COMPLIANCE REPORT

PARTICULATE EMISSION COMPLIANCE PROGRAM - RETEST

for

ALPHA MILL

prepared for:

[redacted]

Purchase Order Number: E-20548

prepared by:

Air Quality Technical Services, Inc.
P. O. Box 9550
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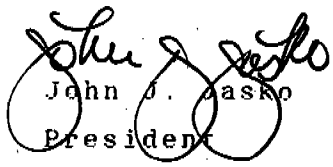
September 28, 1990

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 retest at the Columbia Mill facility which it owns and operates in .

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

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1.0 INTRODUCTION

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.

On June 25, 26, 27, and 28, particulate emission testing was conducted on the Alpha Mill, Bagging Operation, Primary Crusher, and Screen & Belt Transfer to determine compliance with emission limits set forth in Condition 4 of an Air Pollution Control Permit (#AP-89-046) issued by the State of Agency of Natural Resources. After completing a review of the reported results of the program, the Air Pollution Control Division (APCD) concluded that the Alpha Mill was operating in violation of its permit limits at the time of testing.

In a letter dated August 30, 1990, the APCD requested that I have the Alpha Mill source retested to demonstrate that repairs made to dust collector #1 after the initial compliance testing were effective in reducing emissions to within permitted limits.

On September 19 and 20, 1990, the Alpha Mill source was retested to determine compliance with the applicable particulate emission limits.

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

State of Natural Resources

David Manning

Air Quality Technical Services, Inc.

Curtis Puisto

Richard Stergas

2.0 SUMMARY OF RESULTS

2.1 ALPHA ROLLER MILL--Collector #1

The three test runs conducted on the Alpha Roller Mill resulted in particulate concentrations of 0.0007, 0.0011, and 0.0010 gr/dscf, and mass emission rates of 0.057, 0.091, and 0.081 lb/hr, respectively. The arithmetic means of the three test runs upon which compliance is judged were 0.0009 gr/dscf and 0.076 lb/hr. This represents a concentration that is 9.0 % of the limit of 0.01 gr/dscf and an emission rate that is 13.3 % of the limit of 0.57 lb/hr.

A summary of pertinent test results for the Alpha Roller Mill are found in Table 2-1.

TEST DATA SUMMARY SHEET

Alpha Roller Mill

Test/Run	1-1	1-2	1-3	Average
Date				
Test Time	1118-1352	1516-1745	0825-1053	
Plant Operating Data				
Production Rate (TPH)				≈ 20
Test Measurements				
Sample Volume (dscf)	67.154	69.295	68.829	
Isokinetics (%)	94.8	95.5	97.2	
Moisture (%)	2.5	3.2	3.4	3.0
Temperature (°F)	174.2	169.6	189.1	177.6
Velocity (fps)	54.4	55.4	56.8	55.5
Volumetric Flow (dscfm)	9491.2	9643.1	9484.1	9539.5
(acfm)	12565.3	12255.6	12034.4	12285.1
CO_2 (%)	0.7	0.5	1.0	0.7
O_2 (%)	20.7	20.5	20.0	20.4
N_2 (%)	78.6	79.0	79.0	78.9
Particulate Emission Determinations				
Concentration (gr/dscf)	0.0007	0.0011	0.0010	0.0009
Emission Rate (lb/hr)	0.057	0.091	0.081	0.076
Particulate Emission Standard				
Emission Limit (gr/dscf)	0.01	0.01	0.01	0.01
Percent of Limit	7.0	11.0	10.0	9.0
Emission Limit (lb/hr)	0.57	0.57	0.57	0.57
Percent of Limit	10.0	16.0	14.2	13.3

Table 2-1

2.2 DATA REDUCTION

The results generated from the particulate emission compliance test program were computed by programed methods. For comparative and illustrative purposes, Appendix A contains a data reduction example for the Alpha Mill test run 1-1 and a listing of calculation input parameters for each test run.

4.0 SOURCE DESCRIPTION

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 storage.

5.0 OPERATING AND PRODUCTION CAPACITY

The production rate for the source involved in the test program was subject to process variability between interconnected processes. Best efforts were made to test during maximum operating capacity of the 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.

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

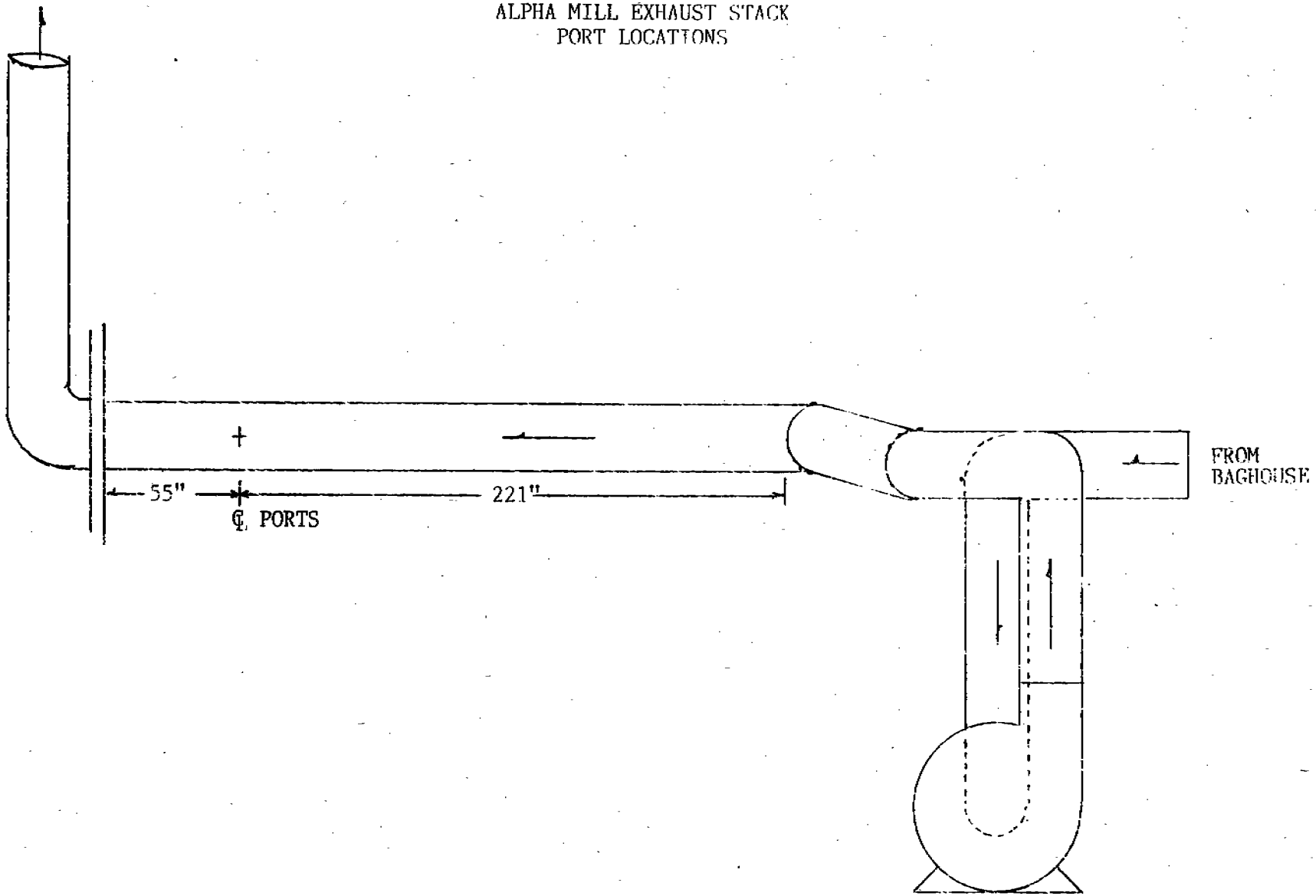
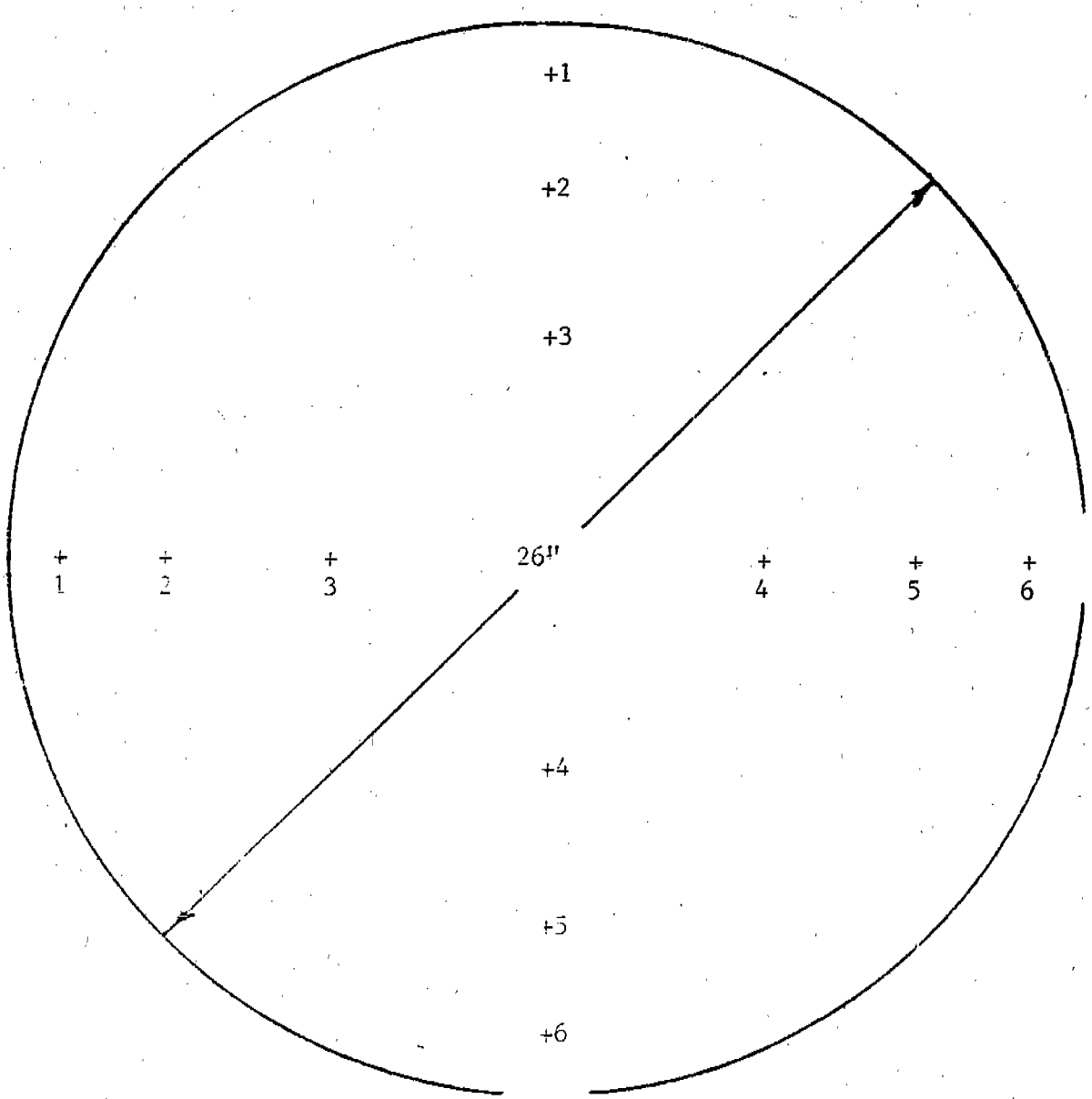


FIGURE 6-1

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

6.2 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 6-3.

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

Copies of the field test data and summaries are found in Appendix B.

METHOD 17 SAMPLE TRAIN

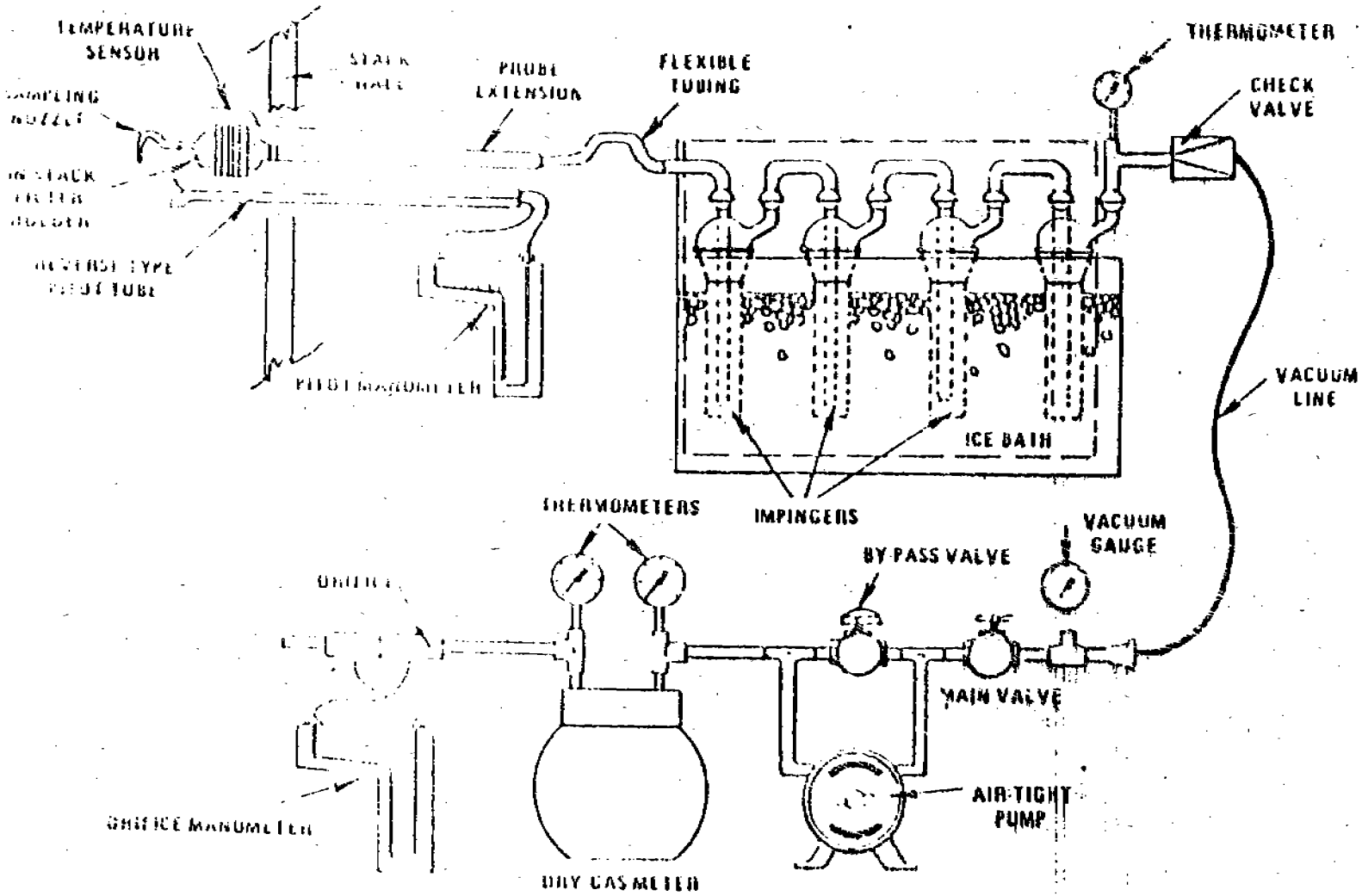


FIGURE 6-3

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 C.

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 D.

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:
d) reweighed to a establish 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: _ Unit: Alpha Mill

Facility: J Test: 1-1

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

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

$$= 17.65\ (\ 73.814\ )\ (\ 0.997\ )\ \frac{29.03 + \frac{0.838}{13.6}}{102.7 + 460} = \underline{67.154}$$

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

$$Vw_{std} = 0.04707\ Vl_c$$

$$= 0.04707\ (\ 37.2\ ) = \underline{1.751}$$

3. Stack gas proportion of water by volume

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

$$= \frac{1.751}{1.751 + 67.154} = \underline{0.025}$$

4. Stack gas dry molecular weight, lb/lb-mole

$$MW_d = \%CO_2 + \%O_2 + \%CO + \%N_2$$

$$= 0.44 \times 0.7 + 0.32 \times 20.7 + 0.28 \times 78.6 + 0 = \underline{28.94}$$

5. Stack gas molecular weight, lb/lb-mole

$$MW_s = MW_d\ (1 - B_{wo}) + 18\ B_{wo}$$

$$= 28.94\ (1 - 0.025) + 18\ (0.025) = \underline{28.67}$$

6. Pressure of the stack, in. Hg

$$P_s = P_b + \frac{P_g}{13.6}$$

$$= 29.03 + \frac{0.60}{13.6} = \underline{29.07}$$

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

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

$$= 85.49\ (0.84\ (\ 0.868\ )\ \sqrt{\frac{174.2\ +\ 460}{(29.07\ )\ (\ 28.67\ )}} = \underline{54.4}$$

8. Stack gas volume at standard conditions (scfm)

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

$$= 60\ (1 - 0.025\ )\ (\ 54.4\ \ )\ (3.687\ )\left(\frac{528}{174.2 + 460}\right)\left(\frac{29.07}{29.92}\right) = \underline{9491.2}$$

acfm = 12034.4

9. Test percent isokinetic

$$\%I = \frac{17.33\ (T_s - 460)\ \left[0.04707\ (Vl_c) + Vm_{std}\right]}{\theta\ \ V_s\ \ P_s\ \ D_n^2}$$

$$= \frac{17.33\ (174.2 + 460)\ \left[0.04707\ (37.2\ \ \ ) + 67.154\ \right]}{(\ 144\ )\ \ (\ 54.4\ \ )\ (\ 29.07\ )\ (0.1873\ \ )^2} = \underline{94.8}$$

10. Particulate matter concentration, gr/scf

$$C_s = 15.432\left(\frac{M_n}{Vm_{std}}\right)$$

$$= 15.432\left(\frac{0.0030}{67.154}\right) = \underline{0.0007}$$

11. Emission rate of particulate matter, lb/hr

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

$$= 0.00857\ (\ 9491.2\ \ )\ (\ 0.0007\ ) = \underline{0.057}$$

CALCULATION INPUT PARAMETERS

Test/run		1-1	1-2	1-3
Dry gas meter volume (cu ft)		73.814	75.458	76.117
Meter correction factor		0.997	0.997	0.997
Barometric press. (in Hg)		29.73	29.95	29.70
Avg orifice press. differ. (in H_2O)		0.838	0.893	0.903
Avg meter temperature (°F)		104.7	96.0	99.8
Volume H_2O condensed (ml)	impinger	25.0	38.0	39.0
	silica gel	7	11.1	12.1
	total	32	49.1	51.2
CO_2 (%)		0	0.5	0.0
O_2 (%)		20	20.5	20.8
N_2 (%)		80	79.0	79.0
CO (%)		0	0.0	0.0
Static press. (in H_2O)		0.50	0.64	0.60
Pitot correction factor		0.84	0.84	0.84
Avg square root of Δp		0.906	0.937	0.939
Avg stack temperature (°F)		172	164	180
Area of stack (sq ft)		3.887	3.887	3.887
Test duration (min)		144	144	144
Diameter of nozzle (in)		0.1870	0.1880	0.1870
Mass of particulate catch (g)	wash	0.0021	0.0020	0.0020
	filter	0.0009	0.0031	0.0025
	total	0.0030	0.0051	0.0045

APPENDIX B

PARTICULATE TEST FIELD DATA SUMMARY

Client: CWM, Inc.
Facility:
Date:
Unit: ALPHA MILL
Test Run: 1-1

Vmstd =	67.154	Vm =	73.814
Vwstd =	1.751	Avg. Delta P =	0.755
Bwo =	0.025	Avg. Delta H =	0.838
Md =	28.94	Avg. Ts =	174.2
Ms =	28.67	Avg. Tm =	102.7
Cp =	29.07	Avg. SQRT Delta P =	0.868
Ts =	54.4		
Qstdm =	9491.2	NOTES:	
Qstds =	12034.4		
%I =	94.8		
=	0.0007		
%	0.057		

AQTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

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

Barometric Pressure 29.03
Static Pressure +0.62/+0.58 = (+0.60)
Pitot Coefficient 0.84
Pitot Number 29 IS
Meter Box Number 1084-239
Meter H@ 1.993 Y 0.997
Nozzle Size & Number ~0.1875" A-3
Leak Rate cfm 0.01 cfm @ 15 in Hg
0.001 cfm @ 15 in Hg

Fyrite

TIME	CO_2	O_2	CO
A	0.5 / 1.0	21.0 / 20.0	
B	0.5	21.0	
	0.7	20.7	

IMPINGER VOLUMES

100	123
100	102
0	0

SILICA GEL

200g | 212.2

Holder / FILTER DATA

NUMBER	TARE	FINAL WT.
47-076	1.0244	

READ AND RECORD ALL DATA EVERY 12 MINUTES pitot 5

TRAVERSE POINT NUMBER	SAMPLING TIME min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m) ft³	VELOCITY HEAD (ΔP_s) in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH) in H_2O DESIRED	ACTUAL	STACK (T_s) °F	DRY GAS METER INLET (T_{MI}) °F	DRY GAS METER OUTLET (T_{MO}) °F	SAMPLE BOX °F	PROBE °F	IMPINGER °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$
A1	0	11:18	302.569	0.86	0.95	0.95	171	105	80	—	—	62	5	.927
2	12	11:30	306.9	0.82	0.90	0.90	172	110	88	—	—	62	5	.906
3	24	11:42	315.36	0.72	0.80	0.80	175	110	92	—	—	65	4.5	.849
4	36	11:54	321.27	0.68	0.76	0.76	174	111	94	—	—	56	4.5	.825
5	48	12:06	327.13	0.78	0.86	0.86	175	112	96	—	—	53	5	.883
6	60	12:18	333.40	0.76	0.84	0.84	174	113	96	—	—	54	5	.872
END	72	12:30	339.588											
B1	72	12:36	339.588	0.68	0.76	0.76	173	110	97	—	—	55	4.5	.825
2	84	12:48	345.94	0.86	0.95	0.95	175	113	98	—	—	52	5	.927
3	96	13:00	352.04	0.74	0.82	0.82	176	114	98	—	—	63	5	.860
4	108	13:12	358.17	0.67	0.74	0.74	176	113	98	—	—	53	4.5	.819
5	120	~~13:24~~	363.527	0.74	0.82	0.82	175	109	98	—	—	61	5	.860
6	132	13:27:30	370.16	0.75	0.85	0.85	176	112	98	—	—	55	5	.866
END	144	13:52	376.383											

.000 13:23:30 → 30 sec left pt 5
@10 in Hg crimp in umbilical hose

13:27:30 (pt 6 13:30)

AQTS

AIR QUALITY TECHNICAL SERVICES

QUALITY ASSURANCE FIELD SHEET
PARTICULATE SAMPLE

CLIENT: _____ LOCATION: exhaust

SOURCE: Alpha Mill

TEST/RUN: 1-1 DATE: _____

FILTER DATA **Sample Number:** B 332

Type: Glass Fiber Number ~~10~~ 47-076 Tare wt. 1.0244

Holder Number: 1 Recovery Site: lab (Hotel) / field Date: 19 Sept 90

Physical Description: white low-loading

IMPINGER DATA

Recovery Site: lab / field Date: 9/19/90

Physical Description: slightly cloudy white

#1	Final	123 ml	Initial	100 ml	Net:	23 ml
#2	Final	102 ml	Initial	100 ml	Net:	2 ml
#3	Final	0 ml	Initial	0 ml	Net:	— ml
Si Gel	Final	212.2 g	Initial	200 g	Net:	12.2 g

Total: 37.2 ml

WASH DATA Sample Number: B 333

Solvent: Acetone Recovery Site: lab (Hotel) / field Date: 19 Sept 90

Rinse Components: nozzle / ~~probe~~ / front of holder

Net Volume: ~ 16 ml

Physical Description: relatively clear

PHYSICAL DATA

Meter Volume: Final: 376.383 Initial: 302.569 Net: 73.814

Barometric Pressure: 29.03 inches / mm Hg

Temperature: Dry Bulb: ~70°F Wet Bulb: _____ Rel Humid: _____

PARTICULATE TEST FIELD DATA SUMMARY

Client:
Facility:
Date:
Unit: ALPHA MILL
Test Run: 1-2

VMstd =	69.295	Vm =	75.458
VWstd =	2.311	Avg. Delta P =	0.783
Bwo =	0.032	Avg. Delta H =	0.893
MWd =	28.9	Avg. Ts =	169.6
MWs =	28.55	Avg. Tm =	96
Ps =	29	Avg. SQRT Delta P =	0.885
Vs =	55.4		
Qscfm =	9643.1	NOTES:	
Qacfm =	12255.6		
%I =	95.5		
Cs =	0.0011		
ER =	0.091		

AQTS AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Client
Facility
Date
Unit Alpha mill
Test Location exhaust
Load/Conditions
Test Number 1-2
Stack Dimensions 26" ID
Operator RS OP

Barometric Pressure 28.95
Static Pressure +0.66/+0.59 (+0.64)
Pitot Coefficient 0.84
Pitot Number 24 ISA
Meter Box Number 1084 339
Meter H@ [illegible]
Nozzle Size & Number [illegible]
Leak Rate Pre 0.002 CFM @ 11 in Hg
Post 0.002 CFM @ 14 in Hg

IMPINGER VOLUMES	
100	138
100	100
0	0

SILICA GEL	
200 g	211.1

Holder 2 FILTER DATA

NUMBER	TARE	FINAL WT.
47-077	1.0164	

Fyrite

TIME	CO_2	O_2	CO
A	0.5	20.5	
	0.5	20.5	
B	0.5	20.5	
	0.5	20.5	

READ AND RECORD ALL DATA EVERY 12 MINUTES Pitot ✓

TRAVERSE POINT NUMBER	SAMPLING TIME, min θ	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (ΔP_s), in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ACTUAL	STACK (T_s), °F	DRY GAS METER INLET (T_{mi}), °F	DRY GAS METER OUTLET (T_{mo}), °F	SAMPLE BOX °C °F	PROBE °C °F	IMPINGER °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$
A1	0	15:16	376.527	0.72	0.82	0.82	160	92	73	—	—	51	4	.849
2	12	15:28	382.51	0.85	0.97	0.97	165	98	76	—	—	45	4	.922
3	24	15:40	388.98	0.84	0.96	0.96	167	104	82	—	—	45	4	.917
4	36	15:52	395.44	0.83	0.95	0.95	169	106	86	—	—	45	4	.911
5	48	16:04	401.90	0.79	0.90	0.90	170	107	88	—	—	4[illegible]	4	.889
6	60	16:16	408.20	0.85	0.97	0.97	171	107	90	—	—	45	4	.922
END	72	16:28	414.738											
B1	72	16:33	414.738	0.79	0.90	0.90	170	107	90	—	—	45	3.5	.889
2	84	16:45	421.11	0.79	0.90	0.90	172	108	91	—	—	50	4	.889
3	96	16:57	427.45	0.74	0.84	0.84	173	109	91	—	—	48	4	.860
4	108	17:09	433.60	0.80	0.91	0.91	173	109	92	—	—	58	4	.894
5	120	17:21	440.2	0.70	0.80	0.80	173	108	91	—	—	50	4	.837
6	132	17:33	446.00	0.70	0.80	0.80	172	108	93	—	—	50	4	.837
END	144	17:45	451.985											

AQTS

AIR QUALITY TECHNICAL SERVICES

QUALITY ASSURANCE FIELD SHEET
PARTICULATE SAMPLE

CLIENT: _____ LOCATION: exhaust

SOURCE: _____

TEST/RUN: 1-2 DATE: _____

FILTER DATA **Sample Number:** B 335

Type: Glass Fiber Number ~~110~~ 47077 (Hotel) Tare wt. 1.0164

Holder Number: 2 Recovery Site: (lab) / field Date: 19 Sept 90

Physical Description: white low-load

IMPINGER DATA

Recovery Site: lab / ~~field~~ Date: 9/19/90

Physical Description: _____

#1	Final	138 ml	Initial	100 ml	Net:	38 ml
#2	Final	100 ml	Initial	100 ml	Net:	0 ml
#3	Final	0 ml	Initial	0 ml	Net:	0 ml
Si Gel	Final	211.1 g	Initial	200 g	Net:	11.1 g
					Total:	49.1 ml

WASH DATA Sample Number: B 336

Solvent: Acetone Recovery Site: (Hotel) lab field Date: 19 Sept 90

Rinse Components: (nozzle) / ~~probe~~ n/a / (Front of Holder)

Net Volume: ≈ 11 ml

Physical Description: relatively clear

PHYSICAL DATA

Meter Volume: Final: 451.985 Initial: 376.527 Net: 75.458

Barometric Pressure: 28.95 (inches) mm Hg

Temperature: Dry Bulb: 270°F Wet Bulb: _____ Rel Humid: _____

PARTICULATE TEST FIELD DATA SUMMARY

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

VMstd =	68.829	Vm =	76.117
VWstd =	2.41	Avg. Delta H =	0.793
Bwo =	0.034	Avg. Delta H =	0.903
MWd =	28.96	Avg. Ts =	389.1
MWs =	28.59	Avg. Tm =	99.8
Ps =	28.74	Avg. SQRT Delta P =	0.89
Vs =	56.8		
Qscfm =	9484.1	NOTES:	
Qacfm =	12565.3		
%I =	97.2		
Cs =	0.001		
ER =	0.081		

AIR QUALITY TECHNICAL SERVICES

PARTICULATE TEST FIELD DATA SHEET

Fyrite

Client
Facility
Date
Unit Alpha Mill
Test Location Exhaust
Load/Conditions
Test Number 1-3
Stack Dimensions 26" ID
Operator BS CP

Barometric Pressure 28.70
Static Pressure +0.69/+0.90 (+0.60)
Pitot Coefficient 0.84
Pitot Number 29 15
Meter Box Number 1084-239
Meter Bar 1.993 Y 0.997
Nozzle Size & Number ~0.1875" A-3
Leak Rate PRE 0.006 CFM @ 13.5 in Hg
POST 0.004 CFM @ 11.5 in Hg

IMPINGER VOLUMES	
100	139
100	100
0	0

SILICA GEL	
200g	212.2

Filter 1 FILTER DATA

NUMBER	TARE	FINAL WT.
47-078		

TIME	CO_2	O_2	CO
A	1.0	20.0	
	1.0	20.0	
B	1.0	20.0	
	1.0	20.0	

READ AND RECORD ALL DATA EVERY 12 MINUTES pitot ✓

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 in H_2O mm H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL in H_2O mm H_2O ACTUAL	STACK (T_s) °C	DRY GAS METER INLET (T_{MI}) °C	DRY GAS METER OUTLET (T_{MO}) °C	SAMPLE BOX °C °F	PROBE °C °F	IMPINGER °C °F	PUMP VACUUM in Hg	$\sqrt{\Delta P}$
A1	0 0825	452.955	0.79	0.90	0.90	163	94	76			65	5	.889
2	12 0837	459.17	0.76	0.86	0.86	175	97	79			59	5	.872
3	24 0849	465.32	0.93	1.05	1.05	183	102	82			59	5	.964
4	36 0901	472.10	0.86	0.98	0.98	190	104	89			62	5	.927
5	48 0913	478.68	0.83	0.95	0.95	192	109	91			57	5	.911
6	60 0925	485.17	0.77	0.88	0.88	194	110	93			56	5	.877
END	72 0937	491.457											
B1	72 0941	491.457	0.70	0.80	0.80	193	110	95			60	7.5	.837
2	84 0953	497.47	0.81	0.92	0.92	198	112	96			59	5	.900
3	96 1005	503.90	0.74	0.90	0.90	200	114	97			58	5	.889
4	108 1017	510.32	0.88	1.00	1.00	199	114	98			58	5	.938
5	120 1029	516.96	0.72	0.82	0.82	198	115	98			60	5	.849
6	132 1041	523.10	0.68	0.78	0.78	189	114	99			61	5	.825
END	144 1053	529.072											

AQTS

AIR QUALITY TECHNICAL SERVICES

QUALITY ASSURANCE FIELD SHEET
PARTICULATE SAMPLE

CLIENT: _____ LOCATION: exhaust

SOURCE: _____

TEST/RUN: 1-3 DATE: _____

FILTER DATA Sample Number: B338

Type: Glass Fiber Number ~~110~~ 47-078 Tare wt. 1.0147

Holder Number: 1 Recovery Site: (lab) / field Date: 20 Sept 90

Physical Description: low-loading of white / off-white

IMPINGER DATA

Recovery Site: lab (field) Date: 9/20/90

Physical Description: slightly cloudy

#1	Final	139 ml	Initial	100 ml	Net:	ml
#2	Final	100 ml	Initial	100 ml	Net:	ml
#3	Final	0 ml	Initial	0 ml	Net:	ml
Silica Gel	Final	212.2 g	Initial	200 g	Net:	g
					Total:	

WASH DATA Sample Number: B339

Solvent: Acetone Recovery Site: (lab) / field Date: 20 Sept

Rinse Components: (nozzle) ~~probe~~ / (front of holder)

Net Volume: 17 ml

Physical Description: relatively clean

PHYSICAL DATA

Meter Volume: Final: 529.072 Initial: 452.955 Net: 76.117

Barometric Pressure: 28.70 (inches) / mm Hg

Temperature: Dry Bulb: 75°F Wet Bulb: _____ Rel Humid: _____

APPENDIX C

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date _____ Meter box number 1084-239

Barometric pressure, P_b = 29.67 in. Hg Calibrated by _____

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 41 / 75	73 75 / 78	83.5	13.1	0.999	1.897
1.0	5	5.192	70.1 / 70.1	97 101 / 104	80 81 / 82	90.3	9.4	0.998	1.927
1.5	10	10.465	70.1 / 70.1	99 102 / 106	83 85 / 85	93.8	15.7	0.995	2.007
2.0	10	10.504	70.1 / 70.1	103 105 / 108	87 88 / 90	97	13.7	0.995	2.023
3.0	10	10.517	70.1 / 70.1	106 108 / 109	89 90 / 90	98.5	11.3	0.997	2.059
4.0	10	10.536	70.1 / 70.1	113 115 / 118	92 92 / 93	104	9.8	1.000	2.045
							Avg	0.997	1.995

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b \left(\frac{t_d + 460}{t_w + 460}\right)^2 \left(\frac{\theta}{V_w}\right)^2}$
0.5	0.037	5(29.67)(553.5) / (5.122)(29.67)(530.1)	[0.0317(0.5) / (29.67)(553.5)] × [530.1 × 13.1 / 5]²
1.0	0.074	5(29.67)(553.8) / (5.192)(29.74)(530.1)	[0.0317(1.0) / (29.67)(553.8)] × [530.1 × 9.4 / 5]²
1.5	0.110	10(29.67)(553.8) / (10.465)(29.78)(530.1)	[0.0317(1.5) / (29.67)(553.8)] × [530.1 × 15.7 / 10]²
2.0	0.147	10(29.67)(557) / (10.504)(29.82)(530.1)	[0.0317(2.0) / (29.67)(557)] × [530.1 × 13.7 / 10]²
3.0	0.221	10(29.67)(558.5) / (10.517)(29.89)(530.1)	[0.0317(3.0) / (29.67)(558.5)] × [530.1 × 11.3 / 10]²
4.0	0.294	10(29.67)(564) / (10.536)(29.96)(530.1)	[0.0317(4.0) / (29.67)(564)] × [530.1 × 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 THRU 3 Date 9/19-9/20/90 Meter box number 1084-239 Plant

Barometric pressure, P_b = 29.69 in. Hg Dry gas meter number Pretest Y 0.977

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	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 (t_d)[a], °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
-1.0	10	10.364	67.5	86 (94, 100)	76 (89, 82)	86.5	20.3	5	0.997	10(29.69)(86.5+460) / 10.364(29.69+ΔH/13.6)(67.5+460)
-1.0	10	10.499	67.9	101 (104, 106)	83 (85, 87)	94.2	20.4		0.998	10(29.69)(94.2+460) / 10.499(29.69+ΔH/13.6)(67.9+460)
-1.0	10	10.564	68.0	103 (105, 106)	88 (89, 90)	96.8	20.1		0.996	10(29.69)(96.8+460) / 10.564(29.69+ΔH/13.6)(68+460)
									Y =	0.997

POST CAL COMPUTED 9/20/90

[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.

STACK TEMPERATURE SENSOR
CALIBRATION DATA FORM

METER BOX 1084-239

Date: 21 Jan 90 Thermocouple number: DRY GAS INLET

Ambient temperature: 73F Barometric pressure: 29.89

Calibrated by: C Pinsle Reference: mercury-in-glass ✓

other

Reference Point Number	Source[a]	Reference Thermometer Temperature °C	°F	Thermocouple Potentiometer Temperature °C	°F	Temperature Difference[b] %
1	ICE H_2O	0.0C		32 F		0.0
2	AMB H_2O	17.0C		63		0.0
3	HOT H_2O	71.0C		160		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
1084-237

Date: _____ Thermocouple number: OUTLET GAS METER

Ambient temperature: 78°F Barometric pressure: 29.84

Calibrated by: CRUSTO Reference: mercury-in-glass ✓

other _____

Reference Point Number	Source[a]	Reference Thermometer Temperature °C	°F	Thermocouple Potentiometer Temperature °C	°F	Temperature Difference[b] %
1	ICE H2O	0.0 C		32.4		0.0
2	AMB N2	24 C		"		0.0
3	BOIL H2O	99.0 C		99.1		0.1

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 TO AN "S" TYPE PITOT TUBE

ITOT # 29 15 DATE 1/ OBSERVATIONS BY

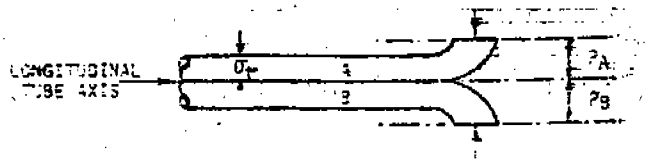
) All construction criteria for an isolated "S" type pitot are within given tolerances prescribed in Federal Register, Vol. 42, No. 160. Thursday, August 18, 1977.

REQUIRED MEASUREMENTS

a. External tubing diameter, D_t, 0.23 in. < D_t < 0.38 in.

b. Base to plane opening Distance, P_A and P_B, 0.40 in. < P_A=P_B < 0.60 in.

D_t= 0.375
P_A= 0.475
P_B= 0.450



) All assembly criteria to prevent aerodynamic interference for a sampling arrangement of an "S" type pitot, nozzle thermocouple, are within given tolerances prescribed in Federal Register, Vol. 42, No. 160, Thursday, August 18, 1977.

REQUIRED MEASUREMENTS

a. External tubing diameter. See i.a. above

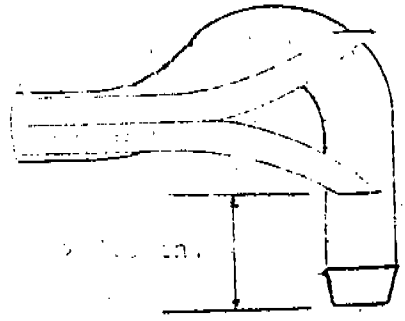
b. Pitot / nozzle separation, X. X ≥ 1.75 in. for nozzle diameter, D_n = 0.50 in.

c. Plane of impact side of pitot in relation to plane of [illegible] opening.

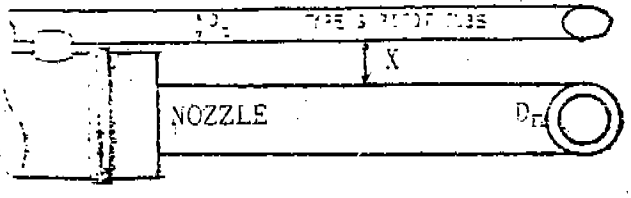
d. Thermocouple placement, Z, A-Z ≥ 0.75 in., A-W ≥ 3.0 in., B-Z ≥ 1.0 in.

e. Pitot / probe sheath distance, Y, Y ≥ 3.0 in.

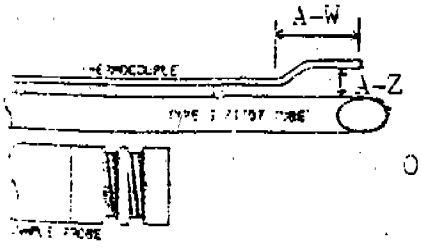
D_n= 0.1875
X = 1.39
Z = 1.19 A-Z A-W ≥ 3.0
Y = 3.0



b.



d.



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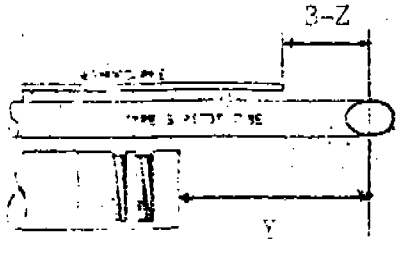
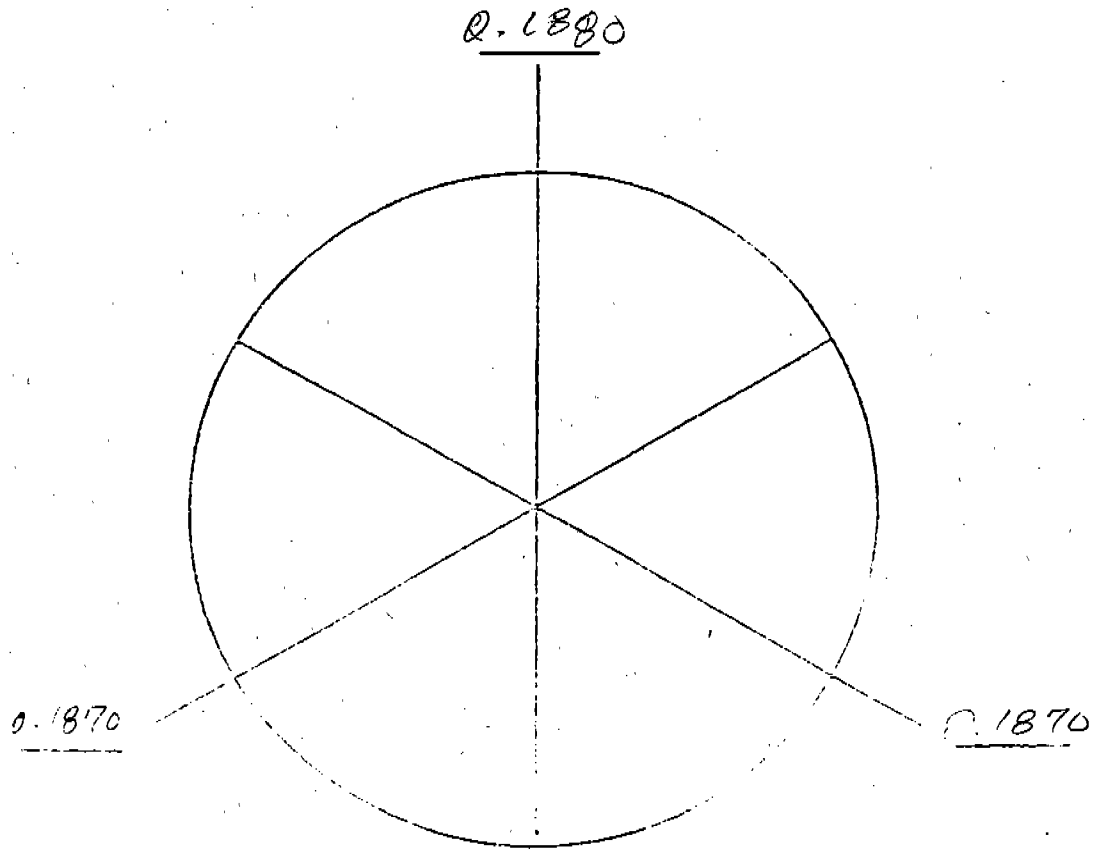


e.

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.)		
A - 3	0.1880	0.1870	0.1870	0.001	0.1873

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date: _____ Thermocouple number: T2-3

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

Calibrated by: K. 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 O/C	150	153	0.71
2	BOIL H_2O	100	101	0.27
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 TO AN "S" TYPE PITOT TUBE

PITOT # 29 15 A DATE _____ OBSERVATIONS BY _____

a) 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.

REQUIRED MEASUREMENTS

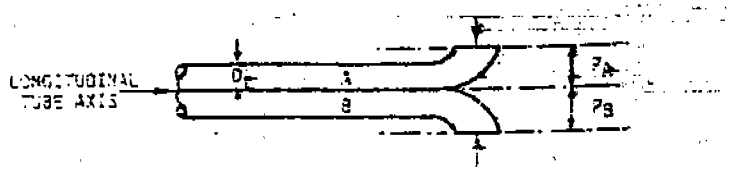
a. External tubing diameter, D_t, 0.23 in. $\leq D_t \leq$ 0.38 in.

b. Base to plane opening Distance, P_A and P_B, 0.40 in. $\leq P_A = P_B \leq$ 0.60 in.

D_t = 0.375

P_A = 0.440

P_B = 0.430



c) All assembly criteria to prevent aerodynamic interference for a sampling arrangement of an "S" type pitot, nozzle and thermocouple, are within given tolerances prescribed in Federal Register, Vol. 42, No. 160. Thursday, August 18, 1977.

REQUIRED MEASUREMENTS

a. External tubing diameter. See 1.a. above

b. Pitot / nozzle separation, X, X $\geq$ 0.75 in. for nozzle diameter, D_n = 0.50 in.

c. Plane of impact side of pitot in relation to plane of nozzle opening.

d. Thermocouple placement, Z, A-Z $\geq$ 0.75 in., A-W $\geq$ 3.0 in., B-Z $\geq$ 3.0 in.

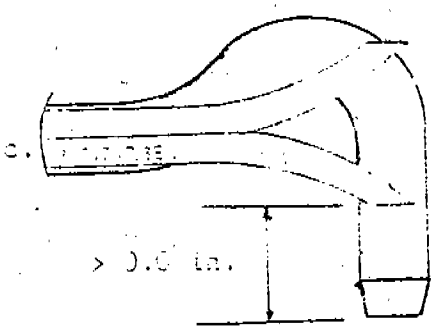
e. Pitot / probe sheath distance, Y, Y $\geq$ 3.0 in.

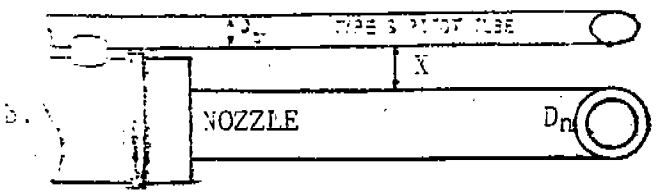
D_n = 0.1875

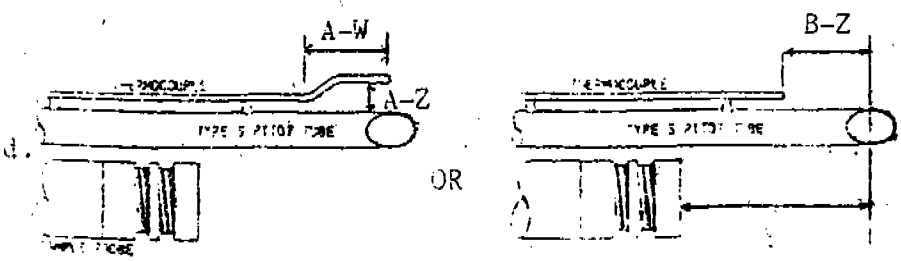
X = 1.39

= 1.36 A-Z, 5.0

= 3.0

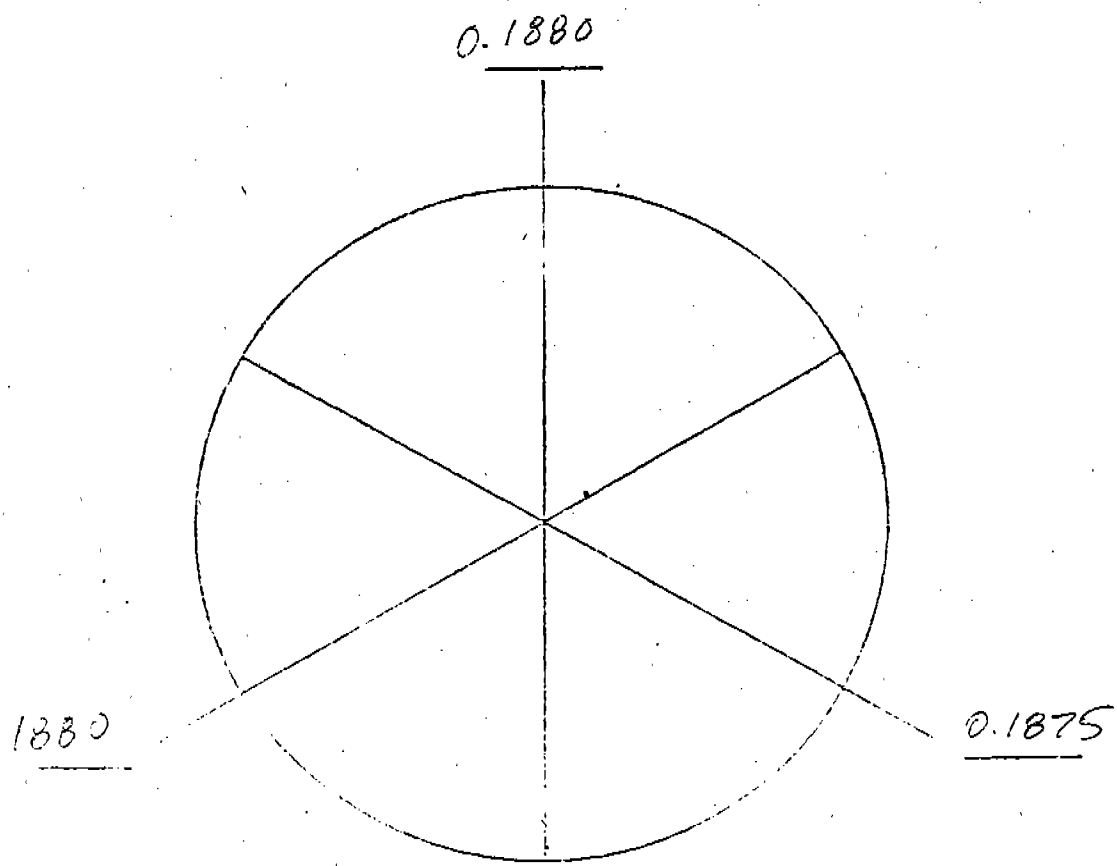






NOZZLE CALIBRATION DATA FORM

Date: _____ Calibrated by: _____



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	0.1880	0.1875	0.1880	0.0005	0.1880

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

STACK TEMPERATURE SENSOR
CALIBRATION DATA FORM

Date: _____ Thermocouple number: T2-2

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

Calibrated by: R. STERGAS 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
3	AMB H_2O	22	22	0
4	ICE H_2O	1	1	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

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

APPENDIX D

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 1-1
Unit: Alpha Mill

Date:
Location: Exhaust

Sample Identification

ID Number	Description
B 332	Glass Fiber Filter - # 47-076
B 233	Front Half Acetone Wash - 20 ml
B 234	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	225 ml	Gross Weight:	212.2 g	Impingers:	25
Tare Vol:	200 ml	Tare Weight:	200 0 g	Silica Gel:	12 2
Net Vol:	25 ml	Net Weight:	12 2 g	Total:	37.2 ml

Acetone Background Data

Manufacturer: Fisher Scientific
Lot Number: 002245 Density: 0.7865 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)] = (0 2) / (20) (785 5) = 000013

Acetone Blank Data

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

Wa = (Ca)(Vaw)(pa) = (0 0000) (20) (785 5) = 0 0002 g

Front Half Wash

Beaker Number: 15-1

Gross Weight:	62 0115	g
Tare Weight:	62.0922	g
Less Wa	0 0002	g
Weight of particulate in wash:	0 0021	g

Filter Data

Filter Number: 47-076

Gross Weight:	1 0253	g
Tare Weight:	1 0244	g
Weight of particulate on filter:	0 0009	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0021	g
Weight of particulate on filter:	0 0009	g
Total weight of particulate catch:	0 0030	g

Analyst: R Stergas

Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 1-2 Date:
Unit: Alpha Mill Location: Exhaust

Sample Identification

ID Number	Description
B 335	Glass Fiber Filter - # 47-077
B 336	Front Half Acetone Wash - 22 ml
B 337	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	238 ml	Gross Weight:	211.1 g	Impingers:	38
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	11.1
Net Vol:	38 ml	Net Weight:	11.1 g	Total:	49.1 ml

Acetone Background Data

Manufacturer: Fisher Scientific
Lot Number: 902245 Density: 0.7855 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)] = [0.2] / [(20)(785.5)] = 0.000013

Acetone Blank Data

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

Wa = (Ca)(pa)(Va)/(1000) = (0.000013)(22)(785.5)/(1000) = 0.0002 g

Front Half Wash Data

Beaker Number: 15-5

Gross Weight:	63.1332	g
Tare Weight:	63.1330	g
Less Wa	0.0002	g
Weight of particulate in wash:	0.0020	g

Filter Data

Filter Number: 47-077

Gross Weight:	1.0195	g
Tare Weight:	1.0164	g
Weight of particulate on filter:	0.0031	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0020	g
Weight of particulate on filter:	0.0031	g
Total weight of particulate catch:	0.0051	g

Analyst: R. Stergas Date:

LAB ANALYSIS SHEET - METHOD 5

Test/Run: 1-3
Unit: Alpha Mill

Date:
Location: Exhaust

Sample Identification

ID Number	Description
B 338	Glass Fiber Filter - # 47-078
B 339	Front Half Acetone Wash - 30 ml
B 340	Silica Gel

Moisture Catch Data

Impingers		Silica Gel		Net	
Gross Vol:	239 ml	Gross Weight:	212.2 g	Impingers:	39
Tare Vol:	200 ml	Tare Weight:	200.0 g	Silica Gel:	12.2
Net Vol:	39 ml	Net Weight:	12.2 g	Total:	51.2 ml

Acetone Background Data

Manufacturer: Fisher Scientific
Lot Number: [illegible] Density: 0.7855 g/ml
Ca = Acetone blank residue concentration (mg/mg)
Wa = Mass of residue after evaporation (mg)
Va = Volume of acetone blank (ml)
ρa = Density of acetone (mg/ml)

Ca = Wa / (Va)(ρa) = (0.2) / [(20)(785.5)] = 0.000013

Acetone Blank Data

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

Wa = (Ca)(Vaw)(ρa) = (0.000013)(30)(785.5)/(1000) = 0.0003 g

Front Half Wash Data

Beaker Number: 15-8

Gross Weight:	65.0513	g
Tare Weight:	65.0510	g
Less Wa:	0.0003	g
Weight of particulate in wash:	0.0020	g

Filter Data

Filter Number: 47-078

Gross Weight:	1.0172	g
Tare Weight:	1.0147	g
Weight of particulate on filter:	0.0025	g

Particulate Weight Summary

Weight of particulate in front half wash:	0.0020	g
Weight of particulate on filter:	0.0025	g
Total weight of particulate catch:	0.0045	g

Analyst: R. Stergas

Date:

SAMPLE LOG SHEET

Client: ___

Facility: ___

Project: α mill particulate emission compliance - Retest

Sample Number	Date Received	Test Number	Description
B 332	9/19/90	1-1	GFF 47-076
B 333		1-1	Front ½ wash 20 mls
B 334		1-1	Si Gel
B 335		1-2	GFF 47-077
B 336		1-2	Front wash 20 mls
B 337	↓	1-2	Si Gel
B 338	9/20/90	1-3	GFF 47-078
B 339		1-3	Front wash 20 mls
B 340		1-3	Si gel
B 341		Blk	Acetone blank 200 mls
B 342	↓	BLK	Acetone blank 200 mls

FILTER TARE WEIGHT LOG SHEET

Client:

Location:

Project: 901037

Filter Type: Glass fiber w/ rings 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			
	1.0243 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			

<u>LAB ANALYSIS - SAMPLE WEIGHT LOG SHEET</u>

Client:

Facility:

Project: ~~x~~ Mill Compl. Retest

Sample Type: G.F. Filter 47mm w/Teflon Rings

Sample Number	Background	Date/Time			
	Tare Weight	Gross Weight			
B332	Test/Run 1-1	9/21/90 10 ~~09~~00	9/24 0845		
	1.0244 g	1.0252	1.0253 g		
B335	T/R 1-2	9/21/90 10 ~~09~~00	9/24 0845		
	[illegible] g	1.0196 g	1.0195 g		
B338	T/R 1-3	9/21/90 10 ~~09~~00	9/24 0845		
	1.0147 g	1.0173 g	1.0172 g		

BEAKER TARE WEIGHT LOG SHEET

Client: T

Project: L Mill Compliance Retest

Facility:

Beaker Volume: 150 ml

BEAKER NUMBER	BEAKER 0900 9/25/10 TARE WEIGHTS						
15 - 7 BK	63.9722g	63.9717g	63.9717				
15 - 8 BK	63.6147g	63.6142g	63.6147				
15 - 4 (1-1) 20ml/s	62.0922g	62.0917g	62.0922				
15 - 6 (1-3) 30ml/s	65.0513g	65.0508g	65.0510				
15 - 5 (1-2) 22ml/s	63.1304g	63.1297g	63.~~1303~~ 1300				
15 - 9	66.8389g	66.8383g	66.8384				

LAB ANALYSIS - SAMPLE WEIGHT LOG SHEET

Client: _____

Facility: _____

Project: 901037

Sample Type: Front wash

Sample Number	Background / Tare Weight	Date/Time / Gross Weight			
B233	Beaker 15-4 Tare wt 9/25/90	9/26/90 0900	9/26/90 1540		
	62.0922 g	62.0943 g	62.0945 g		
B234	Beaker 15-5 9/25/90	9/26/90 0900	9/26/90 1540		
	63.1300 g	63.1325 g	63.1322 g		
B235	Beaker 15-6 9/25/90	9/26/90 0900	9/26/90 1540		
	65.0510 g	65.0532	65.0533		
B236	Beaker 15-7 9/25/90	9/26/90 0900	9/26/90 1540		
	63.9717	63.9723	63.9719		
B237	Beaker 15-8 9/25/90	9/26/90 0900	9/26/90 1540		
	63.6147	63.6148	63.6149		

Source category: Talc P...
Plant name :
Process :

Filename: TALC_R13.WQ1
Location: [illegible] VT
Test date:

Date:
Ref. No.: 13/
Process rate basis: production

Source	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.
Roller mill	fabric filter	filterable PM	1	EPA 5	94.8	67.15	9,491	0.0030	0.00069	0.056	20.00	0.0014	0.0028	
		filterable PM	2		95.5	69.30	9,643	0.0051	0.0011	0.094	20.00	0.0023	0.0047	
		filterable PM	3		97.2	68.83	9,484	0.0045	0.0010	0.082	20.00	0.0021	0.0041	
									%		Average	0.0019	0.0039	B
		CO2	1	Fyrite	NA	NA	9,491	NA	0.7	456	20.00	11	23	
		CO2	2		NA	NA	9,643	NA	0.5	331	20.00	8.3	17	
		CO2	3		NA	NA	9,484	NA	1.0	651	20.00	16	33	
											Average	12	24	C

Basis for rating: Average process rates provided; run-by-run rates not specified.
Problems noted:
Other notes: Test conducted after repairs made to APCD, which had been malfunctioning during previous test. (See Reference 12.)