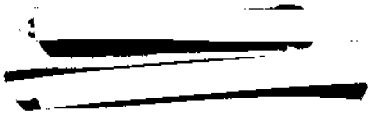
AP-42 Section 11.26
Reference 10
Report Sect. 4
Reference 3

COMPLIANCE REPORT

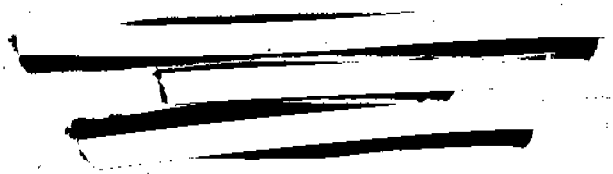
PARTICULATE EMISSION COMPLIANCE PROGRAM

for the



Alpha Mill
Bagging Operation
Primary Jaw Crusher
Screen & Belt Conveyor Transfer

prepared for:



Purchase Order Number: E-20545

prepared by:

Air Quality Technical Services, Inc.
P. O. Box 9550
401 Patchen Road
South Burlington, Vermont 05407

July 15, 1990

FOREWORD

Air Quality Technical Services, Inc., an environmental consulting company specializing in the monitoring, measurement and evaluation of contaminants in source emissions and ambient air, was contracted by Cyprus-Windsor Minerals, Inc. to conduct a source emissions compliance program at the Columbia Mill facility which it owns and operates in [redacted].

The following is a report of the results for the compliance program, the test methods and analytical procedures employed for determining the results, and all other pertinent data relevant to the tests conducted.

To the best of my knowledge, the data contained herein are correct and reliable.

John J. Jasko
President

TABLE OF CONTENTS

1.0 INTRODUCTION

[redacted] Columbia Mill, is a talc mineral processing facility. Raw minerals are reduced and classified to produce products which meet particle size range requirements of the end usage application for which they are intended.

The State of Vermont Agency of Natural Resources has requested that [redacted] demonstrate that the dust collectors serving the Alpha Mill (D/C-1), Bagging (D/C-9 & D/C-9A), Primary Jaw Crusher (D/C-14), and Screen & Belt Conveyor Transfer (D/C-15) processes are in compliance with the particulate emission limits set forth in Condition 4 of the Air Pollution Control Permit Conditions dated February 1, 1990.

It was the desire of [redacted] to demonstrate that the aforementioned sources comply with the applicable standards. The compliance program began on June 25 and was completed June 28, 1990.

The major on-site representatives of the organizations participating in the program and their affiliations are as follows:

Agency of Natural Resources
David Manning

[redacted]

Air Quality Technical Services, Inc.
Curtis Puisto
Richard Stergas

2.0 SUMMARY OF RESULTS

2.1 PARTICULATE EMISSION COMPLIANCE

For the purpose of determining compliance with the applicable emission standard, all sources were evaluated on the concentration of particulate matter present in the effluent stream, expressed in terms of grains per dry standard cubic feet (gr/dscf).

2.1.1 Bagging Operation--Collectors 9 & 9A

The three test runs conducted on the Bagging Operation showed particulate concentrations of 0.0024, 0.0013, and 0.0006 gr/dscf, respectively. The mean concentration of the three test runs was 0.0014 gr/dscf. This represents a concentration 14.0 % of the 0.01 gr/dscf emission limit. A summary of pertinent test determinations for the Bagging Operation are found in Table 2-1.

TEST DATA SUMMARY SHEET

Bagging Operation

Test/Run	1-1	1-2	1-3	Average
Date	[redacted]	[redacted]	[redacted]	-----
Test Time	1359-1607	1750-1933	0725-0907	-----
Plant Operating Data				
Production Rate (TPH)	-----	-----	-----	24
Test Measurements				
Sample Volume (dscf)	76.157	67.932	69.488	-----
Isokinetics (%)	98.0	97.8	98.4	-----
Moisture (%)	1.1	1.6	1.4	1.4
Temperature (°F)	81.4	82.9	75.1	79.8
Velocity (fps)	66.1	65.5	65.2	65.6
Volumetric Flow (dscfm)	11642.1	11446.4	11635.5	11574.7
(acfm)	12453.2	12340.2	12283.7	12359.0
CO2 (%)	0.0	0.0	0.0	0.0
O2 (%)	20.9	20.9	20.9	20.9
N2 (%)	79.1	79.1	79.1	79.1
Particulate Emission Determinations				
Concentration (gr/dscf)	0.0024	0.0013	0.0006	0.0014
Emission Rate (lb/hr)	0.239	0.128	0.060	0.142
Particulate Emission Standard				
Emission Limit (gr/dscf)	0.01	0.01	0.01	0.01
Percent of Limit	24.0	13.0	6.0	14.0

Table 2-1

2.1.2 Primary Crusher--Collector #14

The three test runs conducted on the Primary Crusher showed particulate concentrations of 0.0015, 0.0008, and 0.0011 gr/dscf, respectively. The mean concentration of the three test runs was 0.0011 gr/dscf. This represents a concentration 22.0 % of the 0.005 gr/dscf emission limit. A summary of pertinent test determinations for the Primary Crusher are found in Table 2-2.

[redacted]

TEST DATA SUMMARY SHEET

Primary Crusher

Test/Run	2-1	2-2	2-3	Average
Date	[redacted]			-----
Test Time	1314-1440	1535-1658	1800-1930	-----
Plant Operating Data				
Production Rate (TPH)	-----	-----	-----	95
Test Measurements				
Sample Volume (dscf)	51.915	52.913	53.164	-----
Isokinetics (%)	96.9	98.6	98.2	-----
Moisture (%)	1.2	1.4	1.5	1.4
Temperature (°F)	84.1	85.5	81.5	83.7
Velocity (fps)	62.9	63.5	63.7	63.4
Volumetric Flow (dscfm)	10191.7	10206.5	10296.7	10231.6
(acfm)	10944.6	11049.0	11083.8	11025.8
CO2 (%)	0.0	0.0	0.0	0.0
O2 (%)	20.9	20.9	20.9	20.9
N2 (%)	79.1	79.1	79.1	79.1
Particulate Emission Determinations				
Concentration (gr/dscf)	0.0015	0.0008	0.0011	0.0011
Emission Rate (lb/hr)	0.131	0.070	0.097	0.010
Particulate Emission Standard				
Emission Limit (gr/dscf)	0.005	0.005	0.005	0.005
Percent of Limit	30.0	16.0	22.0	22.0

Table 2-2

2.1.3 Alpha Roller Mill--Collector #1

The three test runs conducted on the Alpha Roller Mill showed particulate concentrations of 0.0538, 0.0451, and 0.0492 gr/dscf, respectively. The mean concentration of the three test runs was 0.0494 gr/dscf. This represents a concentration 494.0 % of the 0.01 gr/dscf emission limit. A summary of pertinent test determinations for the Alpha Roller Mill are found in Table 2-3.

TEST DATA SUMMARY SHEET

Alpha Roller Mill

Test/Run	3-1	3-2	3-3	Average
Date	[redacted]			-----
Test Time	0809-1016	1109-1326	1417-1716	-----
Plant Operating Data				
Production Rate (TPH)	-----	-----	-----	20
Test Measurements				
Sample Volume (dscf)	55.593	60.612	62.463	-----
Isokinetics (%)	97.2	98.1	98.7	-----
Moisture (%)	6.6	5.7	6.6	6.3
Temperature (°F)	173.3	178.9	176.9	176.4
Velocity (fps)	55.2	54.2	56.0	55.1
Volumetric Flow (dscfm)	9224.1	9064.1	9292.1	9193.4
(acfm)	12221.3	11999.9	12398.4	12206.5
CO2 (%)	0.5	0.5	0.25	0.4
O2 (%)	21.0	21.0	21.0	21.0
N2 (%)	78.5	78.5	78.75	78.6
Particulate Emission Determinations				
Concentration (gr/dscf)	0.0538	0.0451	0.0492	0.0494
Emission Rate (lb/hr)	4.253	3.503	3.918	3.891
Particulate Emission Standard				
Emission Limit (gr/dscf)	0.01	0.01	0.01	0.01
Percent of Limit	538.0	451.0	492.0	494.0

Table 2-3

2.1.4 Screen & Belt Conveyor Transfer--Collector #15

The three test runs conducted on the Screen & Belt Conveyor Transfer showed particulate concentrations of 0.0021, 0.0028, and 0.0155 gr/dscf, respectively. The mean concentration of the three test runs was 0.0068 gr/dscf. This represents a concentration 68.0 % of the 0.01 gr/dscf emission limit. A summary of pertinent test determinations for the Screen & Belt Conveyor Transfer are found in Table 2-4.

[redacted]

TEST DATA SUMMARY SHEET

Screen & Belt Conveyor Transfer

Test/Run	4-1	4-2	4-3	Average
Date	[redacted]			-----
Test Time	0815-1007	1050-1358	1435-1651	-----
Plant Operating Data				
Production Rate (TPH)	-----	-----	-----	95
Test Measurements				
Sample Volume (dscf)	69.487	69.603	68.610	-----
Isokinetics (%)	95.5	95.8	95.8	-----
Moisture (%)	1.4	1.6	1.3	1.4
Temperature (°F)	72.0	76.4	81.7	76.7
Velocity (fps)	74.5	75.2	74.8	74.8
Volumetric Flow (dscfm)	12308.1	12296.8	12119.4	12241.4
(acfm)	12963.0	13084.8	13015.2	13021.0
CO2 (%)	0.0	0.0	0.0	0.0
O2 (%)	20.9	20.9	20.9	20.9
N2 (%)	79.1	79.1	79.1	79.1
Particulate Emission Determinations				
Concentration (gr/dscf)	0.0021	0.0028	0.0155	0.0068
Emission Rate (lb/hr)	0.222	0.295	1.61	0.709
Particulate Emission Standard				
Emission Limit (gr/dscf)	0.01	0.01	0.01	0.01
Percent of Limit	21.0	28.0	155	68.0

Table 2-4

2.2 DATA REDUCTION

The results generated from the particulate emission compliance test program were computed by programed methods. The format of the equations used in the program can be found in Appendix A. For comparative and illustrative purposes, the supplied equation format has been completed for Bagging Operation test run 1-1.

A listing of calculation input parameters for each test are found in Appendix A.

3.0 DISCUSSION

Over the course of the test program there were occurrences which caused deviations from normal sampling procedures and test requirements.

3.1 PROCESS INTERRUPTIONS

In some instances temporary process shutdowns necessitated interrupting the sampling procedure.

The test runs for the Primary Crushing System were periodically stopped when the feed hopper was depleted of raw ore. This was due to the inability of the delivery truck to maintain a constant supply of raw ore for the system. This situation is consistent with normal system operation.

3.2 MINIMUM SAMPLE VOLUMES

Subpart OOO of the STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES (40 CFR Part 60, Subpart OOO -Standards of Performance for Nonmetallic Mineral Processing Plants, pp. 528 - 533, Rev. 07/01/89) affects facilities that commence construction, reconstruction, or modification after August 31, 1983. This Subpart contains a testing requirement (§60.675 Test Methods and Procedures) that specifies a minimum sample volume of 60 dscf for determination of particulate matter concentration. The Primary Crusher is a source that is affected by this requirement; however, the three test runs conducted all had sample volumes less than the specified amount (52.664 dscf average). In consideration of the fact that each sample resulted in a particulate catch of sufficient size to be accurately quantifiable (0.0052, 0.0029 and 0.0037 grams respectively), it is felt that the test results are an valid representation of source performance.

4.0 SOURCE DESCRIPTIONS

The following is a description of processes and sources involved in the performance test program.

4.1 ALPHA MILL SYSTEM

The Alpha roller mill system consists of two sub-systems; a closed loop process system and an exhaust system. The closed loop process system consists of a furnace which supplies heated process makeup air, an induced draft fan which circulates the process air, a roller mill, a product recovery cyclone and two shaker screens. The exhaust system consists of a dust collector and an exhaust fan.

Crushed talc ore is fed into the roller mill from the raw product silo which has a storage capacity of approximately 800 tons. The talc ore is reduced by the interaction of a stationary circular race and rollers which rotate in a horizontal plane. The induced draft fan takes process air, combines it with a necessary volume of heated makeup air and forces the air stream up through the roller mill, entraining fine pulverized talc. The talc particles are removed from the air stream via the product recovery cyclone prior to returning to the process fan. Recovered product passes from the cyclone hopper into two bins, which, in turn feed the two shaker screens. Proper sized particles pass through the sieve and are conveyed pneumatically to storage. Oversized particles are screened off and pass back into the mill for further processing.

The exhaust system serves to prevent the buildup of humidity in the closed loop system by venting off a percentage of the recirculated air. Without this exchange, the moisture content of the conveying air stream would increase to saturation and would cause the talc product to agglomerate. That portion of the circulated air stream which is vented off passes through a fabric filter dust collector

prior to being vented to the atmosphere. Recovered talc is discharged from the baghouse hopper through an air lock to the pneumatic conveying system and is carried to product storage.

4.2 BAGGING OPERATION

The bagging operation consists of four product silos, orientated in a rectangular north to south configuration, each servicing its own bagging area, and one bulk packaging location. The northeastern silo contains grade 36 product, the northwestern silo contains grade 100 product, the southeastern silo contains special order product, and the southwestern silo contains grade 85 product. Desired product is bagged at the base outlet of the silo or is pneumatically conveyed from any product silo to the bulk packaging location. Once packaged, the bags are mechanically conveyed to one of two flatteners which shape the bags to a uniform dimension. One flattener services the 100 and 36 grade locations (northern silos) and the other services the special order and 85 grade locations (southern silos).

The exhaust system consists of two separate dust collectors serviced by a common exhaust fan. The system services all points of dust generation: including the bagging spouts, bagging area floor panels, bulk packaging location, conveyors, and flatteners. The dust collector designated number 9A services the northeast silo (grade 36 product) bagging location and the bulk packaging unit only. The dust collector designated number 9 services the remaining bagging locations and both flatteners.

4.3 PRIMARY CRUSHING SYSTEM

The primary crushing system consists of the primary crusher, a primary transport system, and capture systems to control fugitive emissions.

4.3.1 Primary Crusher

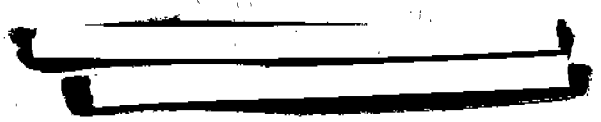
Truckloads of ore are dumped into a feed hopper which supplies the primary crusher. This primary crusher is an impact unit which accepts ore up to 40 inches in size and is grated to discharge ore sized less than 5 3/4 inches. The maximum rated capacity of the primary crusher is 300 TPH.

The primary crusher emission control system consists of a cartridge collector and an exhauster. The suspended particulates created by the crushing process are captured at three pickup points. These points are located above the crusher where the ore enters the crusher from the feed hopper; below the crusher where the ore is discharged from the crusher; and at the skirting enclosing the belt conveyor after the transfer point on the conveyor.

4.3.2 Screen and Belt Conveyor Transfer

The primary transport system consists of two enclosed belt conveyors with an intermediate screening and a chute transfer. Ore discharged from the primary crusher is deposited on an enclosed belt conveyor that transports the ore to a screen and chute transfer to a second enclosed belt conveyor. This primary transport system has a maximum short-term rated capacity of 550 TPH, but typically operates at a rate that is dictated by the primary crusher.

The belt conveyor transfer capture system consists of a cartridge collector and an exhauster. The suspended particulates created by the screening and transfer process are captured at the screen and two pickup points located in



the skirted section of second belt conveyor.

5.0 OPERATING AND PRODUCTION CAPACITIES

Operating/production rates for all sources involved in the test program are subject to process variability due to each and/or interconnected processes. Best efforts were made to test during maximum operating capacity of each source.

5.1 ALPHA ROLLER MILL SYSTEM

Alpha roller mill production rate was governed by the variable hardness of the raw ore entering the milling process and could not be controlled. A harder ore requires a longer milling time to achieve the desired grade of the final talc product and results in a lower production rate. The mill operates at 100% capacity as determined by this factor. The Alpha roller mill is used to produce one size grade of talc in the product 36 class.

Although the percentage of larger particles is varied, the percentage of fines present in the system for any given product size grade remains fairly constant. These fines, small enough to pass through the product recovery cyclone, are continuously transported through the circulating system. Fines are removed by the dust collector when air is drawn off from the closed loop process via the exhaust system. An estimate of the range of production rate for the Alpha Mill is 10 to 26 tons per hour. The estimated production rate during the test program was 20 tons per hour.

5.2 BAGGING OPERATION

The bagging system operates per product request. During the test program, both bulk and bagged product was generated. The bulk product was G36 and the bagged product TC100. An estimated production rate of 24 tons per hour was established.

5.3 PRIMARY CRUSHING SYSTEM

The primary crusher system was designed to operate intermittently in the crushing and transporting of ore. The primary crusher at maximum capacity can process 300 tons of ore per hour. The primary crusher belt conveyors (screen & belt) at maximum capacity can transport ore at a rate equal to 550 tons per hour, this rate can only be maintained for periods of short duration.

The actual time of active operation for the crushing and transporting processes is dictated by associated processes relating to input and output. These factors governing system operation are: (a) the ability for the delivery trucks to supply the primary crusher with the material to process, approximately 115 TPH; (b) the ability of a secondary transport system to convey crushed ore from the secondary crusher to ore storage silos, approximately 120 TPH. During continuous crushing and transport, the primary crushing system has an estimated maximum operating capacity of 115 to 120 TPH. Neither the primary or secondary systems are equipped with weigh bridge scales, batch scales, or other devices for the determination of the actual operation rate.

The production rate was estimated based on 35 tons per truck load. The production rate during the test program was approximately 95 tons per hour.

6.0 PARTICULATE EMISSION COMPLIANCE PROCEDURES

The procedures used in the particulate emission compliance program were conducted in accordance with the standard methods described in Appendix A of 40 CFR Part 60, STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES, as revised July 1, 1989.

6.1 SAMPLING LOCATIONS

The sampling locations were located according to the guidelines set forth in Method 1 - Sample and Velocity Traverses for Stationary Sources (40 CFR, Part 60, App. A, pp. 570 - 577).

6.1.1 Alpha Mill

The sample ports for the Alpha roller mill exhaust were located in the discharge duct approximately 18.4 feet downstream from the last disturbance and 4.6 feet upstream from a stack elbow. At the sampling location, the duct has an inside diameter of 26 inches. This positioned the sampling location 8.5 diameters downstream and 2.1 diameters upstream from the respective disturbances. A schematic of the sample port locations can be found in Figure 6-1. In accordance with Method 1, a minimum of 12 sample points were required for a particulate traverse. A cross-sectional view of the exhaust duct at the sampling location and the traverse point layout can be found in Figure 6-2.

ALPHA MILL EXHAUST STACK
PORT LOCATIONS

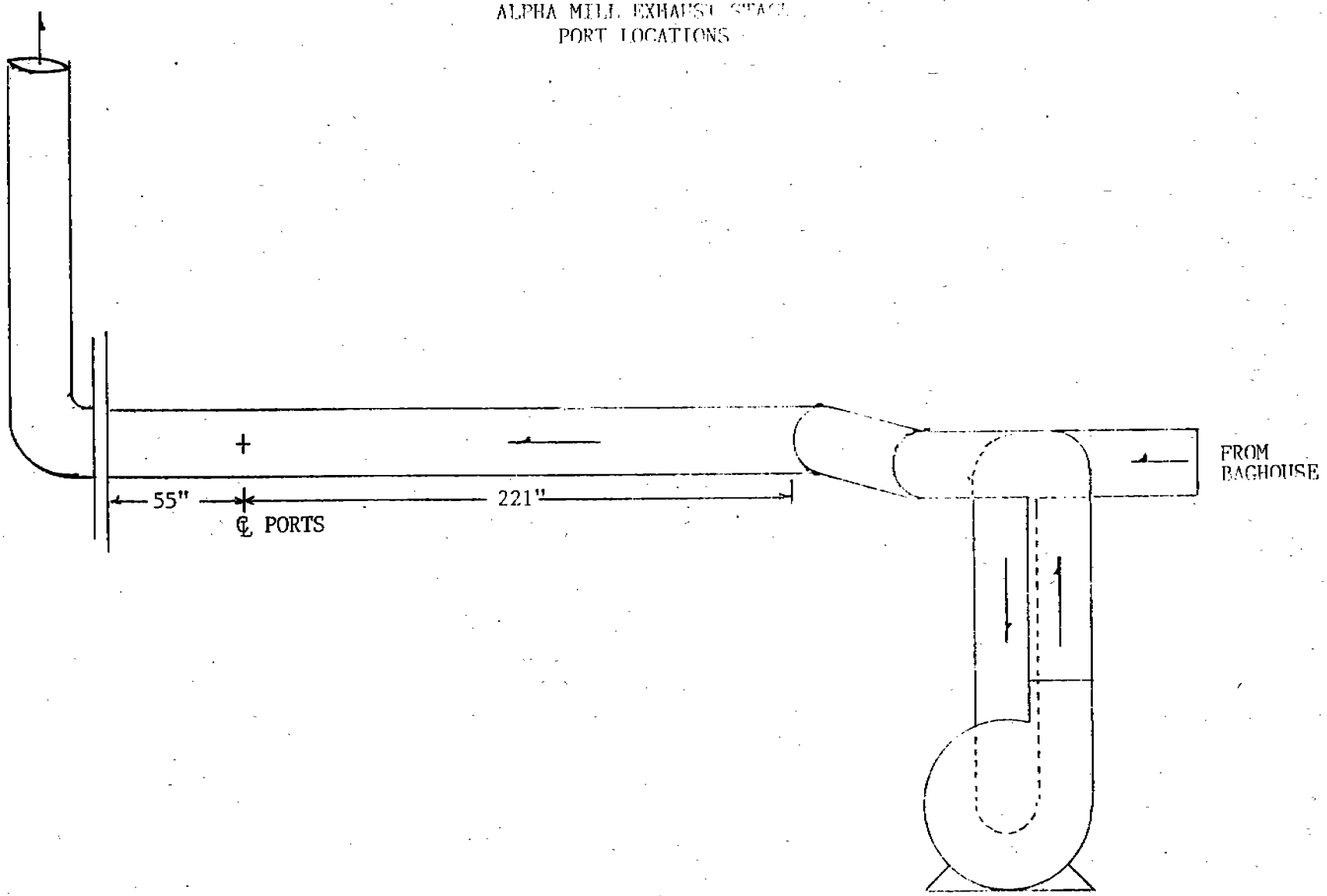
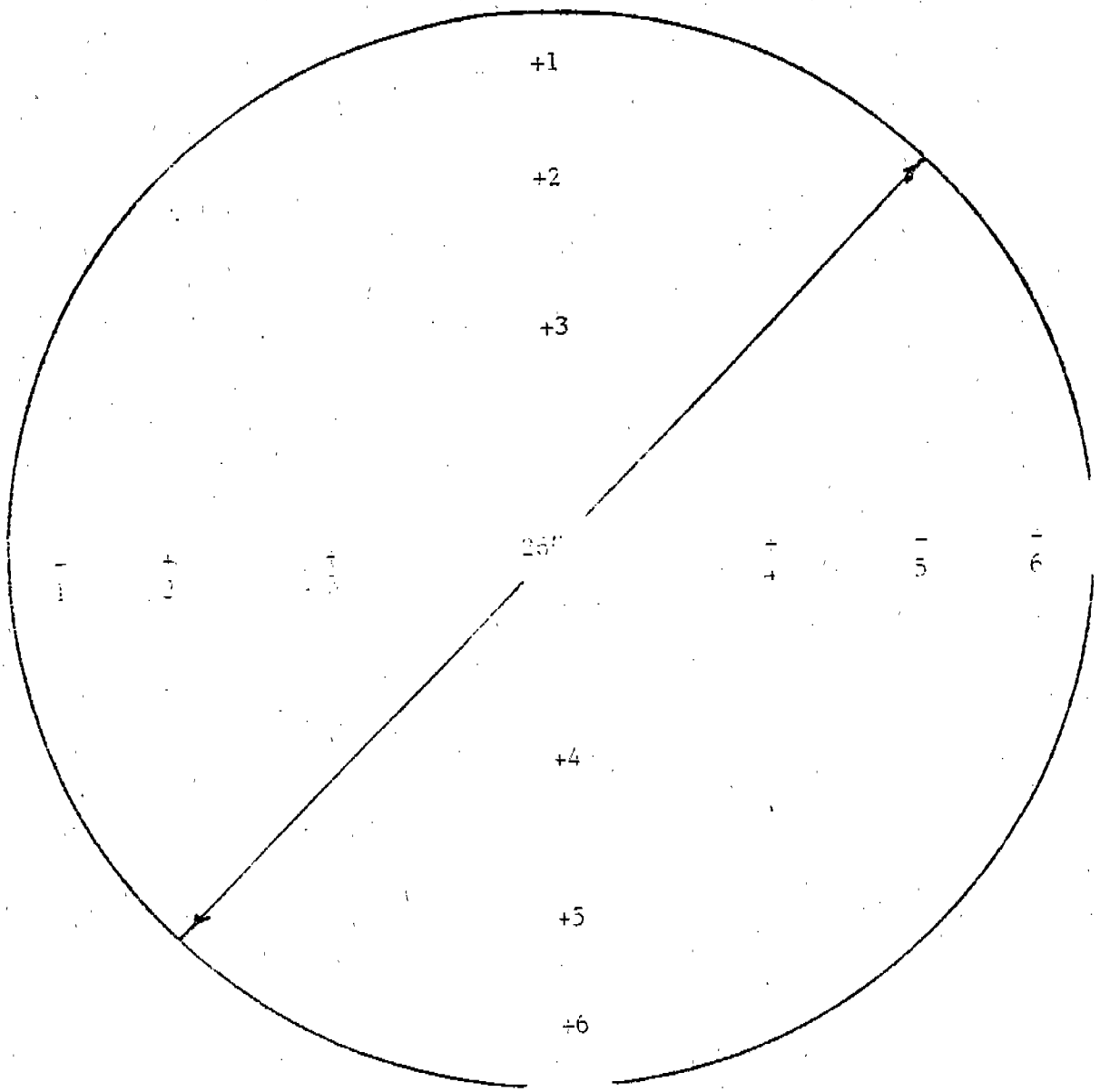


FIGURE 6-1

ALPHA MILL
TRAVERSE POINT LOCATION



POINT	DISTANCE
1.	1.1
2.	3.8
3.	7.7
4.	18.3
5.	22.2
6.	24.9

FIGURE 6-2

6.1.2 Bagging Operation

The sample ports for the bagging stack were located approximately 10.0 feet downstream and 27.0 feet upstream from respective disturbances. The stack diameter at the sampling location was 24 inches. This positioned the sample ports 5.0 diameters downstream and 13.5 diameters upstream from respective disturbances. A schematic of the sample port location can be found in Figure 6-3. In accordance with Method 1, a minimum of 20 sample points were required for a particulate traverse. A cross-sectional view of the exhaust duct at the sampling location and the traverse point layout can be found in Figure 6-4.

BAGGING OPERATION
SAMPLE PORT LOCATION

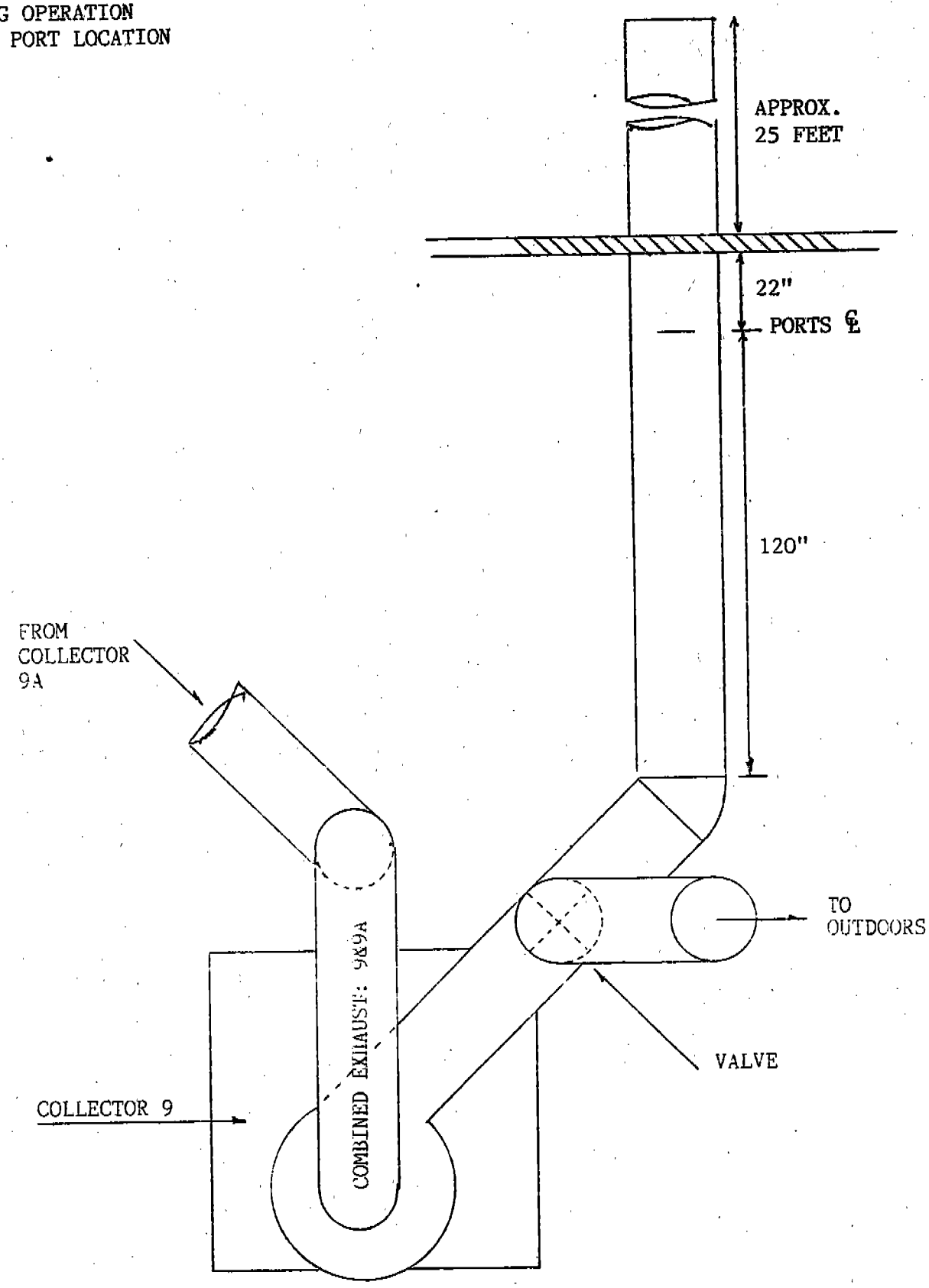
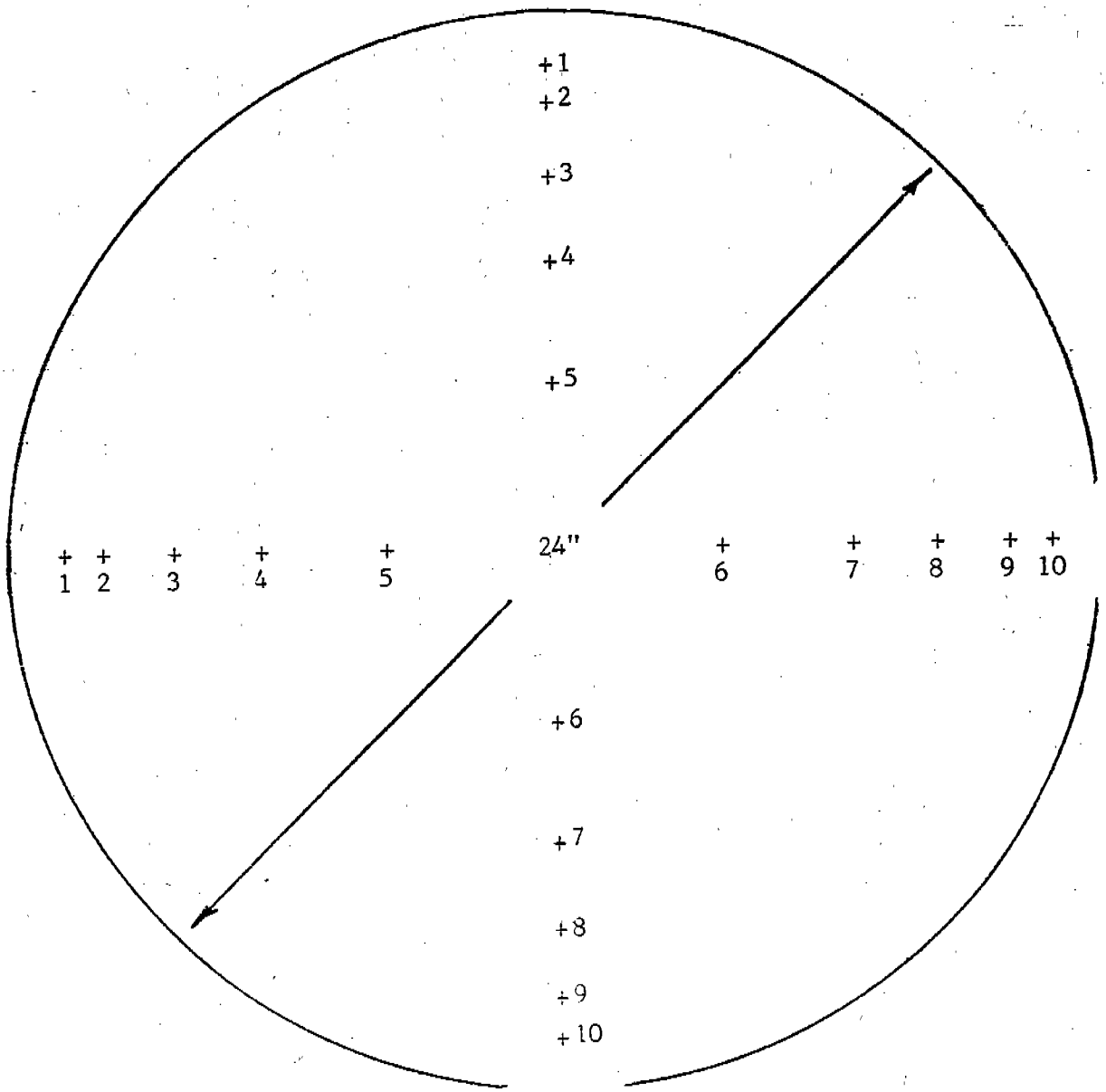


FIGURE 6-3

BAGGING OPERATION
TRAVERSE POINT LAYOUT



TRAVERSE POINT	DISTANCE
1.	1.0"
2.	2.0
3.	3.5
4.	5.4
5.	8.2

TRAVERSE POINT	DISTANCE
6.	15.8"
7.	18.6
8.	20.5
9.	22.0
10.	23.0

FIGURE 6-4

6.1.3 Primary Crusher and Belt Conveyor Transfer

The exhausters for the primary crusher and belt conveyor transfer systems are not equipped with discharge ducts. An interchangeable duct was installed for testing purposes.

The sample ports were located in the discharge duct approximately 118 inches downstream from the exhauster outlet and approximately 26 inches upstream from the discharge.

At the sampling location, the duct has inside dimensions of 17.75 inches x 23.5 inches. This positions the sampling location 5.8 diameters downstream and 1.3 diameters upstream from the appropriate flow disturbances. A schematic of the sample port location can be found in Figure 6-5.

In accordance with Method 1, a minimum of 20 sample points were required for a particulate traverse. A cross-sectional view of the exhaust duct at the sampling location and the traverse point layout can be found in Figure 6-6.

CRUSHER AND BELT TRANSFER
PORT LOCATIONS

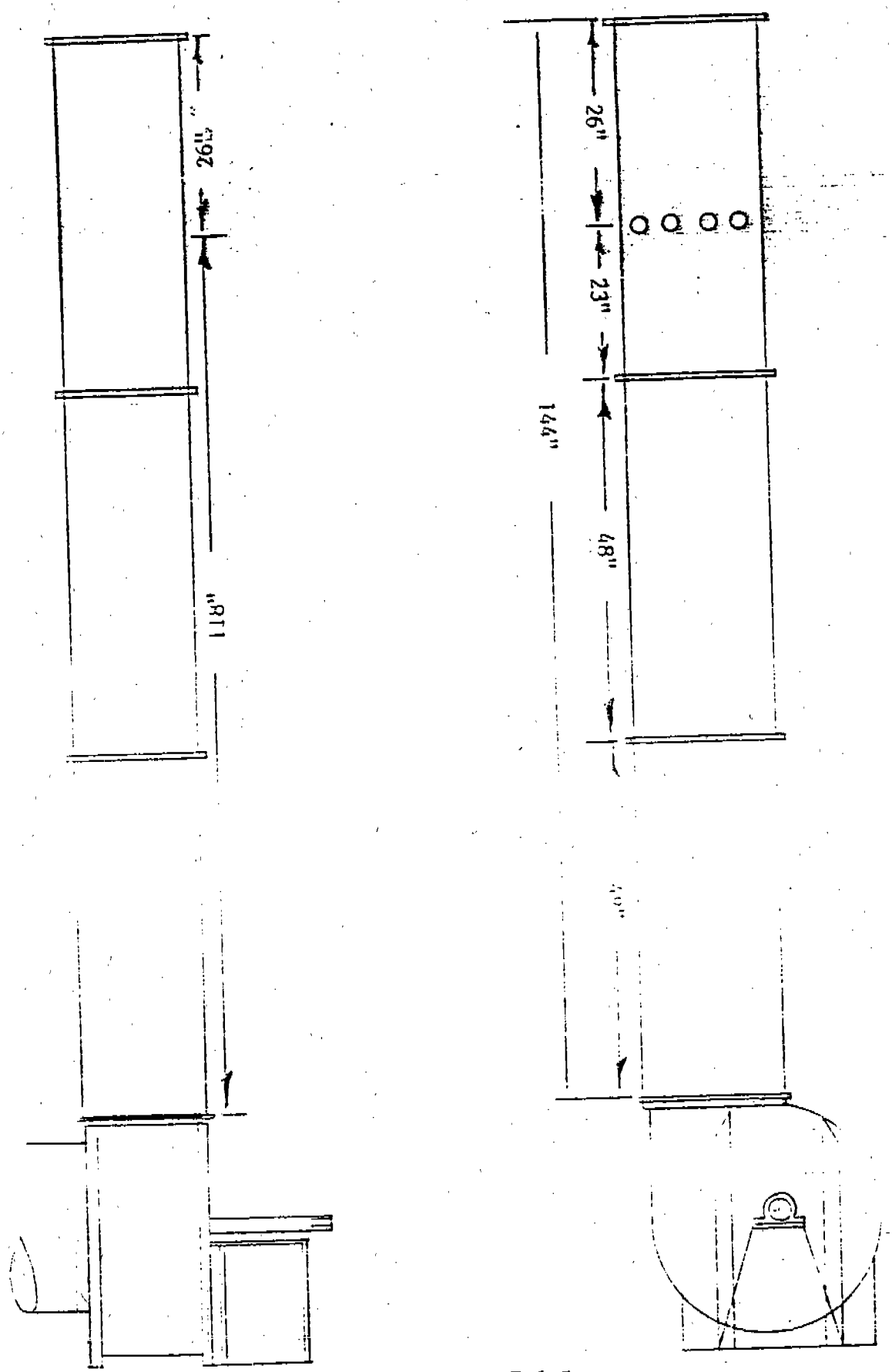


FIGURE 6-5

CRUSHER & BELT TRANSFER

TRAVERSE POINT LAYOUT

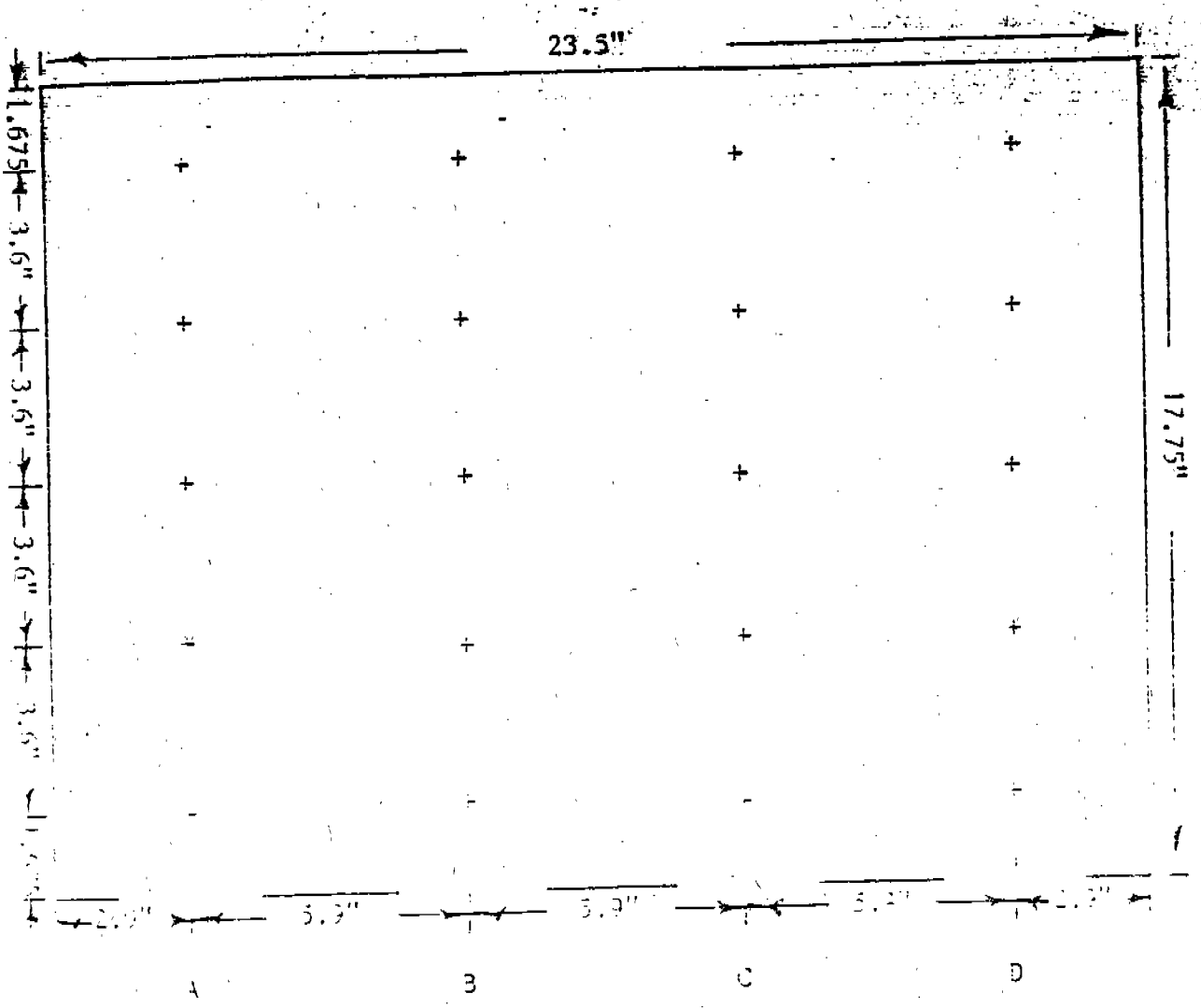


FIGURE 6-6

6.2 SAMPLE COLLECTION

Particulate sampling for the Alpha roller mill source was conducted in accordance with standard procedures described in EPA Method 17 - Determination of Particulate Emissions from Stationary Sources (in-stack filtration method) (40 CFR Part 60, App. A, pp. 851 - 868). The particulate sampling apparatus is depicted in Figure 6-7.

Particulate sampling for the bagging and primary crushing systems were conducted using a modified Method 5 - Determination of Particulate Emissions from Stationary Sources (40 CFR Part 60, App. A, pp. 624 - 648). The modification consisted of placing a unheated filter holder assembly at the discharge end of the sample probe. In this configuration the filter holder assembly was not disturb the flow pattern in the cross-sectional area of the ducts. This modification does not compromise the validity of sample collection since these sources operate at ambient air conditions (temperature, humidity, composition). The particulate sampling apparatus for the crusher system is depicted in Figure 6-8.

The sample train was operated so that an isokinetic rate, +/- 10% of the true isokinetic rate, was maintained over the course of each test run.

Copies of the field test data sheets used for recording pertinent test measurements for each unit are found in Appendix B.

METHOD 17 SAMPLE TRAIN

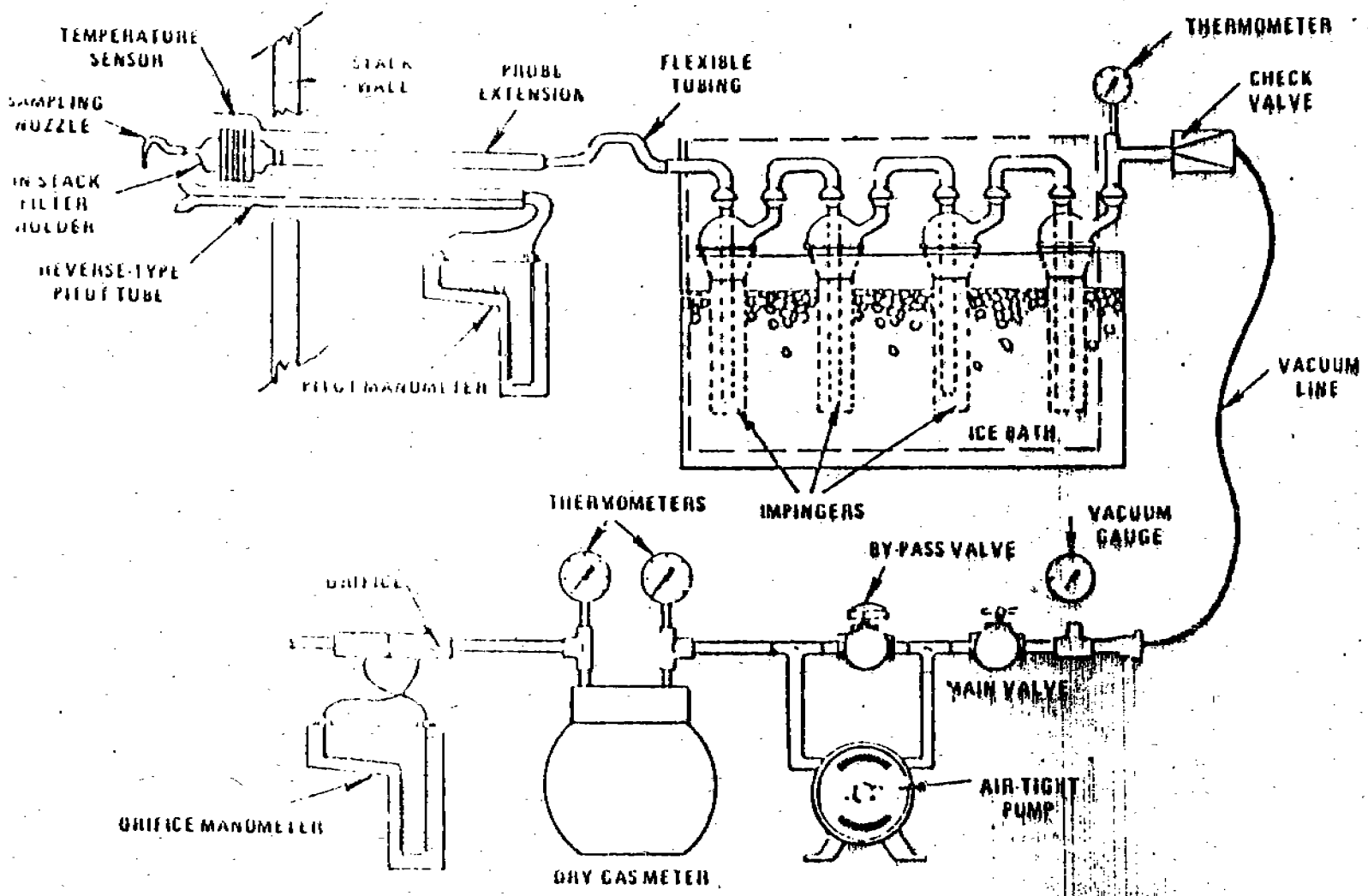


FIGURE 6-7

MODIFIED METHOD 5 SAMPLE TRAIN

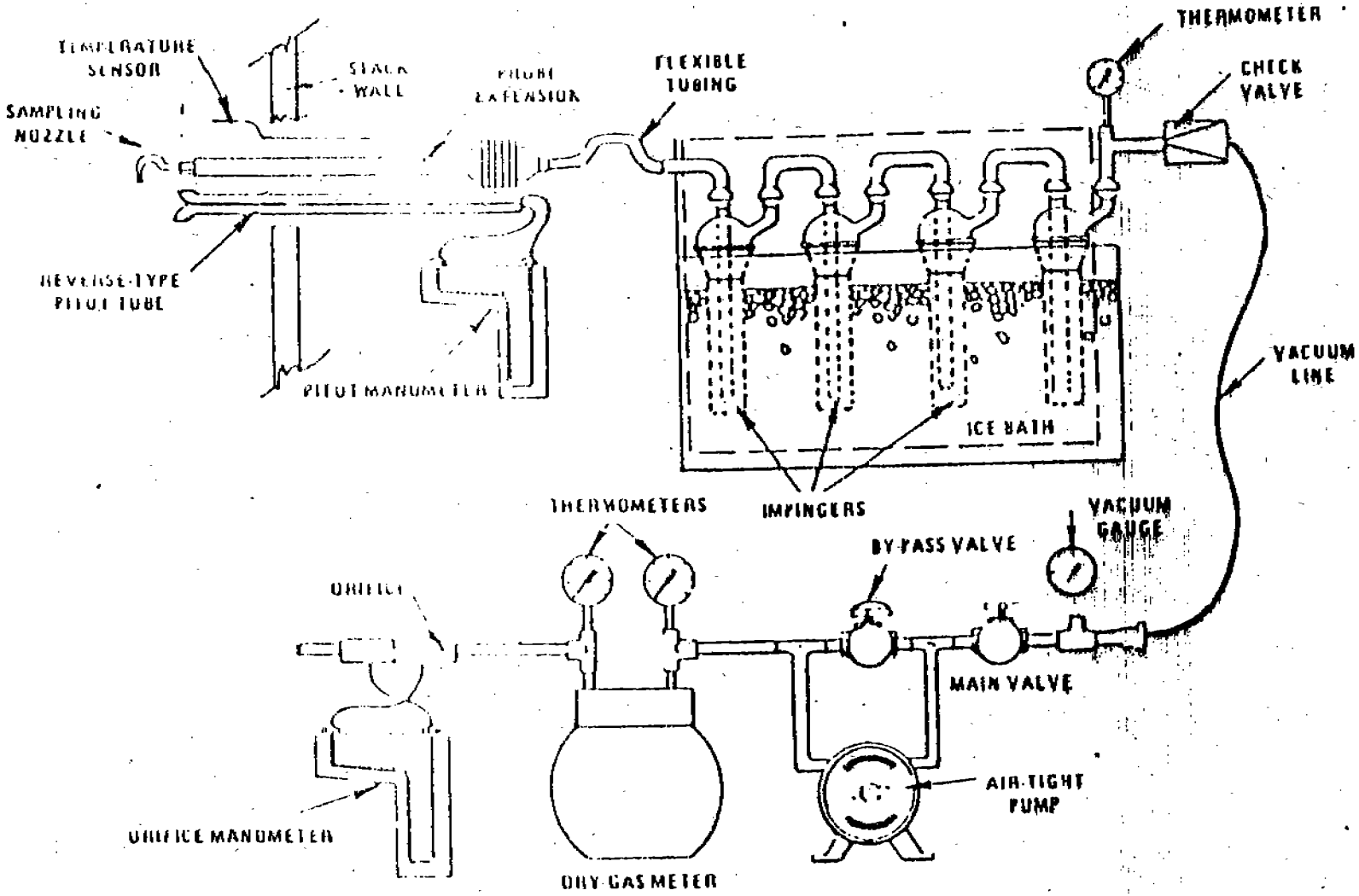


FIGURE 6-8

6.2.1 Collection System

The typical sample train consisted of:

a) a nozzle properly sized to maintain isokinetic sampling;

b) a stainless steel lined probe;

c) an encased tared filter;

d) a moisture condensing unit made up of four 500 ml impingers immersed in an ice water bath -
1 modified Greenburg-Smith type containing 100 ml of water,
1 Greenburg-Smith type containing 100 ml of water,
1 modified Greenburg-Smith type empty,
1 modified Greenburg-Smith type containing 200 grams of silica gel;

e) an umbilical;

f) a control console with:
a main on/off valve,
by-pass valve for flow adjustment,
leakless pump,
dry gas meter for measuring sample volume,
calibrated orifice equipped with pressure taps connected to an inclined manometer.

6.2.2 Sample Recovery

At the completion of each test run, the collected samples were recovered in the following manner:

Filter - The filter was removed from the filter holder, placed in it's original container, sealed and labeled for identification.

Front half rinse - The nozzle, probe, and front half of the filter holder were internally brushed and rinsed with acetone to remove any particulate matter which may have been deposited during the test run. The rinse collected in a glass jar, sealed and labeled for identification.

Impinger catch - The volume of water in the first three impingers was measured and the amount recorded.

Silica gel - The silica gel was removed from the fourth impinger, placed in it's original container, sealed and labeled for identification.

6.2.3 Quality Control/Quality Assurance

6.2.3.1 Equipment Calibration

The dry gas meter and orifice undergo semi-annual calibration according to procedures outlined in Method 5, Section 5 - Calibration (5.3 Metering System, §5.3.1 Calibration Prior to Use).

After the completion of the test program, the dry gas meter calibration was rechecked for accuracy according to procedures outlined in Method 5, Section 5 - Calibration (5.3 Metering System, §5.3.2 Calibration After Use).

Prior to use in the compliance test program the probe nozzle was calibrated according to procedures outlined in Method 5, Section 5 - Calibration (5.1 Probe Nozzle)

Copies of the pretest and post-test calibration sheets are found in Appendix D.

6.2.3.2 Equipment Leak Check

The sample train was leak checked according to procedures outlined in Method 5, Section 4 - Procedure (4.1 Sampling, §4.1.4 Leak-Check Procedures).

Before the start of each test run the inlet of the nozzle was plugged and a vacuum of 15" Hg was drawn and held. The metering dial was timed for a period of one minute and any movement during that period was noted. At the end of each test run the same procedure was followed using the

highest vacuum attained during the run. In each instance the maximum acceptable leakage rate was 0.02 cfm.

6.2.3.3 Chain of Custody

After recovery the samples collected during each test run were sealed in appropriate containers, labeled for identification, logged on a chain of custody record sheet, and placed in a secure container. The secure container remained in control of the project director in the field and until such time that it is returned to the lab. Any change of custody was recorded on the chain of custody record.

6.3 GAS VELOCITY/VOLUMETRIC FLOW DETERMINATIONS

Measurement of the stack gas velocity and volumetric flow was conducted in accordance with the standard procedures described in Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate (40 CFR Part 60, App A, pp. 580 - 598).

These determinations were made simultaneous with the particulate sampling and were used to adjust the isokinetic sample rate.

6.3.1 Measurement Apparatus

The apparatus for measuring velocity head differential pressure and temperature profiles consisted of:

a) a Type S (Stausscheibe) pitot tube with an assigned design coefficient of 0.84 connected to an inclined manometer;

b) a thermocouple connected to a digital pyrometer.

6.3.2 Quality Control/Quality Assurance

6.3.2.1 Equipment Calibration

Prior to use in the test program the pitot tube assemblies were checked for conformity with the design specifications listed in Method 2, Section 4 - Calibration (4.1 Type S Pitot Tube, §4.1.1 Type S Pitot Tube Assemblies).

The thermocouple probe used in the test program undergoes annual calibration according to procedures outlined in the Quality Assurance Handbook, Section 3.1 -Method 2 (§3.1.2 Calibration of Apparatus).

6.3.2.2 Equipment Leak Check

The pitot tubes were leak checked according to procedures outlined in Method 2 (§3 Procedure).

The pitot tubes were subjected to leak checks prior to and after each sample run. The impact opening of the pitot was blown through until a minimum velocity pressure of 3" H_2O registered on the inclined manometer. The impact opening was then closed off and the pressure reading observed. The reading was required to remain stable for a period of 15 seconds. The same procedure was used to check the static pressure side of the pitot by applying suction to the static opening.

6.4 GAS COMPOSITION DETERMINATION

Stack gas composition was determined in accordance with the standard procedures described in Method 3 - Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (40 CFR Part 60, App. A, pp. 606 - 613).

6.4.1 Fyrite Analysis

Several single-point grab samples were taken during the Alpha mill test runs and analyzed for CO_2 and O_2 by Fyrite analyzer, the balance considered N_2. The results were used to determine the dry molecular weight of the effluent stream.

6.5 ANALYTICAL PROCEDURES

Sample analysis was conducted in accordance with the standard procedures described in Method 5 - Determination of Particulate Emissions From Stationary Sources.

Copies of the sample log sheets, filter tare weights, sample weight sheets, and lab analysis summary sheets are found in Appendix C.

6.5.1 Particulate Samples - Filters

Prior to use in the test program each glass fiber filter was:

a) marked with an identifying number;
b) desiccated for a minimum of 24 hours;
c) weighed;
d) re-desiccated for a minimum of 6 hours;
e) reweighed to establish a final constant weight (<0.5 mg difference); and,
f) sealed in a plastic petri dish container that was labeled with the identifying number and tare weight of the contained filter.

After sample collection each glass fiber filter used in the program was:

a) desiccated for a minimum of 24 hours;
b) weighed;
c) re-desiccated for a minimum of 6 hours;
d) reweighed to establish a final constant weight (<0.5 mg difference).

6.5.2 Particulate Samples - Front Half Rinse

The front half rinse of the sampling train from each test run, along with a blank sample of the acetone used in the recovery process, was:

a) transferred from the sample jar to a tare weighed beaker that was marked with an identifying number;
b) evaporated to dryness;
c) desiccated for a minimum of 24 hours;
d) weighed;
e) re-desiccated for a minimum of 6 hours [illegible] a final constant weight (<0.5 mg difference).

6.5.3 Moisture Content - Silica Gel

The silica gel quantities used in the test program were;

a) initially tare weighed to 200 grams;
b) re-weighed after sample collection to establish the net volume of moisture absorbed.

6.5.4 Quality Control/Quality Assurance

The filter media used for sample collection will be retained for a period of four months after analysis. A blank tare weighed filter from the group used in the test program will also be retained.

APPENDIX A

PARTICULATE CALCULATION LEGEND

A_s = Area of stack, ft^2

B_{wo} = Stack gas proportion of water vapor, by volume

C_p = Pitot tube coefficient

C_s = Particulate matter concentration, gr/dscf

D_n = Diameter of nozzle, inches

ΔH = Pressure differential across orifice, inches H_2O

M_p = Weight of particulate matter in grams

MW_d = Molecular weight of dry stack gas, lb/lb-mole

MW_s = Molecular weight of stack gas, lb/lb-mole

P_b = Barometric pressure, inches Hg

P_s = Pressure of stack, inches Hg

P_{st} = Static pressure of stack, inches H_2O

P_{std} = Standard pressure, 29.92 inches Hg

ΔP = Stack differential pressure, inches H_2O

Q_{sd} = Stack flow, dscfm Q_{sa} = Stack flow, acfm

T_m = Temperature of gas meter, ^oF

T_s = Temperature offstack, ^oF

T_{std} = Standard temperature, 68^oF

Vl_c = Volume of liquid condensate, ml.

Vm = Volume of gas meter, ft^3

Vm_{std} = Volume of gas meter at standard conditions, dscf

V_s = Velocity of stack, ft/sec

Vw_{std} = Volume of water at standard conditions, scf

Y = Gas meter correction factor

θ = Test time, minutes

0.04707 = Conversion factor, ml. to ft^3

0.00857 = Conversion factor, grains to pounds and minutes to hours

17.65 = Conversion factor, standard temperature and standard pressure

17.33 = Percent isokenetic constant from factoring

85.49 = Pitot tube constant, K_p

0.264 = Ratio of O_2 to N_2 in air, v/v

15.432 = Conversion factor, grams/ft^3 to grains/ ft^3

PARTICULATE CALCULATIONS

Client: Cyprus-Windsor Minerals, Inc. Unit: Bagging Operation

Facility: Columbia Mill Ludlow, VT Test: 1-1

1. Volume of dry gas sampled at standard conditions, 68°F, 29.92" Hg (scf)

$$Vm_{std} = 17.65\ Vm\ Y\ \frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}$$

$$= 17.65\ (\ 82.588\ )\ (0.997)\ \frac{29.02 + \frac{1.933}{13.6}}{96.5 + 460} = \underline{76.157}$$

2. Stack gas moisture condensed at standard conditions (scf)

$$Vw_{std} = 0.047\ Vl_c$$

$$= 0.047\ (\ 18.2\ ) = \underline{0.857}$$

3. Stack gas proportion of water by volume

$$B_{ws} = \frac{Vw_{std}}{Vw_{std} + Vm_{std}}$$

$$= \frac{0.857}{0.857 + 76.157} = \underline{0.011}$$

4. Stack gas dry molecular weight (lb/lb-mole)

$$Md = 0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$= 0.44\ (\ 0.0\ ) + 0.32\ (\ 20.9\ ) + 0.28\ (79.1\ ) = \underline{28.84}$$

5. Stack gas molecular weight (lb/lb-mole)

$$Ms = Md\ (1 - B_{ws}) + 18\ (B_{ws})$$

$$= 28.84\ (1 - 0.011\ ) + 18\ (0.011\ ) = \underline{28.72}$$

6. Pressure of the stack, in. Hg

$$P_s = P_b + \frac{P_{st}}{13.6}$$

$$= 29.02 + \frac{-0.3}{13.6} = \underline{29.00}$$

7. Stack gas velocity at stack conditions (ft/sec)

$$V_s = 85.49\ (C_p)\ \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_{s,avg} + 460}{P_s\ MW_s}}$$

$$= 85.49\ (0.84\ (\ 1.141\ )\ \sqrt{\frac{81.4\ + 460}{(29.00\ )\ (\ 28.72\ )}} = \underline{66.1}$$

8. Stack gas volume at standard conditions (scfm)

$$Q_s = 60\ (1 - B_{wo})\ V_{s,avg}\ A_s\ \left(\frac{528}{T_{s,avg} + 460}\right)\ \left(\frac{P_s}{29.92}\right)$$

$$= 60\ (1 - 0.011\ )\ (\ 66.1\ )\ (\ 3.14\ )\left(\frac{528}{81.4\ + 460}\right)\left(\frac{29.00}{29.92}\right) = \underline{11642.1}$$

acfm = 12453.2

9. Test percent isokinetic

$$\%I = \frac{17.33\ (T_s + 460)\left[0.0473\ (V_{lc}) + V_{m,std}\right]}{\theta\ V_s\ P_s\ D_n^2}$$

$$= \frac{17.33\ (\ 81.4\ + 460)\left[0.0473\ (\ 18.2\ ) + 76.157\right]}{(\ 110\ )\ (\ 66.1\ )\ (\ 29.00\ )\ (0.1870\ )^2} = \underline{98.0}$$

10. Particulate matter concentration, gr/scf

$$C_s = 15.432\left(\frac{M_n}{V_{m,std}}\right)$$

$$= 15.432\left(\frac{0.0116}{76.157}\right) = \underline{0.0024}$$

11. Emission rate of particulate matter, lb/hr

$$ER = 0.00857\ (Q_s)\ C_s$$

$$= 0.00857\ (11642.1\ )\ (\ 0.0024\ ) = \underline{0.239}$$

CALCULATION INPUT PARAMETERS

Test/run		1-1	1-2	1-3
Dry gas meter volume (cu ft)		82 588	74 088	74 124
Meter correction factor		0 997	0 997	0 997
Barometric press (in Hg)		29 02	29 04	29 17
Avg orifice press differ (in H_2O)		1 933	1 303	1 918
Avg meter temperature (°F)		96 5	100 0	90 2
Volume H_2O condensed (ml)	impinger	0 0	8 0	7.0
	silica gel	18 2	16 2	14 1
	total	18 2	24 2	21 1
CO_2 (%)		0 0	0 0	0 0
O_2 (%)		20 9	20 9	20 9
N_2 (%)		79 1	79 1	79 1
CO (%)		0 0	0 0	0 0
Static press (in H_2O)		0 3	0 5	-0 5
Pitot correction factor		0 84	0 84	0 84
Avg square root of velocity press		1 142	1 198	1 135
Avg stack temperature (°F)		81 4	82 9	75 1
Area of stack (sq ft)		3 14	3 14	3 14
Test duration (min)		110	100	100
Diameter of nozzle (in)		0 1870	0 1870	0 1870
Mass of particulate catch (g)	wash	0 0103	0 0054	0 0032
	filter	0 0013	0 0002	-0 0003
	total	0 0116	0 0056	0 0029

CALCULATION INPUT PARAMETERS

Test/run	2-1	2-2	2-3
Dry gas meter volume (cu ft)	57.034	58.265	57 913
Meter correction factor	0.997	0 997	0 997
Barometric press. (in Hg)	29.05	28.95	28.93
Avg. orifice press. differ (in H_2O)	1.758	1.778	1 803
Avg meter temperature (°F)	104.1	103 5	97 1
Volume H_2O condensed (ml) impinger	3.0	6.0	7.0
silica gel	10.5	9 5	10 0
total	13.5	15.5	17 0
CO_2 (%)	0 0	0 0	0.0
O_2 (%)	20.9	20.9	20.9
N_2 (%)	79.1	79 1	79.1
CO (%)	0 0	0 0	0 0
Static press. (in H_2O)	0 2	0 2	0 2
Pitot correction factor	0 84	0.84	0 84
Avg. square root of velocity press.	1.085	1.091	1.099
Avg. stack temperature (°F)	84 1	85.5	84 5
Area of stack (sq ft)	2 90	2.90	2.90
Test duration (min)	80	80	80
Diameter of nozzle (in)	0 1870	0 1870	0 1870
Mass of particulate catch (g) wash	0.0050	0.0030	0.0037
filter	0.0002	-0.0001	0.0000
total	0.0052	0.0029	0.0037

CALCULATION INPUT PARAMETERS

Test/run		3-1	3-2	3-3
Dry gas meter volume (cu ft)		61.478	68.197	69.889
Meter correction factor		0.997	0.997	0.997
Barometric press. (in Hg)		28.96	28.96	28.92
Avg orifice press differ. (in H_2O)		0.871	0.838	0.893
Avg. meter temperature (°F)		102.8	114.6	110.7
Volume H_2O condensed (ml)	impinger	72.0	66.0	82.0
	silica gel	11.5	11.5	12.5
	total	83.5	77.5	94.5
CO_2 (%)		0.5	0.5	0.25
O_2 (%)		21.0	21.0	21.0
N_2 (%)		78.5	78.5	78.75
CO (%)		0.0	0.0	0.0
Static press (in H_2O)		0.55	0.55	0.55
Pitot correction factor		0.84	0.84	0.84
Avg square root of velocity press		0.873	0.855	0.883
Avg stack temperature (°F)		173.3	178.9	176.9
Area of stack (sq ft)		3.69	3.69	3.69
Test duration (min)		120	132	132
Diameter of nozzle (in)		0.1870	0.1870	0.1870
Mass of particulate catch (g)	wash	0.0168	0.0166	0.0181
	filter	0.1770	0.1607	0.1810
	total	0.1938	0.1773	0.1991

CALCULATION INPUT PARAMETERS

Test/run		4-1	4-2	4-3
Dry gas meter volume (cu ft)		74.918	75.325	75.948
Meter correction factor		0.997	0.997	0.997
Barometric press (in Hg)		29.00	29.00	28.95
Avg. orifice press. differ. (in H_2O)		2.440	2.450	2.428
Avg. meter temperature (°F)		93.6	95.7	107.4
Volume H_2O condensed (ml)	impinger	6.0	11.0	8.0
	silica gel	15.0	13.8	12.8
	total	21.0	24.8	20.8
CO_2 (%)		0.0	0.0	0.0
O_2 (%)		20.9	20.9	20.9
N_2 (%)		79.1	79.1	79.1
CO (%)		0.0	0.0	0.0
Static press (in H_2O)		0.34	0.45	0.11
Pitot correction factor		0.84	0.84	0.84
Avg. square root of velocity press.		1.298	1.304	1.291
Avg. stack temperature (°F)		72.0	76.4	81.7
Area of stack (sq ft)		2.90	2.90	2.90
Test duration (min)		90	90	90
Diameter of nozzle (in)		0.1870	0.1870	0.1870
Mass of particulate catch (g)	wash	0.0077	0.0092	0.0286
	filter	0.0016	0.0033	0.0403
	total	0.0093	0.0125	0.0689

APPENDIX B

NOMOGRAPH DATA FORM (English units)

Plant _____

Date _____

Sampling location Bagging Operation

Calibrated pressure differential across orifice, in. H_2O	$\Delta H_@$	1.993
Average meter temperature (ambient + 20°F), °F	$t_{m_{avg}}$	90°F
Percent moisture in gas stream by volume, %	B_{wo}	< 1%
Barometric pressure at meter, in. Hg	P_m	
Station pressure in stack, in. Hg ($P_m \pm 0.073 \times$ stack gauge pressure, in. H_2O)	P_s	
Ratio of static pressure to meter pressure	P_s/P_m	
Average stack temperature, °F	$t_{s_{avg}}$	4M B 65°F
Average velocity head, in. H_2O	Δp_{avg}	0.94
Maximum velocity head, in. H_2O	Δp_{max}	1.15
C factor		
Calculated nozzle diameter, in.		0.20
Actual nozzle diameter, in.	3/16" ~~1/4"~~	0.1875"
Reference Δp, in. H_2O		

0.1875"

AVG ΔP = 0.94 ⇒ ΔH = 1.40

MAX ΔP = 1.15 ⇒ ΔH = 1.70

$\sqrt{\frac{1.40}{1.993}} \times 0.75 =$ ~~0.838~~ 0.629

20 pts @ 5 min/pt = 62.9 ft³

20 pts @ 6 min/pt = 75.5 ft³

0.250"

AVG ΔP = 0.94 ⇒ ΔH = 1.2 too high

MAX ΔP = 1.15 ⇒ ΔH = 5.2

AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client [illegible]
Facility
Date [illegible]
Unit Bagging Operation
Test Location Exhaust stack 9 & 9A
Load/Conditions 1
Test Number 1-1
Stack Dimensions
Operator CP & RS

Barometric Pressure 29.02
Static Pressure -0.3
Pitot Coefficient 0.84
Pitot Number 31 SS lined
Meter Box Number 1084-259
Meter H@ 1.995 Y 0.997
Nozzle Size & Number 3/16" 0.1875
Leak Rate PRE 0.000 cfm @ 16" Hg
POST 0.003 cfm @ " Hg

IMPINGER VOLUMES	
100	100
100	100
0	0

SILICA GEL	
200g	218.2

H1 FILTER DATA

NUMBER	TARE	FINAL WT.
25-053		

AMBIENT

TIME	CO_2	O_2	CO

READ AND RECORD ALL DATA EVERY 5.5 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME, min Θ		GAS METER READING (V_m), ft.³ M³	VELOCITY HEAD (ΔP_s), In. H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), In. H_2O mm H_2O		TEMPERATURE						PUMP VACUUM In Hg	$\sqrt{\Delta P}$
							STACK (T_s), °F °C	DRY GAS METER		SAMPLE BOX °C °F	PROBE °C °F	IMPINGER °C °F		
					DESIRED	ACTUAL		INLET (T_{MI}), °F °C	OUTLET (T_{MO}), °F °C					
A 1	0	1359	43.227	1.30	1.90	1.90	80.0	83	76	AMB	AMB		5.5	1.140
2	5.5	1404	47.4	1.30	1.90	1.90	80.4	97	76	AMB	AMB		5.5	1.140
3	11.0	1410	51.4	1.35	2.00	2.00	80.6	102	79	"	"		5.5	1.162
4	16.5	1415	55.5	1.40	2.10	2.10	80.7	106	81	"	"		6.0	1.183
5	22.0	1421	59.9	1.25	1.85	1.85	81.5	109	84	"	"	65	5.5	1.118
6	27.5	1426	63.25	1.30	2.10	2.10	82.0	111	87	"	"		6.0	1.183
7	33.0	1432	66.24	1.40	2.10	2.10	81.8	111	88	"	"		6.0	1.183
8	38.5	1437	72.5	1.30	1.90	1.90	81.6	113	90	"	"	65	5.5	1.140
9	44.0	1443	76.7	1.40	2.10	2.10	81.5	113	91	"	"		5.5	1.183
10	49.5	1448	81.0	1.20	1.80	1.80	81.3	113	92	"	"		5.5	1.095
End	55.0	1454	85.030	—	—	—	—	—	—	—	—	—	—	—
B 1	55.0	1456	85.030	1.10	1.60	1.60	81.1	99	91	"	"		5.0	1.049
2	60.5	1501	88.8	1.10	1.60	1.60	81.1	107	91	"	"	65	5.0	1.049
3	66.0	1523	92.65	1.25	1.85	1.85	80.9	93	84	"	"		5.0	1.118
4	71.5	1528	96.7	1.25	1.85	1.85	81.1	102	85	"	"	62	5.0	1.118
5	77.0	1534	100.7	1.40	2.10	2.10	81.1	107	86	"	"		6.0	1.183
6	82.5	1539	104.9	1.40	2.10	2.10	81.5	109	88	"	"		6.0	1.183
7	88.0	1545	109.3	1.30	1.90	1.90	82.2	111	89	"	"		5.5	1.140
8	93.5	1550	113.3	1.50	2.20	2.20	82.2	113	90	"	"		6.0	1.225
9	99.0	1556	117.7	1.30	1.90	1.90	82.2	114	91	"	"	65	6.0	1.140
10	104.5	1602	121.8	1.20	1.80	1.80	82.5	114	93	"	"	63	5.5	1.095
END	110.0	1607	125.615	—	—	—	—	—	—	—	—	—	—	—
	(110)		(82.588)		(1.47)		(81.4)	(96.5)						(1.141)

PARTICULATE TEST FIELD DATA SUMMARY

Client:
Facility:
Date:
Unit: BAGGING OPERATION
Test Run 1-1

VMstd =	76.157	Vm =	82.588
VWstd =	0.857	Avg. Delta P =	1.305
Bwo =	0.011	Avg. Delta H =	1.933
MWd =	28.84	Avg. Ts =	81.4
MWs =	28.72	Avg. Tm =	96.5
Ps =	29	Avg. SQRT Delta P =	1.141
Vs =	66.1		
Qscfm =	11642.1	NOTES:	
Qacfm =	12453.2		
%I =	98.0		
Cs =	0.0024		
ER =	0.230		

ATTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Bagging Operation
Test Location Static Exhaust
Load/Conditions Bagging Bulk packages
Test Number 1-2
Stack Dimensions 24" dia
Operator CP : RS

Barometric Pressure 29.04
Static Pressure ~~-0.03~~ -0.5
Pitot Coefficient 0.84
Pitot Number B'55
Meter Box Number 1084-239
Meter Hw 1.773 Y 0.997
Nozzle Size & Number 0.1875
Leak Rate PRE 0.003 CFM @ 13 "Hg
POST 0.005 CFM @ 9 "Hg

IMPINGER VOLUMES	
100	104
100	104
0	0

SILICA GEL	
200 g	216.2

42 FILTER DATA

NUMBER	TARE	FINAL WT.
25.054		

AMBIENT

TIME	CO_2	O_2	CO

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME, min θ		GAS METER READING (V_m), ft³ M	VELOCITY HEAD (ΔP_s), in H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O mm H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O mm H_2O ACTUAL	STACK (T_s), °F °C	TEMPERATURE DRY GAS METER INLET (T_{MI}), °F °C	TEMPERATURE DRY GAS METER OUTLET (T_{MO}), °F °C	SAMPLE BOX °C °F	PROBE °C °F	IMPINGER °C °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$
A 1	0	1750	25.975	1.35	2.00	2.00	82.4	79	77	AMB	AMB	60	5.0	1.162
2	5	1755	29.75	1.35	2.00	2.00	82.7	94	78	"	"	61	5.0	1.162
3	10	1800	33.6	1.40	2.10	2.10	82.9	103	80	"	"	61	5.5	1.183
4	15	1805	37.4	1.35	2.00	2.00	82.7	108	83	"	"	61	5.5	1.162
5	20	1810	41.2	1.20	1.80	1.80	82.7	112	84	"	"	61	5.0	1.095
6	25	1815	44.85	1.30	1.90	1.90	82.7	112	87	"	"	61	5.0	1.140
7	30	1820	48.5	1.35	2.00	2.00	82.9	113	89	"	"	61	5.5	1.162
8	35	1825	52.35	1.35	2.00	2.00	83.1	114	89	"	"	61	5.5	1.162
9	40	1830	56.15	1.20	1.80	1.80	83.1	113	92	"	"	61	5.0	1.095
10	45	1835	59.8	1.15	1.70	1.70	83.3	115	93	"	"	60	5.0	1.072
End	50	1840	63.305	—	—	—	—	—	—	—	—	—	—	—
B1	50	1843	63.305	1.15	1.70	1.70	83.3	106	93	"	"		5.0	1.072
2	55	1848	66.80	1.15	1.70	1.70	83.3	112	93	"	"	60	5.0	1.072
3	60	1853	70.3	1.20	1.80	1.80	82.9	112	93	"	"		5.0	1.095
4	65	1858	74.05	1.25	1.85	1.85	82.7	113	94	"	"		5.0	1.118
5	70	1903	77.6	1.25	1.85	1.85	82.7	115	94	"	"	60	5.0	1.118
6	75	1908	81.4	1.30	2.00	2.00	82.7	115	95	"	"		5.0	1.162
7	80	1913	85.0	1.40	2.10	2.10	82.5	116	95	"	"		5.5	1.183
8	85	1918	89.00	1.45	2.15	2.15	82.7	117	95	"	"	60	5.5	1.204
9	90	1923	93.15	1.35	1.85	1.85	83.1	118	95	"	"	80	5.0	1.118
10	95	1928	96.8	1.10	1.60	1.60	83.0	116	96	"	"		5.0	1.049
End	100	1933	100.063	—	—	—	—	—	—	—	—	—	—	—
			(74.088)		(1.895)		(83)		(94.95)					(1.129)

PARTICULATE TEST FIELD DATA SUMMARY

Client:
Facility:
Date:
Unit: BAGGIN[illegible]ATION
Test Run: 1-2

VMstd =	67.932	Vm =	74.088
VWstd =	1.139	Avg. Delta P =	1.275
Bwo =	0.016	Avg. Delta H =	1.895
MWd =	28.84	Avg. Ts =	82.9
MWs =	28.67	Avg. Tm =	100
Ps =	29	Avg. SQRT Delta P =	1.128
Vs =	65.5		
Qscfm =	11446.4	NOTES:	
Qacfm =	12340.2		
%I =	97.8		
Cs =	0.0013		
ER =	0.128		

ALTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client [illegible]
Facility
Date
Unit Bagging Op
Test Location Exhaust Stack
Load/Conditions Bulk
Test Number 1-3
Stack Dimensions 24" ϕ
Operator CP & RS

Barometric Pressure 29.17
Static Pressure -0.5
Pitot Coefficient 0.84
Pitot Number 21 55
Meter Box Number 1084-239
Meter No 1.993 Y 0.997
Nozzle Size & Number 0.1875
Leak Rate PRE 0.002 CFM @ 15" Hg
POST 0.008 CFM @ 13" Hg

IMPINGER VOLUMES	
100	104
100	103
0	0

SILICA GEL	
200g	214.1

FILTER DATA

NUMBER	TARE	FINAL WT.
25155		

AMBIENT

TIME	CO_2	O_2	CO

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME, min θ		GAS METER READING (V_m), ft³ M³	VELOCITY HEAD ($\sqrt{\Delta P_s}$), in. H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O mm H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O mm H_2O ACTUAL	TEMPERATURE STACK (T_s), °F °C	TEMPERATURE DRY GAS METER INLET (T_{MI}), °F °C	TEMPERATURE DRY GAS METER OUTLET (T_{MO}), °F °C	TEMPERATURE SAMPLE BOX °C °F	TEMPERATURE PROBE °C °F	TEMPERATURE IMPINGER °C °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$
A 1	0	0725	01.952	1.35	~~2.00~~ 1.85	~~2.00~~ 1.85	73.9	74	65	AMB	AMB		5.5	1.162
2	5	0730	05.67	1.40	2.10	2.10	73.7	87	66	"	"		5.5	1.183
3	10	0735	09.53	1.30	1.90	1.90	73.5	94	68	"	"	63	5.0	1.140
4	15	0740	13.22	1.30	1.90	1.90	73.7	97	70	"	"		5.0	1.140
5	20	0745	16.90	1.35	2.00	2.00	74.1	99	73	"	"		5.0	1.162
6	25	0750	19.9	1.30	1.90	1.90	74.3	100	75	"	"		5.0	1.140
7	30	0756	24.4	1.35	2.00	2.00	74.4	102	77	"	"		5.0	1.162
9	35	0800	28.17	1.35	2.00	2.00	74.7	103	79	"	"		5.0	1.162
9	40	0805	32.0	1.20	1.80	1.80	74.4	104	79	"	"	57	5.0	1.095
10	45	0810	35.6	1.05	1.55	1.55	75.0	104	82			60	4.5	1.025
End	50	0815	38.903	—	—	—	—	—	—	—	—	—	—	
B 1	50	0817	38.903	1.20	1.80	1.80	74.8	95	83	"	"		5.0	1.095
2	55	0822	42.51	1.20	1.80	1.80	75.0	101	83	"	"	57	5.0	1.095
3	60	0827	46.10	1.20	1.80	1.80	75.5	104	83	"	"	58	5.0	1.095
4	65	0832	49.70	1.20	1.80	1.80	76.0	105	84	"	"		5.0	1.095
5	70	0837	53.30	1.20	1.80	1.80	76.0	106	85	"	"	56	5.0	1.095
6	75	0842	56.90	1.35	2.00	2.00	76.4	107	86	"	"		5.0	1.162
7	80	0847	60.70	1.40	2.10	2.10	76.5	108	86	"	"		5.0	1.183
8	85	0852	64.58	1.45	2.15	2.15	76.6	110	87	"	"	58	5.5	1.204
9	90	0857	68.55	1.40	2.10	2.10	76.8	111	88	"	"		5.0	1.183
10	95	0902	72.45	1.25	1.85	1.85	76.8	111	88	"	"	58	5.0	1.118
End	100	0907	76.076	—	—	—	—	—	—	—	—	—	—	1.135
			(74.124)		(1.918)		(75)	(97)						

PARTICULATE TEST FIELD DATA SUMMARY

Client: [illegible]
Facility: [illegible]
Date: [illegible]
Unit: BAGGING OPERATION
Test Run: 1-3

VMstd =	69.488	Vm =	74.124
VWstd =	0.993	Avg. Delta P =	1.29
Bwo =	0.014	Avg. Delta H =	1.918
MWd =	28.84	Avg. Ts =	75.1
MWs =	28.69	Avg. Tm =	90.2
Ps =	29.13	Avg. SQRT Delta P =	1.135
Vs =	65.2		
Qscfm =	11635.5	NOTES:	
Qacfm =	12283.7		
%I =	98.4		
Cs =	0.0006		
ER =	0.06		

Plant _____

Date _____

Sampling location Primary Crusher

Calibrated pressure differential across orifice, in. H_2O	$\Delta H_@$	1.993
Average meter temperature (ambient + 20°F), °F	$t_{m_{avg}}$	90
Percent moisture in gas stream by volume, %	B_{wo}	< 1 %
Barometric pressure at meter, in. Hg	P_m	
Station pressure in stack, in. Hg ($P_m \pm 0.073 \times$ stack gauge pressure, in. H_2O)	P_s	-
Ratio of static pressure to meter pressure	P_s/P_m	-
Average stack temperature, °F	$t_{s_{avg}}$	AMB 65°F
Average velocity head, in. H_2O	Δp_{avg}	1.60
Maximum velocity head, in. H_2O	Δp_{max}	2.30
C factor		
Calculated nozzle diameter, in.		0.171
Actual nozzle diameter, in.	3/16"	0.1875"
Reference Δp, in. H_2O		

Δp_{avg} = 1.60 ⇒ ΔH = 2.30

Δp_{max} = 2.30 ⇒ ΔH = 3.30

$\sqrt{\frac{2.30}{1.993}} \times 0.75 = 0.806$

20 pts @ 4 min/pt = 80 min = 64.5 ft³

20 pts @ 5 min/pt = 100 min = 80.6 ft³

24
3.

ATS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Primary crusher
Test Location Exhaust stack
Load/Conditions Crushing
Test Number 2-1
Stack Dimensions 17.75 X 23.5
Operator CP & RS

Barometric Pressure 29.05
Static Pressure +02
Pitot Coefficient 0.84
Pitot Number 255
Meter Box Number 1084-239
Meter Hg 1.995 Y 0.997
Nozzle Size & Number 0.1875
Leak Rate PRE 0.001 CFM @ 17.5" Hg
POST 0.004 CFM @ 16" Hg

IMPINGER VOLUMES	
100	102
100	101
0	0

SILICA GEL	
200	210.5

H2 FILTER DATA

NUMBER	TARE	FINAL WT.
25-057		

TIME	CO_2	O_2	CO

READ AND RECORD ALL DATA EVERY 4 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME, min θ		GAS METER READING (V_m), ft³ M³	VELOCITY HEAD (ΔP), in. H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O mm H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O mm H_2O ACTUAL	TEMPERATURE STACK (T_s), °F °C	TEMPERATURE DRY GAS METER INLET (T_{MI}), °F °C	TEMPERATURE DRY GAS METER OUTLET (T_{MO}), °F °C	TEMPERATURE SAMPLE BOX °C °F	TEMPERATURE PROBE °C °F	TEMPERATURE IMPINGER °C °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$
			57.034											
A 1	0	1314	76.298	1.10	1.65	1.65	89	82	81	AMB	AMB	64	5.5	1.049
2	4	1318	79.0	1.35	2.00	2.00	88	100	82	"	"	58	6.0	1.162
3	8	1322	82.09	1.40	2.10	2.10	88	105	83	"	"	65	6.0	1.183
4	12	1326	85.2	1.45	2.15	2.15	86	111	85	"	"	66	6.0	1.204
5	16	1330	88.33	1.40	2.10	2.10	85	114	87	"	"	62	6.0	1.183
END	20	1334	91.487											
B 1	20	1336	91.487	1.30	1.90	1.90	83	105	90	"	"	59	6.0	1.140
2	24	1340	94.4	1.20	1.80	1.80	83	118	92	"	"	51	6.0	1.095
3	28	1344	97.2	1.30	1.90	1.90	83	122	93	"	"	49	6.0	1.140
4	32	1348	100.2	1.25	1.85	1.85	82	124	95	"	"		6.0	1.118
5	36	1352	103.11	1.20	1.80	1.80	83	124	97	"	"		6.0	1.095
END	40	1356	106.003											
C 1	40	1358	106.003	1.30	1.90	1.90	84	108	98	"	"	55	6.0	1.140
2	44	1402	108.7	0.98	1.45	1.45	83	120	98	"	"	50	5.0	0.990
3	48	1406	111.6	0.97	1.45	1.45	83	121	97	"	"		5.0	0.985
4	52	1410	114.35	0.97	1.45	1.45	83	119	100	"	"	49	5.0	0.985
5	56	1414	116.8	0.92	1.35	1.35	83	121	101	"	"	49	5.0	0.959
END	60	1418	119.362											
D 1	60	1420	119.362	1.15	1.70	1.70	85	107	99	"	"	54	5.5	1.072
2	64	1424	122.18	1.20	1.80	1.80	83	118	100	"	"	50	5.0	1.095
3	68	1428	125.1	1.10	1.65	1.65	83	121	100	"	"	50	5.5	1.049
4	72	1432	128	1.10	1.65	1.65	82	122	100	"	"	51	5.5	1.049
5	76	1436	130.6	1.00	1.50	1.50	82	122	100	"	"	52	5.0	1.049
END	80	1440	133.332		(1.76)		(84)	(104.0)						(1.085)

PARTICULATE TEST FIELD DATA SUMMARY

Client:
Facility:
Date:
Unit: PRIMARY CRUSHER
Test Run: 2-1

VMstd =	51.915	Vm =	57.034
VWstd =	0.635	Avg. Delta P =	1.182
Bwo =	0.012	Avg. Delta H =	1.758
MWd =	28.84	Avg. Ts =	84.1
MWs =	28.71	Avg. Tm =	104.1
Ps =	29.06	Avg. SQRT Delta P =	1.085
Vs =	62.9		
Qscfm =	10191.7	NOTES:	
Qacfm =	10944.6		
%I =	96.9		
Cs =	0.0015		
ER =	0.131		

AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Primary Crusher
Test Location Exhaust Stack
Load/Conditions
Test Number 2-2
Stack Dimensions 17.75 X 33.5
Operator CP ; RS

Barometric Pressure 28.95
Static Pressure +0.2
Pitot Coefficient 0.84
Pitot Number 255
Meter Box Number 1084-239
Meter Hw 1.993 Y 0.997
Nozzle Size & Number 0.1875
Leak Rate PRE 0.001 CFM @ 9.5" Hg
POST 0.001 CFM @ 9" Hg

IMPINGER VOLUMES	
100	105
100	101
0	0

SILICA GEL	
200 g	209.5

H1 FILTER DATA

NUMBER	TARE	FINAL WT.
25-056		

AMBIENT

TIME	CO_2	O_2	CO

READ AND RECORD ALL DATA EVERY 4 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME min θ		GAS METER READING (V_m), ft³ (58.265)	VELOCITY HEAD (ΔP), in H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O mm H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O mm H_2O ACTUAL	TEMPERATURE STACK (T_s), °F °C	TEMPERATURE DRY GAS METER INLET (T_{MI}), °F °C	TEMPERATURE DRY GAS METER OUTLET (T_{MO}), °F °C	TEMPERATURE SAMPLE BOX °C °F	TEMPERATURE PROBE °C °F	TEMPERATURE IMPINGER °C °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$ (1.071)
A 1	0	1535	33.590	1.15	1.70	1.70	86	86	85	AMB	AMB	54	6.0	1.072
2	4	1539	36.43	1.35	2.00	2.00	86	101	86	"	"	59	6.5	1.162
3	8	1543	39.49	1.40	2.10	2.10	85	110	87	"	"	52	6.5	1.183
4	12	1547	42.62	1.50	2.20	2.20	85	113	89	"	"	52	6.5	1.235 / 1.2
5	16	1551	45.90	1.45	2.15	2.15	86	118	90	"	"	53	6.5	1.204
END	20	1555	49.021	—	—	—	—	— 96.5 —		—	—	—	—	—
B 1	20	1556	49.021	1.40	2.10	2.10	85	110	91	"	"	54	6.5	1.183
2	24	1600	52.35	1.25	1.85	1.85	86	119	93	"	"	51	6.0	1.118
3	28	1604	55.15	1.30	1.90	1.90	86	118	95	"	"	50	6.0	1.140
4	32	1608	58.12	1.30	1.90	1.90	86	117	96	"	"	49	6.0	1.140
5	36	1612	61.15	1.15	1.70	1.70	85	118	97	"	"	49	6.0	1.072
END	40	1616	63.342	—	—	—	—	— 105.4 —		—	—	—	—	—
C 1	40	1617	63.342	1.40	2.10	2.10	85	110	97	"	"	51	6.5	1.183
2	44	1621	67.34	0.97	1.45	1.45	86	118	97	"	"	48	5.5	0.985
3	48	1625	69.17	0.95	1.48	1.45	85	116	98	"	"	48	5.5	0.985
4	52	1629	72.61	0.96	1.45	1.45	85	115	98	"	"	48	5.5	0.980
5	56	1633	75.2	0.90	1.35	1.35	85	115	98	"	"	48	5.0	0.948
END	60	1637	77.837	—	—	—	—	— 110.2 —		—	—	—	—	—
D 1	60	1638	77.837	1.10 25	1.65	1.65	87	108	98	"	"	51	6.0	1.118
2	64	1642	80.78	1.15	1.70	1.70	86	115	97	"	"	48	6.0	1.072
3	68	1646	83.104	1.10	1.65	1.65	85	116	97	"	"	48	6.0	1.049
4	72	1650	86.46	1.05	1.55	1.55	85	116	98	"	"	48	5.5	1.025
5	76	1654	89.25	0.95	1.40 (1.78)	1.40	85	116 (110.8) (105.7)	97	"	"	49	5.5	0.976
END	80	1658	91.855											

PARTICULATE TEST FIELD DATA SUMMARY

Client:
Facility:
Date:
Unit: PRIMARY CRUSHER
Test Run: 2-2

VMstd =	52.913	Vm =	58.265
VWstd =	0.73	Avg. Delta P =	1.198
Bwo =	0.014	Avg. Delta H =	1.778
MWd =	28.84	Avg. Ts =	85.5
MWs =	28.69	Avg. Tm =	103.6
Ps =	28.96	Avg. SQRT Delta P =	1.091
Vs =	63.5		
Qscfm =	10206.5	NOTES:	
Qacfm =	11049		
%I =	98.6		
Cs =	0.0008		
ER =	0.07		

ATTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Primary Crusher
Test Location Exhaust Stack
Load/Conditions Full Bin
Test Number 2-3
Stack Dimensions 17.75 x 23.5
Operator CP / RS

Barometric Pressure 28.93
Static Pressure ± 0.2
Pitot Coefficient 0.84
Pitot Number 255
Meter Box Number 1084-239
Meter Hw @ 1.993 Y 0.997
Nozzle Size & Number 0.1875
Leak Rate PRE 0.002 CFM @ 13.5" Hg
POST 0.004 CFM @ 9" Hg

IMPINGER VOLUMES	
100	106
100	101
0	0

SILICA GEL	
200g	210.0

N3 FILTER DATA

NUMBER	TARE	FINAL WT.
25.058		

AMBIENT

TIME	CO_2	O_2	$CO-N_2$
	0.0	20.9	79.1

READ AND RECORD ALL DATA EVERY 4 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME, min θ		GAS METER READING (V_m), ft³ M	VELOCITY HEAD (ΔP_s), in. H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O mm H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O mm H_2O ACTUAL	TEMPERATURE STACK (T_s), °F °C	TEMPERATURE DRY GAS METER INLET (T_{MI}), °F °C	TEMPERATURE DRY GAS METER OUTLET (T_{MO}), °F °C	TEMPERATURE SAMPLE BOX °C °F	TEMPERATURE PROBE °C °F	TEMPERATURE IMPINGER °C °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$
			57.913					97.0						1.099
A 1	0	1800	92.025	1.20	1.80	1.80	85	83	81	AMB	AMB	52	5.5	1.095
2	4	1804	94.90	1.40	2.10	2.10	83	93	81	–	–	47	6.0	1.183
3	8	1808	97.97	1.40	2.10	2.10	84	99	82	–	–	49	6.0	1.183
4	12	1812	100.97	1.50	2.25	2.25	82	106	83	–	–	51	6.0	1.225
5	16	1816	104.29	1.45	2.15	2.15	83	110	85			52	6.0	1.204
END	20	1820	107.454	–	–	–	–	– 90.3 –		–	–	–	–	–
B 1	20	1821	107.454	1.20	1.80	1.80	82	102	87	–	–	54	5.5	1.096
2	24	1825	110.3	1.30	1.90	1.90	82	109	88	–	–		6.0	1.140
3	28	1829	113.35	1.35	2.00	2.00	82	111	87	–	–	52	6.0	1.162
4	32	1833	116.30	1.30	1.90	1.90	82	113	90	–	–	52	6.0	1.140
5	36	1837	119.40	1.15	1.70	1.70	81	113	91	–	–	52	5.5	1.072
END	40	1841	122.220	–	–	–	–	– 99.1 –		–	–	–	–	–
C 1	40	1845	122.220	1.45	2.15	2.15	81	100	91	–	–	52	6.0	1.204
2	44	1849	125.45	0.98	1.45	1.45	80	110	92	–	–	52	5.0	0.990
3	48	1853	128.04	1.005	1.55	1.55	81	111	92	–	–	52	5.0	1.025
4	52	1857	130.74	1.10	1.60	1.60	81	112	92	–	–	52	5.0	1.049
5	56	1901	133.56	0.90	1.45	1.45	80	102	92	–	–	52	5.0	0.949
END	60	1906	136.095	–	–	–	–	– 99.4 –		–	–	–	–	–
D 1	60	1910	136.095	1.25	1.85	1.85	81	98	91	–	–	52	5.5	1.118
2	64	1914	139.03	1.15	1.70	1.70	80	108	92	–	–	51	5.5	1.072
3	68	1918	141.86	1.10	1.60	1.60	80	108	92	–	–	51	5.0	1.049
4	72	1922	144.64	1.10	1.60	1.60	80	110	92	–	–	51	5.0	1.049
5	76	1926	147.39	0.95	1.40	1.40	80	111	92	–	–	51	5.0	0.976
END	80	1930	149.438		1.803		81.5	99.9						

PARTICULATE TEST FIELD DATA SUMMARY

Client:
Facility:
Date:
Unit: PRIMARY CRUSHER
Test Run: 2-3

VMstd =	53.164	Vm =	57.913
VWstd =	0.8	Avg. Delta P =	1.214
Bwo =	0.015	Avg. Delta H =	1.803
MWd =	28.84	Avg. Ts =	81.5
MWs =	28.68	Avg. Tm =	97.1
Ps =	28.94	Avg. SQRT Delta P =	1.099
Vs =	63.7		
Qscfm =	10296.7		
Qacfm =	11083.8		
%I =	98.2		
Cs =	0.0011		
ER =	0.097		

NOTES:

NOMOGRAPH DATA FORM (English units)

Plant _____

Date _____

Sampling location alpha Mill

Calibrated pressure differential across orifice, in. H_2O	$\Delta H_@$	1.993
Average meter temperature (ambient + 20°F), °F	$t_{m_{avg}}$	90°F
Percent moisture in gas stream by volume, %	B_{wo}	0.04
Barometric pressure at meter, in. Hg	P_m	
Station pressure in stack, in. Hg ($P_m \pm 0.073 \times$ stack gauge pressure, in. H_2O)	P_s	
Ratio of static pressure to meter pressure	P_s/P_m	
Average stack temperature, °F	$t_{s_{avg}}$	184
Average velocity head, in. H_2O	Δp_{avg}	0.78
Maximum velocity head, in. H_2O	Δp_{max}	0.87
C factor		0.226
Calculated nozzle diameter, in.	3/16" or 1/4"	
Actual nozzle diameter, in.		
Reference Δp, in. H_2O		

0.1875 .992 1.02 1.04 0.444 65.3

AVG ΔP = 0.78 ⇒ ΔH = 0.87
MAX ΔP = 0.87 ⇒ ΔH = 0.98

$\sqrt{\frac{0.87}{1.993}} \times 0.75 = 0.496$

12 pts @ 10 min = 59.5 65.3
12 pts @ 11 min = 65.5 71.8

0.250

AVG ΔP = 0.78 ⇒ ΔH = 2.75
MAX ΔP = 0.87 ⇒ ΔH = 3.10

$\sqrt{\frac{2.75}{1.993}} \times 0.75 = 0.881$

12 pts @ 5 min/pt = 52.8 ft³
12 pts @ 6 min/pt = 63.4 ft³

ADTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Alpha Mill
Test Location exhaust duct
Load/Conditions
Test Number 3-1
Stack Dimensions 26" ID
Operator RS : CP

Barometric Pressure START 28.96
Static Pressure +.55
Pitot Coefficient 0.84
Pitot Number 3' SS lined
Meter Box Number 1084-239
Meter Hg 1.493 Y 0.997
Nozzle Size & Number 3/16" 0.1875
Leak Rate PRE 0.004 @ 15" Hg
POST 0.007 @ 16" Hg

IMPINGER VOLUMES	
100	168
100	103
0	1

SILICA GEL	
200g	211.0

FILTER DATA

NUMBER	TARE	FINAL WT.
47007	1.0378	

TIME	CO_2	O_2	CO
A	0.5	21.0	
B	0.5	21.0	
	0.5	21.0	
	Fyrite		

READ AND RECORD ALL DATA EVERY 10 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME, min θ	GAS METER READING (V_m), ft³ M	VELOCITY HEAD (ΔP_s), in H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O mm H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O mm H_2O ACTUAL	TEMPERATURE STACK (T_s), °F °C	TEMPERATURE DRY GAS METER INLET (T_{MI}), °F °C	TEMPERATURE DRY GAS METER OUTLET (T_{MO}), °F °C	TEMPERATURE SAMPLE BOX °C °F	TEMPERATURE PROBE °C °F	TEMPERATURE IMPINGER °C °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$
A1	0 08:09	550.100	0.85	0.97	0.97	171	100	79			60	5	.922
2	10 09:19	555.45	0.78	0.88	0.88	171	106	83			61	5	.883
3	20 08:29	560.47	0.96	1.08	1.08	172	111	89			61	7	.980
4	30 08:39	566.05	0.75	0.86	0.86	173	111	92			61	6	.866
5	40 08:49	571.21	0.73	0.82	0.83	173	113	95			63	8.5	.854
6	50 08:59	576.23	0.67	~~0.77~~	~~0.65~~	171	112	97			63	8.5	.819
END	60 09:09	580.912											
B1	60 09:16	580.912	0.82	0.93	0.93	173	117	100			63	5	.906
2	70 09:26	586.5	0.82	0.93	0.93	173	118	100			64	6.5	.906
3	80 09:36	591.58	0.78	0.89	0.89	174	119	102			61	7.5	.883
4	90 09:46	596.73	~~0.68~~ 0.74	0.85	0.85	174	120	103			61	8	.860
5	100 09:56	601.91	0.63	0.72	0.72	177	120	104			62	8	.794
6	110 10:06	606.76	0.65	0.74	0.74	177	120	104			62	9	.806
END	120 10:16	611.579											
		61.478	(.76)	(0.87)		(173)	104.8						(.873)

PARTICULATE TEST FIELD DATA SUMMARY

Client:
Facility:
Date:
Unit: ALPHA MILL
Test Run 3-1

VMstd =	55.593	Vm =	61.478
VWstd =	3.907	Avg. Delta P =	0.765
Bwo =	0.066	Avg. Delta H =	0.871
MWd =	28.92	Avg. Ts =	173.3
MWs =	28.2	Avg. Tm =	104.8
Ps =	29	Avg. SQRT Delta P =	0.873
Vs =	55.2		
Qscfm =	9224.1	NOTES:	
Qacfm =	12221.3		
%I =	97.2		
Cs =	0.0538		
ER =	4.253		

AQTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Alpha Mill
Test Location exhaust duct
Load/Conditions
Test Number 3-2
Stack Dimensions 26" ID
Operator RS : CP

Barometric Pressure 28.96
Static Pressure +0.55
Pitot Coefficient 0.84
Pitot Number 3' SS lined
Meter Box Number 1084-239
Meter Hg 1.943 Y 0.997
Nozzle Size & Number 3/16" 0.1875
Leak Rate PRE 0.007cfm @ 14.5" Hg
POST 0.011CFM @ 14.5" Hg

IMPINGER VOLUMES	
100	163
100	103
0	0

SILICA GEL	
200g	211.5

FILTER DATA

NUMBER	TARE	FINAL WT.
47-064	1.0618	

TIME	CO_2	O_2	CO
A	0.5	21.0	
B	0.5	21.0	
fyrite			

READ AND RECORD ALL DATA EVERY 11 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME, min θ		GAS METER (V_m) (ft³) (m³)	VELOCITY HEAD (ΔP_s) in. H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH) in. H_2O mm H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH) in. H_2O mm H_2O ACTUAL	TEMPERATURE STACK (T_s) °F °C	TEMPERATURE DRY GAS METER INLET (T_{MI}) °F °C	TEMPERATURE DRY GAS METER OUTLET (T_{MO}) °F °C	TEMPERATURE SAMPLE BOX °C °F	TEMPERATURE PROBE °C °F	TEMPERATURE IMPINGER °C (F)	PUMP VACUUM in Hg	$\sqrt{\Delta P}$
A1	0	11:09	611.868	0.74	0.84	0.84	180	~~109~~ 114	94 ~~92~~			66	5	.860
2	11	11:20	617.43	0.77	0.88	0.88	179	120	98			59	6	.877
3	22	11:31	623.3	0.86	0.98	0.98	176	125	104			57	6	.927
4	33	11:42	628.9	0.73	0.85	0.85	174	125	105			59	6.5	.854
5	44	11:53	634.90	0.70	0.80	0.80	174	125	108			60	7	.837
6	55	12:04	640.49	0.62	0.70	0.70	174	124	108			60	7	.787
END	66	12:15	645.897											
B1	66	12:20	645.897	~~0.73~~ 0.70	~~0.85~~ 0.80	0.80	179	123	108			65	5	.837
2	77	12:31	651.45	0.81	0.92	0.92	179	123	109			65	6	.900
3	88	12:42	657.42	0.81	0.92	0.92	180	128	109			60	6	.900
4	99	12:53	663.37	0.65	0.74	0.74	184	125	110			60	6	.806
5	110	13:04	669.0	0.75	0.86	0.86	184	124	109			63	7	.866
6	121	13:15	674.8	0.66	0.76	0.76	184	124	109			63	8	.812
END	132	13:26	680.065											
			68.197	.74	.84		179	115						.856

PARTICULATE TEST FIELD DATA SUMMARY

Client:
Facility:
Date:
Unit: ALPHA MILL
Test Run: 3-2

VMstd =	60.612	Vm =	68.197
VWstd =	3.648	Avg. Delta P =	0.733
Bwo =	0.057	Avg. Delta H =	0.838
MWd =	28.92	Avg. Ts =	178.9
MWs =	28.3	Avg. Tm =	114.6
Ps =	29	Avg. SQRT Delta P =	0.855
Vs =	54.2		
Qscfm =	9064.1	NOTES:	
Qacfm =	11999.9		
%I =	98.1		
Cs =	0.0451		
ER =	3.503		

AQTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Alpha Unit
Test Location exhaust duct
Load/Conditions
Test Number 3-3
Stack Dimensions 26" ID
Operator RS & CP

Barometric Pressure 28.92
Static Pressure +0.55
Pitot Coefficient 0.84
Pitot Number 3' SS lined
Meter Box Number 1084-239
Meter Hve 1.993 Y 0.997
Nozzle Size & Number 3/16" 0.1875
Leak Rate PRE 0.005 cfm @ 20" Hg
POST 0.02 cfm @ 19 " Hg

IMPINGER VOLUMES	
100	178
100	102
0	2

SILICA GEL	
200g	212.5

FILTER DATA

NUMBER	TARE	FINAL WT.
47-065	10676	

TIME	CO_2	O_2	CO
A	0.5	21.0	
B	0.0	21.0	

READ AND RECORD ALL DATA EVERY 11 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME: min 0		GAS METER READING (V_m) (ft³) M³	VELOCITY HEAD (ΔP_s) (in H_2O) mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH) (in H_2O) mm H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH) (in H_2O) mm H_2O ACTUAL	TEMPERATURE STACK (T_s) °F °C	TEMPERATURE DRY GAS METER INLET (T_{MI}) °F °C	TEMPERATURE DRY GAS METER OUTLET (T_{MO}) °F °C	TEMPERATURE SAMPLE BOX °C °F	TEMPERATURE PROBE °C °F	TEMPERATURE IMPINGER °C (°F)	PUMP VACUUM in Hg	$\sqrt{\Delta P}$
A 1	0	14:18	680.348	0.88	1.00	1.00	175	112	94			65	5	.938
2	11	14:28	686.70	0.96	1.10	1.10	172	102	90			65	6	.980
3	22	14:39	693.951	0.85	0.97	0.97	172	112	91			66	6	.922
4	33	14:50	698.67	0.72	0.82	0.82	174	107	95			65	6.5	.849
5	44	15:01	704.28	0.78	0.89	0.89	174	121	100			65	7	.883
6	55	15:12	710.90	0.68	0.78	0.78	177	123	104			67	7	.825
END	66	15:23	715.660											
B 1	66	16:10	715.660	0.77	0.88	0.88	184	124	107			68	5	.877
2	77	16:21	721.57	0.75	0.85	0.85	184	125	108			62	5	.866
3	88	16:32	727.30	0.77	0.88	0.88	183	124	108			67	5	.877
4	99	16:43	733.11	0.72	0.82	0.82	178	124	109			62	6	.849
5	110	16:54	738.67	0.80	0.92	0.92	176	124	110			62	7.5	.894
6	121	17:05	744.62	0.70	0.80	0.80	174	123	109			64	8	.837
END	132	17:16	750.237											
			69.889											

PARTICULATE TEST FIELD DATA SUMMARY

Client:
Facility:
Date:
Unit: ALPHA MILL
Test Run: 3-3

VMstd =	62.463	Vm =	69.889
VWstd =	4.448	Avg. Delta P =	0.782
Bwo =	0.066	Avg Delta H =	0.893
MWd =	28.88	Avg. Ts =	176.9
MWs =	28.16	Avg. Tm =	110.7
Ps =	28.96	Avg. SQRT Delta P =	0.883
Vs =	56		
Qscfm =	9292.1	NOTES:	
Qacfm =	12398.4		
%I =	98.7		
Cs =	0.0492		
ER =	3.918		

NOMOGRAPH DATA FORM (English units)

Plant [illegible]

Date _____

Sampling location Screen & Belt

Calibrated pressure differential across orifice, in. H_2O	$\Delta H_@$	1.993
Average meter temperature (ambient + 20°F), °F	$t_{m_{avg}}$	100
Percent moisture in gas stream by volume, %	B_{wo}	<1%
Barometric pressure at meter, in. Hg	P_m	29
Station pressure in stack, in. Hg ($P_m \pm 0.073 \times$ stack gauge pressure, in. H_2O)	P_s	
Ratio of static pressure to meter pressure	P_s/P_m	
Average stack temperature, °F	$t_{s_{avg}}$	75
Average velocity head, in. H_2O	Δp_{avg}	1.62
Maximum velocity head, in. H_2O	Δp_{max}	1.90
C factor		
Calculated nozzle diameter, in.		0.375
Actual nozzle diameter, in.	3/8	0.375
Reference Δp, in. H_2O		

Δ_{avg} 1.62 · ΔH = 2.30
Δ_{max} 1.9 ΔH = 2.75

$\sqrt{\frac{2.30}{1.993}} \times 0.75 = 0.806$

20 lbs @ 4 min = 64.5
4.5 min = 72.45

AQTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Belt conveyo transfer
Test Location exhaust stack
Load/Conditions Crushing
Test Number 4-1
Stack Dimensions 17.75 x 23.5"
Operator CP & RS

Barometric Pressure 29.00
Static Pressure +0.34
Pitot Coefficient 0.84
Pitot Number 255
Meter Box Number 1084-239
Meter ΔH@ .993 Y 0.997
Nozzle Size & Number
Leak Rate PRE 0.003 CFM @ 18" Hg
POST 0.007 CFM @ 9" Hg

IMPINGER VOLUMES	
100	104
100	102
0	0

SILICA GEL	
200	215.0

#1 FILTER DATA

NUMBER	TARE	FINAL WT.
25-059		

AMBIENT

TIME	CO_2	O_2	CO

READ AND RECORD ALL DATA EVERY 4.5 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME, min θ	GAS METER READING (V_m), ft³ M³ (24.918)	VELOCITY HEAD (ΔP_s), in. H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O mm H_2O (2.44) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O mm H_2O (2.44) ACTUAL	TEMPERATURE STACK (T_s), °F °C (72)	TEMPERATURE DRY GAS METER (93.5) INLET (T_{MI}), °F °C	TEMPERATURE DRY GAS METER (93.5) OUTLET (T_{MO}), °F °C	SAMPLE BOX °C °F	PROBE °C °F	IMPINGER °C °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$ (1.298)
A 1	0 0815	50.555	1.95	2.80	2.80	71	73	65	AMB	AMB	60	8.0	1.396
2	4.5 0820	54.5	1.95	2.80	2.80	69	97	67	"	^	56	8.0	1.396
3	9.0 0824	58.5	1.75	2.50	2.50	70	103	70	"	"	56	7.5	1.323
4	13.5 0829	62.25	1.75	2.50	2.50	73	106	74	"	"	58	7.5	1.323
5	18.0 0833	66.0	1.45	2.10	2.10	73	108	77	"	"	58	6.5	1.204
END	22.5 0838	69.522	—	—	—	—	— 84 —		—	—	—	—	
B 1	22.6 0850	69.522	2.05	2.95	2.95	75	82	78	"	"	52	8.0	1.432
2	27.0 0855	73.6	1.45	2.10	2.10	72	98	78	"	"	53	6.5	1.204
3	31.5 0859	77.1	1.55	2.25	2.25	72	104	80	"	"	54	7.0	1.245
4	36.0 0904	80.7	1.80	2.60	2.60	71	108	82	"	"	58	7.5	1.342
5	40.5 0908	84.5	1.80	2.60	2.60	71	112	84			58	7.5	1.342
END	45.0 0913	88.412	—	—	—	—	— 90.6 —		—	—	—	—	
C 1	~~49.5~~ 45 ~~0916~~	88.412	2.00	2.90	2.90	72	102	84	"	"	58	8.0	1.414
2	~~54.0~~ 49.5	92.5	1.45	2.10	2.10	72	111	86	"	"	58	6.5	1.204
3	~~58.5~~ 54	95.97	1.45	2.10	2.10	72	112	87	"	"	59	6.5	1.204
4	~~63.0~~ 58.5	99.50	1.75	2.50	2.50	73	113	84	"	"	60	7.0	1.323
5	~~67.5~~ 63	103.	1.845	2.70	2.70	74	115	89	"	"	60	7.5	1.360
END	~~72.0~~ 67.5 0936	107.247	—	—	—	—	— 98.3 —		—	—	—	—	
D 1	~~72.0~~ 67.5 0942	107.247	1.40	2.00	2.00	71	105	89	"	"	59	6.0	1.183
2	72.0	110.8	1.80	2.60	2.60	71	113	90	"	"	58	7.5	1.342
3	76.5	114.53	1.60	2.30	2.30	72	114	90	"	"	58	7.0	1.265
4	81	118.23	1.50	2.20	2.20	72	115	90	"	"	59	7.0	1.225
5	85.5	121.85	1.50	2.20	2.20	73	115	92	"	"	60	7.0	1.225
END	90 1007	125.473					101						

PARTICULATE TEST FIELD DATA SUMMARY

Client: [redacted]
Facility: [redacted]
Date: [redacted]
Unit: SCREEN & BELT
Test Run: 4-1

VMstd =	69.487	Vm =	74.918
VWstd =	0.988	Avg. Delta P =	1.69
Bwo =	0.014	Avg. Delta H =	2.44
MWd =	28.84	Avg. Ts =	72
MWs =	28.69	Avg. Tm =	93.6
Ps =	29.03	Avg. SQRT Delta P =	1.298
Vs =	74.5		
Qscfm =	12308.1	NOTES:	
Qacfm =	12963		
%I =	95.5		
Cs =	0.0021		
ER =	0.222		

AQTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Conveyor Belt Transfer
Test Location Exhaust stack
Load/Conditions Crushing
Test Number 4-2
Stack Dimensions 17.75 x 23.5
Operator OP: RS

Barometric Pressure 29.02
Static Pressure +0.45
Pitot Coefficient 0.84
Pitot Number 255
Meter Box Number 1084-239
Meter Hea 1.995 Y 0.997
Nozzle Size & Number 0.1875
Leak Rate PRE 0.001 CFM @ 13 " Hg
POST 0.007 CFM @ 10 " Hg

IMPINGER VOLUMES	
100	104 107
100	102 101
0	0 3

SILICA GEL	
200 g	213.8

H2 FILTER DATA

NUMBER	TARE	FINAL WT.
25-060		

AMBIENT

TIME	CO_2	O_2	CO

READ AND RECORD ALL DATA EVERY 4.5 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME, min θ	GAS METER READING (V_m), ft³ M³	VELOCITY HEAD (ΔP_s), in. H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O mm H_2O 2.45 DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O mm H_2O 2.45 ACTUAL	STACK (T_s), °F °C 76.4	TEMPERATURE DRY GAS METER 95.7 INLET (T_{MI}), °F °C	TEMPERATURE DRY GAS METER 95.7 OUTLET (T_{MO}), °F °C	TEMPERATURE SAMPLE BOX °C °F	TEMPERATURE PROBE °C °F	TEMPERATURE IMPINGER °C °F	PUMP VACUUM In Hg	$\sqrt{\Delta P}$ 1.304
		75.335											
			2.00	2.90	2.90								
A 1	C 10.50	85.677	1.95	2.80	2.80	72							
2	4.5 1055	29.78	1.80	2.60	2.60	72	92	75	AMB	AMB	60	7.5	1.414
3	9.0 1059	33.7	1.75	2.55	2.55	72	106	79	"	"	55	7.0	1.342
4	13.5 1104	37.44	1.80	2.60	2.60	73	108	83	"	"	55	7.0	1.323
5	18.0 1108	41.31	1.60	2.30	2.30	72	110	83	"	"	55	7.0	1.342
END	22.5 1113	94.993	—	—	—	—	110	85	"	"	55	6.5	1.265
B 1	22.5 1115	44.993	2.10	3.00	3.00	73	98.1						
2	27.0 1120	49.0	1.50	2.00	2.00	74	106	86	"	"	56	7.5	1.449
3	31.5 1124	52.55	1.60	2.30	2.30	74	111	87	"	"	55	6.0	1.225
4	36.0 1129	56.22	1.75	2.55	2.55	74	110	88	"	"	56	6.5	1.265
5	40.5 1102	60.1	1.80	2.60	2.60	80	111/109	89/86	"	"	55	6.5	1.323
END	45.0 1307	63.941	—	—	—	—	84	76	"	"	51	7.0	1.342
C 1	45.0 1310	63.941	2.00	2.90	2.90	78	94.0						
2	49.5 1315	68.03	1.45	2.10	2.10	79	92	81	"	"	53	7.5	1.414
3	54.0 1319	71.55	1.45	2.10	2.10	78	102	80	"	"	56	6.0	1.204
4	58.5 1324	74.99	1.75	2.55	2.55	77	106	82	"	"	60	6.0	1.204
5	63.0 1328	78.6	1.80	2.60	2.60	79	107	84	"	"	57	7.0	1.323
END	67.5 1333	82.728	—	—	—	—	111	86	"	"	57	7.0	1.342
D 1	67.5 1335	82.728	1.60	2.30	2.30	78	93.1						
2	72.0 1340	86.92	1.75	2.55	2.55	80	107	88	"	"	61	6.5	1.265
3	76.5 1344	90.27	1.65	2.40	2.40	79	113	90	"	"	58	7.0	1.323
4	81.0 1349	94.04	1.50	2.00	2.00	80	115	91	"	"	60	6.5	1.285
5	85.5 1353	97.10	1.45	2.10	2.10	80	115	91	"	"	61	6.0	1.225
END	90.0 1358	101.002					115	93	"	"	61	6.0	1.204
							101.8						

PARTICULATE TEST FIELD DATA SUMMARY

Client:
Facility: L
Date:
Unit: SCREEN & BELT
Test Run: 4-2

VMstd =	69.603	Vm =	75.325
VWstd =	1.167	Avg Delta P =	1.705
Bwo =	0.016	Avg. Delta H =	2.45
MWd =	28.84	Avg. Ts =	76.4
MWs =	28.67	Avg. Tm =	95.7
Ps =	29.03	Avg SQRT Delta P =	1.304
Vs =	75.2		
Qscfm =	12296.8	NOTES:	
Qacfm =	13084.3		
%I =	95.8		
Cs =	0.0028		
ER =	0.295		

AQTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Conveyor Belt transfer
Test Location Exhaust Stack
Load/Conditions Crushing
Test Number 4-3
Stack Dimensions 17.75 x 23.5
Operator SP : RS

Barometric Pressure 28.95
Static Pressure + 0.11
Pilot Coefficient 0.84
Pilot Number 255
Meter Box Number 1084-239
Meter Hai 1.973 Y 0.997
Nozzle Size & Number 0.1875
Leak Rate PRE 0.002 CFM @ 14.5 "Hg
POST 0.002 CFM @ 12.5 "Hg

IMPINGER VOLUMES	
100	107
100	100
0	0

SILICA GEL	
200g	212.8

M3 FILTER DATA

NUMBER	TARE	FINAL WT.
25-061		

TIME	CO_2	O_2	CO

READ AND RECORD ALL DATA EVERY 4.5 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) SAMPLING TIME min θ		GAS METER READING (V_m), ft^3 M³ (75.948)	VELOCITY HEAD (ΔP_s), in. H_2O mm H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O mm H_2O (2.43) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O mm H_2O (2.43) ACTUAL	STACK (T_s), °F °C (81.7)	TEMPERATURE DRY GAS METER (107.3) INLET (T_{MI}), °F °C	TEMPERATURE DRY GAS METER (107.3) OUTLET (T_{MO}), °F °C	SAMPLE BOX °C °F	PROBE °C °F	IMPINGER °C °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$ (1.291)
A 1	0	1435	1.217	1.85	2.60	2.60	83	98	93	AMB	AMB	54	7.0	1.360
2	4.5	1451	5.16	1.80	2.60	260	80	124	96	"	"	54	7.0	1.342
3	9.0	1456	9.10	1.90	2.45	2.45	81	125	97	"	"	51	6.5	1.304
4	13.5	1500	13.05	1.70	2.45	2.45	81	127	98	"	"	51	6.5	1.304
5	18.0	1505	16.80	1.50	2.20	2.20	82	125	99	"	"	51	6.0	1.225
END	22.5	1509	20.475					108.2						
B 1	22.5	1540	20.475	2.00	2.80	2.90	83	105	93	"	"	55	7.0	1.414
2	27.0	1545	24.56	1.45	2.10	2.10	83	119	93	"	"	52	6.0	1.204
3	31.5	1549	28.13	1.60	2.30	2.30	83	117	95	"	"	52	6.5	1.265
4	36.0	1554	31.77	1.75	2.50	2.50	85	119	96	"	"	53	6.5	1.323
5	40.5	1558	35.	1.95	2.50	2.50	84	119	97	"	"	53	6.5	1.323
END	45.0	1603	39.461					115						
C 1	45.0	1604	39.461	1.85	2.70	2.70	82	109	96	"	"	56	7.0	1.360
2	49.5	1609	43.34	1.50	2.20	2.20	84	121	98	"	"	55	6.0	1.225
3	54.0	1613	47.08	1.45	2.10	2.10	79	119	97	"	"	53	6.0	1.204
4	58.5	1618	50.81	1.65	2.40	2.40	79	118	98	"	"	53	6.5	1.285
5	63.0	1622	54.30	1.85	2.70	2.70	79	121	98	"	"	53	7.0	1.360
END	67.5	1627	58.387					107.5						
D 1	67.5	1628	58.387	1.50	2.20	2.20	83	109	98	"	"	53	6.0	1.225
2	72.0	1633	62.	1.80	2.65	2.65	82	120	98	"	"	57	7.0	1.342
3	76.5	1637	65.48	1.60	2.35	2.35	82	121	100	"	"	56	6.5	1.265
4	81.0	1642	69.73	1.55	2.30	2.30	81	120	99	"	"	56	6.5	1.245
5	85.5	1646	73.415	1.55	2.30	2.30	81	120	99			56	6.0	1.245
END	90	1651	77.165					108.4						

PARTICULATE TEST FIELD DATA SUMMARY

Client: [illegible]
Facility:
Date: [illegible]
Unit: SCREEN & BELT
Test Run: 4-3

VMstd =	68.61	Vm =	75.948
VWstd =	0.932	Avg. Delta P =	1.67
Bwo =	0.013	Avg. Delta H =	2.428
MWd =	28.84	Avg. Ts =	81.7
MWs =	28.7	Avg. Tm =	107.4
Ps =	28.96	Avg. SQRT Delta P =	1.291
Vs =	74.8		
Qscfm =	12119.4	NOTES:	
Qacfm =	13015.2		
%I =	95.8		
Cs =	0.0155		
ER =	1.61		

APPENDIX C

SAMPLE LOG SHEET

Client: _____

Facility: _____

Project: Compliance

Sample Number	Date Received	Test Number	Description
B 276	25 June	1-1	GFF 25-053
B277	"	1-1	Front wash 20 mL
B278	"	1-1	Si gel
B279	"	1-2	GFF 25-054
B280	"	1-2	Front wash 20 mL
B281	"	1-2	Si gel
B282	26 June	1-3	GFF 25-055
B283	"	1-3	Front wash 20 mL
B284	"	1-3	Si gel
B285	"	2-1	GFF 25-056
B286	"	2-1	Front wash 20 mL
B287	"	2-1	Si gel
B288	"	2-2	GFF 25-057
B289	"	2-2	Front wash 20 mL
B290	"	2-2	Si gel
B291	"	2-3	GFF 25-058
B292	"	2-3	Front wash 20 mL
B293	"	2-3	Si gel
B294	27 June	3-1	GFF 25-059
B295	"	3-1	Front wash 20 mL
B296	"	3-1	Si gel

SAMPLE LOG SHEET

Client: [illegible]

Facility: [illegible]

Project: Compliance

Sample Number	Date Received	Test Number	Description
B297	27 Jun	7-2	GFF 47-064
B298		3-2	Front wash 15 mL
B299		3-2	Si gel
B300		3-3	GFF 47-065
B301		3-3	Front wash 15 mL
B302	↓	3-3	Si gel
B303	23 June	4-1	GFF 25-059
B304	↓	4-1	Front wash 45 mL
B305		4-1	Si gel
B306		4-2	GFF 25-060
B307		4-2	Front wash 45 mL
B308		4-2	Si gel
B309		4-3	GFF 25-061
B310		4-3	Front wash 50 mL
B311		4-3	Si gel
B312		BLK	Acetone Field Blank 100mL
B313	↓	BLK	Acetone Field Blank 100mL

FILTER TARE WEIGHT LOG SHEET

Client: _____

Location: _____

Project: Compliance - Particulate

Filter Type: Glass Fiber Size: 2.5"

Filter Number	Date/Time / Weight				
25-	5/29/90 1400	5/30/90 1115			
053	0.2171g	0.2171g			
	5/29/90 1400	5/30 1115			
054	0.2170g	0.2171g			
	5/29/90 1400	5/30 1115			
055	0.2188g	0.2190g			
	5/29/90 1400	5/30 1115			
056	0.2169g	0.2170g			
	5/29/90 1400	5/30 1115			
057	0.2177g	0.2178g			
	5/29/90 1400	5/30 1115			
058	0.2175g	0.2176g			
	5/29/90 1400	5/30 1115			
059	0.2169g	0.2170			
	5/29/90 1400	5/30 1115			
060	0.2193g	0.2193g			
	5/29/90 1400	5/30 1115			
061	0.2180g	0.2181g			
	5/29/90 1400	5/30 1115			
062	0.2165g	0.2166g			

FILTER TARE WEIGHT LOG SHEET

Client: _____

Location: _____

Project: Compliance Particulate

Filter Type: Glass fiber w/ binder Size: 47 mm

Filter Number	Date/Time / Weight				
47 - 007	6/20/90 1000	6/21/90 0800			
	1.0376 g	1.0378 g			
47 - 064	6/20/90 1000	6/21/90 0800			
	1.0620 g	1.0618 g			
47 - 065	6/20/90 1000	6/21/90 0800			
	1.0675 g	1.0676 g			
47 - 076	6/20/90 1000	6/21/90 0800			
	1.9243 g	1.0244 g			
47 - 077	6/20/90 1000	6/21/90 0800			
	1.0163 g	1.0164 g			
47 - 078	6/20/90 1000	6/21/90 0800			
	1.0150 g	1.0147 g			
47 - 079	6/20/90 1000	6/21/90 0800			
	1.0070 g	1.0070 g			
47 - 080	6/20/90 1000	6/21/90 0800			
	1.0015 g	1.0016 g			
47 - 081	6/20/90 1000	6/21/90 0800			
	1.0111 g	1.0111 g			
47 - 082	6/20/90 1000	6/21/90 0800			
	0.9972 g	0.9973 g			

LAB ANALYSIS - SAMPLE WEIGHT LOG SHEET

Client: _____

Facility: _____

Project: _____

Sample Type: GF Filters

Sample Number	Background / Tare Weight	Date/Time / Gross Weight			
B276	1-1 25-053	7/1/90 0900	7/2/90 1500		
	0.2174g	0.2191g	0.2187g		
B279	1-2 25-054	7/1/90 0900	7/2/90 1500		
	0.2171g	0.2176g	0.2173g		
B282	1-3 25-055	7/2/90 0900	7/2/90 1500		
	0.2190g	0.2191g	0.2187g		
B285	2-1 25-057	7/2/90 0900	7/2/90 1500		
	0.2177g	0.2178g	0.2179g		
B288	2-2 25-056	7/2/90 0900	7/2/90 1500		
	0.2170g	0.2168g	0.2169g		
B291	2-3 25-058	7/2/90 0900	7/2/90 1500		
	0.2176	0.2179g	0.2176g		
B294	3-1 47-007	7/2/90 0900	7/2/90 1500	7/5/90 0900	
	1.0378g	1.2162g	1.2150g	1.2148g	
B297	3-2 47-064	7/2/90 0900	7/2/90 1500	7/5/90 0900	
	1.0618	1.2242g	1.2230g	1.2225g	
B300	3-3 47-065	7/2/90 0900	7/2/90 1500	7/5/90 0900	
	1.0676g	1.2495g	1.2489g	1.2486g	

LAB ANALYSIS - SAMPLE WEIGHT LOG SHEET

Client: ______________

Facility: ______________

Project: Compliance

Sample Type: GF Filters

Sample Number	Background Tare Weight	Date/Time Gross Weight			
B303	4-1 25-059	7/2/90 0900	7/2/90 1500		
	0.2170g	0.2186g	0.2186g		
B306	4-2 25-060	7/2/90 0900	7/2/90 1500		
	0.2193g	0.2225g	0.2226g		
B309	4-3 25-061	7/2/90 0900	7/2/90 1500		
	0.2181g	0.2588g	0.2584g		

LAB ANALYSIS - SAMPLE WEIGHT LOG SHEET

Client: C[illegible]

Facility: [illegible]

Project: Particulate Compliance

Sample Type: Wash Beakers 150 ~~250~~ mls

Sample Number	Background / Tare Weight	Date/Time / Gross Weight			
B277 15-6	1-1	7/9/90 0830	7/9/90 1435	7/10/90 0830	7/10/90 1430
	65.0520 g	65.0632 g	65.0638 g	65.0637 g	65.0637 g
B280 15-2	1-2	7/9/90 0830	7/9/90 1435	7/10/90 0830	7/10/90 1430
	65.8588 g	65.8687 g	65.8693 g	65.8660	65.8661 g
B283 15-1	1-3	7/9/90 0830	7/9/90 1435	7/10/90 0830	7/10/90 1430
	64.1925 g	64.1976 g	64.1982 g	64.1973 g	64.1976 g
B286 15-8	2-1	7/9/90 0830	7/9/90 1435	7/10/90 0830	7/10/90 1430
	63.6153 g	63.6231 g	63.6241 g	63.6222 g	63.6227 g
B289 15-3	2-2	7/9/90 0830	7/9/90 1435	7/10/90 0830	7/10/90 1430
	65.8522 g	65.8573 g	65.8583 g	65.8570 g	65.8571 g
B292 15-5	2-3	7/9/90 0830	7/9/90 1435	7/10/90 0830	7/10/90 1430
	63.1312 g	63.1373 g	63.1378 g	63.1365 g	63.1368 g
B295 15-4	3-1	7/9/90 0830	7/9/90 1435	7/10/90 0830	7/10/90 1430
	62.0929 g	62.1101 g	62.1113 g	62.1102 g	62.1106 g
B298 15-7	3-2	7/9/90 0830	7/9/90 1435	7/10/90 0830	7/10/90 0430
	63.9726 g	63.9891 g	63.9906 g	63.9898 g	63.9899
B301 15-9	3-3	7/9/90 0830	7/9/90 1435	7/10/90 0830	7/10/90 1430
	66.8394 g	66.8578 g	66.8601 g	66.8585 g	66.8582 g

LAB ANALYSIS - SAMPLE WEIGHT LOG SHEET

Client: [illegible]

Facility: [illegible]

Project: Particulate Compliance

Sample Type: Wash Beakers 150ml & 250ml

Sample Number	Background / Tare Weight	Date/Time / Gross Weight			
B304	4-1	7/9/90 0830	7/9/90 1500	7/10/90 0815	7/10/90 1430
25-20	106.3503g	106.3600g	106.3609g	106.3598g	106.3601g
B307	4-2	7/9/90 0830	7/9/90 1500	7/10/90 0815	7/10/90 1430
25-16	98.4554g	98.4681g	98.4683g	98.4660g	98.4665g
B310	4-3	7/9/90 0830	7/9/90 1500	7/10/90 0815	7/10/90 1430
25-10	96.1558g	96.1866g	96.1880g	96.1866g	96.1868g
B312	BLANK	7/9/90 0830	7/9/90 1500	7/10/90 0815	7/10/90 1430
25-14	97.8185g	97.8224g	97.8245g	97.8226g	97.8228g
B313	BLANK	7/9/90 0830	7/9/90 1500	7/10/90 0815	7/10/90 1430
25-12	97.0280g	97.0343g	97.0358g	97.0330g	97.0331g

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 1-1
Unit: Bagging

Date:
Location: Stack

Sample Identification

ID Number	Description
B 276	Glass Fiber Filter - # 25-053
B 277	Front Half Acetone Wash - 30 ml
B 278	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	200 ml	Gross Weight:	218.2 g	Impingers:	0
Tare Vol:	200 ml	Tare Weight:	200 0 g	Silica Gel:	18 2
Net Vol:	0 ml	Net Weight:	18.2 g	Total:	18.2 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA
Density: ≈ 0.785 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (1.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(30)(785) / (1000) = 0.0014 g

Front Half Wash Data

Beaker Number: 15-6

Gross Weight:	65.0537	g
Tare Weight:	65.0520	g
Less Wa:	0.0014	g
Weight of particulate in wash:	0.0103	g

Filter Data

Filter Number: 25-053

Gross Weight:	0.2187	g
Tare Weight:	0.2174	g
Weight of particulate on filter:	0.0013	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0103	g
Weight of particulate on filter:	0.0013	g
Total weight of particulate catch:	0.0116	g

Analyst: C Puisto

Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 1-2
Unit: Bagging

Date:
Location: Stack

Sample Identification

ID Number	Description
B 279	Glass Fiber Filter - # 25-054
B 280	Front Half Acetone Wash - 40 ml
B 281	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	208 ml	Gross Weight:	216.2 g	Impingers:	8
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	16.2
Net Vol:	8 ml	Net Weight:	16.2 g	Total:	24.2 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA Density: ≈ 0.785 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(40)(785)/(1000) = 0.0019 g

Front Half Wash Data

Beaker Number: 15-2

Gross Weight:	65.8661	g
Tare Weight:	65.8588	g
Less Wa:	0.0019	g
Weight of particulate in wash:	0.0054	g

Filter Data

Filter Number: 25-054

Gross Weight:	0.2173	g
Tare Weight:	0.2171	g
Weight of particulate on filter:	0.0002	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0054	g
Weight of particulate on filter:	0.0002	g
Total weight of particulate catch:	0.0056	g

Analyst: C. Puisto Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 1-3 Date:
Unit: Bagging Location: Stack

Sample Identification

ID Number	Description
B 282	Glass Fiber Filter - # 25-055
B 283	Front Half Acetone Wash - 40 ml
B 284	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	207 ml	Gross Weight:	214.1 g	Impingers:	7
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	14.1
Net Vol:	7 ml	Net Weight:	14.1 g	Total:	21.1 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA Density: ≈ 0.785 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(40)(785)/(1000) = 0.0019 g

Front Half Wash Data

Beaker Number: 15-1

Gross Weight:	64.1976	g
Tare Weight:	64.1925	g
Less Wa:	0.0019	g
Weight of particulate in wash:	0.0032	g

Filter Data

Filter Number: 25-055

Gross Weight:	0.2187	g
Tare Weight:	0.2190	g
Weight of particulate on filter:	-0.0003	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0032	g
Weight of particulate on filter:	-0.0003	g
Total weight of particulate catch:	0.0029	g

Analyst: C. Puisto Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 2-1
Unit: Primary Crusher

Date:
Location: Stack

Sample Identification

ID Number	Description
B 285	Glass Fiber Filter - # 25-057
B 286	Front Half Acetone Wash - 50 ml
B 287	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	203 ml	Gross Weight:	210.5 g	Impingers:	3
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	10.5
Net Vol:	3 ml	Net Weight:	10.5 g	Total:	13.5 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA

Density: ≈ 0.785 g/ml

Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(50)(785)/(1000) = 0.0024 g

Front Half Wash Data

Beaker Number: 15-8

Gross Weight:	63.6227	g
Tare Weight:	63.6153	g
Less Wa:	0.0024	g
Weight of particulate in wash:	0.0050	g

Filter Data

Filter Number: 25-057

Gross Weight:	0.2179	g
Tare Weight:	0.2177	g
Weight of particulate on filter:	0.0002	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0050	g
Weight of particulate on filter:	0.0002	g
Total weight of particulate catch:	0.0052	g

Analyst: C. Puisto

Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 2-2
Unit: Primary Crusher

Date:
Location: Stack

Sample Identification

ID Number	Description
B 288	Glass Fiber Filter - # 25-056
B 289	Front Half Acetone Wash - 40 ml
B 290	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	206 ml	Gross Weight:	209.5 g	Impingers:	6
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	9.5
Net Vol:	6 ml	Net Weight:	9.5 g	Total:	15.5 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA
Density: ≈ 0.785 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(40)(785)/(1000) = 0.0019 g

Front Half Wash Data

Beaker Number: 15-3

Gross Weight:	65.8571	g
Tare Weight:	65.8522	g
Less Wa:	0.0019	g
Weight of particulate in wash:	0.0030	g

Filter Data

Filter Number: 25-056

Gross Weight:	0.2169	g
Tare Weight:	0.2170	g
Weight of particulate on filter:	-0.0001	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0030	g
Weight of particulate on filter:	-0.0001	g
Total weight of particulate catch:	0.0029	g

Analyst: C. Puisto

Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 2-3 Date:
Unit: Primary Crusher Location: Stack

Sample Identification

ID Number	Description
B 291	Glass Fiber Filter - # 25-058
B 292	Front Half Acetone Wash - 40 ml
B 293	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	207 ml	Gross Weight:	210.0 g	Impingers:	7
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	10.0
Net Vol:	7 ml	Net Weight:	10.0 g	Total:	17.0 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA Density: ≈ 0.785 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(40)(785)/(1000) = 0.0019 g

Front Half Wash Data

Beaker Number: 15-5

Gross Weight:	63.1368	g
Tare Weight:	63.1312	g
Less Wa:	0.0019	g
Weight of particulate in wash:	0.0037	g

Filter Data

Filter Number: 25-058

Gross Weight:	0.2176	g
Tare Weight:	0.2176	g
Weight of particulate on filter:	0.0000	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0037	g
Weight of particulate on filter:	0.0000	g
Total weight of particulate catch:	0.0037	g

Analyst: C. Puisto Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 3-1
Unit: Alpha Mill

Date: [illegible]
Location: Stack

Sample Identification

ID Number	Description
B 294	Glass Fiber Filter - # 47-007
B 295	Front Half Acetone Wash - 20 ml
B 296	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	272 ml	Gross Weight:	211.5 g	Impingers:	72
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	11.5
Net Vol:	72 ml	Net Weight:	11.5 g	Total:	83.5 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA
Density: ≈ 0.785 g/ml

Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(20)(785)/(1000) = 0.0009 g

Front Half Wash Data

Beaker Number: 15-4

Gross Weight:	62 1106	g
Tare Weight:	62.0929	g
Less Wa:	0.0009	g
Weight of particulate in wash:	0.0168	g

Filter Data

Filter Number: 47-007

Gross Weight:	1.2148	g
Tare Weight:	1.0378	g
Weight of particulate on filter:	0.1770	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0168	g
Weight of particulate on filter:	0.1770	g
Total weight of particulate catch:	0.1938	g

Analyst: C. Puisto

Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 3-2
Unit: Alpha Mill

Date:
Location: Stack

Sample Identification

ID Number	Description
B 297	Glass Fiber Filter - # 47-064
B 298	Front Half Acetone Wash - 15 ml
B 299	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	266 ml	Gross Weight:	211.5 g	Impingers:	66
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	11.5
Net Vol:	66 ml	Net Weight:	11.5 g	Total:	77.5 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA
Density: ≈ 0.785 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(15)(785)/(1000) = 0.0007 g

Front Half Wash Data

Beaker Number: 15-7

Gross Weight:	63.9899	g
Tare Weight:	63.9726	g
Less Wa:	0.0007	g
Weight of particulate in wash:	0.0166	g

Filter Data

Filter Number: 47-064

Gross Weight:	1.2225	g
Tare Weight:	1.0618	g
Weight of particulate on filter:	0.1607	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0166	g
Weight of particulate on filter:	0.1607	g
Total weight of particulate catch:	0.1773	g

Analyst: C. Puisto

Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 3-3
Unit: Alpha Mill

Date:
Location: Stack

Sample Identification

ID Number	Description
B 300	Glass Fiber Filter - # 47-065
B 301	Front Half Acetone Wash - 15 ml
B 302	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	282 ml	Gross Weight:	212.5 g	Impingers:	82
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	12.5
Net Vol:	82 ml	Net Weight:	12.5 g	Total:	94.5 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA
Density: ≈ 0.785 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(15)(785)/(1000) = 0.0007 g

Front Half Wash Data

Beaker Number: 15-9

Gross Weight:	66.8582	g
Tare Weight:	66.8394	g
Less Wa:	0.0007	g
Weight of particulate in wash:	0.0181	g

Filter Data

Filter Number: 47-065

Gross Weight:	1.2486	g
Tare Weight:	1.0676	g
Weight of particulate on filter:	0.1810	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0181	g
Weight of particulate on filter:	0.1810	g
Total weight of particulate catch:	0.1991	g

Analyst: C. Puisto

Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 4-1
Unit: Screen & Belt

Date:
Location: Stack

Sample Identification

ID Number	Description
B 303	Glass Fiber Filter - # 25-059
B 304	Front Half Acetone Wash - 45 ml
B 305	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	206 ml	Gross Weight:	215.0 g	Impingers:	6
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	15.0
Net Vol:	6 ml	Net Weight:	15.0 g	Total:	21.0 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA
Density: ≈ 0.785 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(45)(785)/(1000) = 0.0021 g

Front Half Wash Data

Beaker Number: 25-20

Gross Weight:	106.3601 g
Tare Weight:	106.3503 g
Less Wa:	0.0021 g
Weight of particulate in wash:	0.0077 g

Filter Data

Filter Number: 25-059

Gross Weight:	0.2186 g
Tare Weight:	0.2170 g
Weight of particulate on filter:	0 0016 g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0077 g
Weight of particulate on filter:	0.0016 g
Total weight of particulate catch:	0.0093 g

Analyst: C. Puisto
Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 4-2
Unit: Screen & Belt

Date:
Location: Stack

Sample Identification

ID Number	Description
B 306	Glass Fiber Filter - # 25-060
B 307	Front Half Acetone Wash - 40 ml
B 308	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	211 ml	Gross Weight:	213.8 g	Impingers:	11
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	13.8
Net Vol:	11 ml	Net Weight:	13.8 g	Total:	24.8 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA
Density: ≈ 0.785 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(40)(785)/(1000) = 0.0019 g

Front Half Wash Data

Beaker Number: 25-16

Gross Weight:	98.4665	g
Tare Weight:	98.4554	g
Less Wa:	0.0019	g
Weight of particulate in wash:	0.0092	g

Filter Data

Filter Number: 25-060

Gross Weight:	0.2226	g
Tare Weight:	0.2193	g
Weight of particulate on filter:	0.0033	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0092	g
Weight of particulate on filter:	0.0033	g
Total weight of particulate catch:	0.0125	g

Analyst: C. Puisto

Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 4-3
Unit: Screen & Belt

Date: [illegible]
Location: Stack

Sample Identification

ID Number	Description
B 309	Glass Fiber Filter - # 25-061
B 310	Front Half Acetone Wash - 50 ml
B 311	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	208 ml	Gross Weight:	212.8 g	Impingers:	8
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	12.8
Net Vol:	8 ml	Net Weight:	12.8 g	Total:	20.8 ml

Acetone Background Data

Manufacturer: Unknown
Lot Number: NA
Density: ≈ 0.785 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Ma = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
pa = Density of acetone (mg/ml)

Ca = Ma / [(Va)(pa)] = (4.7) / [(100)(785)] = 0.00006

Acetone Blank Data

Wa = Weight of calculated residue in acetone wash (g)
Vaw = Volume of acetone wash (ml)

Wa = (Ca)(Vaw)(pa) = (0.00006)(50)(785)/(1000) = 0.0024 g

Front Half Wash Data

Beaker Number: 25-10

Gross Weight:	96.1868	g
Tare Weight:	96.1558	g
Less Wa:	0.0024	g
Weight of particulate in wash:	0.0286	g

Filter Data

Filter Number: 25-061

Gross Weight:	0.2584	g
Tare Weight:	0.2181	g
Weight of particulate on filter:	0.0403	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0286	g
Weight of particulate on filter:	0.0403	g
Total weight of particulate catch:	0.0689	g

Analyst: C. Puisto
Date: [illegible]

APPENDIX D

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date [illegible] Meter box number 1084-239

Barometric pressure, P_b = 29.67 in. Hg Calibrated by [signature]

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperatures: Wet test meter (t_w), °F	Temperatures: Dry gas meter: Inlet (t_{d_i}), °F	Temperatures: Dry gas meter: Outlet (t_{d_o}), °F	Temperatures: Dry gas meter: Avg[a] (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$, in. H_2O
0.5	5	5.122	70.2 / 70.2	88 91.5 / 95	73 75.5 / 78	83.5	13.1	0.999	1.897
1.0	5	5.192	70.1 / 70.1	97 100.5 / 104	80 81 / 82	90.8	9.4	0.998	1.927
1.5	10	10.465	70.1 / 70.1	99 102.5 / 106	83 85 / 87	93.8	15.7	0.995	2.007
2.0	10	10.504	70.1 / 70.1	103 105.5 / 108	87 88.5 / 90	97	13.7	0.995	2.023
3.0	10	10.517	70.1 / 70.1	106 107.5 / 109	89 89.5 / 90	98.5	11.3	0.997	2.059
4.0	10	10.536	70.1 / 70.1	113 115.5 / 118	92 92.5 / 93	104	9.8	1.000	2.045
							Avg	0.997	1.993

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368	$5(29.67)(543.5) / 5.122(29.71)(530.2)$	$[0.01585 / (29.67)(543.5)] \times [530.2 \times 13.1 / 5]^2$
1.0	0.0737	$5(29.67)(550.8) / (5.192)(29.74)(530.1)$	$[0.0317 / (29.67)(550.8)] \times [530.1 \times 9.4 / 5]^2$
1.5	0.110	$10(29.67)(553.8) / (10.465)(29.78)(530.1)$	$[0.0476 / (29.67)(553.8)] \times [530.1 \times 15.7 / 10]^2$
2.0	0.147	$10(29.67)(557) / (10.504)(29.82)(530.1)$	$[0.0634 / (29.67)(557)] \times [530.1 \times 13.7 / 10]^2$
3.0	0.221	$10(29.67)(558.5) / (10.517)(29.89)(530.1)$	$[0.0951 / (29.67)(558.5)] \times [530.1 \times 11.3 / 10]^2$
4.0	0.294	$10(29.67)(564) / (10.536)(29.96)(530.1)$	$[0.1268 / (29.67)(564)] \times [530.1 \times 9.8 / 10]^2$

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test numbers 1-1,2,3 3-1,2,3 2-1,2,3 4-1,2,3 Date 7/2/90 Meter box number 1084-239 Plant [illegible]

Barometric pressure, P_b = 29.80 in. Hg Dry gas meter number Pretest Y 0.997

Orifice manometer setting, $(\Delta H)_i$, in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1.75	10	10.437	74.0 / 74.0	103 / 107 / 111	91 / 91	99.0	14.6	9	.999	10 29.80(559) / 10.437(29.93)(534)
1.75	10	10.446	74.0 / 74.0	108 / 112	91 / 93	100.5	14.6	9	1.000	10 29.80(560.5) / 10.446(29.93)(534)
1.75	10	10.471	74.0 / 74.0	111 / 111.5	92 / 93 / 94	102.2	14.6	9	1.001	10 29.80(562.2) / 10.471 29.93(534)
									Y = 1.000	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ±0.05Y

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

RJS

STACK TEMPERATURE SENSOR
CALIBRATION DATA FORM

METER BOX
10E4-239

Date: [illegible] Thermocouple number: DRY GAS INLET

Ambient temperature: 73F Barometric pressure: 29.84

Calibrated by: C Pinto Reference: mercury-in-glass V

other

Reference Point Number	Source[a]	Reference Thermometer Temperature °C	°F	Thermocouple Potentiometer Temperature °C	°F	Temperature Difference[b] %
1	ICE H2O	0°C		32		0.0
2	AMB H2O	[illegible]°C		69		0.1
3	[illegible] H2O	[illegible]°C		212		0.0

Where:

a = Type of calibration system used

b = Metric units

$$\frac{(\text{ref temp } ^\circ\text{C} + 273) - (\text{test thermom temp } ^\circ\text{C} + 273)}{\text{ref temp } ^\circ\text{C} + 273} \quad 100 \leq 1.5\%$$

b = English units

$$\frac{(\text{ref temp } ^\circ\text{F} + 460) - (\text{test thermom temp } ^\circ\text{F} + 460)}{\text{ref temp } ^\circ\text{F} + 460} \quad 100 \leq 1.5\%$$

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

METER BOX 1084-239

Date: 1 [illegible]

Thermocouple number: OUTLET GAS METER

Ambient temperature: 73°F

Barometric pressure: 29.84

Calibrated by: C. Pristo

Reference: mercury-in-glass ✓

other _____

Reference Point Number	Source[a]	Reference Thermometer Temperature °C	Reference Thermometer Temperature °F	Thermocouple Potentiometer Temperature °C	Thermocouple Potentiometer Temperature °F	Temperature Difference[b] %
1	ICE H2O	0.0 C			32 F	0.0
2	AMB H2O	17.0 C			62 F	0.0
3	BOIL H2O	99.6 C			211 F	0.1

Where:

a = Type of calibration system used

b = Metric units

$$\frac{(\text{ref temp } ^{\circ}C + 273) - (\text{test thermom temp } ^{\circ}C + 273)}{\text{ref temp } ^{\circ}C + 273} \quad 100 \leq 1.5\%$$

b = English units

$$\frac{(\text{ref temp } ^{\circ}F + 460) - (\text{test thermom temp } ^{\circ}F + 460)}{\text{ref temp } ^{\circ}F + 460} \quad 100 \leq 1.5\%$$

Pitot # 255 Date

Measurements and Observations By:

1). All construction criteria for an isolated "S" type pitot are within given tolerances prescribed in Federal Register, Vol. 42, No. 160. Thursday, August 18, 1977. (See Fig. 2-2 and 2-3).

REQUIRED MEASUREMENTS

(a) External tubing diameter (see Fig. 2-2b)

D_t = 0.373

Tolerance D_t, between .23 and .38 in.

(b) Base to Opening Plane Distance

P_A = 0.495

P_B = 0.495

Tolerance P, $P_A = P_B$ and between .40 and .60 in.

2). All assembly criteria to prevent aerodynamic interference for a sampling arrangement of a "S" type pitot, nozzle, and thermal couple, are within given tolerances prescribed in Federal Register, Vol. 42, No. 160 - Thursday, August 18, 1977. (see Fig. 2-6, 2-7, 2-8).

REQUIRED MEASUREMENTS

(a) External tubing diameter (see 1-a)

(b) Pitot nozzle separation (see Fig. 2-6A)

D_n = 0.50

X = 0.807

Tolerance X, $\geq$ .75 in. for D_n = .50 in

(c) Plane of impact side of pitot in relation to plane of nozzle opening (see Fig. 2-6B).

(d) Thermal Couple Placement (see Fig. 2-7A or B)

Z = 0.95

Tolerance A-Z $\geq$ .75 in. A-W $\geq$ 3.0 in.

Tolerahce B-Z $\geq$ 2.0 in.

(e) Pitot Probe Sheath Distance (see Fig. 2-8)

Y = 43"

Tolerance Y $\geq$ 3.0 in

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date: _____ Thermocouple number: T2-2

Ambient temperature: 69°F Barometric pressure: 29.80 in Hg

Calibrated by: R. STERGIS Reference: mercury-in-glass ✓

other _____

Reference Point Number	Source[a]	Reference Thermometer Temperature °C °F	Thermocouple Potentiometer Temperature °C °F	Temperature Difference[b] %
1	~~HOT~~ OIL	167	170	0.68
2	BOIL H_2O	100	100	0.0
3	AMB H_2O	22	22	0.0
4	ICE H_2O	1	1	0.0

Where:

a = Type of calibration system used

b = Metric units

$$\frac{(\text{ref temp } ^\circ\text{C} + 273) - (\text{test thermom temp } ^\circ\text{C} + 273)}{\text{ref temp } ^\circ\text{C} + 273} \quad 100 \leq 1.5\%$$

b = English units

$$\frac{(\text{ref temp } ^\circ\text{F} + 460) - (\text{test thermom temp } ^\circ\text{F} + 460)}{\text{ref temp } ^\circ\text{F} + 460} \quad 100 \leq 1.5\%$$

OF 0.84 (Cp) TO [illegible]

Pitot # 2715 Date [illegible]

Measurements and Observations By: [illegible]

1). All construction criteria for an isolated "S" type pitot are within given tolerances prescribed in Federal Register, Vol. 42, No. 160. Thursday, August 18, 1977. (See Fig. 2-2 and 2-3).

REQUIRED MEASUREMENTS

(a) External tubing diameter (see Fig. 2-2b)

D_t = 0.378

Tolerance D_t, between .23 and .38 in.

(b) Base to Opening Plane Distance

P_A = 0.444

P_B = 0.462

Tolerance P, $P_A = P_B$ and between .40 and .60 in.

2). All assembly criteria to prevent aerodynamic interference for a sampling arrangement of a "S" type pitot, nozzle, and thermal couple, are within given tolerances prescribed in Federal Register, Vol. 42, No. 160 - Thursday, August 18, 1977. (see Fig. 2-6, 2-7, 2-8).

REQUIRED MEASUREMENTS

(a) External tubing diameter (see 1-a)

(b) Pitot nozzle separation (see Fig. 2-6A)

D_n = 0.56

X = 1.015

Tolerance X, $\geq$ .75 in. for D_n = .50 in

(c) Plane of impact side of pitot in relation to plane of nozzle opening (see Fig. 2-6B).

(d) Thermal Couple Placement (see Fig. 2-7A or B)

Z = 1.05

Tolerance A-Z $\geq$ .75 in. A-W $\geq$ 3.0 in.

Tolerahce B-Z $\geq$ 2.0 in.

(e) Pitot Probe Sheath Distance (see Fig. 2-8)

Y = 5.0

Tolerance Y $\geq$ 3.0 in

[redacted] TEMPERATURE SENSOR CALIBRATION DATA FORM

Date: [redacted]

Thermocouple number: T2-3

Ambient temperature: 68°F

Barometric pressure: 29.80 in Hg

Calibrated by: K. STERGIS

Reference: mercury-in-glass [redacted]

other [redacted]

Reference Point Number	Source[a]	Reference Thermometer Temperature °C °F	Thermocouple Potentiometer Temperature °C °F	Temperature Difference[b] %
1	HOT OIL	150	153	0.71
2	ICE H2O	00	01	0.37
3	AMB AIR	22	22	0 0
4	ICE H2O	[illegible]	[illegible]	0 [illegible]

[illegible]

[illegible]

$$\frac{\text{[illegible]} - \text{[illegible]}}{\text{ref temp °K} - 273} \leq \text{[illegible]}$$

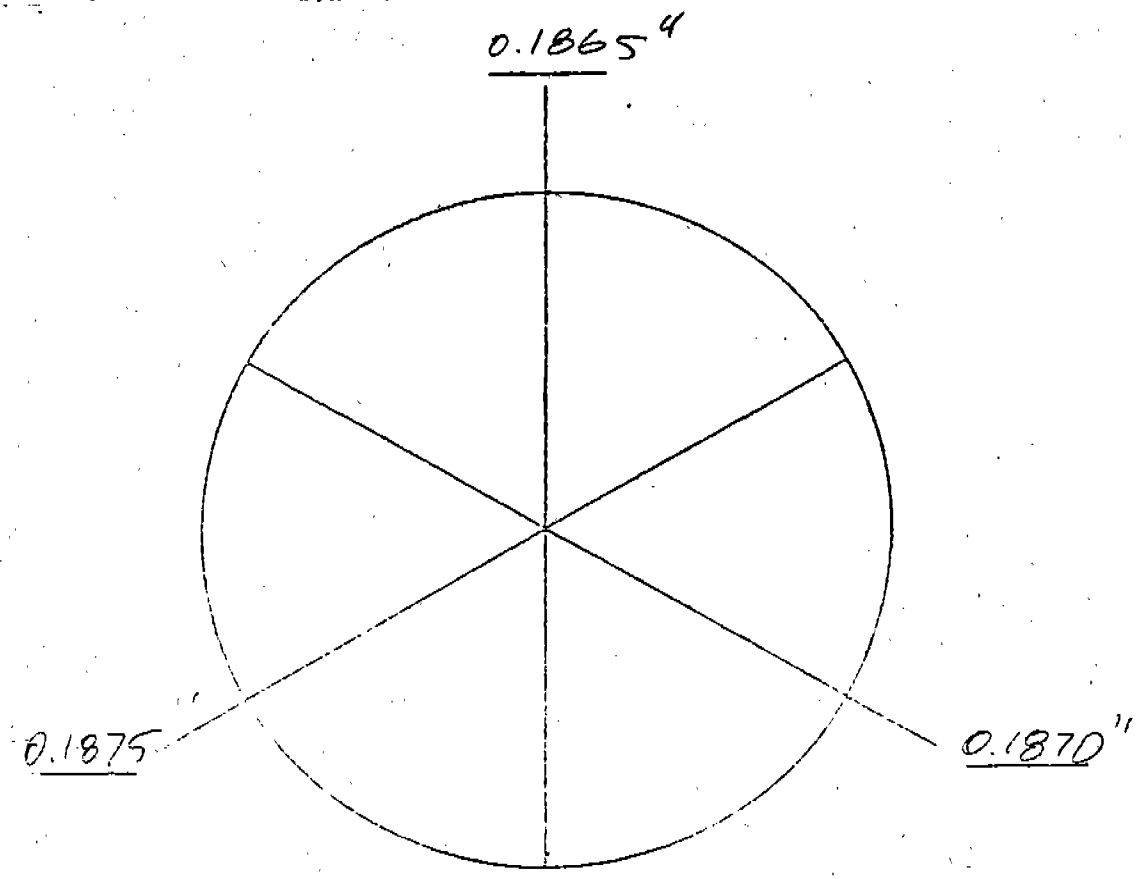
[illegible] = English units

$$\frac{(\text{ref temp °F} + 460) - (\text{test thermom temp °F} + 460)}{\text{ref temp °F} + 460} \leq 1.5\%$$

NOZZLE CALIBRATION DATA FORM

Date: [illegible]

Calibrated by: [signature]



Nozzle Identification Number	Nozzle Diameter[a]			ΔD^b mm (in.)	$D_{avg}{}^c$
	D_1 mm (in.)	D_2 mm (in.)	D_3 mm (in.)		
125-3	0.1865"	0.1875"	0.1870"	0.001"	0.1870"

Where:
a = nozzle diameters b = maximum difference c = average diameter

Source category: Talc Processing
Plant name :
Process :

Filename:
Location:
Test date:

Date:
Ref. No.: 12/
Process rate basis: production

Process	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
Packaging and storage	fabric filter	filterable PM	1	EPA 5	98.0	76.16	11,642	0.0116	0.0024	0.235	24.00	0.0049	0.0098	
		filterable PM	2		97.8	68.93	11,446	0.0056	0.0013	0.123	24.00	0.0026	0.0051	
		filterable PM	3		98.4	69.49	11,575	0.0029	0.00064	0.064	24.00	0.0013	0.0027	
									gr/DSCF	Average		0.0029	0.0059	B
Primary crushing	fabric filter	filterable PM	1	EPA 5	96.9	51.92	10,192	0.0052	0.0015	0.1350	95.00	0.00071	0.0014	
		filterable PM	2		98.6	52.91	10,207	0.0029	0.00085	0.0740	95.00	0.00039	0.00078	
		filterable PM	3		98.2	53.16	10,297	0.0037	0.0011	0.0948	95.00	0.00050	0.0010	
									%	Average		0.00053	0.0011	B
Grinding and screening	fabric filter	filterable PM	1	EPA 5	97.2	55.59	9,224	0.1938	0.0538	4.25	20.00	0.11	0.21	
		filterable PM	2		98.1	60.61	9,064	0.1773	0.0451	3.51	20.00	0.088	0.18	
		filterable PM	3		98.7	62.46	9,292	0.1991	0.0492	3.92	20.00	0.098	0.20	
									%	Average		0.097	0.19	D
		CO2	1	Fyrite	NA	NA	9,224	NA	0.5	317	20.00	7.9	16	
		CO2	2		NA	NA	9,064	NA	0.5	311	20.00	7.8	16	
		CO2	3		NA	NA	9,292	NA	0.25	159	20.00	4.0	8.0	
										Average		6.6	13	C
Crushed material screening and transfer	fabric filter	filterable PM	1	EPA 5	95.9	69.49	12,308	0.0093	0.0021	0.218	95.00	0.0011	0.0023	
		filterable PM	2		95.8	69.60	12,297	0.0125	0.0028	0.292	95.00	0.0015	0.0031	
		filterable PM	3		95.8	68.61	12,119	0.0689	0.0155	1.61	95.00	0.0085	0.017	
										Average		0.0037	0.0074	B

Basis for rating: Data downrated to B because average process rates provided; run-by-run rates not specified.
Roller mill PM data rated D because control device was malfunctioning during test.
Roller mill CO2 data rated C because fyrite was used to measure concentrations.

Problems noted:

Other notes: