M13A, 5, 6, 7

Couldn't find production rate
but (gave #/hr)

no info on control device
— went through scrubber & ESP

Method 1-4 seem ok — but 1 run was not sampled isokinetically — however the results seem fairly consistant

3 impingers were fine

Couldn't find calibration data
no clear record of leak checks
no clear record of blanks

I'm not sure about the recovery for Method 7

Evaluator/Date _____

PRIMARY EMISSIONS TEST REPORT EVALUATION

STATE: WA TEST DATE: June 8 1978 PROCESS(ES) TESTED (SCC): _____

FACILITY: ALCOA Scrubber / Wet Precip.

ADDRESS: WENATCHEE

WA.

OBJECTIVE CATEGORIES:

Inclusion of production/ operation rate	Yes Apply	Documentation of stack/process tested	Yes
Documentation of Methods 1-4	Yes	Documentation of test/ estimation method	?

RATED ITEMS: [1-3, 3 being highest]

Process Description	1	Equipment prep documentation	1
Documentation of control equipment and efficiency	1	Thorough field data on standard forms for at least 3 runs	3
Documentation of Q/A	1	Consistency of results	2

STATE: _____ TEST DATE: _____ PROCESS(ES) TESTED (SCC): _____

FACILITY: _____

ADDRESS: _____

OBJECTIVE CATEGORIES:

Inclusion of production/ operation rate		Documentation of stack/process tested	
Documentation of Methods 1-4		Documentation of test/ estimation method	

RATED ITEMS: [1-3, 3 being highest]

Process Description		Equipment prep documentation	
Documentation of control equipment and efficiency		Thorough field data on standard forms for at least 3 runs	
Documentation of Q/A		Consistency of results	

1996 1

PRIMARY
ALUMINUM PRODUCTION
AP-42 Section 7.1
Reference Number
6

EMISSION TESTING REPORT

ETB TEST NUMBER 71-MM-16

EMISSIONS FROM

PRIMARY ALUMINUM SMELTING PLANT
(SPECIAL EMISSION CONTROL SYSTEM)

at

ALUMINUM COMPANY OF AMERICA
WENATCHEE, WASHINGTON

PROJECT OFFICER
FREDERICK E. MAERKER

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF AIR PROGRAMS
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

REPORT NO. Y-7730-B June 8, 1972

TABLE OF CONTENTS

I. PREFACE

An Emission Test Program was conducted for the Environmental Protection Agency at the Alcoa Aluminum Plant in Wenatchee, Washington, from 18 October 71 through 26 October 71 inclusive.

Source sampling was performed in accordance with EPA Test Methods and Procedures at the inlet and outlet of the special emission control system developed by Alco, Pittsburgh, Pennsylvania to eliminate emissions from the primary smelting operations.

The following samples were taken:

Emission Sample	Test Method
Particulate	EPA #5
Total Nitrogen Oxides	EPA #7
Sulfur Dioxide	EPA #6
Fluorides	EPA

During this test the York Research crew consisted of the following members:

Robert Epstein - Field Project Director
Richard W. Kling - Senior Test Engineer
Roger Kniskern - Senior Test Engineer
Kenneth Crepeau - Field Engineer
Geoffrey Knobel - Field Engineer
Erwin Theisz - Field Chemist

Technical Note:

For this phase of the work all analysis of the samples were conducted by EPA in their own laboratory. The results of the analysis were transmitted to York Research and used as the basis for the emission rate calculation.

II. SUMMARY

The Appendix Section of this report contains all results and data collected and computed for this series of tests. For convenience, the most salient results and data are tabulated below.

TABULAR SUMMARY

Inlet	Particulate lb/ton	Total Fluorides* lb/ton		Gaseous Fluoride lb/ton		SO_2 ppm	NO_x* ppm
#1 Paper Filter	9.34	4.53	#1 in H_2O	6.47	#1	1.4	-
#2 Paper Filter	14.20 11.99	4.05	#2 in H_2O	5.87	#2	4.4	-
#3 Paper Filter	11.78	5.01	#3 in H_2O	17.98	#3	3.0	-
#1 Glass Fiber Filter	11.35	4.40		-		5.2	-
#2 Glass Fiber Filter	12.36 11.92	4.20		-		4.2	-
#3 Glass Fiber Filter	12.05	4.13		-		4.1	-
Outlet							
#1 Paper Filter	.365	.000812	#1 in H_2O	.132	#1	10.5	-
#2 Paper Filter	.353	.000867	#2 in H_2O	.300	#2	7.2	-
#3 Paper Filter	.707	.000433	#3 in H_2O	.233 .270	#3	10.5	-
#1 Glass Fiber Filter	.587	.000503		-		9.3	-
#2 Glass Fiber Filter	.353	.000580		-		11.6	-
#3 Glass Fiber Filter	.617	.000509		-		9.9	-
#1 Membrane Filter	.350	.000638		-		-	-
#2 Membrane Filter	.414	.000689		-		-	-
#3 Membrane Filter	.222	.001111		-		-	-

*Results questionable because of analytical procedures.

III. INTRODUCTION

The source test series were performed at the Alcoa Primary Aluminum Plant at Wenatchee, Washington from 18 October 1971 to 26 October 1971, for the purpose of gathering emission data for the Performance Standards Branch (SDID) and control unit efficiency data for the Industrial Studies Branch (ATD) of EPA.

Emissions from the Primary Aluminum cells were recirculated through the process via a specially developed system designed by Alcoa to improve the quality of aluminum produced and drastically reduce emissions. A block diagram showing the location of sampling ports is included in Section V of this report.

The standard EPA particulate train (Method #5) was used to sample both particulate matter and fluorides. Six simultaneous samples were taken across the control system using Whatman 541 paper filters in three runs and MSA 1106BH glass fiber filters in the other three runs.

Also, three outlet tests were run using Millipore AA membrane type filters. Triplicate gaseous samples of fluorides, sulfur dioxide (Method #6, adapted), and nitrogen oxides (Method #7) were also taken at both inlet and outlet. Experimentation with two types of absorbing media in the midget impingers of the fluoride gas train was performed by collecting three fluoride samples in water and three in a 0.1 N solution of NaOH at both inlet and outlet.

IV. PROCESS DESCRIPTION

Process description to be supplied by Environmental Protection Agency, Research Triangle Park, North Carolina.

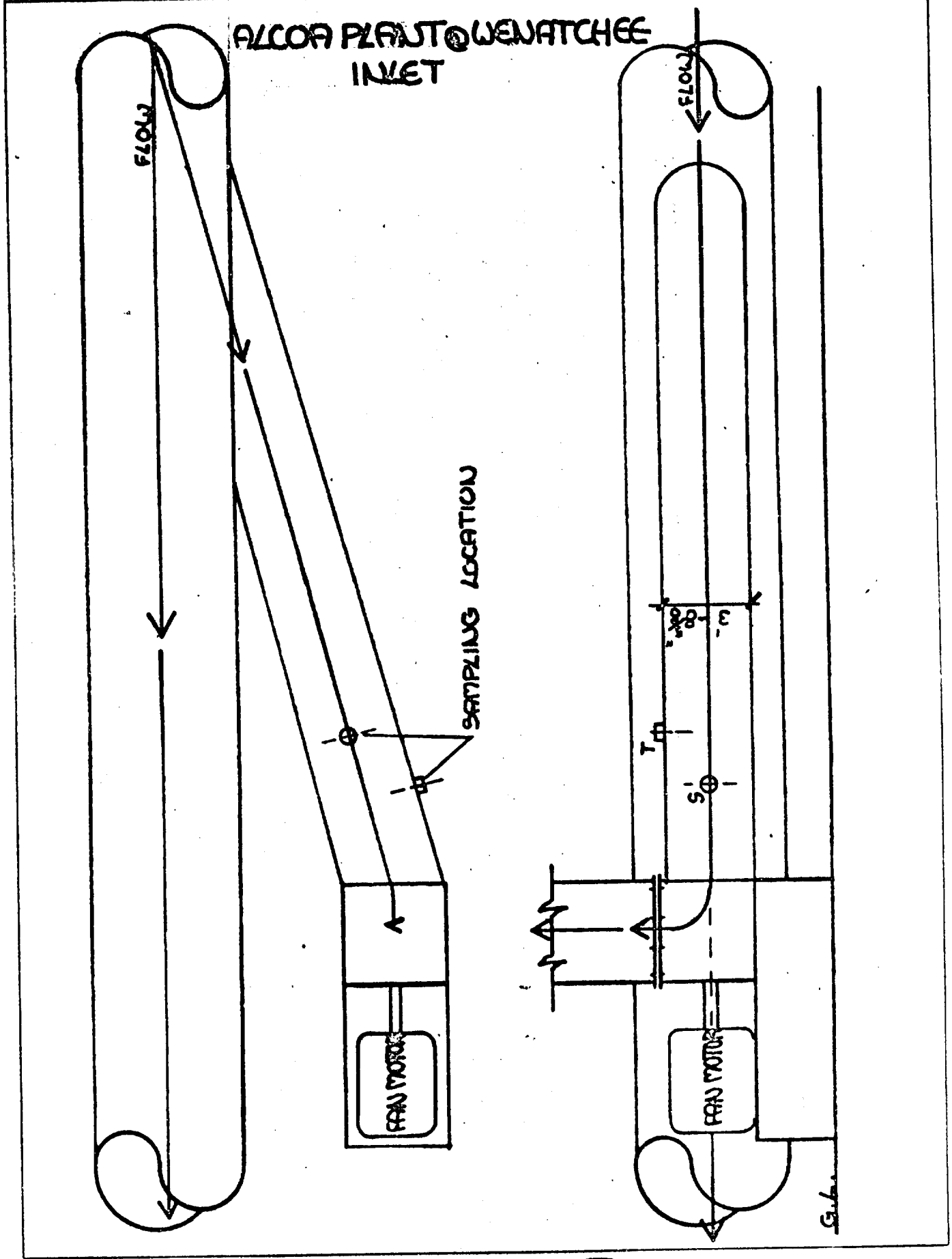
V. SAMPLING POINTS

The inlet sampling ports were located in a round horizontal duct, three (3) feet eight (8) inches in diameter, at least six (6) diameters from any upstream flow interference. Port "T", the top port, was located about five (5) feet from the system induction fan suction and port "S", the side port, was located about four (4) feet from the fan suction. (Port "T" was originally in the same vertical plane as Port "S" but was moved one (1) foot upstream due to lack of overhead clearance for the sampling train.)

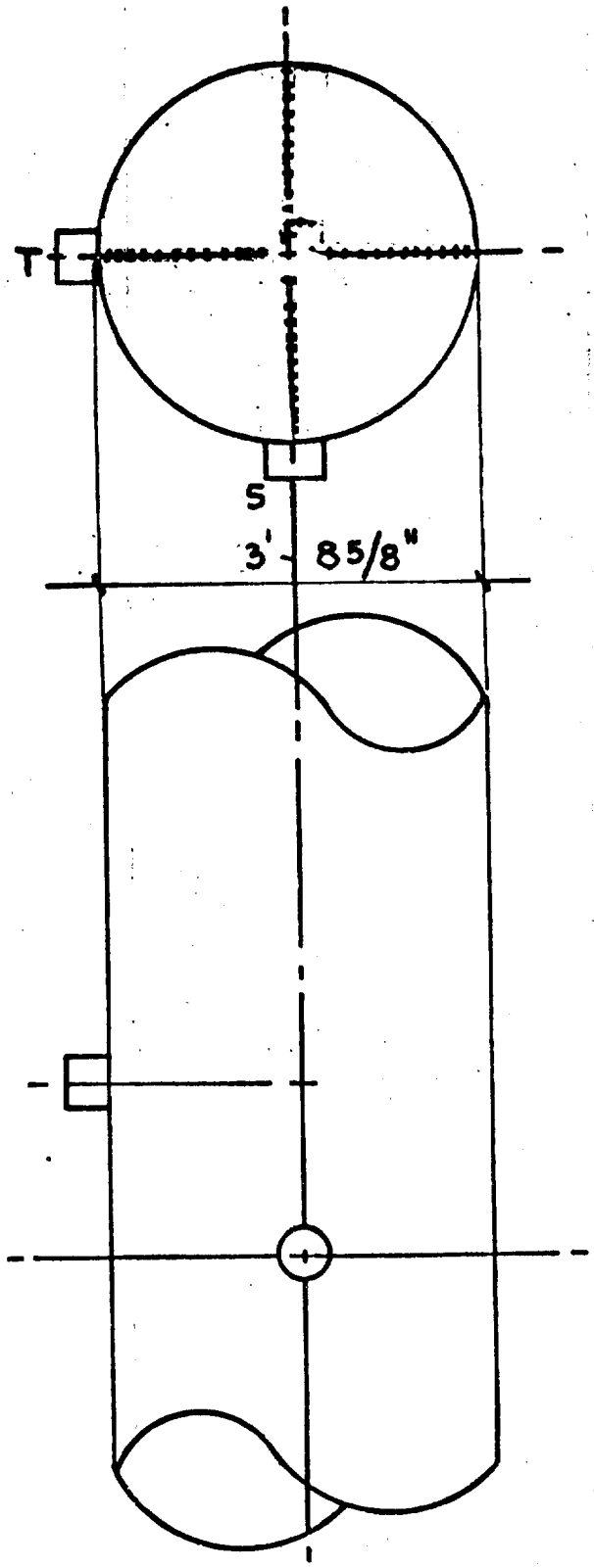
Twenty-four (24) sampling points were used in each port numbered one (1) through twenty-four (24), preceeded by the port letter designation (i.e., T-6). The points started with one (1) being farthest from the port entrance and advancing towards the port. This convention was used in both ports.

The outlet sampling ports were located in a round vertical duct one (1) foot ten (10) inches in diameter. Ports A and B were located on the same horizontal plane five (5) feet above the roof and three (3) feet below the top of the flue.

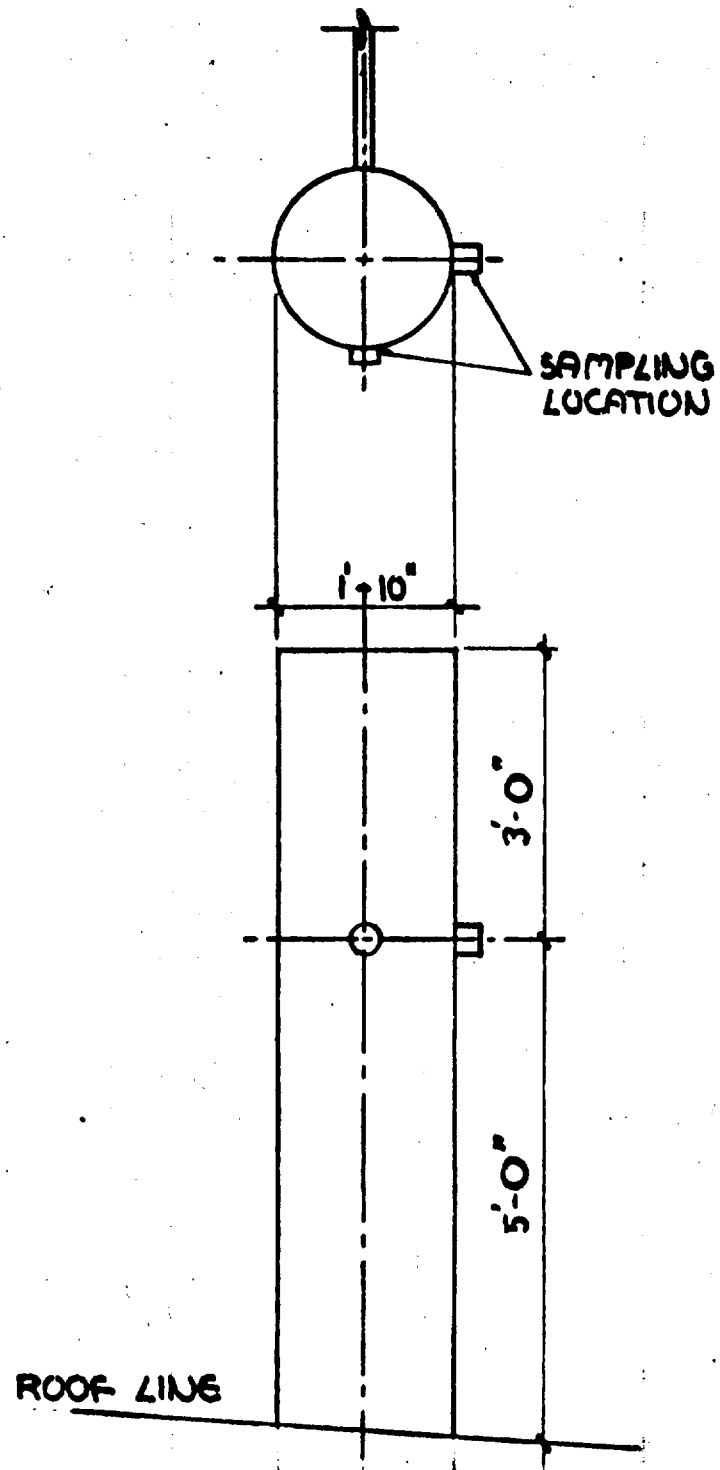
Twenty-two (22) points were used for each port numbered one (1) to twenty-two (22) preceeded by the port letter designation. The same convention was used as on the inlet for point number - duct location position.


ALCOA PLANT @ WENATCHEE
INLET
FLOW
FLOW
SAMPLING LOCATION
FAN MOTOR
FAN MOTOR

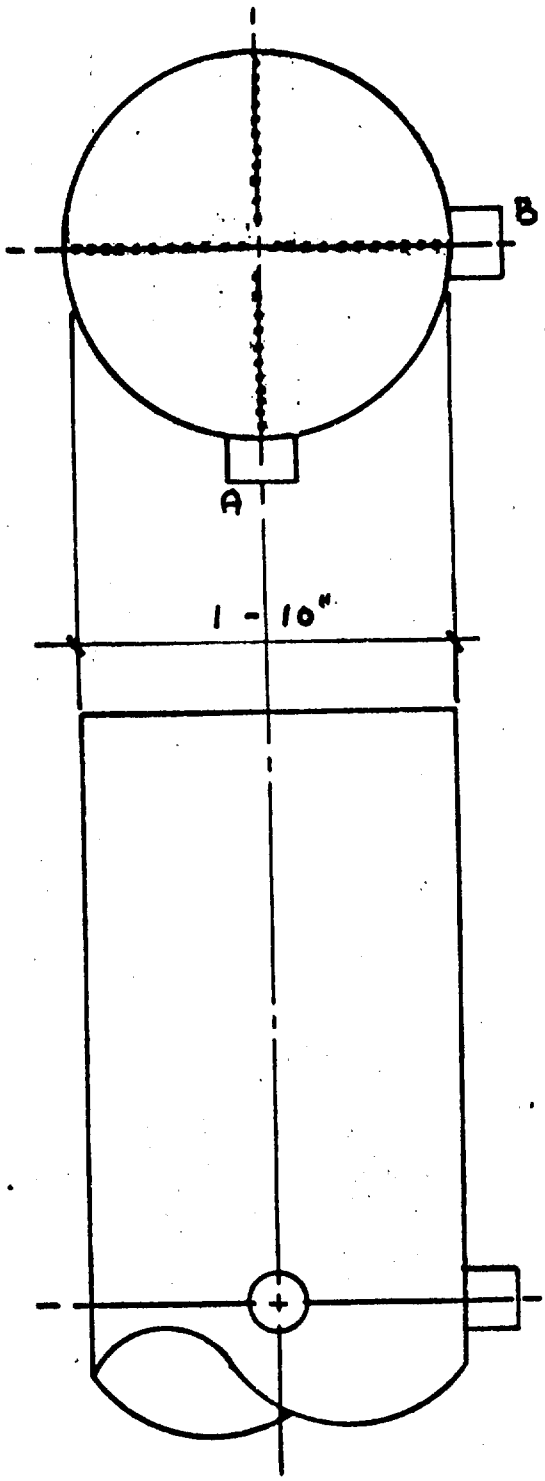
ALCOA PLANT @ WENATCHEE
POINT LOCATIONS ON INLET TRAVERSE



ALCOA PLANT @ WENATCHEE
OUTLET



ALCOA PLANT @ WENATCHEE
POINT LOCATIONS ON OUTLET TRAVERSE



VI. PROCESS OPERATION

Basic process operating parameters are tabulated in the following Tables. This data was supplied to York Research Corporation by the Environmental Protection Agency.

OPERATING DATA

Date:	10/20/71	10/20/71	10/21/71	10/21/71	10/22/71	10/22/71	10/22/71
Time Intervals - From	1015	1253	0920	0958	0735	0742	1315
To	1440	1739	1320	1402	1125	1027	1705
No. of Cells to Test Unit	151	151	151	151	152	152	152
Aluminum produced (lbs/day/cell)	1100	1100	1100	1100	1100	1100	1100
Average Alumina used (lbs/day/cell)	2100	2100	2100	2100	2100	2100	2100
Weight of each anode block (lbs)	235	235	235	235	235	235	235
No. of Crust Breakings during test interval	31	31	27	27	28	24	28
No. of Anodes replaced during test interval	42	40	42	42	42	42	21
No. of Anodes per cell	40	40	40	40	40	40	40

OPERATING DATA

Date:	10/22/71	10/23/71	10/23/71	10/25/71	10/25/71	10/25/71	10/26/71	10/26/71
Time Interval - From:	1428	0725	0732	0756	0810	1415	0810	1255
To:	1706	1115	1016	1052	1155	1800	1200	1640
No. of Cells to Test Unit	152	152	152	152	152	152	153	153
Aluminum produced (lbs/day/cell)	1100	1100	1100	1100	1100	1100	1100	1100
Average Alumina used (lbs/day/cell)	2100	2100	2100	2100	2100	2100	2100	2100
Weight of each anode block (lbs)	235	235	235	235	235	235	235	235
No. of Crust Breakings during test interval	28	25	25	22	25	30	25	24
No. of Anodes replaced during test interval	21	42	42	40	40	38	44	44
No. of Anodes per cell	40	40	40	40	40	40	40	40

VII. SAMPLING AND ANALYTICAL PROCEDURES

BASIC SAMPLING DESCRIPTION

PARTICULATE SAMPLING

Representative particulate samples were collected from the flue gas at the inlet and outlet of the tandem scrubber electrostatic precipitator system. The inlet and outlet were sampled simultaneously for each of three test runs using fiberglass (0.3 micron) and paper (Whatman 541) filter media. In addition, three outlet test runs were performed using membrane (0.45 micron) filters.

TOTAL NITROGEN OXIDES

The samples for total nitrogen oxides were collected in dilute H_2SO_4 - H_2O_2 solution using the evacuated flask technique and analyzed by the phenoldisulphonic acid method. A total of six samples were collected - three at the scrubber inlet and three at scrubber outlet.

SULPHUR DIOXIDE

Samples for sulphur dioxide were aspirated into midget impingers utilizing isopropanol to extract SO_3 and H_2O_2 to absorb the SO_2 as per APCO procedure. A total of six samples were taken - three at the scrubber inlet and three at the wet ESP outlet.

GASEOUS FLUORIDE

Samples for gaseous fluoride were aspirated into midget impingers utilizing two reagent systems. A series of three inlet and three outlet test runs were conducted using water as the reagent. Then a duplicate series of test runs were conducted using 0.1 N NaOH as the reagent. Samples were analyzed by the Spadns-Zirconium Lake Method as presented in the paper by Decker and Smith - Determination of Fluorides in Stack Gas - Spadns Zirconium Lake Method.

ORSAT ANALYSIS

Integrated samples for CO_2, O_2, and CO were collected in leveling bottles over a 60 minute period.

BASIC LABORATORY PROCEDURE

The following paragraphs briefly describe the methods used in the laboratory to obtain the raw data used in the calculations of our results as reported in Section II of this report. For this phase of the work, all analysis of the samples were conducted by EPA in their own laboratory. The results of the analysis were transmitted to York Research and used as the basis for the emission rate calculation.

A. Particulate

The tests are run in the field using a Research Appliance Corporation "Staksampler" particulate train. The clean up is done in the field according to NAPCA. (Section 5.3.6 in the Federal Register). The filter discs were previously tare weighed and recorded at the laboratory. Upon return they are dried, cooled in a dessicator, then weighed on an analytical balance and the amount of particulate collected is the difference in the two weights. The particulate wash solution (taken from the train between the filter disc and nozzle) is placed in a tared beaker, the wash solution is evaporated with an Infra-Red Heat Lamp and the beaker weighed again. The difference in weight is the weight of the particulate in the wash. This is combined with the filter catch as the weight of the sample. Examples of the laboratory report (particulate clean up sheet) can be found in the Appendix.

B. Sulfur Oxides

The isopropanol portion of the sample is used in detection of sulphur trioxide. The isopropanol is transferred to a beaker and diluted to 100 milliliters with H_2O. A suitable aliquot is taken and placed in an Erlenmeyer flask. The volume is then brought to 80 milliliters with isopropyl alcohol and titrated with alcoholic $BaCl_2$. Using thorin indicator, titrate from a yellow to orange color. The volume of thorin indicator used to titrate the sample determines the total milligrams of sulphur in the sample.

The H_2O_2 portion of the sample is diluted with H_2O to 250 milliliters and the same procedure is followed as was used for SO_3 with the exception of the $BaCl_2$ solution not being alcoholic but of H_2O_2 and $BaCl_2$. The amount of sulphur determined is from the SO_2 obtained in that portion of the sample.

C. Oxides of Nitrogen

Samples are collected in nominal 2 liter evacuated flasks (pre-calibrated and numbered for identification) as per EPA approved procedures, in a solution of H_2SO_4 and H_2O_2. In the field, immediately after the sample is taken, it is disconnected from the probe and set aside for sixteen (16) more hours in the flask. It is then thoroughly shaken and a final pressure of the flask is taken via a Mercury "U" tube manometer. The sample is then transferred to a plastic bottle for shipment to the laboratory.

In the laboratory, the amount of nitrogen in the sample is determined by the phenoldisulphonic method. This method is as follows:

The sample is placed in a beaker and NaOH is slowly added until the solution is neutral or slightly basic by litmus paper indication. This solution is then evaporated in the beaker used for neutralization. To the dry residue two (2) milliliters of phenoldisulphonic acid are added and mixed to dampen all the precipitate. Then add two (2) milliliters of H_2O and mix thoroughly; add twenty (20) more milliliters of H_2O and mix. Add concentrated NH_4OH to this solution in excess of neutralizing it. Filter solution if necessary and transfer to a volumetric flask. Using a spectrophotometer at 420 mu, compare results with a standard curve based on standard concentrations, and read milligrams of nitrogen in the sample.

D. Fluorides

Fluorides are collected in an impinger train and determined in the laboratory by a distillation procedure as follows:

Place 400 ml H_2O, 200 ml concentrated H_2SO_4, and about 25 carborundum chips into the boiling flask, and swirl to mix. Caution - the sulfuric acid-water solution should be mixed thoroughly before heat is applied to prevent splattering. Connect the apparatus as shown in Figure 2. Begin heating slowly at first, then rapidly until a temperature of 180°C has been reached. The connection between the boiling flask and condenser must be separated immediately after the heat is removed to prevent suck-back of the sample and for safety reasons. About 300 ml of water should have been distilled over in about 45 minutes. At this point, the apparatus has been flushed free of fluoride and the acid-H_2O ratio has been adjusted. When the flask has cooled to 120°C, the apparatus is ready for the sample.

Add 300 ml of distilled water containing an aliquot of the impinger sample corresponding to 0.5 to 0.9 mg of fluoride to the boiling flask; swirl to mix; and connect the apparatus and distill as before until the distillation temperature reaches 180°C. For distillation of water-soluble particulate fluorides, take a suitable aliquot of the supernatant liquid of the particulate sample, dilute to 300 ml with distilled water, and add to the distillation flask. For distillation of total particulate fluorides, use a suitable aliquot of the water- soluble plus water-insoluble sample. To obtain a representative sample, withdraw an aliquot using a calibrated, sawed-off pipette, immediately after intimate mixing of the sample. In no case should the aliquot contain more than 0.9 mg of fluoride. Distill the sample, as before, until a temperature of 180°C has been reached. Fluoride content of phosphate rock or fertilizer may be determined using these same procedures, provided the approximate percent weight of fluoride in the sample is known so that the still is not overcharged. Weigh out a sample to the nearest 0.1 mg, corresponding to about 0.5 mg of fluoride, dilute to 300 ml with distilled water and distill as before until a temperature of 180°C has been reached. Pipet a suitable aliquot (containing 10 to 40 ug of fluoride) from the distillate and dilute to 50 ml.

Add 10 ml of Spadns reagent, mix thoroughly, and read the absorbance. If the absorbance falls beyond the calibration curve range, repeat the procedure using a smaller aliquot.

CALCULATIONS

$$X = \frac{44.82\ (C)\ (F)}{V_s}$$

where:

C = concentration fluoride in aliquot, mg

F = dilution factor

V_s = volume of gas sampled at 70°F and 29.92 inches Hg, scf

X = ppm fluoride

$$44.82 = \frac{\frac{530°F}{492°F} \times 22.4 \frac{\text{liters}}{\text{mole}} \times 10^6}{19 \frac{g}{\text{mole}} \times 10^3 \frac{mg}{6} \times 28.32 \frac{\text{liters}}{\text{cu.ft.}}}$$

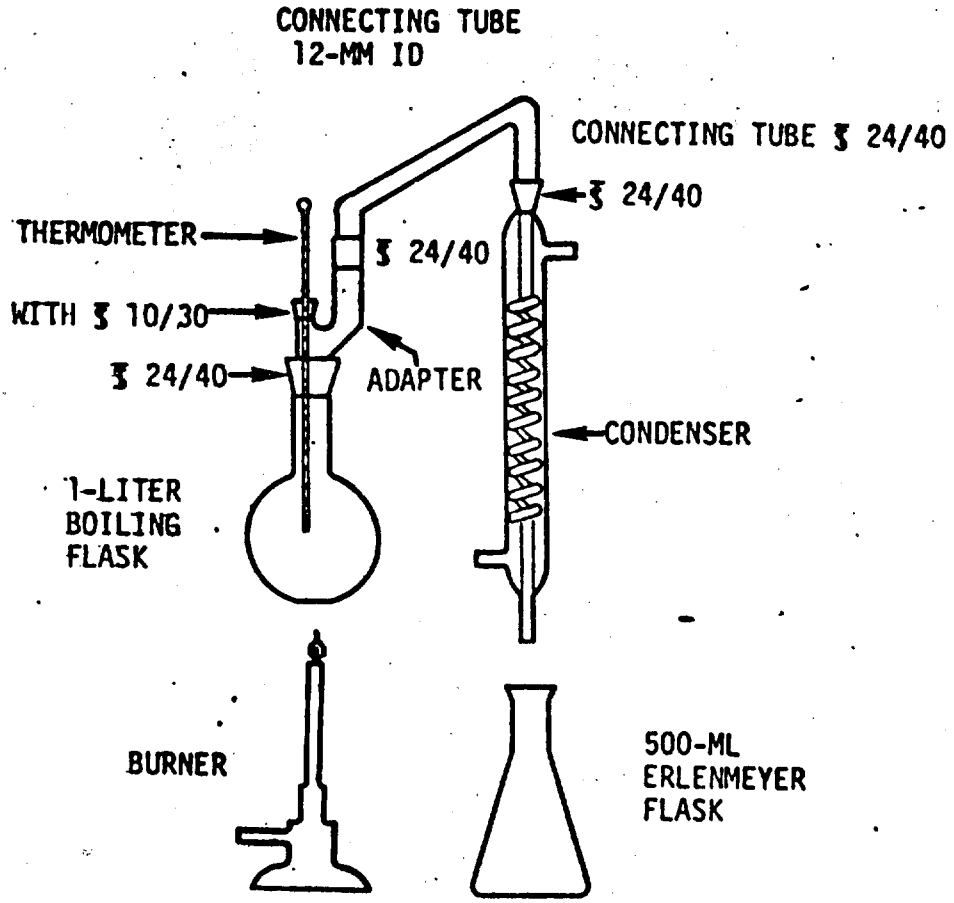


Figure 1. Fluoride distillation apparatus.

Preparation:	Jerold W. Grabiner Environmental Test Engineer
Laboratory Supervision:	Gregory Pantchenko Chief Chemist
Review:	Robert S. Epstein Project Director
Approval:	Abraham J. Kurtz Vice President Environmental Sciences

VIII. APPENDIX

SUMMARY SECTION

To facilitate data correlation, this Section of the report consists of five (5) Tables summarizing the results of the entire test series. More detailed test data will be found in its entirety in other Sections of the Appendix.

TABLE A-1

SUMMARY OF PARTICULATE EMISSIONS USING PAPER FILTERS

Run No.:	1		2		3	
Location:	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Date:	10/20/71	10/20/71	10/21/71	10/21/71	10/22/71	10/22/71
CO%	1.3	1.0	0.8	0.8	0.4	0.6
CO_2%	0.3	0.4	1.1	1.1	1.1	0.3
O_2%	19.5	19.7	19.8	19.8	19.9	20.3
Stack Temperature °F	175	187	176	187	178	194
Stack Velocity-ft/min	3190	2970	3280	3140	3300	3230
Stack Flow Rate-SCFM	31,000	11,700	32,100	12,500	31,600	12,600
Fluoride Emission						
Impinger Solution (gr/SCF)	5.89×10^{-2}	2.75×10^{-5}	5.10×10^{-2}	2.77×10^{-5}	6.44×10^{-2}	1.40×10^{-5}
(lbs/hr)	15.66	2.81×10^{-3}	14.03	3.00×10^{-3}	17.44	1.51×10^{-3}
Total Particulate Emission						
Probe, Cyclone & Filter (gr/SCF)	12.16×10^{-2}	12.61×10^{-3}	17.86×10^{-2}	17.87×10^{-3}	15.14×10^{-2}	22.79×10^{-3}
(Lbs/hr)	32.3	1.26	49.1	1.91	41.0	2.46

TABLE A-II

SUMMARY OF PARTICULATE EMISSIONS USING GLASS FIBER FILTERS

Run No.	1		2		3	
Location:	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Date:	10/22/71	10/22/71	10/23/71	10/23/71	10/25/71	10/25/71
CO%	0.4	0.6	0.8	0.8	0.5	0.7
CO_2%	1.1	0.3	0.5	0.5	0.6	0.6
O_2%	19.9	20.3	19.7	19.7	20.4	20.1
Stack Temperature °f	188	204	174	193	178	196
Stack Velocity-ft/min	3220	3020	3170	3060	3230	3050
Stack Flow Rate-SCFM	30,600	11,600	30,300	11,900	31,000	11,800
Fluoride Emission						
Impinger Solution (gr/SCF)	5.80×10^{-2}	1.76×10^{-5}	5.62×10^{-2}	2.02×10^{-5}	5.42×10^{-2}	1.71×10^{-5}
(Lbs/hr)	15.21	1.74×10^{-3}	14.60	2.02×10^{-3}	14.38	1.77×10^{-3}
Total Particulate Emission						
Probe, Cyclone & Filter (gr/SCF)	0.150	2.04×10^{-2}	0.166	1.20×10^{-2}	0.158	2.12×10^{-2}
(lbs/hr)	39.3	2.03	43.0	1.23	41.9	2.15

TABLE A-III

SUMMARY OF PARTICULATE EMISSIONS USING MEMBRANE FILTERS

Run No.:	1	2	3
Location:	Outlet	Outlet	Outlet
Date:	10/25/71	10/26/71	10/26/71
CO%	0.7	0.6	0.6
CO_2%	0.6	0.5	0.5
O_2%	20.1	20.5	20.5
Stack Temperature °F	196	187	189
Stack Velocity-ft/min	3050	3070	3100
Stack Flow Rate-SCFM	11,800	12,100	12,200
Fluoride Emission			
Impinger Solution (gr/SCF)	2.22×10^{-5}	2.28×10^{-5}	3.69×10^{-5}
(Lbs/hr)	2.24×10^{-3}	2.42×10^{-3}	3.40×10^{-5}
Total Particulate Emission			
Probe, Cyclone & Filter (gr/SCF)	12.11×10^{-3}	13.97×10^{-3}	7.49×10^{-3}
(Lbs/hr)	1.23	1.45	0.78

TABLE A - IV

SUMMARY OF GASEOUS EMISSIONS

Run No.:	1		2		3	
Location:	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Date:	10/21/71	10/22/71	10/21/71	10/22/71	10/21/71	10/22/71
SO_2 ppm	1.4	10.5	4.4	7.2	3.0	10.5
Date:	10/22/71	10/22/71	10/22/71	10/22/71	10/22/71	10/22/71
NO_x ppm	*	*	*	*	*	*
Date:	10/20/71	10/23/71	10/20/71	10/25/71	10/20/71	10/25/71
$\frac{\text{lb. } F^-}{\text{Ton Alum.}}$ (in water)	6.47	.132	5.87	.300	17.98	.233
Date:	10/20/71	10/23/71	10/20/71	10/25/71	10/20/71	10/25/71
$\frac{\text{lb. } F^-}{\text{Ton Alum.}}$ (in .IN NaOH)	6.42	.303	7.28	.227	6.68	.227

*Samples not neutralized with caustic during analytical preparation.

TABLE A - V

SUMMARY OF GASEOUS EMISSIONS

Run No.:	1		2		3	
Location:	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Date:	10/21/71	10/22/71	10/21/71	10/23/71	10/21/71	10/23/71
SO_2 ppm	5.2	9.3	4.2	11.6	4.1	9.9
Date:						
NO_x ppm	-	-	-	-	-	-
Date:		10/23/71				
$\frac{lb.\ F^-}{Ton\ Alum.}$ (in water)		.270				
Date:		10/25/71				
$\frac{lb.\ F^-}{Ton\ Alum.}$ (in .IN NaOH)		.259				

Samples 4, 5 and 6 were additional tests that were performed during testing.

EXAMPLE PARTICULATE CALCULATIONS

The following are the basic equations used in calculating final data as found in the final summary.

1. Volume of dry gas sampled at standard conditions - 70°F 29.92" Hg, ft.^{3}

$$V_{m_{std}} = \frac{17.7 \times V_m \quad P_b + \frac{P_m}{13.6}}{(T_m + 460)} = Ft.^3$$

$$202.399 = \frac{17.7 \times 209.959 \quad 29.55 + \frac{2.54}{13.6}}{86 + 460)}$$

2. Volume of water vapor at 70°F and 29.92" Hg, ft.^{3}

$$V_{w_{gas}} = 0.0474 \times V_w = Ft.^3$$

$$1.185 = 0.0474 \times 25.0$$

3. % Moisture in stack gas

$$\%M = \frac{100 \times V_{w_{gas}}}{V_{m_{std}} + V_{w_{gas}}} = \%$$

$$.58 = \frac{100 \times 1.185}{202.399 + 1.185}$$

4. Mole fraction of dry gas

$$M_d = \frac{100 - \%M}{100}$$

$$.9942 = \frac{100 - .58}{100}$$

5. Average molecular weight of dry stack gas

$$M W_d = (\%\ CO_2 \times \frac{44}{100}) + \%O_2 \times \frac{32}{100}) + (\%N_2 \times \frac{28}{100}) + (\%\ CO \times \frac{28}{100})$$

$$28.49 = (0.3 \times \frac{44}{100}) + (19.5 \times \frac{32}{100}) + (77.9 \times \frac{28}{100}) + (1.3 \times \frac{28}{100})$$

6. Molecular weight of stack gas

$$M W = M W_d \times M_d + 18\ (1 - M_d)$$

$$28.49 = 28.49 \times .9942 + 18\ )1 - .9942)$$

7. Stack velocity at stack conditions, fpm

$$V_s = 4350 \times P_s \times (T_s + 460) \left(\frac{1}{P_s \times M W}\right)^{1/2} = \text{fpm}$$

$$3190 = 4350 \times 21.15 \left(\frac{1}{(29.13 \times 28.49)}\right)^{1/4}$$

8. Stack gas volume at standard conditions, SCFM

$$Q_s = \frac{0.123 \times V_s \times A_s \times M_d \times P_s}{(T_s + 460)} = \text{SCFM}$$

$$31,000 = \frac{0.123 \times 3190 \times 1734 \times .9942 \times 29.13}{(175 + 460)}$$

9. Percent isokinetic

$$\%I = \frac{1032 \times (T_s + 460) \times V_{m_{std}}}{V_s \times T_t \times P_s \times M_d \times (D_n)^2} = \%$$

$$96\% = \frac{1032 \times (175 + 460) \times .202.399}{3190 \times 240 \times 29.13 \times .9942 \times (.25)^2}$$

10. Particulate - probe, cyclone and filter, gr/SCF

$$C_{an} = 0.0154 \times \frac{M_f}{V_{m\ std}} = \text{gr/SCF}$$

$$.1216 = \frac{.0154 \times 1598.9}{202.399}$$

11. Particulate total, gr/SCF

$$C_{ao} = 0.0154 \times \frac{M_+}{V_{m\ std}} = \text{gr/SCF}$$

$$.0589 = \frac{.0154 \times 774.2}{202.399}$$

12. Particulate - probe, cyclone and filter, gr/CF at stack conditions

$$C_{at} = \frac{17.7 \times C_{an} \times P_s \times M_d}{(T_s + 460)} = \text{gr/CF}$$

$$.0982 = \frac{17.7 \times .1216 \times 29.13 \times .9942}{(175 + 460)}$$

13. Particulate - total, gr/CF at stack conditions

$$C_{au} = \frac{17.7 \times C_{ao} \times P_s \times M_d}{(T_s + 460)} = \text{gr/CF}$$

$$.0475 - \frac{17.7 \times .0589 \times 29.13 \times .9942}{(175 + 460)}$$

14. Particulate - probe, cyclone and filter, lb/hr.

$$C_{aw} = 0.00857 \times C_{an} \times Q_s = \text{lb/hr.}$$

$$32.31 = .00857 \times .1216 \times 31000$$

3.89

15. Particulate - total, lb/hr.

$$C_{ax} = 0.00857 \times C_{ao} \times Q_s = \text{lb/hr.}$$

$$15.66 = .00857 \times .0589 \times 31000$$

EXAMPLE GAS CALCULATIONS

$$\text{ppm } NO_2 = \frac{29.63 \times \text{mg } NO_2 \times (T_f + 460)}{V_f \times (P_i - P_f)}$$

$$\text{ppm } SO_2 = \frac{0.7332 \times \text{mg } SO_2 \times (T_m + 460)}{Pb \times V_m}$$

$$\text{ppb } F^- = \frac{2.054 \times \text{mg } F^- \times T_m + 460)}{V_m \times Pb}$$

VELOCITY TRAVERSE DATA

CLIENT ALCOA (WENATCHEE) PAGE 30 OF 147

Location of Test INLET DATE OF TEST 10/16/71

Conditions PRELIMINARY PITOT TRAVERSE TEST NO. —

Personnel — JOB NO. 7730B

Ba. _____ " Hg AMBIENT TEMP. _____ °F STACK AREA — SQ. FT.

MOLECULAR WGT. _____ #/CU. FT.

$$V_s = \frac{2.90 \times F_s}{\sqrt{\frac{29.92}{P_s} \times \frac{28.95}{M.Wgt.} \times \Delta P \times T}}$$

Fs = 1.0 FOR STD. PITOT TUBE
Fs = 0.83 FOR TYPE "S" PITOT TUBE

$$K = \frac{\quad}{\sqrt{\frac{29.92}{\quad} \times \frac{28.95}{\quad}}} = \quad$$

POINT NO.	STACK TEMP. °F	STACK TEMP. °R T = F + 460	STATIC PRESS. Abs.	K	Δp	Δp × T	√Δp × T	VS Ft/Sec.
S 1	200				.148			
2	200				.153			
3	200				.155			
4	200				.161			
5	200				.162			
6	200				.170			
7	200				.170			
8	200				.177			
9	200				.174			
10	200				.181			
11	200				.183			
12	200				.193			
~~TOTAL~~ 13	200				.185			
~~READINGS~~ 14	200				.174			
~~AVE.~~ 15	200				.168			

VELOCITY TRAVERSE DATA

CLIENT ALCOA (WENATCHEE) PAGE 31 OF 147

Location of Test INLET DATE OF TEST 10/18/71

Conditions PRELIMINARY PITOT TRAVERSE TEST NO. —

Personnel — JOB NO. 77303

Ba. ____ " Hg AMBIENT TEMP. — °F STACK AREA — SQ. FT.

MOLECULAR WGT. — #/CU. FT.

$$V_s = \frac{2.90 \times F_s}{\sqrt{\frac{29.92}{P_s} \times \frac{28.95}{M.Wgt.} \times \Delta P \times T}}$$

Fs = 1.0 FOR STD. PITOT TUBE
Fs = 0.83 FOR TYPE "S" PITOT TUBE

$$K = \text{\_\_\_\_} \cdot \sqrt{\frac{29.92}{\text{\_\_\_\_}} \times \frac{28.95}{\text{\_\_\_\_}}} = \text{\_\_\_\_}$$

POINT NO.	STACK TEMP. °F	STACK TEMP. °R T = F + 460	STATIC PRESS. Abs.	K	Δp	Δp × T	√Δp × T	VS Ft/Sec.
16	200				.61			
17	200				.54			
18	200				.46			
19	190				.50			
20	180				.38			
21	115				.45			
22	110				.77			
T 1	190				.70			
2	190				.76			
3	195				.81			
4	195				.87			
~~TOTAL~~ 5	195				.91			
READINGS 6	195				.94			
AVG. 7	195				.97			

VELOCITY TRAVERSE DATA

CLIENT ALCOA (WENATCHEE) PAGE 32 OF 147

Location of Test INLET DATE OF TEST 12/16/71

Conditions PRELIMINARY PITOT TRAVERSE TEST NO. —

Personnel — JOB NO. 7730 B

Ba. _____ " Hg AMBIENT TEMP. — °F STACK AREA — SQ. FT.

MOLECULAR WGT. — #/CU. FT.

$$V_s = \frac{2.90 \times F_s}{\sqrt{\frac{29.92}{P_s} \times \frac{28.95}{M.Wgt.} \times \Delta P \times T}}$$

Fs = 1.0 FOR STD. PITOT TUBE
Fs = 0.83 FOR TYPE "S" PITOT TUBE

$$K = \text{_____} \sqrt{\frac{29.92}{\text{_____}} \times \frac{28.95}{\text{_____}}} = \text{_____}$$

POINT NO.	STACK TEMP. °F	STACK TEMP. °R T = F + 460	STATIC PRESS. Abs.	K	Δp	Δp × T	√Δp × T	VS Ft/Sec.
T 8	195				195			
9	195				195			
10	195				195			
11	195				195			
12	195				195			
13	195				195			
14	195				195			
15	195				195			
16	195				195			
17	195				195			
18	195				195			
19	185				185			
~~TOTAL~~ 20	185				185			
~~READINGS~~ 21	175				175			
AVE. 22	140				140			

VELOCITY TRAVERSE DATA

CLIENT ALCOA (WENATCHEE) PAGE 33 OF 147

Location of Test OUTLET DATE OF TEST 10/18/71

Conditions PRELIMINARY PITOT TRAVERSE. TEST NO. —

Personnel _____ JOB NO. 27308

Ba. — " Hg AMBIENT TEMP. — °F STACK AREA — SQ. FT.

MOLECULAR WGT. — #/CU. FT.

$$Vs = \frac{2.90 \times Fs}{\sqrt{\frac{29.92}{Ps} \times \frac{28.95}{M.Wgt.} \times \Delta P \times T}}$$

Fs = 1.0 FOR STD. PITOT TUBE
Fs = 0.83 FOR TYPE "S" PITOT TUBE

$$K = \_\_\_\_ \sqrt{\frac{29.92}{\_\_\_\_} \times \frac{28.95}{\_\_\_\_}} = \_\_\_\_$$

POINT NO.	STACK TEMP. °F	STACK TEMP. °R T = F + 460	STATIC PRESS. Abs.	K	Δp	Δp × T	√Δp × T	VS Ft/Sec.
N 1	195				.65			
2	200				.75			
3	200				.66			
4	200				.73			
5	200				.67			
6	200				.76			
7	210				.70			
8	210				.73			
9	210				.74			
10	210				.76			
11	210				.76			
12	210				.79			
13	210				.76			
READINGS 14	210				.68			
15	210				.64			

VELOCITY TRAVERSE DATA

CLIENT ALCOA (WENATCHEE) PAGE 34 OF 147

Location of Test OUTLET DATE OF TEST 10/18/71

Conditions PRELIMINARY PITOT TRAVERSE TEST NO. —

Personnel JOB NO. 77303

Ba. — " Hg AMBIENT TEMP. — °F STACK AREA — SQ. FT.

MOLECULAR WGT. — #/CU. FT.

$$Vs = \frac{2.90 \times Fs}{\sqrt{\frac{29.92}{Ps} \times \frac{28.95}{M.Wgt.} \times \Delta P \times T}}$$

Fs = 1.0 FOR STD. PITOT TUBE
Fs = 0.83 FOR TYPE "S" PITOT TUBE

$$K = \text{\_\_\_\_\_} \sqrt{\frac{29.92}{\text{\_\_\_\_\_}} \times \frac{28.95}{\text{\_\_\_\_\_}}} = \text{\_\_\_\_\_}$$

POINT NO.	STACK TEMP. °F	STACK TEMP. °R T = F + 460	STATIC PRESS. Abs.	K	Δp	Δp × T	√Δp × T	VS Ft/Sec.
N 16	200				.58			
17	200				.63			
18	200				.57			
19	200				.57			
20	200				.46			
21	200				.43			
22	200				0			
E 1	190				.56			
2	210				.67			
3	210				.69			
4	210				.73			
~~TRAV~~ 5	210				.73			
~~READINGS~~ 6	210				.77			
MID. 7	210				.77			

VELOCITY TRAVERSE DATA

CLIENT Alcia (Wenatchee) PAGE 35 OF 147

Location of Test Outlet DATE OF TEST 10/16/71

Conditions Preliminary Pitot Traverse TEST NO. —

Personnel _____ JOB NO. 7730b

Ba. — " Hg AMBIENT TEMP. — °F STACK AREA — SQ. FT.

MOLECULAR WGT. — #/CU. FT.

$$Vs = \frac{2.90 \times Fs}{\sqrt{\frac{29.92}{Ps} \times \frac{28.95}{M.Wgt.} \times \Delta P \times T}}$$

Fs = 1.0 FOR STD. PITOT TUBE
Fs = 0.83 FOR TYPE "S" PITOT TUBE

$$K = \frac{\quad}{\sqrt{\frac{29.92}{\quad} \times \frac{28.95}{\quad}}} = \quad$$

POINT NO.	STACK TEMP. °F	STACK TEMP. °R T = F + 460	STATIC PRESS. Abs.	K	Δp	Δp × T	√Δp × T	VS Ft/Sec.
E 8	210				.125			
9	210				.84			
10	210				.80			
11	210				.80			
12	210				.64			
13	210				.62			
14	210				.56			
15	210				.52			
16	210				.52			
17	210				.48			
18	210				.50			
19	210				.45			
~~RECAL~~ 20	210				.46			
~~RECALCS~~ 21	200				.40			
~~RECAL~~ 22	200				.36			

SOURCE TESTING CALCULATION FORMS

Test No. Paper Filter No. Runs 3

Name of Firm ALCOA

Location of Plant Wenatchee, Wash

Type of Plant Alum. Reduction

Control Equipment

Sampling Point Locations INLET

Pollutants Sampled

Time of Particulate Test:

Run No.	1	Date	10/20/71	Begin	1253	End	1739
Run No.	2	Date	10/21/71	Begin	0958	End	1402
Run No.	3	Date	10/22/71	Begin	0742	End	1027

PARTICULATE EMISSION DATA

Run No.	1			
P_b barometric pressure, "Hg Absolute	29.55	29.77	29.54	
P_m orifice pressure drop, "H_2O	2.54	1.02	.89	
V_m volume of dry gas sampled @ meter conditions, ft.^{3}	209.959	80.176	76.727	
T_m Average Gas Meter Temperature, °F	86	88	80	
V_m Volume of Dry Gas Sampled @ Standard std. conditions, ft.^{3}	202.399	77.267	74.456	
V_w Total H_2O collected, ml., Impingers & Silica Gel.	25.0	10.8	18.2	
V_w Volume of Water Vapor Collected gas ft.^{3} @ Standard Conditions*	1.185	.512	.863	

* 70°F, 29.92" Hg.

PARTICULATE EMISSION DATA (cont'd)

Run No.	1	2	3	
%M - % Moisture in the stack gas by volume	.58	.66	1.15	
M_d - Mole fraction of dry gas	.9942	.9934	.9885	
% CO	1.3	.8	0.4	
% CO_2	0.3	1.1	1.1	
% O_2	19.5	19.8	19.9	
% N_2	77.9	78.3	78.6	
M W $_d$ - Molecular weight of dry stack gas	28.55	28.77	28.77	
M W - Molecular weight of stack gas	28.49	28.70	28.84	
Δ Ps - Velocity Head of stack gas, In. H_2O	.713	.802	.769	
T_s - Stack Temperature, °F	175	176	178	
$\sqrt{\Delta P_s X (T_s+460)}$	21.15	21.95	22.01	
P_s - Stack Pressure, "Hg. Absolute	29.13	29.35	29.12	
V_s - Stack Velocity @ stack conditions, fpm	3190.	3280.	3300.	
A_s - Stack Area, $in.^2$	1734	1734	1734	
Q_s - Stack Gas Volume @ Standard Conditions, *SCFM	31000.	32100.	31600.	
T_t - Net Time of Test, min.	240	144	144	
D_n - Sampling Nozzle Diameter, in.	1/4	1/4 / 3/16	3/16	
%I - Percent isokinetic	96	93,101	102	
m_f - Particulate - Front Half Mass probe, cyclone and filter, mg.	1598.8	896.3	759.9	
m_t - Particulate - Back Half Flouride mg.	774.2	256.0	311.3	
C_{an} - Particulate - Front Half Mass probe, cyclone, and filter, gr/SCF	.1216	.1786	.1514	
C_{ao} - Particulate - Back Half Flouride gr/SCF	.0589	.0510	.0644	
C_{at} - Particulate - Front Half Mass probe, cyclone, and filter gr/cf @ stack conditions	.0982	.1449	.1209	

PARTICULATE EMISSION DATA (cont'd)

Run No.	1	2	3	
C_{au} - Particulate, Back Half Flouride gr/cf @ stack cond.	.0475	.0414	.0514	
C_{aw} - Particulate, front half Mass probe, cyclone, and filter, lb/hr.	32.31	49.13	41.00	
C_{ax} - Particulate - Back Half Flouride lb/hr.	15.66	14.03	17.44	
%EA - % Excess air @ sampling point	—	—	—	

* 70°F. 29.92" Hg.

Plant ALCOA - WENATCHEE

Run No. 1 Paper Filter

Location INLET UNIT #3

Date 10/20/71

Operator

Sample Box No.

Meter Box No. 557

Meter H 1.90

C Factor 1.10

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filters
PS-91
PS-80
PS-72
PS-102

Ambient Temp °F 55°

Bar. Press. "Hg 27.55

Assumed Moisture % 27.

Heater Box Setting, °F 250°

Probe Tip Dia., In. 1/4"

Probe Length 5'

Probe Heater Setting

Avg. ΔP — Avg. ΔH 2.50

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in. Hg	Stack Temp °F
START	1253	409.124	—	—	—	—	—	—	—	—		—
T 1	1258	414.0	.85	3.00	3.00	75	68	11.0	200	50		195
2	1303	418.3	.87	3.05	3.05	78	68	11.0	200	60		195
3	1308	422.2	.88	3.10	3.10	79	68	12.5	200	60		195
4	1313	427.2	.95	3.30	3.30	82	68	14.0	200	70		195
5	1318	432.2	.95	3.30	3.30	90	70	14.5	210	75		195
6	1323	437.2	1.02	3.60	3.60	93	72	16.0	210	80		200
7	1328	442.2	.78	3.45	3.45	95	75	17.0	210	80		200
8	1333	447.65	.91	3.20	3.20	90	74	16.0	215	80		200
9	1338	452.4	.90	3.10	3.10	92	74	15.0	215	80		200
10	1343	457.8	.91	3.20	3.20	93	75	15.0	200	65		200
11	1348	462.45	.96	3.35	3.35	95	75	16.0	210	65		195
12	1353	467.60	.95	3.30	3.30	90	75	16.0	210	65		195
13	1358	472.70	.92	3.20	3.20	87	74	16.0	215	65		195
14	1403	477.2	.89	3.10	3.10	88	74	16.0	215	65		195
15	1408	482.3	.81	2.80	2.80	88	74	14.0	215	65		195

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
16	1413	486.9	.78	2.70	2.70	86	73	14.0	215	65		175
17	1418	491.6	.74	2.60	2.60	84	73	13.5	215	65		170
18	1423	496.2	.75	2.65	2.65	85	73	14.0	215	65		170
19	1428	500.5	.65	2.40	2.40	85	73	13.0	215	65		170
20	1433	504.6	.60	2.10	2.10	84	77	11.5	215	65		165
21	1438	508.5	.52	2.00	2.00	86	73	11.5	215	65		150
22	1443	512.4	.53	1.85	1.85	87	73	11.0	215	65		150
23	1448	516.0	.47	1.75	1.75	84	74	10.5	215	65		150
24	1453	520.398	.56	2.00	2.00	84	74	11.0	215	65		150
		111.284										
START	1524	520.916	—	—	—	—	—	—	—	—		—
S-1	1529	524.18	.54	1.90	1.90	79	73	10.0	225	55		190
2	1534	527.95	.54	1.90	1.90	86	73	10.5	235	55		190
3	1539	531.79	.55	1.95	1.96	93	74	11.0	250	60		190
4	1544	535.78	.60	2.10	2.10	99	78	12.0	250	60		190
5	1549	539.69	.58	2.05	2.05	102	78	12.0	260	60		185
6	1554	543.00	.65	2.30	2.30	106	80	14.0	265	65		185
7	1559	546.85	.65	2.30	2.30	109	80	15.0	255	65		185
8	1604	550.80	.71	2.50	2.50	112	82	16.0	250	70		185
9	1609	554.83	.70	2.45	2.45	113	84	17.0	265	70		185
10	1614	561.23	.80	2.90	2.90	114	85	21.0	255	70		190
11	1619	566.75	.82	2.85	2.85	116	86	21.0	266	70		190
12	1624	571.408	.93	3.20	3.20	116	88	22.0	250	70		190
13	1644	576.96	.85	2.95	2.95	99	82	11.0	315	65		190
14	1649	581.00	.72	2.50	2.50	106	83	13.5	260	60		190
15	1654	585.33	.65	2.30	2.30	108	83	13.0	250	55		190
16	1659	589.38	.55	1.95	1.95	107	83	11.0	255	70		190
17	1704	593.45	.60	2.10	2.10	106	83	11.0	310	70		190
18	1709	597.47	.55	1.95	1.95	105	83	11.5	250	60		185
19	1714	601.07	.46	1.60	1.60	104	83	9.0	255	60		185
20	1719	604.63	.45	1.60	1.60	103	83	9.5	260	60		185
21	1724	608.10	.43	1.55	1.55	102	83	9.5	260	60		150
22	1729	611.70	.55	1.95	1.95	103	83	12.0	260	65		150
23	1734	615.57	.45	1.60	1.60	103	84	11.0	260	65		150
24	1739	619.171	.47	1.65	1.65	108	85	11.0	260	65		150

Date: 20 OCT 71 Plant: ALCOA - WENATCHEE

Run Number: 1 Location of sample port: INLET

Operator: PAPER Filter Barometric Pressure: 29.55

Sample Box Number: Ambient Temperature:

Impinger H_2O

Volume after sampling 161 ml Container No. Ether-chloroform extraction of impinger water mg

Impinger prefilled with 200 ml Extra No. Impinger water residue mg

Volume Collected -36 ml

Impingers and back half of filter, acetone wash: Container No. Extra No. Weight results mg

Dry probe and cyclone catch: Container No. Extra No. Weight results mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. Extra No. Weight results mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight mg

Total particulate weight mg

Silica Gel

Weight after test:	361.0			
Weight before test:	300.0			
Moisture weight collected:	61.0			
Container Number:	1.	2.	3.	4.

61.0
-36.0

Moisture Total 25.0 gm

Sample Number: Analyze for:

Method determination:

Comments:

JOB NO. Y-7730-B

PARTICULATE FIELD DATA

Plant ALCOA - WENATCHEE

Run No. 2 - Paper Filter

Location INLET UNIT #3

Date 10/21/71

Operator

Sample Box No.

Meter Box No. 557

Meter H 1.90

C Factor 1.10

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filters
PS-93
PS-103
PS-82
PS-118
PS-85
PS-101

Ambient Temp °F 45°

Bar. Press. "Hg 29.77

Assumed Moisture % 2

Heater Box Setting, °F 250

Probe Tip Dia., In. 1/4", 3/16"

Probe Length 5'

Probe Heater Setting 607

Avg. ΔP Avg. ΔH .99

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in. Hg	Stack Temp °F
				Desired	Actual	Inlet	Outlet					
START	0958	620.687	—	—	—	—	—	—	—	—	—	—
1	1001	623.2	.80	2.75	2.75	57	50	14.0	200	50		180
2	1004	625.940	.90	3.10	2.60	66	52	22.0	225	50		180
2 start	1021	626.040	—	—	—	—	—	—	—	—		—
3	1024	628.663	.91	3.20	2.50	66	56	23.0	300	60		175
3 start	1129	632.492	—	—	—	—	—	—	—	—	—	—
4	1132	639.10	1.00	1.15	1.15	73	73	3.0	310	65		195
5	1135	641.00	1.04	1.20	1.20	62	74	6.0	225	60		195
6	1138	642.90	1.10	1.25	1.26	90	75	7.0	230	55		195
7	1141	644.75	1.10	1.25	1.25	93	76	8.0	235	55		195
8	1144	646.55	1.05	1.20	1.20	97	75	8.0	240	55		195
9	1147	648.40	1.05	1.20	1.20	98	78	9.0	250	60		190
10	1150	650.15	1.10	1.25	1.25	100	80	10.0	250	60		190
11	1153	652.10	1.10	1.25	1.25	103	80	10.0	350	60		190
12	1156	654.20	1.05	1.20	1.20	104	91	10.5	240	55		190
13	1159	656.20	.95	1.10	1.10	105	83	10.5	250	60		190

JOB NO. Y-7730-B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger, Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
1-14	1302	652.65	.95	1.10	1.10	106	83	10.5	250	60		190
15	1305	659.35	.84	.98	.98	106	82	10.0	250	60		190
16	1308	661.00	.80	.93	.93	106	84	10.0	250	60		195
17	1311	662.75	.78	.91	.91	106	84	10.0	250	60		180
18	1314	664.30	.78	.91	.91	106	84	10.0	250	60		190
19	1317	666.00	.65	.77	.77	106	85	11.0	250	60		175
20	1320	667.70	.65	.77	.77	106	85	11.0	250	60		170
21	1323	669.00	.60	.71	.71	106	86	10.0	250	60		160
22	1326	670.65	.55	.65	65	104	86	10.0	250	60		160
23	1327	671.75	.55	.65	.65	104	86	10.0	250	60		110
24	1332	673.327	.55	.65	.65	101	86	10.0	250	60		105
START	1350	673.327	—	—	—	—	—	—	—	—		—
2-1	1353	674.70	.65	.65	.65	77	77	9.0	240	65		120
2	1356	676.15	.60	.70	.70	90	78	10.5	245	70		185
3	1359	677.67	.63	.74	.74	84	77	11.5	250	65		170
4	1402	679.12	.63	.74	.74	87	77	13.0	255	65		185
5	1405	680.66	.68	.80	.80	90	77	13.0	255	65		185
6	1408	682.22	.70	.82	.82	92	77	14.0	255	55		190
7	1411	683.89	.73	.85	.85	94	78	14.5	260	70		190
8	1414	685.44	.75	.88	.88	97	79	15.0	260	70		190
9	1417	687.10	.80	.93	.93	99	79	16.5	265	75		190
10	1420	688.79	.87	1.00	1.00	101	80	17.0	265	75		190
11	1423	690.52	.90	1.03	1.05	102	80	19.0	260	75		190
12	1426	692.30	1.10	1.25	1.25	104	81	20.0	250	80		190
13	1429	694.00	.90	.97	.93	105	81	20.0	250	80		190
14	1432	695.65	.77	.85	.85	105	82	18.0	265	80		190
15	1435	697.22	.68	.80	.80	106	83	17.0	265	90		190
16	1438	698.75	.63	.74	.74	107	83	17.0	265	90		190
17	1441	700.25	.60	.71	.71	106	85	16.5	265	85		195
18	1444	701.62	.50	.59	.59	106	85	15.0	250	75		170
19	1447	702.76	.50	.59	.59	106	85	14.5	255	75		170
20	1450	704.35	.45	.53	.53	105	85	14.0	255	75		170
21	1453	705.63	.50	.59	.59	105	86	15.0	255	75		170
22	1456	706.94	.50	.59	.59	105	86	15.0	255	75		130
23	1459	708.35	.60	.71	.71	105	86	15.0	255	75		130
24	1502	709.792	.60	.71	.71	105	86	16.0	255	75		130
		80.176										
	1444 hr											

PARTICULATE CLEANUP SHEET

Date: 21 OCT 71 Plant: ALCOA - WENATCHEE

Run Number: 2 Location of sample port: INLET

Operator: PAPER F. Iter Barometric Pressure: 28.77

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 177 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected -23 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	333.8				+33.8 −33.0
Weight before test:	300.0				
Moisture weight collected:	33.8				Moisture Total 10.8 gm
Container Number:	1.	2.	3.	4.	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

JOB NO. Y-7730-B

PARTICULATE FIELD DATA

Plant ALCOA WENATCHEE

Run No. 3 - Pope - Filter

Location INLET UNIT # 3

Date 10/22/71

Operator

Sample Box No.

Meter Box No. 557

Meter H 1.90

C Factor 1.10

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filters
PS-115
PS-119
PS-78
PS-97

Ambient Temp °F 50°

Bar. Press. "Hg 29.54

Assumed Moisture % 27.

Heater Box Setting, °F 250°

Probe Tip Dia., In. 3/16"

Probe Length 6'

Probe Heater Setting 607

Avg. ΔP Avg. ΔH .89

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in. Hg	Stack Temp °F
				Desired	Actual	Inlet	Outlet					
START	0742	710.436	—	—	—	—	—	—	—	—		—
1	0745	712.00	.83	.96	.96	63	60	4.0	200	55		190
2	0748	713.13	.90	1.05	1.05	68	60	7.0	200	55		190
3	0751	715.40	.93	1.08	1.08	72	62	8.0	200	55		190
4	0754	717.00	.90	1.05	1.05	77	62	8.5	200	55		190
5	0757	718.75	.95	1.10	1.10	79	64	9.0	200	55		195
6	0800	720.50	.95	1.10	1.10	81	64	10.0	205	55		195
7	0803	722.30	1.00	1.15	1.15	84	66	11.0	225	55		195
8	0806	725.00	1.10	1.25	1.25	85	66	12.0	235	55		190
9	0809	726.90	1.10	1.25	1.25	89	68	13.0	250	60		190
10	0812	728.70	1.10	1.25	1.25	90	69	14.0	250	60		190
11	0815	729.60	1.05	1.20	1.20	92	70	15.0	255	60		195
12	0818	731.35	.95	1.10	1.10	93	71	15.0	255	65		190
13	0821	733.00	.95	1.10	1.10	95	72	15.0	255	65		190
14	0824	734.75	.88	1.02	1.01	96	72	15.0	255	65		195
15	0827	736.50	.95	.98	.98	97	74	15.0	255	65		190

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
T-16	0830	736.10	.80	.93	.93	98	74	15.0	255	65		[illegible]
17	0833	739.90	.80	.93	.93	97	75	15.0	255	65		[illegible]
18	0836	741.45	.78	.91	.91	96	75	15.5	255	65		[illegible]
19	0839	742.95	.75	.88	.88	97	76	15-5	255	65		175
20	0842	744.50	.55	.65	.65	96	76	13.0	255	65		175
21	0845	745.80	.55	.65	.65	95	76	13.0	255	65		180
22	0848	742.35	.55	.65	.65	95	76	13.0	255	65		175
23	0851	748.71	.55	.65	.65	94	76	13.0	255	65		175
24	0854	750.144	.58	.65	.65	94	76	14.0	255	65		175
Start	0915	750.144	—	—	—	—	—	—	—	—		—
S-1	0918	751.56	.55	.65	.65	68	70	3.0	220	55		190
2	0921	753.00	.62	.72	.72	72	70	6.0	225	55		190
3	0924	754.52	.65	.78	.78	77	70	7.0	235	50		190
4	0927	756.00	.60	.71	.71	41	71	7.0	235	50		195
5	0930	757.54	.70	.82	.82	84	72	8.0	245	50		195
6	0933	759.10	.67	.80	.80	86	72	8.5	250	50		195
7	0936	760.68	.75	.92	.87	55	72	9.5	250	55		195
8	0939	762.30	.78	.90	.90	86	72	10.0	250	55		190
9	0942	763.90	.75	.87	.87	88	72	10.0	250	60		190
10	0945	765.60	.85	.98	.98	90	73	12.0	255	60		190
11	0948	767.25	.70	1.02	1.02	90	73	12.5	255	60		190
12	0951	769.20	1.05	1.20	1.20	91	73	16.5	255	50		190
13	0954	771.20	.95	1.10	1.10	93	73	15.0	250	55		190
14	0957	773.20	.85	.99	.99	94	74	14.5	250	55		190
15	1000	774.35	.73	.85	.85	94	74	13.0	255	55		190
16	1003	775.90	.68	.80	.80	93	74	11.5	255	55		190
17	1006	777.40	.63	.74	.74	92	75	12.0	255	55		190
18	1009	778.90	.60	.71	.71	91	74	12.0	245	55		190
19	1012	780.25	.50	.59	.59	90	74	11.0	250	60		190
20	1015	781.52	.50	.59	.59	90	74	11.0	250	60		190
21	1018	783.00	.53	.63	.63	90	75	11.0	250	60		185
22	1021	784.33	.56	.66	.66	90	75	12.0	250	60		190
23	1024	785.73	.56	.66	.66	90	75	12.0	250	60		195
24	1027	787.163	.58	.68	.68	92	76	13.0	250	60		195
	144											

PARTICULATE CLEANUP SHEET

Date: 22 OCT 71 Plant: ALCOA - WENATCHEE

Run Number: 3 Location of sample port: INLET

Operator: PAPER FILTER Barometric Pressure: 29.54

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 195 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected - 5 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	323.2	____	____	____	* 23.2 - 5.0
Weight before test:	300.0	____	____	____	
Moisture weight collected:	23.2	____	____	____	Moisture Total 18.2 gm
Container Number:	1. ____	2. ____	3. ____	4. ____	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

SOURCE TESTING CALCULATION FORMS

Test No. PAPER Filter No. Runs 3

Name of Firm ALCOA -

Location of Plant WENATCHEE, WASH

Type of Plant ALUM. REDUCTION

Control Equipment

Sampling Point Locations OUTLET

Pollutants Sampled

Time of Particulate Test:

Run No.	1	Date	20 OCT 71	Begin	1015	End	1440
Run No.	2	Date	21 OCT 71	Begin	0920	End	1320
Run No.	3	Date	22 OCT 71	Begin	0735	End	1125

PARTICULATE EMISSION DATA

Run No.	1	2	3	
P_b barometric pressure, "Hg Absolute	29.55	29.77	29.54	
P_m orifice pressure drop, "H_2O	.881	.824	.854	
V_m volume of dry gas sampled @ meter conditions, ft.^{3}	115.834	112.800	113.287	
T_m Average Gas Meter Temperature, °F	82	75	78	
V_m Volume of Dry Gas Sampled @ Standard std. conditions, ft.^{3}	112.026	111.324	110.331	
V_w Total H_2O collected, ml., Impingers & Silica Gel.	13.5	18.2	17.4	
V_w gas Volume of Water Vapor Collected ft.^{3} @ Standard Conditions*	.640	.863	.825	

* 70°F, 29.92" Hg.

PARTICULATE EMISSION DATA (cont'd)

Paper Filter - Outlet

	1	2	3	
Run No.				
%M - % Moisture in the stack gas by volume	.57	.77	.74	
M_d - Mole fraction of dry gas	.9943	.9923	.9926	
% CO	1.0	0.8	0.6	
% CO_2	0.4	1.1	0.3	
% O_2	19.7	19.8	20.3	
% N_2	78.9	78.3	78.8	
M W d - Molecular weight of dry stack gas	28.85	28.97	28.86	
M W - Molecular weight of stack gas	28.79	28.89	28.78	
Δ Ps - Velocity Head of stack gas, In. H_2O	.684	.70	.725	
T_s - Stack Temperature, °F	187	187	194	
$\sqrt{\Delta P_s X (T_s+460)}$	19.91	21.16	21.68	
P_s - Stack Pressure, "Hg. Absolute	29.58	29.80	29.57	
V_s - Stack Velocity @ stack conditions, fpm	29.70.	3140.	3230.	
A_s - Stack Area, $in.^2$	707	707	707	
Q_s - Stack Gas Volume @ Standard Conditions, *SCFM	11,700.	12,500.	12,600.	
T_t - Net Time of Test, min.	220	220	220	
D_n - Sampling Nozzle Diameter, in.	3/16	3/16	3/16	
%I - Percent isokinetic	111	104	102	
m_f - Front half Mass Particulate - probe, cyclone and filter, mg.	91.7	129.2	163.3	
m_t - Back half Flouride Particulate - mg.	0.2	0.2	0.1	
C_{an} - Front half Mass. Particulate - probe, cyclone, and filter, gr/SCF	0.01261	0.01787	0.2279	
C_{ao} - Back half Flouride Particulate - gr/SCF	.000275	.000277	.000140	
C_{at} - Particulate - probe, cyclone, and filter gr/cf @ stack conditions	.01014	.01445	.01811	

PARTICULATE EMISSION DATA (cont'd)

Paper Filter - Outlet

Run No.	1	2	3	
C_{au} - Particulate, Back half Flouride gr/cf @ stack cond.	.0000221	.0000224	.0000111	
C_{aw} - Particulate, probe, cyclone, Front half Mass and filter, lb/hr.	1.264	1.914	2.861	
C_{ax} - Particulate - Back half Flouride lb/hr.	.00281	.00300	.00151	
%EA - % Excess air @ sampling point	—	—	—	

* 70°F. 29.92" Hg.

JOB NO Y-7730-B PARTICULATE FIELD DATA

Plant ALCOA - Wenatchee, Wash

Run No. 1 Paper Filter

Location Outlet

Date 20 oct 71

Operator

Sample Box No.

Meter Box No.

Meter H 1.89

C Factor 1.15

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filter

Ps-38

Ambient Temp °F 60

Bar. Press. "Hg 29.55

Assumed Moisture % 27

Heater Box Setting, °F

Probe Tip Dia., In. .1875

Probe Length 5 ft

Probe Heater Setting 557

Avg. ΔP Avg. ΔH .860

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in. Hg	Stack Temp °F
A-1	1015	316.998	.65	.84	.84	53	56	2.0	200	60°		190°
2	1020	319.48	.70	.90	.90	59	58	2.0	240	60		185
3	1025	321.98	.80	1.02	1.02	64	56	2.5	240	60		185
4	1030	323.13	.78	1.0	1.0	73	59	2.0	240	60		180
5	1035	327.82	.76	.98	.98	74	60	2.0	240	60		180
6	1040	330.67	.78	1.0	1.0	78	62	2.5	250	60		180
7	1045	330.00	.79	1.0	1.0	78	62	2.5	250	60		185
8	1050	336.05	.80	1.02	1.02	79	64	3.0	250	60		185
9	1055	338.40	.82	1.05	1.05	84	66	3.5	230	60		190
10	1100	341.70	.85	1.1	1.1	84	68	4.0	240	60		190
11	1105	344.67	.85	1.1	1.1	85	68	4.0	250	60		190
12	1110	347.50	.84	1.07	1.07	54	69	4.5	250	60		190
13	1115	350.35	.80	1.02	1.02	88	70	4.5	250	60		190
14	1120	353.25	.78	1.0	1.0	89	72	4.5	230	60		190
15	1125	356.20	.76	.98	.98	90	74	4.5	240	60		180
16	1130	358.75	.70	.90	.90	90	75	4.0	250	60		190

JOB NO. Y-7730-13

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
A-17	1135	361.43	.69	.88	.88	85	74	4.0	230	60		170
18	1140	364.15	.65	.85	.85	84	74	4.0	250	60		185
19	1145	366.90	.61	.79	.79	85	72	4.5	250	60		180
20	1150	369.25	.59	.75	.75	86	76	4.0	250	60		180
21	1155	371.20	.43	.55	.55	87	76	4.0	250	60		180
22	1200	373.90	.45	.58	.58	88	76	4.0	240	60		190
Pmtl	1205	375.999	—	—	—	—	—	—	—	—	—	190
B-1	1250	375.195	.78	.91	.91	72	70	5.0	250	60		185
2	1255	378.20	.78	.91	.91	78	74	5.0	250	65		190
3	1300	381.40	.74	.94	.94	85	75	5.5	240	65		180
4	1305	384.07	.77	.99	.99	89	76	6.0	250	65		190
5	1310	386.90	.80	1.03	1.03	94	79	6.0	250	65		190
6	1315	389.78	.77	.99	.99	95	79	6.0	250	65		190
7	1320	392.56	.81	1.05	1.05	96	80	6.0	250	65		185
8	1325	395.40	.81	1.05	1.05	94	81	6.0	250	65		185
9	1330	398.20	.81	1.05	1.05	95	80	6.0	250	60		190
10	1335	401.21	.79	1.00	1.00	95	82	6.0	250	60		195
11	1340	403.9	.77	.99	.99	96	82	6.0	250	60		190
12	1345	407.3	.66	.86	.86	96	83	6.0	240	60		190
13	1350	410.00	.63	.84	.84	101	85	5.5	250	65		185
14	1355	412.1	.55	.73	.73	106	85	5.5	250	60		190
15	1400	414.10	.56	.74	.74	107	90	5.0	250	60		190
16	1405	417.10	.57	.74	.74	105	89	5.0	250	60		190
17	1410	419.50	.51	.66	.66	106	90	5.0	250	60		185
18	1415	421.80	.49	.64	.64	100	88	5.0	250	60		190
19	1420	424.11	.49	.64	.64	98	89	5.0	250	60		185
20	1425	426.50	.51	.66	.66	102	89	5.0	250	60		185
21	1430	428.75	.48	.63	.63	103	89	5.0	250	60		185
22	1435	431.00	.26	.34	.34	102	87	5.0	250	60		185
Pmtl	1440	432.832	—	—	—	—	—	—	—	—	—	—

Date: 20 OCT 71 Plant: ALCOA - WENATCHEE

Run Number: 1 Location of sample port: OUTLET

Operator: ROPER Filter Barometric Pressure: 27.55

Sample Box Number: Ambient Temperature: 60

Impinger H_2O

Volume after sampling 118 ml Container No. ---- Ether-chloroform extraction of impinger water ____ mg

Impinger prefilled with 200 ml Extra No. ---- Impinger water residue ____ mg

Volume Collected -12 ml

Impingers and back half of filter, acetone wash: Container No. ____ Extra No. ____ Weight results ____ mg

Dry probe and cyclone catch: Container No. ____ Extra No. ____ Weight results ____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. ____ Extra No. ____ Weight results ____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight ____ mg

Total particulate weight 91.7 mg

Silica Gel

Weight after test:	325.5			
Weight before test:	300.0			
Moisture weight collected:	25.5			
Container Number:	1. ____	2. ____	3. ____	4. ____

+25.5
-12.0

Moisture Total 13.5 gm

Sample Number: Analyze for:

Method determination:

Comments:

JOB NO. Y-7230-B

PARTICULATE FIELD DATA Page 54 of 147

Plant ALCOA

Run No. 2 - Paper Filter

Location OUTLET

Date 21 OCT 71

Operator

Sample Box No.

Meter Box No.

Meter H 1.89

C Factor 1.1

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filter

PS-62

Ambient Temp °F ~ 60°F

Bar. Press. "Hg 29.77

Assumed Moisture % ½ - 1

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16

Probe Length 5 ft.

Probe Heater Setting 552

Avg. ΔP Avg. ΔH .824

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in. Hg	Stack Temp °F
				Desired	Actual	Inlet	Outlet					
B-1	0920	432.958	.69	.82	.82	59	58	2.0	240	40		190
2	0925	435.82	.78	.93	.93	63	58	2.0	240	40		195
3	0930	438.30	.77	.91	.91	70	59	2.0	240	40		195
4	0935	441.37	.77	.91	.91	74	60	2.0	240	45		190
5	0940	444.30	.81	.96	.96	78	61	2.0	250	40		195
6	0945	446.70	.81	.96	.96	78	63	2.0	250	40		190
7	0950	449.51	.85	.99	.99	83	66	2.0	250	40		195
8	0955	452.63	.83	.97	.97	85	66	2.0	250	40		190
9	1000	455.00	.83	.97	.97	84	66	2.0	250	40		195
10	1005	457.80	.85	.99	.99	85	66	2.0	250	40		195
11	1010	460.11	.86	1.00	1.00	86	67	2.0	250	40		190
12	1015	463.45	.70	.83	.83	82	69	2.0	250	40		190
13	1020	466.10	.68	.79	.79	88	70	2.0	250	40		195
14	1025	468.55	.65	.77	.77	88	70	2.0	250	40		190
15	1030	471.00	.60	.72	.72	74	68	2.0	250	40		190
16												

JOB NO. Y-7730-B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
R-17	1040	475.75	.52	.68	.68	69	68	2.5	250	50		130
18	1045	478.05	.51	.62	.62	69	64	2.5	250	50		125
19	1050	480.20	.55	.65	.65	72	66	2.5	250	55		125
20	1055	482.48	.51	.62	.60	74	66	2.5	250	55		125
21	1100	484.64	.53	.63	.63	74	66	2.5	250	55		125
22	1105	486.97	.41	.48	.48	74	66	2.5	250	55		125
Final	1110	488.918	—	—	—	—	—	—	—	—		—
D-1	1130	488.918	.72	.85	.85	66	65	3.5	250	55		125
2	1135	491.50	.70	.90	.90	73	67	4.0	250	55		125
3	1140	494.18	.75	.82	.81	80	69	4.5	250	55		125
4	1145	496.83	.75	.87	.87	80	69	4.5	250	55		125
5	1150	499.40	.77	.90	.90	80	69	4.5	250	60		125
6	1155	502.60	.77	.90	.90	86	72	5.0	250	60		125
7	1200	505.42	.83	.90	.90	89	75	5.5	250	60		130
8	1205	508.05	.83	.92	.92	89	74	5.5	250	60		130
9	1210	510.80	.87	.97	.97	89	75	5.5	250	60		135
10	1215	513.40	.87	1.02	1.02	89	75	5.5	250	60		130
11	1220	516.15	.82	.92	.92	88	73	5.5	250	60		130
12	1225	518.23	.81	.95	.95	87	74	5.5	250	60		135
13	1230	521.60	.83	.97	.97	87	74	6.0	250	55		130
14	1235	524.38	.64	.81	.81	87	75	6.0	250	55		135
15	1240	526.98	.69	.81	.81	87	74	6.0	250	60		135
16	1245	529.70	.74	.87	.87	83	73	5.5	250	60		130
17	1250	532.29	.67	.80	.80	84	73	5.5	250	60		130
18	1255	535.00	.65	.76	.76	88	74	5.5	250	60		130
19	1300	537.02	.57	.68	.68	88	74	5.0	250	55		135
20	1305	539.49	.58	.63	.63	86	75	5.0	250	55		130
21	1310	541.75	.48	.57	.57	87	75	5.0	250	55		135
22	1315	543.95	.38	.335	.335	87	77	4.5	250	55		135
Final	1320	545.758	—	—	—	87	77	4.0	250	55		135

PARTICULATE CLEANUP SHEET

Date: 21 OCT 71 Plant: ALCOA - WENATCHEE

Run Number: 2 Location of sample port: OUTLET

Operator: PAPER Filter Barometric Pressure: 29.77

Sample Box Number: Ambient Temperature: 60°F

Impinger H_2O

Volume after sampling 196 ml Container No. ____ Ether-chloroform extraction of impinger water ____ mg

Impinger prefilled with 200 ml Extra No. ____ Impinger water residue ____ mg

Volume Collected -4 ml

Impingers and back half of filter, acetone wash: Container No. ____

Extra No. ____ Weight results ____ mg

Dry probe and cyclone catch: Container No. ____

Extra No. ____ Weight results ____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. ____

Extra No. ____ Weight results ____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight ____ mg

Total particulate weight 23.6 mg

Silica Gel

Weight after test:	322.2				+22.2
Weight before test:	300.0				-4.0
Moisture weight collected:	22.2				Moisture Total 18.2 gm
Container Number:	1. ____	2. ____	3. ____	4. ____	

Sample Number: Analyze for:

Method determination:

Comments:

JOB NO. Y-7730-B

PARTICULATE FIELD DATA Page 57 of 147

Plant ALCOA - Wenatchee, Wash

Run No. 3 - Paper Filter

Location Outlet

Date 22 Oct 71

Operator

Sample Box No.

Meter Box No.

Meter H 1.89

C Factor

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filter

PS-61 $\sqrt{\Delta P (T_s + 460}$ = 21.20

Ambient Temp °F 60°

Bar. Press. "Hg 29.54

Assumed Moisture % 1.0

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16

Probe Length 5 ft

Probe Heater Setting 557

Avg. ΔP Avg. ΔH

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice Δ H in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in. Hg	Stack Temp °F
				Desired	Actual	Inlet	Outlet					
A-1	0735	546.083	.68	.84	.84	60	60	1.0	200	55		190
2	0740	548.51	.73	.87	.87	65	61	1.0	200	55		195
3	0745	551.10	.75	.88	.88	72	63	1.0	220	55		195
4	0750	553.82	.78	.92	.92	74	64	1.5	225	55		195
5	0755	556.56	.80	.94	.94	75	64	1.5	240	55		200
6	0800	559.16	.80	.94	.94	79	66	1.5	250	55		190
7	0805	561.86	.80	.94	.94	81	66	2.0	250	55		195
8	0810	563.72	.82	.96	.96	85	70	2.0	250	55		190
9	0815	567.43	.82	.96	.96	86	70	2.0	250	55		195
10	0820	570.20	.84	.98	.98	87	71	2.0	250	55		200
11	0825	573.03	.86	1.01	1.01	89	74	2.5	250	55		195
12	0830	575.84	.84	.96	.96	89	74	2.5	260	55		195
13	0835	578.62	.86	1.01	1.01	86	74	2.5	250	56		200
14	0840	581.65	.80	.94	.94	86	74	2.5	250	55		195
15	0845	584.20	.80	.94	.94	86	74	3.0	250	55		195
11	0850	586.85	.75	.88	.88	86	74	2.5	250	55		

JOB NO. Y-7730-B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
A-17	0855	589.63	.72	.86	.86	82	73	3.5	255	50		190
18	0900	592.20	.67	.79	.79	81	72	2.0	250	50		185
19	0905	594.70	.66	.78	.78	80	71	2.0	250	50		185
20	0910	597.27	.58	.68	.68	79	71	2.0	250	50		185
21	0915	599.10	.50	.59	.59	79	71	1.5	250	50		175
22	0920	601.25	.48	.57	.57	77	71	1.5	250	50		175
final	0925	603.475	—	—	—	—	—	—	—	—		—
B-1	0935	603.475	.73	.87	.87	69	67	4.0	250	50		195
2	0940	605.40	.77	.92	.92	75	69	4.0	250	50		200
3	0945	608.65	.80	.93	.93	80	70	4.0	250	50		195
4	0950	610.80	.84	.97	.97	84	72	4.5	250	50		195
5	0955	613.71	.84	.97	.97	85	72	4.5	250	50		200
6	1000	616.45	.88	1.04	1.04	86	74	5.0	250	50		200
7	1005	619.15	.81	.99	.99	86	74	5.0	250	50		195
8	1010	621.952	.88	1.04	1.04	86	74	5.0	250	50		195
9	1015	624.85	.88	1.04	1.04	87	74	5.0	250	50		195
10	1020	627.31	.88	1.04	1.04	87	74	5.0	250	50		195
11	1025	630.55	.84	.97	.97	87	74	5.0	250	50		195
12	1030	633.31	.77	.81	.81	89	76	5.0	250	50		190
13	1035	636.00	.67	.79	.79	88	75	5.0	250	50		185
14	1040	638.60	.62	.73	.73	88	75	5.0	250	50		195
15	1045	641.90	.62	.73	.73	88	75	4.5	250	50		190
16	1050	643.71	.58	.69	.69	91	78	4.5	250	60		190
17	1055	645.71	.56	.67	.67	92	79	4.0	250	60		195
18	1100	648.21	.56	.67	.67	94	80	4.0	250	60		195
19	1105	650.05	.56	.67	.67	94	80	4.0	250	60		200
20	1110	653.20	.45	.53	.53	91	84	4.0	250	65		200
21	1115	655.30	.50	.60	.60	97	84	4.5	250	65		195
22	1120	657.10	.50	.60	.60	98	84	4.5	250	65		200
final	1125	659.370	—	—	—	—	—	—	—	—		—

PARTICULATE CLEANUP SHEET

Date: 22 OCT 71 Plant: ALCOA - WENATCHEE

Run Number: 3 Location of sample port: OUTLET

Operator: PAPER FILTER Barometric Pressure: 29.54

Sample Box Number: _____ Ambient Temperature: 60°F

Impinger H_2O

Volume after sampling 194 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected − 6 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight 163.3 mg

Silica Gel

Weight after test:	323.4	____	____	____	+ 23.4 −6.0
Weight before test:	300.0	____	____	____	
Moisture weight collected:	23.4	____	____	____	Moisture Total 17.4 gm
Container Number:	1. ____	2. ____	3. ____	4. ____	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YOUNG RESEARCH CORPORATION

SOURCE TESTING CALCULATION FORMS

Test No. Glass Fiber No. Runs 3

Name of Firm ALCOA

Location of Plant WENATCHEE, WASH

Type of Plant ALUMINUM REDUCTION

Control Equipment

Sampling Point Locations INLET

Pollutants Sampled

Time of Particulate Test:

Run No.	1	Date	10/22/71	Begin	1425	End	1706
Run No.	2	Date	10/23/71	Begin	0732	End	1016
Run No.	3	Date	10/25/71	Begin	0756	End	1052

PARTICULATE EMISSION DATA

Run No.	1	2	3	
P_b barometric pressure, "Hg Absolute	29.44	29.30	29.40	
P_m orifice pressure drop, "H_2O	.84	.82	.85	
V_m volume of dry gas sampled @ meter conditions, ft.^{3}	75.347	74.058	75.442	
T_m Average Gas Meter Temperature, °F	87	80	85	
V_m Volume of Dry Gas Sampled @ Standard std. conditions, ft.^{3}	71.928	71.271	72.187	
V_w Total H_2O collected, ml., Impingers & Silica Gel.	10.3	25.4	14.9	
V_w gas Volume of Water Vapor Collected ft.^{3} @ Standard Conditions*	.488	1.204	.706	

* 70°F, 29.92" Hg.

PARTICULATE EMISSION DATA (cont'd)

Run No.	1	2	3	
%M - % Moisture in the stack gas by volume	.67	1.66	.97	
M_d - Mole fraction of dry gas	.9933	.9834	.9903	
% CO	.4	0.8	0.5	
% CO_2	1.1	0.5	0.6	
% O_2	19.9	19.7	20.4	
% N_2	78.6	79.0	78.5	
M W $_d$ - Molecular weight of dry stack gas	28.77	28.87	28.91	
M W - Molecular weight of stack gas	28.90	28.69	28.80	
Δ Ps - Velocity Head of stack gas, In. H_2O	.721	.704	.691	
T_s - Stack Temperature, °F	188	174	178.	
$\sqrt{\Delta P_s X (T_s+460)}$	21.47	21.00	21.47	
P_s - Stack Pressure, "Hg. Absolute	29.02	28.88	28.98	
V_s - Stack Velocity @ stack conditions, fpm	3220	3170	3230	
A_s - Stack Area, $in.^2$	1734	1734	1734	
Q_s - Stack Gas Volume @ Standard Conditions, *SCFM	30600	30300	31000	
T_t - Net Time of Test, min.	144	144	144	
D_n - Sampling Nozzle Diameter, in.	3/16	3/16	3/16	
%I - Percent isokinetic	102	102	101	
m_f - Front half Mass Particulate - probe, cyclone and filter, mg.	699.6	767.0	740.1	
m_t - Back half Flouride Particulate - mg.	270.8	260.1	254.0	
C_{an} - Front half Mass Particulate - probe, cyclone, and filter, gr/SCF	.1498	.1657	.1579	
C_{ao} - Back half Flouride Particulate - gr/SCF	.0580	.0562	.0542	
C_{at} - Front half Mass Particulate - probe, cyclone, and filter gr/cf @ stack conditions	.1179	.1314	.1257	

PARTICULATE EMISSION DATA (cont'd)

Glass Fiber - ~~Pat~~ Inlet

Run No.	1	2	3	
C_{au} - Particulate, Back half Flouride gr/cf @ stack cond.	.0457	.0446	.0432	
C_{aw} - Particulate, probe, cyclone, and filter, lb/hr. Front half Mass	39.28	43.03	41.95	
C_{ax} - Particulate - Back half Flouride lb/hr.	15.21	14.60	14.38	
%EA - % Excess air @ sampling point	—	—	—	

* 70°F. 29.92" Hg.

JOB NO. Y-7730-13

PARTICULATE FIELD DATA

Plant AICOA - WENATCHEE

Run No. 1 Glass Fiber

Location INLET

Date 10/22/71

Operator

Sample Box No.

Meter Box No. 557

Meter H 1.90

C Factor 1.10

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filter

F-210

Ambient Temp °F 50

Bar. Press. "Hg 29.44

Assumed Moisture % 2

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16

Probe Length 5 ft

Probe Heater Setting 607.

Avg. ΔP Avg. ΔH .84

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice Δ H in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in. Hg	Stack Temp °F
				Desired	Actual	Inlet	Outlet					
START	1428	822.637	—	—	—	—	—	—	—	—	-	—
T-1	1431	824.30	.80	.93	.93	68	69	4.0	215	50		195
2	1434	825.90	.82	.96	.96	72	70	4.0	215	50		195
3	1437	827.65	.85	.98	.98	76	70	4.5	225	50		195
4	1440	829.50	.90	1.05	1.05	80	70	5.0	240	50		190
5	1443	830.50	.90	1.05	1.05	82	70	5.0	250	55		200
6	1446	832.75	1.00	1.15	1.15	85	71	6.0	250	55		190
7	1449	834.60	1.05	1.20	1.20	88	72	7.0	250	55		195
8	1452	836.50	.95	1.10	1.10	90	73	7.0	255	60		195
9	1455	838.20	1.00	1.15	1.15	92	74	7.5	260	60		195
10	1458	840.00	1.00	1.15	1.15	93	75	8.0	250	60		195
11	1501	841.75	1.00	1.15	1.15	95	76	8.0	255	60		195
12	1504	843.50	.95	1.10	1.10	96	77	8.5	255	60		195
13	1507	845.30	.90	1.05	1.05	96	78	9.0	255	60		195
14	1510	846.90	.80	.93	.93	96	78	9.0	255	60		195
15	1513	848.60	.80	.93	.93	96	79	9.0	255	60		195

JOB NO. Y-7730-B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
T-16	1516	850.20	.75	.88	.88	96	79	9.0	255	60		190
17	1519	851.70	.70	.83	.83	96	80	9.0	255	60		185
18	1522	853.30	.68	.80	.80	95	80	9.0	255	60		190
19	1525	854.90	.62	.73	.73	94	80	9.0	255	60		185
20	1528	856.30	.60	.70	.70	94	80	9.0	255	60		185
21	1531	857.80	.55	.65	.65	94	80	8.5	255	60		175
22	1534	859.10	.53	.63	.63	94	80	9.0	255	60		180
23	1537	860.44	.50	.59	.59	94	80	8.5	255	60		160
24	1540	861.858	.55	.65	.65	94	80	9.0	255	60		160
START	1554	861.858	—	—	—	—	—	—	—	—		—
S-1	1557	863.12	.50	.59	.59	82	79	8.0	240	65		195
2	1600	864.50	.50	.59	.59	84	79	8.5	240	65		190
3	1603	865.92	.60	.70	.70	87	79	10.0	245	65		190
4	1606	867.40	.60	.70	.70	90	80	11.0	250	65		190
5	1609	868.90	.60	.70	.70	93	80	11.5	250	65		190
6	1612	870.37	.64	.75	.75	95	80	12.0	260	70		190
7	1615	872.00	.68	.84	.84	97	81	11.0	265	70		190
8	1618	873.56	.75	.88	.88	100	81	15.0	270	70		195
9	1621	875.20	.75	.88	.88	101	82	16.0	265	75		195
10	1624	876.85	.80	.93	.93	101	82	17.0	275	80		195
11	1627	878.55	.83	.96	.96	102	83	18.0	275	80		195
12	1630	880.30	.90	1.02	1.02	102	83	20.0	270	85		195
13	1633	882.00	.85	1.00	1.00	101	84	20.0	270	85		195
14	1636	883.66	.80	.93	.93	102	83	20.0	265	80		195
15	1639	885.30	.75	.88	.88	102	84	20.0	265	80		195
16	1642	886.87	.65	.77	.77	102	84	18.0	260	75		200
17	1645	888.40	.65	.77	.77	101	84	17.5	255	75		200
18	1648	889.89	.60	.70	.70	101	84	12.0	250	75		200
19	1651	891.29	.52	.62	.62	101	84	16.0	250	65		190
20	1654	892.72	.60	.70	.70	101	84	17.0	250	65		155
21	1657	894.10	.50	.59	.59	101	84	16.0	250	65		150
22	1700	895.40	.45	.53	.53	100	84	150	250	65		170
23	1703	896.69	.45	.53	.53	99	84	15.0	250	65		165
24	1706	897.984	.45	.53	.53	99	84	15.0	250	65		150

PARTICULATE CLEANUP SHEET

Date: 10/22/71 Plant: ALCOA - WENATCHEE

Run Number: 1 Location of sample port: INLET

Operator: Glass Fiber Filter Barometric Pressure: 29.44

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 175 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected -25 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	335.3	____	____	____	+35.3 -25.0
Weight before test:	300.0	____	____	____	
Moisture weight collected:	35.3	____	____	____	Moisture Total 10.3 gm
Container Number:	1. ____	2. ____	3. ____	4. ____	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

JOB NO. Y-7730-B

PARTICULATE FIELD DATA

Plant ALCOA, WENATCHEE

Run No. 2 - Fiber Glass

Location INLET

Date 10/23/71

Operator

Sample Box No.

Meter Box No. 557

Meter H 1.90

C Factor 1.10

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filter
F-211

Ambient Temp °F 50°

Bar. Press. "Hg 29.30

Assumed Moisture % 27.

Heater Box Setting, °F 250°

Probe Tip Dia., In. 3/16

Probe Length 6 ft

Probe Heater Setting 607.

Avg. ΔP Avg. ΔH .82

Point	Clock Time	Dry Gas Meter, CF.	Pitot in. H_2O ΔP	Orifice Δ H in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp °F
				Desired	Actual	Inlet	Outlet					
Start	0732	898.064	—	—	—	—	—	—	—	—		—
T-1	0735	899.80	.80	.93	.93	62	61	3.0	200	60		190
2	0738	901.30	.85	.97	.97	64	61	3.0	205	45		195
3	0741	903.00	.90	1.05	1.05	68	61	3.0	215	45		195
4	0744	904.75	.90	1.05	1.05	71	62	3.0	225	50		195
5	0747	906.40	.95	1.10	1.10	74	62	4.0	225	50		190
6	0750	908.20	.90	1.05	1.05	77	63	4.0	225	60		190
7	0753	909.90	.95	1.10	1.10	79	64	4.0	225	60		190
8	0756	911.70	1.00	1.15	1.15	80	65	5.0	230	60		190
9	0759	913.50	1.00	1.15	1.15	82	68	5.0	240	60		190
10	0802	915.50	1.00	1.15	1.15	83	67	5.0	240	60		190
11	0805	917.00	1.05	1.20	1.20	85	68	6.0	245	65		185
12	0808	918.90	.95	1.10	1.10	86	69	6.5	250	65		185
13	0811	920.50	.87	1.00	1.00	86	70	6.5	250	70		185
14	0814	922.10	.82	.96	.96	86	71	6.5	250	70		180
15	0817	923.70	.73	.86	.86	86	72	6.0	250	70		180

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
T-16	0820	925.40	.68	.80	.80	86	72	6.5	250	70		180
17	0823	926.80	.65	.76	.76	86	73	7.0	250	70		180
18	0826	928.00	.60	.71	.71	87	74	7.0	250	70		180
19	0829	929.80	.60	.71	.71	87	74	7.0	250	70		170
20	0832	931.20	.55	.65	.65	86	75	7.0	250	70		160
21	0835	932.75	.55	.65	.65	86	75	7.0	250	70		140
22	0838	933.90	.52	.61	.61	86	75	7.0	250	70		130
23	0841	935.20	.40	.47	.47	86	75	6.5	250	70		100
24	0844	936.396	.40	.47	.47	86	75	6.5	250	70		100
START	0904	936.396	—	—	—	—	—	—	—	—		—
1	0907	937.75	.52	.62	.62	73	74	7.0	260	70		185
2	0910	939.08	.50	.60	.60	75	74	8.0	260	70		185
3	0913	940.52	.60	.70	.70	78	74	9.0	265	65		190
4	0916	941.97	.60	.70	.70	81	74	9.0	250	70		190
5	0919	943.41	.60	.70	.70	85	74	9.5	235	70		190
6	0922	944.89	.62	.73	.73	86	74	10.0	250	75		190
7	0925	946.41	.65	.77	.77	88	74	11.0	250	75		190
8	0928	947.99	.70	.82	.82	90	75	12.0	250	75		190
9	0931	949.57	.75	.87	.87	92	75	13.0	260	85		190
10	0934	951.20	.80	.93	.93	94	76	14.5	260	85		190
11	0937	952.87	.80	.93	.93	95	76	15.0	265	85		190
12	0940	954.59	.85	1.00	1.00	96	77	16.0	265	90		190
13	0943	956.23	.80	.93	.93	97	77	16.0	265	90		190
14	0946	957.841	.70	.82	.82	98	78	15.0	265	85		190
15	0949	959.441	.73	.86	.86	98	78	15.0	260	75		190
16	0952	960.98	.65	.77	.77	97	78	15.0	265	75		190
17	0955	962.48	.62	.73	.73	96	78	15.0	255	70		190
18	0958	963.89	.55	.65	.65	96	78	15.0	255	70		180
19	1001	965.24	.50	.60	.60	95	78	13.5	255	70		155
20	1004	966.62	.50	.60	.60	94	78	13.5	255	70		125
21	1007	968.00	.50	.60	.60	94	78	14.0	250	75		110
22	1010	969.35	.55	.65	.65	93	78	14.0	250	75		100
23	1013	970.76	.55	.65	.65	92	78	14.0	250	75		90
24	1016	972.122	.55	.60	.60	92	78	14.0	250	75		
												174

PARTICULATE CLEANUP SHEET

Date: 10/23/71 Plant: ALCOA · WENATCHEE

Run Number: 2 Location of sample port: INLET

Operator: Glass Fiber Filter Barometric Pressure: 29.30

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 186 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected −14 ml

Impingers and back half of filter, acetone wash: Container No. _____

Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____

Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____

Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	339.4				339.4
Weight before test:	300.0				−14.0
Moisture weight collected:	39.4				Moisture Total 25.4 gm
Container Number:	1.	2.	3.	4.	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

PARTICULATE FIELD DATA

JOB NO. Y-7730-B

Plant ALCOA - WENATCHEE

Run No. 3 - Glass Fiber

Location INLET

Date 10/25/71

Operator

Sample Box No.

Meter Box No. 557

Meter H 1.90

C Factor 1.10

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filter
F-238

Ambient Temp °F 50

Bar.Press. "Hg 29.40

Assumed Moisture % 2

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16

Probe Length 6 ft

Probe Heater Setting 60%

Avg. ΔP Avg. ΔH .85

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice Δ H in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp °F
				Desired	Actual	Inlet	Outlet					
START	0756	972.195	—	—	—	—	—	—	—	—		190
T-1	0759	973.80	.75	.88	.88	64	64	4.0	210	65		190
2	0802	975.50	.85	.97	.97	68	64	4.0	215	55		190
3	0805	977.20	.87	1.00	1.00	72	64	5.0	225	55		195
4	0809	978.75	.90	1.05	1.05	76	66	5.0	225	50		195
5	0811	980.70	.90	1.05	1.05	80	66	5.0	225	50		190
6	0814	982.35	.95	1.10	1.10	82	67	6.0	230	50		190
7	0817	983.90	.98	1.15	1.15	86	68	7.0	240	55		190
8	0820	985.90	.98	1.15	1.15	88	70	7.0	240	55		190
9	0823	987.70	1.00	1.17	1.17	90	70	8.0	240	55		190
10	0826	989.50	1.00	1.17	1.17	92	72	8.0	240	55		190
11	0829	991.40	1.05	1.20	1.20	94	75	9.0	245	60		190
12	0832	993.00	1.05	1.20	1.20	96	74	9.5	250	55		190
13	0835	994.90	.93	1.08	1.08	97	76	9.5	250	55		190
14	0838	996.60	.85	.97	.97	98	78	9.5	250	60		190
				97	.97	99	76	9.5	250	60		195

JOB NO. Y-7730-B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
T-16	0844	999.85	.80	.93	.93	100	79	10.0	250	60		190
17	0847	001.50	.75	.88	.88	100	79	10.0	250	60		190
18	0850	003.20	.73	.86	.86	100	80	10.0	250	60		185
19	0853	004.70	.70	.82	.82	101	81	10.0	250	60		180
20	0856	006.20	.62	.73	.73	101	81	10.0	250	60		170
21	0859	007.70	.68	.79	.79	101	82	10.0	250	60		135
22	0902	009.17	.60	.71	.71	100	82	10.0	250	60		130
23	0905	010.68	.60	.71	.71	100	82	10.0	250	60		130
24	0908	012.086	.55	.65	.65	102	83	10.0	250	60		130
START	0940	012.086	—	—	—	—	—	—	—	—		—
S-1	0943	013.04	.50	.59	.59	76	76	10.0	250	70		190
2	0946	014.38	.50	.59	.59	78	77	9.0	255	65		190
3	0949	015.77	.55	.65	.65	81	77	10.5	255	65		190
4	0952	017.22	.60	.71	.71	86	78	12.0	255	65		190
5	0955	018.75	.63	.74	.74	90	78	13.0	255	65		190
6	0958	020.20	.60	.71	.71	91	78	13.0	255	65		190
7	1001	021.72	.65	.76	.76	92	78	14.0	255	65		190
8	1004	023.28	.70	.82	.82	95	79	15.0	255	65		190
9	1007	024.85	.70	.82	.82	96	79	16.0	255	65		190
10	1010	026.50	.80	.93	.93	97	79	18.0	255	65		190
11	1013	028.20	.83	.96	.96	98	80	20.0	255	70		190
12	1016	029.89	.83	.96	.96	99	80	20.5	255	75		190
13	1019	031.53	.75	.88	.88	99	80	21.0	255	70		190
14	1022	033.12	.70	.82	.82	100	81	20.0	255	70		190
15	1025	034.66	.65	.76	.76	101	81	19.0	250	65		190
16	1028	036.19	.65	.76	.76	101	82	18.5	250	65		190
17	1031	037.67	.60	.71	.71	101	82	18.5	250	65		190
18	1034	039.10	.55	.65	.65	101	82	17.5	250	65		190
19	1037	040.52	.55	.65	.65	101	83	12.5	250	65		175
20	1040	041.89	.50	.59	.59	101	83	12.0	250	65		175
21	1043	043.23	.50	.59	.59	102	84	16.5	250	65		155
22	1046	044.68	.60	.71	.71	101	84	18.0	250	60		115
23	1049	046.15	.60	.71	.71	101	84	20.0	250	60		115
24	1052	047.637	.60	.71	.71	101	84	21.0	250	60		110

PARTICULATE CLEANUP SHEET

Date: 10/25/71 Plant: ALCOA - WENATCHEE

Run Number: 3 Location of sample port: INLET

Operator: Glass Fiber Filter Barometric Pressure: 29.40

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 682 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected = 18 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	332.9				32.9 − 18.0
Weight before test:	300.0				
Moisture weight collected:	32.9				Moisture Total 14.9 gm
Container Number:	1.	2.	3.	4.	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

SOURCE TESTING CALCULATION FORMS

Test No. Glass Fiber No. Runs 3

Name of Firm ALCOA

Location of Plant WENATCHEE, WASH

Type of Plant ALUMINUM REDUCTION

Control Equipment

Sampling Point Locations OUTLET

Pollutants Sampled

Time of Particulate Test:

Run No. 1	Date 22 OCT 71	Begin 1315	End 1705
Run No. 2	Date 23 OCT 71	Begin 0725	End 1115
Run No. 3	Date 25 OCT 71	Begin 0810	End 1155

PARTICULATE EMISSION DATA

Run No.	1	2	3	
P_b barometric pressure, "Hg Absolute	29.44	29.30	29.40	
P_m orifice pressure drop, "H_2O	.77	.76	.80	
V_m volume of dry gas sampled @ meter conditions, ft.^{3}	110.305	110.395	111.731	
T_m Average Gas Meter Temperature, °F	88	78	80	
V_m Volume of Dry Gas Sampled @ Standard std. conditions, ft.^{3}	105.098	106.619	107.887	
V_w Total H_2O collected, ml., Impingers & Silica Gel.	16.6	17.3	11.3	
V_w gas Volume of Water Vapor Collected ft.^{3} @ Standard Conditions*	.787	.820	.536	

* 70°F, 29.92" Hg.

PARTICULATE EMISSION DATA (cont'd)

Outlet - Glass Fiber

Run No.	1	2	3	
%M - % Moisture in the stack gas by volume	.74	.76	.49	
M_d - Mole fraction of dry gas	.9926	.9924	.9951	
% CO	0.6	0.8	0.7	
% CO_2	0.3	0.5	0.6	
% O_2	20.3	19.7	20.1	
% N_2	78.8	79.0	78.6	
M W d - Molecular weight of dry stack gas	28.86	28.87	28.90	
M W - Molecular weight of stack gas	28.78	28.79	28.85	
Δ Ps - Velocity Head of stack gas, In. H_2O	.65	.62	.67	
T_s - Stack Temperature, °F	204	193	196	
$\sqrt{\Delta P_s X (T_s+460)}$	20.22	20.44	20.41	
P_s - Stack Pressure, "Hg. Absolute	29.47	29.33	29.43	
V_s - Stack Velocity @ stack conditions, fpm	3020.	3060.	3050.	
A_s - Stack Area, $in.^2$	707	707	707	
Q_s - Stack Gas Volume @ Standard Conditions, *SCFM	11600	11900	11800	
T_t - Net Time of Test, min.	220	220	220	
D_n - Sampling Nozzle Diameter, in.	3/16	3/16	3/16	
%I - Percent isokinetic	105	104	106	
m_f - Particulate - Front half Mass probe, cyclone and filter, mg.	139.0	83.0	148.7	
m_t - Particulate - Back half mg. Flouride	0.12	0.14	0.12	
C_{an} - Particulate - Front half Mass probe, cyclone, and filter, gr/SCF	.02037	.01199	.02123	
C_{ao} - Particulate - Back half Flouride gr/SCF	.0000176	.0000202	.0000171	
C_{at} - Particulate - Front Half Mass probe, cyclone, and filter gr/cf @ stack conditions	.0159	.00946	.0168	

PARTICULATE EMISSION DATA (cont'd)

Outlet - Glass Fiber

Run No.	1	2	3	
C_{au} - Particulate, Back half Flouride gr/cf @ stack cond.	.0000137	.0000160	.0000135	
C_{aw} - Particulate, Front half mass probe, cyclone, and filter, lb/hr.	2.03	1.23	2.147	
C_{ax} - Particulate - Back half Flouride lb/hr.	.00174	.00202	.00177	
%EA - % Excess air @ sampling point	←	—	—	

* 70°F. 29.92" Hg.

JOB NO. Y-7730-B

PARTICULATE FIELD DATA

Plant ALCOA - WENATCHEE

Run No. 1 Glass Fiber

Location OUTLET

Date 22OCT 71

Operator

Sample Box No.

Meter Box No.

Meter H 1.89

C Factor

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filter
I=S -214

Ambient Temp °F 70

Bar.Press. "Hg 29.44

Assumed Moisture % 1.0

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16

Probe Length 5 ft

Probe Heater Setting 557

Avg. ΔP Avg. ΔH .77

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice Δ H in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp °F
				Desired	Actual	Inlet	Outlet					
B-1	1315	659.600	.68	.81	.81	77	79	1.5	240	55		205
2	1320	662.11	.68	.81	.81	80	80	1.5	250	55		200
3	1325	664.62	.67	.80	.80	85	79	1.5	250	55		205
4	1330	667.60	.69	.82	82	88	80	1.5	250	55		210
5	1335	669.90	.70	.84	.84	89	80	1.5	250	55		205
6	1340	672.32	.71	.85	.85	89	80	1.5	250	55		205
7	1345	675.41	.71	.85	.85	89	80	1.5	250	55		205
8	1350	677.51	.74	.87	87	94	82	1.5	250	55		210
9	1355	681.00	.74	.87	.87	97	82	1.5	250	60		205
10	1400	682.91	.74	.87	.87	98	83	1.5	250	60		205
11	1405	685.62	.79	.93	.93	98	83	1.5	250	60		210
12	1410	688.25	.66	.79	.79	97	83	1.5	250	60		200
13	1415	690.90	64	.76	.76	97	83	1.5	250	60		200
14	1420	693.42	.62	.73	.73	98	82	1.5	250	60		195
15	1425	695.84	.59	.70	.70	98	86	1.0	250	60		200
16	1430	698.30	.59	.70	.70	97	89	1.0	250	60		205

JOB NO. Y-7730-B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
B-17	1435	700.68	.56	.67	.67	97	87	1.5	250	60		200
18	1440	703.02	.52	.63	.63	98	87	1.5	250	60		200
19	1445	705.03	.48	.57	.57	98	88	1.5	250	60		200
20	1450	707.50	.48	.57	.57	92	86	1.5	250	60		200
21	1455	709.64	.42	.51	.51	92	84	1.5	250	60		200
22	1500	711.79	.44	.52	.52	91	84	1.0	250	60		205
final	1505	713.815	—	—	—	—	—	—	—	—		—
A-1	1515	713.815	.60	.72	.72	82	79	1.0	260	60		195
2	1520	716.21	.63	.75	.75	88	82	1.0	250	60		205
3	1525	718.65	.70	.83	.83	90	83	1.0	250	60		200
4	1530	721.22	.71	.83	.83	90	83	1.0	250	60		210
5	1535	723.98	.75	.88	.88	91	58	1.0	250	60		200
6	1540	726.61	.71	.83	.83	91	82	1.5	250	60		205
7	1545	728.98	.75	.87	.87	91	83	1.5	250	60		205
8	1550	731.3	.75	.87	.87	92	83	1.5	250	60		210
9	1555	734.2	.75	.87	.87	91	83	1.5	250	60		205
10	1600	737.48	.75	.87	.87	91	83	2.0	250	60		210
11	1605	739.82	.74	.86	.86	95	84	2.0	250	60		205
12	1610	742.58	.78	.92	.92	94	83	2.0	250	60		210
13	1615	745.39	.74	.86	.86	94	83	2.0	250	60		205
14	1620	747.94	.72	.85	.85	94	82	2.0	250	60		205
15	1625	750.61	.65	.77	.77	95	83	2.0	250	60		200
16	1630	753.15	.69	.84	.84	96	83	2.0	250	60		202
17	1635	756.85	.69	.84	.84	95	84	2.0	250	65		205
18	1640	758.40	.60	.72	.72	95	89	1.5	250	65		205
19	1645	761.00	.52	.65	.63	94	83	1.0	250	65		210
20	1650	763.15	.52	.63	.63	93	83	1.0	250	65		210
21	1655	765.42	.50	.60	.60	93	83	1.0	250	65		200
22	1700	767.79	.50	.60	.60	92	84	1.0	250	65		200
final	1705	769.905	—	—	—	—	—	—	—	—		—

PARTICULATE CLEANUP SHEET

Date: 10/22/71 Plant: ALCOA - WENATCHEE

Run Number: 1 Location of sample port: OUTLET

Operator: Glass Fiber Filter Barometric Pressure: 29.44

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 86 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected -4 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	320.6	____	____	____	+20.6 −4.0
Weight before test:	300.0	____	____	____	
Moisture weight collected:	20.6	____	____	____	Moisture Total 16.6 gm
Container Number:	1. ____	2. ____	3. ____	4. ____	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

JOB NO. Y-7730-B

PARTICULATE FIELD DATA

Plant Alcoa, WENATCHEE

Run No. 2 Glass Fiber

Location Outlet

Date 23 OCT 71

Operator

Sample Box No.

Meter Box No.

Meter H 1.89

C Factor

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filter - F-240

Ambient Temp °F 65

Bar. Press. "Hg 29.30

Assumed Moisture % 1.0

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16

Probe Length 5 ft

Probe Heater Setting 55%

Avg. ΔP Avg. ΔH .76

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice Δ H in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp °F
				Desired	Actual	Inlet	Outlet					
A-1	0725	770.175	.68	.80	.80	64	64	1.0	225	55		195
2	0730	772.69	.68	.80	.80	70	65	1.0	225	55		190
3	0735	775.10	.65	.77	.77	74	66	1.0	235	55		195
4	0740	776.11	.73	.86	.86	80	70	1.0	240	55		195
5	0745	780.17	.70	.83	.83	82	70	1.5	250	55		195
6	0750	782.83	.70	.83	.83	84	71	1.5	250	55		190
7	0755	785.45	.74	.88	.88	83	71	1.5	250	55		195
8	0800	788.12	.74	.88	.88	82	70	1.5	250	55		195
9	0805	790.74	.72	.85	.85	81	70	1.5	250	55		190
10	0810	793.49	.74	.88	.88	80	70	2.0	240	55		195
11	0815	796.05	.76	.90	.90	81	70	2.0	240	55		190
12	0820	798.74	.80	.94	.94	81	71	2.0	240	55		195
13	0825	801.46	.78	.92	.92	80	70	2.0	235	55		190
14	0830	803.78	.74	.88	.88	80	70	2.0	240	55		195
15	0835	806.49	.68	.80	.80	80	70	2.0	240	55		190
16	0840	809.41	.68	.80	.80	81	70	2.0	240	55		190

JOB NO. Y-2730-B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
A-17	0845	812.00	.70	.83	.83	81	70	2.0	240	55		190
18	0850	814.60	.63	.75	.75	80	70	2.0	240	55		190
19	0855	817.10	.63	.75	.75	82	71	2.0	240	55		190
20	0900	819.54	.61	.73	.73	81	70	2.0	240	55		195
21	0905	821.95	.42	.50	.50	80	69	2.0	240	55		195
22	0910	824.00	.35	.42	.42	80	69	2.0	240	55		190
final	0915	825.905	—	—	—	—	—	—	—	—		—
B-1	0925	825.905	.63	.75	.75	74	70	2.0	240	55		185
2	0930	828.75	.65	.77	.77	78	73	2.0	240	55		190
3	0935	831.25	.73	.87	.87	82	74	2.0	240	55		195
4	0940	833.69	.75	.89	.89	84	73	2.0	250	55		200
5	0945	836.59	.77	.91	.91	85	74	2.0	250	55		205
6	0950	839.75	.77	.91	.91	85	74	2.0	250	55		200
7	0955	841.92	.73	.87	.87	88	75	2.0	250	55		200
8	1000	844.62	.73	.87	.87	88	77	2.0	250	55		200
9	1005	847.39	.75	.89	.89	88	77	2.0	250	55		200
10	1010	850.00	.75	.89	.89	87	76	2.0	250	55		195
11	1015	852.69	.73	.87	.87	86	76	2.0	250	55		195
12	1020	855.46	.63	.75	.75	86	76	2.0	250	55		195
13	1025	858.00	.61	.73	.73	86	75	1.5	250	55		190
14	1030	860.10	.61	.73	.73	85	75	1.5	250	55		190
15	1035	863.05	.50	.60	.60	91	79	1.5	250	55		195
16	1040	865.55	.50	.60	.60	91	80	1.5	250	55		190
17	1045	867.87	.50	.60	.60	92	81	1.5	250	60		195
18	1050	870.00	.50	.60	.60	90	80	1.0	250	60		190
19	1055	872.21	.45	.45	.45	90	81	1.0	250	60		190
20	1100	874.10	.45	.45	.45	90	81	1.0	250	60		190
21	1105	876.51	.40	.40	.40	91	80	1.0	250	60		195
22	1110	878.54	.40	.40	.40	91	80	1.0	250	60		190
final	1115	880.520	—	—	—	—	—	—	—	—	—	—

PARTICULATE CLEANUP SHEET

Date: 10/23/71 Plant: ALCOA - WENATCHEE

Run Number: 2 Location of sample port: OUTLET

Operator: Glass Fiber Filter Barometric Pressure: 29.30

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 196 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected -4 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	321.3	____	____	____	+21.3 −4.0
Weight before test:	3000	____	____	____	
Moisture weight collected:	[illegible]	____	____	____	Moisture Total 17.3 gm
Container Number:	1. ____	2. ____	3. ____	4. ____	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

JOB NO. Y-7230-B

PARTICULATE FIELD DATA Page ;81 of 147

Plant ALCOA - WENATCHEE

Run No. 3 Glass Fiber

Location Outlet

Date 25 OCT 71

Operator

Sample Box No.

Meter Box No.

Meter H 1.89

C Factor

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Filter

F-226

Ambient Temp °F 40

Bar. Press. "Hg 29.40

Assumed Moisture % 1.0

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16

Probe Length 5 ft

Probe Heater Setting

Avg. ΔP Avg. ΔH .80

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice Δ H in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp °F
				Desired	Actual	Inlet	Outlet					
B-1	0810	880.804	.64	.75	.75	58	59		200	55		190
2	0815	883.11	.70	.84	.84	62	60		200	55		195
3	0820	885.90	.72	.86	.86	72	64		210	55		195
4	0825	888.27	.72	.86	.86	75	64		210	55		200
5	0830	891.09	.70	.84	.84	80	65		220	55		200
6	0835	893.65	.72	.86	.86	84	68		225	55		195
7	0840	896.20	.76	.88	.88	85	68		225	55		190
8	0845	898.91	.76	.88	.88	84	68		220	55		195
9	0850	901.82	.79	.92	.92	86	70		225	55		195
10	0855	904.71	.79	.92	.92	87	70		225	55		200
11	0900	907.10	.79	.92	.92	89	73		225	55		200
12	0905	909.64	.68	.81	.81	89	74		225	55		195
13	0910	912.11	.68	.81	.81	90	75		225	55		200
14	0915	914.51	.64	.75	.75	90	75		225	55		195
15	0920	917.21	.61	.73	.73	91	79		225	55		195
16	0925	918.75	.60	.71	.71	91	79		225	55		195

JOB NO. Y-7730-B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
B-17	0930	921.8	.56	.66	.66	90	78		225	55		200
18	0935	924.1	.53	.64	.64	90	78		225	60		200
19	0940	926.8	.50	.60	.60	90	78		225	60		195
20	0945	926.68	.45	.54	.54	88	79		225	60		200
21	0950	931.21	.43	.53	.53	89	79		225	60		200
22	0953	932.95	.40	.47	.47	89	80		225	60		200
final	1000	934.876	—	—	—	—	—	—	—	—		—
A-1	1005	934.826	.72	.85	.85	81	76		240	60		195
2	1010	937.51	.77	.92	.92	85	76		240	60		200
3	1015	940.10	.70	.84	.84	86	76		240	60		200
4	1020	942.90	.70	.84	.84	87	75		240	60		195
5	1025	945.99	.74	.87	.87	87	75		240	60		195
6	1030	948.41	.74	.87	.87	91	76		240	60		195
7	1035	951.00	.77	.92	.92	90	76		240	60		200
8	1040	954.11	.80	.94	.94	90	75		240	60		200
9	1045	956.33	.74	.87	.87	90	75		240	60		195
10	1050	959.55	.77	.92	.92	90	74		240	60		195
11	1055	961.84	.80	.94	.94	90	74		240	60		200
12	1100	964.55	.82	.96	.96	89	75		240	60		195
13	1105	967.41	.80	.94	.94	89	74		240	60		195
14	1110	970.20	.74	.87	.87	90	76		240	60		190
15	1115	973.31	.70	.87	.87	90	76		240	60		190
16	1120	976.03	.65	.77	.77	90	76		240	60		195
17	1125	978.11	.70	.87	.87	91	76		240	60		190
18	1130	980.21	.65	.87	.87	90	75		240	60		190
19	1135	983.45	.55	.66	.66	90	75		240	60		195
20	1140	985.81	.55	.66	.66	90	75		240	60		195
21	1145	988.11	.50	.60	.60	91	74		240	60		195
22	1150	990.41	.50	.60	.60	90	72		240	60		190
final	1155	992.535	—	—	—	—	—	—	—	—		—

PARTICULATE CLEANUP SHEET

Date: 10/25/71 Plant: ALCOA - WENATCHEE

Run Number: 3 Location of sample port: OUTLET

Operator: Glass Fiber Filter Barometric Pressure: 29.40

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 192 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected -8 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	219.3	____	____	____	+19.3 −8.0
Weight before test:	3000	____	____	____	
Moisture weight collected:	19.3	____	____	____	Moisture Total 11.3 gm
Container Number:	1. ____	2. ____	3. ____	4. ____	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

SOURCE TESTING CALCULATION FORMS

Test No. MEMBRANE No. Runs 3

Name of Firm ALCOA

Location of Plant WENATCHEE, WASH

Type of Plant Alum Reduction

Control Equipment

Sampling Point Locations Outlet

Pollutants Sampled

Time of Particulate Test:

Run No. 1 Date 10/25/71 Begin 1415 End 1800

Run No. 2 Date 10/26/71 Begin 0810 End 1200

Run No. 3 Date 10/26/71 Begin 1255 End 1640

PARTICULATE EMISSION DATA

Run No.	1	2	3	
P_b barometric pressure, "Hg Absolute	29.40	29.40	29.40	
P_m orifice pressure drop, "H_2O	.759	.782	.796	
V_m volume of dry gas sampled @ meter conditions, ft.^{3}	110.110	110.927	111.822	
T_m Average Gas Meter Temperature, °F	91	75	78	
V_m Volume of Dry Gas Sampled @ Standard std. conditions, ft.^{3}	104.188	108.107	108.424	
V_w Total H_2O collected, ml., Impingers & Silica Gel.	11.9	7.3	6.6	
V_w gas Volume of Water Vapor Collected ft.^{3} @ Standard Conditions*	.564	.346	.313	

* 70°F, 29.92" Hg.

PARTICULATE EMISSION DATA (cont'd)

Run No.	1	2	3	
%M - % Moisture in the stack gas by volume	.54	.32	.29	
M_d - Mole fraction of dry gas	.9946	.9968	.9971	
% CO	0.7	0.6	0.6	
% CO_2	0.6	0.5	0.5	
% O_2	20.1	20.5	20.5	
% N_2	78.6	78.4	78.4	
M W d - Molecular weight of dry stack gas	28.90	28.90	28.90	
M W - Molecular weight of stack gas	28.84	28.87	28.87	
Δ Ps - Velocity Head of stack gas, In. H_2O	.639	.66	.675	
T_s - Stack Temperature, °F	196	187	189	
$\sqrt{\Delta P_s X (T_s+460)}$	20.41	20.57	20.79	
P_s - Stack Pressure, "Hg. Absolute	29.43	29.43	29.43	
V_s - Stack Velocity @ stack conditions, fpm	3050	3070.	3100.	
A_s - Stack Area, $in.^2$	707	707	707	
Q_s - Stack Gas Volume @ Standard Conditions, *SCFM	11800	12100	12200	
T_t - Net Time of Test, min.	220	220	220	
D_n - Sampling Nozzle Diameter, in.	3/16	3/16	3/16	
%I - Percent isokinetic	102.	104.	103.	
m_f - Particulate - Front half Mass probe, cyclone and filter, mg.	81.9	98.1	52.6	
m_t - Particulate - Back half Flouride mg.	0.15	0.16	0.26	
C_{an} - Particulate - Front half Mass probe, cyclone, and filter, gr/SCF	.01211	.01397	.00749	
C_{ao} - Particulate - Back half Flouride gr/SCF	.0000222	.0000225	.0000364	
C_{at} - Particulate - Front half Mass probe, cyclone, and filter gr/cf @ stack conditions	0.00956	0.01121	0.00591	

PARTICULATE EMISSION DATA (cont'd)

Run No.	1	2	3	
C_{au} - Back half Flouride Particulate, @ stack cond. gr/cf	.0000175	.0000183	.0000295	
C_{aw} - Front half Mass Particulate, probe, cyclone, and filter, lb/hr.	1.227	1.452	.7808	
C_{ax} - Back half Flouride Particulate - lb/hr.	.00224	.00242	.00390	
%EA - % Excess air @ sampling point	—	—	—	

* 70°F. 29.92" Hg.

JOB NO. Y-7730B

PARTICULATE FIELD DATA

Plant ALCOA - WENATCHEE

Run No. 1 MEMBRANE

Location OUTLET UNIT #3

Date 10/25/71

Operator KLING/CREPEAU

Sample Box No.

Meter Box No.

Meter H 1.89

C Factor 1.10

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

FILTER - M-19

Ambient Temp °F 70°

Bar.Press. "Hg 29.40

Assumed Moisture % 1.0

Heater Box Setting, °F 250°

Probe Tip Dia., In. 3/16

Probe Length 3'

Probe Heater Setting 55

Avg. ΔP Avg. ΔH .159

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice Δ H in H_2O Desired	Orifice Δ H in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp °F
A 1	1415	992.751	.55	.65	65	69	69	9.0	200	65	—	200
2	1420	995.00	.65	.78	.78	78	70	10.0	220	65	—	200
3	1425	997.41	.72	.85	.85	82	72	12.0	225	70	—	195
4	1430	999.95	.70	.84	.84	86	74	13.0	220	70	—	190
5	1435	002.53	.65	.78	.78	90	75	12.0	220	70	—	195
6	1440	005.11	.70	.84	.84	94	76	12.5	220	70	—	195
7	1445	007.71	.70	.84	.84	97	78	12.5	220	70	—	190
8	1450	009.91	.70	.84	.84	98	80	13.0	220	70	—	195
9	1455	012.99	.72	.85	.85	98	80	13.0	220	70	—	195
10	1500	015.61	.75	.89	.89	98	81	13.0	220	70	—	195
11	1505	018.25	.75	.89	.89	98	81	13.0	220	70	—	190
12	1510	021.20	.80	.94	.94	102	83	13.5	220	70	—	195
13	1515	024.21	.75	.89	.89	104	83	13.5	220	60	—	195
14	1520	026.72	.68	.80	.80	106	85	13.0	220	60	—	195
15	1525	027.91	.68	.80	.80	106	85	13.0	220	60	—	195
16	1530	032.31	.65	.78	.78	106	85	13.0	220	60	—	195

JOB NO. Y-7730B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
				Desired	Actual	Inlet	Outlet					
17	1535	034.69	.68	.80	.80	106	85	13.0	220	60	—	190
18	1540	037.15	.55	.65	.65	102	87	10.0	230	60	—	195
19	1545	039.58	.55	.65	.65	102	80	9.0	220	60	—	200
20	1550	041.91	.55	.65	.65	101	79	8.0	220	60	—	195
21	1555	044.31	.50	.60	.60	101	79	8.0	220	66	—	195
22	1600	046.65	.48	.57	.57	98	78	8.0	220	60	—	195
FINAL	1605	048.768	—	—	—	—	—	—	—	—	—	—
B 1	1610	048.768	.60	.71	.71	90	85	7.5	220	66	—	195
2	1615	051.10	.60	.71	.71	90	84	8.0	220	60	—	200
3	1620	053.41	.70	.84	.84	90	84	9.0	220	60	—	200
4	1625	055.75	.70	.84	.84	95	85	9.0	220	60	—	200
5	1630	058.40	.74	.87	.87	100	86	13.5	220	60	—	205
6	1635	060.97	.74	.87	.87	104	86	13.5	220	60	—	200
7	1640	063.11	.74	.87	.87	103	86	13.5	220	60	—	200
8	1645	066.41	.74	.87	.87	103	86	13.5	220	60	—	200
9	1650	070.25	.74	.87	.87	103	86	13.5	220	60	—	200
10	1655	072.10	.80	.94	.94	106	89	13.5	220	60	—	200
11	1700	075.28	.78	.92	.92	106	89	13.5	220	60	—	200
12	1705	078.04	.65	.77	.77	105	88	13.5	220	60	—	200
13	1710	080.00	.60	.71	.71	105	88	12.5	220	60	—	200
14	1715	082.95	.55	.65	.65	102	87	11.0	220	60	—	200
15	1720	084.99	.60	.71	.71	101	88	10.0	220	60	—	195
16	1725	087.65	.60	.71	.71	97	87	10.0	220	60	—	195
17	1730	090.26	.48	.57	.57	96	86	9.0	220	60	—	195
18	1735	092.15	.48	.57	.57	96	86	9.0	220	60	—	195
19	1740	094.31	.48	.57	.57	96	85	9.0	220	55	—	190
20	1745	096.61	.44	.54	.54	94	83	8.5	220	55	—	190
21	1750	099.73	.48	.57	.57	93	83	8.5	220	55	—	190
22	1755	101.11	.42	.52	.52	93	82	8.5	220	55	—	195
FINAL	1800	102.861	—	—	—	—	—	—	—	—	—	—
NET TIME = 220 MIN		110.110										

PARTICULATE CLEANUP SHEET

Date: 25 OCT 71 Plant: ALCOA - WENATCHEE

Run Number: 1 Location of sample port: OUTLET

Operator: MEMBRANE Barometric Pressure: 29.40

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 187 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected -13 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	324.9	____	____	____	+24.9
Weight before test:	300.0	____	____	____	-13.0
Moisture weight collected:	24.9	____	____	____	Moisture Total 11.9 gm
Container Number:	1. ____	2. ____	3. ____	4. ____	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

JOB NO. Y-7730B

PARTICULATE FIELD DATA

Plant ALCOA - WENATCHEE

Run No. 2 MEMBRANE

Location OUTLET UNIT #3

Date 10/26/71

Operator RAK | RSE | RWK

Sample Box No.

Meter Box No.

Meter H 1.89

C Factor 1.10

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

FILTER M-53

Ambient Temp °F 70

Bar.Press. "Hg 29.40

Assumed Moisture % 1.0

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16

Probe Length 3'

Probe Heater Setting 55

Avg. ΔP Avg. ΔH .782

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice Δ H in H_2O Desired	Orifice Δ H in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp °F
B 1	0810	103.023	.58	.69	.69	58	58	2.0	200	55	—	185
2	0815	105.29	.58	.69	.69	61	59	2.0	220	55	—	180
3	0820	107.62	.58	.69	.69	66	60	2.0	220	55	—	180
4	0825	109.95	.61	.72	.72	69	61	2.5	200	55	—	185
5	0830	112.12	.61	.72	.72	70	61	2.0	200	55	—	180
6	0835	114.74	.63	.75	.75	72	61	2.0	200	55	—	180
7	0840	117.51	.63	.75	.75	73	61	2.0	200	55	—	185
8	0845	119.75	.87	.99	.99	75	64	4.0	210	55	—	185
9	0850	122.41	.81	.96	.96	78	66	4.0	200	55	—	180
10	0855	124.11	.78	.92	.92	79	66	4.0	200	55	—	185
11	0900	127.99	.81	.96	.96	79	66	4.0	200	55	—	180
12	0905	130.75	.63	.75	.75	82	70	4.0	210	55	—	185
13	0910	133.19	.61	.72	.72	82	70	3.0	200	55	—	185
14	0915	135.61	.59	.71	.71	82	70	3.0	200	55	—	185
15	0920	137.92	.54	.64	.64	82	70	2.5	200	55	—	185
16	0925	140.22	.48	.57	.57	83	71	2.0	200	60	—	175

JOB NO. Y-7730B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
17	0930	142.69	.45	.54	.54	83	71	2.0	200	60	—	175
18	0935	145.10	.43	.52	.52	83	71	2.0	200	60	—	190
19	0940	147.70	.43	.52	.52	83	71	2.0	200	60	—	195
20	0945	149.10	.43	.52	.52	83	71	2.0	200	60	—	200
21	0950	151.22	.44	.53	.53	84	71	2.0	200	60	—	200
22	0955	153.32	.46	.55	.55	84	71	2.0	200	60	—	200
FINAL	1000	155.597	—	—	—	—	—	—	—	—	—	—
A 1	1010	155.597	.67	.79	.79	73	72	2.0	200	60	—	190
2	1015	157.90	.68	.80	.80	76	72	2.0	225	60	—	190
3	1020	160.51	.72	.86	.86	80	72	2.5	225	60	—	190
4	1025	163.15	.75	.89	.89	81	72	2.5	225	60	—	190
5	1030	165.85	.75	.89	.89	82	72	2.5	225	60	—	190
6	1035	168.54	.78	.92	.92	83	72	2.5	225	60	—	195
7	1040	171.28	.80	.94	.94	82	72	2.5	200	60	—	190
8	1045	174.06	.80	.94	.94	83	72	3.0	200	60	—	190
9	1050	176.84	.82	.97	.97	83	72	3.0	200	60	—	190
10	1055	179.65	.80	.94	.94	83	72	3.0	200	60	—	190
11	1100	182.43	.80	.94	.94	82	72	4.0	200	60	—	190
12	1105	185.20	.78	.92	.92	83	72	4.0	200	60	—	190
13	1110	187.94	.75	.89	.89	83	73	4.0	200	60	—	185
14	1115	190.79	.78	.92	.92	83	73	4.0	210	60	—	185
15	1120	193.41	.75	.89	.89	83	74	4.0	200	60	—	185
16	1125	196.04	.75	.89	.89	85	74	4.0	220	60	—	185
17	1130	198.80	.72	.86	.86	86	75	4.0	210	60	—	185
18	1135	201.18	.68	.80	.80	87	75	4.0	200	60	—	185
19	1140	204.04	.68	.80	.80	86	76	4.0	200	60	—	185
20	1145	206.14	.63	.75	.75	86	76	3.0	200	60	—	190
21	1150	208.60	.61	.72	.72	85	75	3.0	200	60	—	185
22	1155	211.53	.58	.69	.69	85	74	3.0	210	60	—	180
FINAL	1200	213.950	—	—	—	—	—	—	—	—	—	—
NET TIME	220MIN.	110.927										

Date: 26 OCT 71 Plant: ALCOA - WENATCHEE

Run Number: 2 Location of sample port: OUTLET

Operator: MEMBRANE Barometric Pressure: 29.40

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 188 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected -12 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	319.3	____	____	____	19.3
Weight before test:	300.0	____	____	____	-12.0
Moisture weight collected:	19.3	____	____	____	Moisture Total 7.3 gm
Container Number:	1. ____	2. ____	3. ____	4. ____	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

JOB NO. Y-7730B

PARTICULATE FIELD DATA Page 93 of 147

Plant ALCOA - WENATCHEE

Run No. 3 MEMBRANE

Location OUTLET UNIT #3

Date 10/26/71

Operator RAK / GVK

Sample Box No. —

Meter Box No. —

Meter H 1.89

C Factor 1.10

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

FILTER M-41

Ambient Temp °F 70

Bar.Press. "Hg 29.40

Assumed Moisture % 1.0

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16

Probe Length 3

Probe Heater Setting 55

Avg. ΔP ____ Avg. ΔH .796

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice Δ H in H_2O Desired	Orifice Δ H in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp °F
A 1	1255	215.103	.80	.94	.94	69	69	5.5	200	60	—	200
2	1300	217.85	.78	.91	.91	76	71	7.0	200	60	—	195
3	1305	220.56	.77	.90	.90	79	71	7.0	200	60	—	190
4	1310	223.25	.77	.90	.90	82	72	7.0	200	60	—	190
5	1315	225.42	.80	.94	.94	84	72	7.0	200	60	—	190
6	1320	228.16	.82	.96	.96	86	73	7.5	200	60	—	190
7	1325	230.96	.85	1.00	1.00	88	74	7.5	200	60	—	190
8	1330	233.81	.82	.96	.96	87	74	7.5	200	60	—	190
9	1335	236.50	.85	1.00	1.00	86	75	7.5	200	60	—	195
10	1340	240.07	.80	.94	.94	87	75	7.0	200	60	—	195
11	1345	242.86	.80	.94	.94	86	75	7.0	200	60	—	200
12	1350	245.66	.78	.91	.91	84	74	7.0	200	60	—	200
13	1355	248.39	.80	.94	.94	84	74	7.5	200	60	—	195
14	1400	250.62	.75	.89	.89	82	73	7.0	200	60	—	190
15	1405	253.32	.70	.83	.83	84	73	6.5	200	60	—	190
16	1410	255.95	.68	.80	.80	85	73	6.5	200	60	—	190

JOB NO. Y-7730B

Point	Clock Time	Dry Gas Meter, CF	Pitot in.H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in.Hg	Stack Temp. °F
17	1415	258.53	.68	.80	.80	84	74	6.5	200	60	—	190
18	1420	261.08	.60	.71	.71	84	74	6.0	200	60	—	185
19	1425	263.53	.55	.65	.65	84	74	5.5	200	60	—	190
20	1430	265.85	.50	.60	.60	84	74	5.5	200	60	—	185
21	1435	267.25	.50	.60	.60	84	74	5.5	200	60	—	185
22	1440	270.74	.50	.60	.60	84	74	5.0	200	60	—	185
FINAL	1445	272.526	—	—	—	—	—	—	—	—	—	—
B 1	1450	272.526	.73	.87	.87	78	72	7.0	200	60	—	190
2	1455	275.12	.70	.83	.83	84	74	7.0	200	60	—	190
3	1500	277.75	.75	.88	.88	85	75	7.0	200	60	—	190
4	1505	280.40	.75	.88	.88	81	74	7.0	200	60	—	190
5	1510	283.11	.75	.88	.88	86	74	7.0	200	60	—	190
6	1515	285.74	.78	.92	.92	87	75	7.5	200	60	—	190
7	1520	288.49	.78	.92	.92	85	75	7.5	200	60	—	190
8	1525	291.25	.78	.92	.92	85	74	7.5	200	60	—	190
9	1530	294.00	.82	.96	.96	86	75	7.5	200	60	—	190
10	1535	297.00	.80	.94	.94	86	75	7.5	200	60	—	190
11	1540	299.70	.80	.94	.94	86	74	7.5	200	60	—	190
12	1545	302.40	.70	.83	.83	87	75	7.0	200	60	—	190
13	1550	305.52	.55	.65	.65	85	75	6.0	200	60	—	185
14	1555	307.86	.53	.63	.63	82	73	5.5	200	60	—	185
15	1600	310.13	.50	.60	.60	82	73	5.0	200	60	—	180
16	1605	312.35	.50	.60	.60	82	72	5.0	200	60	—	180
17	1610	314.58	.47	.57	.57	82	73	5.0	200	60	—	180
18	1615	316.76	.47	.57	.57	82	73	5.0	200	60	—	180
19	1620	318.94	.47	.57	.57	82	73	5.0	200	60	—	180
20	1625	320.68	.40	.47	.47	82	73	5.0	200	60	—	180
21	1630	322.65	.40	.47	.47	82	73	5.0	200	60	—	180
22	1635	324.68	.35	.42	.42	82	73	5.0	200	60	—	180
FINAL	1640	326.975	—	—	—	—	—	—	—	—	—	—
												193
NET TIME	220 MIN	111.872				83	74					
							79					

YORK RESEARCH CORPORATION

PARTICULATE CLEANUP SHEET

Date: 26 OCT 71 Plant: ALCOA - WENATCHEE

Run Number: 3 Location of sample port: OUTLET

Operator: MEMBRANE Barometric Pressure: 29.40

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

Volume after sampling 158 ml Container No. _____ Ether-chloroform extraction of impinger water _____ mg

Impinger prefilled with 200 ml Extra No. _____ Impinger water residue _____ mg

Volume Collected -42 ml

Impingers and back half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Dry probe and cyclone catch: Container No. _____ Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. _____ Extra No. _____ Weight results _____ mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.

Filter particulate weight _____ mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	348.6	____	____	____	48.6 − 42.0
Weight before test:	300.0	____	____	____	
Moisture weight collected:	48.6	____	____	____	Moisture Total 6.6 gm
Container Number:	1. ____	2. ____	3. ____	4. ____	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

NO_x EMISSION DATA

RUN NO.	Inlet I	Inlet II	Inlet III	Outlet I	Outlet II	Outlet III	
Date	10/22/71	10/22/71	10/22/71	10/22/71	10/22/71	10/22/71	
mg NO_2	*	*	*	*	*	*	
T_f - Flask Temperature, °F							
V_f - Flask Volume, liters	2.063	2.076	2.086	2.073	2.090	2.081	
P_i - Initial Flask Vacuum, "Hg.	25.0	24.9	24.9	23.4	23.4	23.2	
P_f - Final Flask Vacuum, "Hg.	0.0	0.03	0.0	0.01	0.02	0.02	
ppm NO_2	*	*	*	*	*	*	

$$\text{ppm } NO_2 = \frac{29.63 \times \text{mg } NO_2 \times (T_f + 460)}{V_f \times (P_i - P_f)}$$

* Samples not neutralized with caustic during analytical preparation.

JOB NO. Y-7730B

Date 10/22/71

Plant Wenatchee, Wash.

Sample Collected By ET

Run No. 1-3 Inlet

Power Stat Setting

Field Data

Inlet

Clock Time	10:26		10:55		
Flask Number	1	3	6		
Volume of flask less correction (liter)	2.063	2.076	2.086		
Pressure before sampling in Hg.	25.	24.9	24.9		
Pressure after sampling in Hg.	.0	.03	.0		
Flask temperature, °F					

Remarks:

JOB NO. Y-7730 B

Date 10/22/71

Plant Wenatchee, Wash.

Sample Collected By ET

Run No. 1-3 Outlet

Power Stat Setting

Field Data

	Outlet				
Clock Time	12:25		1250		
Flask Number	9	10	25		
Volume of flask less correction (liter)	2.073	2.090	2.081		
Pressure before sampling in Hg.	23.4	23.4	23.2		
Pressure after sampling in Hg.	.01	.02	.02		
Flask temperature, °F					

Remarks:

SO_2 EMISSION DATA

Inlet

RUN NO.	1	2	3	4	5	6
Date	10/21/71	10/21/71	10/21/71	10/21/71	10/21/71	10/21/71
mg SO_2	0.9	2.8	1.9	3.3	2.6	2.6
Tm - Average Gas Meter Temperature, °F	70	68	74	64	75	72
P_b - Barometric Pressure, "Hg abs.	29.77	29.77	29.77	29.77	29.77	29.77
V_m - Volume of dry gas sampled @ meter conditions, $ft.^3$	8.45	8.48	8.47	8.41	8.44	8.42
ppm SO_2	1.4	4.4	3.0	5.2	4.2	4.1

$$\text{ppm } SO_2 = \frac{0.751 \times \text{mg } SO_2 \times (T_m + 460)}{P_b \times V_m}$$

SO_3 EMISSION DATA

Inlet

RUN NO.	1	2	3	4		
Date	10/21/71	10/21/71	10/21/71	10/21/71		
mg SO_3	0.5	1.7	0.8	1.7		
Tm - Average Gas Meter Temperature, °F	70	68	74	64		
P_b - Barometric Pressure, "Hg abs.	29.77	29.77	29.77	29.77		
V_m - Volume of dry gas sampled @ meter conditions, $ft.^3$	8.45	8.48	8.47	8.44		
ppm SO_3	0.6	2.1	1.0	2.1		

$$\text{ppm } SO_3 = \frac{.6008 \text{ X mg } SO_2 \text{ X } (T_m + 460)}{P_b \text{ X } V_m}$$

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Inlet SO_2

Date 10/21/71

Plant _____ Location Wenatchee

Bar. Pressure 29.77 "Hg Comments:

Ambient Temp. _____

Run No. 1

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
0855	221.05		66
0905	221.76		
925	223.17		68
0935	223.89		68
0955	225.21		72
1005	225.90		
1025	227.38		
1035	228.01		
1055	229.50		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for SO_2 Inlet

Date 10/21/71

Plant _____ Location Wenatchee

Bar. Pressure 29.77 "Hg Comments:

Ambient Temp. _____

Run No. 2

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
0855	280.04		60
0905	280.73		62
0925	282.12		
0935	282.86		
0955	284.28		60
1005	284.90		
1025	286.38		78
1035	287.02		
1055	288.52		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730 B

Material Sampled for Inlet SO_2

Date 10/21/72

Plant _____ Location Wenatchee

Bar. Pressure 29.77 "Hg Comments:

Ambient Temp. _____

Run No. 3

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1207	233.21		74
1217	233.95		78
1237	235.38		76
1247	236.00		
1307	237.42		
1317	238.17		
1337	239.55		72
1347	240.26		72
1407	241.68		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO: Y-7730B

Material Sampled for Inlet SO_2

Date 10/21/77

Plant _____ Location Wenatchee

Bar. Pressure 29.77 "Hg Comments:

Ambient Temp. _____

Run No. 4

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1207	289.47		64
1217	290.14		68
1237	291.59		
1247	292.26		
1307	293.65		
1317	294.31		
1337	295.71		58
1347	296.46		
1407	297.91		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Inlet SO2

Date 10/21/71

Plant _____ Location Wenatchee

Bar. Pressure 29.77 "Hg Comments:

Ambient Temp. _____

Run No. 5

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1445	223.00		74
1455	223.71		76
1515	225.10		
1525	225.83		
1545	227.29		
1555	227.91		74
1615	229.37		76
1625	230.02		
1645	231.44		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Inlet SO_2

Date 10/21/71

Plant _____ Location Wenatchee

Bar. Pressure 29.77 "Hg Comments:

Ambient Temp. _____

Run No. 6

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1445		298.57	70
1455		299.28	72
1515		300.69	
1525		301.32	
1545		302.71	
1555		303.48	
1615		304.84	72
1625		305.52	
1645		306.99	

Comments:

Impinger Bucket No. _____

Meter Box No. _____

SO_2 EMISSION DATA

Outlet

RUN NO.	1	2	3	4	5	6
Date	10/22/71	10/22/71	10/22/71	10/22/71	10/23/71	10/23/71
mg SO_2	6.5	4.5	6.5	5.9	7.3	6.3
T_m - Average Gas Meter Temperature, °F	74	67	72	66	60	59
P_b - Barometric Pressure, "Hg abs.	29.44	29.44	29.44	29.44	29.30	29.30
V_m - Volume of dry gas sampled @ meter conditions, $ft.^3$	8.45	8.41	8.41	8.47	8.40	8.47
ppm SO_2	10.5	7.2	10.5	9.3	11.6	9.9

$$\text{ppm } SO_2 = \frac{0.751 \times \text{mg } SO_2 \times (T_m + 460)}{P_b \times V_m}$$

SO_3 EMISSION DATA

Outlet

RUN NO.	1	2	3	4		
Date	10/22/71	10/22/71	10/22/71	10/22/71		
mg SO_3	0.5	0.7	0.6	0.5		
Tm - Average Gas Meter Temperature, °F	74	67	72	66		
P_b - Barometric Pressure, "Hg abs.	29.54	29.54	29.54	29.54		
V_m - Volume of dry gas sampled @ meter conditions, $ft.^3$	8.45	8.41	8.41	8.47		
ppm SO_3	0.6	0.9	0.8	0.6		

$$\text{ppm } SO_3 = \frac{.6008 \times \text{mg } SO_2 \times (Tm + 460)}{P_b \times V_m}$$

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for SO_2 Outlet

Date 10/22/71

Plant _____ Location Wenatchee

Bar. Pressure 29.44 "Hg Comments:

Ambient Temp. _____

Run No. 1

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1310	252.01		74
1320	252.72		76
1340	254.12		
1350	254.87		
1410	256.25		75
1420	256.96		
1440	258.34		
1450	259.08		
1510	260.46.		72

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Outlet SO_2

Date 10/22/71

Plant _____ Location Wenatchee

Bar. Pressure 29.44 "Hg Comments:

Ambient Temp. _____

Run No. 2

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1310	307.11		64
1320	307.84		68
1340	309.24		
1350	309.96		
1410	311.37		72
1420	312.03		
1440	313.45		
1450	314.19		
			67
1510	315.52		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Outlet SO_2

Date 10/22/71

Plant _____ Location Wenatchee

Bar. Pressure 29.44 "Hg Comments:

Ambient Temp. _____

Run No. 3

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1535	260.46		72
1545	261.14.		
1605	262.57		72
1615	263.28		
1635	264.69		72
1645	265.30		
1705	266.75		
1715	267.48		
1735	268.87.		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Outlet SO_2

Date 10/22/71

Plant _____ Location Wenatchee

Bar. Pressure 29.44 "Hg Comments:

Ambient Temp. _____

Run No. 4

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1535	305.52		64
1545	306.21		66
1605	307.63		
1615	308.35		
1635	309.76		68
1645	310.40		
1705	311.82		
1715	312.54		
1735	313.99.		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Outlet SO_2

Date 10/23/71

Plant _____ Location Wenatchee

Bar. Pressure 29.30 "Hg Comments:

Ambient Temp. _____

Run No. 5

Power Stat Setting _____

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
0730	268.99		58
0740	269.62		60
0800	271.04		
0810	271.73		
0830	273.15		60
0840	278.81		60
0900	275.24		
0910	275.99		
0930	277.39		62

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730 B

Material Sampled for Outlet SO_2

Date 10/23/71

Plant _____ Location Wenatchee

Bar. Pressure 29.30 "Hg Comments:

Ambient Temp. _____

Run No. 6

Power Stat Setting ←

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
0730	325.81		56
0740	326.57		58
0800	327.96		
0810	328.64		
0830	330.03		58
0840	330.78		
0900	332.19		
0910	332.80		
0930	334.28.		60

Comments:

Impinger Bucket No. _____

Meter Box No. _____

F⁻ EMISSION DATA

	Inlet H_2O Soln.			Inlet .1N NaOH		
Run No.	1	2	3	1	2	3
Date	10/20/71	10/20/71	10/20/71	10/20/71	10/20/71	10/20/71
mg F⁻	4.1	2.7	11.2	4.6	4.3	4.4
T_m - Average Gas Meter Temperature, °F	62	67	75	66	68	73
P_b - Barometric Pressure - "Hg abs.	29.55	29.55	29.55	29.55	29.55	29.55
V_m - Volume of dry gas sampled @ meter conditions, $ft.^3$	7.50	5.48	7.55	8.56	7.52	7.94
SCFM	31000	31000	31000	31000	31000	31000
lb F⁻/hr	2.24	2.03	6.22	2.22	2.52	2.31
Ton Al/hr	0.346	0.346	0.346	0.346	0.346	0.346
lb F⁻/Ton Al	6.47	5.87	17.98	6.42	7.28	6.68

$$\frac{\text{lb } F^-}{\text{hr}} = 7.47 \times 10^{-6} \frac{\text{mg } F^- (T_m + 460)\ \text{SCFM}}{V_m\ P_b}$$

GAS SAMPLING FIELD DATA

JOB NO. Y-7730 B

Material Sampled for Inlet HF in H_2O

Date 10/20/71

Plant _____ Location Wenatchee, Wash

Bar. Pressure 29.55 "Hg Comments:

Ambient Temp. _____

Run No. 1

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ETT

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
0925	195.51		60
0935	196.41		62
0945	197.28		
0955	198.62		
1005	199.76		
1015	200.72		
1025	201.64		62
1035	202.22		
1045	203.01		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

NCAP 36 (12/67)

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Inlet HF in H_2O

Date 10/20/71

Plant _____ Location Wenatchee, Wash

Bar. Pressure 29.55 "Hg Comments:

Ambient Temp. _____

Run No. 2

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1215	105.74		60
1225	106.63		62
1235	107.77		74
1245	108.24		
1255	109.29		
1305	110.82		
1315	111.22		75

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730-B

Material Sampled for Inlet HF in H_2O

Date 10/20/71

Plant _____ Location Wenatchee

Bar. Pressure 29.58 "Hg Comments:

Ambient Temp. _____

Run No. 3

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1430	113.37		74
1440	114.28		
1450	115.83		
1500	116.24		
1510	117.71		76
1520	118.18		
1530	119.45		
1540	120.00		
1545	120.92.		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Inlet HF in 1N NaOH

Date 10/20/71

Plant _____ Location Wenatchee

Bar. Pressure 29.59 "Hg Comments:

Ambient Temp. _____

Run No. 1

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
0925	354.42		64
0935	355.46		
0945	356.68		
0955	357.22		
1005	358.30		
1015	359.28		
1025	360.62		66
1035	361.81		
1045	362.98.		66

Comments:

Impinger Bucket No. _____

Meter Box No. _____

NCAP 36 (12/67)

GAS SAMPLING FIELD DATA

JOB NO. Y-7730-B

Material Sampled for Inlet HF in .1N NaOH

Date 10/20/71

Plant _____ Location Wenatchee

Bar. Pressure 29.55 "Hg Comments:

Ambient Temp. _____

Run No. 2

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1215	364.49		66
1225	365.18		
1235	366.82		
1245	367.44		
1255	368.48		67
1305	369.90		
1315	370.52		70
1325	371.42		
1330	372.01		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730 B

Material Sampled for Inlet HF in W NaOH

Date 10/20/71

Plant _____ Location Wenatchee

Bar. Pressure 29.55 "Hg Comments:

Ambient Temp. _____

Run No. 3

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1430	372.01		70
1440	373.81		73
1450	374.22		
1460	375.38		74
1410	376.47		74
1420	377.40		
1430	378.11		
1440	379.00		
1445	379.95.		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

NCAP 36 (12/67)

F^- EMISSION DATA

Outlet HF in H_2O

Run No.	1	2	3	4		
Date	10/23/71	10/25/71	10/25/71	10/25/71		
mg F^-	0.16	0.22	0.17	0.20		
T_m - Average Gas Meter Temperature, °F	68	67	67	63		
P_b - Barometric Pressure - "Hg abs.	29.30	29.40	29.40	29.40		
V_m - Volume of dry gas sampled @ meter conditions, $ft.^3$	10.03	10.06	10.02	10.10		
SCFM	11900	11900	11900	11900		
lb F^-/hr	.0153	.0348	.0270	.0513		
Ton Al/hr	.116	.116	.116	.116		
lb F^-/Ton Al	.132	.300	.233	.270		

$$\frac{\text{lb } F^-}{\text{hr}} = 7.47 \times 10^{-6} \frac{\text{mg } F^- (T_m + 460)\ \text{SCFM}}{V_m\ P_b}$$

GAS SAMPLING FIELD DATA

Job No. Y-7730B

Material Sampled for Outlet HF in H_2O

Date 10/23/71

Plant _____ Location Wenatchee

Bar. Pressure 29.30 "Hg Comments:

Ambient Temp. _____

Run No. 1

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1010	377.39		64
1020	378.32		68
1040	380.30		68
1050	381.38		69
1110	383.38		
1120	384.32		
1140	386.37		
1150	387.42		68

Comments:

Impinger Bucket No. _____

Meter Box No. _____

NCAP 36 (12/67)

GAS SAMPLING FIELD DATA

Job No. Y-77206

Material Sampled for Outlet HF to H2O

Date 10/25/71

Plant _____ Location Wenatchee

Bar. Pressure 29.40 "Hg Comments:

Ambient Temp. _____

Run No. 2

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
0800	387.42		64
0810	388.38		66
0830	390.42		
0840	391.58		68
0900	393.71		
0910	394.28		
0930	396.91		
0940	397.48		68

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

Source No. X-7

Material Sampled for Outlet HF in H_2O

Date 10/25/71

Plant _____ Location Wenatchee

Bar. Pressure 29.40 "Hg Comments:

Ambient Temp. _____

Run No. 3

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1035	357.48		66
1045	358.26		68
1105	360.84		
1115	361.71		
1135	363.61		
1145	364.18		
1205	366.70		
1215	367.50		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

Test No. Y-7230B

Material Sampled for Outlet HF in H_2O

Date 10/25/71

Plant _____ Location Wenatchee

Bar. Pressure 29.40 "Hg Comments:

Ambient Temp. _____

Run No. 4

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1410	307.50		60
1420	308.51		62
1440	310.48		62
1450	311.32		
1510	313.36		62
1520	314.24		
1540	316.11		
1550	317.60		66

Comments:

Impinger Bucket No. _____

Meter Box No. _____

F⁻ EMISSION DATA

Outlet HF in .1 N NaOH

Run No.	1	2	3	4		
Date	10/23/71	10/25/71	10/23/71	10/25/71		
mg F⁻	0.22	0.17	0.18	0.19		
T_m - Average Gas Meter Temperature, °F	67	55	58	68		
P_b - Barometric Pressure - "Hg abs.	29.30	29.40	29.40	29.40		
V_m - Volume of dry gas sampled @ meter conditions, $ft.^3$	10.01	10.05	10.06	10.11		
SCFM	11900	11900	11900	11900		
lb F⁻/hr	.0351	.0263	.0263	.0300		
Ton Al/hr	.116	0.116	0.116	0.116		
lb F⁻/Ton Al	0.303	0.227	0.227	0.257		

$$\frac{\text{lb F}^-}{\text{hr}} = 7.47 \times 10^{-6} \frac{\text{mg F}^- (T_m + 460)\ \text{SCFM}}{V_m\ P_b}$$

GAS SAMPLING FIELD DATA

Job No. Y-7730B

Material Sampled for Outlet HF in NaOH

Date 10/23/71

Plant _____ Location Wenatchee

Bar. Pressure 29.30 "Hg Comments:

Ambient Temp. _____

Run No. 1

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1010	334.28		70
1020	335.26		
1040	337.29		72
1050	338.21		
1110	340.26		
1120	341.23		
1140	343.22		
1150	344.29		62

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

Job No. Y-7730 B

Material Sampled for Outlet HF in 1N NaOH

Date 10/25/-1

Plant _____ Location Wenatchee

Bar. Pressure 29.40 "Hg Comments:

Ambient Temp. _____

Run No. 2

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
0800	344.20		50
0810	345.31		52
0830	347.71		
0840	248.22		58
0900	250.71		
0910	251.68		
0930	253.70		
0940	254.25		56

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Outlet HF in 1N NaOH

Date 10/25/71

Plant _____ Location Wenatchee

Bar. Pressure 29.40 "Hg Comments:

Ambient Temp. _____

Run No. 3

Power Stat Setting ✓

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1035	354.25		56
1045	355.31		58
1105	357.96		
1115	358.71		58
1135	360.28		
1145	361.18		
1205	363.22		
1215	364.31		58

Comments:

Impinger Bucket No. _____

Meter Box No. _____

GAS SAMPLING FIELD DATA

JOB NO. Y-7730B

Material Sampled for Outlet HF in .1N NaOH

Date 10/25/71

Plant _____ Location Wenatchee

Bar. Pressure 29.40 "Hg Comments:

Ambient Temp. _____

Run No. 4

Power Stat Setting —

Filter Used: Yes ____ No X

Operator ET

CLOCK TIME	METER (Ft^3)	FLOW METER SETTING (CFM)	METER TEMPERATURE TM
1410	364.31		68
1420	365.38		68
1440	367.14		
1450	368.29		68
1510	370.29		
1520	371.31		
1540	373.65		
1550	374.42		

Comments:

Impinger Bucket No. _____

Meter Box No. _____

NCAP 36 (12/67)

JOB NO. 7730 B ORSAT FIELD DATA

Location INLET & OUTLET Comments:

Date 10/20/71

Time

Operator RS

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
INLET 1	0.5	20.0	21.0
2	0.2	19.8	21.2
3	0.2	19.5	21.2
OUTLET 1	0.5	20.2	21.0
2	0.5	20.0	21.0
3	0.3	20.0	21.2

JOB NO. 7730 B ORSAT FIELD DATA

Location INLET & OUTLET Comments:

Date 10/21/21

Time

Operator RE

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
OUTLET 1	1.0	20.0	21.6
2	1.0	21.0	21.5
3	1.4	21.7	22.0
INLET 1	1.0	20.0	21.6
2	1.0	21.0	21.5
3	1.4	21.7	22.0

JOB NO. 7730 B

ORSAT FIELD DATA

Location INLET & OUTLET Comments:

Date 10/22/71

Time

Operator RS

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
INLET			
1	1.2	20.4	20.9
2	1.0	21.5	22.0
3	1.0	21.2	21.3
OUTLET			
1	0.5	20.6	21.2
2	0.2	20.7	21.2
3	0.3	20.6	21.1

JOB. NO. 7730 B

ORSAT FIELD DATA

Location OUTLET & INLET

Comments:

Date 10/23/71

Time

Operator RE

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
OUTLET 1	0.5	20.3	21.0
2	0.5	20.1	21.0
3	0.4	20.2	21.0
INLET 1	0.5	20.3	21.0
2	0.5	20.1	21.0
3	0.4	20.2	21.0

JOB NO. 7730 B

ORSAT FIELD DATA

Location INLET & OUTLET Comments:

Date 10/25/71

Time

Operator RE

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
INLET 1	0.8	20.6	21.6
2	0.4	21.2	21.5
3	0.6	21.1	21.5
OUTLET 1	0.6	21.0	21.6
2	0.6	20.6	21.3
3	0.6	20.6	21.4

JOB NO. 7730B

ORSAT FIELD DATA

Location OUTLET

Comments:

Date 10/26/71

Time

Operator RE

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
OUTLET 1	0.3	21.0	21.5
2	0.6	21.0	21.6
3	0.5	21.0	21.6

IV. GENERAL SAMPLING METHODS - APPARATUS AND PROCEDURE

PARTICULATE SAMPLING TRAIN - APCO METHOD

Apparatus

The sampling apparatus consisted of a 5 foot probe, cyclone, filter, four impingers, dry gas meter, vacuum pump and flow meter as shown in Figure 1. The stainless steel, button-hook type probe tip (1) was equipped with a 5/8 inch diameter fitting connected by a stainless steel coupling (2) with asbestos packing to the probe. The probe (3) consisted of 5/8 inch outside diameter medium-wall Pyrex glass tube with a ground glass joint on one end. The glass probe was logarithmically wound from the entrance end with 26-gauge nickel-chromium wire. During sampling, the wire was connected to a variable transformer to maintain a gas temperature of 250°F in the probe. The wire wound glass tube was wrapped with fiber glass tape and encased in a 1-inch-OD stainless steel tube for protection. The end of the steel tube that does not have the balljoint protruding has a nut welded to it for connection to the stainless steel coupling used to attach the nozzle. The probe connects to a cyclone and flask (4). The cyclone connects to a very coarse fritted glass filter holder (5), which holds a tared glass fiber filter. The cyclone, flask, and filter were contained in an electrically heated enclosed box (6), which is thermostatically maintained at a minimum temperature of 250°F to prevent water condensation. Attached to the heated box was an ice bath (7) containing four impingers connected in series with glass balljoints. The first impinger (8) receives the gas stream from the filter. This impinger is of the Greenburg-Smith design modified by replacing the tip with a 1/2 inch-ID glass tube extending to 0.5 inch from the bottom of the flask. This impinger was initially filled with 100 milliliters of distilled water. The second impinger (9) is a Greenburg-Smith impinger with tip, and also filled with 100 milliliters of distilled water. The third impinger (10), which was left dry, is a Greenburg-Smith impinger modified like the first. The fourth impinger (11) is also a Greenburg-Smith type modified like the first and contained dry silica gel.

From the fourth impinger (11) the effluent stream flows through a check valve (13); flexible rubber vacuum tubing (14); vacuum gauge (15); a needle valve (16); a leakless vacuum pump (17), rated at 4 cubic feet per minute at 0 inches of mercury gauge pressure and 0 cubic feet per minute at 26 inches of mercury gauge pressure, and connected in parallel with a by-pass valve (18); and a dry gas meter rated at .1 cubic foot per revolution

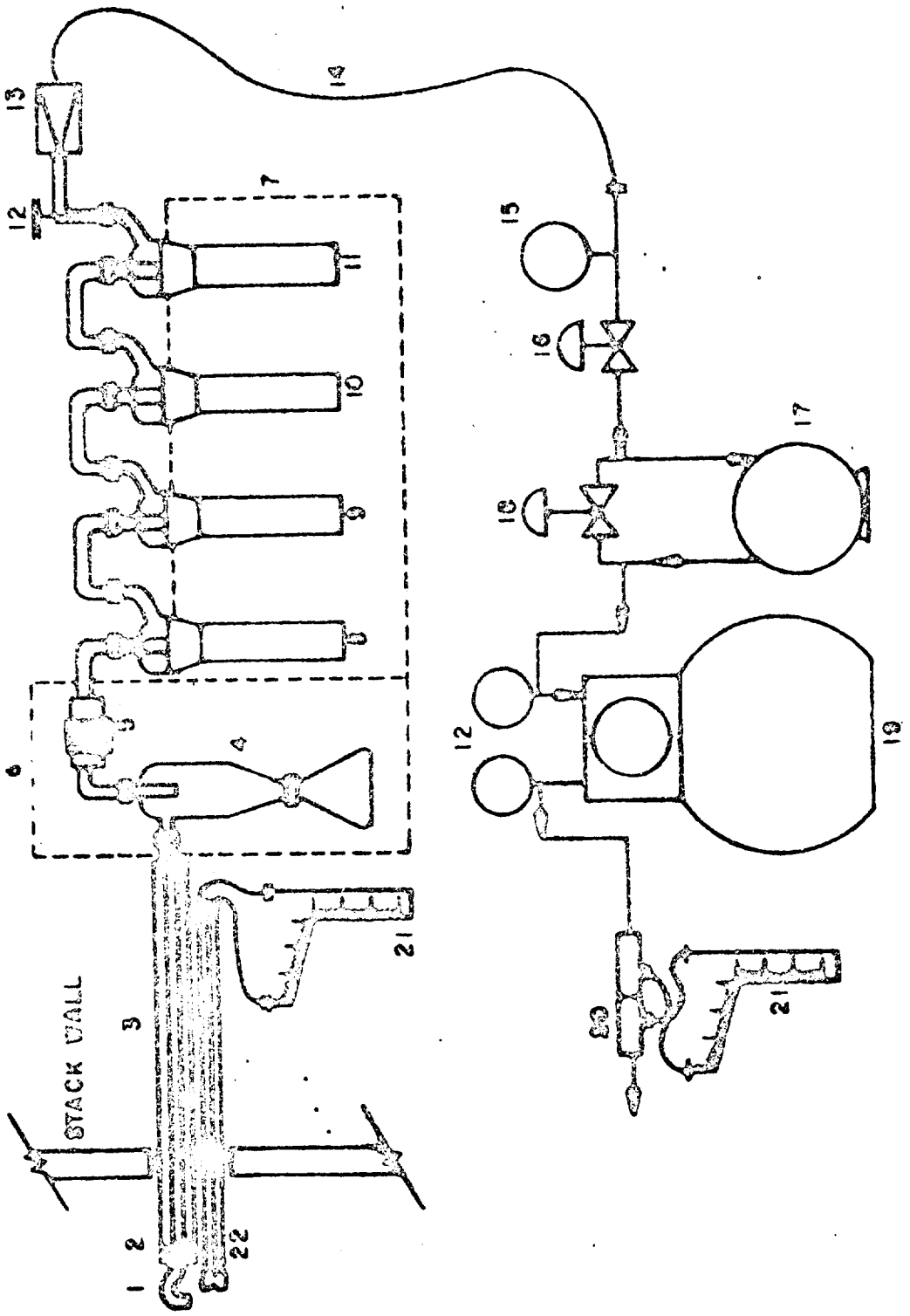


FIGURE 1
ACTINOLATE SAMPLING TRAIN

(19). A calibrated orifice (20) completes the train and was used to measure instantaneous flow rates. The three thermometers (12) are dial type with a range of 25° to 125°F. A fourth thermometer in the heated portion of the box has a range up to 500°F. The dual manometer (21) across the calibrated orifice is an inclined-vertical type graduated in hundredths of an inch of water from 0 to 1.0 inch and in tenths from 1 to 10 inches.

Moisture

The percent moisture was assumed to be 2% at the inlet and 1% at the outlet by the Federal Project Officer. This was reasonable for the inlet and the outlet gas streams.

SO_2 Sampling

The sampling apparatus consisted of the following components arranged and illustrated schematically in Figure 3: (1) glass wool filter, (2) an electrically heated glass probe, (3) a coarse frit midget impinger, (4) fiber glass filter, (5,6,7) three midget impingers, (8) ice bath, (9) a silica gel tube drier, (10) vacuum gauge, (11) valve, (12) a leakless pump with by-pass valve, (13) a dry gas meter, (14) a rotometer and (15) a pitot tube with manometer.

The probe was made of a 3 foot length medium wall from Pyrex tubing wound with 26-gauge Nichrome heating wire. The front end included a two-inch long expansion for insertion of the glass wool filter. The wire was connected to a variable transformer which allows the voltage and hence the heat input to be controlled. The wire was covered with a fiber glass insulation tape.

The probe connects to a coarse frit midget bubbler containing 15 ml of 80% isopropanol and three midget impingers, the first two of which contained 15 ml of 3% H_2O_2 each with the third left dry, connected in series. The chamber near the bubbler outlet was stuffed with fine glass wool. An ice bath was provided for the bubbler and impingers. Attached to the outlet of the third impinger was a drying tube filled with silica gel of the indicator type. A by-pass valve was provided for the leakless pump and a vacuum gauge and needle valve were installed at the inlet of the pump. The dry gas meter had a sensitivity of 0.001 cubic foot and was fritted with thermo-

meters on the meter inlet and outlet.

A calibrated type "S" Pitot Tube was attached to the probe and connected to an inclined manometer with a sensitivity of 0.01 in H_2O.

Oxides of Nitrogen

Samples were collected by grab sampling, using evacuated flasks containing a dilute solution of hydrogen peroxide and sulfuric acid. The hydrogen peroxide oxidizes the lower oxides of nitrogen (with the exception of nitrous oxides) to nitric acid. The resultant solution was then evaporated to dryness and treated with phenoldisulfphonic acid reagent and ammonium hydroxide. The yellow trialkali salt of 6-nitro-1-phenol-2, 4-disulfphonic acid is formed, which was then measured colorimetrically. Some analytical problems were encountered since samples were not neutralized with caustic during analytical preparation.

CO_2, O_2, CO by Orsat

Integrated samples for CO_2 and O_2 were collected over a 60 minute period as per Section 5.2 of the General Procedure.

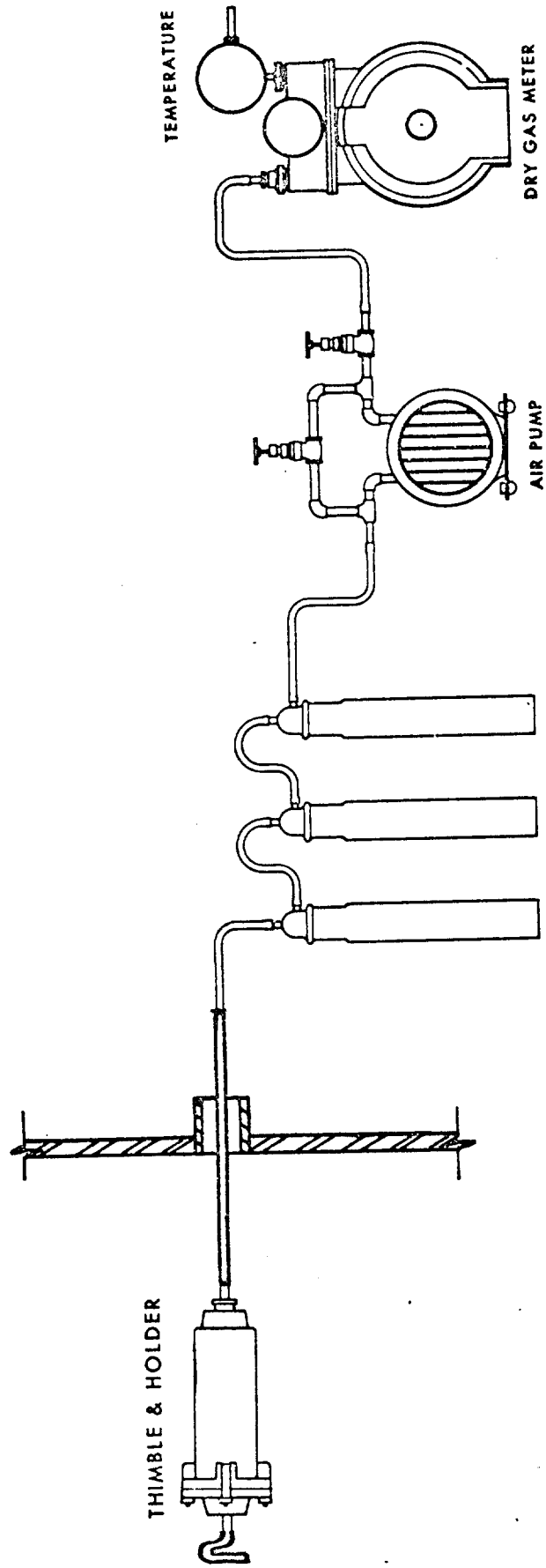
ASME Gas Sampling Equipment

The particulate sampling train was arranged as illustrated in figure 2. The sampling nozzle extracts a uniform sample of gas and particulate from the gas stream. The proper nozzle size is a function of the velocity of the flue gas and the sampling rate to be maintained.

The gas sample next passes through a paper thimble mounted in a thimble holder. The thimble and holder are inserted in the stack to prevent condensation in the thimble. The gas now passes through a stainless steel sampling probe.

Upon discharge from the probe, the sample gas next enters the three Greenburg-Smith impingers. The first two impingers contained 100 ml of H_2O, while the third impinger was operated dry. The impingers were maintained in a wet ice bath. The purpose of the impingers was to trap particulate matter smaller than 1 micron and to condense any vapors present in the sample gas.

The sample gas then passes through a vacuum pump and gas regulating valve to a Sprague Dry Gas Meter and is exhausted. All connections were made using heavy rubber tubing checked for tightness by blocking the sampling nozzle, and carefully applying suction; if the meter does not creep, the system is tight.



SAMPLING TRAIN

FIGURE #2

SO_2 SAMPLING TRAIN

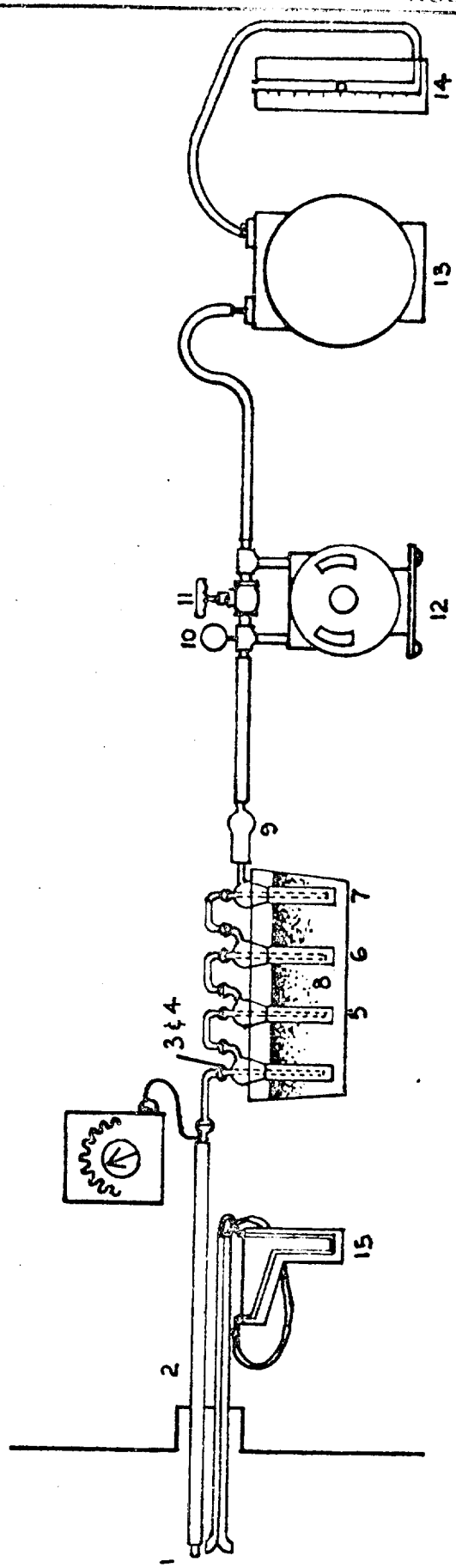


FIGURE #3

WENATCHEE LOG

10-17-71 - Sunday

2130 - Arrived Wenatchee, Washington

10-18-71 - Monday

0830 - Arrived at Alcoa Plant
1000 - Meeting with Plant Officials to discuss test methods and procedures.
1330 - Set up for test (measured stack diameter, b brought equipment to test locations, set up NAPCA and gas trains, marked probes, preliminary pitot traverse, etc.). Requested - platform for inlet train, removal of support blocking outlet train.

1700 Returned to Motel

10-19-71 - Tuesday

0800 - Arrived at Plant, prepared to start test, found vertical inlet port in poor location. (Support above blocked sample box when inserting probe into port.) Plant personnel unable to relocate port until after 1700.

1500-Returned to Motel

10-20-71 - Wednesday

0800 - Arrived at Plant prepared to start test
025-1045 - Inlet HF Test #1
1015 - Started Test #1 (paper filter)
Outlet Test 1015-1440
Inlet Test 1250-1740 (Test was delayed due to low voltage supplied by Plant.)
1215-1315 - Inlet HF Test #2
1430-1545 - Inlet HF Test #3

1630 - Returned to Motel

10-21-71 - Thursday

0800 - Arrived at Plant
0855-1055 - SO_2 and SO_3 Test 1, 2
0920-1320 - Outlet Paper Test #2
1000-1400 - Inlet Paper Test #2

10-21-71 - Thursday (Continued)

1205-1405 - SO_2 and SO_3 Test 3,4
1445-1645 - SO_2 and SO_3 Test 5,6

1700 - Returned to Motel

10-22-71 - Friday

0630 - Arrived at Plant
0735-1125 Outlet Paper Test 3
0740-1030 - Inlet Paper Test 3
1310-1510 - Outlet SO_2 and SO_3 Test 1,2
1315-1700 - Outlet Glass Fiber Test 1
1430-1705 - Inlet Glass Fiber Test 1
1535-1735 - Outlet SO_2 and SO_3 Test 3,4
1730-1930 - Outlet SO_2 and SO_3 Test 3,6

1950 - Returned to Motel

10-23-71 - Saturday

0630 - Arrived at Plant
0725-1115 - Outlet Glass Fiber Test 2
1730-1015 - Inlet Glass Fiber Test 2
1010-1150 - Outlet HF Test 1

1400 - Returned to Motel

10-25-71 - Monday

0630 - Arrived at Plant
0800-1100 - Inlet Glass Fiber Test 3
0800-0940 - Outlet HF Test 2
0810-1200 - Outlet Glass Fiber Test 3
1035-1215 - Outlet HF Test 3
1410-1550 - Outlet HF Test 4
1415-1800 - Outlet Membrane Test 1

1930 - Returned to Motel

10-26-71 - Tuesday

0810-1200 - Outlet Membrane Test 2
0800-1800 - Pack equipment and run extra test requested by Plant
1300-1640 - Outlet Membrane Test 3

1800 - Return to Motel

PROJECT PARTICIPANTS

Robert S. Epstein - Project Director

Erwin Theisz - Assistant Project Director

Richard Kling - Test Engineer

Roger Kniskern - Test Engineer

Geoffrey Knobel - Test Engineer

Kenneth Crepeau - Test Engineer