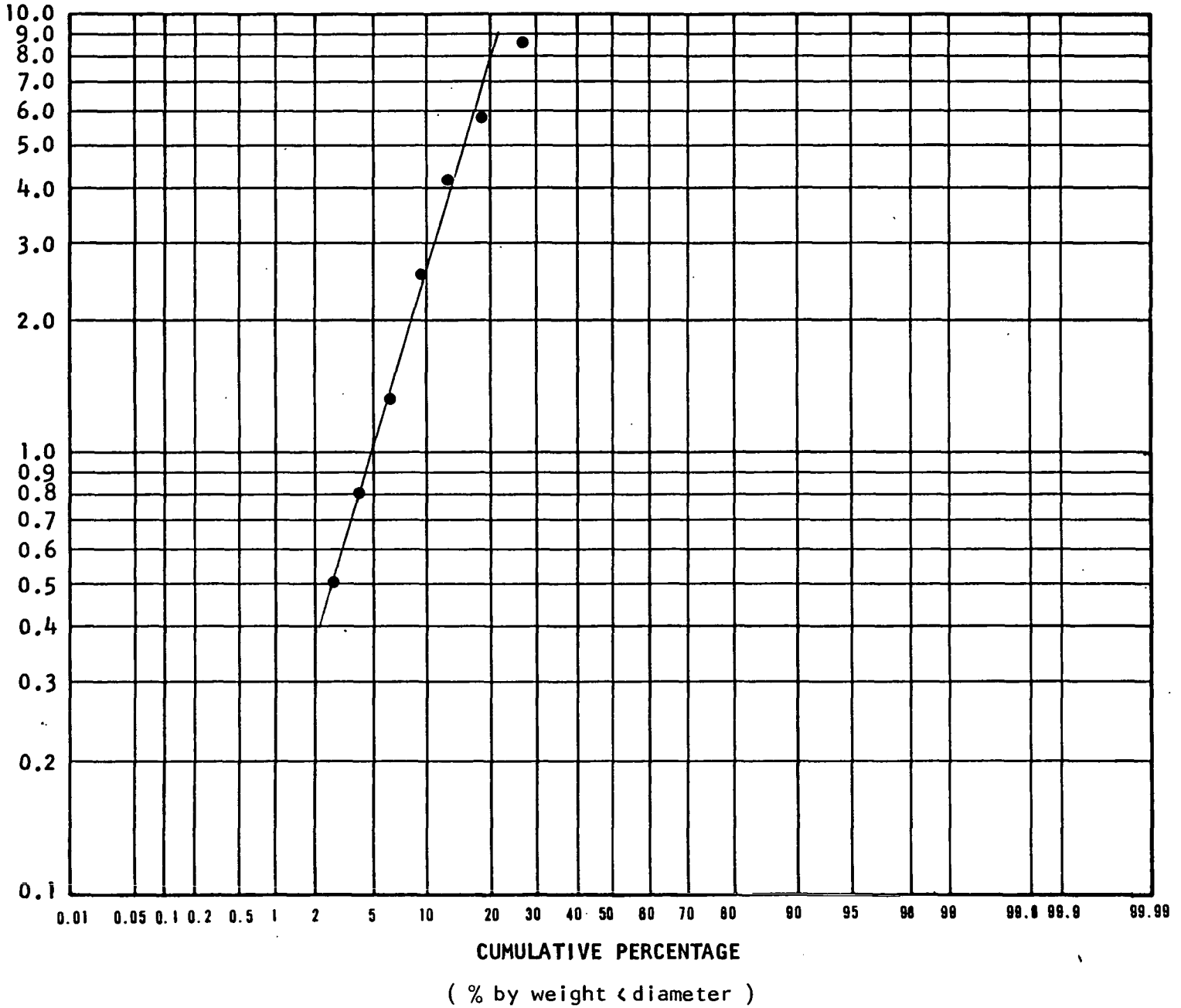
Traverse Point No. Sampled: X-6

P_{bar} (in. Hg)	30.1
Stack Temp (^{o}F)	200.
Sample Time (min.)	60.0
Sample Volume (cf)	33.3
Moisture (% H_2O)	8.3
Meter Temp (^{o}F)	102.
Flow Setting, ΔH (in. H_2O)	1.0
Nozzle Diameter (in.)	0.181

Sample Flow Rate (at stack conditions): 0.58 cfm

Plate No.	Net Wt. (mg)	Percent	Cumulative Percent	EAD (microns)
1	60.2	73.87	100.0	14.2
2	5.4	6.63	26.1	8.7
3	5.2	6.38	19.5	5.8
4	3.0	3.68	13.1	4.1
5	2.0	2.45	9.4	2.5
6	2.5	3.07	7.0	1.3
7	0.6	0.74	3.9	0.8
8	0.7	0.86	3.2	0.5
Backup Filter	1.9	2.32	2.3	----
TOTAL	81.5	100.0		

Rock Dryer Baghouse Outlet Stack
Run 1



SUMMARY OF VISIBLE EMISSIONS
TABLE 32

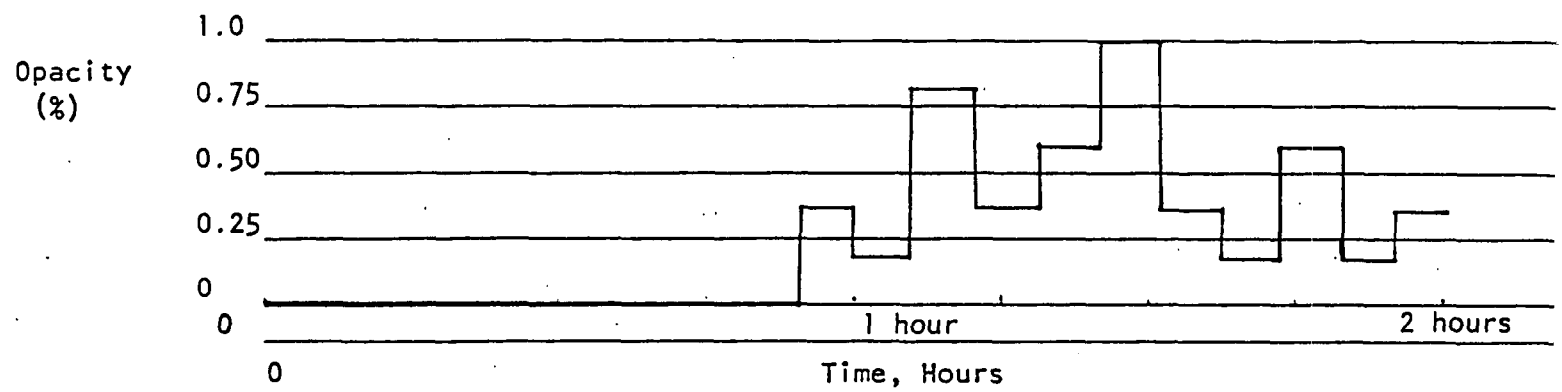
Date: May 19, 1980
Type of Discharge: Stack
Height of Point of Discharge: 10' above roof
Wind Direction: Westerly
Color of Plume: White
Observer No.:
Distance from Observer to Discharge Point: 25 feet
Direction of Observer from Discharge Point: South of stack
Height of Observation Point: 6 feet
Description of Background: Sky

Type of Plant: Gypsum Processing Facility
Location of Discharge: #2 Calcidyne Baghouse
Description of Sky: Partly Cloudy
Wind Velocity: 10-15 mph
Detached Plume: No
Duration of Observation: 1400-1600

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	1400	1406	0	0	21				
2	1406	1412	0	0	22				
3	1412	1418	0	0	23				
4	1418	1424	0	0	24				
5	1424	1430	0	0	25				
6	1430	1436	0	0	26				
7	1436	1442	0	0	27				
8	1442	1448	0	0	28				
9	1448	1454	0	0	29				
10	1454	1500	10	0.4	30				
11	1500	1506	5	0.2	31				
12	1506	1512	20	0.8	32				
13	1512	1518	10	0.4	33				
14	1518	1524	15	0.6	34				
15	1524	1530	25	1.0	35				
16	1530	1536	10	0.4	36				
17	1536	1542	5	0.2	37				
18	1542	1548	15	0.6	38				
19	1548	1554	5	0.2	39				
20	1554	1600	10	0.4	40				

Sketch Showing How Opacity Varied with Time:



SUMMARY OF VISIBLE EMISSIONS
TABLE 33

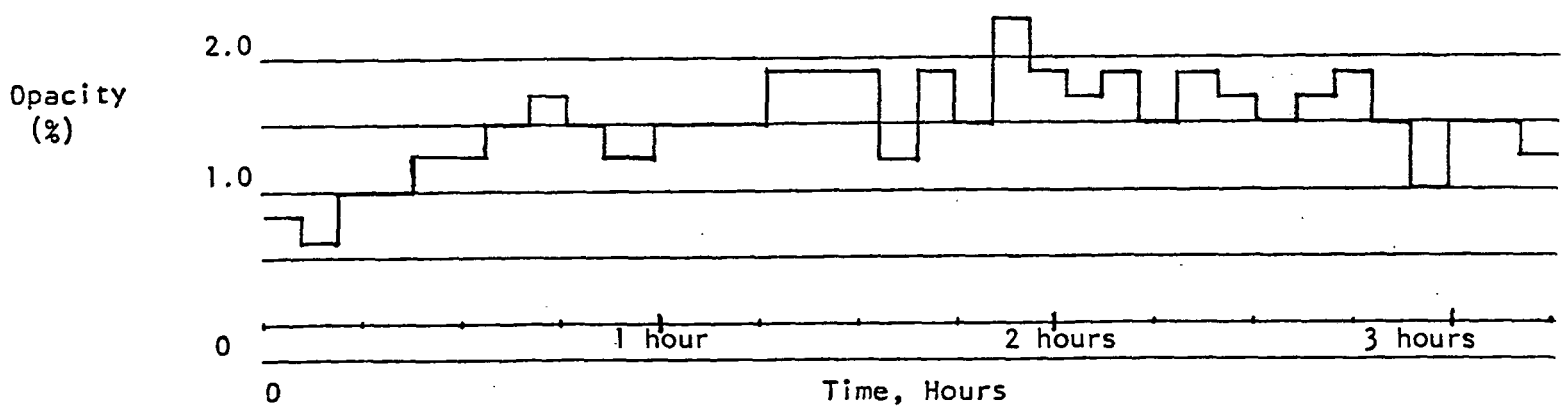
Date: May 20, 1980
Type of Discharge: Stack
Height of Point of Discharge: 10' above roof
Wind Direction: West
Color of Plume: White
Observer No.:
Distance from Observer to Discharge Point: 25 feet
Direction of Observer from Discharge Point: south of stack
Height of Observation Point: 6 feet
Description of Background: sky

Type of Plant: Gypsum Processing Facility
Location of Discharge: #2 Calcidyne Baghouse
Description of Sky: Partly Cloudy
Wind Velocity: 10-15 mph
Detached Plume: NO
Duration of Observation: 0934-1513

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	0934	0940	20	0.8	21	1351	1357	45	1.9
2	0940	0946	15	0.6	22	1357	1403	40	1.7
3	0946	1952	25	1.0	23	1403	1409	45	1.9
4	0952	0958	25	1.0	24	1409	1415	35	1.5
5	0958	1004	30	1.3	25	1415	1421	45	1.9
6	1004	1010	30	1.3	26	1421	1427	40	1.7
7	1010	1016	35	1.5	27	1427	1433	35	1.5
8	1016	1022	40	1.7	28	1433	1439	40	1.7
9	1022	1028	35	1.5	29	1439	1445	45	1.9
10	1028	1034	30	1.3	30	1445	1451	35	1.5
11	1034	1040	35	1.5	31	1451	1457	25	1.0
12	1040	1046	35	1.5	32	1457	1503	35	1.5
13	1046	1052	35	1.5	33	1503	1509	35	1.5
14	1052	1058	45	1.9	34	1509	1513	25	1.3
15	1058	1104	45	1.9	35				
16	1104	1110	45	1.9	36				
17	1110	1113	20	1.3	37				
18	1333	1339	45	1.9	38				
19	1339	1345	35	1.5	39				
20	1345	1351	55	2.3	40				

Sketch Showing How Opacity Varied with Time:



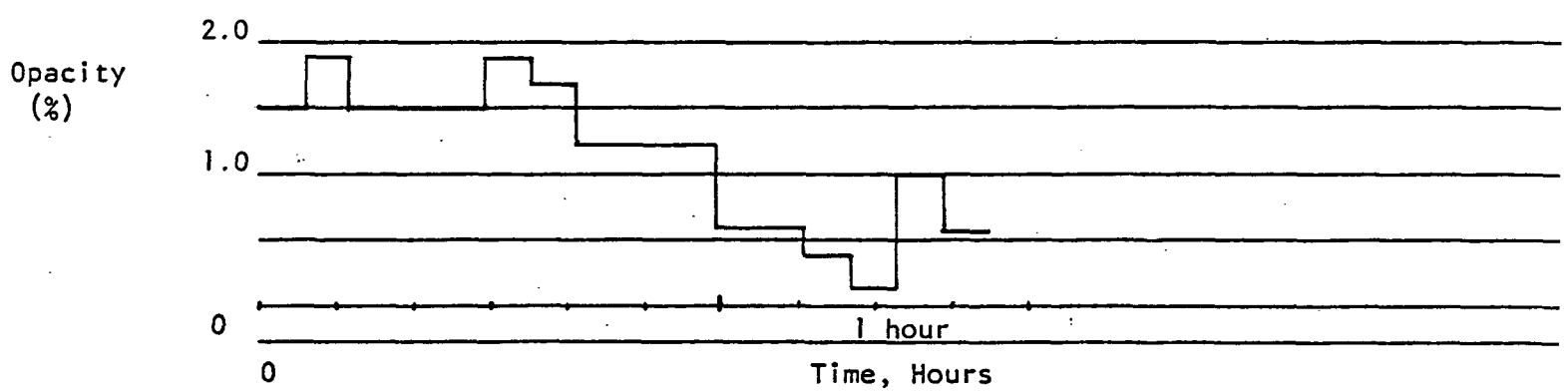
SUMMARY OF VISIBLE EMISSIONS
TABLE 34

Date: May 21, 1980
Type of Plant: Gypsum Processing Facility
Type of Discharge: Stack
Location of Discharge: Rock Dryer Baghouse Outlet
Height of Point of Discharge: 8' above roof
Description of Sky: Clear
Wind Direction: Westerly
Wind Velocity: 5-10 mph
Color of Plume: White
Detached Plume: NO
Observer No.:
Duration of Observation: 1157-1332 Run 1
Distance from Observer to Discharge Point: 15 feet
Direction of Observer from Discharge Point: South
Height of Observation Point: 4 feet
Description of Background: Clear Blue Sky

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	1157	1203	35	1.5	21				
2	1203	1209	45	1.9	22				
3	1209	1215	35	1.5	23				
4	1215	1221	35	1.5	24				
5	1221	1227	35	1.5	25				
6	1227	1233	45	1.9	26				
7	1233	1239	40	1.7	27				
8	1239	1245	30	1.3	28				
9	1245	1251	30	1.3	29				
10	1251	1257	30	1.3	30				
11	1257	1303	15	0.6	31				
12	1303	1309	15	0.6	32				
13	1309	1315	10	0.4	33				
14	1315	1321	5	0.2	34				
15	1321	1327	25	1.0	35				
16	1327	1332	15	0.6	36				
17					37				
18					38				
19					39				
20					40				

Sketch Showing How Opacity Varied with Time:



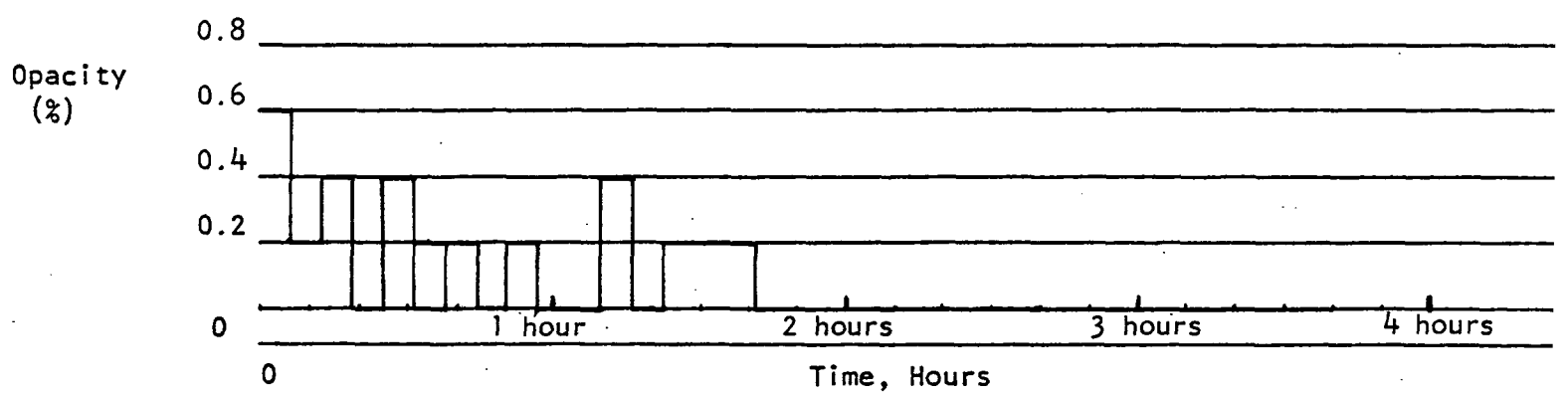
SUMMARY OF VISIBLE EMISSIONS
TABLE 35

Date: May 22, 1980
Type of Plant: Gypsum Processing Facility
Type of Discharge: stack
Location of Discharge: Rock Dryer Baghouse
Height of Point of Discharge: 8' above roof
Description of Sky: Partly Cloudy
Wind Direction: Southeast
Wind Velocity: 5-10 mph
Color of Plume: White
Detached Plume: No
Observer No.:
Duration of Observation: 0849-1426 Runs 2-3
Distance from Observer to Discharge Point: 50 feet
Direction of Observer from Discharge Point: South
Height of Observation Point: 6 feet
Description of Background: cloudy sky

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	0849	1855	15	0.6	21	1248	1254	0	0.0
2	0855	0901	5	0.2	22	1254	1300	0	0.0
3	0901	0907	10	0.4	23	1300	1306	0	0.0
4	0907	0913	0	0.0	24	1306	1312	0	0.0
5	0913	1919	10	0.4	25	1312	1318	0	0.0
6	0919	0925	0	0.0	26	1318	1324	0	0.0
7	0925	0931	5	0.2	27	1324	1330	0	0.0
8	0931	0937	0	0.0	28	1330	1336	0	0.0
9	0937	0943	5	0.2	29	1336	1342	0	0.0
10	0943	0949	0	0.0	30	1342	1348	0	0.0
11	0949	0955	0	0.0	31	1348	1354	0	0.0
12	0955	1001	10	0.4	32	1354	1400	0	0.0
13	1001	1007	0	0.0	33	1400	1406	0	0.0
14	1007	1013	5	0.2	34	1406	1412	0	0.0
15	1013	1019	5	0.2	35	1412	1418	0	0.0
16	1419	1025	5	0.2	36	1418	1424	0	0.0
17	1025	1028	0	0.0	37	1424	1426	0	0.0
18	1230	1236	0	0.0	38				
19	1236	1242	0	0.0	39				
20	1242	1248	0	0.0	40				

Sketch Showing How Opacity Varied with Time:



SUMMARY OF VISIBLE EMISSIONS
TABLE 36

Date: May 27, 1980
Type of Plant: Gypsum Processing Facility
Type of Discharge: Stack
Location of Discharge: Stucco Baghouse
Height of Point of Discharge: 6' above roof
Description of Sky: Clear
Wind Direction: Southwest
Wind Velocity:
Color of Plume: White
Detached Plume: No
Observer No.:
Duration of Observation: 1330-1705 Runs 1-3
Distance from Observer to Discharge Point: 20 feet
Direction of Observer from Discharge Point: West
Height of Observation Point: roof level
Description of Background: clear

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	1330	1336	90	3.8	21	1605	1611	95	4.0
2	1336	1342	95	4.0	22	1611	1617	70	2.9
3	1342	1348	70	2.9	23	1617	1623	90	3.8
4	1348	1354	110	4.6	24	1623	1629	100	4.2
5	1354	1400	115	4.8	25	1629	1635	75	3.1
6	1400	1406	120	5.0	26	1635	1641	75	3.1
7	1406	1412	60	2.5	27	1641	1647	90	3.8
8	1412	1418	75	3.1	28	1647	1653	100	4.2
9	1418	1424	60	2.5	29	1653	1659	95	4.0
10	1424	1430	75	3.1	30	1659	1705	85	3.5
11	1440	1446	40	1.7	31				
12	1446	1452	45	1.9	32				
13	1452	1458	60	2.5	33				
14	1458	1504	80	3.3	34				
15	1504	1510	85	3.5	35				
16	1510	1516	55	2.3	36				
17	1516	1522	110	4.6	37				
18	1522	1528	105	4.4	38				
19	1528	1534	65	2.7	39				
20	1534	1540	100	4.2	40				

Sketch Showing How Opacity Varied with Time:

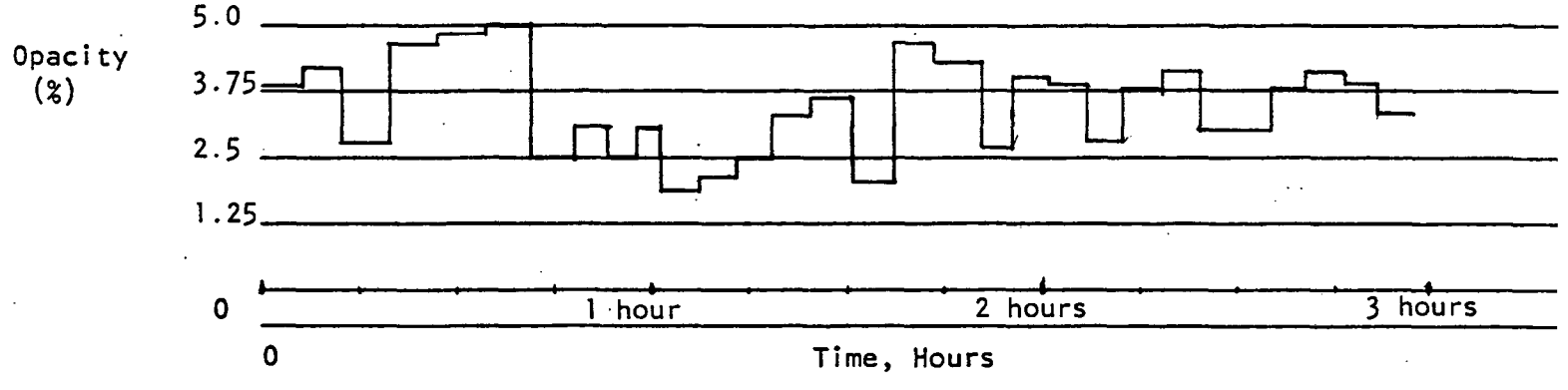


Table 37

Mean Fugitive Emission Values (% Frequency Emission)
For Three Tests at Each Location

Board End Sawing

Test	Test Mean
Test 1	37.5
Test 2	35.8
Test 3	19.2
Site Mean	30.8

Score Wheel

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

Admix Conveyor

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

Fiberglass Shredder

Test	Test Mean
Test 1	0.13
Test 2	0.22
Test 3	0.22
Site Mean	0.19

Vermiculite Addition

Test	Test Mean
Test 1	65.5
Site Mean	65.5