AP-42 Section 11.10
Reference 17
Report Sect.
Reference

10

CI - 6

FINAL

Reference #7 in existing section.

REPORT

by

YORK RESEARCH CORPORATION

on

EMISSIONS FROM THE ISLAND CREEK COAL COMPANY COAL PROCESSING PLANT

at

VANSANT, VIRGINIA 24656

By

Richard W. Kling
Project Engineer

February 14, 1972

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I. INTRODUCTION

I. ABSTRACT

An Emission Test Program was conducted for EPA at the Island Creek Coal Company's Pocohontas Number 3 Coal Processing Plant at Vansant, Virginia, from the 24th to the 28th of January, 1972. Sampling was performed by York Research Corporation in accordance with the EPA Test Procedures at the inlet and outlet of the Research Cottrel Venturi wet scrubber, which was used to control emissions from the coal processing plant. The contaminants measured at the scrubber inlet and outlet included particulate, sulfur dioxide, carbon dioxide, oxygen and carbon monoxide. In addition, the exhaust of the scrubber was sampled for total nitrogen oxides and total gaseous hydrocarbons.

II. PURPOSE

This test and report is intended to obtain the quantity of air pollutant emissions from the specified coal processing plant. The information was obtained by conducting a test at the site. The samples from the test were then analyzed in the laboratory and reported upon. Finally, the field data and laboratory report was coordinated and combined in a final report. The results of this report will show the level of emission control possible by Research Cottrel's Venturi scrubber.

III. SCOPE OF WORK

The test program was developed by the Environmental Protection Agency and is shown in the following schedule tables.

Sample Schedule Inlet

Test Run No.	Particulate	SO_2	NOx	Orsat	Hydrocarbons
1	1	1	-	1	-
2	1	1	-	1	-
3	1	1	-	1	-

Sample Schedule Outlet

1	1	1	1	1	-
2	1	1	1	1	1
3	1	1	1	1	1

II. TEST RESULTS

TABLE I

SUMMARY OF RESULTS - TEST #1

	Inlet	Outlet
Date:	1/25/72	1/25/72
Stack Flow Rate - SCFM	156,000	162,000
% Water Vapor - Vol. %	15.0	13.3
% CO_2 - Vol. % Dry	1.1	1.1
% O_2 - Vol. % Dry	17.4	17.4
% N_2 - Vol. % Dry	81.5	81.5
SO_2 Emission - ppm	37.1	6.71
NO_2 Emission - ppm		
#1	-	73.9
#2	-	69.6
#3	-	53.9
Hydrocarbons - ppm		
#1	-	44.91
#2	-	64.53
#3	-	62.78
Particulate Emission - Filter, Cyclone and Probe		
Gr./CF @ Stack Conditions	1.2719	0.0177
Gr./SCFD	1.8360	0.0236
Lb./hr.	2450.	32.8
Particulate Emission - Total		
Gr./CF @ Stack Conditions	1.2763	.0229
Gr./SCFD	1.8423	0.0305
Lb/hr.	2460.	42.3

TABLE II

SUMMARY OF RESULTS - TEST #2

	Inlet	Outlet
Date:	1/26/72	1/26/72
Stack Flow Rate - SCFM	157,000	157,000
% Water Vapor - Vol. %	8.4	13.4
% CO_2 - Vol. % Dry	1.6	1.6
% O_2 - Vol. % Dry	17.3	17.7
% N_2 - Vol. % Dry	81.1	80.7
SO_2 Emission - ppm	41.0	2.68
NO_2 Emission - ppm		
#1	-	17.2
#2	-	71.7
#3	-	88.3
Hydrocarbons - ppm		
#1	-	53.64
#2	-	65.40
#3	-	44.14
Particulate Emission - Filter, Cyclone and Probe		
Gr./CF @ Stack Conditions	.5518	0.0088
Gr./SCFD	.7356	0.0118
Lb./hr.	990.	15.9
Particulate Emission - Total		
Gr/CF @ Stack Conditions	.5627	0.0117
Gr/SCFD	.7502	0.0157
Lb./hr	1010.	21.1

TABLE III

SUMMARY OF RESULTS - TEST #3

	Inlet	Outlet
Date:	1/27/72	1/27/72
Stack Flow Rate - SCFM	170,000	157,000
% Water Vapor - Vol. %	9.6	12.7
% CO_2 - Vol. % Dry	1.6	1.5
% O_2 - Vol. % Dry	17.8	17.7
% N_2 - Vol. % Dry	80.6	80.8
SO_2 Emissions - ppm	44.5	25.7
NO_2 Emissions - ppm		
#1	-	43.1
#2	-	72.5
#3	-	71.8
Hydrocarbons - ppm		
#1	-	175.5
#2	-	160.5
#3	-	-
Particulate Emission - Filter, Cyclone and Probe		
Gr/CF @ Stack Conditions	1.6255	0.0120
Gr/SCFD	2.1644	0.0159
Lb./hr	3150.	21.4
Particulate Emission - Total		
Gr/CF @ Stack Conditions	1.6285	0.0157
Gr/SCFD	2.1684	0.0208
Lb./Hr	3160.	28.0

PARTICLE SIZE ANALYSIS

The following two graphs show the particle size distribution of the inlet and the outlet samples on the first test.

This report was submitted to York Research by Commercial Testing and Engineering Company of Chicago, Illinois.

All analyses were done on the Coulter Counter. Each sample was dispersed with Aerosol OT, and further dispersed using an ultrasonic bath. Isoton was the electrolyte used.

COULTER COUNTER®

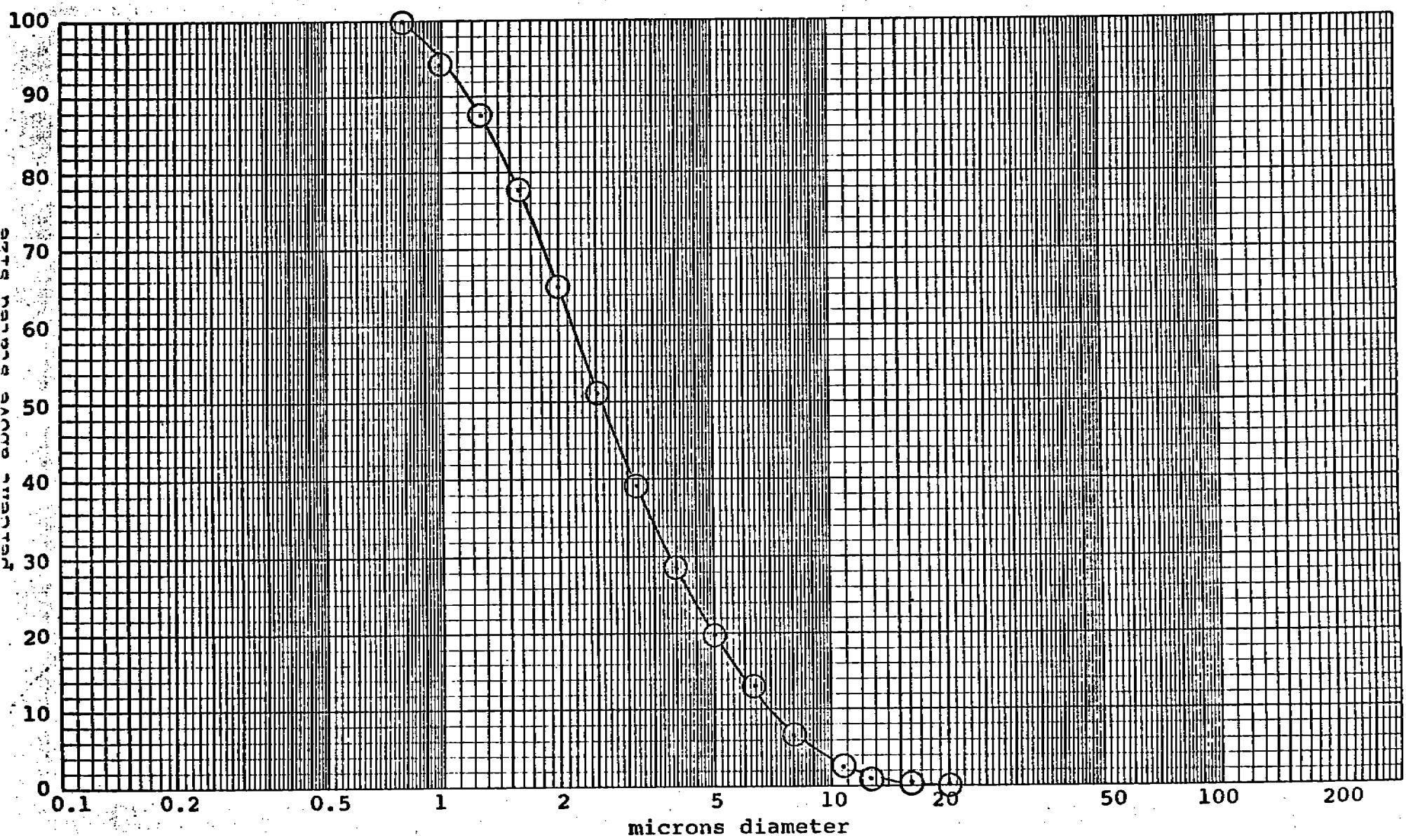
PARTICLE SIZE ANALYSIS

COMMERCIAL TESTING & ENGINEERING CO
CHICAGO, ILLINOIS 60601
228 NORTH LA SALLE STREET
312/726-8434

Source YORK RESEARCH CORPORATION Operator LSB Date 2-16-72

material and sample no. electrolyte & dispersant aperture

⊙	Y-7730-H (in)	Isoton	Aerosol OT	100 μ
⊡			Ultrasonic	30 μ
△			bath	
◊				



COULTER COUNTER®

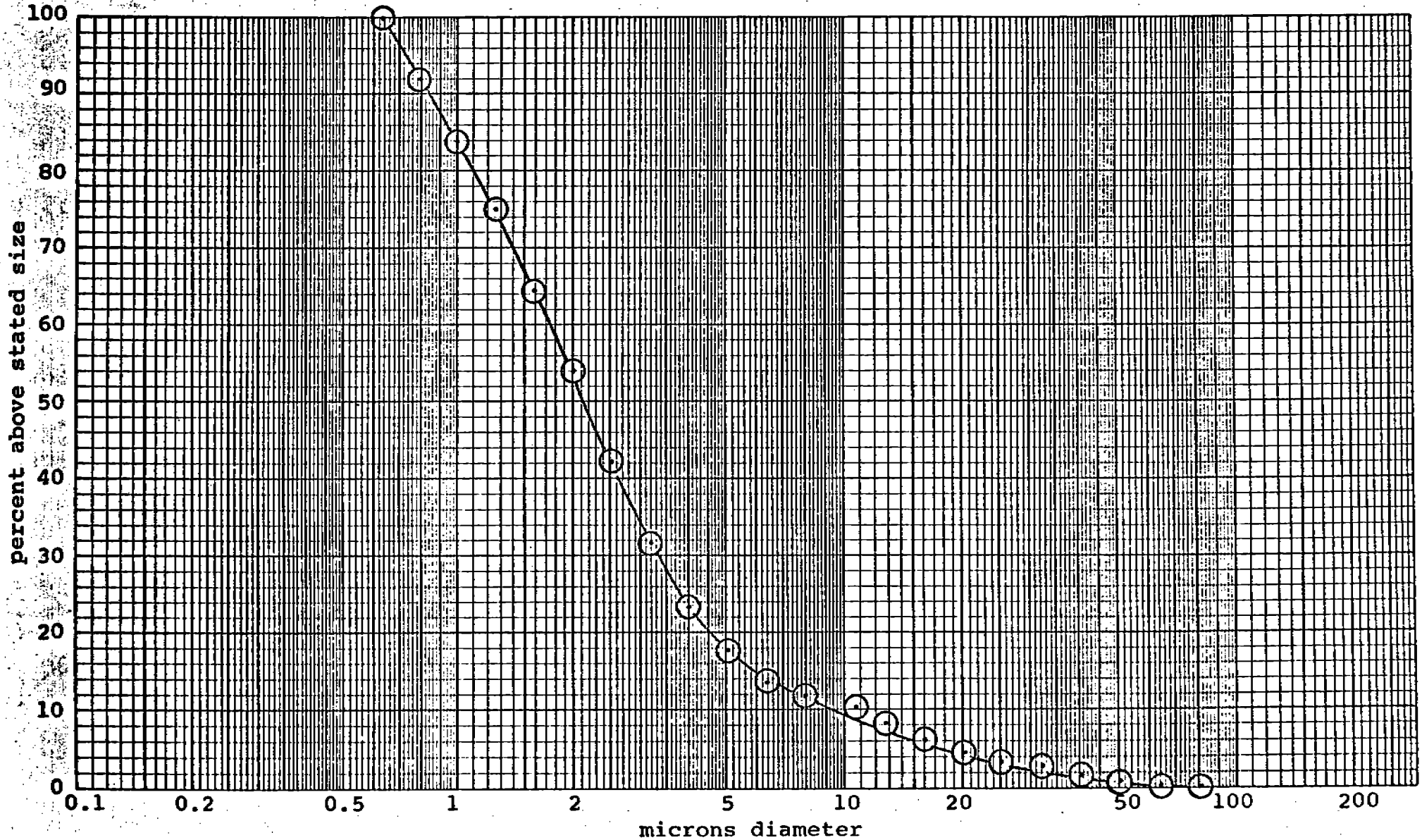
PARTICLE SIZE ANALYSIS

COMMERCIAL TESTING & ENGINEERING CO.
CHICAGO, ILLINOIS 60601
228 NORTH LA SALLE STREET
312/726-8434

Source YORK RESEARCH CORPORATION Operator LSB Date 2-18-72

material and sample no. electrolyte & dispersant aperture

⊙	Y-7730-H (out)	Isoton	Aerosol OT	280 μ
⊡			Ultrasonic	100 μ
△			bath	30 μ
◈				



III. THE PROCESS

THE PROCESS

The following four paragraphs were submitted to York Research Corporation for inclusion in Report No. Y-7730-H. This contains all available data pertinent to the tests at the Island Creek Coal Company Plant at Vansant, Virginia.

I. Purpose

The trip was made to monitor process conditions during the source test of a thermal dryer-scrubber system on a wet coal cleaning process.

II. Place and Date

The test was conducted at Island Creek Coal Company's Virginia Pocahantas No. 3 preparation plant, Vansant, Virginia during January 24-28, 1972.

III. Attendees

Name	Affiliation	Function
Tom Ward	EPA/OAP/ETB	Test Engineer
Joe Sableski	EPA/OAP/ISB	Section Chief
Larry Jones	EPA/OAP/ISB	Chemical Engineer
Charlie Sedman	EPA/OAP/ISB	Chemical Engineer
Bob Resensteel	EPA/OAP/AQMB	Chemical Engineer
Mike Overstreet	Va. Air Pollution Control Board, Region I	Assistant Director
Nick Buchholz	Virginia APCB	Engineer (EPA Assignee)
Tom Creasy	Virginia APCB	Staff Engineer
Jack Catron	Virginia APCB	APC Officer, Region I
Mel Williams	Virginia APCB	Region II, Director
Bliss Blankenship	Island Creek Coal Co.	Director of Preparation, V.P. Division
Rex Blankenship	Island Creek Coal Co.	Preparation Engineer
Dennis Willis	Island Creek Coal Co.	Field Engineer
W. E. White	Island Creek Coal Co.	Chief Chemist
Lundy Taylor	Island Creek Coal Co.	Tipple Foreman, V.P.#3
George Cook	Research-Cottrell, Inc.	Project Engineer
Rick Dubrovsky	Research-Cottrell, Inc.	Project Manager
Ken Matthews	McNally-Pittsburg	V.P.-Engineering
John R. Bryan, Jr.	Clinchfield Coal Co.	Environmental Engineer

(Eight employees of York Research conducted test.)

IV. TEST DISCUSSION

A. The test series conducted by York Research under the observation of representatives of EPA created interest among members of the Virginia State Air Pollution Control Board. Several members of the State Board were on the site as observers during the test. Research Cottrel sent representatives to observe York Research testing and perform tests using their own methods. Research Cottrel representatives were also present to assure that the Venturi scrubber was operating as designed. McNally-Pittsburg had representatives present to assure that the Plant was operating under a normal condition.

B. The first run was performed on 25 January 1972. The test was secured before completion due to exhaustion of the coal supply available for the process. The second and third runs were run on the 26th and 27th of January, respectively. The coal supply ran short during the second run similar to the first run. The third test was completed in its entirety, the coal supply being adequate for the duration of the run. During York Research's second and third run, Research Cottrel ran simultaneous particulate tests using their own method and equipment.

C. The process parameters monitored during the testing were; raw coal feed, furnace combustion zone temperature and dryer exhaust temperature. EPA also monitored Ringelmann data on the stack and the Venturi throat pressure drop. Parameters such as dryer feed rate, gas flow rate and scrubber water flow rate were pre-set at design ratings and were not measured.

Range of Monitored Parameters

Run No.	Combustion Zone Temp. °F	Dryer Exit Temp. °F	Scrubber P in H_2O
1	950-1050°F	125-130°F	--
2	910-1050°F	120-130°F	32.0-32.5
3	980-1050°F	120-131°F	37.5-32.0

1. Opacity: During all runs the plume opacity was 100% at the stack and 0-5% after steam plume dissipation.

2. Cleaned Coal Flow Rate: This was checked only during the third run. It was determined by loading rail hopper cars at the same rate as clean coal was fed into the loading bin.

For a 32 minute load out, three car loads (240 tons each) were processed. This indicates a cleaned coal rate of 450 TPH.

3. Rejects: The rate of material rejected was calculated by Plant personnel and the average was estimated at 360 TPH (dryer capacity 385 TPH).

IV. TEST PROCEDURES

SAMPLING METHODS

The particulate sampling was performed as specified by Federal Register, Volume 36, Number 247, Thursday, December 23, 1971. In addition the impinger catch was analyzed on both inlet and outlet of the Research-Cottrel Venturi type scrubber. Hydrocarbon samples and oxides of nitrogen samples were taken in grab flasks. Sulfur oxide samples were taken in a train consisting of five midget impingers at both inlet and outlet.

A. Port Location

Ports were located as far downstream from obstructions, turns, constrictions and any other duct characteristic which would cause uneven flow distribution or turbulence as practically as possible. Two ports were located 90° apart on the duct. Twelve points were taken on each diameter for the preliminary traverse, for nozzle selection and for sampling during the test. This gives six (6) equal sampling areas with four (4) sampling points in each area.

B. Velocity - Nozzle Sizing

The preliminary traverse was taken at all twenty-four points using a reverse "S" type pitot tube and manometer, graduated in inches of water. This determined the velocity head at each point. A thermocouple/potentiometer system was used simultaneously to determine temperature at each point. An average duct static pressure was determined and recorded for future use in calculations at this time. The most suitable nozzle size was then selected for sampling by using the R.A.C. nomograph and the information obtained in the preliminary traverse.

C. Particulate Sampling

A schematic of the sampling train is shown in Figure 1. A cyclone was used with a fiber glass filter following it. The box containing the filter and cyclone was heated to approximately 250°F to maintain the stack gas above the dew point of H_2O. The four (4) impingers are kept in an ice bath to condense out any condensibles after the gas has passed through the heated filter.

The first two impingers contain 100 milliliters of water each and the third impinger dry. The fourth contained 300 grams of silica gel as a desicant to insure all moisture was removed

from the gas for two purposes; to make a truly accurate calculation of the moisture in the gas and to protect the pump, meter and control valves of the sampling train.

The sampling time was five (5) minutes per point, making the net sampling time of a complete test 120 minutes. Actual or gross test times varied due to time lapse in changing ports or interrupted sampling due to plant and process malfunction.

D. Flue Gas Sampling - Orsat Analysis

To insure a representative gas sample to use in analysis for CO_2 and O_2, a large sample was aspirated from the sampling ports over a one (1) hour period. A solution of dilute sulfuric acid with a red dye (used for ease of observation) filled a two (2) gallon plastic bottle. This bottle had one hose leading from the top into the duct being sampled and one hose leading from the bottom into an empty two (2) gallon plastic bottle vented at the top. The empty bottle is placed lower than the full one and as the fluid runs from the full to the empty bottle, it draws a gas sample into the upper bottle. The rate of flow is controlled by a valve in the line between the two bottles. The gas collected is then analysed by a standard Orsat procedure.

E. SO_2 Sampling

A sampling train of five (5) midget impingers was used to obtain an SO_2 sample from the duct at both inlet and outlet locations. The first two impingers contained isopropyl alcohol, the second pair contained H_2O_2 and the fifth impinger was dry. The entire train was kept in an ice bath for the duration of the test sampling. The sampling probe was steel with glass insert, the insert being wrapped with heating tape to prevent condensation in the probe. The front end of the probe was plugged with glass wool to prevent contamination and possible physical plugging of the system by particulate from the gas sample.

A sampling rate of 0.1 cubic feet per minute was used to draw four (4) cubic feet of gas through the train. After sampling, the system was purged for fifteen (15) minutes with a charcoal filter (used to prevent SO_2 contamination from ambient air) to insure all the SO_2 was drawn from the first two (2) impingers into the H_2O_2 in the second two impingers. The sample was then placed in a bottle to be sent to the laboratory for analysis.

F. NO_x Sampling

During each run a series of three samples was taken on the outlet of the scrubber. Figure 3 shows the flask and probe arrangement used. Each flask contained 25 ml of a mixture of H_2SO_4 and H_2O_2. The flasks were evacuated, the vacuum recorded, and a sample drawn into the flask. The sample was left in contact with the solution for sixteen (16) hours, then shaken, the final flask pressure taken, and transferred into a bottle to be sent to the laboratory for analysis.

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.

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 EPA test procedure. The filters 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 in front of the filter 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 changes 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. Hydrocarbons

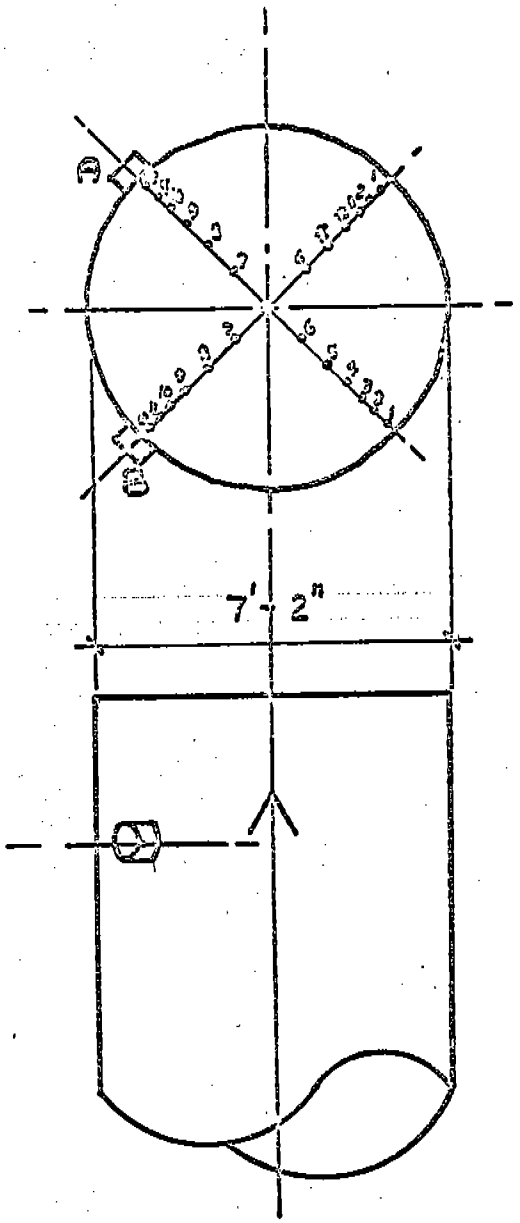
Samples were taken in evacuated flasks in accordance with EPA approved procedures. The hydrocarbon concentrations were then determined by gas chromatography. A known concentration, which is held as a standard in the lab, is run through the chromatograph with a helium carrier gas. The peak height [PH] and antenuation [At] are measured which gives the sensitivity factor in helium [SF_h].

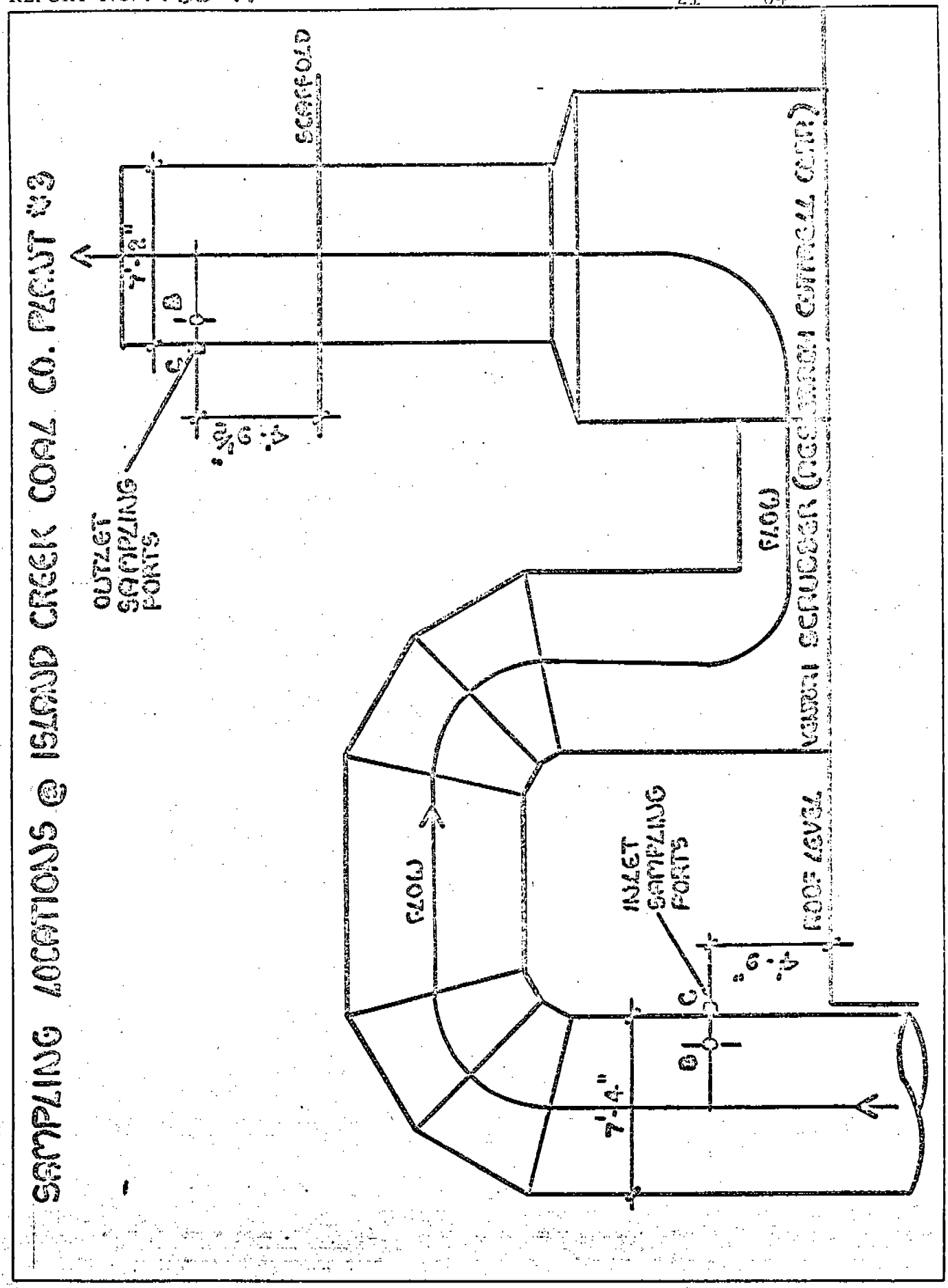
$$SF_h = ppm/At. \times PH$$

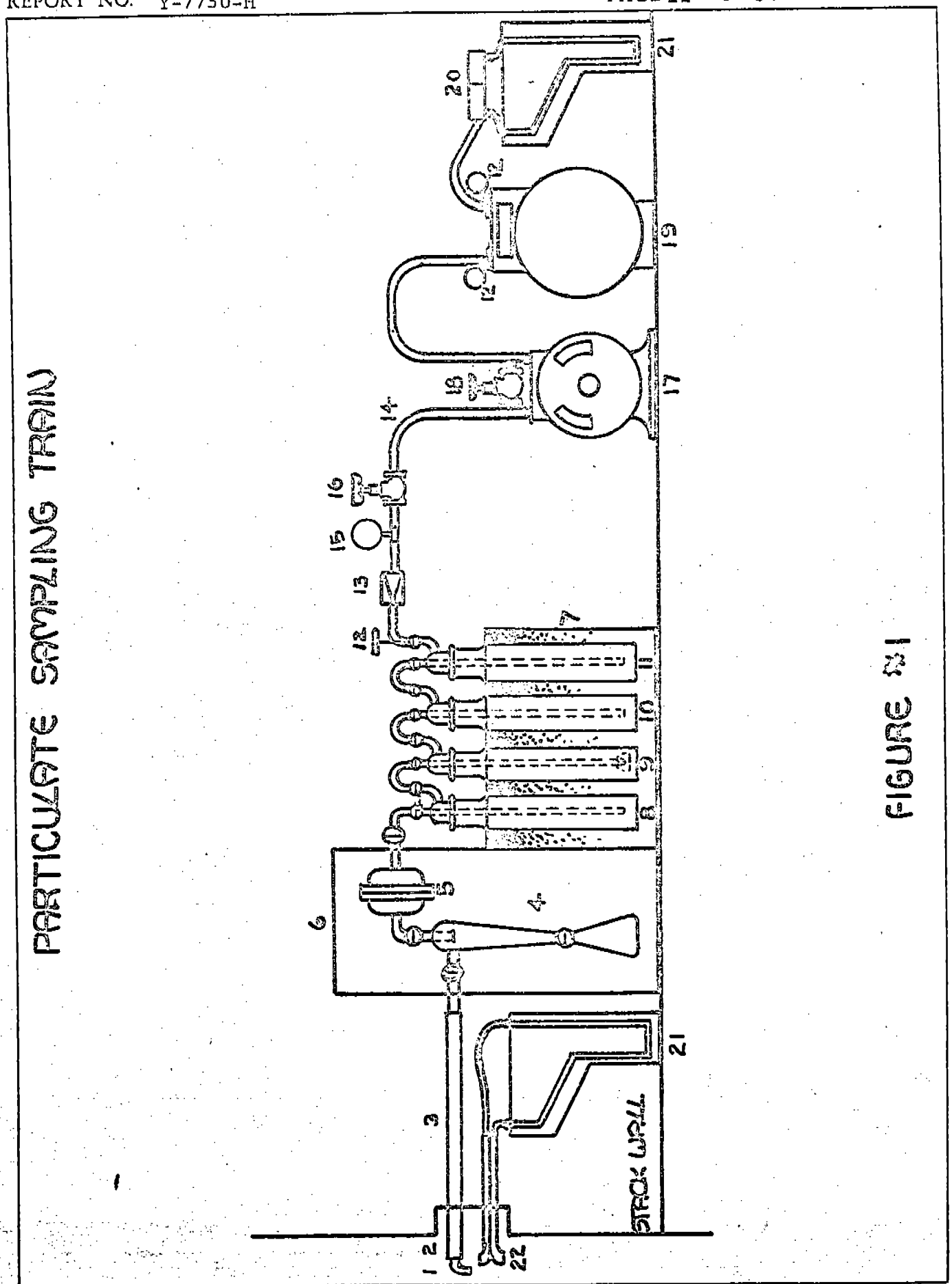
To obtain concentrations for each sample, the sensitivity factor times the antenuation times the peak height determines the ppm.

$$ppm = SF_h \times At \times PH$$

ISLAND CREEK COAL COMPANY
POINT LOCATIONS ON TRAVERSE




SAMPLING LOCATIONS @ ISLAND CREEK COAL CO. PLANT #3
SCAFFOLD
7'-2"
B
C
OUTLET SAMPLING PORTS
FLOW
MAIN SCRUBBER (ABSORBER CONTROL CONT.)
FLOW
INLET SAMPLING PORTS
ROOF LEVEL
C
B
7'-4"


PARTICULATE SAMPLING TRAIN
STACK WALL
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
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21
22

FIGURE #1

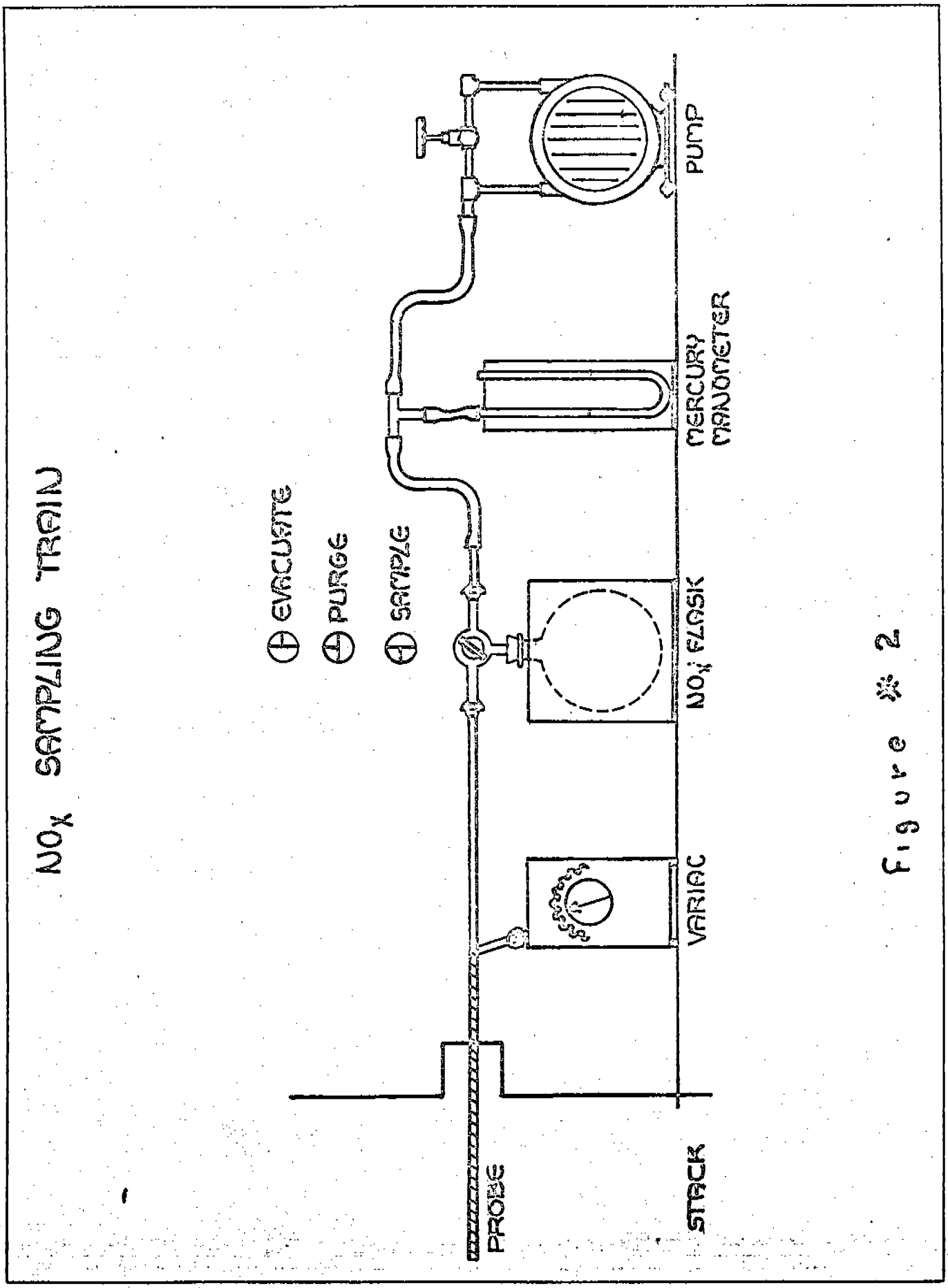
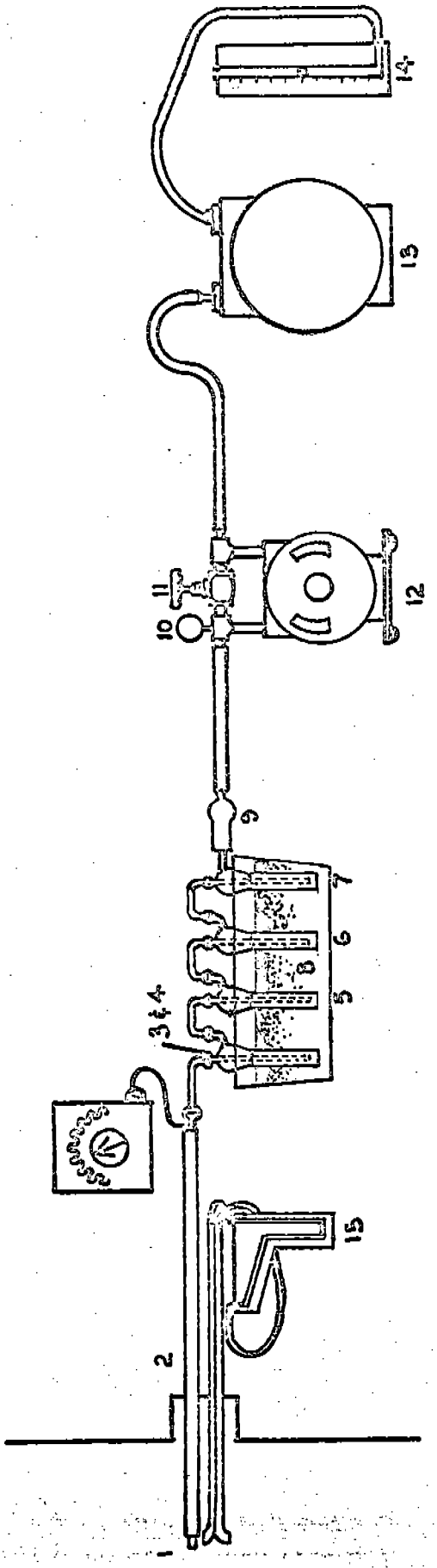

NOx SAMPLING TRAIN
EVACUATE
PURGE
SAMPLE
PUMP
MERCURY MANOMETER
NOx FLASK
VARIAC
PROBE
STACK

Figure # 2



SO_2 SAMPLING TRAIN

FIGURE #3

Gregory Pantchenko
Chief Chemist

Abraham J. Kurtz
Vice President

Louis A. Terracciano
Project Director, Field Testing

Richard W. Kling
Project Engineer

V. APPENDIX - DATA

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}

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

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

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

3. % Moisture in stack gas

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

4. Mole fraction of dry gas

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

5. Average molecular weight of dry stack gas

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

6. Molecular weight of stack gas

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

7. Stack velocity at stack conditions, fpm

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

8. Stack gas volume at standard conditions, SCFM

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

9. Percent isokinetic

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

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

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

11. Particulate total, gr/SCF

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

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

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

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

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

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

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

15. Particulate - total, lb/hr.

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

16. % Excess air at sampling point

$$\% \text{ EA} = \frac{100 \times \% O_2}{0.264 \times \% N_2 - \% O_2} = \%$$

SOURCE TESTING CALCULATION FORMS

Test No. Y-7730-H No. Runs 3

Name of Firm Island Creek Coal Co., Pinchurst #3 Plant

Location of Plant Hanson W. Va.

Type of Plant Coal Cleaning

Control Equipment Venturi Scrubber

Sampling Point Locations Inlet

Pollutants Sampled Particulate

Time of Particulate Test:

Run No.	1	Date	1/25/72	Begin	1312	End	1511
Run No.	2	Date	1/26/72	Begin	1036	End	1241
Run No.	3	Date	1/27/72	Begin	0939	End	1155

PARTICULATE EMISSION DATA

Run No.	1	2	3	
P_b barometric pressure, "Hg Absolute	29.10	29.10	28.96	
P_m orifice pressure drop, "H_2O	0.67	2.28	2.35	
V_m volume of dry gas sampled @ meter conditions, ft.^{3}	40.742	85.228	95.677	
T_m Average Gas Meter Temperature, °F	53	75	75	
V_m Volume of Dry Gas Sampled @ Standard std. conditions, ft.^{3}	40.976	82.536	93.315	
V_w Total H_2O collected, ml., Impingers & Silica Gel.	152.4	159.6	206.0	
V_w Volume of Water Vapor Collected gas ft.^{3} @ Standard Conditions*	7.224	7.565	9.764	

* 70°F, 29.92" Hg.

PARTICULATE EMISSION DATA (cont'd)

Run No. INLET	1	2	3	
%M - % Moisture in the stack gas by volume	15.0	8.4	9.6	
M_d - Mole fraction of dry gas	.850	.916	.904	
% CO_2	1.1	1.6	1.6	
% O_2	17.4	17.3	17.8	
% N_2	81.5	81.1	80.6	
M W $_d$ - Molecular weight of dry stack gas	28.87	28.95	28.97	
M W - Molecular weight of stack gas	27.23	28.05	27.95	
Δ Ps - Velocity Head of stack gas, In. H_2O	2.48	2.09	2.45	
T_s - Stack Temperature, °F	175	172	160	
$\sqrt{\Delta P_s X (T_s+460)}$	38.04	35.74	38.37	
P_s - Stack Pressure, "Hg. Absolute	29.24	29.24	29.10	
V_s - Stack Velocity @ stack conditions, fpm	5862	5430	5854	
A_s - Stack Area, $in.^2$	5538	5538	5538	
Q_s - Stack Gas Volume @ Standard Conditions, *SCFM	156,000	157,000	170,000	
T_t - Net Time of Test, min.	107	110	120	
D_n - Sampling Nozzle Diameter, in.	.125	.1875	.1875	
%I - Percent isokinetic	110	96	91	
m_f - Particulate - probe, cyclone and filter, mg.	4885.2	3942	12960.4	
m_t - Particulate - total, mg.	4902.1	4020.	12984.2	
C_{an} - Particulate - probe, cyclone, and filter, gr/SCF	1.8360	.7356	2.1644	
C_{ao} - Particulate - total, gr/SCF	1.8423	.7502	2.1684	
C_{at} - Particulate - probe, cyclone, and filter gr/cf @ stack conditions	1.2719	.5518	1.6255	

PARTICULATE EMISSION DATA (cont'd)

Run No. INLET	1	2	3	
C_{au} - Particulate, total, gr/cf @ stack cond.	1.3262	.5627	1.6385	
C_{aw} - Particulate, probe, cyclone, and filter, lb/hr.	2450.	990.	3150.	
C_{ax} - Particulate - total, lb/hr.	2460.	1010.	3160.	
%EA - % Excess air @ sampling point	—	—	—	

* 70°F. 29.92" Hg.

PARTICULATE FIELD DATA

JOB NO. 77304

Plant ISLAND CREEK COAL CO

Run No. 1

Location INLET

Date 1/25/72

Operator [illegible]

Sample Box No.

Meter Box No.

Meter H 1.89

C Factor 1.15

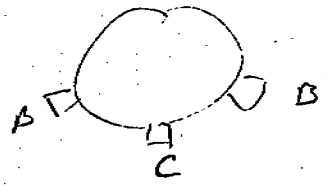
VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

Gross H_2O 332 cc

Filter F1-8



Ambient Temp °F 50

Bar. Press. "Hg 29.10

Assumed Moisture % 10

Heater Box Setting, °F

Probe Tip Dia., In. 1/8

Probe Length 10 ft

Probe Heater Setting

Avg. ΔP 2.75 Avg. ΔH .57

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
A7	2 min	586.731	1.90	.51	.51	46	48		250	60		170
A7	1312	588.196	1.6	.46	.46	48	46		250	60		170
8	1317	590.59	1.6	.46	.46	48	46		250	60		170
9	1322	592.02	1.5	.42	.42	52	46		250	60		170
10	1327	593.59	1.9	.51	.51	55	48		250	60		165
11	1332	595.31	2.1	.59	.59	60	50		250	60		165
12	1337	597.58	2.4	.67	.67	58	50		250	60		165
	1342	598.024										
B1	1350	598.024	1.6	.46	.46	50	50		250	60		180
2	55	599.50	1.3	.37	.37	54	51		250	60		180
3	1400	600.95	.95	.24	.24	58	52		250	60		175
4	05	602.19	1.03	.38	.38	56	54		250	60		175
5	10	603.118	1.7	.46	.46	53	50		250	60		170
6	15	605.29	2.1	.58	.58	52	50		250	60		165
7	20	607.21	2.6	.70	.70	58	50		250	60		165

JOB NO. 7730 H

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 8	1425	609.11	4.0	1.1	1.1	59	51		250	60		176
9	1430	612.11	4.6	1.2	1.2	62	52		250	60		178
10	1435	614.42	5.0	1.4	1.4	62	54		250	60		182
11	1440	617.27	4.5	1.5	1.5	62	54		250	60		177
12	1445	620.03	4.6	1.2	1.2	60	54		250	60		179
	1450	622.448										
A 1	1458	627.448	2.0	.156	.156	54	50		250	60		177
2	1503	624.52	2.1	.157	.157	52	50		250	60		177
3	1508	626.12	2.0	.156	.156	52	50		250	60		177
4	1511	627.473										
5												
6		40.742										

PARTICULATE FIELD DATA

JOB NO. 7730 H

Plant ISLAND CREEK COAL CO

Run No. 2

Location INLET

Date 1/26/72

Operator [illegible]

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.

Gross CMP H_2O 345 cc

FL31

Ambient Temp °F 30.

Bar.Press. "Hg 29.10

Assumed Moisture % 15

Heater Box Setting, °F

Probe Tip Dia., In. 3/16

Probe Length 10 ft

Probe Heater Setting

Avg. ΔP 2.09 Avg. ΔH 2.2

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
B1	1036	628.257	1.8	2.0	2.0	60	57		200	60		156
2	41	631.22	1.6	1.8	1.8	72	59		200	60		160
3	46	634.66	1.6	1.8	1.8	74	60		200	60		165
	51	637.741										
4	1105	637.741	1.0	1.1	1.1	64	60		200	60		174
5	10	640.31	1.2	1.15	1.25	76	60		200	60		175
6	15	643.12	1.7	1.85	1.85	80	60		200	60		[illegible]
7	20	646.63	2.1	2.3	2.3	84	62		200	60		[illegible]
8	25	650.75	2.1	2.3	2.3	88	64		250	60		[illegible]
9	30	654.96	2.5	2.6	2.6	90	66		250	60		[illegible]
10	35	659.37	3.2	3.6	3.6	90	68		250	60		[illegible]
11	40	664.31	4.1	4.5	4.5	96	69		250	60		180
12	45	670.37	4.8	5.0	5.0	94	70		250	60		181
	1150	676.551										
A1	1155	676.551	1.8	2.0	2.0	72	66		200	60		158
2	1200	679.51	2.0	2.2	2.2	80	66		200	60		156

JOB NO. 7730 H

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 3	1205	623.42	2.1	2.3	2.3	88	68		200	60		170
4	10	627.31	2.1	2.3	2.3	90	68		200	60		170
5	15	691.45	2.0	2.2	2.2	90	65		200	60		172
6	20	695.22	1.90	2.05	2.05	84	69		200	60		172
7	25	699.46	1.65	1.80	1.80	89	69		200	60		165
8	30	703.08	1.50	1.65	1.65	92	70		200	60		164
9	35	706.51	1.50	1.65	1.65	90	70		200	60		167
10	40	710.33	1.70	1.85	1.85	94	71		200	60		170
11	1244	713.515										
		85.228										

JOB NO. 773017

PARTICULATE FIELD DATA

Plant ISLAND CREEK COAL CO

Run No. 3

Location INLET

Date 1/27/77

Operator JS

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.

GROSS IMP H_2O 255 cc

Filter - FL-41

* COULD NOT PULL ISOKINETIC RATE

Ambient Temp °F 40

Bar. Press. "Hg 28.96

Assumed Moisture % 10

Heater Box Setting, °F

Probe Tip Dia., In. 3/16

Probe Length

Probe Heater Setting

Avg. ΔP 2.48 Avg. ΔH 2.35

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
B1	0939	718.971	1.8	2.0	2.0	58	56		250	60		
2	44	722.13	1.5	1.8	1.8	69	59		250	60		
3	49	725.89	1.1	1.3	1.3	74	60		250	60		
4	54	728.94	1.2	1.1	1.1	74	60		250	60		
5	59	732.12	1.5	1.7	1.7	73	60		250	60		
6	10 04	735.31	2.2	2.5	2.5	78	61		250	60		
7	09	739.47	2.6	2.9	2.9	81	61		250	60		
8	14	743.92	3.5	* 10.0	3.3	88	67		250	60		
9	19	748.89	4.7	* 4.6	2.8	84	65		250	60		
10	24	753.27	4.7	* 5.7	2.8	89	67		250	60		
11	29	757.61	5.1	* 5.6	2.75	90	69		250	60		
12	34	762.10	5.1	* 5.6	2.7	91	70		250	61		
...	10 39	766.751										
	SAMPLE LINE CHECKED FOR POSSIBLE OBSTRUCTIONS											
A1	1055	767.131	2.4	2.7	2.7	67	70		250	60		
2	1100	770.11	2.4	2.7	2.7	66	81		250	60		

JOB NO. 7730 H

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
A3	1105	774.68	2.4	2.7	2.7	90	68		250	60		160
4	10	778.50	2.4	2.7	2.7	96	68		250	60		160
5	15	782.50	2.3	2.6	2.6	96	68		250	60		160
6	20	786.57	2.2	2.4	2.4	96	70		250	60		160
7	25	790.77	2.3	2.6	2.6	96	70		250	60		160
8	30	794.97	1.5	1.75	1.75	98	70		250	60		160
9	35	798.78	1.5	1.75	1.75	94	70		250	60		160
10	40	802.11	1.7	1.95	1.95	90	70		250	60		160
11	45	805.91	2.1	2.4	2.4	88	64		250	60		160
12	50	809.82	2.2	2.5	2.5	88	62		250	60		160
	1255	814.865										
	NOTE: A SYSTEM LEAK CHECK WAS MADE AFTER TRAVERSE WHEN CALCULATING TOTAL GAS VOLUMES. SEE NOTES BECAUSE OF TRAVERSE					MINOR BTU FLOW VARIATIONS OCCURRED						
		95.627				THOMAS						
							2 JAN 72					
						ORIGINAL		SIGNED		JAMES D		

SOURCE TESTING CALCULATION FORMS

Test No. Y-7730 No. Runs 3

Name of Firm ISLAND CREEK COAL CO. PLANT # 3

Location of Plant Vansant, Va.

Type of Plant Coal Cleaning

Control Equipment Venturi Scrubber

Sampling Point Locations OUTLET

Pollutants Sampled Particulate

Time of Particulate Test:

Run No.	1	Date	1/25/72	Begin	1313	End	1532
Run No.	2	Date	1/26/72	Begin	1036	End	1244
Run No.	3	Date	1/27/72	Begin	0930	End	1140

PARTICULATE EMISSION DATA

Run No.	1	2	3	
P_b barometric pressure, "Hg Absolute	29.10	29.10	28.96	
P_m orifice pressure drop, "H_2O	2.72	3.13	3.21	
V_m volume of dry gas sampled @ meter conditions, $ft.^3$	79.878	102.976	107.339	
T_m Average Gas Meter Temperature, °F	53	69	65	
V_m Volume of Dry Gas Sampled @ Standard std. conditions, $ft.^3$	80.752	101.056	105.655	
V_w Total H_2O collected, ml., Impingers & Silica Gel.	261.8	330.8	323.6	
V_w gas Volume of Water Vapor Collected $ft.^3$ @ Standard Conditions*	12.409	15.680	15.339	

* 70°F, 29.92" Hg.

PARTICULATE EMISSION DATA (cont'd)

Run No. OUTLET	1	2	3	
%M - % Moisture in the stack gas by volume	13.3	13.4	12.7	
M_d - Mole fraction of dry gas	.867	.866	.873	
% CO_2	1.1	1.6	1.5	
% O_2	17.4	17.7	17.7	
% N_2	81.5	80.7	80.8	
M W $_d$ - Molecular weight of dry stack gas	28.87	28.96	28.94	
M W - Molecular weight of stack gas	27.42	27.49	27.55	
Δ Ps - Velocity Head of stack gas, In. H_2O	2.58	2.39	2.43	
T_s - Stack Temperature, °F	130	134	130	
$\sqrt{\Delta P_s X (T_s+460)}$	38.10	37.17	36.75	
P_s - Stack Pressure, "Hg. Absolute	28.91	28.92	28.78	
V_s - Stack Velocity @ stack conditions, fpm	5886.	5734.	5677.	
A_s - Stack Area, $in.^2$	5278	5278	5278	
Q_s - Stack Gas Volume @ Standard Conditions, *SCFM	162,000	157,000	157,000	
T_t - Net Time of Test, min.	110	120	120	
D_n - Sampling Nozzle Diameter, in.	.1875	.250	.250	
%I - Percent isokinetic	56.2	57.5	60.1	
m_f - Particulate - probe, cyclone and filter, mg.	123.5	77.3	109.4	
m_t - Particulate - total, mg.	159.9	103.3	142.9	
C_{an} - Particulate - probe, cyclone, and filter, gr/SCF	0.0236	0.0118	0.0159	
C_{ao} - Particulate - total, gr/SCF	.0305	0.0157	0.0208	
C_{at} - Particulate - probe, cyclone, and filter gr/cf @ stack conditions	.0177	.0088	.0120	

PARTICULATE EMISSION DATA (cont'd)

Run No. OUTLET	1	2	3	
C_{au} - Particulate, total, gr/cf @ stack cond.	.0229	0.0117	.0157	
C_{aw} - Particulate, probe, cyclone, and filter, lb/hr.	32.8	15.9	21.4	
C_{ax} - Particulate - total, lb/hr.	42.3	21.1	28.0	
%EA - % Excess air @ sampling point	—	—	—	

* 70°F. 29.92" Hg.

JOB NO. 7730 H

PARTICULATE FIELD DATA

Plant ISLAND CREEK COAL CO. PLANT #3

Run No. ONE (1) OUTLET

Location VANSANT, VA.

Date 1-25-72

Operator R $ E, LCM

Sample Box No. S/N 1279

Meter Box No. —

Meter H 1.91

C Factor .95

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 # FL-29

MRGross COLLECTED 415 mg

Ambient Temp °F 45

Bar. Press. "Hg 29.10

Assumed Moisture % 12%

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16 = .1875

Probe Length 5' & 10'

Probe Heater Setting 60

Avg. ΔP .262 Avg. ΔH .372

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	1313	777.747	1.70	1.80	1.80	42	42	3	250	45	—	125
2	1318	781.3	1.70	1.80	1.80	48	42	3	250	45	—	125
3	1323	784.9	2.10	2.20	2.20	58	43	3	250	45	—	125
4	1328	789.4	2.90	3.00	3.00	63	45	4	260	45	—	135
5	1333	792.1	3.60	3.70	3.70	68	45	7	260	50	—	135
6	1338	798.0	5.00	5.35	5.35	78	48	3	270	60	—	135
	1343	803.234	—	—	—	—	—	—	—	—	—	—
** B 1	1405	803.234	4.10	4.25	4.25	60	58	7	250	60	—	130
2	1410	807.4	2.60	2.70	2.70	62	58	4	250	60	—	130
3	1415	812.1	2.30	2.40	2.40	58	52	4	250	60	—	130
4	1420	817.6	1.40	1.60	1.60	58	52	2	250	60	—	130
5	1425	819.6	1.20	1.25	1.25	58	52	2	250	60	—	130
6	1430	823.3	1.20	1.25	1.25	58	52	2	250	60	—	130
7	1435	825.4	2.10	2.20	2.20	58	52	3	250	60	—	130
8	1440	829.9	2.60	2.70	2.70	58	52	4	250	60	—	130

JOB NO. 7730 H OUTLET TEST #1

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
B9	1445	833.5	3.10	3.20	3.20	58	52	5	250	60	—	130
10	1450	837.7	3.50	3.70	3.70	58	52	5	250	45	—	130
11	1455	842.3	4.00	4.30	4.30	58	52	6	250	45	—	130
12	1500	846.4	4.00	4.30	4.30	58	52	6	250	45	—	130
		851.265										
A7	1507	851.265	1.70	1.85	1.85	58	52	4	250	40	—	130
8	1512	854.3	1.60	1.75	1.75	58	52	4	250	40	—	130
*9	1517	857.625	1.70	1.85	1.85	58	52	4	250	40	—	130
10	1522	—	—	—	—	—	—	—	—	—	—	—
11	1527	—	—	—	—	—	—	—	—	—	—	—
12	1532	—	—	—	—	—	—	—	—	—	—	—
		79.878										

* THE TEST WAS STOPPED AT THIS POINT DUE TO THE PROCESS AT THE PLANT BEING SHUT DOWN.

** TWO PROBES WERE USED THEREFORE THE EAST PORT WAS STARTED AT 1445 AND POINT A7 ON THE SOUTH PORT WAS STARTED AT 1507. POINT [illegible] WAS [illegible] WITH A SHORT PROBE.

JOB NO. 7730H

PARTICULATE FIELD DATA

Plant ISLAND CREEK COAL CO. PLANT #3

Run No. TEST # 2 (TWO) OUTLET

Location VANSANT, VA.

Date 1-26-72

Operator R & E, LCM

Sample Box No. S/N 1279

Meter Box No. —

Meter H 1.91

C Factor .95

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 # FL-47

Imp. gross collected 471 ml

Ambient Temp °F 40

Bar. Press. "Hg 29.10

Assumed Moisture % 12%

Heater Box Setting, °F 250

Probe Tip Dia., In. ¼ = .250

Probe Length 10'

Probe Heater Setting 60

Avg. ΔP 2.39 Avg. ΔH DESIRED - 3.10 ACTUAL - 3.12

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					
B1	1036	858.440	.14	.23	.23	48	48	1	250	60	—	140
2	1041	859.9	.10	.14	.14	48	48	1	250	60	—	140
2	1042	861.047	—	—	—	—	—	—	—	—	—	—
1	1044	861.047	3.00	4.00	4.00	48	50	10	250	60	—	140
2	1049	865.1	2.30	3.10	3.10	52	52	8	250	60	—	140
3	1054	868.4	1.90	2.60	2.60	62	58	7	260	60	—	140
4	1059	872.8	1.50	2.00	2.00	60	42	6	260	60	—	140
5	1104	877.1	1.20	1.60	1.60	60	48	6	260	60	—	140
6	1109	880.8	1.20	1.60	1.60	62	[illegible]	6	[illegible]	60	—	[illegible]
7	1114	[illegible]	2.30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]
8	1119	888.7	3.10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]
9	1124	893.3	3.90	4.40	4.40	76	[illegible]	15	260	[illegible]	—	[illegible]
10	1129	898.8	3.90	5.10	5.10	84	54	15	[illegible]	[illegible]	—	[illegible]
11	1134	904.7	3.90	5.10	5.10	90	57	15	[illegible]	[illegible]	—	[illegible]
12	1139	911.1	4.10	5.40	5.40	94	62	17	[illegible]	[illegible]	—	[illegible]
END	1144	916.[illegible]	—	—	—	—	—	—	—	—	—	—

JOB NO. 7730H OUTLET TEST #2 PAGE 45 OF 64 PAGES

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	1150	916.725	1.40	1.90	1.90	70	62	4	260	60	—	120
2	1155	921.0	1.10	1.50	1.50	74	63	4	260	60	—	120
3	1200	923.9	1.00	1.35	1.35	74	63	4	260	60	—	120
4	1205	927.3	1.10	1.50	1.50	70	62	4	260	60	—	120
5	1210	931.0	1.10	1.50	1.50	70	62	4	260	60	—	120
6	1215	933.8	1.60	2.10	2.10	70	61	4	260	61	—	120
7	1220	939.2	2.00	2.70	2.70	74	62	7	260	60	—	120
8	1225	942.1	3.00	4.00	4.00	79	62	11	260	60	—	120
9	1230	946.6	2.70	3.60	3.60	83	63	10	260	60	—	120
10	1235	951.2	3.70	4.80	4.80	86	64	14	260	60	—	120
11	1240	954.7	4.50	5.70	5.20	97	68	17	260	60	—	120
END	1245	961.4	—	—	—	—	—	—	—	—	—	—
		102.976										
*	TEST HAD TO BE RESTARTED DUE TO CONDENSED WATER BLOCKING THE ΔP LINES. AND WORKING THE READINGS. THE FT3 WILL BE USED IN OUR CALCULATIONS, BUT NOT THE TEST TIME PER TOM WARD.											

YORK RESEARCH CORPORATION

JOB NO. 7730 H

PARTICULATE FIELD DATA

Plant ISLAND CREEK COAL CO. PLANT #3

Run No. 3 (THREE) OUTLET

Location VANSANT, VA.

Date 1-27-72

Operator R $ E, LCM

Sample Box No. S/N 1279

Meter Box No. —

Meter H 1.91

C Factor .95

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 # FL-49

Imp gross COLLECTED 465 ml

Ambient Temp °F 40

Bar. Press. "Hg 28.96

Assumed Moisture % 12%

Heater Box Setting, °F 250°

Probe Tip Dia., In. 1/4" = .250

Probe Length 10'

Probe Heater Setting 60°

Avg. ΔP 2.43 Avg. ΔH 3.21 (DESIRED = 3.22)

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	930	973.678	1.40	1.85	1.85	50	48	7	250	60	—	130
2	935	976.5	1.30	1.80	1.80	56	48	5	250	60	—	130
3	940	979.7	1.30	1.80	1.80	60	48	5	250	60	—	130
4	945	983.2	1.50	2.00	2.00	60	48	5	250	60	—	130
5	950	986.9	1.20	1.60	1.60	62	48	3	250	60	—	130
6	955	990.6	1.60	2.20	2.20	66	48	4	250	60	—	130
7	1000	994.4	1.60	2.20	2.20	67	48	4	250	60	—	130
8	1005	998.5	1.90	2.50	2.50	67	48	5	250	60	—	130
9	1010	002.4	2.80	3.70	3.70	70	50	7	250	60	—	130
10	1015	007.3	3.90	5.00	5.00	74	50	11	250	60	—	130
11	1020	013.2	4.20	5.40	5.40	86	52	13	250	60	—	130
12	1025	019.2	5.00	6.60	6.30	96	57	16	250	60	—	130
END	1030	025.850	—	—	—	—	—	—	—	—	—	—

JOB NO. 7730 H OUTLET TEST #3 PAGE 47 OF 64 PAGES

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	1040	025.850	2.70	3.40	3.40	72	59	6	250	60	—	130
2	1045	030.1	2.30	3.00	3.00	78	59	6	250	60	—	130
3	1050	034.5	1.60	2.10	2.10	82	59	4	250	60	—	130
4	1055	038.6	1.30	2.20	2.20	83	60	4	250	60	—	130
5	1100	042.3	1.20	1.60	1.60	84	61	3	250	60	—	130
6	1105	046.1	1.20	1.60	1.60	78	60	3	250	60	—	130
7	1110	049.5	2.00	2.60	2.60	76	60	6	250	60	—	130
8	1115	054.0	2.90	3.80	3.80	80	60	9	250	60	—	130
9	1120	058.5	3.30	4.70	4.70	84	60	12	250	60	—	130
10	1125	064.0	3.70	4.80	4.80	88	61	15	250	60	—	130
11	1130	069.8	4.10	5.40	4.50	90	62	18	250	60	—	130
12	1135	075.2	4.20	5.50	5.00	90	62	18	250	60	—	130
END	1140	081.017	—	—	—	—	—	—	—	—	—	—
		107.339										

REPORT NO. Y-7730-H

PARTICULATE CLEANUP SHEET

Date: 1/12/82

Plant: Illinois Power Coal Co

Run Number: 1

Location of sample port: Inlet

Operator:

Barometric Pressure:

Sample Box Number:

Ambient Temperature:

Impinger H_2O

Volume after sampling 332 ml Container No. _____

Impinger prefilled with 200 ml Extra No. _____

Volume Collected 132 ml

Ether-chloroform extraction of impinger water _____ mg

Impinger water residue _____ mg

Impingers and back half of filter, acetone wash: Container No. 5

Extra No. _____

U8, 5124
U8, 5104

49.6149
49.6012

Weight results .0169 mg
.0032

Dry probe and cyclone catch: Container No. _____

Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. 2

Extra No. _____

52, 3026
45, 4594

Weight results 3.84 32 mg

Filter Papers and Dry Filter Particulate

1.5472
.5256

Filter Number	Container No.	Filter Number	Container No.
1-8	1		

Filter particulate weight 1.0320 mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	313.5				
Weight before test:	300				
Moisture weight collected:	13.5				Moisture Total 13.5 gm
Container Number:	1. 4	2.	3.	4.	

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

Date: 1/[illegible]/73 Plant: [illegible]

Run Number: 2 Location of sample port: [illegible]

Operator: Barometric Pressure:

Sample Box Number: Ambient Temperature:

Impinger H_2O

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

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

Volume Collected ____ ml

Impingers and back half of filter, acetone wash: Container No. 35 Extra No. ____ Weight results .0479 mg

49.3115 − 49.3072 = .0043

48.9629 − 48.9193 = .0479

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

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. 2 Extra No. ____ Weight results 3.6147 mg

52.5367 − 48.9222 = 3.6147

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.
FL-39	1		

.6010 + .5253 = .1273

Filter particulate weight .1273 mg

.2363 + .0133 = Total particulate weight ____ mg

Silica Gel

Weight after test:	316.0				
Weight before test:	300.0				
Moisture weight collected:	16.0				Moisture Total ____ gm
Container Number:	1. 4	2.	3.	4.	

Sample Number: Analyze for:

Method determination:

Comments:

QUALITY CONTROLLED YORK RESEARCH CORPORATION

PARTICULATE CLEANUP SHEET

Date: 1/27/72 Plant: ISLAND CREEK COAL Co.

Run Number: 2 Location of sample port: INLET

Operator: _____ Barometric Pressure: _____

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

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

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

Volume Collected _____ ml

Impingers and back half of filter, acetone wash: Container No. 35 50.0448 50.0432 Extra No. _____ Weight results .0238 mg .0016

49. 5334 49. 5112 .0222

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

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. 21 Extra No. _____ Weight results 12.9720 mg

60,7198 47,8478

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.
FG-41	1		

,6066 ,5182

Filter particulate weight .0884 mg

Total particulate weight _____ mg

Silica Gel

Weight after test: 350.8

Weight before test: 300.0

Moisture weight collected: 50.8 Moisture Total _____ gm

Container Number: 1. 4 2. ____ 3. ____ 4. ____

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

REPORT NO. Y-7730-H

PARTICULATE CLEANUP SHEET

Date: 11/15/72

Plant: ISLAND COFFEE CORP. CO.

Run Number: 1

Location of sample port: OUTLET

Operator: _____

Barometric Pressure: _____

Sample Box Number: _____

Ambient Temperature: _____

Impinger H_2O

Volume after sampling ____ ml Container No. ____

Impinger prefilled with 200 ml Extra No. _____

Volume Collected _____ ml

Ether-chloroform extraction of impinger water _____ mg

Impinger water residue _____ mg

Impingers and back half of filter, acetone wash: Container No. 3,5

Extra No. _____

48.9987
48.9974

48.0458
48.0202

Weight results .0364 .0256 mg

.0108

Dry probe and cyclone catch: Container No. _____

Extra No. _____ Weight results _____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. 2

Extra No. _____ Weight results .6871 mg

48.7871
48.7000

Filter Papers and Dry Filter Particulate

.5486
.5122

Filter Number	Container No.	Filter Number	Container No.
FL-35	1		

Filter particulate weight .0364 mg

Total particulate weight _____ mg

Silica Gel

Weight after test: 346.0

Weight before test: 300.0

Moisture weight collected: 46.0

Moisture Total _____ gm

Container Number: 1. 4 2. ____ 3. ____ 4. ____

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH

Date: 1/26/72 Plant: ISLAND CREEK COAL CO.

Run Number: 2 Location of sample port: OUTLET

Operator: Barometric Pressure:

Sample Box Number: Ambient Temperature:

Impinger H_2O

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

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

Volume Collected ____ ml

Impingers and back half of filter, acetone wash: Container No. 35 Extra No. ____ 48.5862 48.5753 Weight results .0260 mg .0109

48.6992 − 48.6841 = .0151

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

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. 2 Extra No. ____ 49.7264 49.6761 Weight results .0503 mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.
FL 47	1		

.5500 .5230

Filter particulate weight .0270 mg

Total particulate weight ____ mg

Silica Gel

Weight after test:	351.5			
Weight before test:	3000			
Moisture weight collected:	51.5			

Moisture Total ____ gm

Container Number: 1. 4 2. ____ 3. ____ 4. ____

Sample Number: Analyze for:

Method determination:

Comments:

QUALITY CONTROLLED YORK RESEARCH CORPORATION

PARTICULATE CLEANUP SHEET

Date: 1/27/72 Plant: ISLAND CREEK COAL CO.

Run Number: 3 Location of sample port: OUTLET

Operator: _____ Barometric Pressure: _____

Sample Box Number: _____ Ambient Temperature: _____

Impinger H_2O

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

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

Volume Collected _____ ml

Impingers and back half of filter, acetone wash: Container No. 3.5 Extra No. _____ 49.9959 − 49.4356 = .0103 Weight results .0335 mg 48.1612 − 48.1290 = .0322

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

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. 2 Extra No. _____ 49.2209 − 49.1397 = .0812 Weight results .0812 mg

Filter Papers and Dry Filter Particulate

Filter Number	Container No.	Filter Number	Container No.
FL-49	1		

.5419 − .5137 = .0282

Filter particulate weight .0282 mg

Total particulate weight _____ mg

Silica Gel

Weight after test:	358.1			
Weight before test:	300			
Moisture weight collected:	58.1			

Moisture Total _____ gm

Container Number: 1. 4 2. ____ 3. ____ 4. ____

Sample Number: _____ Analyze for: _____

Method determination: _____

Comments: _____

QUALITY CONTROLLED YORK RESEARCH CORPORATION

JOB NO. 7730H ORSAT FIELD DATA

ISLAND CREEK COAL CO.
PLANT #3

Location VANSANT, VA. Comments:

Date 1-25-72

Time TEST #1

Operator R&E, LCM

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
1 INLET	1.0	17.4	< 100 PPM
2 ↓	1.1	17.4	< 100 PPM
3 ↓	1.1	17.4	< 100 PPM
INLET AVERAGE	1.06	17.40	< 100 PPM
1 OUTLET	1.1	17.3	< 100 PPM
2 ↓	1.1	17.3	< 100 PPM
3 ↓	1.0	17.5	< 100 PPM
OUTLET AVERAGE	1.06	17.36	< 100 PPM

JOB NO. 7730 H ORSAT FIELD DATA

ISLAND CREEK COAL CO.
PLANT # 3

Location VANSANT VA. Comments:

Date 1-26-72

Time TEST # 2

Operator R $ E, LCM

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
1 INLET	1.7	17.1	< 100 PPM
2 ↓	1.6	17.4	< 100 PPM
3 ↓	1.6	17.4	< 100 PPM
INLET AVERAGE	1.63	17.30	< 100 PPM
1 OUTLET	1.5	18.5	< 100 PPM
2 ↓	1.6	17.4	< 100 PPM
3 ↓	1.6	17.2	< 100 PPM
OUTLET AVERAGE	1.56	17.70	< 100 PPM

JOB NO. 7730H ORSAT FIELD DATA

ISLAND CREEK COAL CO.
PLANT #3

Location VANSANT VA. Comments:

Date 1-27-72

Time TEST #3

Operator R$E, LCM

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
1 INLET	1.6	17.9	<100PPM
2 ↓	1.7	17.7	<100 PPM
3 ↓	1.6	17.8	<100 PPM
INLET AVERAGE	1.63	17.80	<100PPM
1 OUTLET	1.5	17.0	<100 PPM
2 ↓	1.6	18.2	<100 PPM
3 ↓	1.5	17.8	<100 PPM
OUTLET AVERAGE	1.53	17.67	<100 PPM

PRELIMINARY TRAVERSE
Outlet

Point	Port A		Port B		Port C	
	P	T	P	T	P	T
1	1.8	145	1.5	145	1.5	145
2	2.4	145	1.4	145	1.9	145
3	2.6	145	1.4	140	1.6	140
4	2.3	140	.92	140	1.6	140
5	2.3	140	1.3	135	2.0	140
6	2.3	140	1.5	135	1.9	135
7	2.3	140	2.5	135	2.2	135
8	2.1	135	3.4	140	2.1	135
9	2.2	140	3.8	145	2.5	140
10	2.2	145	4.7	145	2.9	140
11	2.1	145	6.0	145	3.7	140
12	2.6	145	3.4	145	3.2	145

NO_x EMISSION DATA
Outlet

RUN NO. (1)	1	2	3				
Date	1/25/72	1/25/72	1/25/72				
mg NO_2	.237	.223	.170				
T_f - Flask Temperature, °F	72	72	72				
V_f - Flask Volume, liters	2.090	2.086	2.063				
P_i - Initial Flask Vacuum, "Hg.	24.4	24.4	24.3				
P_f - Final Flask Vacuum, "Hg.	24.2	24.2	24.1				
ppm NO_2	73.9	69.6	53.9				

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

1) $\frac{29.63 \times .237 \times 532}{2.090 \times 24.2}$ = 73.86 ppm NO_2

2) $\frac{29.63 \times .223 \times 532}{2.086 \times 24.2}$ = 69.63 ppm NO_2

3) $\frac{29.63 \times .170 \times 532}{2.063 \times 24.1}$ = 53.89 ppm NO_2

NO_x EMISSION DATA
Outlet

RUN NO. (2)	4	5	6				
Date	11/26/72	11/26/72	11/26/72				
mg NO_2	.055	.227	.280				
T_f - Flask Temperature, °F	72	72	72				
V_f - Flask Volume, liters	2.074	2.063	2.066				
P_i - Initial Flask Vacuum, "Hg.	24.6	24.6	24.7				
P_f - Final Flask Vacuum, "Hg.	24.3	24.2	24.2				
ppm NO_2	17.2	71.7	88.3				

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

$$\frac{4}{2.074} \frac{29.63}{\times 24.3} \frac{\times .055}{} \frac{\times 532}{} = 17.2 \text{ ppm } NO_2$$

$$\frac{5}{2.063} \frac{29.63}{\times 24.2} \frac{\times .227}{} \frac{\times 532}{} = 71.7 \text{ ppm } NO_2$$

$$\frac{6}{2.066} \frac{29.63}{\times 24.2} \frac{\times .280}{} \frac{\times 532}{} = 88.3 \text{ ppm } NO_2$$

QUALITY CONTROLLED YORK RESEARCH CORPORATION

NO_x EMISSION DATA
Outlet

RUN NO. (3)	7	8	9				
Date	1/27/72	1/27/72	1/27/72				
mg NO_2	.133	.223	.223				
T_f - Flask Temperature, °F	72	72	72				
V_f - Flask Volume, liters	2.081	2.073	2.091				
P_i - Initial Flask Vacuum, "Hg.	23.6	23.6	23.6				
P_f - Final Flask Vacuum, "Hg.	23.4	23.4	23.4				
ppm NO_2	43.1	72.5	71.8				

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

7) $\frac{29.63 \times .133 \times 532}{2.081 \times 23.4}$ = 43.05 ppm NO_2

8) $\frac{29.63 \times .223 \times 532}{2.073 \times 23.4}$ = 72.46 ppm NO_2

9) $\frac{29.63 \times .223 \times 532}{2.091 \times 23.4}$ = 71.84 ppm NO_2

QUALITY CONTROLLED YORK RESEARCH CORPORATION

SO_2 EMISSION DATA

Job Y-7730-H

	Inlet			Outlet		
RUN NO.	1	2	3	1	2	3
Date	1/25/72	1/26/72	1/27/72	1/25/72	1/26/72	1/27/72
mg SO_2	11.22	12.42	14.42	2.00	.80	7.62
Tm - Average Gas Meter Temperature, °F	52	52	50	60	60	60
P_b - Barometric Pressure, "Hg abs.	29.10	29.10	28.96	29.10	29.10	28.96
V_m - Volume of dry gas sampled @ meter conditions, $ft.^3$	4.0	4.0	4.3	4.0	4.0	4.0
ppm SO_2	37.1	41.0	44.5	6.71	2.68	25.7

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

Inlet: 1) $\frac{.751 \times 11.22 \times 512}{29.1 \times 4.0} = 37.06$ ppm SO_2

2) $\frac{.751 \times 12.42 \times 512}{29.1 \times 4.0} = 41.03$ "

3) $\frac{.751 \times 14.43 \times 510}{28.9 \times 4.3} = 44.47$ "

Outlet: 1) $\frac{.751 \times 2.00 \times 520}{29.1 \times 4.0} = 6.71$ "

2) $\frac{.751 \times .80 \times 520}{29.1 \times 4.0} = 2.68$ "

3) $\frac{.751 \times 7.62 \times 520}{28.9 \times 4.0} = 25.74$

HYDROCARBON ANALYSIS

OUTLET

Test No. 1

Run No.	1	2	3	Average
Date:	1/25/72	1/25/72	1/25/72	
Total Hydrocarbons in ppm	44.91	64.53	62.78	57.41

Test No. 2

Run No.	1	2	3	Average
Date:	1/26/72	1/26/72	1/26/72	
Total Hydrocarbons in ppm	53.64	65.40	44.14	54.39

Test No. 3

Run No.	1	2		Average
Total Hydrocarbons in ppm	175.5	160.5	[illegible]	168.00

Calculation Example

$$SF_h = \frac{ppm}{At. \times PH} = \frac{45}{20 \times 10.3} = 0.218$$

$$ppm = SF_h \times At \times PH$$

$.218 \times 20 \times 10.3 = 44.91$ ppm total hydrocarbons

PERSONNEL LIST
YORK RESEARCH CORPORATION

Richard W. Kling - Project Engineer
Robert S. Epstein - Assistant Project Engineer
Erwin Theisz - Field Chemist
Jerold Grabiner - Field Engineer
Geoffrey Knobel - Field Engineer
Louis Milspaugh - Field Engineer
Bruce Ranck - Field Engineer

EPA

Thomas E. Ward - Project Officer
J. J. Sableski - Industrial Studies
Charles Sedman - Industrial Studies

LOG OF EVENTS ON TEST NO. Y-7730-H

Monday - 24 January 1972

1030	York Research all present at LaGuardia Airport,N.Y.
1230	Arrived Tri-City Airport, Tennessee
1530	Arrived at Island Creek Coal Company Plant. Unloaded equipment.
1800	Secured and left Plant for motel.

Tuesday - 25 January 1972

0700	Arrived at Plant with crew and setup for tests
1300-1530	Testing Process
1530-1730	Clean up at motel with entire crew

Wednesday - 26 January 1972

0800	Arrive at Plant with crew and set up for test
0820	Plant start up
1000	Plant stabilized
1230-1300	Testing Process
1430-1600	Clean up at motel

Thursday - 27 January 1972

0700	Arrive at Plant with crew and set up for test
0930-1200	Testing Process
1300-1600	Clean up at motel and pack equipment

Friday - 28 January 1972

0500	Crew leaves motel for airport. R. Kling and R. Epstein drive toward Connecticut with equipment in truck.
	Approximately 8 hours travel time for crew Due to bad weather, Kling and Epstein stopped driving.

Saturday - 29 January 1972

0700	Kling and Epstein drive the rest of the way to New York and Connecticut.