SN 16544.010

Test Number FA-7

Union Carbide Corporation Ferroalloys Division Ashtabula, Ohio

by

T. E. Eggleston/R. N. Allen

June 1972

RESOURCES RESEARCH, INC.
A SUBSIDIARY OF TRW INC.
WESTGATE PARK • 7600 COLSHIRE DRIVE • McLEAN, VIRGINIA 22101

Contract Number CPA 70-81

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II. INTRODUCTION

Source emission tests are being performed on a series of electric furnace installations, known as reactive metals or ferroalloys, for the Office of Air Programs, Environmental Protection Agency. This report covers the tests performed at the Union Carbide Corporation Plant, Ashtabula, Ohio during the weeks of February 14-25, 1972. The tests at these facilities include grain loading measurements and carbon monoxide determinations.

Emissions for this particular plant were determined for a 50 percent ferro silicon furnace (#20) and a calcium carbide furnace (#13). These units have similar collection and abatement equipment with gases being taken directly from the furnace cover into high pressure drop scrubbers (#20 , Chemico Venturi; #13, Buffalo Forge). In addition, each furnace is equipped with a fugitive fume hood located over the furnace, to which is connected several ducts which carry the gases directly to the atmosphere. A separate hood and duct system carried tapping fumes directly to the atmosphere.

In each installation the scrubber exhaust was provided with one port for sampling. The fugitive fume hood ducts had four ports spaced for equal area sampling. The tapping exhaust had one port. The circular scrubber exhaust is 14 inches in diameter. The ducts venting the fugitive fume hood varies in size, but are all approximately 4 feet x 4 feet. The

tapping exhausts are 52 inch diameter circular ducts. Sample point locations for both furnaces are shown in Figure 1. Further detailed diagrams and descriptions are included in Sections IV and V (Process Description and Location of Sampling Points).

Three samples were taken at each sampling location. Since no scrubber inlet sampling points were accessible or satisfactory, water samples were taken from the scrubber discharges for solids analysis, to determine collection efficiency.

During these surveys particulate matter was sampled using a standard EPA train as described in Appendix E-1. Combustion gases were measured using an Orsat analyzer. Carbon monoxide was determined by using a continuously indicating infrared analyzer. The overall survey for the two furnaces included 36 particulate emission runs, 5 Orsat measurements, 7 scrubber water samples, and continuous carbon monoxide measurements at 4 locations for a total period of 4-1/2 hours.

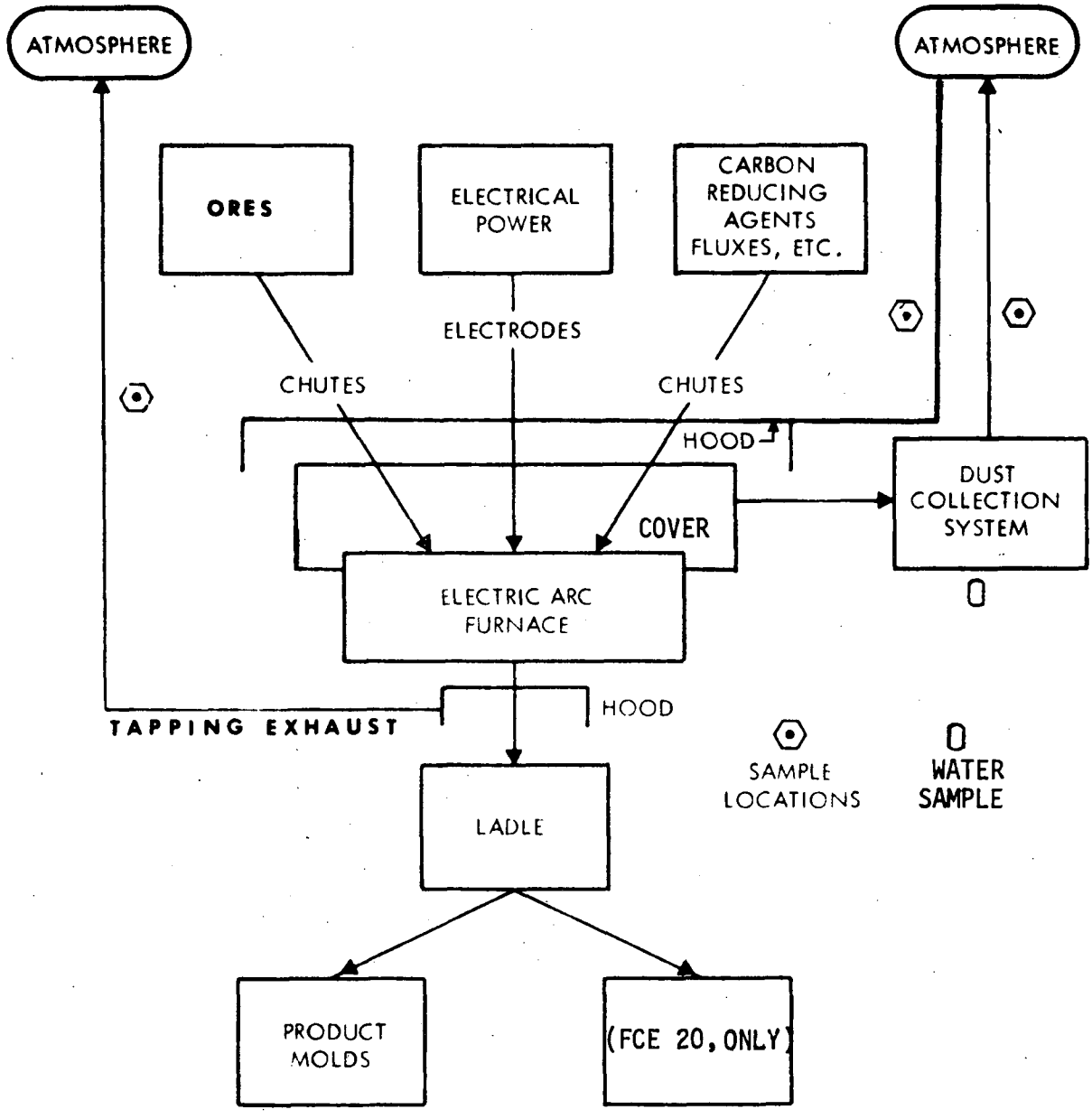


Figure 1. BLOCK DIAGRAM - SAMPLE LOCATIONS
FURNACE NOS. 20 & 13

III. SUMMARY OF RESULTS

(Part I - Furnace No. 20)

Shown below, in Table 1, are the results and averages for testing emissions from Furnace 20, along with corresponding collection efficiency, using the complete EPA sample train.

TABLE 1

Overall Summary of Emissions and Collection Efficiency

Date	Run No.	Location	Filterable Particulate lbs/hr	Total Particulate lbs/hr	Average Total lbs/hr.	Percent Efficiency
2/15/72	One	Hood	* 86.1	* 95.7		
2/16/72	Two	Hood	569.2	602.5		
2/16/72	Three	Hood	457.7	516.5	429.4	None
2/16/72	Four	Hood	136.1	169.1		
2/17/72	One	Scrubber	——	86.1		
2/17/72	Two	Scrubber	——	11.2	35.2	88.
2/17/72	Three	Scrubber	——	8.29		
2/17/72	One	Tapping	100.9	105.2		
2/17/72	Two	Tapping	55.2	76.6	90.8**	None
2/18/72	Three	Tapping	89.6	90.7		
2/17/72	One	Scrubber Water	——	278.4	248.3	——
2/17/72	Two	Scrubber Water	——	218.2		

* Two of three ducts sampled, NOT USED in percent efficiency.
** Tapping normally occurs only for about 15 minutes during each 75-90 minute cycle.

Some rather wide variations in results were experienced. This is felt to have been the result of several factors, including process operation.

The relatively poor overall performance of the scrubbers is influenced by two factors. Kerosine is injected in the gas stream prior to the blower and was thus measured as an emission. The primary reason, however, is the loss of fumes directly to the atmosphere. The scrubber is 88% efficient on those fumes that are routed to it, but only 39% of the total furnace fumes/ hour are routed to the control system, thus the overall efficiency is only 34%.

The relatively poor efficiency of the scrubbers includes an emission of kerosine that is injected into the gas stream prior to the blower. Due to the loss of fumes directly to the atmosphere, from the hood ducts, the overall efficiency of the furnace fume collection (excluding tapping) was only 34.8 percent.

Particulate emission summaries for Furnace 20 are shown in Tables 2 through 4 on the following pages. Table 5 shows the results for total particulate in the scrubber water effluent. Flue gas conditions are included, and percent particulate matter in the impinger train has been calculated where possible.

Flue gas conditions appeared stable in the scrubber exhaust, but varied widely at other locations. Carbon monoxide levels in the south hood duct were rather variable. The general range was 50-75 ppm, with peaks to 130 ppm. Fume capture of the hood was estimated to be greater than 95 percent but the tapping exhaust was only about 75 percent. The reliability of results was considered to be only fair.

TABLE 2

Furnace 20 SUMMARY OF RESULTS North Duct From Fugitive Fume Hood

Run Number	NHE-1	NHE-2	NHE-3	NHE-4		
Date	2-15-72	2-16-72	2-16-72	2-16-72		
Stack Flow Rate - SCFM * dry	50003	51327	47977	54208		
% Water Vapor - % Vol.	.78	.23	1.12	.99		
% CO_2 - Vol % dry	.20	.20	.20	.20		
% O_2 - Vol % dry	20.60	20.60	20.60	20.60		
% Excess air @ sampling point	4409	4409	4409	4409		
SO_2 Emissions - ppm dry	NA	———	———	———		
NO_x Emissions - ppm dry	NA	———	———	———		
Particulates Probe, Cyclone, & Filter Catch gr/SCF* dry	.0948	.4231	.0543	.0776		
gr/CF @ Stack Conditions	.0831	.3584	.0438	.0699		
lbs./hr.	40.6	186.1	22.3	36.0		
Particulate from impinger train (% of total)	8.1	6.1	52.9	30.0		
Total Catch gr /SCF * dry	.1032	.4507	.1154	.1108		
gr /CF @ Stack Conditions	.0905	.3818	.0931	.0998		
lbs./hr.	44.2	198.3	47.4	51.5		

* 70°F, 29.92" Hg

TABLE 2 (con't)

Furnace 20 SUMMARY OF RESULTS Center Duct From Fugitive Fume Hood

Run Number	CHE-2	CHE-3	CHE-4			
Date	2-16-72	2-16-72	2-16-72			
Stack Flow Rate - SCFM * dry	54566	52086	55521			
% Water Vapor - % Vol.	.94	1.73	2.12			
% CO_2 - Vol % dry	.20	.20	.20			
% O_2 - Vol % dry	20.60	20.60	20.60			
% Excess air @ sampling point	4409	4409	4409			
SO_2 Emissions - ppm dry	———	———	———			
NO_x Emissions - ppm dry	———	———	———			
Particulates Probe, Cyclone, & Filter Catch gr/SCF* dry	.3373	.3583	.0774			
gr/CF @ Stack Conditions	.3022	.3077	.0695			
lbs./hr.	157.7	159.9	36.8			
Particulate from impinger train (% of total)	4.3	15.1	28.1			
Total Catch gr /SCF * dry	.3525	.4223	.1076			
gr /CF @ Stack Conditions	.3159	.3626	.0966			
lbs./hr.	164.9	188.5	51.2			

* 70°F, 29.92" Hg

TABLE 2 (con't)

Furnace 20 SUMMARY OF RESULTS South Hood From Fugitive Fume Hood

Run Number	SHE-1	SHE-2	SHE-3	SHE-4		
Date	2-15-72	2-16-72	2-16-72	2-16-72		
Stack Flow Rate - SCFM * dry	48160	46570	43443	45208		
% Water Vapor - % Vol.	.72	.75	1.29	1.57		
% CO_2 - Vol % dry	.20	.20	.20	.20		
% O_2 - Vol % dry	20.60	20.60	20.60	20.60		
% Excess air @ sampling point	4409	4409	4409	4409		
SO_2 Emissions - ppm dry	NA	———	———	———		
NO_x Emissions - ppm dry	NA	———	———	———		
Particulates Probe, Cyclone, & Filter Catch gr/SCF* dry	.1102	.5648	.7399	.1633		
gr/CF @ Stack Conditions	.0981	.4724	.5760	.1412		
lbs./hr.	45.5	225.4	275.5	63.3		
Particulate from impinger train (% of total)	11.6	5.8	1.8	4.7		
Total Catch gr /SCF * dry	.1247	.5996	.7537	.1713		
gr /CF @ Stack Conditions	.1110	.5015	.5867	.1481		
lbs./hr.	51.5	239.3	280.6	66.4		

* 70°F, 29.92" Hg

TABLE 3

Furnace 20 SUMMARY OF RESULTS Tapping Exhaust

Run Number	ATE-1	ATE-2	ATE-3			
Date	2-17-72	2-17-72	2-18-72			
Stack Flow Rate - SCFM * dry	31709	31216	30137			
% Water Vapor - % Vol.	.73	2.72	2.83			
% CO_2 - Vol % dry	.02	.02	.02			
% O_2 - Vol % dry	20.50	20.50	20.50			
% Excess air @ sampling point	3195	3195	3195			
SO_2 Emissions - ppm dry	NA	———	———			
NO_x Emissions - ppm dry	NA	———	———			
Particulates Probe, Cyclone, & Filter Catch gr/SCF* dry	.3715	.2062	.3467			
gr/CF @ Stack Conditions	.3161	.1693	.2806			
lbs./hr.	100.9	55.2	89.6			
Particulate from impinger train (% of total)	4.1	28.0	1.3			
Total Catch gr /SCF * dry	.3872	.2865	.3512			
gr /CF @ Stack Conditions	.3295	.2353	.2842			
lbs./hr.	105.2	76.6	90.7			

* 70°F, 29.92" Hg

TABLE 4

Furnace 20 SUMMARY OF RESULTS Scrubber Exhaust

Run Number	ASE-1	ASE-2	ASE-3			
Date	2-17-72	2-17-72	2-17-72			
Stack Flow Rate - SCFM * dry	11,736	11,383	11,383			
% Water Vapor - % Vol.	0	2.51	2.55			
% CO_2 - Vol % dry	1.5	1.5	1.5			
% O_2 - Vol % dry	6.0	6.0	6.0			
% Excess air @ sampling point	25	25	25			
SO_2 Emissions - ppm dry	NA	———	———			
NO_x Emissions - ppm dry	NA	———	———			
Particulates Probe, Cyclone, & Filter Catch gr/SCF* dry	0.667	0.088**	0.062**			
gr/CF @ Stack Conditions	0.618	0.079**	0.056**			
lbs./hr.	67.09	8.58**	6.05**			
Total Catch gr /SCF * dry	0.856	0.115	0.085			
gr /CF @ Stack Conditions	0.913	0.119	0.088			
lbs./hr.	86.1	11.2	8.25			

*70°F, 29.92" Hg

**Filter After Silica Gel Impinger

TABLE 5

Solids In Scrubber Water Effluent

Furnace No. 20

Location	Date	Time	lbs solids / gallon	Water Flow, GPM	lbs solids / hour	Furnace Total
North Scrubber	2-17-72	1400-1420	1.636×10^{-3}	422	41.4	278.4*
South Scrubber	2-17-72	1400-1420	1.308×10^{-2}	302	237.0	
North Scrubber	2-17-72	1545-1630	4.557×10^{-3}	422	115.4	218.2*
South Scrubber	2-17-72	1545-1630	5.676×10^{-3}	302	102.8	

*See Discussion

Furnace No. 13

Location	Date	Time	lbs solids / gallon	Water Flow, GPM	lbs solids / hour
Scrubber	2-23-72	0900-0950	2.632×10^{-2}	450	710.6
Scrubber	2-24-72	1015-1105	3.003×10^{-2}	450	810.8
Scrubber	2-24-72	1525-1615	2.023×10^{-2}	450	546.2

SUMMARY OF RESULTS

(Part 2 - Furnace No. 13)

Shown below, in Table 6, are the results and averages of testing emissions from Furnace 13, along with corresponding collection efficiency, using the complete EPA sample train.

TABLE 6

Overall Summary of Emissions and Collection Efficiency

Date	Run No.	Location	Filterable Particulate lbs/hr	Total Particulate lbs/hr	Average Total lbs/hr.	Percent Efficiency
2/22/72	One	Hood	* 65.4	69.0		
2/23/72	Two	Hood	46.5	57.9	63.2	None
2/23/72	Three	Hood	49.9	68.5		
2/23/72	One	Scrubber	——	0.577		
2/24/72	Two	Scrubber	——	0.423	0.488	99.9
2/24/72	Three	Scrubber	——	0.464		
2/23/72	One	Tapping	52.4	53.6		
2/24/72	Two	Tapping	47.2	50.2	49.7**	None
2/24/72	Three	Tapping	44.4	45.2		
2/24/72	One	Scrubber Water	——	710.6		
2/24/72	Two	Scrubber Water	——	810.8	689.2	——
2/24/72	Three	Scrubber Water	——	546.2		

* Three of four ducts sampled, NOT USED in averages.
** Tapping continuously.

Fairly wide variations were noted in some of the results but this was expected due to the configuration of ducts and sample locations. The efficiency of the scrubber was excellent, but this result was not masked by kerosine, as with tests on Furnace 20. The overall furnace fume collection (excluding tapping exhaust) was 91.5 percent.

Particulate emission summaries for Furnace No. 13 are shown in tables on the following pages. Flue gas conditions are included, and percent particulate matter in the impinger train has been calculated where possible. Table 5 shows the results for total particulate in the scrubber water effluent.

Flue gas conditions were stable in the scrubber exhaust, but were very erratic and unstable at other locations. Carbon monoxide levels, in the hood duct measured, were extremely variable across the area of the traverse. They ranged from 50 ppm, to greater than 500 ppm. The tapping exhaust was more stable and was generally in the range of 35 ppm, with occasional peaks to 150 ppm. Fume capture was greater than 95 percent for the entire system.

TABLE 7

Furnace 13 SUMMARY OF RESULTS Fugitive Fume Hood Ducts (Northeast, Northwest)

Run Number	NEH-1	NEH-2	NEH-3	NWH-1	NWH-2	NWH-3
Date	2-22-72	2-23-72	2-23-72	2-22-72	2-23-72	2-23-72
Stack Flow Rate - SCFM * dry	11483	11990	13363	63573	61544	61761
% Water Vapor - % Vol.	.31	.52	1.06	.37	.19	.62
% CO_2 - Vol % dry	1.00	1.00	1.00	1.00	1.00	1.00
% O_2 - Vol % dry	20.70	20.70	20.70	20.70	20.70	20.70
% Excess air @ sampling point	16197	16197	16197	16197	16197	16197
SO_2 Emissions - ppm dry	NA	———	———	———	———	———
NO_x Emissions - ppm dry	NA	———	———	———	———	———
Particulates						
Probe, Cyclone, & Filter Catch						
gr/SCF* dry	.1609	.0792	.0791	.0374	0.0180	.0205
gr/CF @ Stack Conditions	.1456	.0758	.0722	.0343	0.0170	.0190
lbs./hr.	15.8	8.1	9.1	20.4	9.5	10.8
Particulate from impinger train (% of total)	2.1	8.1	7.7	9.4	7.2	12.8
Total Catch						
gr /SCF * dry	.1644	.0862	.0857	.0413	.0194	.0235
gr /CF @ Stack Conditions	.1487	.0825	.0783	.0378	.0183	.0219
lbs./hr.	16.2	8.9	9.8	22.5	10.2	12.5

* 70°F, 29.92" Hg

TABLE 7 (con't)

Furnace 13 SUMMARY OF RESULTS Fugitive Fume Hood Ducts (Southeast, Southwest)

Run Number	SEH-2	SEH-3	SWH-1	SWH-2	SWH-3	
Date	2-23-72	2-23-72	2-22-72	2-23-72	2-23-72	
Stack Flow Rate - SCFM * dry	33383	31652	67973	64308	60239	
% Water Vapor - % Vol.	.59	.53	.14	.06	.73	
% CO_2 - Vol % dry	1.00	1.00	1.00	1.00	1.00	
% O_2 - Vol % dry	20.70	20.70	20.70	20.70	20.70	
% Excess air @ sampling point	16197	16197	16197	16197	16197	
SO_2 Emissions - ppm dry	NA	———	———	———	———	
NO_x Emissions - ppm dry	NA	———	———	———	———	
Particulates Probe, Cyclone, & Filter Catch gr/SCF* dry	.0460	.0366	.0502	.0285	.0390	
gr/CF @ Stack Conditions	.0457	.0357	.0508	.0295	.0389	
lbs./hr.	13.2	9.9	29.2	15.7	20.1	
Particulate from impinger train (% of total)	9.8	4.4	3.5	35.1	43.7	
Total Catch gr /SCF * dry	.0510	.0383	.0520	.0439	.0693	
gr /CF @ Stack Conditions	.0506	.0373	.0526	.0454	.0692	
lbs./hr.	14.6	10.4	30.3	24.2	35.8	

* 70°F, 29.92" Hg

TABLE 8

Furnace 13 SUMMARY OF RESULTS Tapping Exhaust

Run Number	BTE-1	BTE-2	BTE-3			
Date	2-23-72	2-24-72	2-24-72			
Stack Flow Rate - SCFM * dry	29613	29011	27590			
% Water Vapor - % Vol.	.38	1.12	3.75			
% CO_2 - Vol % dry	1.00	1.00	1.00			
% O_2 - Vol % dry	20.80	20.80	20.80			
% Excess air @ sampling point	1733333	1733333	1733333			
SO_2 Emissions - ppm dry	NA	———	———			
NO_x Emissions - ppm dry	NA	———	———			
Particulates Probe, Cyclone, & Filter Catch gr/SCF* dry	.2066	.1897	.1877			
gr/CF @ Stack Conditions	.1858	.1660	.1539			
lbs./hr.	52.4	47.2	44.4			
Particulate from impinger train (% of total)	2.2	6.0	1.9			
Total Catch gr /SCF * dry	.2113	.2018	.1914			
gr /CF @ Stack Conditions	.1900	.1766	.1569			
lbs./hr.	53.6	50.2	45.2			

* 70°F, 29.92" Hg

TABLE 9

Furnace 13 SUMMARY OF RESULTS Scrubber Exhaust

Run Number	BSE-1	BSE-2	BSE-3			
Date	2-23-72	2-24-72	2-24-72			
Stack Flow Rate - SCFM * dry	1585	1585	1585			
% Water Vapor - % Vol.	1.83	1.28	0.98			
% CO_2 - Vol % dry	1.5	1.5	1.5			
% O_2 - Vol % dry	6.0	6.0	6.0			
% Excess air @ sampling point	12.5	12.5	12.5			
SO_2 Emissions - ppm dry	———	———	———			
NO_x Emissions - ppm dry	———	———	———			
Particulates Probe, Cyclone, & Filter Catch gr/SCF* dry	0.040	0.020	0.031			
gr/CF @ Stack Conditions	0.037	0.019	0.029			
lbs./hr.	0.533	0.266	0.413			
Total Catch gr /SCF * dry	0.0425	0.0311	0.0342			
gr /CF @ Stack Conditions	0.0449	0.0328	0.0361			
lbs./hr.	0.577	0.423	0.464			

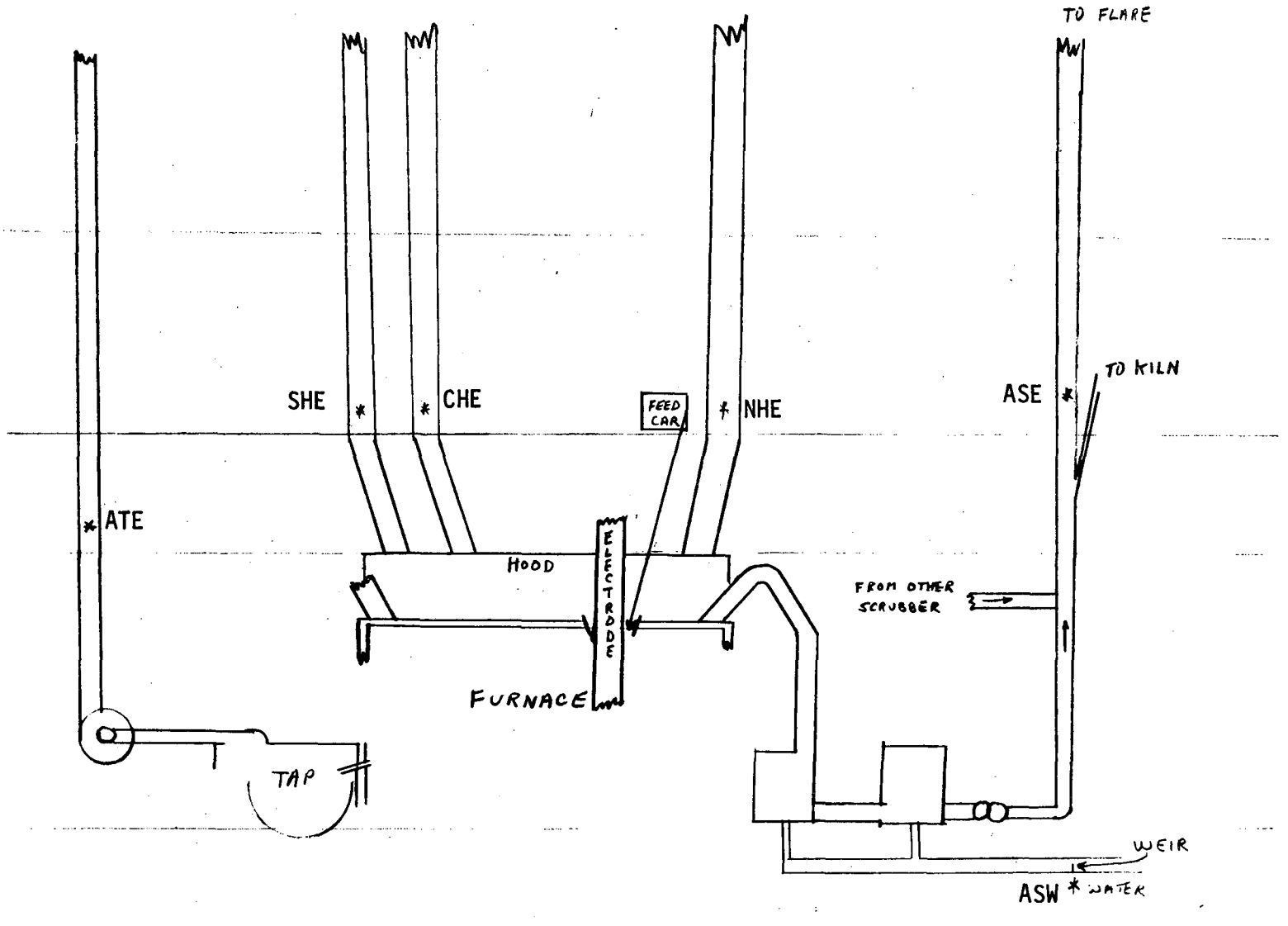
* 70°F, 29.92" Hg

IV. PROCESS DESCRIPTION

Ferroalloys and calcium carbide are produced in submerged arc electric furnaces. The facilities under consideration in this report are semi-closed furnaces, with covers, hooding and scrubber cleaning systems to reduce the emission of fumes and dust following collection. Figures 2 and 3 are process flow diagrams indicating the actual furnaces under test in this survey.

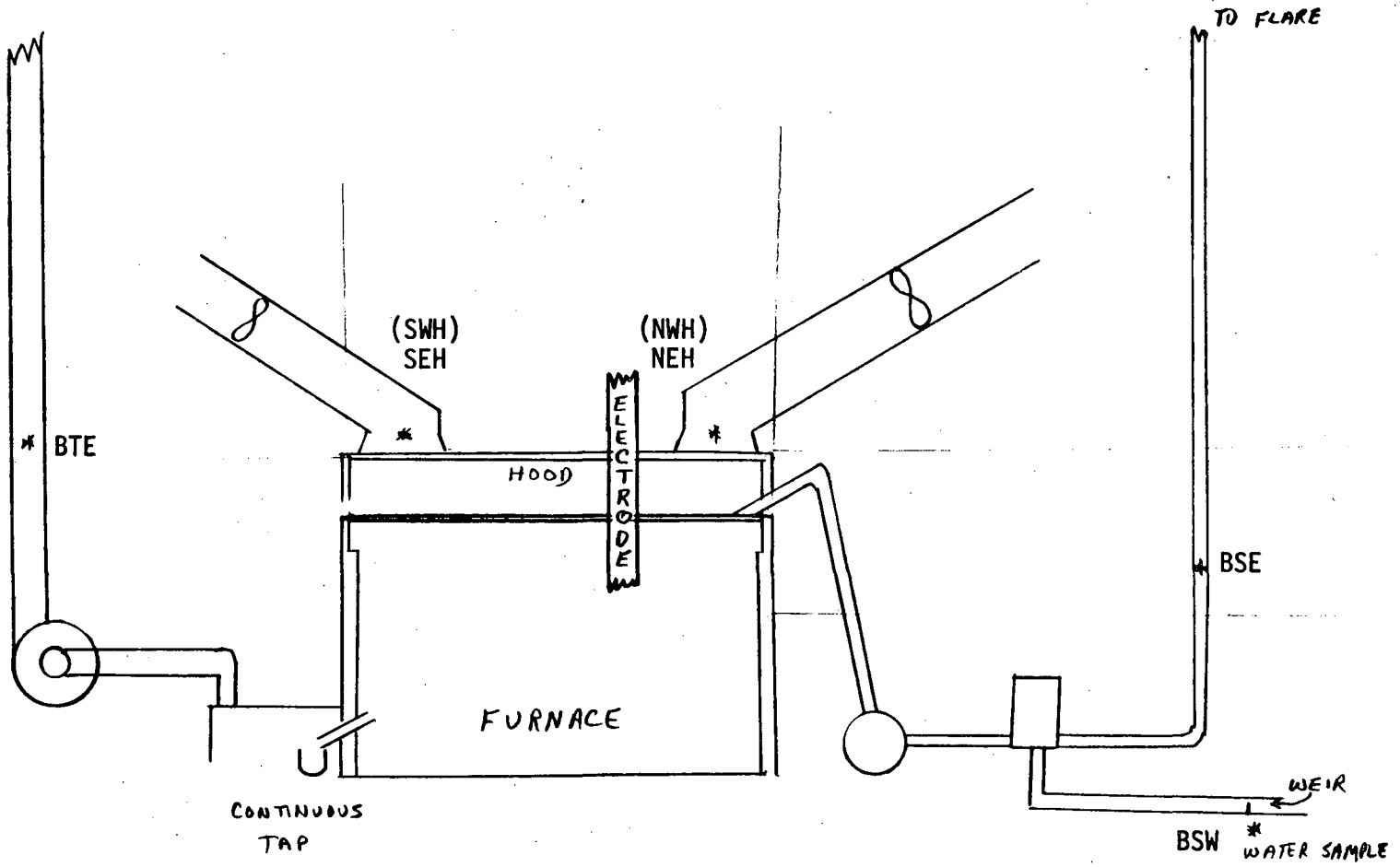
The electric arc is employed as a concentrated source of heat. Appropriate ores are added to the surface of the furnace through mechanized equipment and chutes. Additional carbon in the form of coke, wood chips, etc., is an integral part of the furnace mixes, along with specialized fluxes, etc. The mix for Furnace 20 is gravity fed from chutes to the semi-covered furnace through an annular space around the electrodes. There is no mechanical stoking for this furnace design.

The very high temperatures produced initiate a reaction in the bottom of the furnaces and form a layer of metal which is tapped at appropriate times. As the ores and carbonaceous materials gradually settle to the bottom of the furnace, the heat, in conjunction with a lack of oxygen, react with the oxide ores in order to remove oxygen and thus produce the elemental metal. The units under examination in this survey were semi-closed units where the gases containing carbon monoxide were recovered and passed through high energy water scrubbing systems. However, some gas escaped and burned around each of the electrodes.



*Sample Points

Figure 2. PROCESS FLOW DIAGRAM FURNACE 20 (SIDE VIEW)



NOTE: NEH & SEH hoods have SWH & NWH hoods located immediately behind them.

*Sample Points

Figure 3. PROCESS FLOW DIAGRAM NO. 13 FURNACE (SIDE VIEW)

Furnace 20 is designed for a nominal 40 to 50 megawatt load, and produces hard cast 50 percent ferro silicon metal using Soderburg type electrodes. Gases and fumes from normal operation are passed through two Chemico Venturi scrubbers at pressure drops of 70-80 inches of water. Fumes missed by this collection system are picked up by a secondary hood, and passed directly to the atmosphere.

Tapping fumes are collected by a separate hood and exhausted to the atmosphere. The furnace is tapped for about 15 minutes per cycle of 1 hour-15 minutes to 1 hour-30 minutes. Molten metal and slag pour into ladles, and the fumes produced in this operation are drawn off by the separate tapping exhaust system. The slag is removed from the ladle and disposed of by various means. Molten product is poured into molds, after which it is broken into usable sizes.

Furnace 13 is a unit of some 24 megawatt capacity and produces 80-85% grade calcium carbide using prebaked electrodes. The fume collection system is similar to that on Furnace 20 except that the scrubber system is a pair of parallel Buffalo Forge scrubbers, with only one on line, and one as spare. The tapping operation is continuous and the hood over this area directs all fumes directly to the atmosphere. The molten product pours directly into molds, is cooled, and dumped from the molds in an automatic operation.

V. LOCATION OF SAMPLING POINTS

Sample ports were selected during a presurvey inspection trip, and approved by the EPA Project Officer. As described below, most locations were chosen not by normal criteria, but rather because they were the only possible or usable locations.

Furnace 20

Furnace 20 emission streams included one scrubber exhaust sample location with a single port, three hood duct sample points having four ports each, one tapping exhaust duct with a single port, and two water collection points in the scrubber sump area. The scrubber port was in the middle of a long straight run of pipe. Due to the high pressure and high carbon monoxide content in this stack, a sealed port/probe assembly was constructed. Only one point was sampled.

The three hood ducts were each provided with four ports, spaced for equal area sampling, with six equal area points sampled per port. A total of 24 equal areas were sampled per duct. These locations were the only possible points available, but were located only 1 or 2 equivalent diameters downstream from the hood inlets. There was a long straight run after the sample points although axial flow fans were only about ten feet above the test location.

The tapping exhaust stack had one sample port, and twelve equal area points were sampled. This location was in a short straight section

between two approximately 30° bends. Only the scrubber exhaust location met the normal EPA criteria for sample point location. Water samples were taken before and after the weir in the scrubber sump area. Figures 4 and 5 show dimensions and details for these locations.

Furnace 13

Furnace 13 emission flows included one scrubber exhaust sample port, which was essentially identical in location to its counterpart on Furnace 20. There were four hood duct sample locations each having four ports, one tapping exhaust location with a single port, and one water collection location in the scrubber sump area. Each of the hood duct ports was sampled at six equal area points for a total of 24 equal areas sampled per duct. Ports were placed in the only usable locations, which were less than one equivalent diameter from an upstream expansion and/or bend and only one or two diameters from downstream bends and fans. The tapping exhaust sample port was located in a straight section between two approximately 30° bends, both within two stack diameters of the test port. Water samples were taken after the weir in the sump area. Figures 6 and 7 show the physical conditions at these locations.

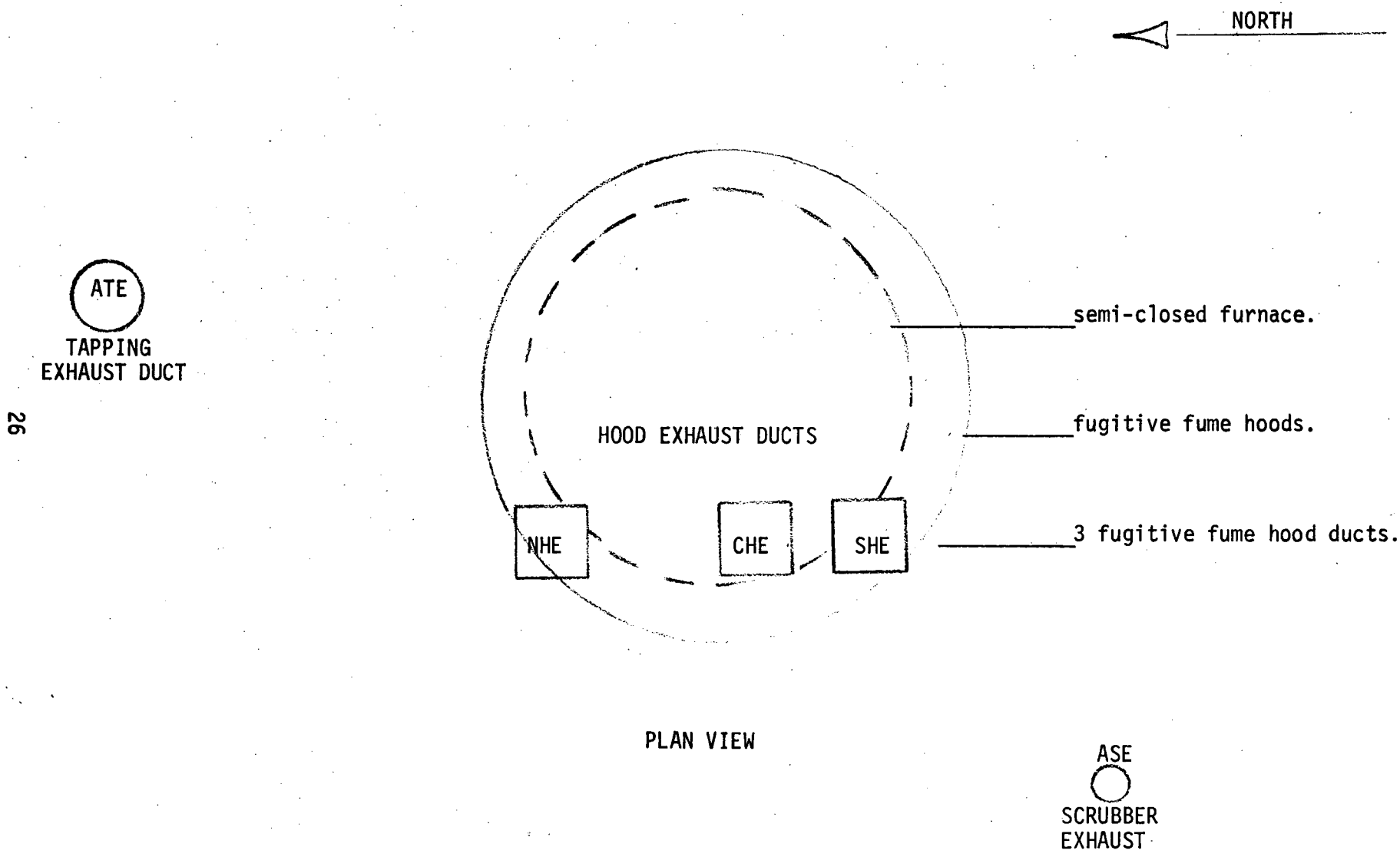
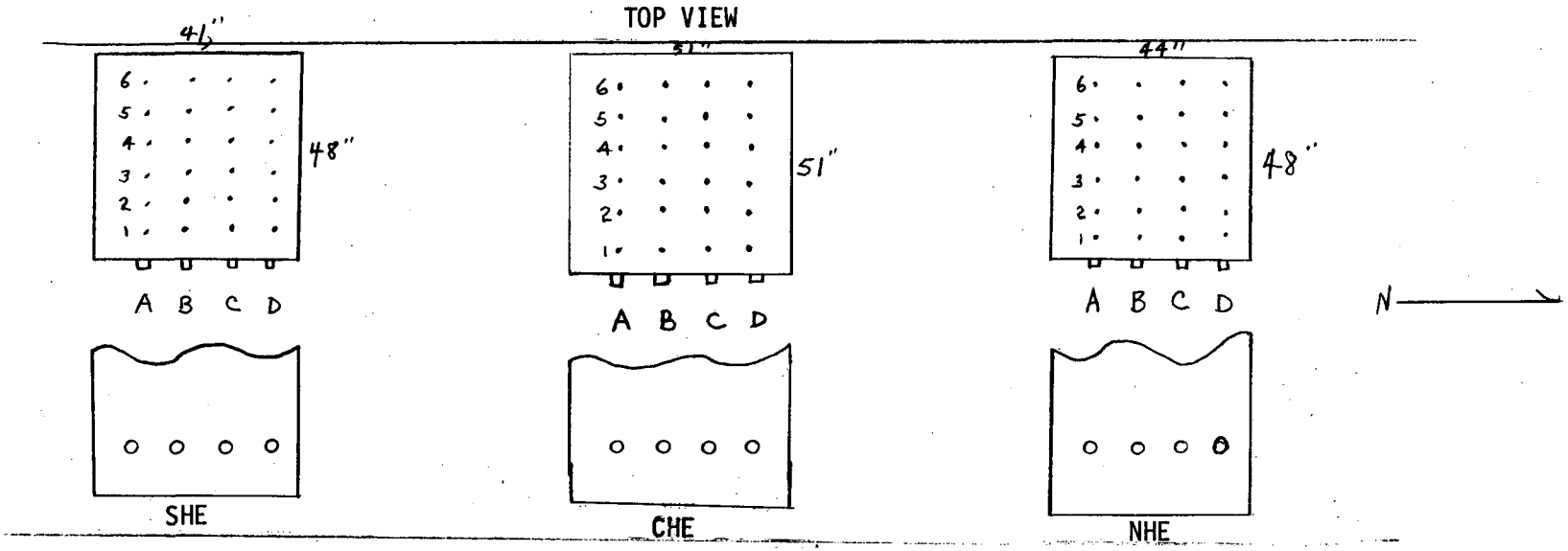
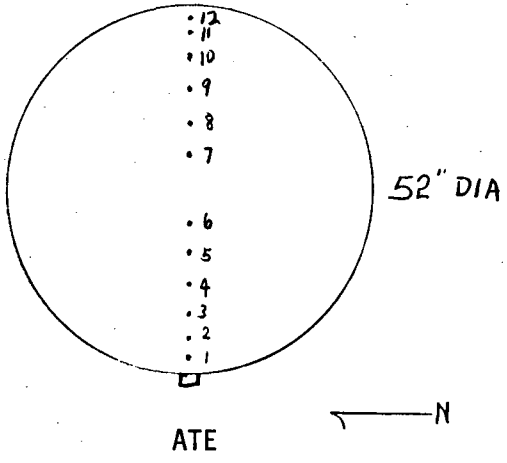


Figure 4. FURNACE 20 SAMPLE LOCATION LAYOUT



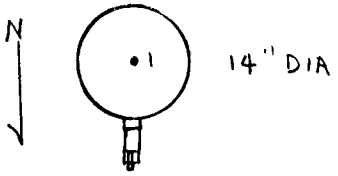
SIDE VIEW OF FUGITIVE FUME HOOD DUCTS

TOP VIEW - TAPPING EXHAUST



ATE

TOP VIEW - SCRUBBER EXHAUST



ASE

Figure 5. SAMPLE POINT LOCATIONS NO. 20 FURNACE

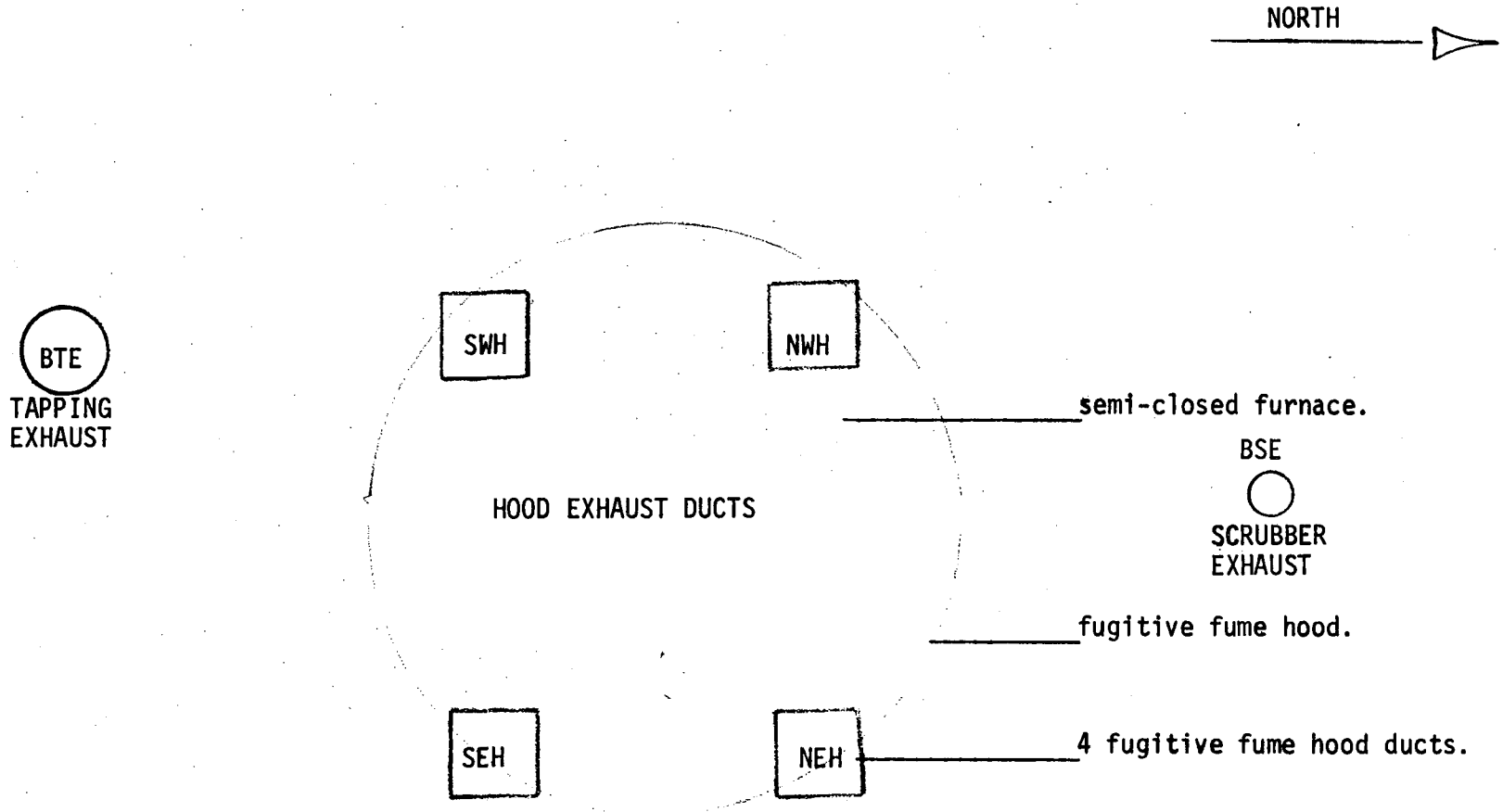
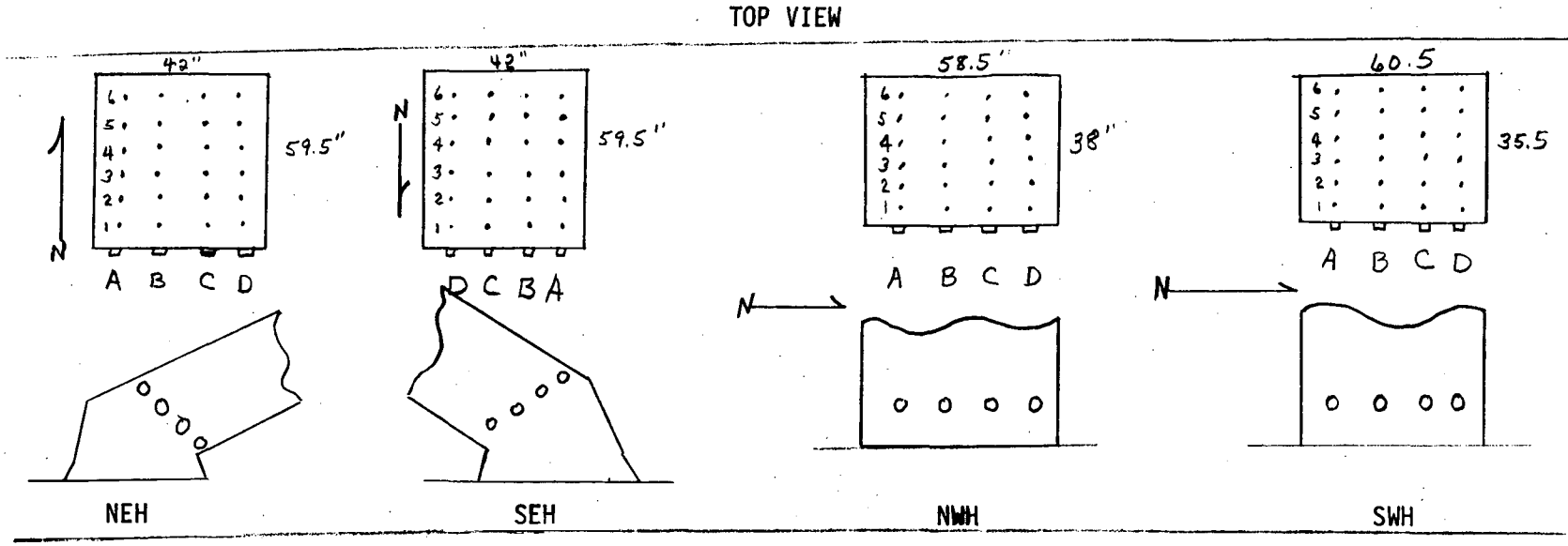
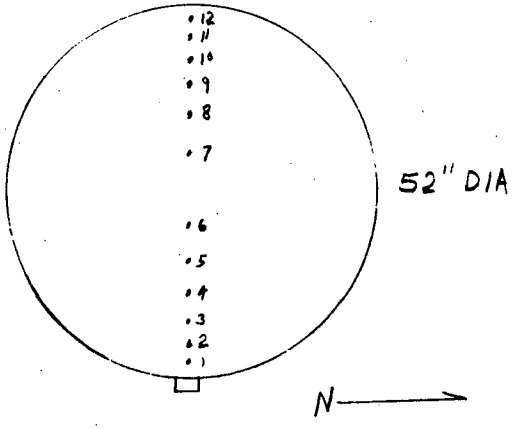


Figure 6. FURNACE 13 SAMPLE LOCATION LAYOUT



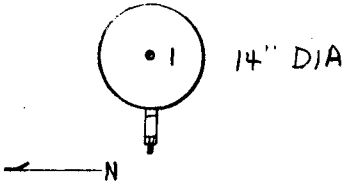
SIDE VIEW = FUGITIVE FUME HOOD DUCTS

TOP VIEW - TAPPING EXHAUST



BTE

TOP VIEW - SCRUBBER EXHAUST



ASE

Figure 7. SAMPLE POINT LOCATIONS NO. 13 FURNACE

VI. PROCESS OPERATION

All sampling was carried out while the processes were believed to be running normally. There were periods with furnace "blows" or minor process load variations but these are normal conditions and are rapidly corrected.

Appendix C tabulates the available operating data. There were some fluctuations in the furnace loads during testing, but these were considered to be within normal operating conditions. Tapping was conducted as often as necessary, depending upon the total power input to Furnace 20; and continuously for Furnace 13.

VII. SAMPLING PROCEDURES

Test methods were in accordance with standard methods as published in the Federal Register, Volume 36, Number 159, Part II, August 17, 1971. See Appendix E for pertinent sections of this publication.

Deviations from the above methods were as follows.

1. With the exception of the ASE and BSE locations, sample port locations did not meet location criteria.
   (Reason: Used only available locations.)

2. At the ASE location, sample times were 30 minutes or less at a single point, with no pitot or temperature traverse. For samples ASE-2 & 3, the filter was placed after the silica gel impinger.
   (Reason: The location and equipment available necessitated the above actions.)

3. Sampling time at the tapping exhausts (ATE & BTE) was approximately 15 minutes.
   (Reason: Covered tapping period of one furnace cycle, fumes not being emitted during remainder of cycle.)

4. Sampling time was reduced to less than 2 hours on all fugitive fume hood samples except NHE-1, CHE-1 and SHE-1.
   (Reason: Necessary to conform to furnace schedule and available sampling time.)

Carbon monoxide was sampled directly into an MSA Lira Model 200* infrared analyzer and results were recorded continuously on a strip chart recorder.

It was impossible to obtain samples of gases and fumes prior to the scrubbers. Composite samples of water effluent were therefore obtained from each scrubber, along with inlet water to the system.

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*Mention of a specific company or product does not constitute endorsement by EPA.

VIII. DISCUSSION

(Part I - Furnace No. 20)

A. RESULTS

Collection Efficiency (#20)

If collection efficiency is based upon total emissions from the furnace (except tapping fumes), the collection efficiency for this unit is computed to be approximately 35%. The results used to compute this figure varied widely from point to point, and from sample to sample.

Scrubber efficiency, based only on the scrubber water effluent solids and the scrubber exhaust samples, is considerably higher, averaging 88%. The true efficiency is probably higher due to two factors. One of three exhaust samples is significantly higher than the others and raises the average emission from 9.8 lbs/hr to 35.2 lbs/hr. Probably the most significant factor is that kerosine is introduced into the gas stream as part of the normal process, and is therefore captured by the sample train and measured as a particulate emission.

It is conceivable that the blank collected for No. 20 furnace scrubber is in error. It is unusually high, and the blank from No. 13 furnace scrubber is considerably lower. If the blank from No. 13 furnace is used, the solids removal average becomes 493 lbs/hour, which raises the average scrubber efficiency to 93 percent.

Emissions (#20)

Emissions from the overall process were high due to poor capture of fumes by the primary cover as shown in Figure 2. This left large amounts of fumes to be collected by the hood, which exhausted directly to the atmosphere. The overall fume capture for the furnace, except the tapping fumes, appeared to be greater than 95 percent at all times.

Sample results of emissions from the scrubber are believed to be high because of the kerosine injection. The first sample, ASE-1, was immediately clogging, therefore the regular glass fiber filter was moved for future scrubber samples. Instead of being placed prior to the impinger train it was placed after the silica gel impinger. This is probably the reason for the large drop in particulate results after the initial sample.

Particulate Versus Total Catch (#20)

No inlet gas samples were taken so that the percent condensibles could be determined at the scrubber location. Three tapping exhaust samples averaged 11% and ranged from approximately 1% to 28% condensibles. Percent condensibles in the eleven hood samples ranged from 2% to 53% and averaged 15%. Because of the configuration of the sampling train the scrubber exhaust fractions could not be measured separately. An oily residue in the samples of the fugitive fume escaping from around the electrodes may explain part of the variation encountered. This material has not been noticed in any previous sampling of open furnace emissions. It is postulated that some sort of destructive distillation from incomplete combustion may be taking place as mix is placed around the electrode opening.

Flue Gas Conditions (#20)

Flue gas measurements were variable on the hood and tapping exhausts, but not extremely so.

Gaseous Emissions (#20)

As has been noted in the past, the hood gases had low carbon dioxide and high oxygen concentrations due to dilution. Results were indicative only for measurement of system leakage.

Low level carbon monoxide measurements in the hood exhausts were relatively low with occasional peaks, probably due to normal process variations.

Gases collected by the cover, and scrubbed by the venturi, however, were very low in carbon dioxide due to lack of combustion. The carbon monoxide level was well above the calibrated scale of the Orsat, and at Furnace 13 was estimated to be approximately 65 percent.

B. OPERATING CONDITIONS

Scrubber System (#20)

During the test period ASE-1 the north scrubber effluent water had a very low solids content, while water leaving the south scrubber had a very high solids content. During the test period ASE-2 the solids content was close to equal. During both tests, however, the average was similar. This would indicate that some operational variation was involved. With both gaseous effluents going into the common exhaust stack, this should

not be expected to create any problem with results. No ASE-3 samples were available.

Furnace No. 20

Considerable down time was experienced with this furnace, but no shutdowns occurred during actual testing. Furnace load varied from 40,000 kw to 52,000 kw during the testing. These load variations were said to be typical of the operation of this furnace. Although the load variations, etc. may have been perfectly normal, it is suspected that the poor duplication of results was largely due to changes in furnace operation. Sampling locations, and conditions, were far worse at Furnace 13 but the uniformity of results was much better.

Each sample run on the hood exhausts was carefully scheduled to include one tapping cycle near the middle of that test period.

C. TEST CONDITIONS

Safety (#20)

Due to the nature of the operation, and the indoor location of the sampling locations, a potential hazard of carbon monoxide build-up was present. This condition was monitored both by Union Carbide and RRI personnel.

The only location to experience levels in excess of 50 ppm CO (A.C.G.I.H. Threshold Limit Value) was the area of the scrubber sample port during sampling. This area was blocked off and monitored during testing, with one man constantly available to assist the operator, if needed, while he entered the area to take sample readings.

At the exhaust hood locations, an automatic hopper-type feed car was in operation within inches of our equipment at times. It therefore had to be watched, and special care taken, at all times.

Hood Ducts (#20)

The sample locations did not meet normal minimum EPA requirements. The ports were only one or two equivalent pipe diameters downstream from a bend in the duct. No preliminary temperature or velocity checks could be made due to the furnace being down prior to the first sample.

Some delay was encountered on sample CHE-1 while waiting for an experimental sampling device (being demonstrated for EPA) to finish at the port that was due to be sampled. In addition, all trains were shut down during the first sample in order to reduce filter plugging. Smaller nozzles were employed to reduce the sampling rate.

The first set of hood exhaust samples was repeated, after it was found that a heating element short of some kind had caused a cracked probe in sample CHE-1.

Tapping Duct (#20)

The tapping hood and ductwork did not appear to capture any more than 75 percent of escaping fumes during the tapping operation. At times, even less than this was captured.

Samples were taken only during tapping, and thus were limited to about 15 minutes duration. A twelve point traverse, at one minute per point, was conducted, with the points repeated until the tap was completed. The sample location was fair in that there was about one stack diameter upstream, and several diameters downstream, clear of bends or obstructions. Sampling rates were less than isokinetic during the first test due to too large a nozzle diameter. The nozzle had been selected on the basis of a preliminary velocity traverse, and was deliberately on the large side, to provide maximum sample volume in the short tapping period. Changes in flue gas conditions occurred so that a smaller nozzle was required, to achieve isokinetic conditions on subsequent tests.

Scrubber Exhaust (#20)

The scrubber exhaust presented a unique sampling situation. Exhaust gases contained carbon monoxide concentrations well in excess of 50 percent under a positive pressure of several pounds per square inch. In addition, kerosine vapors and droplets were mixed with these fumes.

Sampling was accomplished using a special, glass lined probe, friction-fitted into a steel plug, and sealed with a special pipe joint sealant. This assembly was then screwed into a long nipple attached to the exhaust stack, which was equipped with a gate valve. After sealing the probe, the gate valve was opened and the probe slipped into the gas stream. The probe was then attached to a standard sampling train.

After the first run, the filter was moved due to plugging, thus some particulate was probably trapped in the silica gel. Estimated flue gas

volume was used, as supplied by Union Carbide. A long straight section of stack on both sides of the sample port should have allowed reasonably good flow patterns for single, center point sampling. This was considered necessary because, the possibility of CO leaks endangering test personnel dictated that the probe not be moved any more than necessary.

Scrubber Water (#20)

Scrubber water flow rate data was supplied by Union Carbide. A water sample was not taken during Run No. 3 due to the non-availability of a Union Carbide gas man to escort the RRI sampler to the sample location. Composite water samples were taken in small amounts, at approximately five minute intervals during samples ASE-1 and 2, from each of the scrubber sump areas.

Power (#20)

No problems were encountered with lack of sufficient power during the tests on Furnace 20.

Filter Plugging (#20)

Filter plugging was a problem with the first test run on the hood exhaust ducts. Trains were shut down early in the run to change nozzles. The problem was not encountered thereafter. A possible cause was the oily like substance found in the impinger water (during analysis) of all the hood exhaust samples. Some were worse than others, but all had the residue. This oily substance also complicated the analyses, in that the samples were very difficult to stabilize in weight.

The filter in sample ASE-1, scrubber exhaust, plugged almost immediately. The cause was almost assuredly the high kerosine content in the stack gases which was injected into the blower to keep the vanes from fouling. The filter was removed as mentioned previously.

Miscellaneous (#20)

Due to lack of an appropriate location for equipment storage and preparation inside the plant buildings, a large van type truck was rented. This presented problems due to the cold weather encountered. Even with space heaters some freezing of liquids was encountered.

Handling of glassware was made difficult because the cold necessitated wearing gloves much of the time. Breakage was encountered, that was directly related to the cold working conditions.

One of the source sampling trains presented some minor mechanical problems in operation, but they were soon overcome.

DISCUSSION

(Part 2 - Furnace No. 13)

A. RESULTS

Collection Efficiency (#13)

Basing the collection efficiency on total emissions from the furnace (except tapping fumes) the efficiency of this unit was computed to be approximately 92%. Consideration must be given to the % fume that goes to the scrubber versus the total fumes. 86% of the fumes went to the scrubber. The actual scrubber, when considered alone, was very effective. The average calculated efficiency was 99.9%.

Emissions (#13)

Atmospheric emissions from this furnace were considerably lower than for Furnace 20. Although the power usage was only about half, this was a completely different product, and this furnace produced slightly more fumes. However, the cover and scrubber system was removing a greater share of the total dust load created by the furnace. Based upon emissions and water effluent solids Furnace 13 was producing a dust load of about 800 lbs/hr and Furnace 20 was producing about 700 lbs/hr. No. 20 scrubber emissions were ignored due to the high kerosine content.

The secondary hood appeared to be catching far less fumes which was most likely due partly to the charging method and the apparently good capture by the cover. Overall fume capture, including tapping, was very good.

Particulate Versus Total Catch (#13)

Results of Furnace 13 emissions were similar to those of Furnace 20, except that the tapping exhaust was more uniform, ranging from approximately 2% to 6% condensibles.

Flue Gas Conditions (#13)

Temperature and flow measurements on the tapping exhaust were stable but the velocity profile was variable. The hood exhausts displayed very wide and erratic changes in velocity and temperature, as explained in the Test Conditions section.

Gaseous Emissions (#13)

Orsat analysis was essentially the same as Furnace 20. An Orsat analysis was made of the scrubber exhaust gas to determine the approximate carbon monoxide content. This was off normal scale, in the range of 65%. This analysis was used in calculations for both furnaces.

Carbon monoxide gas from this process is either used for heating in the lime kiln, or burned when emitted to the atmosphere. The carbon monoxide emissions were low, with occasional peaks, in the tapping exhaust, but were very erratic and variable in the southeast hood duct. This is explained in the Test Conditions section of the Discussion.

B. OPERATING CONDITIONS

Scrubber System (#13)

No unusual conditions were observed or recorded.

Furnace No. 13

Very little down time was experienced with this furnace, and none was experienced during actual test periods. Furnace load was 21,500 kw to 24,000 kw. This was a continuous tap furnace, which would aid in producing a more uniform operation.

C. TEST CONDITIONS

Safety (#13)

Similar problems concerning carbon monoxide, as those experienced with Furnace 20, were experienced at this location. In addition, an overhead crane was operating over the hood and tapping exhaust sample locations. This required personnel to move each time it passed over.

Dust levels were extremely high in the hood and tapping exhaust sampling areas, frequently requiring the use of dust respirators.

Exposed electrodes were located within 3-5 feet of two of the hood exhaust sampling locations. This necessitated extreme care when in the area, especially when handling the metal jacketed pitobe assemblies.

Union Carbide had a man present at all times while RRI personnel were working in the operating areas of No. 13 furnace.

Hood Ducts (#13)

The hood duct sampling ports on this furnace were located in the only available locations. These locations were totally inadequate for good

representative sampling in ducts. Serious doubt must be expressed about the accuracy of these eleven samples in spite of the repeatability achieved.

The reasons given for this doubt are:

1. Many indications point to the uneven flow at these points.
2. Velocities were very erratic.
3. Positive, zero and negative velocities were experienced in close proximity to each other.
4. Temperatures varied widely from point to point, indicating an uneven, unmixed gas stream.
5. The carbon monoxide measurements on the southwest hood (Appendix B) graphically show the eddied, non-uniform nature of the stack gas.
6. In addition, some ports could not be reached due to pipes blocking access.

Sample ports on the northeast and southeast fugitive fume hood ducts were on a diagonal, thus requiring a platform of four different heights. The platforms supplied were very unstable. This, coupled with very close working quarters, contributed to one probe being broken at the southeast hood location and a corresponding loss of sample SEH-1. These conditions, combined with the safety factors previously mentioned, make these hood locations a "textbook example" of what sampling locations should not be.

Unfortunately there was no other choice, and, although the representativeness of the sample may be in some doubt, the reproducibility was much better than for Furnace 20.

Tapping Duct (#13)

The tapping duct location and operation, allowed normal sampling periods to be used at this location.

Scrubber Exhaust (#13)

The scrubber exhaust on Furnace 13 was identical to the one on Furnace 20. The only difference in procedure was that RRI personnel gathered flow data by a readout on the Union Carbide computer during the tests.

Scrubber Water (#13)

Scrubber water flow was supplied by Union Carbide. RRI personnel took measurements on the weir during the BSE test series that generally confirmed the numbers supplied, but the weir was very worn and pitted. Composite samples were collected as with No. 20 furnace scrubber.

Power (#13)

No problems were encountered with power during the tests on Furnace 13. However, an initial delay was incurred due to non-availability on the first day of testing.

Filter Plugging (#13)

No unusual conditions were encountered.

Miscellaneous (#13)

The problem of the cold cleanup and preparation area was overcome at this location by moving the van inside the building and renting an 85,000 BTU heater.

IX. APPENDIX

APPENDIX A

COMPLETE PARTICULATE RESULTS WITH EXAMPLE CALCULATIONS

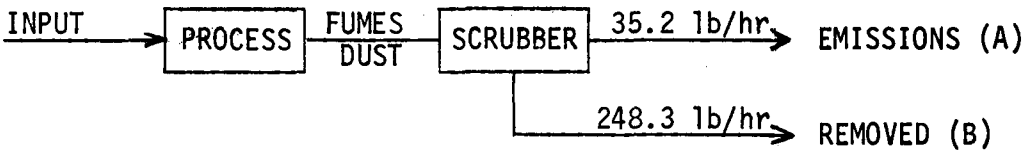
EXAMPLE CALCULATION

% EFFICIENCY

#20 FURNACE SCRUBBER

$$\frac{\text{PARTICULATE REMOVED (B)}}{\text{TOTAL PARTICULATE EMISSIONS (A \& B)}} \times 100 = \% \text{ REMOVAL EFFICIENCY}$$

$$\frac{248.3 \text{ lb/hr}}{248.3 \text{ lb/hr} + 35.2 \text{ lb/hr}} \times 100 = 87.6\%$$



SAMPLE PARTICULATE CALCULATIONS
#20 FURNACE
SHE-1

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

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

$$\frac{17.7 \times 78.41 \ (28.90 + \frac{1.51}{13.6})}{(88.4 + 460)} = 73.4$$

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

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

$$0.0474 \times 11.2 = 0.53$$

3. % moisture in stack gas

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

$$\frac{100 \times 0.53}{73.4 + 0.53} = .72$$

4. Mole fraction of dry gas

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

$$\frac{100 - .72}{100} = 0.993$$

5. Average molecular weight of dry stack gas

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

$$(0.20 \times \frac{44}{100}) + (20.60 \times \frac{32}{100}) + (79.20 \times \frac{28}{100}) = 28.86$$

6. Molecular weight of stack gas

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

$$28.86 \times 0.993 + 18(1-0.993) = 28.78$$

7. Stack velocity @ stack conditions, fpm

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

$$4350 \times \sqrt{\text{Average}} \left[\frac{1}{28.90 \times 28.78}\right]^{1/2} = 3687$$

8. Stack gas volume @ standard conditions, SCFM

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

$$\frac{0.123 \times 3687 \times 2112 \times .993 \times 28.90}{(111 + 460)} = 48{,}160$$

9. Percent isokinetic

$$\%I = \frac{1032 \times (T + 460) \times V_{m\ STD}}{V_s \times T_t \times P_s \times M_d \times (D_n)^2} = \%$$

$$\frac{1032 \times (111 + 460)\ 73.4}{3687 \times 120 \times 28.90 \times .993 \times (0.1875)^2} = 97\%$$

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

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

$$0.0154 \times \frac{525.4}{73.4} = 0.1102$$

11. Particulate total, gr/SCF

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

$$0.0154 \times \frac{594.6}{73.4} = 0.1247$$

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

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

$$\frac{17.7 \times 0.1102 \times 28.90 \times .993}{(111 + 460)} = 0.0981$$

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

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

$$\frac{17.7 \times 0.1247 \times 28.90 \times .993}{(111 + 460)} = 0.1110$$

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

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

$0.00857 \times 0.1102 \times 48{,}160 = 45.5$

15. Particulate - total, lb/hr.

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

$0.00857 \times 0.1247 \times 48{,}160 = 51.5$

16. % excess air at sampling point

$$\% \text{ EA} = \frac{100 \times \% O_2}{(0.266 \times \% N_2) - \% O_2} = \%$$

$$\frac{100 \times 20.60}{(0.266 \times 79.20) - 20.60} = 4409$$

EXAMPLE CALCULATIONS

Scrubber Water Solids - Total Solids Collected

No. 20 North Scrubber

Sample NSW-1	10.59×10^{-4}	$\frac{gms}{ml}$	sample
less	8.63×10^{-4}	$\frac{gms}{ml}$	blank*
	1.96×10^{-4}	$\frac{gms}{ml}$	scrubbed from gas

$$1.96 \times 10^{-4} \frac{gms}{ml} \times 2.205 \times 10^{-3} \frac{lbs}{gm} \times \frac{1}{2.6418 \times 10^{-4}} \frac{gal}{me} = lbs/gallon$$

$$1.96 \times 10^{-4} \times 8.347 = 0.001636 \text{ lbs/gallon}$$

422 gallons/minute Average flow**

422 gal/min x 0.001636 lbs/gal x 60 min/hr = 41.42 lbs/hour removal

41.42 lbs/hour + 237.0 lbs hour (South Scrubber) = 278.42

*Value unusually high and suspect.

**NOTE: Water flow supplied by Union Carbide.

NAME OF FIRM UNION CARBIDE

LOCATION OF PLANT -- ASHTABULA #20

TYPE OF PLANT REACTIVE METALS

CONTROL EQUIPMENT SCRUBBER

SAMPLING POINT LOCATIONS NORTH HOOD EXHAUST

POLLUTANTS SAMPLED TOTAL PARTICULATE

TIME OF PARTICULATE TEST

RUN NO NHE-1	DATE 2-15-72	BEGIN	1342	END	1702
RUN NO NHE-2	DATE 2-16-72	BEGIN	1100	END	1239
RUN NO NHE-3	DATE 2-16-72	BEGIN	1335	END	1450
RUN NO NHE-4	DATE 2-16-72	BEGIN	1648	END	1803

PARTICULATE EMISSION DATA

RUN NO.	NHE-1	NHE-2	NHE-3	NHE-4
PB BAROMETRIC PRESSURE INCHES HG ABSOLUTE	28.90	29.48	29.48	29.48
PM ORIFICE PRESSURE DROP, INCHES WATER	1.39	1.37	1.16	1.40
VM VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, CU.FT.	74.20	56.47	41.36	45.55
TM AVERAGE GAS METER TEMPERATURE, DEG. F	92.9	84.0	85.5	88.5
VMSTD VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS CU.FT.	68.9	54.4	39.7	43.5
VW TOTAL H2O COLLECTED ML., IMPINGERS AND SILICA GEL	11.4	2.7	9.5	9.2
VWGAS VOLUME OF WATER VAPOR COLLECTED. CU.FT. AT STANDARD CONDITIONS	.54	.13	.45	.44
PCTM PERCENT MOISTURE IN THE STACK GAS BY VOLUME	.78	.23	1.12	.99
MD MOLE FRACTION OF DRY GAS	.992	.998	.989	.990
PCTCO2 PERCENT CO2	.20	.20	.20	.20
PCTO2 PERCENT O2	20.60	20.60	20.60	20.60
PCTN2 PERCENT N2	79.20	79.20	79.20	79.20

MWD MOLECULAR WEIGHT OF DRY STACK GAS	28.86	28.86	28.86	28.86
MW MOLECULAR WEIGHT OF STACK GAS	28.77	28.83	28.73	28.75
DELPS VELOCITY HEAD OF STACK GAS, INCHES OF WATER	1.32	1.45	1.34	1.52
TS STACK TEMPERATURE, DEG.F.	117	151	176	110
DPS X (TS + 460)	27.59	29.60	29.01	29.36
PS STACK PRESSURE, IN. HG. ABSOLUTE	28.80	29.30	29.30	29.30
VS STACK VELOCITY AT STACK CONDITIONS, FPM	4170	4431	4350	4400
AS STACK AREA, SQ.IN.	1968	1968	1968	1968
QS STACK GAS VOLUME AT STANDARD CONDITON *SCFM	50003	51327	47977	54208
TT NET TIME OF TEST, MIN.	147	96	72	72
DN SAMPLING NOZZLE DIAMETER, IN.	.1875	.1875	.1875	.1875
PCTI PERCNT ISOKINETIC	67	78	82	80
MF PARTICULATE - PROBE CYCLONE AND FILTER, MG.	424.0	1493.4	139.9	219.1
MT PARTICULATE TOTAL, MG.	461.5	1590.8	297.3	312.8
CAN PARTICULATE PROBE CYCLONE AND FILTER GR/SCF	.0948	.4231	.0543	.0776
CAO PARTICULATE TOTAL GR/SCF	.1032	.4507	.1154	.1108
CAT PARTICULATE PROBE CYCLONE AND FILTER, GR/CF AT STACK COND	.0831	.3584	.0438	.0699
CAU PARTICULATE TOTAL GR/CF AT STACK COND	.0905	.3818	.0931	.0998

CAW PARTICULATE PROBE CYCLONE AND FILTER, LB/HR.	40.6	186.1	22.3	36.0
CAX PARTICULATE TOTAL LB/HR.	44.2	198.3	47.4	51.5
PCTEA PERCENT EXCESS AIR AT SAMPLING PT	4409	4409	4409	4409

NAME OF FIRM UNION CARBIDE

LOCATION OF PLANT -- ASTABULA #20

TYPE OF PLANT REACTIVE METALS

CONTROL EQUIPMENT SCRUBBER

SAMPLING POINT LOCATIONS CENTER HOOD EXHAUST, A TAPPING EXHAUST

POLLUTANTS SAMPLED TOTAL PARTICULATE

TIME OF PARTICULATE TEST

RUN NO ATE-1	DATE 2-17-72	BEGIN	1348	END	1405
RUN NO ATE-2	DATE 2-17-72	BEGIN	1639	END	1655
RUN NO ATE-3	DATE 2-18-72	BEGIN	1014	END	1026
RUN NO CHE-2	DATE 2-16-72	BEGIN	1100	END	1246
RUN NO CHE-3	DATE 2-16-72	BEGIN	1440	END	1557
RUN NO CHE-4	DATE 2-16-72	BEGIN	1655	END	1818

PARTICULATE EMISSION DATA

RUN NO.	ATE-1	ATE-2	ATE-3	CHE-2	CHE-3	CHE-4
PB BAROMETRIC PRESSURE INCHES HG ABSOLUTE	29.30	29.30	29.50	29.48	29.48	29.48
PM ORIFICE PRESSURE DROP, INCHES WATER	.88	.79	2.11	1.12	1.07	1.16
VM VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, CU.FT.	7.32	6.94	8.88	46.40	32.75	36.97
TM AVERAGE GAS METER TEMPERATURE, DEG. F	73.2	85.0	79.6	90.3	96.7	91.8
VMSTD VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS CU.FT.	7.1	6.6	8.6	44.1	30.8	35.1
VW TOTAL H2O COLLECTED ML., IMPINGERS AND SILICA GEL	1.1	3.9	5.3	8.8	11.4	16.0
VWGAS VOLUME OF WATER VAPOR COLLECTED. CU.FT. AT STANDARD CONDITIONS	.05	.18	.25	.42	.54	.76
PCTM PERCENT MOISTURE IN THE STACK GAS BY VOLUME	.73	2.72	2.83	.94	1.73	2.12

MD MOLE FRACTION OF DRY GAS	.993	.973	.972	.991	.983	.979
PCTCO2 PERCENT CO2	.20	.20	.20	.20	.20	.20
PCTO2 PERCENT O2	20.50	20.50	20.50	20.60	20.60	20.60
PCTN2 PERCENT N2	79.48	79.48	79.48	79.20	79.20	79.20
MWD MOLECULAR WEIGHT OF DRY STACK GAS	28.82	28.82	28.82	28.86	28.86	28.86
MW MOLECULAR WEIGHT OF STACK GAS	28.74	28.53	28.52	28.75	28.67	28.63
DELPS VELOCITY HEAD OF STACK GAS, INCHES OF WATER	.48	.48	.46	.89	.86	.93
TS STACK TEMPERATURE, DEG.F.	145	154	167	117	140	109
DPS X (TS + 460)	16.84	17.12	16.83	22.55	22.47	22.83
PS STACK PRESSURE, IN. HG. ABSOLUTE	29.30	29.30	29.50	29.48	29.60	29.48
VS STACK VELOCITY AT STACK CONDITIONS, FPM	2525	2575	2523	3369	3356	3419
AS STACK AREA, SQ.IN.	2124	2124	2124	2601	2601	2601
QS STACK GAS VOLUME AT STANDARD CONDITON *SCFM	31709	31216	30137	54566	52086	55521
TT NET TIME OF TEST, MIN.	17	16	12	96	72	72
DN SAMPLING NOZZLE DIAMETER, IN.	.2500	.1875	.2500	.1875	.1875	.1875
PCTI PERCNT ISOKINETIC	57	102	103	79	77	82

MF PARTICULATE - PROBE CYCLONE AND FILTER, MG.	172.1	88.6	194.5	966.3	716.2	176.2
MT PARTICULATE TOTAL, MG.	179.4	123.1	197.0	1010.0	844.0	244.9
CAN PARTICULATE PROBE CYCLONE AND FILTER GR/SCF	.3715	.2062	.3467	.3373	.3583	.0774
CAO PARTICULATE TOTAL GR/SCF	.3872	.2865	.3512	.3525	.4223	.1076
CAT PARTICULATE PROBE CYCLONE AND FILTER, GR/CF AT STACK COND	.3161	.1693	.2806	.3022	.3077	.0695
CAU PARTICULATE TOTAL GR/CF AT STACK COND	.3295	.2353	.2842	.3159	.3626	.0966
CAW PARTICULATE PROBE CYCLONE AND FILTER, LB/HR.	100.9	55.2	89.6	157.7	159.9	36.8
CAX PARTICULATE TOTAL LB/HR.	105.2	76.6	90.7	164.9	188.5	51.2
PCTEA PERCENT EXCESS AIR AT SAMPLING PT	3195	3195	3195	4409	4409	4409

NAME OF FIRM UNION CARBIDE

LOCATION OF PLANT -- ASHTABULA #20

TYPE OF PLANT REACTIVE METALS

CONTROL EQUIPMENT SCRUBBER

SAMPLING POINT LOCATIONS SOUTH HOOD EXHAUST

POLLUTANTS SAMPLED TOTAL PARTICULATE

TIME OF PARTICULATE TEST

RUN NO SHE-1	DATE 2-15-72	BEGIN	1350	END	1712
RUN NO SHE-2	DATE 2-16-72	BEGIN	1055	END	1309
RUN NO SHE-3	DATE 2-16-72	BEGIN	1442	END	1605
RUN NO SHE-4	DATE 2-16-72	BEGIN	1657	END	1816

PARTICULATE EMISSION DATA

RUN NO.	SHE-1	SHE-2	SHE-3	SHE-4
PB BAROMETRIC PRESSURE INCHES HG ABSOLUTE	28.90	29.48	29.48	29.48
PM ORIFICE PRESSURE DROP, INCHES WATER	1.51	1.12	.99	1.14
VM VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, CU.FT.	78.41	59.40	39.85	41.51
TM AVERAGE GAS METER TEMPERATURE, DEG. F	88.4	77.3	77.8	76.2
VMSTD VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS CU.FT.	73.4	57.8	38.8	40.5
VW TOTAL H2O COLLECTED ML., IMPINGERS AND SILICA GEL	11.2	9.2	10.7	13.6
VWGAS VOLUME OF WATER VAPOR COLLECTED. CU.FT. AT STANDARD CONDITIONS	.53	.44	.51	.64
PCTM PERCENT MOISTURE IN THE STACK GAS BY VOLUME	.72	.75	1.29	1.57
MD MOLE FRACTION OF DRY GAS	.993	.993	.987	.984
PCTCO2 PERCENT CO2	.20	.20	.20	.20
PCTO2 PERCENT O2	20.60	20.60	20.60	20.60
PCTN2 PERCENT N2	79.20	79.20	79.20	79.20
MWD MOLECULAR WEIGHT OF DRY STACK GAS	28.86	28.86	28.86	28.86

MW MOLECULAR WEIGHT OF STACK GAS	28.78	28.77	28.72	28.69
DELPS VELOCITY HEAD OF STACK GAS, INCHES OF WATER	1.06	1.05	.99	.97
TS STACK TEMPERATURE, DEG.F.	111	159	202	134
DPS X (TS + 460)	24.44	25.40	25.43	23.82
PS STACK PRESSURE, IN. HG. ABSOLUTE	28.90	29.48	29.48	29.48
VS STACK VELOCITY AT STACK CONDITIONS, FPM	3687	3794	3803	3563
AS STACK AREA, SQ.IN.	2112	2112	2112	2112
QS STACK GAS VOLUME AT STANDARD CONDITON *SCFM	48160	46570	43443	45208
TT NET TIME OF TEST, MIN.	120	96	72	72
DN SAMPLING NOZZLE DIAMETER, IN.	.1875	.1875	.1875	.1875
PCTI PERCNT ISOKINETIC	97	99	95	95
MF PARTICULATE - PROBE CYCLONE AND FILTER, MG.	525.4	2121.5	1862.3	429.6
MT PARTICULATE TOTAL, MG.	594.6	2252.2	1896.9	450.7
CAN PARTICULATE PROBE CYCLONE AND FILTER GR/SCF	.1102	.5648	.7399	.1633
CAO PARTICULATE TOTAL GR/SCF	.1247	.5996	.7537	.1713
CAT PARTICULATE PROBE CYCLONE AND FILTER, GR/CF AT STACK COND	.0981	.4724	.5760	.1412
CAU PARTICULATE TOTAL GR/CF AT STACK COND	.1110	.5015	.5867	.1481
CAW PARTICULATE PROBE CYCLONE AND FILTER, LB/HR.	45.5	225.4	275.5	63.3
CAX PARTICULATE TOTAL LB/HR.	51.5	239.3	280.6	66.4
PCTEA PERCENT EXCESS AIR AT SAMPLING PT	4409	4409	4409	4409

REPORT NO. _____ PAGE _____ OF _____ PAGES

SOURCE TESTING CALCULATION FORMS

Test No. ASE No. Runs _____

Name of Firm Union Carbide

Location of Plant Ashtabula #20

Type of Plant Reactive Metals

Control Equipment Scrubber

Sampling Point Locations Scrubber Exhaust

Pollutants Sampled Total Particulate

Time of Particulate Test:

Run No. ASE-1	Date 2-17-72	Begin 1406	End 1410
Run No. ASE-2	Date 2-17-72	Begin 1543	End 1606
Run No. ASE-3	Date 2-17-72	Begin 1637	End 1707
Run No. _____	Date _____	Begin _____	End _____

PARTICULATE EMISSION DATA

Run No.	ASE-1	ASE-2	ASE-3			
P_b barometric pressure, "Hg Absolute	29.30	29.30	29.30			
P_m orifice pressure drop, "H_2O	1.5	1.5	1.5			
V_m volume of dry gas sampled @ meter conditions, ft.^{3}	1.73	14.08	18.74			
T_m Average Gas Meter Temperature, °F	52	63	71			
$V_{m_{std.}}$ Volume of Dry Gas Sampled @ Standard Conditions, ft.^{3}	1.76	14.01	18.37			
V_w Total H_2O collected, ml., Impingers & Silica Gel.	-1.2	7.5	10.2			
$V_{w_{gas}}$ Volume of Water Vapor Collected ft.^{3} @ Standard Conditions*	-0.057	0.36	0.48			

* 70°F, 29.92" Hg.

PARTICULATE EMISSION DATA (CONT'D)

Run No.	ASE-1	ASE-2	ASE-3	Orsat		
%M - % Moisture in the stack gas by volume	0	2.51	2.55			
M_d - Mole fraction of dry gas	1.0	.97	.97			
% CO_2	———	———	———	1.5		
% O_2	———	———	———	6.0		
% N_2	———	———	———	30.0		
$M W_d$ - Molecular weight of dry stack gas	28.44	28.44	28.44			
M W - Molecular weight of stack gas	28.44	28.08	28.03			
Δ Ps - Velocity Head of stack gas, In.H_2O	———	———	———			
T_s - Stack Temperature, °F	~100	~100	~100			
$\sqrt{\Delta P_s X(T_s + 460)}$	———	———	———			
P_s - Stack Pressure, "Hg.Absolute	———	———	———			
V_s - Stack Velocity @ stack conditions, fpm	10,290	10,290	10,290			
A_s - Stack Area, $in.^2$	153.9	153.9	153.9			
Q_s - Stack Gas Volume @ Standard Conditions, *SCFM	11,736	11,383	11,383			
Tt - Net Time of Test, min.	4	23	30			
D_n - Sampling Nozzle Diameter, in.	0.25	0.25	0.25			
%I - Percent isokinetic	———	———	———			
m_f - Particulate - probe, cyclone and filter, mg.	76.2	80.4	73.9			
m_t - Particulate - total, mg	97.8	104.4	101.4			
C_{an} - Particulate - probe, cyclone, and filter, gr/SCF	0.667	0.088	0.062			
C_{ao} - Particulate - total, gr/SCF	0.856	0.115	0.085			
C_{at} - Particulate - probe, cyclone, and filter, gr/cf @ stack conditions	0.618	0.079	0.056			

PARTICULATE EMISSION DATA (cont'd)

Run No.	ASE-1	ASE-2	ASE-3	Orsat		
C_{au} - Particulate, total, gr/cf @ stack cond.	0.913	0.119	0.088			
C_{aw} - Particulate, probe, cyclone, and filter, lb/hr.	67.09	8.58	6.05			
C_{ax} - Particulate - total, lb/hr.	86.1	11.2	8.29			
% EA- % Excess air @ sampling point	———	———	———	12.5		

* 70°F, 29.92" Hg.

NAME ØF FIRM UNIØN CARBIDE

LØCATIØN ØF PLANT -- ASHTABULA #13

TYPE ØF PLANT REACTIVE METALS

CØNTRØL EQUIPMENT SCRUBBER

SAMPLING PØINT LØCATIØNS NØRTH WEST HØØD, NØRTH EAST HØØD

PØLLUTANTS SAMPLED TØTAL PARTICULATE

TIME ØF PARTICULATE TEST

RUN NØ NEH-1	DATE 2-22-72	BEGIN	1413	END	1533
RUN NØ NEH-2	DATE 2-23-72	BEGIN	859	END	1020
RUN NØ NEH-3	DATE 2-23-72	BEGIN	1218	END	1339
RUN NØ NWH-1	DATE 2-22-72	BEGIN	1412	END	1533
RUN NØ NWH-2	DATE 2-23-72	BEGIN	854	END	1012
RUN NØ NWH-3	DATE 2-23-72	BEGIN	1218	END	1336

PARTICULATE EMISSIØN DATA

RUN NØ.	NEH-1	NEH-2	NEH-3	NWH-1	NWH-2	NWH-3
PB BARØMETRIC PRESSURE INCHES HG ABSØLUTE	30.00	29.68	29.68	30.00	29.68	29.68
PM ØRIFICE PRESSURE DRØP, INCHES WATER	1.00	1.00	1.00	2.12	1.94	1.96
VM VØLUME ØF DRY GAS SAMPLED AT METER CØNDITIØNS, CU.FT.	39.61	39.78	41.19	53.93	52.02	53.86
TM AVERAGE GAS METER TEMPERATURE, DEG. F	73.5	67.9	71.3	79.1	79.2	80.7
VMSTD VØLUME ØF DRY GAS SAMPLED AT STANDARD CØNDITIØNS CU.FT.	39.5	39.7	40.8	53.4	50.9	52.6
VW TØTAL H20 CØLLECTED ML., IMPINGERS AND SILICA GEL	2.6	4.4	9.2	4.2	2.0	6.9
VWGAS VØLUME ØF WATER VAPØR CØLLECTED. CU.FT. AT STANDARD CØNDITIØNS	.12	.21	.44	.20	.09	.33
PCTM PERCENT MØISTURE IN THE STACK GAS BY VØLUME	.31	.52	1.06	.37	.19	.62
MD MØLE FRACTIØN ØF DRY GAS	.997	.995	.989	.996	.998	.994

PCTC02 PERCENT C02	1.00	1.00	1.00	1.00	1.00	1.00
PCT02 PERCENT 02	20.70	20.70	20.70	20.70	20.70	20.70
PCTN2 PERCENT N2	78.30	78.30	78.30	78.30	78.30	78.30
MWD MOLECULAR WEIGHT OF DRY STACK GAS	28.99	28.99	28.99	28.99	28.99	28.99
MW MOLECULAR WEIGHT OF STACK GAS	28.95	28.93	28.87	28.95	28.97	28.92
DELPS VELOCITY HEAD OF STACK GAS, INCHES OF WATER	.05	.05	.06	1.63	1.47	1.52
TS STACK TEMPERATURE, DEG.F.	125	86	109	118	94	101
DPS X (TS + 460)	4.95	4.86	5.67	30.44	28.36	28.94
PS STACK PRESSURE, IN. HG. ABSOLUTE	30.00	29.68	29.68	30.00	29.68	29.68
VS STACK VELOCITY AT STACK CONDITIONS, FPM	731	722	842	4494	4207	4297
AS STACK AREA, SQ.IN.	2499	2499	2499	2223	2223	2223
QS STACK GAS VOLUME AT STANDARD CONDITON *SCFM	11483	11990	13363	63573	61544	61761
TT NET TIME OF TEST, MIN.	72	73	73	72	72	69
DN SAMPLING NOZZLE DIAMETER, IN.	.1875	.1875	.1875	.1875	.1875	.1875

PCTI PERCNT ISØKINETIC	431	409	378	94	92	99
MF PARTICULATE - PRØBE CYCLØNE AND FILTER, MG.	412.9	204.1	209.6	129.7	59.4	69.9
MT PARTICULATE TØTAL, MG.	421.8	222.2	227.3	143.1	64.0	80.4
CAN PARTICULATE PRØBE CYCLØNE AND FILTER GR/SCF	.1609	.0792	.0791	.0374	.0180	.0205
CAØ PARTICULATE TØTAL GR/SCF	.1644	.0862	.0857	.0413	.0194	.0235
CAT PARTICULATE PRØBE CYCLØNE AND FILTER, GR/CF AT STACK CØND	.1456	.0758	.0722	.0343	.0170	.0190
CAU PARTICULATE TØTAL GR/CF AT STACK CØND	.1487	.0825	.0783	.0378	.0183	.0219
CAW PARTICULATE PRØBE CYCLØNE AND FILTER, LB/HR.	15.8	8.1	9.1	20.4	9.5	10.8
CAX PARTICULATE TØTAL LB/HR.	16.2	8.9	9.8	22.5	10.2	12.5
PCTEA PERCENT EXCESS AIR AT SAMPLING PT	16197	16197	16197	16197	16197	16197

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NAME OF FIRM UNION CARBIDE

LOCATION OF PLANT -- ASHTABULA #13

TYPE OF PLANT REACTIVE METALS

CONTROL EQUIPMENT SCRUBBER

SAMPLING POINT LOCATIONS SOUTH WEST HOOD EXHAUST, SOUTH EAST HOOD EXHAUST

POLLUTANTS SAMPLED TOTAL PARTICULATE

TIME OF PARTICULATE TEST

RUN NO SEH-2	DATE 2-23-72	BEGIN	851	END	1010
RUN NO SEH-3	DATE 2-23-72	BEGIN	1221	END	1341
RUN NO SWH-1	DATE 2-22-72	BEGIN	1415	END	1531
RUN NO SWH-2	DATE 2-23-72	BEGIN	855	END	1010
RUN NO SWH-3	DATE 2-23-72	BEGIN	1228	END	1343

PARTICULATE EMISSION DATA

RUN NO.	SEH-2	SEH-3	SWH-1	SWH-2	SWH-3
PB BAROMETRIC PRESSURE INCHES HG ABSOLUTE	29.68	29.68	30.00	29.68	29.68
PM ORIFICE PRESSURE DROP, INCHES WATER	.42	1.19	2.20	1.89	1.73
VM VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, CU.FT.	22.39	36.21	54.32	51.76	49.44
TM AVERAGE GAS METER TEMPERATURE, DEG. F	51.9	62.7	73.2	71.1	79.0
VMSTD VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS CU.FT.	23.0	36.5	54.4	51.4	48.4
VW TOTAL H2O COLLECTED ML., IMPINGERS AND SILICA GEL	2.9	4.1	1.6	.6	7.5
VWGAS VOLUME OF WATER VAPOR COLLECTED. CU.FT. AT STANDARD CONDITIONS	.14	.19	.08	.03	.36
PCTM PERCENT MOISTURE IN THE STACK GAS BY VOLUME	.59	.53	.14	.06	.73
MD MOLE FRACTION OF DRY GAS	.994	.995	.999	.999	.993
PCTCO2 PERCENT CO2	1.00	1.00	1.00	1.00	1.00
PCTO2 PERCENT O2	20.70	20.70	20.70	20.70	20.70
PCTN2 PERCENT N2	78.30	78.30	78.30	78.30	78.30

MWD MOLECULAR WEIGHT OF DRY STACK GAS	28.99	28.99	28.99	28.99	28.99
MW MOLECULAR WEIGHT OF STACK GAS	28.92	28.93	28.97	28.98	28.91
DELPS VELOCITY HEAD OF STACK GAS, INCHES OF WATER	.34	.31	1.79	1.57	1.43
TS STACK TEMPERATURE, DEG.F.	66	76	61	47	61
DPS X (TS + 460)	13.04	12.59	30.41	28.07	27.16
PS STACK PRESSURE, IN. HG. ABSOLUTE	29.68	29.68	29.80	29.68	29.60
VS STACK VELOCITY AT STACK CONDITIONS, FPM	1937	1868	4502	4164	4039
AS STACK AREA, SQ.IN.	2499	2499	2148	2148	2148
QS STACK GAS VOLUME AT STANDARD CONDITON *SCFM	33383	31652	67973	64308	60239
TT NET TIME OF TEST, MIN.	63	63	72	72	72
DN SAMPLING NOZZLE DIAMETER, IN.	.1875	.2500	.1875	.1875	.1875
PCTI PERCNT ISOKINETIC	99	93	86	86	87
MF PARTICULATE - PROBE CYCLONE AND FILTER, MG.	68.7	86.8	177.3	95.2	122.4
MT PARTICULATE TOTAL, MG.	76.2	90.7	183.7	146.7	217.7
CAN PARTICULATE PROBE CYCLONE AND FILTER GR/SCF	.0460	.0366	.0502	.0285	.0390
CAO PARTICULATE TOTAL GR/SCF	.0510	.0383	.0520	.0439	.0693
CAT PARTICULATE PROBE CYCLONE AND FILTER, GR/CF AT STACK COND	.0457	.0357	.0508	.0295	.0389
CAU PARTICULATE TOTAL GR/CF AT STACK COND	.0506	.0373	.0526	.0454	.0692

CAW PARTICULATE PROBE CYCLONE AND FILTER, LB/HR.	13.2	9.9	29.2	15.7	20.1
CAX PARTICULATE TOTAL LB/HR.	14.6	10.4	30.3	24.2	35.8
PCTEA PERCENT EXCESS AIR AT SAMPLING PT	16197	16197	16197	16197	16197

LOG,X
LOGOFF.

NAME OF FIRM UNION CARBIDE

LOCATION OF PLANT -- ASHTABULA #13

TYPE OF PLANT REACTIVE METALS

CONTROL EQUIPMENT SCRUBBER

SAMPLING POINT LOCATIONS B TAP EXHAUST

POLLUTANTS SAMPLED TOTAL PARTICULATE

TIME OF PARTICULATE TEST

RUN NO BTE-1	DATE 2-23-72	BEGIN	1530	END	1630
RUN NO BTE-2	DATE 2-24-72	BEGIN	903	END	1003
RUN NO BTE-3	DATE 2-24-72	BEGIN	1034	END	1134

PARTICULATE EMISSION DATA

RUN NO.	BTE-1	BTE-2	BTE-3
PB BAROMETRIC PRESSURE INCHES HG ABSOLUTE	29.68	29.30	29.30
PM ORIFICE PRESSURE DROP, INCHES WATER	1.65	1.64	1.61
VM VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, CU.FT.	41.04	41.15	41.37
TM AVERAGE GAS METER TEMPERATURE, DEG. F	81.9	88.8	103.5
VMSTD VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS CU.FT.	40.0	39.0	38.2
VW TOTAL H2O COLLECTED ML., IMPINGERS AND SILICA GEL	3.2	9.3	31.4
VWGAS VOLUME OF WATER VAPOR COLLECTED. CU.FT. AT STANDARD CONDITIONS	.15	.44	1.49
PCTM PERCENT MOISTURE IN THE STACK GAS BY VOLUME	.38	1.12	3.75
MD MOLE FRACTION OF DRY GAS	.996	.989	.963
PCTCO2 PERCENT CO2	1.00	1.00	1.00
PCTO2 PERCENT O2	20.80	20.80	20.80
PCTN2 PERCENT N2	78.20	78.20	78.20
MWD MOLECULAR WEIGHT OF DRY STACK GAS	28.99	28.99	28.99

MW MOLECULAR WEIGHT OF STACK GAS	28.95	28.87	28.58
DELPS VELOCITY HEAD OF STACK GAS, INCHES OF WATER	.39	.38	.38
TS STACK TEMPERATURE, DEG.F.	122	126	149
DPS X (TS + 460)	15.04	15.01	15.16
PS STACK PRESSURE, IN. HG. ABSOLUTE	29.68	29.30	29.30
VS STACK VELOCITY AT STACK CONDITIONS, FPM	2231	2245	2280
AS STACK AREA, SQ.IN.	2124	2124	2124
QS STACK GAS VOLUME AT STANDARD CONDITON *SCFM	29613	29011	27590
TT NET TIME OF TEST, MIN.	60	60	60
DN SAMPLING NOZZLE DIAMETER, IN.	.2500	.2500	.2500
PCTI PERCNT ISOKINETIC	97	97	100
MF PARTICULATE - PROBE CYCLONE AND FILTER, MG.	536.0	481.0	465.8
MT PARTICULATE TOTAL, MG.	548.1	511.7	475.0
CAN PARTICULATE PROBE CYCLONE AND FILTER GR/SCF	.2066	.1897	.1877
CAO PARTICULATE TOTAL GR/SCF	.2113	.2018	.1914
CAT PARTICULATE PROBE CYCLONE AND FILTER, GR/CF AT STACK COND	.1858	.1660	.1539
CAU PARTICULATE TOTAL GR/CF AT STACK COND	.1900	.1766	.1569
CAW PARTICULATE PROBE CYCLONE AND FILTER, LB/HR.	52.4	47.2	44.4
CAX PARTICULATE TOTAL LB/HR.	53.6	50.2	45.2
PCTEA PERCENT EXCESS AIR AT SAMPLING PT	1733333	1733333	1733333

REPORT NO. PAGE OF PAGES

SOURCE TESTING CALCULATION FORMS

Test No. BSE No. Runs

Name of Firm Union Carbide

Location of Plant Ashtabula #13

Type of Plant Reactive Metals

Control Equipment Scrubber

Sampling Point Locations Scrubber Exhaust

Pollutants Sampled Total Particulate

Time of Particulate Test:

Run No. BSE-1	Date 2-23-72	Begin 1520	End 1620
Run No. BSE-2	Date 2-24-72	Begin 0855	End 0955
Run No. BSE-3	Date 2-24-72	Begin 1010	End 1110
Run No.	Date	Begin	End

PARTICULATE EMISSION DATA

Run No.	BSE-1	BSE-2	BSE-3			
P_b barometric pressure, "Hg Absolute	29.30	29.68	29.68			
P_m orifice pressure drop, "H_2O	1.0	1.0	1.0			
V_m volume of dry gas sampled @ meter conditions, ft.^{3}	38.32	35.32	36.11			
T_m Average Gas Meter Temperature, °F	71	86	94			
$V_{m_{std.}}$ Volume of Dry Gas Sampled @ Standard Conditions, ft.^{3}	38.00	34.06	34.32			
V_w Total H_2O collected, ml., Impingers & Silica Gel.	15.0	9.2	7.1			
$V_{w_{gas}}$ Volume of Water Vapor Collected ft.^{3} @ Standard Conditions*	0.71	0.44	0.34			

* 70°F, 29.92" Hg.

PARTICULATE EMISSION DATA (cont'd)

Run No.	BSE-1	BSE-2	BSE-3			
C_{au} - Particulate, total, gr/cf @ stack cond.	0.0449	0.0328	0.0361			
C_{aw} - Particulate, probe, cyclone, and filter, lb/hr.	0.533	0.266	0.413			
C_{ax} - Particulate - total, lb/hr.	0.566	0.415	0.455			
% EA- % Excess air @ sampling point	———	———	———	12.5		

* 70°F, 29.92" Hg.

PARTICULATE EMISSION DATA (CONT'D)

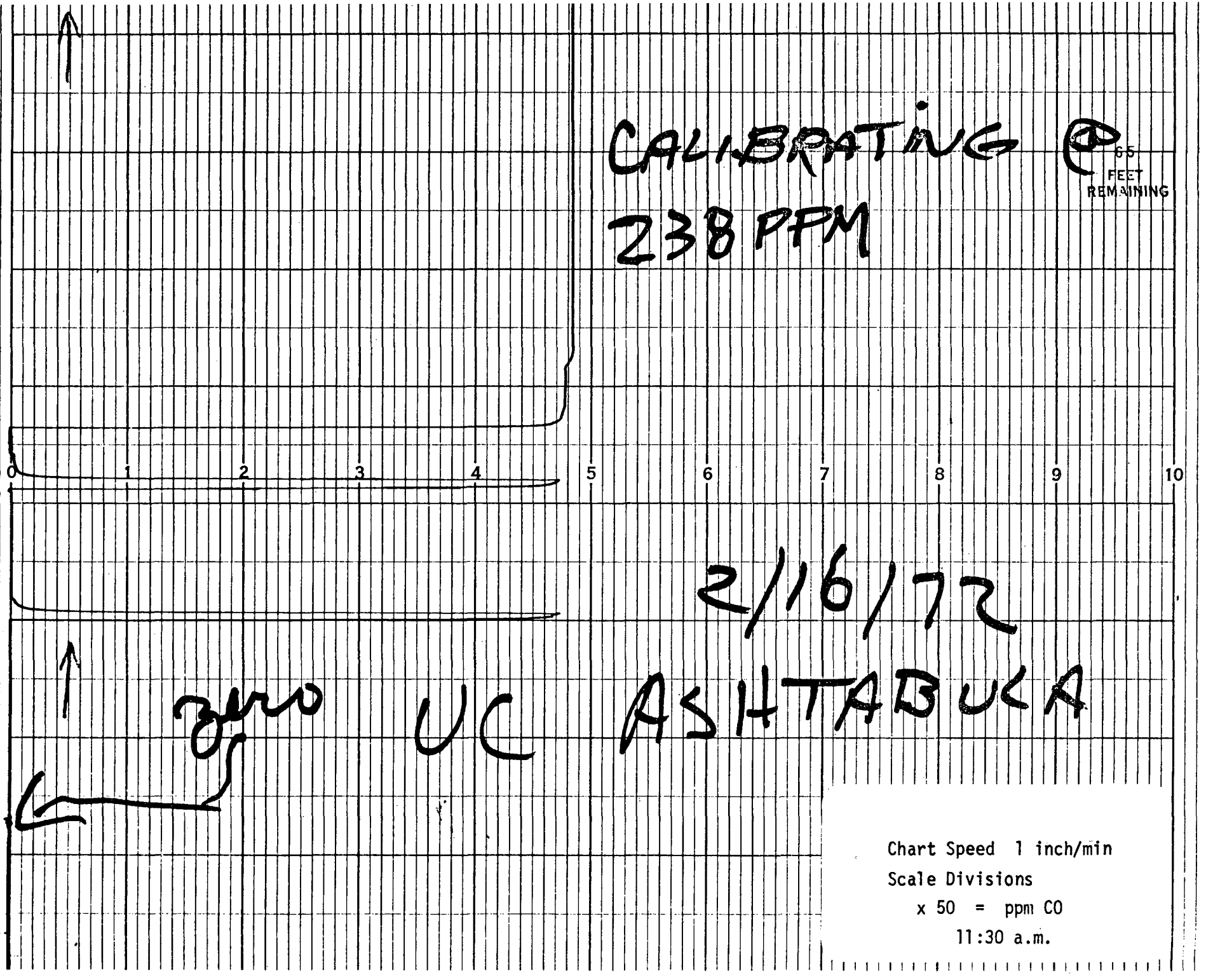
Run No.	BSE-1	BSE-2	BSE-3			
%M - % Moisture in the stack gas by volume	1.83	1.28	0.98			
M_d - Mole fraction of dry gas	.99	.99	.99			
% CO_2	———	———	———	1.5		
% O_2	———	———	———	6.0		
% N_2	———	———	———	30.0		
M W_d - Molecular weight of dry stack gas	28.44	28.44	28.44			
M W - Molecular weight of stack gas	28.34	28.34	28.34			
Δ Ps - Velocity Head of stack gas, In.H_2O	———	———	———			
T_s - Stack Temperature, °F	~100	~100	~100			
$\sqrt{\Delta P_s X(T_s + 460)}$	———	———	———			
P_s - Stack Pressure,"Hg.Absolute	———	———	———			
V_s - Stack Velocity @ stack conditions, fpm	1403	1403	1403			
A_s - Stack Area, $in.^2$	153.9	153.9	153.9			
Q_s - Stack Gas Volume @ Standard Conditions, *SCFM	1554	1554	1554			
Tt - Net Time of Test, min.	60	60	60			
D_n - Sampling Nozzle Diameter, in.	0.25	0.25	0.25			
%I - Percent isokinetic	———	———	———			
m_f - Particulate - probe, cyclone and filter, mg.	98.1	44.3	69.4			
m_t - Particulate - total, mg	104.8	68.8	76.2			
C_{an} - Particulate - probe, cyclone, and filter, gr/SCF	0.040	0.020	0.031			
C_{ao} - Particulate - total, gr/SCF	0.0425	0.0311	0.0342			
C_{at} - Particulate - probe, cyclone, and filter, gr/cf @ stack conditions	0.037	0.019	0.029			

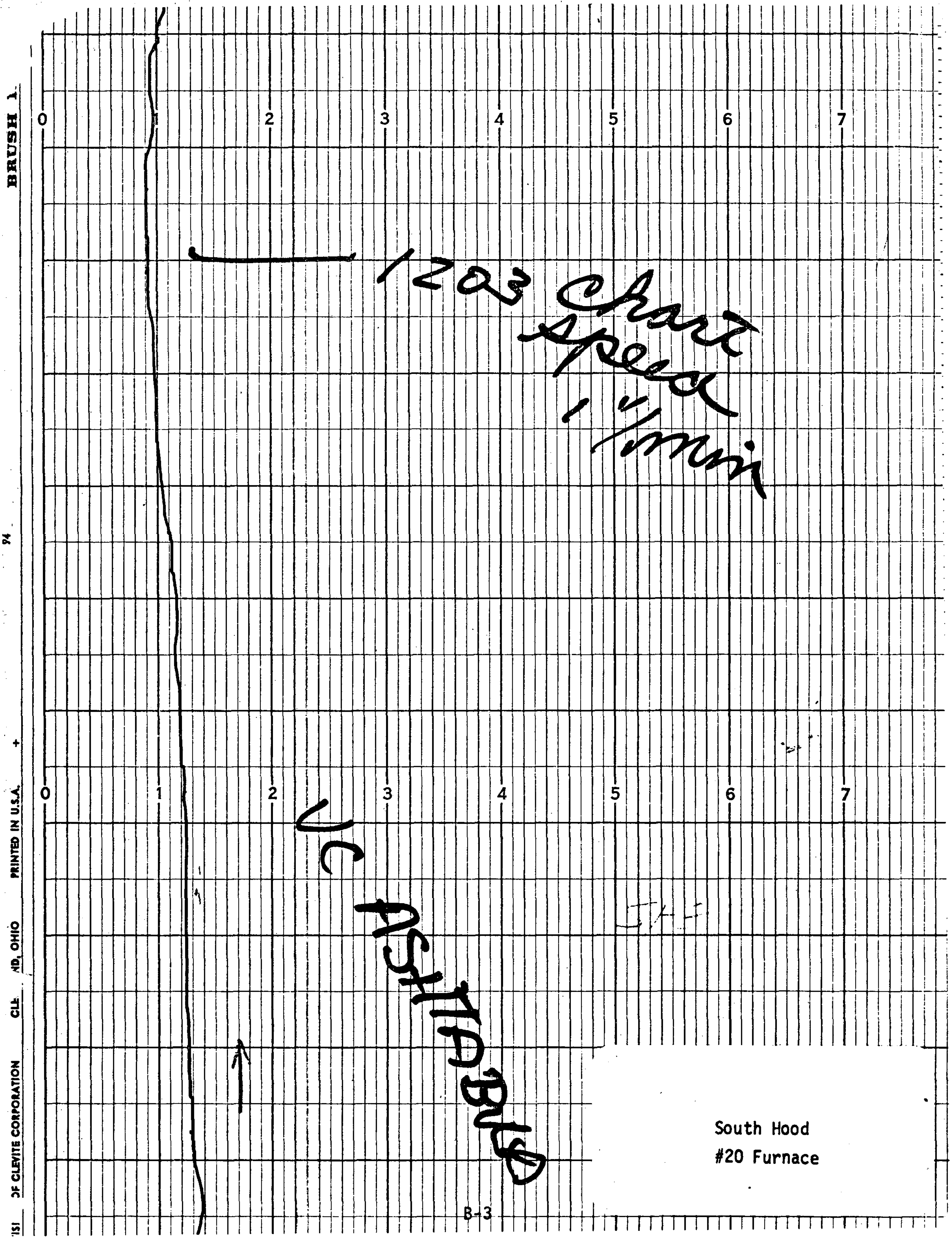
APPENDIX B

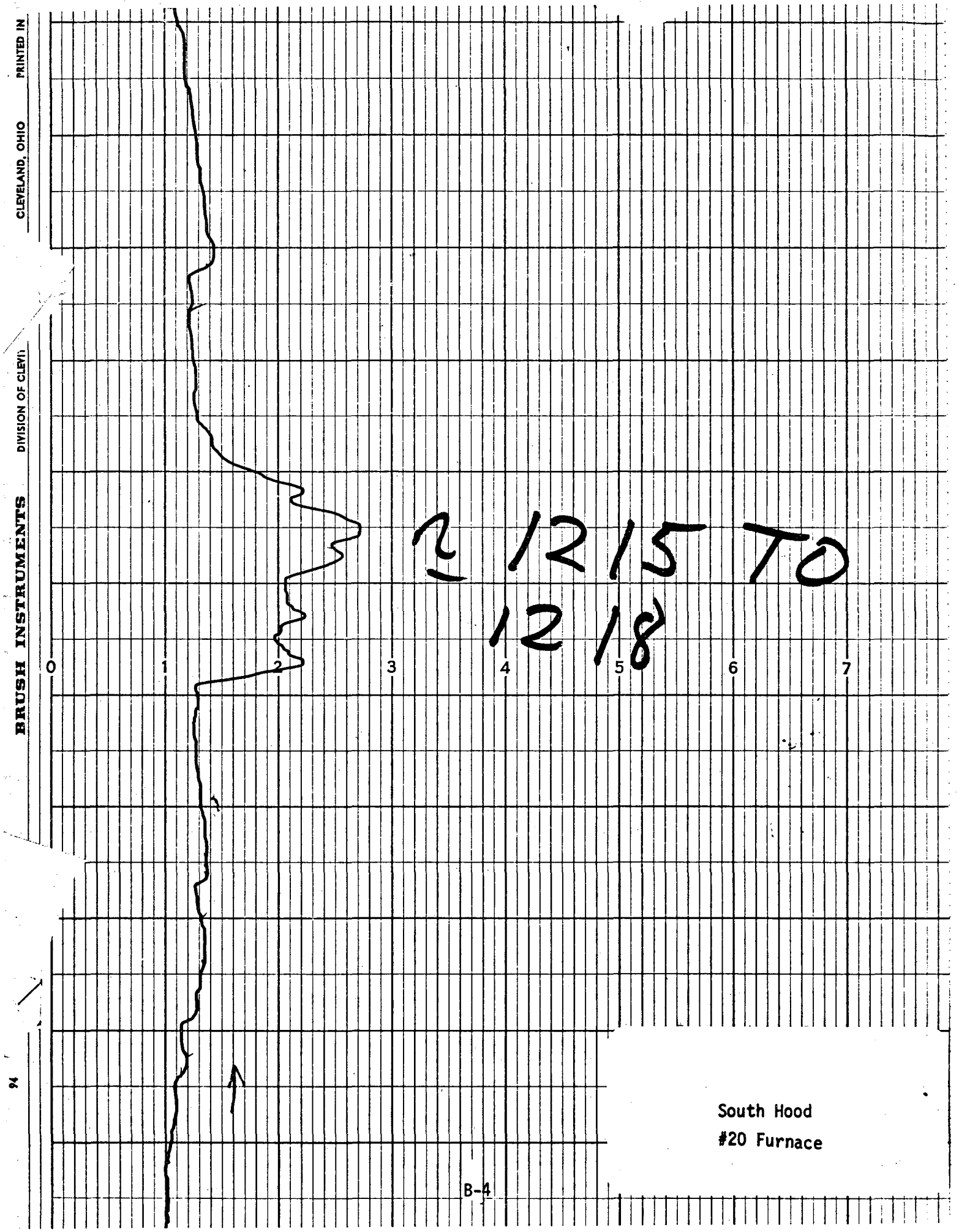
COMPLETE GASEOUS RESULTS WITH EXAMPLE CALCULATIONS

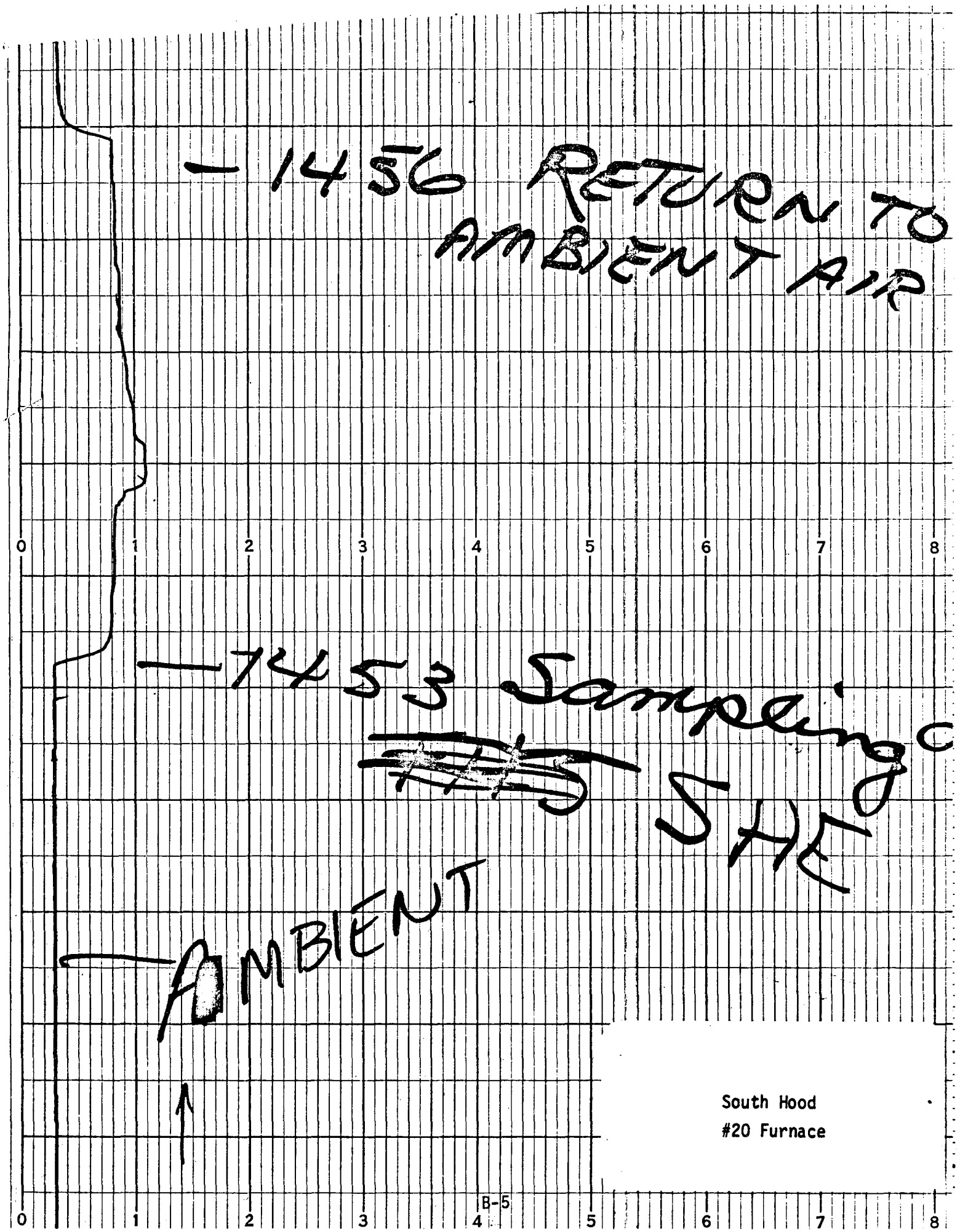
The following are tracings from the recorder connected to the infrared carbon monoxide analyzer showing the carbon monoxide levels.

Scale divisions X 50 = ppm CO.

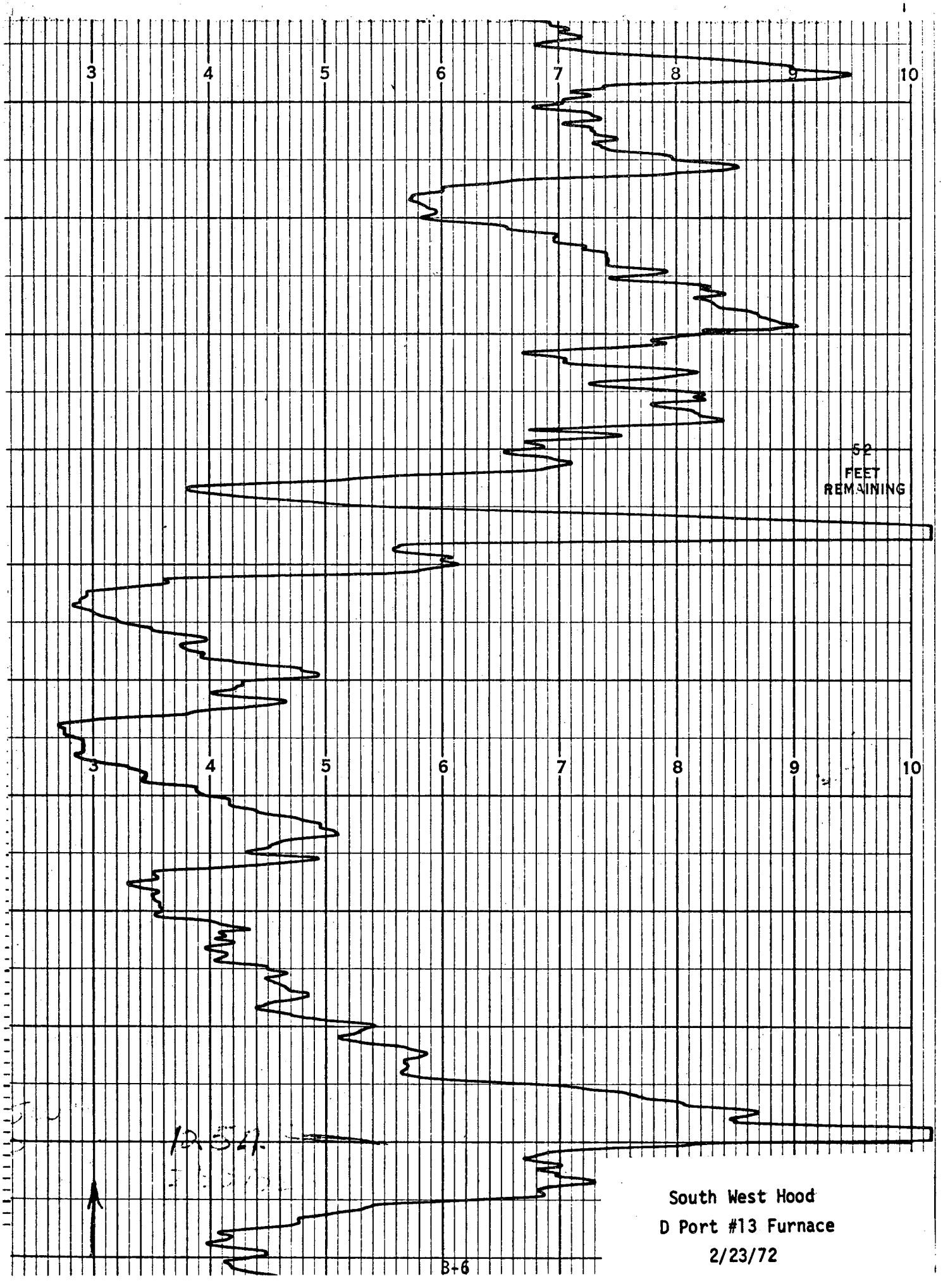

CALIBRATING @
65
FEET
REMAINING
238 PPM
0
1
2
3
4
5
6
7
8
9
10
2/16/72
ZERO
UC
ASHTABULA
Chart Speed 1 inch/min
Scale Divisions
x 50 = ppm CO
11:30 a.m.
DIVISION OF CLEVITE CORPORATION CLEVELAND, OHIO PRINTED IN U.S.A.
B-2

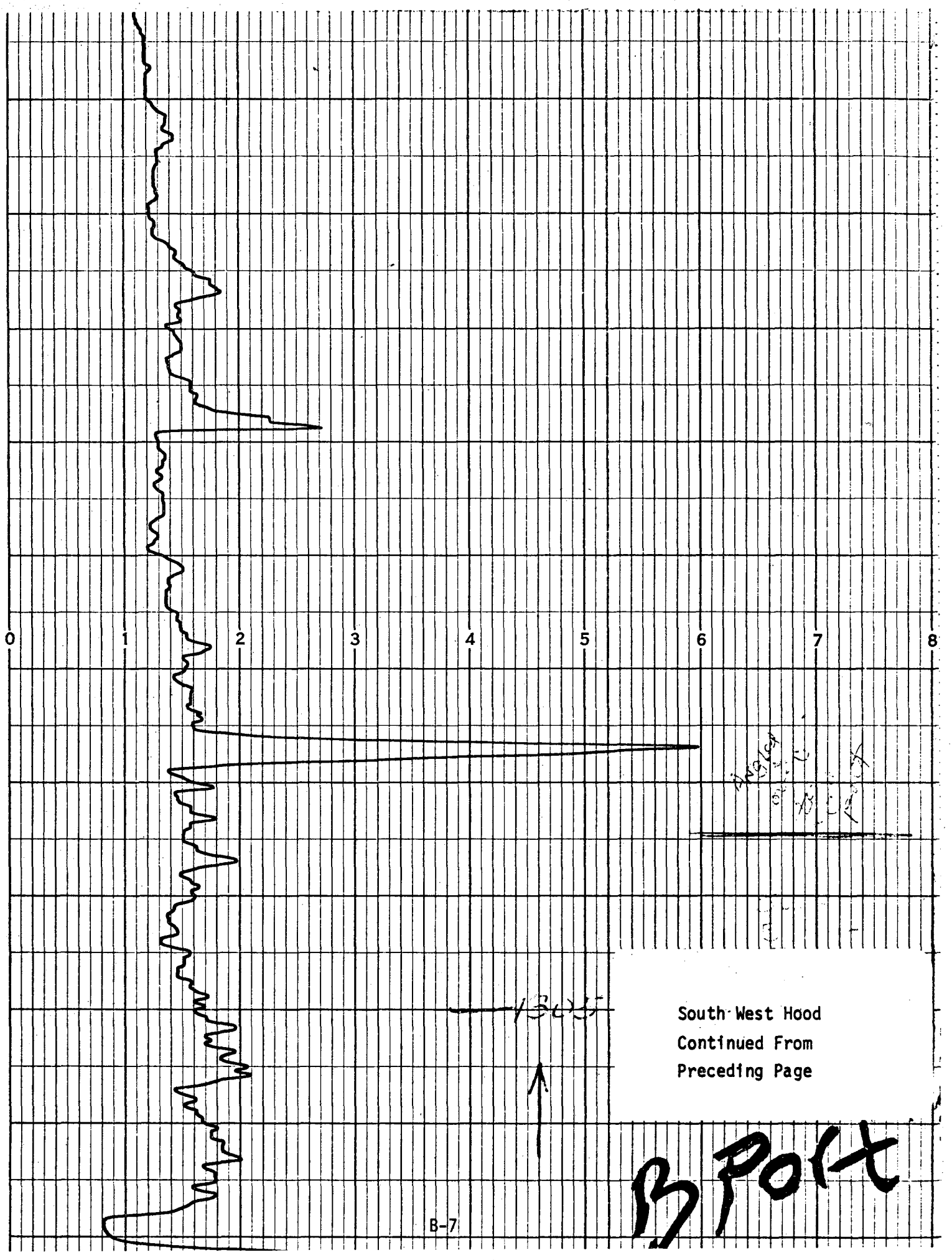

BRUSH 1
0 1 2 3 4 5 6 7
1203 Chart speed 1"/min
0 1 2 3 4 5 6 7
UC ASHTABULA
South Hood
#20 Furnace
PRINTED IN U.S.A.
CLEVITE CORPORATION


BRUSH INSTRUMENTS DIVISION OF CLEVITE PRINTED IN CLEVELAND, OHIO
0
1
2
3
4
5
6
7
12 15 TO
12 18
South Hood
#20 Furnace



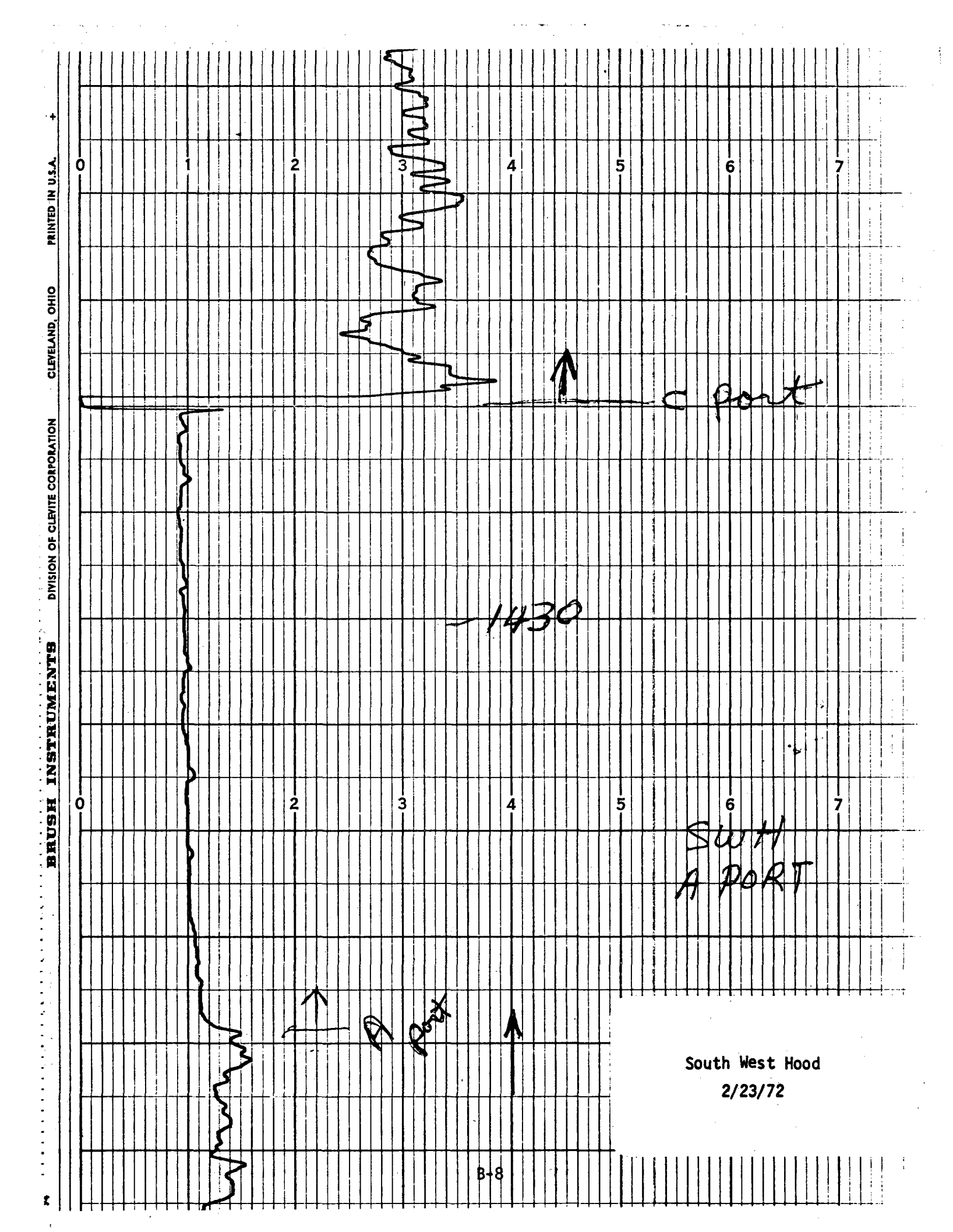
South Hood
#20 Furnace

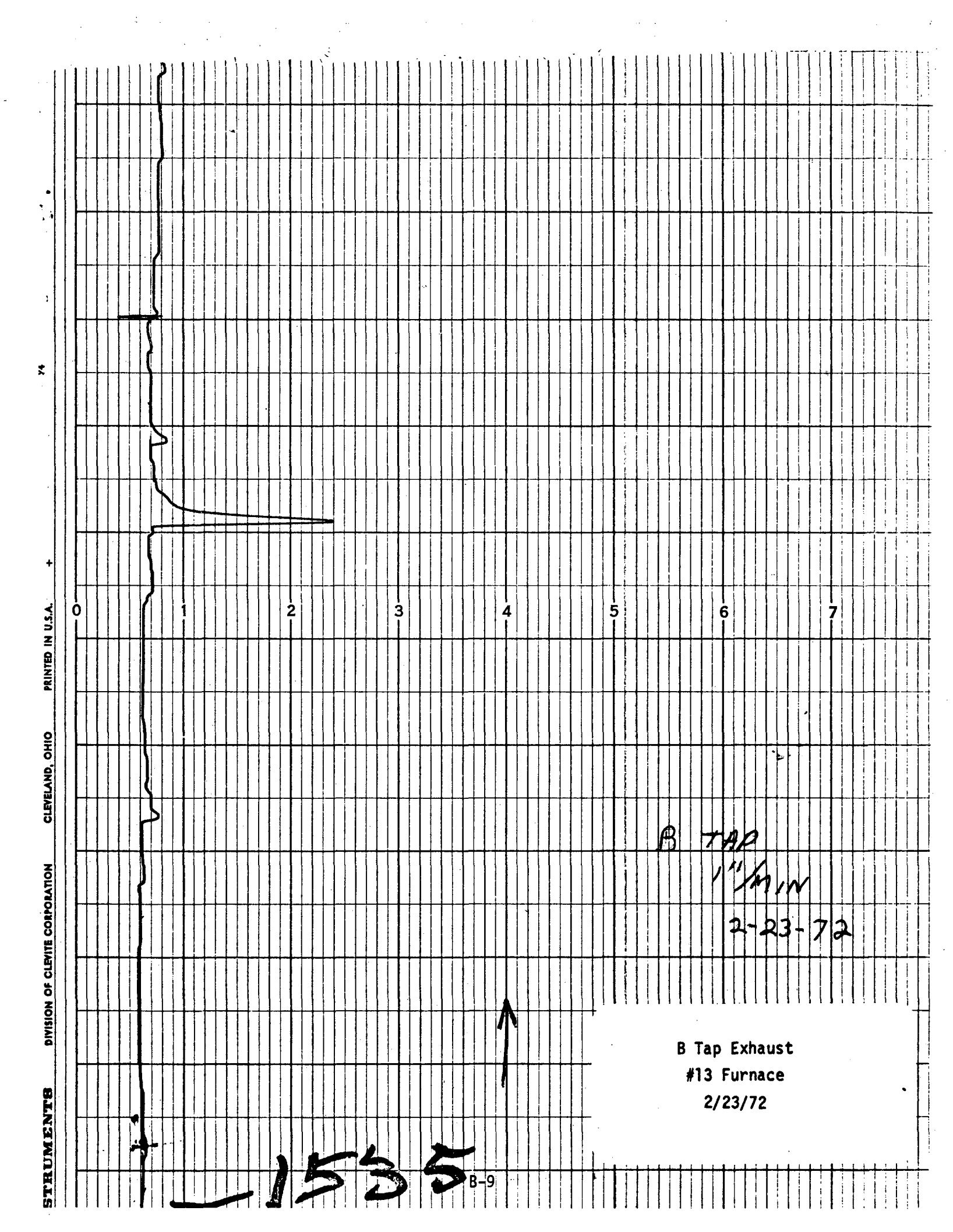

3
4
5
6
7
8
9
10
52
FEET
REMAINING
3
4
5
6
7
8
9
10
South West Hood
D Port #13 Furnace
2/23/72
B+6

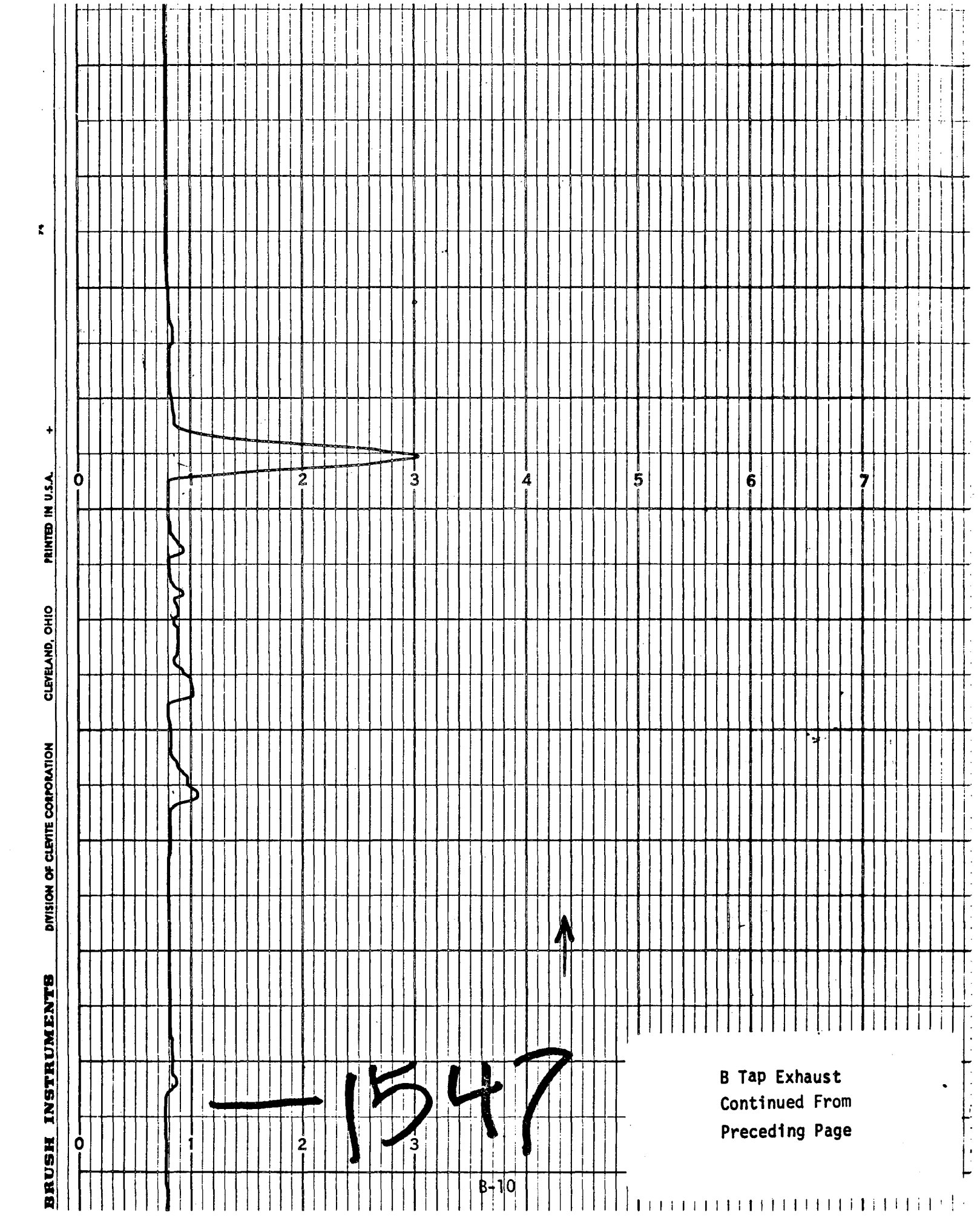


South West Hood
Continued From
Preceding Page

B Port


BRUSH INSTRUMENTS
DIVISION OF CLEVITE CORPORATION
CLEVELAND, OHIO
PRINTED IN U.S.A.
0
1
2
3
4
5
6
7
C port
1430
0
2
3
4
5
6
7
SWTH
A PORT
A Port
South West Hood
2/23/72
B-8


0
1
2
3
4
5
6
7
B TAP
1 11/16 IN
2-23-72
B Tap Exhaust
#13 Furnace
2/23/72
1535
B-9
STRUMENTS
DIVISION OF CLEVITE CORPORATION
CLEVELAND, OHIO
PRINTED IN U.S.A.



-1547

B Tap Exhaust
Continued From
Preceding Page

ORSAT FIELD DATA

#20 Furnace
Location Center Hood Exhaust Comments:

Date 2-18-72

Time 0930

Operator GONZALEZ

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
1	0.2	20.8	20.8
2	0.2	20.7	20.7
AVG	0.2	20.8	20.8

ORSAT FIELD DATA

Location #20 Furnace TAPING EXHAUST Comments:

Date 2-18-72

Time 0930

Operator GONZALEZ

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
1	0.02	20.7	20.7
2	0.03	20.9	20.8
3	0.02	20.6	20.7
AVG	0.02	20.7	20.7

ORSAT FIELD DATA

#13 Furnace

Location South West Hood Comments:

Date 2-23-72

Time P.M.

Operator GONZALEZ

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
1	0.0	20.7	20.7
2	0.0	20.6	20.7
3	0.0	20.7	20.7
AVG	0.0	20.7	20.7

ORSAT FIELD DATA

#13 Furnace

Location TAPPING EXHAUST Comments:

Date 2-23-72

Time P.M.

Operator GONZALEZ

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
1	0.0	20.8	20.8
2	0.0	20.8	20.8
AVG	0.0	20.8	20.8

ORSAT FIELD DATA

Location Furnace #13 Scrubber exhaust

Comments:

Date 2-23-72

Time P.M.

Operator GONZALEZ

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
1	1.5	7.5	±70.0
			off scale - estimated rdg.

VELOCITY TRAVERSE FIELD DATA

Plant U.C. Ashtabula

Test B SE-3

Location Scrubber #13

Date 2/24/72

Operator B.M. Brown (UNION CARBIDE)

FLOW FROM COMPUTER every five minutes

Clock Time	~~Point~~	ACFM ~~ΔP, in. H_2O~~	Stack Temp., °C	~~Stack Pres., In. Hg~~	~~ΔP x (T+460)**~~	~~$\sqrt{\Delta P \times (T+460)}$**~~
1010		01496	36			
1015		01509	36			
1020		01551	36			
1025		01523	36			
1030		01545	36			
1035		01480	36			
1040		01537	36			
1045		01471	38			
1050		01481	38			
1055		01480	37			
1100		01432	37			
	AVG	1500	37			

** - Calculation columns, not Field data

Comments:

$$1500 \times \frac{29.30}{29.92} \times \frac{273 + 37}{273 + 20} = 1554$$

NCAP-29 (12/67)

APPENDIX C

COMPLETE OPERATION RESULTS WITH EXAMPLE CALCULATIONS

Plant 60616
Ashtabula, Ohio
February 25, 1972

FURNACE NO. 20 OPERATING DATA

DATE	TESTING PLACE	TESTING TIME	AVERAGE FURNACE KW DURING TEST	TAPHOLE OPEN TIME DURING TEST
2-15-72	Hood	1330-1715	50200 KW	1355-1410 1500-1515 1615-1630 1730-1755
2-16-72	Hood	1100-1300	48700 KW	1150-1210
		1430-1615	52300 KW	1430-1445 1535-1555
		1645-1830	50000 KW	1650-1720
2-17-72	Taphole Duct	1348-1405	40500 KW	1345-1410
		1640-1655	39500 KW	1645-1655
	Scrubber	1406-1410	40500 KW	1345-1410
		1543-1606	39500 KW	Not Open
		1637-1707	39500 KW	1645-1655
2-18-72	Taphole Duct	1014-1026	42000 KW	1020-1040

PRODUCT MADE: 50% FeSi (Hard Cast)

AVG. WATER FLOWS: North Scrubber - 422 GPM
South Scrubber - 302 GPM

TWLopuszynski:clj

Plant 60616
Ashtabula, Ohio
February 29, 1972

FURNACE NO. 13 OPERATING DATA

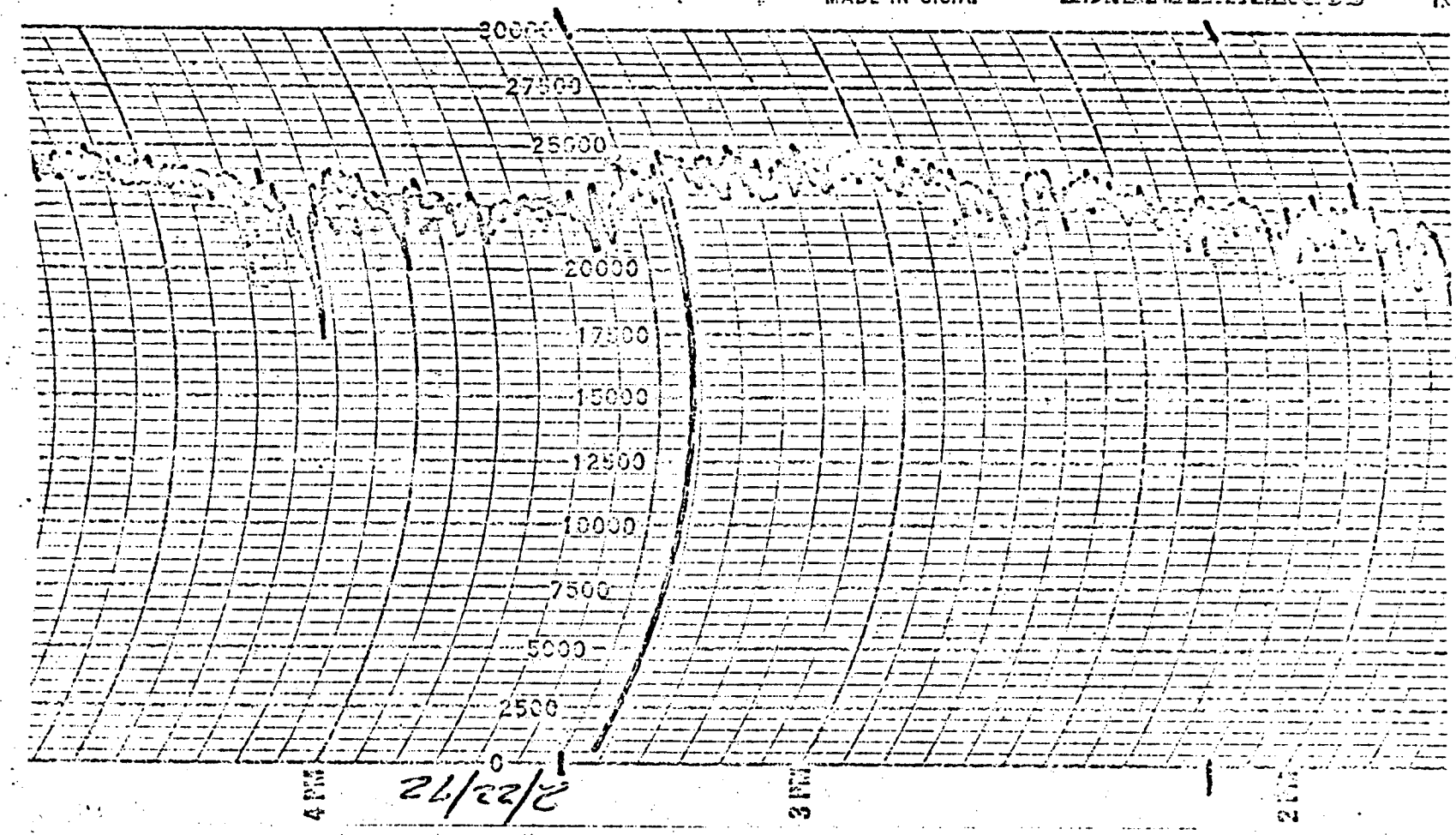
DATE	TEST PLACE	TIME	ACCURATE * AVG. FURNACE LOAD (KW)
2-22-72	Hood	1410-1530	22,800
2-23-72	Hood	1215-1345	23,000
	Hood	0850-1030	21,500
	Scrubber Exhaust	1520-1620	24,000
2-24-72	Scrubber Exhaust	855- 955	23,800
	Scrubber Exhaust	1010-1110	23,500
2-23-72	Tap Exhaust	1530-1630	24,000
2-24-72	Tap Exhaust	903-1003	23,800
2-24-72	Tap Exhaust	1034-1134	23,300

* In general, strip charts read approximately 500 KW low.

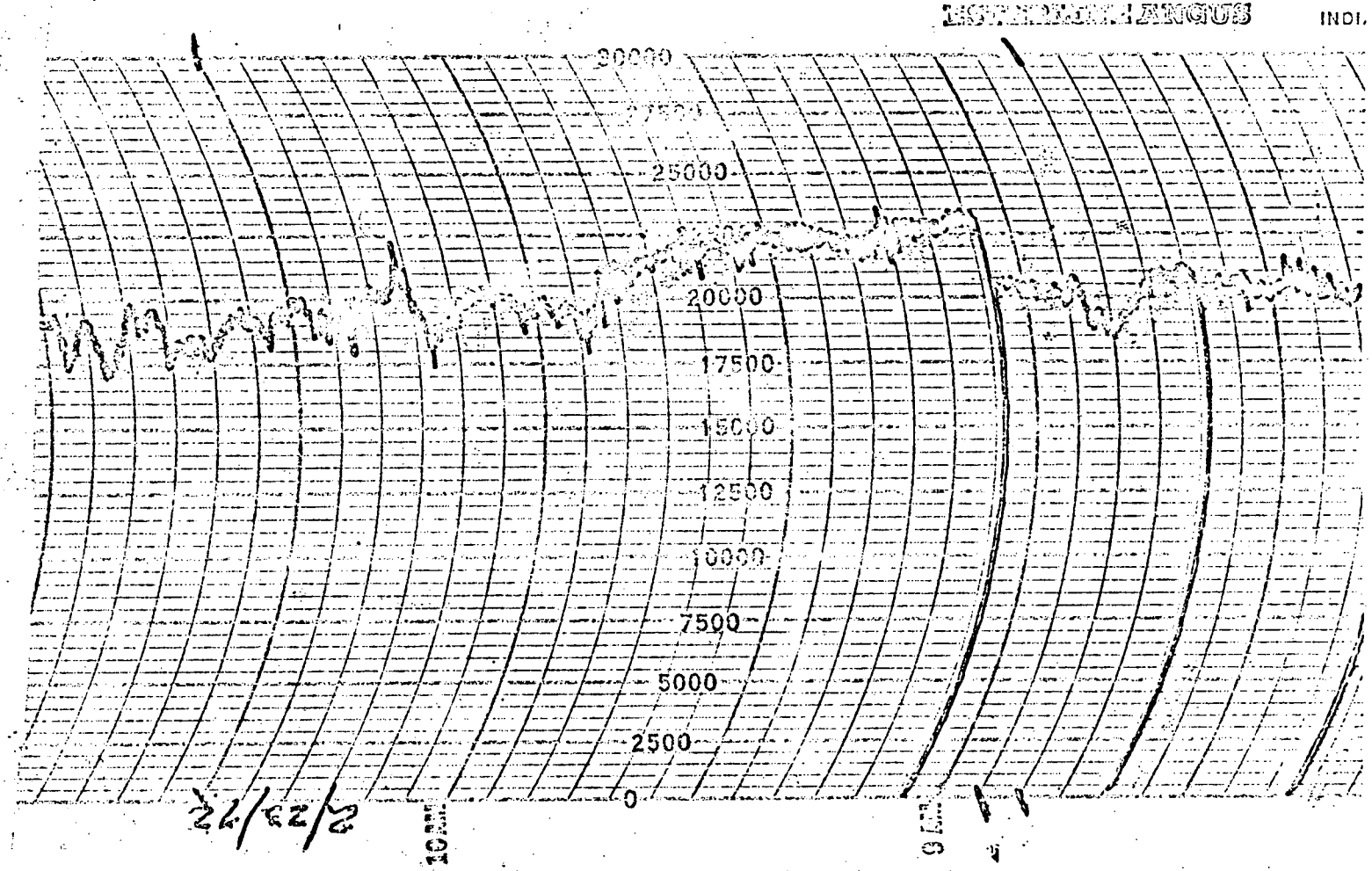
PRODUCT MADE: CaC_2 (80-85% Grade)

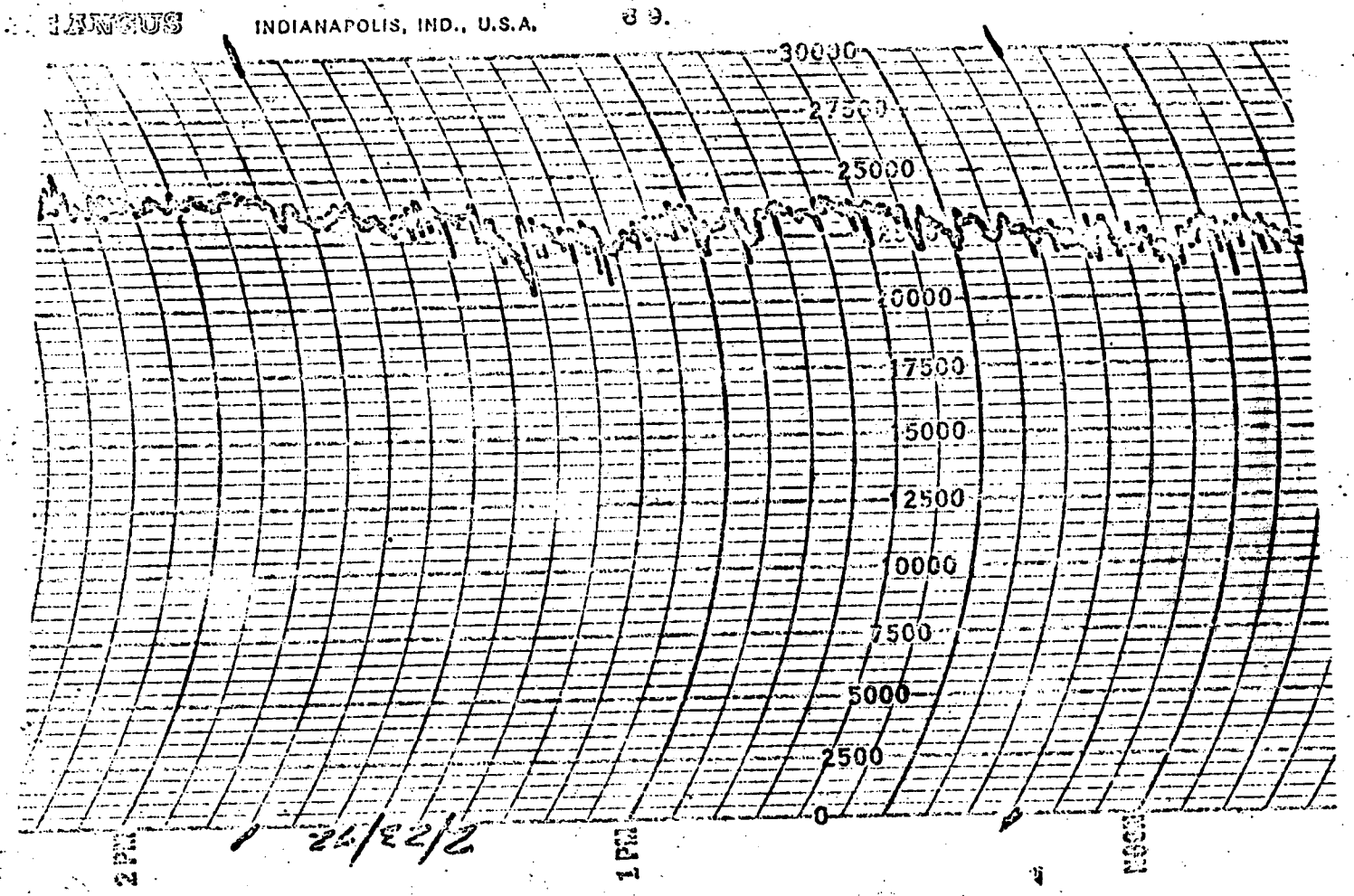
WATER FLOW: Maximum - 490 GPM
Minimum - 324 GPM
Average - 450 GPM

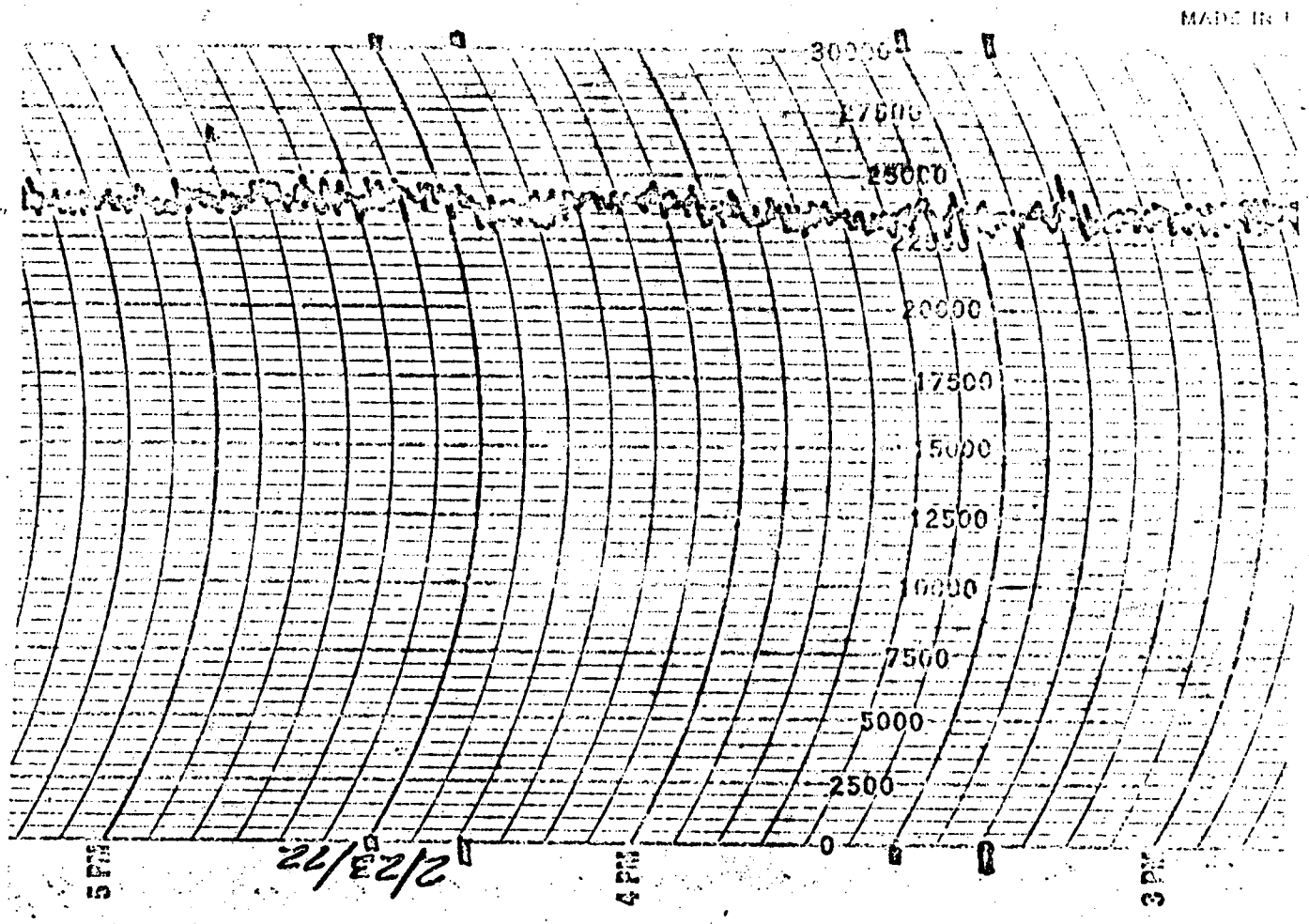
KJKnapp:clj

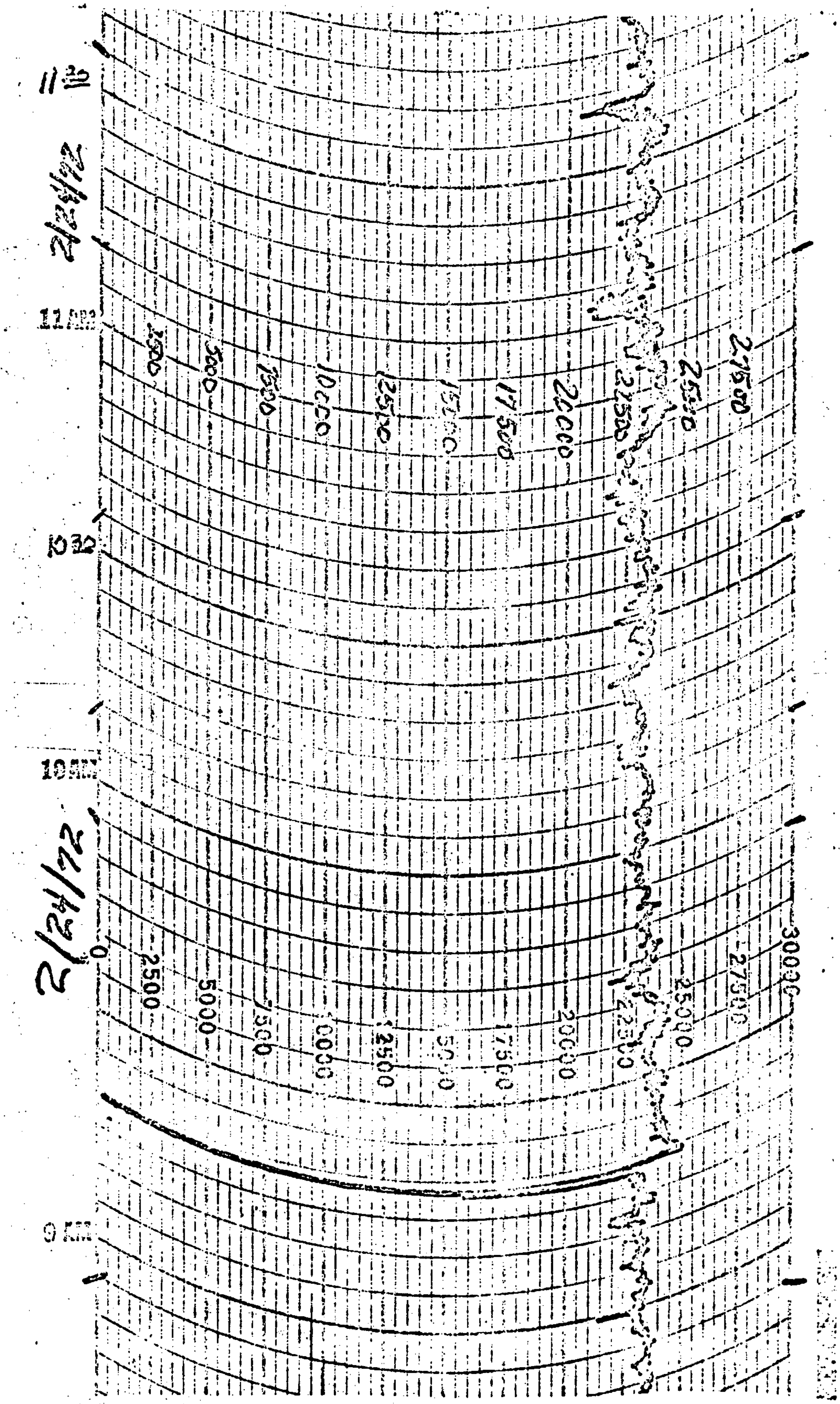

MADE IN U.S.A.
27500
25000
20000
15000
12500
10000
7500
5000
2500
0
4 PM
3 PM
2/22/72

C-3


INDI.
30000
25000
20000
17500
15000
12500
10000
7500
5000
2500
0


INDIANAPOLIS, IND., U.S.A.
30000
25000
17500
5000
12500
10000
7500
5000
2500
0
2 PM
1 PM


MADE IN
30000
27500
25000
22500
20000
17500
15000
12500
10000
7500
5000
2500
0
5 PM
4 PM
3 PM
2/23/72



11 AM
10 AM
9 AM
2/24/72
0
2500
5000
7500
10000
12500
15000
17500
20000
22500
25000
27500
30000

APPENDIX D

FIELD DATA

PARTICULATE FIELD DATA

1 of 2 sheets

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

U_w H.4
$\%CO_2$:2
$\%O_2$ 20.6
As. - 1968
M_f - 4248
M_r 461.5

Plant ~~[illegible]~~ Ashtabula #20

Run No. #NH-1

Location North ~~[illegible]~~ Exhaust

Date 2-15-72

Operator ~~[illegible]~~ BAXLEY

Sample Box No. 2

Meter Box No. 4

Probe Length 5'

Probe Heater Setting 60

Ambient Temp °F 65

Bar. Press. "Hg 28.9

Assumed Moisture % 2%

Heater Box Setting, °F 250

Probe Tip Dia., In. changed 7/16 Apart ~~[illegible]~~ .250

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
Hole #1	13:42	636.5				~~78~~	~~74~~	6	250	55	28.8	100
NGH-1	13:47	639.8	1.40	1.15	1.15	78	74	6		55		100
2	13:52	643.2	1.40	1.15	1.15	86	74	6		55		100
3	13:57	645.9	1.40	1.15	1.15	92	74	4		65		130
4	14:02	648.8	1.50	1.10	1.10	94	78	5		65		110
5	14:07	651.6	1.30	.95	.95	98	80	5		65		128
~~Start~~	14:08	654.3	1.30	1.45	1.45	76	80	7		65	-	125
~~End~~	15:15	657.8	"	"	"	"	"	"		"		"
Hole #2-1	15:20	657.8	1.70	1.90	1.90	80	80	15		60		160
2	15:25	661.5	1.70	1.90	1.90	100	52	21		60		160
3	15:30	664.6	1.50	1.65	1.65	100	82	22		60		132
4	15:35	667.8	1.40	1.60	1.60	104	82	25		60		130
5	15:40	670.6	1.30	1.40	1.40	104	84	25		60		125
6	15:45	673.3	1.20	1.35	1.25	104	86	25		65		135
~~Start~~	16:00	676.7	1.20	"	"	"	"	"		"		"
Hole #3-1	16:05	676.7	1.50	1.70	1.70	90	86	3		70		135
2	16:10	679.5	1.50	1.70	1.70	90	86	5		70		140
3	16:15	683.1	1.30	1.40	1.40	92	86	5		65		115
4	16:20	686.1	1.10	1.25	1.25	100	88	6		60		100
5	16:25	689.2	1.10	1.25	1.25	110	90	6		60		105
~~Stop~~ 6	16:30	691.9	1.10	1.25	1.25	114	92	6		60		95
~~Start~~	16:32	691.9	"	"	"	"	"	"		"		"
Hole #4-1	16:37	695.4	1.40	1.60	1.60	110	92	7		60		100
2	16:42	698.2	1.40	1.60	1.60	112	94	9	V	60	V	90

2-72 sheets 2-15-72 Allen Ash Ohio

Run # 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
NCE- 3	16:47	201.7	1.20	1.35	1.35	118	94	9	250	60	28.8	100
4	16:52	204.8	1.10	1.25	1.25	120	94	9	↓	↓	↓	98
5	16:57	207.7	.95	1.10	1.10	120	94	8				95
6	17:02	210.7	1.05	1.20	1.20	120	94	9				95
END												

D-2

Comments:

NCAP-37 (12/67)

1 of 2 sheets

ash tabulation #20

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

V_w - 2.7
%CO_2 12
%O_2 20.6
As - 1968
mF - 1,493H
MT 1590.8

Plant ~~Akron Ash Ohio~~

Run No. NNE-2

Location North Hood Exhaust

Date 2-16-72

Operator BAXLEY

Sample Box No. 2

Meter Box No. 4

Probe Length 5'

Probe Heater Setting 60°

Ambient Temp °F 38°

Bar. Press. "Hg 29.48

Assumed Moisture % 2

Heater Box Setting, °F 250°

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

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
NGE ②	11:00	717.02										
1	11:04	719.44	1.60	1.75	1.75	60	60	4	250	60	29.3	92°
2	11:08	723.54	1.80	2.00	2.00	68	60	5		60		110
3	11:12	725.46	1.80	2.00	2.00	78	60	5		60		170
4	11:16	728.10	1.60	1.75	1.75	84	62	5		60		115
5	11:20	730.70	1.50	1.65	1.65	90	64	5		60		108
Stop 6	11:24	733.32	1.40	1.55	1.55	90	64	5		60		125
START	11:25	733.32										
NGE-② 1	11:29	736.19	1.90	2.05	2.05	92	70	6		60		160
2	11:33	739.05	1.90	2.05	2.05	94	70	6		60		188
ADJ 3	11:37	741.84	1.80	1.45	1.45	98	74	8		60		210
NoMA 4	11:41	743.40	1.50	1.35	1.25	100	76	7		60		175
5	11:45	745.37	1.30	1.10	1.10	100	76	6		60		170
STOP 6	11:49	746.60	1.30	1.10	1.10	102	76	6		60		170
START	11:50	746.60										
NGE-② 1	11:54	749.05	1.30	1.10	1.10	96	78	8		60		168
2	11:55	751.35	1.60	1.35	1.35	96	78	10		60		150
3	12:02	753.62	1.50	1.25	1.25	98	80	11		60		255
4	12:06	755.74	1.20	.90	.90	100	80	11		60		128
5	12:10	757.87	1.20	1.05	1.05	100	80	11		60		130
Stop 6	12:14	760.09	1.30	1.05	1.05	102	80	12		60		120
START	12:15	760.09										
NGE-② 1	12:19	762.50	1.40	1.25	1.25	102	80	12		60		135
2	12:23	764.78	1.40	1.25	1.25	102	80	14	✓	60	↓	145

2 of 2 sheets Sandy A1104 Ash Ohio 2-16-72

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
NCE- 3	12:27	767.02	1.30	1.20	1.20	102	80	15	250	60	29.3	155
4	12:31	769.22	1.10	1.00	1.00	102	80	15	✓	✓	↓	140
5	12:35	771.35	1.05	.98	.98	104	80	14	✓	✓	↓	148
6	12:39	773.49	1.05	.98	.98	104	80	14	✓	✓	↓	152
End												

Comments:

NCAP-37 (12/67)

1 of 2 sheets

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes. or 4 or 3.

U_w 9.5
%CO_2 .2
%O_2 20.6
A_s -1968
M_E - .1399
M_T 297.3

Plant ~~Avon~~ Ashtabula ~~Ohio~~ #20

Run No. NCE-3

Location North Hood Exhaust

Date 2-16-72

Operator Baxley

Sample Box No. 2

Meter Box No. 4

Probe Length 5'

Probe Heater Setting 60

Ambient Temp °F 40

Bar. Press. "Hg 29.46

Assumed Moisture % 2%

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16 ~~.250~~

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 NCE-3	13:35	773.55										
1	13:38	775.06	.80	.76	.76	68	68	1	250	60	29.3	155
2	13:41	776.77	1.50	1.40	1.40	68	68	3		60		165
3	13:44	778.85	1.70	1.55	1.55	80	68	3		60		162
4	13:47	780.59	1.70	1.50	1.50	84	68	4		60		150
5	13:50	782.50	1.60	1.45	1.45	90	70	5		60		145
STOP 6	13:53	784.25	1.30	1.20	1.20	94	70	5		60		140
START	13:54	784.25										
NCE-3-1	13:57	786.04	1.50	1.30	1.30	94	72	5		60		175
2	14:00	787.94	1.70	1.45	1.45	98	74	5		60		175
3	14:03	789.98	1.80	1.50	1.50	100	76	5		60		200
4	14:06	791.60	1.40	1.15	1.15	102	78	5		60		200
5	14:09	793.24	1.20	.98	.95	104	78	5		60		170
STOP 6	14:12	794.89	1.20	.98	.98	104	80	5		60		160
START	14:13	794.89										
NCE-3-1	14:16	796.52	1.50	1.25	1.25	104	80	5		60		132
2	14:19	798.66	1.50	1.25	1.25	106	80	5		60		145
3	14:22	800.40	1.50	1.25	1.25	102	78	5		60		155
4	14:25	802.12	1.50	1.25	1.25	102	76	6		60		140
5	14:28	803.87	1.10	.94	.94	102	76	6		60		180
STOP 6	14:31	805.58	1.10	.94	.94	104	76	6		60		170
START	14:32	805.58										
NCE-3-1	14:35	807.35	1.40	1.20	1.20	100	74	6		60		190
2	14:38	808.95	1.40	1.20	1.20	100	74	6		60		210

(2 of 2 sheets) NOS-3 Ashtabula Ohio 2-16-72 Sunday

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
3	14:41	810.57	1.10	.94	.94	102	76	6	250	60		200
4	14:44	813.10	1.05	.88	.88	102	74	6	"	"		225
5	14:47	813.53	.88	.75	.75	104	76	6	"	"		245
STOP 6	14:50	814.91	.82	.70	.70	104	76	6	"	"	↓	230
End.												

Comments:

1 of 2 sheets

NHE ABCD #20

PARTICULATE FIELD DATA

Uw 9.2
%CO_2 12
%O_2 20.6
A_s -1968
M_c - 2191
M_T 312.8

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Plant ~~Dravo~~ Ashtabula ~~Ohio~~

Run No. NHE-4

Location ~~North Hood Bag~~

Date 8-16-72

Operator ~~Sanders~~ BAXLEY

Sample Box No. 2

Meter Box No. 4

Probe Length 5'

Probe Heater Setting 60%

Ambient Temp °F 40

Bar. Press. "Hg 29.48

Assumed Moisture % 2%

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16 ~~.250~~

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												
NHE-4	16:48	815.02										
1	16:51	816.80	1.20	.98	.98	90	72	1	250	60	29.3	90
Left To 2	16:54	818.77	1.80	1.50	1.50	94	72	2		60		110
Right 3	16:57	820.87	2.00	1.85	1.85	96	74	3		60		100
D 4	17:00	823.04	1.90	1.80	1.80	94	74	3		60		100
5	17:03	825.42	1.90	1.80	1.80	96	74	3		60		105
STOP 6	17:06	827.28	1.70	1.60	1.60	96	74	3		60		120
START	17:07	827.28										
1	17:10	829.29	1.80	1.70	1.70	96	74	3		60		118
NHE-4-2	17:13	831.40	1.90	1.50	1.80	96	74	3		60		125
3	17:16	833.52	1.80	1.70	1.70	98	76	3		60		125
B 4	17:19	835.52	1.60	1.50	1.50	100	78	3		60		132
5	17:22	837.41	1.40	1.35	1.35	100	80	3		60		112
STOP 6	17:25	839.27	1.40	1.35	1.35	102	82	3		60		115
START	17:26	839.27										
NHE-4-1	17:29	841.42	1.40	1.30	1.30	100	80	3		60		90
2	17:32	843.15	1.70	1.50	1.50	100	80	3		60		110
3	17:35	845.50	1.60	1.40	1.40	102	82	3		60		105
C 4	17:38	847.90	1.40	1.30	1.30	102	82	3		60		105
5	17:41	848.90	1.20	1.10	1.10	102	82	3		60		95
STOP 6	17:44	850.65	1.20	1.10	1.10	102	84	3		60		95
START	17:45	850.65										
NHE-4-1	17:48	852.50	1.50	1.35	1.35	100	82	3		60		95
D 2	17:51	854.44	1.50	1.35	1.35	100	82	3		60		110

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					
NHE-4-3	17:54	856.25	1.40	1.25	1.25	100	82	3	250	60	29.3	125
4	17:57	857.90	1.10	1.00	1.00	100	82	3	"	"		118
5	18:00	859.50	1.10	1.00	1.00	100	82	3	"	"		115
6	18:03	860.57	1.10	1.00	1.00	98	80	3	"	"	↓	125
End												

Comments:

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Vw ~~8.8~~
%CO_2 .2
%O_2 20.6
As .2601
MF .9643
MTo 1010.

#20

Plant Astabula ~~[illegible]~~

Run No. CHE-2

Location Center Hood exhaust

Date 2/16/72

Operator Avery

Sample Box No. GI-2

Meter Box No. GI-2

Probe Length 5'

Probe Heater Setting 200°F

Ambient Temp °F 450

Bar. Press. "Hg 29.48

Assumed Moisture % 3

Heater Box Setting, °F 250

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

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	1100	60.695				75	75		250	75	29.48	
A-1	1104	62.2	.50	.64	.64	75	75	4.0	↓	↓	↓	110
A-2	1108	63.9	.65	.82	.82	75	75	7.0				110
A-3	1112	65.65	.68	.86	.86	75	70	7.0		75		105
A-4	1116	67.90	.75	.95	.95	86	75	6.0		75		110
A-5	1120	69.93	.95	1.2	1.2	85	80	6.0		70		100
~~Stop~~ A-6	1124	71.6	.95	1.2	1.2	85	80	6.0		75		100
START	1130	71.6	START									
~~B-1~~	~~[illegible]~~	~~[illegible]~~										
B-1	1134	73.6	.85	1.07	1.07	85	80	5.5		80		100
B-2	1138	75.8	.75	.95	.9	85	80	5.5		↓		105
B-3	1142	77.17	.72	.92	.92	85	80	6.0				115
B-4	1146	79.01	.79	1.0	1.0	90	85	6.0				115
B-5	1150	81.1	.95	1.2	1.2	90	85	7.0				115
~~Stop~~ B-6	1154	83.23	1.1	1.35	1.35	95	90	8.0				150
START	1155	83.23	START									
C-1	1159	85.2	.95	1.2	1.2	95	90	7.5		80		110
C-2	1203	87.0	.80	1.0	1.0	95	90	7.5		↓		115
C-3	1207	88.93	.78	.99	.99	100	95	7.5				120
C-4	1211	90.72	.80	1.0	1.0	100	95	8.0				125
C-5	1215	92.69	.97	1.25	1.25	100	95	9.5				120
~~Stop~~ C-6	1219	94.90	1.2	1.5	1.5	100	[illegible]	12.0	↓	↓	↓	130

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					
S TAT	1222	94.90										
D-1	1226	96.75	.90	1.15	1.15	100	95	9.5	250	80	29.48	120
D-2	1230	98.88	1.2	1.5	1.5	105	100	13.5	↓	↓	↓	125
D-3	1234	100.93	1.0	1.25	1.25	105	100	13.0				135
D-4	1238	102.98	1.0	1.25	1.25	105	100	13.0				130
D-5	1242	105.06	1.1	1.4	1.4	105	100	14.0				125
D-6	1246	107.09	1.0	1.25	1.25	105	100	14.0				115
END												

D-10

Comments:

NCAP-37 (12/67)

CHE-2
Page 2 of 2

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Uw H.4
%CO2 .2
%O2 20.6
As .2601
Mf .07162
MT 844.0

Plant Astabula ~~uf Rm~~ #20

Run No. CHE-3

Location Center head exhaust

Date 2/16/77

Operator Avery

Sample Box No. GI-2

Meter Box No. GI-2

Probe Length 5' pyrex

Probe Heater Setting 200°F

Ambient Temp °F 55°

Bar. Press. "Hg 29.48

Assumed Moisture % 3

Heater Box Setting, °F 250

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

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	1440	107.155				80	80		250	70	29.6	
A-1	1443	108.12	.40	.52	.52	80	80	2.0	↓	↓	↓	130
A-2	1446	109.30	.59	.75	.75	85	80	2.5				140
A-3	1449	110.54	.63	.80	.80	85	80	3.0				135
A-4	1452	111.84	.73	.93	.93	90	85	4.5				140
A-5	1455	113.20	.79	1.0	1.0	90	85	5.0				135
STOP A-6	1458	114.66	.85	1.1	1.1	95	90	5.5				145
START	1500	114.66										
B-1	1503	116.00	.74	.94	.94	95	90	5.0				130
B-2	1506	117.34	.70	.90	.90	95	90	5.0				135
B-3	1509	118.67	.68	.87	.87	100	95	5.5				160
B-4	1512	120.05	.75	.96	.96	100	95	6.0				145
B-5	1515	121.46	.85	1.08	1.08	100	95	6.5				170
STOP B-6	1518	123.12	1.1	1.37	1.37	100	100	7.5				155
START	1520	123.12										
C-1	1523	124.60	.90	1.15	1.15	100	95	6.5				130
C-2	1526	126.05	.80	1.0	1.0	100	95	6.5				135
C-3	1529	127.44	.72	.91	.91	100	95	6.5				135
C-4	1532	128.84	.75	.96	.96	105	100	7.0				145
C-5	1535	130.33	.95	1.2	1.2	105	100	8.0				130
STOP C-6	1538	131.975	1.1	1.37	1.37	105	100	9.0	↓	↓	↓	145

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	1539	131.975							250	70	29.6	
D-1	1542	[illegible]	.80	1.0	1.0	105	100	8.0	↓	↓		130
D-2	1545	135.01	1.0	1.25	1.0	105	100	9.0				140
D-3	1548	136.62	1.1	1.37	1.37	105	100	9.5				135
D-4	1551	138.23	1.1	1.37	1.37	110	105	10.0				150
D-5	1554	139.90	1.2	1.5	1.5	110	105	11.5				130
D-6	1557	139.90	1.3	1.65	1.65	110	105	12.5				125
END												

D-12

Comments:

NCAP-37 (12/67)

CHE - 3

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PARTICULATE FIELD DATA

U_w 16.0
%CO_2 12
%O_2 20.6
A_3 -2601
M_F -.1742
M_T 244.9

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

#20

Plant Astabula ~~We RHM~~

Run No. CHE-4

Location Center Hood Exhaust

Date 2/16/72

Operator ~~Avery~~ Avery

Sample Box No. GI-1

Meter Box No. GIT

Probe Length 5' pyrex

Probe Heater Setting 200°F

Ambient Temp °F 58

Bar. Press. "Hg 29.48

Assumed Moisture % 3%

Heater Box Setting, °F 250

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

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	1655	141.787				80	80					
D-1	1658	143.30	.90	1.15	1.15	85	80	2.0	250	70°	29.48	95
D-2	1701	145.55	1.2	1.5	1.5	85	80	4.5				105
D-3	1704	146.65	1.1	1.37	1.37	85	85	4.0				110
D-4	1707	148.23	1.1	1.37	1.37	90	85	4.0				110
D-5	1710	149.88	1.1	1.37	1.37	90	85	4.0				110
STOP D-6	1713	151.60	1.2	1.5	1.5	90	85	4.5				110
START	1715	151.60										
C-1	1718	153.22	1.1	1.37	1.37	90	85	4.5				100
C-2	1721	154.70	.85	1.06	1.06	90	85	4.0				110
C-3	1724	156.12	.80	1.0	1.0	95	90	4.0				100
C-4	1727	157.68	.95	1.2	1.2	95	90	4.0				105
C-5	1730	159.40	1.2	1.5	1.5	95	90	5.0				105
STOP C-6	1733	161.50	1.3	1.65	1.65	95	90	5.0				125
START	1738	161.50										
B-1	1741	162.90	.80	1.0	1.0	95	90	3.5				125
B-2	1744	164.40	.80	1.0	1.0	95	90	3.5				125
B-3	1747	165.83	.80	1.0	1.0	95	90	3.5				110
B-4	1750	167.20	.75	.95	.95	95	90	3.5				105
B-5	1753	168.75	.80	1.0	1.0	95	90	3.5				110
STOP B-6	1756	170.36	1.15	1.3	1.3	100	95	4.0				105

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	1400	170.36										
A-1	1803	171.43	.45	.56	.56	100	95	2.5	250	70	29.48	110
A-2	1806	172.70	.65	.83	.83	100	95	3.0	↓	↓	↓	120
A-3	1809	174.11	.65	.83	.83	100	95	3.0				105
A-4	1812	175.92	.75	.95	.95	100	95	3.5				105
A-5	1815	177.12	.92	1.16	1.16	100	95	4.0				100
A-6	1818	178.76	1.0	1.25	1.25	100	95	4.5				100
END												

Comments:

NCAP-37 (12/67)

CHE-4
Page 2 of 2

Pot A — D
left → right facing duct,

PARTICULATE FIELD DATA

Page 1 of 2

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Vw 11.2
% CO_2 0.2
% O_2 20.6
As - 211.2
mf - 525.4
mf - 594.6

Plant ~~[illegible]~~, Ashtabula #20

Run No. SHE-1

Location SOUTH Hood EXHAUST

Date 2/15/72

Operator [illegible] + Patchell

Sample Box No. 3

Meter Box No. 3

Probe Length 5'

Probe Heater Setting 60%

Ambient Temp °F 60

Bar. Press. "Hg 28.9

Assumed Moisture % 2.0

Heater Box Setting, °F 250

Probe Tip Dia., In. .1875

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	13:50	008.51	~~1.10~~	4.0	4.0	74	70	14	250	57	28.9	~~110~~
A-1	:55	—	1.05	3.9	3.9	86	70	16		53		110
~~STOP~~ 2	14:00	021.60	1.05	3.9	3.9	86	70	20		55		130
START	~~15~~:10	—	1.00	1.23	1.23	70	70	7		55		140
	15	—	.87	1.08	1.08	80	70	10		55		130
	20	—	.76	.90	.90	80	70	9		55		130
	25	—	.80	.96	.96	80	70	10		55		120
STOP	30	STOP 31.9	.80	.96	.96	82	70	10		55		
START	15:35	031.9	.23	.28		82	72	6		55		110
B-1	40	—	1.3	1.6	1.6	86	74	15		55		110
-2	45	—	1.3	1.6	1.6	88	74	16		60		120
-3	50	—	.85	1.05	1.05	92	76	15		60		120
-4	55	—	.80	1.00	1.00	100	82	15		60		110
-5	16:00	—	1.00	1.20	1.00	100	82	17		75		120
Stop -6	05	[illegible] 48.70	1.00	1.20	1.00	100	82	17		75		120
START	16:10	048.72	1.3	1.6	1.6	100	80	6		70		120
C-1	15		1.4	1.6	1.7	100	80	7		65		120
-2	20		1.2	1.5	1.5	100	80	7		65		110
-3	25		1.2	1.15	1.15	108	82	8		65		110
-4	30		.95	1.15	1.15	106	82	9		70		110
-5	35		.95	1.15	1.15	108	84	9		70		110
STOP 6	40		.95	1.15	1.15	108	84	9		70		100

waiting for auger

1/4

3/16

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	16 42	67.81	1.3	1.6	1.6	100	82	10	250	70	24.9	100
D-1	47		1.3	1.6	1.6	100	82	12		70		100
-2	52		1.2	1.5	1.5	106	84	13		70		90
-3	57		1.2	1.5	1.5	108	86	15		70		90
-4	17 02		1.2	1.5	1.5	108	86	15		75		95
-5	07		1.0	1.2	1.2	108	86	14		75		95
~~Sta~~ -6	12	86.92	1.0	1.2	1.2	108	86	14		75		95
END												
TOTAL		78.41										

Comments:

Pul. A → D
left to right facing duct

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Vw 9.2
$\%CO_2$ .2
$\%O_2$ 20.6
As - 2112
MF - 2,121.5
MT 2,252.2

Plant ~~U/C~~ Ashtabula #20

Run No. SHE-2

Location South Hood Exhaust

Date 2/16/72

Operator GONZALES

Sample Box No. 3

Meter Box No. 3

Probe Length 5'

Probe Heater Setting 60

Ambient Temp °F 52

Bar. Press. "Hg 29.48

Assumed Moisture % 2

Heater Box Setting, °F 200

Probe Tip Dia., In. .1875

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	1055	087.00	.80	1.00	1.00	58	58	5	200	60	29.48	110
A-1	59		1.10	1.2	1.2	64	58	7		60		170
-2	1103		1.10	1.2	1.2	72	58	7		60		180
-3	07		.78	.90	.90	76	58	6		60		120
-4	11		.80	1.10	1.10	80	62	7		60		100
-5	16 STOP		.90	1.10	1.10	86	62	8		60		120
												110
	24 START		.80	.95	.95	86	62	7		60		110
STOP -6	28 STOP	102.61	.80	.95	.95	86	62	7		60		110
START	1133	102.61	.55	.67	.67	88	66	6		60		110
B-1	37		1.4	1.7	1.7	88	66	10		60		140
-2	41		1.12	1.2	1.2	88	66	10		65		160
-3	45		1.10	1.1	1.1	88	66	10		65		190
-4	49		.85	.82	.82	90	68	11		65		300
-5	53		.95	.95	.95	90	70	14		65		200
STOP -6	57		.95	.95	.95	90	72	14		65		210
START	1201					90	72	13		65		190
C-1	05		.78	.80		90	72	15		65		200
-2	09 STOP · START 1228		1.5	1.6	1.6	90	72	24		65		200
-3	1232		1.2	1.3	1.3	90	72	6		65		200
-4	36		1.0	1.1	1.1	90	72	6		65		210
-5	40		.90	1.0	1.0	90	72	6		65		140
Stop -6	44		.90	1.0	1.0	90	72	7		65		150

plugged filter & fitted glass broken (too high vacuum)

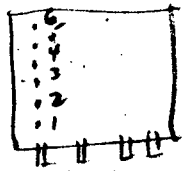
2/16/72 SHE-2 Page 2 of 2

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	1245		1.3	1.4	1.4	90	72	9	200	65	29.48	140
D-1	49		1.4	1.5	1.5	90	72	10	↓	65	↓	140
-2	53		1.4	1.5	1.5	90	72	10		65		120
-3	57		1.3	1.4	1.4	90	72	10		60		105
-4	1301		1.2	1.4	1.4	90	72	10		60		110
-5	1305		.90	1.0	1.0	90	72	9		60		120
-6	1309	146.40	.90	1.0	1.0	90	72	9		60		125
End.												

Comments:

NCAP-37 (12/67)

Ports A → D
~~South~~ → North



Duct diagram

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Uw. 10.7
%CO_2 .2
%O_2 20.6
As -2112
M_F 1,8623
M_T 1896.9

Plant ~~U.C~~ Ashtabula #20

Run No. SHE-3

Location South Wood Exhausts

Date 2/16/72

Operator ~~Geo~~ ~~C~~ Jerry Gonzales

Sample Box No. 4

Meter Box No. 3

Probe Length 5'

Probe Heater Setting 60%

Ambient Temp °F 55

Bar. Press. "Hg 29.48

Assumed Moisture % 2

Heater Box Setting, °F 200

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

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	1442	146.48	.97	1.1	1.1	66	64	5	200	65	29.48	120
A-1	45		1.2	1.3	1.3	68	64	5		65		130
-2	48		.95	1.0	1.0	74	68	4.5		60		180
-3	51		.60	.65	.65	76	68	4		60		180
-4	54		.65	.71	.71	80	68	3.5		60		160
-5	57		.72	.79	.79	80	68	4.0		60		150
STOP-1	1500		.72	.78	.78	80	68	4.0		60		190
START	1503	66	.95	.39	.39	82	70	8.0		60		130
B-1	1506		1.3	1.40	1.40	82	70	8.0		60		170
-2	09		1.3	1.40	1.40	84	70	8.0		60		200
-3	12		.90	1.0	1.0	84	70	7.0		60		210
-4	15		.78	.75	.75	86	70	6.0		65		240
-5	18		.92	.88	.88	86	70	7.0		65		250
STOP-2	21	166.25	.92	.88	.88	86	70	7.0		64		240
START	1523		.95	.89	.89	86	70	10.0		65		390
C-1	1528		1.4	1.4	1.4	86	70	11.0		65		190
-2	31		1.3	1.2	1.1	86	70	13.0		64		280
-3	34		1.1	1.0	1.0	86	70	14.0		65		285
-4	37		.95	.92	.92	86	70	15.0		65		265
-5	40		.92	.90	.90	86	70	15.0		65		260
STOP-3	43		.92	.90	.90	86	70	15.5		64		235

2/16/72 SMC-3 Page 2 of 2

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	1547		1.1	1.0	1.0	92	76	16.0	200	65	29.48	170
D-1	50		1.1	1.0	1.0	92	76	16.0	↓	65	↓	180
-2	53		1.2	1.1	1.1	92	76	18.0		70		165
-3	1556		1.0	.9	.9	92	76	19.0		70		170
-4	1559		1.0	.9	.9	92	76	20.0		70		170
-5	1602		.9	.9	.9	92	76	20.0		70		170
SDY-6	1605	186.33	.9	.9	.9	92	76	20.0	↓	70	↓	170
END												

Comments:

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Uw 136
%CO_2 0
%O_2 20.6
A_s - 2112
M_F - 4294
M_T 450.7

Plant ~~UC~~ Ash Table #20 | Ambient Temp °F 58

Run No. SHE-4 | Sample Box No. 3 | Bar. Press. "Hg 29.48

Location South Hood Exhaust | Meter Box No. 3 | Assumed Moisture % 2

Date 2/16/82 | Probe Length 5' | Heater Box Setting, °F 200

Operator ~~Lee~~ Patchell | Probe Heater Setting 60 | Probe Tip Dia., In. 3/16 .1875

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	1657	186.58	.76	.75	.75	64	64	3.5	200	50	29.~~48~~	170
A-1	1700		1.2	1.2	1.2	66	64	4.5		50		180
-2	03		.90	.95	.95	72	66	5.0		50		170
-3	06		.80	.87	.87	76	66	5.0		50		185
-4	09		.70	.75	.75	76	66	5.5		50		180
-5	12		.65	.70	.70	78	68	5.5		55		170
Stop-6	15		.70	.70	.75	80	68	5.5		55		160
START	1717		.65	.70	.70	80	68	5.5		55		170
B-1	20		1.2	1.4	1.4	80	68	6.5		55		120
-2	23		1.1	1.3	1.3	82	68	6.5		55		120
-3	26		.85	1.05	1.05	86	68	6.0		55		120
-4	29		.70	.86	.86	86	68	5.5		55		110
-5	32		.80	1.00	1.00	86	68	6.0		55		115
Stop-6	35		.80	1.00	1.00	86	68	6.0		55		115
START	1738	[illegible]	.55	.68	.68	84	68	5.0		55		100
C-1	41		1.3	1.6	1.6	86	68	7.5		55		110
-2	44		1.2	1.45	1.45	88	68	7.5		55		130
-3	47		.95	1.2	1.2	90	68	6.0		55		140
-4	50		.85	1.05	1.05	90	68	6.0		55		110
-5	53		.95	1.2	1.2	90	68	7.0		55		130
Stop-6	56		.95	1.2	1.2	90	68	7.0		55		120

2/16/72 SHE-4 pg 2 of 2

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	1758		1.2	1.45	1.45	86	70	7.0	200	55	29.46	100
D-1	1801		1.2	1.45	1.45	86	70	7.0		55		110
-2	04		1.2	1.45	1.45	88	70	7.0		55		120
-3	07		1.2	1.45	1.45	90	70	7.0		55		130
-4	10		1.1	1.3	1.3	90	70	7.0		55		120
-5	13		.95	1.15	1.15	90	70	6.5		55		130
STOP -6	16	228.09	.95	1.15	1.15	90	70	6.5		55		125

Comments:

NCAP-37 (12/67)

[redacted]

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Vw 1.1
$\% CO_2$ .02
$\% O_2$ 20.5
As .2124
Mf 172.1
Mi 179.4

#20

Plant Ashtabula ~~[illegible]~~

Run No. ATE-1

Location Top Exhaust

Date 2/17/72

Operator Avery

Sample Box No. GI 2

Meter Box No. GI 2

Probe Length 5' ~~[illegible]~~

Probe Heater Setting 50%

Ambient Temp °F 50

Bar. Press. "Hg 29.3

Assumed Moisture % 1%

Heater Box Setting, °F 250

Probe Tip Dia., In. 1/4 .25

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
						50	50	—	250	60	29.3	
Start	1348	179.21						—	↓	↓	↓	125
1	1349	179.72	.25	1.25	1.25	55	55	[illegible].0				125
2	1350	180.27	.30	1.46	1.46	55	55	10.0				130
3	1351	180.[illegible]	.35	1.70	1.70	60	60	14.0				135
4	1352	181.[illegible]	.35	1.70	1.00	65	65	–				135
5	1353	[illegible]	.40	1.90	1.2	–	–	15				150
6	1354	[illegible]	.38	1.8	1.6	75	75	15				150
7	1355	182.9	.46	2.2	.85	75	↓	15				150
8	1356	183.2	[illegible]	2.5	.90	75		16				150
9	1357	183.7	[illegible]	2.6	.70	80	[illegible]	[illegible]				150
10	1358	184.1	.58	2.8	.64	80		17				150
11	1359	184.4	.55	2.8	.60	80		17				158
12	1400	184.8	.55	2.7	[illegible]	80		17.5				155
13 12	1401	185.3	[illegible]	2.7	.52	80		[illegible]				150
14 11	1402	185.6	.57	2.5	[illegible]	80	↓	[illegible].0				140
15 10	1403	185.9	.58	2.8	.49	80	80	[illegible]				145
16 9	14[illegible]	186.2	.58	2.8	.46	80	80	18.0				145
17 8	14[illegible]	186.53	.59	2.6	.52	80	80	18.0				140
	End											

[redacted] of 8

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

U_w 3.9
$\%CO_2$ .02
$\%O_2$ 20.5
As 2124
MF - 0886
MT 123.1

Plant Astabula

Run No. ATE-2

Location Top Exhaust

Date 2/17/72

Operator Avery

Sample Box No. GI-I

Meter Box No. GI-1

Probe Length 5'

Probe Heater Setting 50%

Ambient Temp °F 50

Bar. Press. "Hg 29.3

Assumed Moisture % 1 ½

Heater Box Setting, °F 250

Probe Tip Dia., In. [redacted] 3/16 .185

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
	16.39	186.96							250	60	29.3	
START	16 40	187.36	.27	.45	.45	80	80	2.5				160
2	16 41	187.58	.30	.50	.50	80	80	2.5				130
3	16 42	187.95	.39	.62	.62	80	80	3.0				140
4	16 43	188.32	.37	.62	.62	85	85	3.0				150
5	16 44	188.72	.40	.66	.66	90	90	3.0				160
6	16 45	189.12	.40	.66	.66	90	90	3.5				160
7	16 46	189.76	.46	.76	.76	85	85	4.0				160
8	16 47	190.00	.49	.80	.80	85	85	4.0				145
9	16 48	190.5	.55	.90	.90	90	90	4.5				130
10	16 49	191.00	.59	.95	.95	85	85	4.5				160
11	16 50	191.50	.59	.95	.95	85	85	4.5				150
12	16 51	191.90	.59	.95	.95	85	85	5.0				160
13	16 52	192.40	.59	.95	.95	85	85	5.0				160
14	16 53	192.90	.59	.95	.95	85	85	5.0				150
15	16 54	193.15	.59	.95	.95	85	85	5.0				160
16	16 55	193.90	.59	.95	.95	85	85	4.0				150
	END											

D-24

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Uw 5.3
%CO_2 .02
%O_2 20.5
A_s - 2124
MF - 1945
Mt 197.0

#20

Plant Astabula ~~H/C Fan~~

Run No. ATE-3

Location Top Exit Duct

Date 2/18/72

Operator ~~Avery~~ AVERY

Sample Box No. GI-1

Meter Box No. GI-1

Probe Length 5' pyrex

Probe Heater Setting 50%

Ambient Temp °F 60

Bar. Press. "Hg 29.65

Assumed Moisture % 17%

Heater Box Setting, °F 250°

Probe Tip Dia., In. 1/4 (.250)

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
	10:14	194.02				70	70		250	60°	29.5	
1	1015	194.6	.39	1.4	1.4	75	75	4.5				130
2	1016	195.2	.38	1.7	1.7	80	80	5.0				170
3	1017	195.9	.36	1.75	1.75	80	80	6.0				170
4	1018	~~196.6~~	.36	1.75	1.75	80	80	6.0				170
5	1019	197.3	.36	1.75	1.75	80	80	6.0				170
6	1020	197.9	.44	2.1	2.1	80	80	8.0				170
7	1021	198.6	.49	2.35	2.35	80	80	9.0				175
8	1022	199.4	.51	2.45	2.45	80	80	9.5				170
9	1023	200.1	.53	2.60	2.60	80	80	10.5				170
10	1024	200.9	.56	2.70	2.50	80	80	10.5				170
11	1025	201.7	.62	2.90	2.50	80	80	10.5				170
12	1026	202.90	.62	2.90	2.50	80	80	11.0				170
[redacted]	END	END										

D-25

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Uw.
%CO2
%O2
Ms
Mf
Mx

Plant UC ASPHALT

Run No. ASE-1

Location #20 SCRUBBER

Date 2/17/82

Operator [illegible]

Sample Box No. Rec 4

Meter Box No. Rec 4

Probe Length special

Probe Heater Setting 0

Ambient Temp °F 50

Bar. Press. "Hg 29.30

Assumed Moisture % 10

Heater Box Setting, °F 100

Probe Tip Dia., In. 1/4"

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
ASE-1 with filter												
1	1406	860.63	NONE	[illegible]	1.5	52	52	4	100	50	2 lb	~100
1	1410	862.36	USED	1.5	[illegible]	52	54	20	↓	52		
		1.73			1.5	52	52	12				
ASE-2 NO FILTER USED												
1	1543	862.46	NONE	1.5	1.5	[illegible]	[illegible]	3	100		2 lb	~100
1	1546	[illegible]143	USED	1.5	[illegible]	58	60	[illegible]				
1	[illegible]	[illegible]88		1.5	1.5	58	62	12				
1	1603	874.85		[illegible]	[illegible]	[illegible]	[illegible]	18		6		
1	1606	876.51		1.5	1.5	61	60	20		50		
		14.08			1.5	57.2	68.6 / 62.9	11.0	↓			
ASE-3	1637	876.67	NONE	1.5	1.5	60	62	3	100	50	2 lb	~100
1	1647	883.30	USED	1.5	1.5	63	76	5		[illegible]		
1	1651	889.50		1.5	1.5	66	[illegible]	6		[illegible]		
1	[illegible]	895.41		1.5	1.5	[illegible]	81	11		52		
		18.74			1.5	64.5	77.25	6.25	↓	52		
						70.88						

RAC-2

PARTICULATE CLEANUP SHEET

Date: 2/15/72 Plant: ~~Union Carbide~~ (Ashtabula) #20

Run number: NHE-1 Location of sample port: North (Lead) Side

Operator: Sandy & Dennis Barometric pressure: 29.5

Sample box number: 8 Ambient temperature: 70

Impinger H_2O

Volume after sampling 387 ml Container No. NHE-1 Ether-chloroform extraction of impinger water 8.7 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected - 13 ml Impinger water residue 25.9 mg

Impingers and back half of filter, acetone wash: Container No. NHE-1

Extra No. ____ Weight results 8.9 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. NHE-1

Extra No. ____ Weight results 67.9 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000161	NO.8		
001762	Rac 2		
000105	01733		

Filter particulate weight 356.1 mg

~~Total~~ particulate weight 424.0 mg

TOTAL w/ PR Cyclone & Filter 461.5

Silica Gel

Weight after test:	212.1	____	____	____
Weight before test:	187.7	____	____	____
Moisture weight collected:	24.4	____	____	____

Moisture total 24.4 gm

Container number: NO.8 1. Rac.2 2. 8 3. 8 4. ____

Sample number: NHE-1 Analyze for: ____

Method determination: ____

Comments: ____

Prepared by [illegible]

PARTICULATE CLEANUP SHEET

Date: 2-16-72
Plant: Hiley Ohio
Run number: NHE-2
Location of sample port: North Stack Exhaust Hood
Operator: Sandy & Barnie
Barometric pressure: 29.5
Sample box number: 2
Ambient temperature: 70

Impinger H_2O

Volume after sampling 380 ml
Impinger prefilled with 400 ml
Volume collected − 20 ml
Container No. NHE-2
Extra No. ____
Ether-chloroform extraction of impinger water 1.2 mg
Impinger water residue 79.2 mg

Impingers and back half of filter, acetone wash:
Container No. NHE-2
Extra No. ____
Weight results 17.0 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. NHE-2
Extra No. ____
Weight results 235.5 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no. 8	Filter number	Container no.
000254	NHE-2		

Filter particulate weight 1257.9 mg

~~Total~~ particulate weight 1493.4 mg

TOTAL " PR Cyclone & Filter 1590.8

Silica Gel

Weight after test:	201.1			
Weight before test:	183.8			
Moisture weight collected:	17.3			
Container number:	1. 8	2.	3.	4.

Moisture total 17.3 gm

Sample number: NHE-2
Analyze for: ____
Method determination: ____
Comments: ____

PARTICULATE CLEANUP SHEET

Date: 2-16-72 **Plant:** ASHTABULA OHIO

Run number: NHE-3 **Location of sample port:** North Stack 84

Operator: Sandy + Bernie **Barometric pressure:** 29.48

Sample box number: 2 **Ambient temperature:** 38°

Impinger H_2O

Volume after sampling 392 ml Container No. NHE-3 Ether-chloroform extraction of impinger water 2.2 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected −8 ml Impinger water residue 150.5 mg

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

Extra No. ____ Weight results 4.7 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. NHE-3

Extra No. ____ Weight results 139.9 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
1000259	WT-0.6792		

Filter particulate weight 1005.5 mg

~~Total~~ particulate weight 139.9 mg

~~TOTAL~~ " PR Cyclone & Filter 292.3

Silica Gel

Weight after test:	208.0	____	____	____
Weight before test:	190.5	____	____	____
Moisture weight collected:	17.5	____	____	____

Moisture total 17.5 gm

Container number: 1. 8 2. ____ 3. ____ 4. ____

Sample number: NHE-3 Analyze for: ____

Method determination: ____

Comments: ____

PARTICULATE CLEANUP SHEET

Date: 2-16-72 Plant: # 20

Run number: NHE-4 Location of sample port: [illegible]

Operator: [illegible] Barometric pressure: 28.5

Sample box number: 2 Ambient temperature: 38°

Impinger H_2O

Volume after sampling [illegible] ml Container No. NHE-4 Ether-chloroform extraction of impinger water 0.9 mg

Impinger prefilled with [illegible] ml Extra No. ____

Volume collected [illegible] ml Impinger water residue 87.5 mg

Impingers and back half of filter, acetone wash: Container No. NHE-4

Extra No. ____ Weight results 5.3 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. NHE-4

Extra No. ____ Weight results 49.7 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000247	NHE-4		

Filter particulate weight 169.4 mg

~~Total~~ particulate weight 219.1 mg

TOTAL PR cyclone & filter 312.8

Silica Gel

Weight after test:	201.7			
Weight before test:	186.5			
Moisture weight collected:	15.2			Moisture total 15.2 gm
Container number:	1. NHE-4	2. ____	3. ____	4. ____

Sample number: NHE-4 Analyze for: ____

Method determination: ____

Comments: ____

GI 2

PARTICULATE CLEANUP SHEET

Date: 2/15/72 Plant: ~~GE~~ [illegible] #20

Run number: CHF-2 Location of sample port: Center Head

Operator: _____ Barometric pressure: 28.9

Sample box number: 10 INOV Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 394 ml Container No. CHE-2 Ether-chloroform extraction of impinger water 6.2 mg

Impinger prefilled with 400 ml Extra No. _____

Volume collected -6 ml Impinger water residue 28.7 mg

Impingers and back half of filter, acetone wash: Container No. CHE-2

Extra No. _____ Weight results 8.8 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. CHE-2

Extra No. _____ Weight results 76.6 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
00065	0.6925	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Filter particulate weight 889.7 mg

Total particulate weight 966.3 mg

TOTAL IN PR Cyclone & Filter 1010.0

Silica Gel

Weight after test:	188.8	_____	_____	_____
Weight before test:	174.0	_____	_____	_____
Moisture weight collected:	14.8	_____	_____	_____
Container number:	1. _____	2. _____	3. _____	4. _____

Moisture total 14.8 gm

Sample number: CHE-2 Analyze for: _____

Method determination: _____

Comments: _____

Innov-2

PARTICULATE CLEANUP SHEET

Date: 2/16/72 Plant: ~~[illegible]~~ AS Tabula #20

Run number: CHE-3 Location of sample port: Central Hood

Operator: HUEY Barometric pressure: 28.90

Sample box number: 10 Ambient temperature: 60°F

Impinger H_2O

Volume after sampling ____ ml Container No. CHE-3 Ether-chloroform extraction of impinger water 0 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected ____ ml Impinger water residue 102.8 mg

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

Extra No. ____ Weight results 25.0 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. CHE-3

Extra No. ____ Weight results 87.2 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000252	0,6749		

Filter particulate weight 629.0 mg

~~Dust~~ particulate weight 176.2 mg

TOTAL " PR Cyclone & Filter 244.9

Silica Gel

Weight after test:	193.5			
Weight before test:	183.5			
Moisture weight collected:	10.0			

Moisture total 10.0 gm

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

Sample number: CHE-3 Analyze for: ____

Method determination: ____

Comments: ____

Box # 11

PARTICULATE CLEANUP SHEET

Date: 2/16/72 Plant: Astabula #20

Run number: ~~2nd Run~~ CHE-4 Location of sample port: Control Hood

Operator: _____ Barometric pressure: 29.60

Sample box number: Train - I Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 406 ml Container No. CHE-4 Ether-chloroform extraction of impinger water 0.9 mg

Impinger prefilled with 400 ml Extra No. _____

Volume collected + 6 ml Impinger water residue 58.1 mg

Impingers and back half of filter, acetone wash: Container No. CHE-4

Extra No. _____ Weight results 9.7 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. CHE-4

Extra No. _____ Weight results 50.7 mg

Filter Papers and Dry Filter Particulate

Filter number	~~Container~~ Weight no.	Filter number	Container no.
000257	0.6821	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Filter particulate weight 125.5 mg

~~Total~~ particulate weight 176.2 mg

TOTAL w. PR Cyclone & Filter 244.9

Silica Gel

Weight after test:	197.6	____	____	____
Weight before test:	187.6	____	____	____
Moisture weight collected:	10.0	____	____	____

Moisture total 10.0 gm

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

Sample number: CHE-4 Analyze for: _____

Method determination: _____

Comments: _____

Sample box - #5

PARTICULATE CLEANUP SHEET

#20

Date: 2/15/72 Plant: As tabila

Run number: SHE-1 Location of sample port: South hood

Operator: Avery Barometric pressure: 28.90

Sample box number: RAC-3 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 386 ml Container No. SHE-1 Ether-chloroform extraction of impinger water 7.0 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected -14 ml Impinger water residue 53.1 mg

Impingers and back half of filter, acetone wash: Container No. SHE-1 Extra No. ____ Weight results 9.1 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. SHE-1 Extra No. ____ Weight results 28.7 mg

Filter Papers and Dry Filter Particulate

Filter number	TARE Weight Container no.	Filter number	Container no.
000186	0.1770		
000098	0.1782		

Filter particulate weight 238.4 mg

~~Total~~ particulate weight PR, Cyc, & Filter 525.4 mg

TOTAL " 594.6

Silica Gel

Weight after test:	209.7			
Weight before test:	184.5			
Moisture weight collected:	25.2			
~~Container~~ number:	1.	2.	3.	4.

Moisture total 25.2 gm

Sample number: SHE-1 Analyze for: ____

Method determination: ____

Comments: ____

WATCH FOR GLASS IN THE AFTER FILTER WASH

PARTICULATE CLEANUP SHEET

Date: 2/16/72 Plant: #2 U/C, Ashtabula

Run number: SHE-2 Location of sample port: South Hood

Operator: CCC Barometric pressure: 28.90

Sample box number: 3 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 392 ml Container No. SHE-2 Ether-chloroform extraction of impinger water 26.9 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected -8 ml Impinger water residue 87.3 mg

Impingers and back half of filter, acetone wash: Container No. SHE-2

Extra No. ____ Weight results 16.5 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. SHE-2

Extra No. ____ Weight results 293.0 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
4½") 000256	0.6708		
4½") 000258	0.6991		

Filter particulate weight 1828.5 mg

Total particulate weight 2121.5 mg

TOTAL " Per Cyclone & Filter 2252.2

Silica Gel

Weight after test:	198.2			
Weight before test:	181.0			
Moisture weight collected:	17.2			

Moisture total 17.2 gm

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

Sample number: SHE-2 Analyze for: ____

Method determination: ____

Comments: ____

RAC 4

PARTICULATE CLEANUP SHEET

Date: 2/15/72 Plant: VC ASHTABULA #20

Run number: SHE-3 Location of sample port: South Hood

Operator: Pat C. Barometric pressure: 28.90

Sample box number: 2 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 393 ml Container No. SHE-3 Ether-chloroform extraction of impinger water 2.6 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected -7 ml Impinger water residue 22.8 mg

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

Extra No. ____ Weight results 9.2 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. SHE-3

Extra No. ____ Weight results 202.2 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000110	~~0.1945~~		
3000251	0.6634		

Filter particulate weight 1660.1 mg

Total particulate weight 1862.3 mg

TOTAL # Per Cyclone & Filter 1896.9

Silica Gel

Weight after test:	2003			
Weight before test:	1826			
Moisture weight collected:	177			

Moisture total 177 gm

Container number: 1. RAC4 2. ____ 3. ____ 4. ____

Sample number: SHE-3 Analyze for: ____

Method determination: ____

Comments: ____

RAC #3 WATCH FOR GLASS AFTER THE FILTER ON SHE #2

PARTICULATE CLEANUP SHEET

Date: _____ Plant: ~~H.E.~~ Ash. # 20

Run number: SHE 4 Location of sample port: South Hood

Operator: _____ Barometric pressure: 28.90

Sample box number: RAC #3 Ambient temperature: 60°F

SAMPLE BOX #5

Impinger H_2O

Volume after sampling 402 ml Container No. SHE-4 Ether-chloroform extraction

Impinger prefilled with 400 ml Extra No. ____ of impinger water 0.7 mg

Volume collected 2 ml Impinger water residue 15.7 mg

Impingers and back half of filter, acetone wash: Container No. SHE-4

Extra No. ____ Weight results 4.7 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. SHE-4

Extra No. ____ Weight results 67.9 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000253	06542		

Filter particulate weight 361.7 mg

Total particulate weight 429.6 mg

TOTAL " PR Cyclone & Filter 450.7

Silica Gel

Weight after test:	194.8			
Weight before test:	183.2			
Moisture weight collected:	11.6			

Moisture total 11.6 gm

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

Sample number: SHE-4 Analyze for: _____

Method determination: _____

Comments: _____

GI #2 Loaded 2/16/72

PARTICULATE CLEANUP SHEET

Date: 2-16-72 Plant: [redacted] Ash #20

Run number: [redacted] ATE-1 Location of sample port: TAP EX

Operator: _____ Barometric pressure: 29.1

Sample box number: #10 Ambient temperature: 50°

Impinger H_2O

Volume after sampling 394 ml Container No. ATE-1 Ether-chloroform extraction of impinger water 0.7 mg

Impinger prefilled with 400 ml Extra No. _____

Volume collected −6 ml Impinger water residue 0 mg

Impingers and back half of filter, acetone wash: Container No. ATE-1 Extra No. _____ Weight results 6.6 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. ATE-1 Extra No. _____ Weight results 13.7 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000115	0.1755		

Filter particulate weight 158.4 mg

~~Total~~ particulate weight 172.1 mg

TOTAL = PB Cyclone & Filter 179.4

Silica Gel

Weight after test:	194.2			
Weight before test:	187.1			
Moisture weight collected:	7.1			

Moisture total 7.1 gm

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

Sample number: ATE-1 Analyze for: _____

Method determination: _____

Comments: _____

PARTICULATE CLEANUP SHEET

Date: 2/17/72 Plant: ~~TVA~~ ASHTABULA #20

Run number: ATE-2 Location of sample port: TAP Exhaust

Operator: AVERY Barometric pressure: 29.1

Sample box number: 9 Ambient temperature: 50°

Impinger H_2O

Volume after sampling 400 ml Container No. ATE-2 Ether-chloroform extraction of impinger water 0.2 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected 0 ml Impinger water residue 0 mg

Impingers and back half of filter, acetone wash: Container No. ATE-2

Extra No. ____ Weight results 34.3 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. ATE-2

Extra No. ____ Weight results 7.0 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000250	0.6782		

Filter particulate weight 81.6 mg

~~Total~~ particulate weight 88.6 mg

~~TOTAL~~ " PR Cyclone & Filter 123.1

Silica Gel

Weight after test:	190.1			
Weight before test:	186.2			
Moisture weight collected:	3.9			
Container number:	1. ____	2. ____	3. ____	4. ____

Moisture total 3.9 gm

Sample number: ATE-2 Analyze for: ____

Method determination: ____

Comments: ____

PARTICULATE CLEANUP SHEET

Date: 2/18/72 Plant: ASHTABULA #20

Run number: ATE-3 Location of sample port: JAY EXHAUST

Operator: _____ Barometric pressure: 29.1

Sample box number: No. 11 Ambient temperature: 50°

Impinger H_2O

Volume after sampling 402 ml Container No. ATE-3 Ether-chloroform extraction of impinger water 0.1 mg

Impinger prefilled with 400 ml Extra No. _____

Volume collected 0 ml Impinger water residue 0 mg

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

Extra No. _____ Weight results 2.4 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. ATE-3

Extra No. _____ Weight results 18.7 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000231	0.6960	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Filter particulate weight 175.8 mg

~~Total~~ particulate weight 194.5 mg

TOTAL w/ PR Cyclone & Filter 197.0

Silica Gel

Weight after test:	187.6	_____	_____	_____
Weight before test:	182.2	_____	_____	_____
Moisture weight collected:	5.3	_____	_____	_____
Container number:	1. 11	2. _____	3. _____	4. _____

Moisture total 5.3 gm

Sample number: ATE-3 Analyze for: _____

Method determination: _____

Comments: _____

RAC #4 2/16/77

PARTICULATE CLEANUP SHEET

Date: _____ Plant: ~~IKE~~, Ashtabula #20

Run number: ASE-1 Location of sample port: Scrubber Exhaust

Operator: _____ Barometric pressure: 29.10

Sample box number: #2 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling [redacted] ml Container No. ASE-1 Ether-chloroform extraction of impinger water 1.8 mg

Impinger prefilled with 400 ml Extra No. _____

Volume collected [redacted] ml Impinger water residue 1.3 mg

Impingers and back half of filter, acetone wash: Container No. ASE-1

Extra No. _____ Weight results 18.5 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. ASE-1

Extra No. _____ Weight results 65.4 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
~~002250~~	~~06192~~	_____	_____
00159	0.1787	_____	_____
_____	_____	_____	_____

Filter particulate weight 10.8 mg

~~Total~~ particulate weight 76.2 mg

TOTAL " PR cyclone & filter 92.8

Silica Gel

Weight after test:	180.5	_____	_____	_____
Weight before test:	177.7	_____	_____	_____
Moisture weight collected:	2.8	_____	_____	_____

Moisture total 2.8 gm

Container number: 1. _____ 2. _____ 3. _____ 4. _____

Sample number: ASE-1 Analyze for: _____

Method determination: _____

Comments: _____

PARTICULATE CLEANUP SHEET

Date: 2-16-72
Run number: ASE-2
Operator:
Sample box number: 7

Plant: [illegible] #20
Location of sample port: Scrubber Exhaust
Barometric pressure: 29.10
Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 400 ml
Impinger prefilled with 400 ml
Volume collected 00 ml

Container No. ASE-2
Extra No.

Ether-chloroform extraction of impinger water 22.1 mg
Impinger water residue 1.9 mg

Impingers and back half of filter, acetone wash: Container No. ASE-2
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. ASE-2
Extra No.
Weight results 72.2 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000147	0.1721?		

Filter particulate weight 3.2 mg

~~Total~~ particulate weight 80.4 mg

TOTAL " PR Cyclone & Filter 104.4

Silica Gel

Weight after test:	196.5			
Weight before test:	122.0			
Moisture weight collected:	7.5			
Container number:	1. Pac 4	2.	3.	4.

Moisture total 7.5 gm

Sample number: ASE-2
Analyze for:
Method determination:
Comments:

PARTICULATE CLEANUP SHEET

Date: 2-16-22 Plant: Ashtabula # 20

Run number: ASE-3 Location of sample port: Scrubber Exhaust

Operator: _____ Barometric pressure: 29.1

Sample box number: 14 Rac No. 2 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 400 ml Container No. ASE-3 Ether-chloroform extraction of impinger water 24.8 mg

Impinger prefilled with 400 ml Extra No. _____

Volume collected 0 ml Impinger water residue 2.7 mg

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

Extra No. _____ Weight results X 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. ASE-3

Extra No. _____ Weight results 69.5 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000108	WT 0.1775		

Filter particulate weight 4.4 mg

~~Total~~ particulate weight 73.9 mg

TOTAL = PR Cyclone & Filter 101.4

Silica Gel

Weight after test:	198.0			
Weight before test:	187.8			
Moisture weight collected:	10.2			Moisture total 10.2 gm
Container number:	1.	2.	3.	4.

Sample number: ASE-3 Analyze for: _____

Method determination: _____

Comments: _____

FURNACE #13

PARTICULATE FIELD DATA

Vw -2.6
%CO2 0.0 A
%O2 20.7 B
As -2499
Mf - 4129 C
Mt - 4218 D

Page 1 of 2

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Plant E. Ashtabula #13

Run No. 8 NEH-1

Location North East Hood Exhaust

Date 2/22/72

Operator ~~Jim Gordon~~ Patchell

Sample Box No. 4

Meter Box No. 2

Probe Length 5'

Probe Heater Setting 50%

Ambient Temp °F 45°

Bar. Press. "Hg 30.0

Assumed Moisture % 30%

Heater Box Setting, °F 250

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

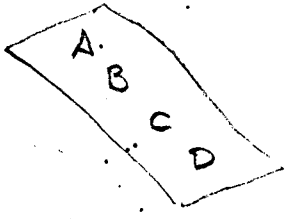
Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in. Hg	Stack Temp °F
START	1413	979.65	none	1.0	1.0		Start					
A-1	1416	980.90	.0	1.0	1.0	58	56	4	250	50	30.0	120
-2	1419	982.64	.0	1.0	1.0	62	56	4		50		160
-3	1422	984.20	.09	1.0	1.0	66	57	4		50		105
-4	1425	985.85	.08	1.0	1.0	70	58	4		≈ 50		105
-5	1428	987.60	.06	1.0	1.0	74	59	4		50		90
STOP 6	1431	989.16	.06	1.0	1.0	74	60	4		50		95
START	1434	989.16	Port B									
B-1	1437	990.89	.09	1.0	1.0	76	62	4		50		150
-2	1440	992.54	.10	1.0	1.0	79	62	4		50		145
-3	1443	994.20	.10	1.0	1.0	79	64	4		50		128
-4	1446	995.77	.09	1.0	1.0	82	65	4		50		11
-5	1449	997.50	.08	1.0	1.0	84	66	4		50		108
STOP 6	1452	999.24	.00	1.0	1.0	84	67	4		50		97
START	1454	999.24	Port C									
C-1	1457	000.90	.04	1.0	1.0	84	68	4		55		180
2	1500	002.57	.12	1.0	1.0	85	69	4		55		168
3	1503	004.27	.06	1.0	1.0	86	70	4		55		132
4	1506	005.93	.06	1.0	1.0	87	71	4		55		118
5	1509	007.61	.05	1.0	1.0	83	72	4		55		120
STOP 6	1512	009.21	.05	1.0	1.0	86	72	4		55		115
			Continued on next page									

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	1515	009.21	Port D									
D-1	1518	010.95	.03	1.0	1.0	86	72	4	250	55	30.0	185
-2	1521	012.62	.01	1.0	1.0	86	73	4	↓	55	↓	170
-3	1524	014.19	.00	1.0	1.0	88	74	4	↓	55	↓	145
-4	1527	015.98	.01	1.0	1.0	88	75	4	↓	55	↓	110
-5	1530	017.66	.06	1.0	1.0	89	75	4	↓	55	↓	98
-6	1533	019.26	.05	1.0	1.0	89	76	4	↓	55	↓	84
END												

D-45

Comments:

UC ash
Run 1
North East
2/22/72



NCAP-37 (12/67)

PARTICULATE FIELD DATA

V_w 4.64
$\%CO_2$ 0.0
$\%O_2$ 20.7
A_s - 2499
m_f - 2041
M_T - .2227

A B C D

Page 10 of 2

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Plant UC ASHTABULA #13 | Ambient Temp °F 55

Run No. NEH-2 | Sample Box No. RAC 4 | Bar. Press. "Hg 29.68

Location NORTH EAST Hood Exhaust | Meter Box No. RAC 2 | Assumed Moisture % 2%

Date 2/23/72 | Probe Length 6" | Heater Box Setting, °F 250

Operator [illegible] | Probe Heater Setting 50% | Probe Tip Dia., In. 3/16 .1875

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	0859	019.45	Start						250		29.68	60
A-1	0902	021.10	.01	1.0	1.0	55	52	4		50		50
-2	0905	022.72	.05	1.0	1.0	58	53	4		50		45
-3	0908	024.34	.06	1.0	1.0	62	53	4		50		68
-4	0911	025.95	.07	1.0	1.0	65	54	4		50		83
-5	0914	027.63	.07	1.0	1.0	67	54	4		50		78
Stop-6	0917	029.28	.07	1.0	1.0	68	55	4		50		90
START	0919	29.28	Part B									118
B-1	0922	030.94	.07	1.0	1.0	70	57	4		50		130
-2	0925	032.59	.08	1.0	1.0	72	58	4		50		123
-3	0928	034.24	.09	1.0	1.0	73	58	4		50		103
-4	0931	035.88	.09	1.0	1.0	76	59	4		50		75
-5	0934	037.54	.08	1.0	1.0	77	60	4		50		80
Stop-6	0937	039.20	.06	1.0	1.0	77	61	4		50		—
START	0941	39.20	Part C									140
C-1	0944	040.84	.07	1.0	1.0	72	63	4		50		140
-2	0947	042.52	.07	1.0	1.0	78	63	4		50		118
-3	0950	044.18	.05	1.0	1.0	80	64	4		50		98
-4	0953	045.84	.05	1.0	1.0	81	65	4		50		85
-5	0957	047.49	.05	1.0	1.0	82	66	4		50		78
Stop-6	1000	049.19	.04	1.0	1.0	82	66	4		50		78

Continue Page-2

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	1002	49.19							250		29.68	75
D-1	1005	050.84	.01	1.0	1.0	80	67	4		50		98
-2	1008	052.50	.01	1.0	1.0	80	67	4		50		102
-3	1011	054.17	.00	1.0	1.0	82	68	4		50		90
-4	1014	055.85	.01	1.0	1.0	84	68	4		50		60
-5	1017	057.54	.01	1.0	1.0	84	69	4		50		60
-6	1020	059.23	.02	1.0	1.0	84	69	4		50		60
END												

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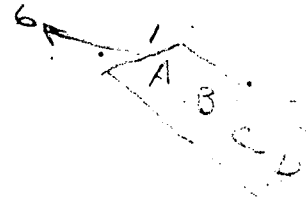
Comments:

NCAP-37 (12/67)

UC Ashtabula
NEH-2
North East #13
2/23/72
Patchell



PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Vw. 9.2
% CO_2 0.0
% O_2 20.7
As - 2499
MF - 2096
MT - 2293

Plant Ashtabula #13

Run No. NEH-3

Location North East #13

Date 2/23/72

Operator Patchell/McReynolds

Sample Box No. Rac 4

Meter Box No. Rac 2

Probe Length 6'

Probe Heater Setting 60%

Ambient Temp °F 55

Bar. Press. "Hg 29.68

Assumed Moisture % 3

Heater Box Setting, °F 250

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

one point #3 for hole A

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
	1218	059.31	Start	1.0		55	55					62
A-1	1222	61.20	.08		.98	60	55	4"	250	50	29.68	120
-2	1224	62.47	.08		.98	60	55	4		50		120
-3	1227	64.19	.08		.99	64	55	4		50		100
-4	1230	65.78	.08		.99	68	55	4		50		110
-5	1233	67.44	.08		.99	69	55	4		50		130
Stop 6	1236	69.23	.08		.99	70	55	4		50		0
Start	1239	69.23 Port B										108
B-1	1242	070.97	.06		1.0	74	59	4		55		122
-2	1245	072.65	.09		1.0	75	59	4		55		140
-3	1248	074.33	.09		1.0	77	61	4		55		125
-4	1251	075.99	.08		1.0	79	62	4		55		90
-5	1254	077.70	.07		1.0	80	63	4		55		80
Stop 6	1258	080.28	.08		1.0	82	64	4		55		70
Start	1301	80.28 Port C										110
C-1	1304	081.93	.08		1.0	80	66	4		55		150
-2	1307	083.62	.09		1.0	81	66	4		55		130
-3	1310	085.27	.06		1.0	82	67	4		55		108
-4	1313	086.97	.06		1.0	84	68	4		55		91
-5	1316	088.59	.05		1.0	86	69	4		55		78
Stop 6	1319	090.19	.05		1.0	86	70	4		55		80

Cont on next page (4)

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	1321	90.19										140
D-1	1324	091.97	.02	1.0	1.0	85	71	4	250	55	29.68	120
-2	1327	093.68	.02	↓	1.0	86	72	4	↓	55	↓	128
-3	1330	095.38	.01	↓	1.0	88	72	4	↓	55	↓	122
-4	1333	097.09	.02	↓	1.0	88	73	4	↓	55	↓	98
-5	1336	098.79	.02	↓	1.0	89	74	4	↓	55	↓	88
-6	1339	100.50	.02	↓	1.0	88	74	4	↓	55	↓	88
End												

Comments:

UC ashtabula
NEH-3
[illegible] #13
2/23/72
Bickell/McReynolds

Page 2 of 2

A B C [illegible]

NCAP-37 (12/67)

PARTICULATE FIELD DATA

Uw. 4.2
%CO_2 0.0
%O_2 20.7
As - 2223
MF - 1297
MT - 1431

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Plant Afabula ~~[illegible]~~ #13

Run No. NWH-1

Location Northwest hood Exhaust

Date Avery

Operator 2/22/72

Sample Box No. GI-2

Meter Box No. GI -

Probe Length 5' pyrex

Probe Heater Setting 50%

Ambient Temp °F 55

Bar. Press. "Hg 30.0

Assumed Moisture % 3

Heater Box Setting, °F 250

Probe Tip Dia., In. 3/16, .1825

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	1412	223.20		-								
A-1	1415	224.73	.60	.87	.87	60	60	5.5	250	55	30.0	75
A-2	1418	226.63	1.1	1.6	1.6	65	65	8.0	↓	↓	↓	95
A-3	21	228.89	1.6	2.3	2.3	70	70	12.5				100
A-4	24	231.20	1.6	2.3	2.3	70	70	12.5				110
A-5	27	233.60	1.7	2.4	2.3	75	75	12.7				100
Stop A-6	1430	235.47	1.0	1.46	1.46	75	75	8.0				120
Start	1437	235.47	0									
C-1	1440	237.76	1.6	2.3	2.3	70	70	12.5				110
C-2	1443	240.06	1.5	2.1	2.1	70	70	11.0				85
C-3	46	242.38	2.2	3.0	2.3	70	70	12.5				115
C-4	49	244.66	2.2	3.0	2.3	70	70	12.5				125
C-5	52	247.06	2.1	2.95	2.3	70	70	12.5				120
C-6	55	249.40	1.6	2.3	2.3	75	75	12.5				120
C-6	55	251.75	1.6	2.3	2.3	75	75	12.5				125
C-5	1501	254.09	1.6	2.3	2.3	80	80	12.5				125
C-4	1504	256.44	2.1	2.95	2.3	80	80	12.5				125
C-3	07	258.80	2.2	3.0	2.3	85	85	12.5				130
C-2	10	261.18	2.1	2.95	2.3	85	85	12.5				130
Stop 1	1513	263.81	1.6	2.3	2.3	85	85	12.5	↓	↓	↓	130

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	1515	263.81										
D-1	18	265.50	1.2	1.7	1.7	90	90	8.0	250	60	30.0	115
D-2	21	267.85	1.8	2.55	2.5	95	95	12.5	↓	↓	↓	115
D-3	24	270.26	1.7	2.5	2.3	95	95	12.5				140
D-4	27	272.63	1.6	2.3	2.3	95	95	12.5				140
D-5	30	274.95	1.5	2.15	2.15	95	95	11.0				145
D-6	33	277.135	1.3	1.85	1.85	100	95	9.5				130
END												

Comments:

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Uw -2.0
% CO_2 0.0
% O_2 20.7
As -.2223
MF - .954
MT. - .640

Plant Astabula ~~No Plm~~ #13
Run No. NWH - 2
Location North West Hood Exhaust
Date 2/23/72
Operator ~~Avery~~ AVERY

Sample Box No. GI-2 (Box #16)
Meter Box No. GI
Probe Length 5' pyrex
Probe Heater Setting 50%

Ambient Temp °F 50
Bar. Press. "Hg 29.68
Assumed Moisture % 2%
Heater Box Setting, °F 250
Probe Tip Dia., In. ~~3/16~~ .1875

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	8 54	277.20				50	50		250	55	29.68	
A-1	8 57	278.63	.60	.83	.83	55	55	5.0	↓	↓	↓	65
A-2	9 00	280.60	1.3	1.75	1.75	55	55	5.0				65
A-3	9 03	282.92	1.7	2.3	2.3	60	60	12.0				65
A-4	9 06		1.8	2.4	2.3	60	60	12.0				65
A-5	9 09	287.62	1.7	2.3	2.3	65	65	12.0				80
Stop A-6	9 12	289.60	.95	1.3	1.3	65	65	7.0				80
START	9 14	289.66										
C-1	9 17	291.50	1.2	1.6	1.6	70	70	7.0				90
C-2	9 20	293.75	1.8	2.4	2.35	75	75	12.0				85
C-3	9 23	296.13	1.9	2.5	2.35	75	75	12.0				80
C-4	9 26	298.51	1.8	2.4	2.3	80	80	12.0				90
C-5	9 29		1.5	2.0	2.0	80	80	9.5				90
C-6	9 32	302.85	1.3	1.75	1.75	80	80	8.0				95
C-6	9 35	304.91	1.3	1.75	1.75	85	80	8.0				95
C-5	9 38	307.10	1.5	2.0	2.0	85	80	9.0				95
C-4	9 41		1.7	2.3	2.3	90	85	12.0				105
C-3	9 44	311.88	1.9	2.5	2.3	90	85	12.0				110
C-2	9 47	314.31	1.9	2.5	2.3	95	90	12.0				105
Stop C-1	9 50	316.36	1.3	1.75	1.75	95	90	8.0	↓	↓	↓	110

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	956	316.36							250	55	29.68	
D-1	957	318.28	1.1	1.5	1.5	95	90	7.0	↓	↓	↓	195
D-2	1000	320.50	1.5	2.0	2.0	95	90	9.0				125
D-3	1003	322.81	1.6	2.15	2.15	95	90	10.0				110
D-4	1006	325.09	1.5	2.0	2.0	95	90	9.0				110
D-5	1009	327.28	1.4	1.88	1.88	95	90	8.5				110
D-6	1012	329.225	1.1	1.5	1.5	95	90	7.0				110
End.												

Comments:

NWH-2

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NCAP-37 (12/67)

PARTICULATE FIELD DATA

V_w 6.9
%CO_2 0.0
%O_2 20.7
A_s -2223
M_F - 69.9
M_T - 1804

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Plant Astoria #13
Run No. NWH - 3
Location North west Hood
Date 2/23/22
Operator Avery

Sample Box No. GI-2 #16
Meter Box No. GI
Probe Length 5' Pyrex
Probe Heater Setting 50%

Ambient Temp °F 60
Bar. Press. "Hg 29.68
Assumed Moisture % 3
Heater Box Setting, °F 250
Probe Tip Dia., In. 3/16 .1875

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	1218	329.338				60	60		250	60	29.68	
A-1	1221	330.80	.60	.83	.83	60	60	5.5				75
A-2	1225	332.79	1.2	1.6	1.6	65	60	8.0				75
A-3	27	335.11	1.7	2.3	2.3	70	65	12.0				75
A-4	30	337.49	1.8	2.4	2.3	70	65	12.0				80
A-5	33	339.78	1.6	2.15	2.15	70	65	11.0				85
Stop A-6	1236	341.49	.92	1.25	1.25	75	70	6.5				95
START	1240	341.49										
C-1	1243	346.04	1.6	2.15	2.15	75	75	10.0				100
C-2	1249		2.1	2.7	2.25	80	75	12.0				100
C-3	1255	355.57	2.1	2.7	2.25	80	75	12.0				100
C-4	1301	360.35	1.9	2.5	2.25	85	80	12.0				110
C-5	1307	365.07	1.6	2.15	2.15	90	90	11.5				105
Stop C-6	1313	369.80	1.6	2.15	2.15	95	90	11.5				110
START	1318	369.80										
D-1	1321	371.91	1.3	1.8	1.8	95	90	9.0				110
D-2	1324	374.28	1.6	2.15	2.15	95	90	11.5				115
D-3	1327	376.68	1.6	2.15	2.15	95	90	11.5				120
D-4	1330	378.97	1.5	2.0	2.0	100	95	10.0				120
D-5	1333	381.17	1.4	1.9	1.9	100	95	9.5				120
Stop D-6	1336	3832	1.2	1.6	1.6	100	95	8.0				125
END												

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

V_w 2.9 1 of 2
% CO_2 0.0
% O_2 20.7
As .2499
MF 687
MT 762

Plant U/B, Chlfabul #13

Run No. SEH-2

Location South east hook Exhaust

Date 2/23/72

Operator Gonzales

Sample Box No. 2

Meter Box No. 3

Probe Length 5'

Probe Heater Setting 70

Ambient Temp °F 40

Bar. Press. "Hg 29.68

Assumed Moisture % 2

Heater Box Setting, °F 250

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

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	0851	246.94	.22	.26	.26	38	38	1.5	250	50	29.68	45
A-1	54		.34	.43	.43	40	40	1.5				70
-2	57		.37	.46	.46	40	40	2.0				60
-3	0900		.38	.47	.47	44	40	2.0				60
-4	03		.40	.50	.50	46	40	2.0				60
-5	06		.40	.50	.50	48	40	2.0				60
-6	09		.40	.50	.50	48	40	2.0				60
START	0912		.22	.26	.26	52	42	1.5				50
B-1	15		.34	.43	.43	52	44	2.0				50
-2	18		.44	.54	.54	56	46	2.0				100
-3	21		.45	.56	.56	62	48	2.0				100
-4	24		.45	.56	.56	64	50	2.0				80
-5	27		.40	.50	.50	66	50	2.0				70
-6	30		.40	.50	.50	68	52	2.0				70
START	0932		.25	.31	.31	68	52	2.0				70
C-1	35		.43	.53	.53	64	52	2.0				85
-2	38		.35	.43	.43	66	52	2.0				80
-3	41		.15	.19	.19	66	52	1.5				60
-4	44		.20	.25	.25	62	50	1.5				60
-5	47		.40	.50	.50	62	50	2.0				40
-6	50		.40	.50	.50	62	50	2.0				50

SEH-2 2 of 2

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	0952		.20	.25	.25	60	54	2.0	250	50	[illegible]	[illegible]
D-1	55		.05	.05	.05	60	54	1.5	↓	↓	↓	80
-2	58	OFF	.00	—	—	—	—	—	—	—	—	—
-3	1001		.00	—	—	—	—	—	—	—	—	—
-4	04	ON	.06	.07	.07	54	52	1.5				50
-5	07		.32	.39	.39	54	52	2.0				40
-6	10	269.33	—	—	—	—	—	—				40
END												

Comments:

NCAP-37 (12/67)

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Uw. 4.1 1 of 2
%CO_2 0.0
%O_2 20.7
As -2499
MF - .848
MT - 90.7

Plant ~~Ashtabula~~, Ashtabula II/13

Run No. SEH-3

Location South East Exhaust

Date 2/23/72

Operator Gonzales

Sample Box No. 2

Meter Box No. 3

Probe Length 5'

Probe Heater Setting 70

Ambient Temp °F 42

Bar. Press. "Hg 29.68

Assumed Moisture % 2

Heater Box Setting, °F 250

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

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	1221	269.33	.25	.96	.96	42	42	3.0	250	60	29.68	74
A-1	24		.28	1.10	1.10	46	44	3.0				90
-2	27		.33	1.30	1.30	48	46	3.5				110
-3	30		.34	1.31	1.31	52	50	3.5				90
-4	33		.33	1.30	1.30	58	54	3.5				85
-5	36		.30	1.15	1.15	60	56	3.0				50
-6	39		.30	1.15	1.15	60	56	3.0				50
START	1241		.23	.82	.82	68	60	2.5				95
B-1	44		.33	1.30	1.30	64	60	3.5				105
-2	47		.38	1.45	1.45	64	60	4.0				100
-3	50		.40	1.55	1.55	66	62	4.0				95
-4	53		.40	1.55	1.55	72	68	4.0				105
-5	56		.36	1.40	1.40	74	70	3.5				80
-6	59		.36	1.40	1.40	74	70	3.5				80
START	1302		.25	.97	.97	68	68	3.0				110
C-1	05		.42	1.60	1.60	70	68	4.0			2	80
-2	08		.34	1.32	1.32	74	72	3.5				70
-3	11		.13	.52	.52	74	70	3.0				70
-4	14		.26	.98	.98	70	68	3.0				50
-5	17		.42	1.60	1.60	70	66	3.5				50
-6	20		.42	1.60	1.60	68	66	3.5				55

P-57

SEH-3 2 of 2

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	1323		.18	.70	.70	68	66	3.0	250	60	29.62	50
D-1	26		.06	.23	.23	68	66	2.0				90
-2	29	OFF	.00	—	—	—	—	—				—
-3	32		.00	—	—	—	—	—				
-4	35	ON	.07	.25	.25	60	56	1.5				60
-5	38		.27	1.02	1.02	62	58	2.0				60
-6	41	305.54	.27	1.02	1.02	62	58	2.0				50
END												

Comments:

NCAP-37 (12/67)

4 holes
A B C D
Left to right
A B C D

Inlet
61" wide
36" Deep

PARTICULATE FIELD DATA

VERY IMPORTANT -- FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

(1 of 2 sheets)

U_w 1.6
$\%CO_2$ 0.0
$\%O_2$ 20.7
A_s -2148
M_F - 1723
M_T - 1837

Plant Alloy Asphalt Tabula #13

Run No. SWH-1

Location South West Hood Exhaust

Date 2-22-72

Operator ~~Shelton~~ BAXLEY

Sample Box No. 2

Meter Box No. 4

Probe Length 5'

Probe Heater Setting 60 70

Ambient Temp °F 45°

Bar. Press. "Hg 30.0

Assumed Moisture % 3%

Heater Box Setting, °F 250°

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

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	14:15	898.26										
3	14:18	900.00	1.30	1.60	1.60	50	50	3.0	250	50	29.9	40
A- 9	14:21	902.02	2.00	2.40	2.40	50	50	4.0		50		40
15	14:24	904.42	2.10	2.60	2.60	64	50	5.0		50		40
21	14:27	906.95	2.10	2.60	2.60	70	50	5.0		50		40
27	14:30	909.40	2.10	2.60	2.60	72	50	5.0		50		40
STOP 33	14:33	911.82	1.90	2.30	2.30	80	54	5.0		50		40
START	14:34	911.82										
3	14:37	914.22	1.90	2.30	2.30	84	58	5.0		50		40
9	14:40	916.74	2.20	2.70	2.70	86	60	5.0		50		42
B- 15	14:43	919.30	2.20	2.70	2.70	88	60	5.0		50		48
21	14:46	921.90	2.10	2.60	2.60	90	60	5.0		50		50
27	14:49	924.38	2.00	2.40	2.40	92	60	4.5		50		50
STOP 33	14:52	926.82	1.80	2.20	2.20	92	62	4.0		50		53
START	14:53											
3	14:56	928.07	1.70	2.10	2.10	92	62	4.0		50		46
9	14:59	931.12	1.90	2.30	2.30	92	62	3.5		50		48
C- 15	15:02	933.33	1.80	2.20	2.20	92	62	3.5		50		50
21	15:05	935.65	1.80	2.20	2.20	94	62	4.0		50		70
27	15:08	937.80	1.60	2.00	2.00	94	66	4.0		50		77
STOP 33	15:11	940.03	1.60	2.00	2.00	96	66	4.0		50		90
START	15:13									50		
3	15:16	942.10	1.30	1.60	1.60	96	66	3.5		55		85
D- 9	15:19	944.00	1.30	1.60	1.60	96	66	3.5	✓	55	✓	80

ASHTABULA

(2 9 2 Sd cuts) SWH-1 Point	2-22-72 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
15	15:22	946.10	1.60	2.00	2.00	96	70	4.0	250	55	29.8	85
21	15:25	948.34	1.60	2.00	2.00	96	70	4.0	↓	55	↓	85
27	15:28	950.50	1.60	2.00	2.00	96	70	4.0	↓	55	↓	104°
33	15:31	952.58	1.50	1.70	1.70	98	72	4.0	↓	55	↓	114
End												

Comments:

NCAP-37 (12/67)

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

U_w, -.6
$\%CO_2$
$\%O_2$
A_s - 2148
m_f - 952
m_T - 1467

Plant Asbestos #13

Run No. SWA-2

Location Lower Hood Exhaust

Date 2-23-72

Operator Baxley

Sample Box No. 3

Meter Box No. 1

Probe Length 5'

Probe Heater Setting 60

Ambient Temp °F 50

Bar. Press. "Hg 29.68

Assumed Moisture % 3

Heater Box Setting, °F 250

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

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	0855	953.09							250			
3	0858	955.04	1.40	1.70	1.70	50	50	4.5		50	29.68	30
9	0901	957.14	1.60	1.95	1.95	58	50	4.5		50		30
A 15	0904	959.35	1.70	2.00	2.00	64	50	5.0		50		30
21	0907	961.50	1.70	2.00	2.00	68	50	5.0		50		30
27	0910	963.73	1.80	2.20	2.20	74	54	5.2		50		30
STOP 33	0913	966.02	1.70	2.00	2.00	76	54	5.0		50		35
START	09:14	966.02										
3	09:17	968.30	1.70	2.00	2.00	78	56	5.0		50		30
9	09:20	970.60	2.00	2.45	2.45	82	56	6.0		50		32
15	09:23	973.10	2.00	2.45	2.45	84	56	6.0		50		32
B 21	09:26	975.60	2.00	2.45	2.45	88	58	6.0		50		32
27	09:29	978.00	1.80	2.20	2.20	88	58	5.5		50		40
STOP 33	09:32	980.27	1.70	2.00	2.00	90	60	5.0		50		40
START	09:39	980.27										
3	09:36	982.16	1.10	1.30	1.30	92	62	3.5		50		45
9	09:39	984.20	1.40	1.70	1.70	92	62	4.0		50		42
C 15	09:42	986.31	1.50	1.80	1.80	92	62	4.0		50		42
21	09:45	988.40	1.40	1.70	1.70	92	62	4.5		50		50
27	09:48	990.46	1.40	1.70	1.70	92	64	4.5		50		55
STOP 33	09:51	992.42	1.20	1.45	1.45	92	64	4.0		50		68
START	09:57	992.42										
3	09:54	994.30	1.10	1.35	1.35	92	64	4.0		50		75
D 9	09:58	996.35	1.40	1.70	1.70	92	64	4.5	✓	50	✓	65

(2 of 2 sheets)

Point	2-23-72 Sw 14-2 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
15	10:01	998.50	1.60	1.90	1.90	92	62	5.0	250	50	29.68	65
21	10:04	1000.69	1.60	1.90	1.90	94	62	5.0	"	"		70
27	10:07	1002.77	1.40	1.70	1.70	94	62	4.5	"	"		80
33	10:10	1004.85	1.40	1.70	1.70	94	62	5.0	"	"	↓	90
End.												

Comments:

NCAP-37 (12/67)

Part 10, p. 4 of 8

Left to right
A B C d
(1 of 2 sheets)

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Uw 7.5
%CO2 0.0
%O2 20.7
As - 2148
MF - 1224
MT 2177

Plant ASHTABULA #13

Run No. SWH-3

Location So wall Hood Inlet

Date 2-23-72

Operator Barley

Sample Box No. 3

Meter Box No. 4

Probe Length 5'

Probe Heater Setting 60

Ambient Temp °F 45

Bar. Press. "Hg 29.68

Assumed Moisture % 3

Heater Box Setting, °F 250

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

SwH-3 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	12:28	10.72										
A-3	12:31	12.58	1.10	1.35	1.35	62	54	4.0	250	50	29.6	40
9	12:34	14.64	1.60	1.95	1.95	72	54	5.5		50		42
A 15	12:37	16.80	1.60	1.95	1.95	78	56	5.5		50		42
A 21	12:40	18.96	1.60	1.95	1.95	80	56	6.0		50		42
27	12:43	21.15	1.60	1.95	1.95	86	56	6.0		50		42
STOP 33	12:46	23.14	1.30	1.60	1.60	88	58	5.0		50		45
START	12:47	23.14										
B-3	12:50	25.26	1.50	1.80	1.80	90	58	5.5		50		45
9	12:53	27.56	1.90	2.20	2.20	94	60	6.5		50		45
15	12:56	29.91	1.90	2.20	2.20	96	60	6.5		50		45
B 21	12:59	32.23	1.80	2.15	2.15	96	62	6.0		50		50
27	13:02	34.14	1.10	1.35	1.35	98	64	4.5		50		50
STOP 33	13:05	36.21	1.50	1.80	1.80	100	66	5.5		50		50
START	13:06	36.21										
C-3	13:09	38.08	1.10	1.35	1.35	100	66	4.5		50		50
9	13:12	40.08	1.40	1.70	1.70	102	66	5.0		50		50
15	13:15	42.19	1.50	1.80	1.80	102	66	5.5		50		50
C 21	13:18	44.26	1.40	1.70	1.70	102	68	5.0		50		60
27	13:21	46.33	1.40	1.70	1.70	102	70	5.0		50		75
STOP 33	13:24	48.32	1.30	1.55	1.55	102	70	5.0		50		90
START	13:25	48.32										
D-3	13:28	50.17	1.10	1.35	1.35	102	70	4.5		50		75
D 9	13:31	52.25	1.40	1.70	1.70	102	70	5.0	✓	50		75

2nd sheet SWH-3 Sandy 2-23-72

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					
15	13:34	54.24	1.40	1.70	1.70	102	70	5.0	250	50	29.6	95
21	13:37	56.29	1.40	1.70	1.20	102	70	5.0	"	50	|	98
27	13:40	58.25	1.20	1.50	1.50	102	70	5.0	"	50	|	98
33	13:43	60.16	1.20	1.50	1.50	102	70	5.0	"	50	|	120
End												

D-64

Comments:

NCAP-37 (12/67)

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

U_w - 3.2
$\%CO_2$ 0.0
$\%O_2$ 20.8
A_s 2124
M_F - 0.5360
M_T - 0.5481

Plant Astabula #13 ~~W. Lorn~~

Run No. BTE-1

Location B Top Exhaust

Date 2/23/72

Operator ~~A. C.~~ RUERY

Sample Box No. GI-2

Meter Box No. GI-2

Probe Length 5' pyrex

Probe Heater Setting 50%

Ambient Temp °F 70

Bar. Press. "Hg 29.68

Assumed Moisture % 1%

Heater Box Setting, °F 250°

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

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.	1530	383.36				70	70		250	70	29.68	
1	1535	386.32	.30	1.27	1.27	70	70	6.0				100
2	1540	389.75	.40	1.70	1.70	75	70	7.0				105
3	1545	"	.39	1.65	1.65	75	70	7.0				105
4	1550	395.53	.38	1.6	1.6	75	70	7.0				115
5	1555	399.80	.35	1.5	1.5	80	75	6.5				120
6	1600	403.09	.35	1.5	1.5	80	75	6.5				115
7	1605	"	.38	1.6	1.6	85	80	7.0				110
8	1610	410.58	.40	1.7	1.7	90	85	7.0				140
9	1615	413.45	.42	1.8	1.8	90	85	7.5				135
10	1620	417.08	.42	1.8	1.8	95	90	7.5				140
11	1625	420.74	.44	1.86	1.86	95	90	8.0				135
12	1630	424.405	.44	1.86	1.86	100	95	8.0				145
END.												

PARTICULATE FIELD DATA

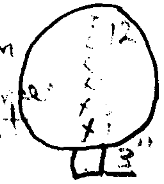
Uw.
%CO_2
%O_2
As
MF
MI

#13

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Stack diagram & [illegible]



Uw. 9.3
%CO_2 0.0
%O_2 20.8
As 2124
MF 0.4810
MI 511.7

Plant: Astabula ~~[illegible]~~
Run No.: BTE-2
Location: B Tap Exh.
Date: 2/24/72
Operator: Avery

Sample Box No.: GI-1
Meter Box No.: GI
Probe Length: 5' pyrex
Probe Heater Setting: 50%

Ambient Temp °F: ~~[illegible]~~ → 80°
Bar. Press. "Hg: 29.3
Assumed Moisture %: 1%
Heater Box Setting, °F: 250
Probe Tip Dia., In.: 1/4 .250

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	903	424.80				65	65		250	65	29.3	
1	908	427.83	.31	1.31	1.31	65	65	6.0	↓	↓	↓	120
2	913	431.20	.38	1.61	1.61	70	65	6.5				105
3	918	434.50	.36	1.55	1.55	70	65	6.5				110
4	923	437.85	.37	1.58	1.58	80	75	6.5				110
5	928	441.24	.37	1.58	1.58	85	80	6.5				120
6	933	444.65	.39	1.65	1.65	90	85	7.0				115
7	938	448.15	.40	1.70	1.70	100	95	7.0				130
8	943	451.60	.39	1.65	1.65	100	95	7.0				135
9	948	455.14	.40	1.70	1.70	100	95	7.5				135
10	953	458.71	.41	1.75	1.75	105	105	7.5				150
11	958	462.30	.41	1.75	1.75	110	110	8.0				150
12	1003	465.95	.43	1.85	1.85	[illegible]	[illegible]	8.5	↓	↓	↓	150
End												

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Uw. 31.4
%CO2 0.0
%O2 20.8
As 2124
MF - 0.4658
MT 0.4750

Plant Astabula ~~U-Hm~~ #13
Run No. BT 3
Location B Top Exhaust
Date 2/24/72
Operator Avery

Sample Box No. ~~3~~ -2
Meter Box No. GI -2
Probe Length 5' Pyrex
Probe Heater Setting 50%

Ambient Temp °F 80
Bar. Press. "Hg 29.3
Assumed Moisture % 1
Heater Box Setting, °F 250
Probe Tip Dia., In. 1/4 .250

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	1034	466.065				100	100		250	80	29.3	
1	1039	469.00	.28	1.2	1.2	100	100	6.0	↓	↓	↓	120
2	1044	472.39	.37	1.58	1.58	100	100	7.0				130
3	1049	475.80	.38	1.61	1.61	100	100	7.0				140
4	1054	479.22	.37	1.58	1.58	105	100	7.0				145
5	1059	482.61	.37	1.58	1.58	105	100	7.0				145
6	1104	486.03	.36	1.55	1.55	105	100	7.0				150
7	1109	489.53	.38	1.61	1.61	105	100	7.0				150
8	1114	493.05	.39	1.65	1.65	105	105	7.5				155
9	1119	496.55	.40	1.70	1.70	105	105	7.5				160
10	1124		.42	1.80	1.80	110	105	8.0				165
11	1129	503.87	.42	1.80	1.80	110	105	8.0				165
12	1134	507.93	.40	1.70	1.70	110	105	8.0	↓	↓	↓	160
End												

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Kw. %CO2 %O2 Ps Mf Mr

Plant: Ashtabula
Run No.: BSE-1
Location: CO Exhaust
Date: 2-23-72
Operator: ~~[illegible]~~ Baxley

Sample Box No.: 4
Meter Box No.: 2
Probe Length: Special
Probe Heater Setting: ~~[illegible]~~

Ambient Temp °F: 65°
Bar. Press. "Hg: 29.~~[illegible]~~
Assumed Moisture %: 10
Heater Box Setting, °F: ~~[illegible]~~
Probe Tip Dia., In.: ¼"

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
	15:20	100.40										
BSE-1	15:30	106.32		1.00	1.00	60	60	5.0	100	50	2 lb	~100
	15:40	112.55		1.00	1.00	72	60	5.5				
	15:50	118.40		1.00	1.00	80	65	6.0				
	16:00	123.30		1.00	1.00	80	70	6.0		40		
	16:10	130.65		1.00	1.00	80	70	7.0				
	16:20	138.72		1.00	1.00	80	70	8.0	✓	✓		
		38.32			1.00	75.33	65.83	6.25				
						70.58						

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PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point or, if single point sampling, read and record every 5 minutes.

Plant: Ashtabula
Run No.: BSE-2 and BSE-3
Location: ~~Co Eof~~ #13 Scrubber
Date: 2-24-72
Operator: ~~[illegible]~~ BAXLEY

Sample Box No.: 3 ~~A~~ 2
Meter Box No.: 2
Probe Length: Special
Probe Heater Setting: 0

Ambient Temp °F: 78
Bar. Press. "Hg: 29.66
Assumed Moisture %: 10
Heater Box Setting, °F: 100
Probe Tip Dia., In.: 1/4"

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
	08:55	136.72		-								
	09:05	142.36		1.00	1.00	78	78	4.0	100	50	2 16	~100
BSE-2	09:15	148.50		1.00	1.00	84	78	4.0	↓	↓		
	09:25	154.38		1.00	1.00	90	78	4.0				
	09:35	160.22		1.00	1.00	96	78	4.0				
	09:45	166.13		1.00	1.00	100	82	4.0				
	09:55	172.04		1.00	1.00	104	84	4.0				
		35.32			1.00	92	79.66	4.0				
						85.83						
	10:10	172.14										
	10:20	178.12		1.00	1.00	92	86	4.0	100	60	2 16	~100
	10:30	184.10		1.00	1.00	98	86	4.5	↓	↓		
	10:40	190.10		1.00	1.00	102	86	5.0				
BSE-3	10:50	196.14		1.00	1.00	104	86	5.5				
	11:00	202.25		1.00	1.00	106	86	6.0				
	11:10	208.25		1.00	1.00	106	86	6.0				
		36.11			1.00 ✓	101.33	86	5.16				
						93.67 ✓						

Sample Box #4

PARTICULATE CLEANUP SHEET

Date: 2/24/72 Plant: Ashtabula ~~#6~~ ~~#5~~ #3

Run number: NEH-1 Location of sample port: N. East Roof

Operator: _____ Barometric pressure: 29.90

Sample box number: RAC-4 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling ~~365~~ ml Container No. NEH-1 Ether-chloroform extraction of impinger water 0 mg

Impinger prefilled with 400 ml Extra No. _____

Volume collected -12 ml Impinger water residue 1.3 mg

Impingers and back half of filter, acetone wash: Container No. NEH-1 Extra No. _____ Weight results 7.6 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. NEH-1 Extra No. _____ Weight results 25.7 mg

Filter Papers and Dry Filter Particulate

Filter number	~~Container~~ Weight no.	Filter number	Container no.
000237	0.6951		

Filter particulate weight 332.2 mg

~~Total~~ particulate weight 412.9 mg

TOTAL = PR cyclone & filter 421.8

Silica Gel

Weight after test:	184.8			
Weight before test:	175.4			
Moisture weight collected:	9.4			

Moisture total 9.4 gm

Container number: 1. _____ 2. _____ 3. _____ 4. _____

Sample number: NEH-1 Analyze for: _____

Method determination: _____

Comments: _____

RAC #4

PARTICULATE CLEANUP SHEET

Date: 2-22-72 Plant: [redacted] Ash. #13

Run number: NEH 2 Location of sample port: North East Hood

Operator: Jim Gordon Barometric pressure: 29.80

Sample box number: #4 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 393 ml Container No. NEH-2 Ether-chloroform extraction

Impinger prefilled with 400 ml Extra No. ____ of impinger water 0 mg

Volume collected -7 ml Impinger water residue 7.4 mg

Impingers and back half of filter, acetone wash: Container No. NEH-2

Extra No. ____ Weight results 10.7 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. NEH-2

Extra No. ____ Weight results 58.0 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
[redacted] 230	0.6[redacted]70		

Filter particulate weight 146.1 mg

Total particulate weight 204.1 mg

TOTAL = PR cyclone & filter 222.2

Silica Gel

Weight after test:	191.3			
Weight before test:	179.9			
Moisture weight collected:	11.4			
Container number:	1. ____	2. ____	3. ____	4. ____

Moisture total 11.4 gm

Sample number: NEH-2 Analyze for: ____

Method determination: ____

Comments: ____

PARTICULATE CLEANUP SHEET

Date: 2/23/72
Run number: NEH-3
Operator: Jim
Sample box number: 4

Plant: ~~Ash~~ # 13
Location of sample port: NE
Barometric pressure: 29.80
Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 396 ml
Impinger prefilled with 400 ml
Volume collected -4 ml

Container No. NEH-3
Extra No. ____

Ether-chloroform extraction of impinger water 0 mg
Impinger water residue 4.3 mg

Impingers and back half of filter, acetone wash:
Container No. NEH-3
Extra No. ____
Weight results 13.4 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. NEH-3
Extra No. ____
Weight results 51.2 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
227	.6769		

Filter particulate weight 158.4 mg

~~Total~~ particulate weight 209.6 mg

TOTAL " PR cyclone & filter 227.3

Silica Gel

Weight after test:	202.4			
Weight before test:	189.2			
Moisture weight collected:	13.2			
Container number:	1.	2.	3.	4.

Moisture total 13.2 gm

Sample number: NEH-3
Analyze for: ____
Method determination: ____
Comments: ____

Box # 16

PARTICULATE CLEANUP SHEET

Date: 2/22/72 Plant: Astabula [redacted] #13

Run number: NWH-1 Location of sample port: North West Roof

Operator: Avery Barometric pressure: 29.90

Sample box number: GI-2 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 390 ml Container No. NWH-1 Ether-chloroform extraction of impinger water 0.4 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected -10 ml Impinger water residue 6.5 mg

Impingers and back half of filter, acetone wash: Container No. NWH-1

Extra No. ____ Weight results 6.5 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. NWH-1

Extra No. ____ Weight results 59.2 mg

Filter Papers and Dry Filter Particulate

Filter number	~~Container no.~~ Weight	Filter number	Container no.
000235	0.6666		

Filter particulate weight 20.5 mg

~~Total~~ particulate weight 129.7 mg

total + PR probe & cyclone 143.1

Silica Gel

Weight after test:	198.4			
Weight before test:	184.2			
Moisture weight collected:	14.2			

Moisture total 14.2 gm

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

Sample number: NWH-1 Analyze for: ____

Method determination: ____

Comments: ____

Box 16

PARTICULATE CLEANUP SHEET

Date: 2/23/72 Plant: Asfakula #13 [redacted]

Run number: NWH-2 Location of sample port: north west Hood

Operator: Avery Barometric pressure:

Sample box number: GI-2 Ambient temperature:

Impinger H_2O

Volume after sampling 384 ml Container No. NWH-2 Ether-chloroform extraction of impinger water 0 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected -16 ml Impinger water residue .0 mg

Impingers and back half of filter, acetone wash: Container No. NWH-2

Extra No. ____ Weight results 4.6 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. NWH-2

Extra No. ____ Weight results 27.4 mg

Filter Papers and Dry Filter Particulate

Filter number	~~Container no.~~ (weight)	Filter number	Container no.
000246	0.6790		

Filter particulate weight 32.0 mg

~~Total~~ particulate weight 59.4 mg

total " PR cyclone & Flask 64.0

Silica Gel

Weight after test:	201.2			
Weight before test:	187.2			
Moisture weight collected:	14.0			

Moisture total 14.0 gm

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

Sample number: NWH-2 Analyze for:

Method determination:

Comments:

BK #16

PARTICULATE CLEANUP SHEET

Date: 2/23/72 Plant: Astatula #13 [redacted]

Run number: NWH-3 Location of sample port: North West Horiz

Operator: Avery Barometric pressure: 29.75

Sample box number: GE-2 Ambient temperature: _____

Impinger H_2O

Volume after sampling 394 ml Container No. NWH-3 Ether-chloroform extraction of impinger water 0 mg

Impinger prefilled with 400 ml Extra No. _____

Volume collected −6 ml Impinger water residue 0 mg

Impingers and back half of filter, acetone wash: Container No. NWH-3 Extra No. _____ Weight results 10.5 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. NWH-3 Extra No. _____ Weight results 38.5 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000229	0.6920		

Filter particulate weight 31.4 mg

~~Total~~ particulate weight 69.9 mg

Total " PR cyclone & filter 80.4

Silica Gel

Weight after test:	197.8			
Weight before test:	184.9			
Moisture weight collected:	12.9			
Container number:	1.	2.	3.	4.

Moisture total 12.9 gm

Sample number: NWH-3 Analyze for: _____

Method determination: _____

Comments: _____

RAC-3
2-23-72

PARTICULATE CLEANUP SHEET

Date: [redacted] Plant: Ashtabula #13

Run number: [redacted] Location of sample port: So East Hood

Operator: SEH-2 Barometric pressure: 29.9"

Sample box number: 2 Ambient temperature: 50°

Impinger H_2O

Volume after sampling 396 ml Container No. SEH-2 Ether-chloroform extraction of impinger water 2.2 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected -4 ml Impinger water residue 1.7 mg

Impingers and back half of filter, acetone wash: Container No. SEH-2

Extra No. ____ Weight results 3.6 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. SEH-2

Extra No. ____ Weight results 28.8 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000119	0.1953		
000[redacted]333	[redacted] 0.6774		
000236	0.6749		

Filter particulate weight 39.9 mg

~~Total~~ particulate weight 68.7 mg

TOTAL PR cyclone & filter 76.2

Silica Gel

Weight after test:	188.2 195.1	____	____	____
Weight before test:	[redacted]	____	____	____
Moisture weight collected:	6.9	____	____	____
Container number:	1. ____	2. ____	3. ____	4. ____

Moisture total 6.9 gm

Sample number: SEH-2 Analyze for: ____

Method determination: ____

Comments: ____

RAC-2

PARTICULATE CLEANUP SHEET

Date: 2-23-72 Plant: ASATABOLA #13

Run number: SEH-3 Location of sample port: So East Horiz

Operator: EEL Barometric pressure: 29.90

Sample box number: 6 Ambient temperature: 50°

Impinger H_2O

Volume after sampling 394 ml Container No. SEH-3 Ether-chloroform extraction of impinger water 0 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected -6 ml Impinger water residue 0 mg

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

Extra No. ____ Weight results 3.9 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. SEH-3

Extra No. ____ Weight results 32.0 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000226	0,6762		

Filter particulate weight 54.8 mg

~~Total~~ particulate weight 86.8 mg

TOTAL IN PR CYCLONE & FILTER 90.7

Silica Gel

Weight after test:	186.2			
Weight before test:	176.1			
Moisture weight collected:	10.1			
Container number:	1. ____	2. ____	3. ____	4. ____

Moisture total 10.1 gm

Sample number: SEH-3 Analyze for: ____

Method determination: ____

Comments: ____

RAC:2

PARTICULATE CLEANUP SHEET

Date: 2-22-72 Plant: ASITAbolz #13

Run number: SWH-1 Location of sample port: So wall Horiz

Operator: Sandy Barometric pressure: 29.80

Sample box number: 13 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 384 ml Container No. SWH-1 Ether-chloroform extraction

Impinger prefilled with 400 ml Extra No. ____ of impinger water 0.9 mg

Volume collected −16 ml Impinger water residue 0 mg

Impingers and back half of filter, acetone wash: Container No. SWH-1

Extra No. ____ Weight results 5.5 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. SWH-1

Extra No. ____ Weight results 73.0 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000232	WT 0.6775	____	____
____	____	____	____
____	____	____	____

Filter particulate weight 104.3 mg

~~Total~~ particulate weight 177.3 mg

TOTAL " PR cyclone & filter 183.7

Silica Gel

Weight after test:	185.2	____	____	____
Weight before test:	177.6	____	____	____
Moisture weight collected:	17.6	____	____	____

Moisture total 17.6 gm

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

Sample number: SWH-1 Analyze for: ____

Method determination: ____

Comments: ____

RAC-3

PARTICULATE CLEANUP SHEET

Date: 2-23-72 Plant: Ashtabula #13

Run number: SWH-2 Location of sample port: So west Hood

Operator: Sandy Barometric pressure: 29.80

Sample box number: 13 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 384 ml Container No. SWH-2 Ether-chloroform extraction of impinger water 0.8 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected -16 ml Impinger water residue 0 mg

Impingers and back half of filter, acetone wash: Container No. SWH-2

Extra No. ____ Weight results 50.7 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. SWH-2

Extra No. ____ Weight results 44.8 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
~~# 000 120~~	~~WE 1778 0.~~		
0000236	0.6749		

Filter particulate weight 50.4 mg

~~Total~~ particulate weight 95.2 mg

TOTAL " PR cyclone & filter 146.7

Silica Gel

Weight after test:	194.8			
Weight before test:	179.4 ~~1800.2~~			
Moisture weight collected:	15.4			Moisture total 15.4 gm
Container number:	1. ____	2. ____	3. ____	4. ____

Sample number: SWH-2 Analyze for: ____

Method determination: ____

Comments: ____

RHC-3

PARTICULATE CLEANUP SHEET

Date: 2-23-72 Plant: Ashtabula #13

Run number: SWH-3 Location of sample port: So West Hood

Operator: Sandy Barometric pressure: 29.80

Sample box number: 13 Ambient temperature: 45°F

Impinger H_2O

Volume after sampling 390 ml Container No. SWH-3 Ether-chloroform extraction of impinger water 12.8 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected -10 ml Impinger water residue 64.7 mg

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

Extra No. ____ Weight results 17.8 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. SWH-3

Extra No. ____ Weight results 53.2 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
.000234	WT 0.6662		

Filter particulate weight 69.2 mg

~~Total~~ particulate weight 122.4 mg

TOTAL = PROBE CYCLONE & FILTER 217.7

Silica Gel

Weight after test:	200.9			
Weight before test:	183.4			
Moisture weight collected:	17.5			
Container number:	1. ____	2. ____	3. ____	4. ____

Moisture total 17.5 gm

Sample number: SWH-3 Analyze for: ____

Method determination: ____

Comments: ____

PARTICULATE CLEANUP SHEET

Date: 2/23/72 Plant: Astabula #13 [redacted]

Run number: BTE - 1 Location of sample port: Top Exhaust

Operator: Avery Barometric pressure: 29.8

Sample box number: GE-2 Box 17 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 394 ml Container No. BTE-1 Ether-chloroform extraction of impinger water 0.1 mg

Impinger prefilled with 410 ml Extra No. ____

Volume collected -16 ml Impinger water residue 0.8 mg

Impingers and back half of filter, acetone wash: Container No. BTE-1 Extra No. ____ Weight results 11.2 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. BTE-1 Extra No. ____ Weight results 140.6 mg

---

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
300239	0.6932		

Filter particulate weight 395.4 mg

~~Total~~ particulate weight 536.0 mg

Total " PR cyclone & filter 548.1

Silica Gel

Weight after test:	198.3			
Weight before test:	185.5			
Moisture weight collected:	12.8			
Container number:	1.	2.	3.	4.

Moisture total 12.8 gm

Sample number: BTE-1 Analyze for: ____

Method determination: ____

Comments: ____

PARTICULATE CLEANUP SHEET

Date: 2/23/72 Plant: [redacted] Ashtabula #13

Run number: BTE-2 Location of sample port: [redacted] Top Exhaust

Operator: _____ Barometric pressure: 29.60

Sample box number: GI-1 #17 Ambient temperature: 50° F

Impinger H_2O

Volume after sampling 392 ml Container No. BTE-2 Ether-chloroform extraction

Impinger prefilled with 400 ml Extra No. _____ of impinger water 0.5 mg

Volume collected -8 ml Impinger water residue 4.7 mg

Impingers and back half of filter, acetone wash: Container No. BTE-2

Extra No. _____ Weight results 25.5 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. BTE-2

Extra No. _____ Weight results 63.6 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000228	0.6840	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Filter particulate weight 417.4 mg

~~Total~~ particulate weight 481.0 mg

Total " PR cyclone & filter 511.7

Silica Gel

Weight after test:	200.3	_____	_____	_____
Weight before test:	1830	_____	_____	_____
Moisture weight collected:	17.3	_____	_____	_____

Moisture total 17.3 gm

Container number: 1._____ 2._____ 3._____ 4._____

Sample number: BTE-2 Analyze for: _____

Method determination: _____

Comments: _____

PARTICULATE CLEANUP SHEET

Date: 2-24-72 Plant: Ashtabula # 13

Run number: BTE-3 Location of sample port: Top Exhaust

Operator: _____ Barometric pressure: 29.80

Sample box number: 2 (GI) Ambient temperature: 50° F

Impinger H_2O

Volume after sampling 404 ml Container No. BTE-3 Ether-chloroform extraction of impinger water 0 mg

Impinger prefilled with 400 ml Extra No. _____

Volume collected +4 ml Impinger water residue 0 mg

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

Extra No. _____ Weight results 9.2 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. BTE-3

Extra No. _____ Weight results 89.8 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
.000238	0.6680	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Filter particulate weight 376.0 mg

~~Total~~ particulate weight 465.8 mg

Total " PR cyclone & filter 475.0

Silica Gel

Weight after test:	220.0	_____	_____	_____
Weight before test:	192.6	_____	_____	_____
Moisture weight collected:	27.4	_____	_____	_____
Container number:	1. _____	2. _____	3. _____	4. _____

Moisture total 27.4 gm

Sample number: BTE-3 Analyze for: _____

Method determination: _____

Comments: _____

PARTICULATE CLEANUP SHEET

Date: 2-24-72 Plant: Ashtabula #13

Run number: BSE-1 Location of sample port: B Scrubber Eff

Operator: Jim MC Barometric pressure: 29.8

Sample box number: #4 Ambient temperature: 45°

Impinger H_2O

Volume after sampling 401 ml Container No. BSE-1 Ether-chloroform extraction of impinger water 0 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected +1 ml Impinger water residue 0 mg

Impingers and back half of filter, acetone wash: Container No. BSE-1

Extra No. ____ Weight results 6.7 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. BSE-1

Extra No. ____ Weight results 26.7 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
0.1753	000119		

Filter particulate weight 71.4 mg

Total particulate weight 98.1 mg

total " PR cyclone & filter 104.8

Silica Gel

Weight after test:	200.7			
Weight before test:	186.7			
Moisture weight collected:	14.0			
Container number:	1.	2.	3.	4.

Moisture total 14.0 gm

Sample number: BSE-1 Analyze for: ____

Method determination: ____

Comments: ____

PARTICULATE CLEANUP SHEET

Date: 2-24-72 Plant: Ashtabula

Run number: BSE-2 Location of sample port: B Scrubber Eff

Operator: [redacted] MC Barometric pressure: 29.8

Sample box number: #3 Ambient temperature: 45°F

Impinger H_2O

Volume after sampling 396 ml Container No. BSE-2 Ether-chloroform extraction of impinger water 0 mg

Impinger prefilled with 400 ml Extra No. ____

Volume collected -4 ml Impinger water residue 0 mg

Impingers and back half of filter, acetone wash: Container No. BSE-2

Extra No. ____ Weight results 24.5 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. BSE-2

Extra No. ____ Weight results 8.6 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
[redacted]	[redacted]	____	____
000120	0.1776	____	____
____	____	____	____

Filter particulate weight 35.7 mg

~~Total~~ particulate weight 44.3 mg

total " PR cyclone & filter 68.8

Silica Gel

Weight after test:	196.4	____	____	____
Weight before test:	183.2	____	____	____
Moisture weight collected:	13.2	____	____	____

Moisture total 13.2 gm

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

Sample number: BSE-2 Analyze for: ____

Method determination: ____

Comments: ____

PARTICULATE CLEANUP SHEET

Date: 2-24-72 Plant: Ashtabula #13

Run number: BSE-3 Location of sample port: Scrubber Outlet

Operator: _____ Barometric pressure: 29.80

Sample box number: 4 Ambient temperature: 50°F

Impinger H_2O

Volume after sampling 388 ml Container No. BSE-3 Ether-chloroform extraction of impinger water 0 mg

Impinger prefilled with 400 ml Extra No. _____

Volume collected -12 ml Impinger water residue 0 mg

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

Extra No. _____ Weight results 6.8 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. BSE-3

Extra No. _____ Weight results 4.8 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
000129	0.1756		

Filter particulate weight 64.6 mg

Total particulate weight 69.4 mg

total in PR cyclone & filter 26.2

Silica Gel

Weight after test:	202.9			
Weight before test:	183.8			
Moisture weight collected:	19.1			
Container number:	1.	2.	3.	4.

Moisture total 19.1 gm

Sample number: BSE-3 Analyze for: _____

Method determination: _____

Comments: _____

APPENDIX E

STANDARD SAMPLING PROCEDURES

Subpart E—Standards of Performance for Nitric Acid Plants

§ 466.50 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to nitric acid plants.

(b) For purposes of § 466.11(e), the entire plant is the affected facility.

§ 466.51 Definitions.

As used in this part, all terms not defined herein shall have the meaning given them in the Act:

(a) "Nitric acid plant" means any facility producing weak nitric acid by either the pressure or atmospheric pressure process.

(b) "Weak nitric acid" means acid which is 50 to 70 percent in strength.

§ 466.52 Standard for nitrogen oxides.

No person subject to the provisions of this subpart shall cause or allow the discharge into the atmosphere of nitrogen oxides in the effluent which are:

(a) In excess of 3 lbs. per ton of acid produced (1.5 Kgm. per metric ton), maximum 2-hour average, expressed as NO_2.

(b) A visible emission within the meaning of this part.

§ 466.53 Emission monitoring.

(a) There shall be installed, calibrated, maintained, and operated, in any nitric acid plant subject to the provisions of this subpart, an instrument for continuously monitoring and recording emissions of nitrogen oxides.

(b) The instrument installed and used pursuant to this section shall have a confidence level of at least 95 percent and be accurate within ±20 percent and shall be calibrated in accordance with the method(s) prescribed by the manufacturer(s) of such instrument; the instrument shall be calibrated at least once per year unless the manufacturer(s) specifies or recommends calibration at shorter intervals, in which case such specifications or recommendations shall be followed.

(c) The owner or operator of any nitric acid plant subject to the provisions of this subpart shall maintain a file of all measurements required by this subpart and shall retain the record of any such measurement for at least 1 year following the date of such measurement.

§ 466.54 Test methods and procedures.

(a) The provisions of this section are applicable to performance tests for determining emissions of nitrogen oxides from nitric acid plants.

(b) All performance tests shall be conducted while the affected facility is operating at or above the acid product rate for which such facility was designed.

(c) Test methods set forth in the appendix to this part shall be used as follows:

(1) For each repetition the NO_x concentration shall be determined by using Method 7. The sampling location shall be selected according to Method 1 and the sampling point shall be the centroid of the stack or duct. The sampling time shall be 2 hours and four samples shall be taken during each 2-hour period.

(2) The volumetric flow rate of the total effluent shall be determined by using Method 2 and traversing according to Method 1. Gas analysis shall be performed by Method 3, and moisture content shall be determined by Method 4.

(d) Acid produced, expressed in tons per hour of 100 percent weak nitric acid, shall be determined during each 2-hour testing period by suitable flow meters and shall be confirmed by a material balance over the production system.

(e) For each repetition, nitrogen oxides emissions, expressed in lb./ton of weak nitric acid, shall be determined by dividing the emission rate in lb./hr. by the acid produced. The emission rate shall be determined by the equation, lb./hr.$=Q\times C$, where Q=volumetric flow rate of the effluent in ft.^{3}/hr. at standard conditions, dry basis, as determined in accordance with § 466.54(d)(2), and $C=NO_x$ concentration in lb./ft.^{3}, as determined in accordance with § 466.54(d)(1), corrected to standard conditions, dry basis.

Subpart F—Standards of Performance for Sulfuric Acid Plants

§ 466.60 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to sulfur acid plants.

(b) For purposes of § 466.11(e) the entire plant is the affected facility.

§ 466.61 Definitions.

As used in this part, all terms not defined herein shall have the meaning given them in the Act:

(a) "Sulfuric acid plant" means any facility producing sulfuric acid by the contact process by burning elemental sulfur, alkylation acid, hydrogen sulfide, organic sulfides and mercaptans, or acid sludge.

(b) "Acid mist" means sulfur acid mist, as measured by test methods set forth in this part.

§ 466.62 Standard for sulfur dioxide.

No person subject to the provisions of this subpart shall cause or allow the discharge into the atmosphere of sulfur dioxide in the effluent in excess of 4 lbs. per ton of acid produced (2 kgm. per metric ton), maximum 2-hour average.

§ 466.63 Standard for acid mist.

No person subject to the provisions of this subpart shall cause or allow the discharge into the atmosphere of acid mist in the effluent which is:

(a) In excess of 0.15 lb. per ton of acid produced (0.075 Kgm. per metric ton), maximum 2-hour average, expressed as H_2SO_4.

(b) A visible emission within the meaning of this part.

§ 466.64 Emission monitoring.

(a) There shall be installed, calibrated, maintained, and operated, in any sulfuric acid plant subject to the provisions of this subpart, an instrument for continuously monitoring and recording emissions of sulfur dioxide.

(b) The instrument installed and used pursuant to this section shall have a confidence level of at least 95 percent and be accurate within ±20 percent and shall be calibrated in accordance with the method(s) prescribed by the manufacturer(s) of such instrument, the instrument shall be calibrated at least once per year unless the manufacturer(s) specifies or recommends calibration at shorter intervals, in which case such specifications or recommendations shall be followed.

(c) The owner or operator of any sulfuric acid plant subject to the provisions of this subpart shall maintain a file of all measurements required by this subpart and shall retain the record of any such measurement for at least 1 year following the date of such measurement.

§ 466.65 Test methods and procedures.

(a) The provisions of this section are applicable to performance tests for determining emissions of acid mist and sulfur dioxide from sulfuric acid plants.

(b) All performance tests shall be conducted while the affected facility is operating at or above the acid production rate for which such facility was designed.

(c) Test methods set forth in the appendix to this part shall be used as follows:

(1) For each repetition the acid mist and SO_2 concentrations shall be determined by using Method 8 and traversing according to Method 1. The sampling time shall be 2 hours, and sampling volume shall be 40 ft.^{3} corrected to standard conditions.

(2) The volumetric flow rate of the total effluent shall be determined by using Method 2 and traversing according to Method 1. Gas analysis shall be performed by Method 3. Moisture content can be considered to be zero.

(d) Acid produced, expressed in tons per hour of 100 percent sulfuric acid shall be determined during each 2-hour testing period by suitable flow meters and shall be confirmed by a material balance over the production system.

(e) For each repetition, acid mist and sulfur dioxide emissions, expressed in lb./ton of sulfuric acid shall be determined by dividing the emission rate in lb./hr. by the acid produced. The emission rate shall be determined by the equation, lb./hr.$=Q\times C$, where Q=volumetric flow rate of the effluent in ft.^{3}/hr. at standard conditions, dry basis, as determined in accordance with § 466.65(d)(2), and C=acid mist and SO_2 concentrations in lb./ft.^{3} as determined in accordance with § 466.65(d)(1), corrected to standard conditions, dry basis.

Appendix—Test Methods

Method 1—Sample and Velocity Traverses for Stationary Sources

1. *Principle and applicability.*

1.1 Principle. A sampling site and the number of traverse points are selected to aid in the extraction of a representative sample.

1.2 Applicability. This method should be applied only when specified by the test procedures for determining compliance with

New Source Performance Standards. This method is not intended to apply to gas streams other than those emitted directly to the atmosphere without further processing.

2. *Procedure.*

2.1 Selection of a sampling site and minimum number of traverse points.

2.1.1 Select a sampling site that is at least eight stack or duct diameters downstream and two diameters upstream from any flow disturbance such as a bend, expansion, contraction, or visible flame. For a rectangular cross section, determine an equivalent diameter from the following equation:

$$\text{equivalent diameter}=2\left[\frac{(\text{length})(\text{width})}{\text{length}+\text{width}}\right] \qquad \text{equation 1–1}$$

2.1.2 When the above sampling site criteria can be met, the minimum number of traverse points is twelve (12).

2.1.3 Some sampling situations render the above sampling site criteria impractical. When this is the case, choose a convenient sampling location and use Figure 1–1 to determine the minimum number of traverse points.

2.1.4 To use Figure 1–1 first measure the distance from the chosen sampling location to the nearest upstream and downstream disturbances. Determine the corresponding number of traverse points for each distance from Figure 1–1. Select the higher of the two numbers of traverse points, or a greater value, such that for circular stacks the number is a multiple of four, and for rectangular stacks the number follows the criteria of section 2.2.2.

2.2 Cross sectional layout and location of traverse points.

2.2.1 For circular stacks locate the traverse points on two perpendicular diameters according to Figure 1–2 and Table 1–1.

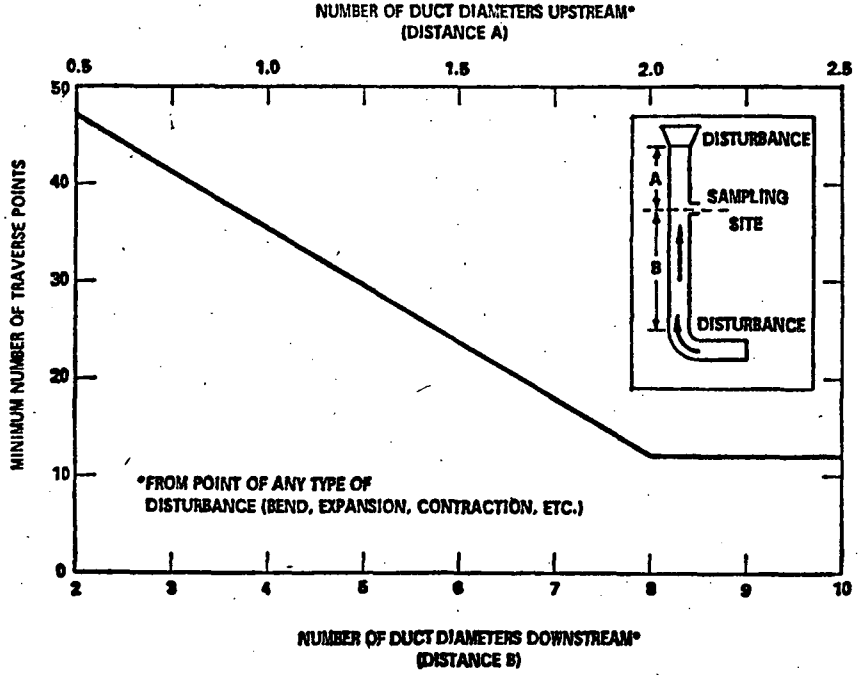

Figure 1-1. Minimum number of traverse points.

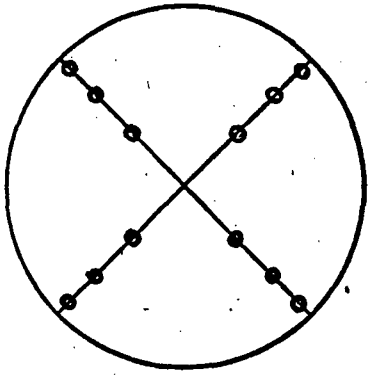

Figure 1-2. Cross section of circular stack showing location of traverse points on perpendicular diameters.

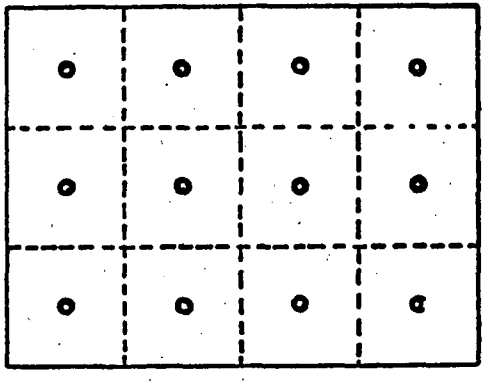

Figure 1-3. Cross section of rectangular stack divided into 12 equal areas, with traverse points at centroid of each area.

Table 1-1. Location of traverse points in circular stacks
(Percent of stack diameter from inside wall to traverse point)

Traverse point number on a diameter	Number of traverse points on a diameter									
	6	8	10	12	14	16	18	20	22	24
1	4.4	3.3	2.5	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	14.7	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	29.5	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	70.5	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5	85.3	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6	95.6	80.6	65.8	35.5	26.9	22.0	18.8	16.5	14.6	13.2
7		89.5	77.4	64.5	36.6	28.3	23.6	20.4	18.0	16.1
8		96.7	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9			91.8	82.3	73.1	62.5	38.2	30.6	26.1	23.0
10			97.5	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11				93.3	85.4	78.0	70.4	61.2	39.3	32.3
12				97.9	90.1	83.1	76.4	69.4	60.7	39.8
13					94.3	87.5	81.2	75.0	68.5	60.2
14					98.2	91.5	85.4	79.6	73.9	67.7
15						95.1	89.1	83.5	78.2	72.8
16						98.4	92.5	87.1	82.0	77.0
17							95.6	90.3	85.4	80.6
18							98.6	93.3	88.4	83.9
19								96.1	91.3	86.8
20								98.7	94.0	89.5
21									96.5	92.1
22									98.9	94.5
23										96.8
24										98.9

2.2.2. For rectangular stacks divide the cross section into as many equal rectangular areas as traverse points, such that the ratio of the length to the width of the elemental areas is between one and two. Locate the traverse points at the centroid of each equal area according to Figure 1-3.

3. *References.* Determining Dust Concentration in a Gas Stream. ASME Performance Test Code #27. New York. 1957.

Devorkin, Howard, et al. Air Pollution Source Testing Manual. Air Pollution Control District, Los Angeles. November 1963.

Methods for Determination of Velocity, Volume, Dust and Mist Content of Gases. Western Precipitation Division of Joy Manufacturing Co. Los Angeles. Bulletin WP-50. 1968.

Standard Method for Sampling Stacks for Particulate Matter. In: 1971 Book of ASTM Standards, Part 23. Philadelphia, 1971. ASTM Designation D-2928-71.

METHOD 2—DETERMINATION OF STACK GAS VELOCITY (TYPE S PITOT TUBE)

1. *Principle and applicability.*

1.1 Principle. Stack gas velocity is determined from the gas density and from measurement of the velocity head using a Type S (Stauscheibe or reverse type) pitot tube.

1.2 Applicability. This method should be applied only when specified by the test procedures for determining compliance with New Source Performance Standards. Being a directional instrument, a pitot tube should not be used in the case of nondirectional flow.

2. *Apparatus.*

2.1 Pitot tube—Type S (Figure 2-1), or equivalent.

2.2 Differential pressure gauge—Inclined manometer, or equivalent, to measure velocity head to within 10 percent of the minimum valve.

2.3. Temperature gauge—Thermocouples, bimetallic thermometers, liquid filled systems, or equivalent, to measure stack temperature to within 1.5 percent of the minimum absolute stack temperature.

2.4 Pressure gauge—Mercury-filled U-tube manometer, or equivalent, to measure stack pressure to within 0.1 in. Hg.

2.5 Barometer—To measure atmospheric pressure to within 0.1 in. Hg.

2.6 Gas analyzer—To analyze gas composition for determining molecular weight.

2.7 Pitot tube—Standard type, to calibrate Type S pitot tube.

3. *Procedure.*

3.1 Set up the apparatus as shown in Figure 2-1. Make sure all connections are tight and leak free. Measure the velocity head at the traverse points specified by Method 1.

3.2 Measure the temperature of the stack gas. If the total temperature variation with time is less than 50° F., a point measurement will suffice. Otherwise, conduct a temperature traverse.

3.3 Measure the static pressure in the stack.

3.4 Determine the stack gas molecular weight by gas analysis and appropriate calculation as indicated in Method 3.

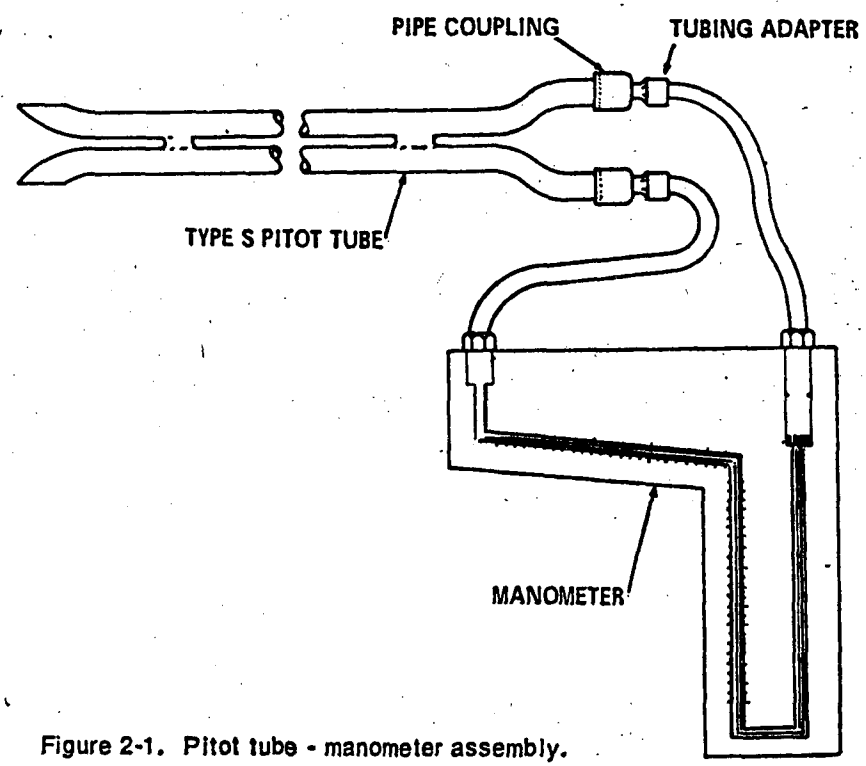

Figure 2-1. Pitot tube - manometer assembly.

4. *Calibration.*

4.1 To calibrate the pitot tube, measure the velocity head at some point in a flowing gas stream with both a Type S pitot tube and a standard type pitot tube with known coefficient. The velocity of the flowing gas stream should be within the normal working range.

4.2 Calculate the pitot tube coefficient using Equation 2-1.

$$C_{p_{test}} = C_{p_{std}} \sqrt{\frac{\Delta P_{std}}{\Delta P_{test}}} \quad \text{equation 2-1}$$

where:

$C_{p_{test}}$ = Pitot tube coefficient of Type S pitot tube.
$C_{p_{std}}$ = Pitot tube coefficient of standard type pitot tube (if unknown, use 0.99).
ΔP_{std} = Velocity head measured by standard type pitot tube.
ΔP_{test} = Velocity head measured by Type S pitot tube.

4.3 Compare the coefficients of the Type S pitot tube determined first with one leg and then the other pointed downstream. Use the pitot tube only if the two coefficients differ by no more than 0.01.

5. *Calculations.*

Use Equation 2-2 to calculate the stack gas velocity.

$$V_s = K_p C_p \sqrt{\frac{T_s \Delta_p}{P_s M_s}} \quad \text{equation 2-2}$$

where:

V_s = Stack gas velocity, feet per second (f.p.s.).

$K_p = 85.48 \frac{\text{ft.}}{\text{sec.}} \left(\frac{\text{lb.}}{\text{lb. mole} - {}^\circ\text{R}}\right)^{1/2}$ when these units are used.

C_p = Pitot tube coefficient, dimensionless.
T_s = Absolute stack gas temperature, °R.
Δ_p = Velocity head of stack gas, in H_2O (see fig. 2-2).
P_s = Absolute stack gas pressure, in Hg.
M_s = Molecular weight of stack gas, lb./lb.-mole.

PLANT_____

DATE_____

RUN NO._____

STACK DIAMETER, in._____

BAROMETRIC PRESSURE, in. Hg._____

STATIC PRESSURE IN STACK (P_g), in. Hg._____

OPERATORS_____

SCHEMATIC OF STACK CROSS SECTION

Traverse point number	Velocity head, in. H_2O	$\sqrt{\Delta_p}$	Stack Temperature (T_s), °F
AVERAGE:			

Figure 2-2. Velocity traverse data.

Figure 2-2 shows a sample recording sheet for velocity traverse data. Use the averages in the last two columns of Figure 2-2 to determine the average stack gas velocity from Equation 2-2.

6. *References.*

Mark, L. S. Mechanical Engineers' Handbook. McGraw-Hill Book Co., Inc., New York, 1951.

Perry, J. H. Chemical Engineers' Handbook. McGraw-Hill Book Co., Inc., New York, 1960.

Shigehara, R. T., W. F. Todd, and W. S. Smith. Significance of Errors in Stack Sampling Measurements. Paper presented at the Annual Meeting of the Air Pollution Control Association, St. Louis, Mo., June 14–19, 1970.

Standard Method for Sampling Stacks for Particulate Matter. In: 1971 Book of ASTM standards, Part 23. Philadelphia, 1971. ASTM Designation D-2928-71.

Vennard, J. K. Elementary Fluid Mechanics. John Wiley and Sons, Inc., New York, 1947.

METHOD 3—GAS ANALYSIS FOR CARBON DIOXIDE, EXCESS AIR, AND DRY MOLECULAR WEIGHT

1. *Principle and applicability.*

1.1 Principle. An integrated or grab gas sample is extracted from a sampling point and analyzed for its components using an Orsat analyzer.

1.2 Applicability. This method should be applied only when specified by the test procedures for determining compliance with New Source Performance Standards.

2. *Apparatus.*

2.1 Grab sample (Figure 3-1).

2.1.1 Probe—Stainless steel or Pyrex[1] glass, equipped with a filter to remove particulate matter.

2.1.2 Pump—One-way squeeze bulb, or equivalent, to transport gas sample to analyzer.

2.2 Integrated sample (Figure 3-2).

2.2.1 Probe—Stainless steel or Pyrex[1] glass equipped with a filter to remove particulate matter.

2.2.2 Air-cooled condenser—To remove any excess moisture.

2.2.3 Needle valve—To adjust flow rate.

2.2.4 Pump—Leak-free, diaphragm type, or equivalent, to pull gas.

2.2.5 Rate meter—To measure a flow range from 0 to 0.035 c.f.m.

2.2.6 Flexible bag—Tedlar,[1] or equivalent, with a capacity of 2 to 3 cu. ft. Leak test the bag in the laboratory before using.

2.2.7 Pitot tube—Type S, or equivalent, attached to the probe so that the sampling flow rate can be regulated proportional to the stack gas velocity when velocity is varying with time or a sample traverse is conducted.

2.3 Analysis.

2.3.1 Orsat analyzer, or equivalent.

3. *Procedure.*

3.1 Grab sampling.

3.1.1 Set up the equipment as shown in Figure 3-1. Place the probe in the stack at a sampling point and purge the sampling line.

[1] Trade name.

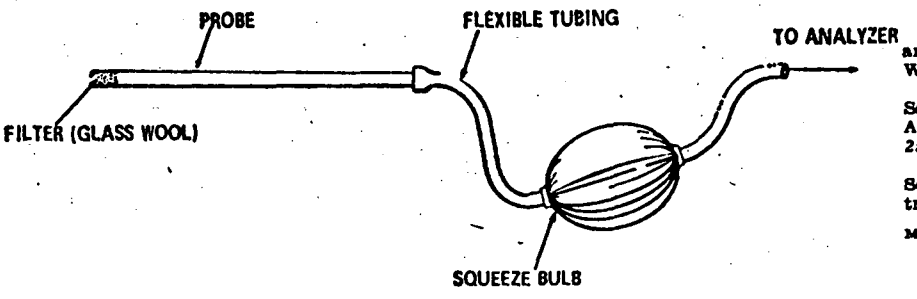

Figure 3-1. Grab-sampling train.

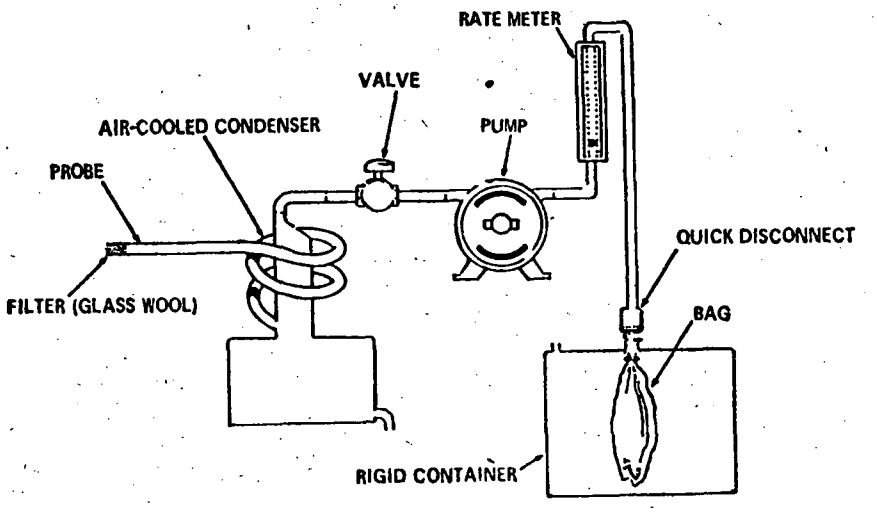

Figure 3-2. Integrated gas - sampling train.

3.1.2 Draw sample into the analyzer.

3.2 Integrated sampling.

3.2.1 Evacuate the flexible bag. Set up the equipment as shown in Figure 3-2 with the bag disconnected. Place the probe in the stack and purge the sampling line. Connect the bag, making sure that all connections are tight and that there are no leaks.

3.2.2 Sample at a rate proportional to the stack gas velocity.

3.3 Analysis.

3.3.1 Determine the CO_2, O_2, and CO concentrations as soon as possible. Make as many passes as are necessary to give constant readings. If more than 10 passes are necessary, replace the absorbing solution.

3.3.2 For integrated sampling, repeat the analysis until three consecutive runs vary no more than 0.2 percent by volume for each component being analyzed.

4. *Calculations.*

4.1 Carbon dioxide. Average the three consecutive runs and report result to the nearest 0.1 percent CO_2.

4.2 Excess air. Use Equation 3-1 to calculate excess air, and average the runs. Report the result to the nearest 0.1 percent excess air.

$$\%\ EA = \frac{(\%\ O_2) - 0.5(\%\ CO)}{0.264(\%\ N_2) - (\%\ O_2) + 0.5(\%\ CO)} \times 100$$

equation 3-1

where:

$\%EA$ = Percent excess air.

$\%O_2$ = Percent oxygen by volume, dry basis.

$\%N_2$ = Percent nitrogen by volume, dry basis.

$\%CO$ = Percent carbon monoxide by volume, dry basis.

0.264 = Ratio of oxygen to nitrogen in air by volume.

4.3 Dry molecular weight. Use Equation 3-2 to calculate dry molecular weight and average the runs. Report the result to the nearest tenth.

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

Equation 3-2

where:

M_d = Dry molecular weight, lb./lb.-mole.

$\%CO_2$ = Percent carbon dioxide by volume, dry basis.

$\%O_2$ = Percent oxygen by volume, dry basis.

$\%N_2$ = Percent nitrogen by volume, dry basis.

0.44 = Molecular weight of carbon dioxide divided by 100.

0.32 = Molecular weight of oxygen divided by 100.

0.28 = Molecular weight of nitrogen divided by 100.

5. *References*

Altshuller, A. P., et al. Storage of Gases and Vapors in Plastic Bags. Int. J. Air & Water Pollution. 6:75–81. 1963.

Conner, William D., and J. S. Nader. Air Sampling with Plastic Bags. Journal of the American Industrial Hygiene Association. 25:291–297. May–June 1964.

Devorkin, Howard, et al. Air Pollution Source Testing Manual. Air Pollution Control District. Los Angeles. November 1963.

METHOD 4—DETERMINATION OF MOISTURE IN STACK GASES

1. *Principle and applicability.*

1.1 Principle. Moisture is removed from the gas stream, condensed, and determined gravimetrically.

1.2 Applicability. This method is applicable for the determination of moisture in stack gas only when specified by test procedures for determining compliance with New Source Performance Standards. This method does not apply when liquid droplets are present in the gas stream.[2]

Other methods such as drying tubes, wet bulb-dry bulb techniques, and volumetric condensation techniques may be used subject to the approval of the Administrator.

2. *Apparatus.*

2.1 Probe—Stainless steel or Pyrex[1] glass sufficiently heated to prevent condensation and equipped with a filter to remove particulate matter.

2.2 Impingers—Two midget impingers, each with 30 ml. capacity, or equivalent.

2.3 Ice bath container—To condense moisture in impingers.

2.4 Silica gel tube—To protect pump and dry gas meter.

2.5 Needle valve—To regulate gas flow rate.

2.6 Pump—Leak-free, diaphragm type, or equivalent, to pull gas through train.

2.7 Dry gas meter—To measure to within percent of the total sample volume.

2.8 Rotameter—To measure a flow range from 0 to 0.1 c.f.m.

2.9 Balance—Capable of measuring to the nearest 0.1 g.

2.10 Barometer—Sufficient to read to within 0.1 in. Hg.

2.11 Pitot tube—Type S, or equivalent, attached to probe so that the sampling flow rate can be regulated proportional to the stack gas velocity when velocity is varying with time or a sample traverse is conducted.

3. *Procedure.*

3.1 Place about 5 ml. distilled water in each impinger and weigh the impinger and contents to the nearest 0.1 g. Assemble the apparatus without the probe as shown in Figure 4–1. Leak check by plugging the inlet to the first impinger and drawing a vacuum. Insure that flow through the dry gas meter is less than 1 percent of the sampling rate.

3.2 Connect the probe, and sample at a constant rate of 0.075 c.f.m. or at a rate proportional to the stack gas velocity not to exceed 0.075 c.f.m. Continue sampling until the dry gas meter registers 1 cu. ft. or until visible liquid droplets are carried over from the first impinger to the second. Record temperature, pressure, and dry gas meter reading as required by Figure 4–2.

3.3 After collecting the sample, weigh the impingers and their contents again to the nearest 0.1 g.

---

[1] Trade name.

[2] If liquid droplets are present in the gas stream, assume the stream to be saturated, determine the average stack gas temperature (Method 1), and use a psychrometric chart to obtain an approximation of the moisture percentage.

4. *Calculations.*

4.1 Volume of water collected.

$$V_{wc}=\frac{(W_f-W_i)RT_{std}}{P_{std}M_w}=\left(0.0474\frac{ft.^3}{g.}\right)(W_f-W_i) \quad \text{equation 4-1}$$

where:

V_{wc}=Volume of water vapor collected (standard conditions), cu. ft.

W_f=Final weight of impingers and contents, g.

W_i=Initial weight of impingers and contents, g.

R=Ideal gas constant, 21.83-in. Hg—cu. ft./lb. mole-° R.

T_{std}=Absolute temperature at standard conditions, 530° R.

P_{std}=Pressure at standard conditions, 29.92 in. Hg.

M_w=Molecular weight of water, 18 lb./lb. mole.

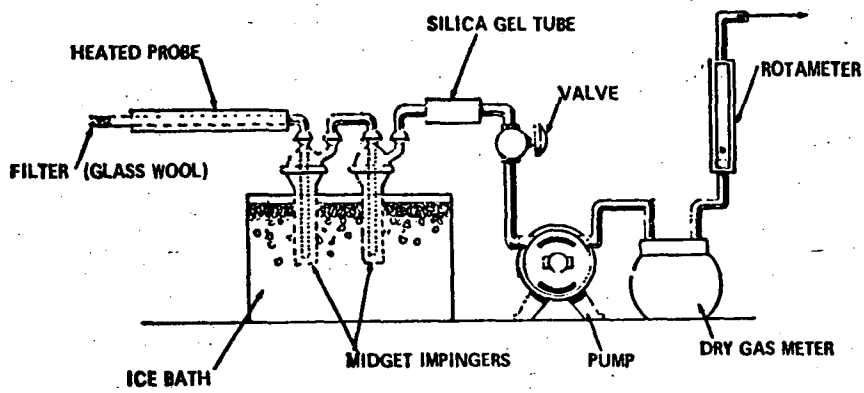

Figure 4-1. Moisture-sampling train.

LOCATION _____ COMMENTS

TEST _____

DATE _____

OPERATOR _____

BAROMETRIC PRESSURE _____

CLOCK TIME	GAS VOLUME THROUGH METER, (Vm), ft^3	ROTAMETER SETTING, ft^3/min	METER TEMPERATURE, °F

Figure 4-2. Field moisture determination.

4.2 Gas volume.

$$V_{mc}=V_m\left(\frac{P_m}{P_{std}}\right)\left(\frac{T_{std}}{T_m}\right)=\left(17.71\frac{°R}{in.\ Hg}\right)\frac{V_mP_m}{T_m} \quad \text{equation 4-2}$$

where:

V_{mc}=Dry gas volume through meter at standard conditions, cu. ft.

V_m=Dry gas volume measured by meter, cu. ft.

P_m=Barometric pressure at the dry gas meter, in. Hg.

P_{std}=Pressure at standard conditions, 29.92-in. Hg.

T_{std}=Absolute temperature at standard conditions, 530° R.

T_m=Absolute temperature at meter (°F.+460), °R.

4.3 Moisture content.

$$B_{wo}=\frac{V_{wc}}{V_{wc}+V_{mc}}+B_{wm}=\frac{V_{wc}}{V_{wc}+V_{mc}}+(0.025) \quad \text{equation 4-3}$$

where:

B_{wo}=Proportion by volume of water vapor in the gas stream, dimensionless.

V_{wc}=Volume of water vapor collected (standard conditions), cu. ft.

V_{mc}=Dry gas volume through meter (standard conditions), cu. ft.

B_{wm}=Approximate volumetric proportion of water vapor in the gas stream leaving the impingers, 0.025.

5. *References.*

Air Pollution Engineering Manual, Danielson, J. A. (ed.). U.S. DHEW, PHS, National Center for Air Pollution Control. Cincinnati, Ohio. PHS Publication No. 999-Ap-40. 1967.

Devorkin, Howard, et al. Air Pollution Source Testing Manual. Air Pollution Control District. Los Angeles, Calif. November 1963.

Methods for Determination of Velocity, Volume, Dust and Mist Content of Gases. Western Precipitation Division of Joy Manufacturing Co., Los Angeles, Calif. Bulletin WP-50. 1968.

METHOD 5.—DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

1. *Principle and applicability.*

1.1 Principle. Particulate matter is withdrawn isokinetically from the source and its weight is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of particulate emissions from stationary sources only when specified by the test procedures for determining compliance with New Source Performance Standards.

2. *Apparatus.*

2.1 Sampling train. The design specifications of the particulate sampling train used by EPA (Figure 5-1) are described in APTD-0581. Commercial models of this train are available.

2.1.1 Nozzle—Stainless steel (316) with sharp, tapered leading edge.

2.1.2 Probe—Pyrex [1] glass with a heating system capable of maintaining a gas temperature of 250° F. at the exit end during sampling. When temperature or length limitations are encountered, 316 stainless steel, or equivalent, may be used, as approved by the Administrator.

2.1.3 Pitot tube—Type S, or equivalent, attached to probe to monitor stack gas velocity.

2.1.4 Filter holder—Pyrex[1] glass with heating system capable of maintaining any temperature to a maximum of 225° F.

2.1.5 Impingers—Four impingers connected in series with glass ball joint fittings. The first, third, and fourth impingers are of the Greenburg-Smith design, modified by replacing the tip with a ½-inch ID glass tube extending to ½-inch from the bottom of the flask. The second impinger is of the Greenburg-Smith design with the standard tip.

2.1.6 Metering system—Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5° F., dry gas meter with 2 percent accuracy, and related equipment, or equivalent, as required to maintain an isokinetic sampling rate and to determine sample volume.

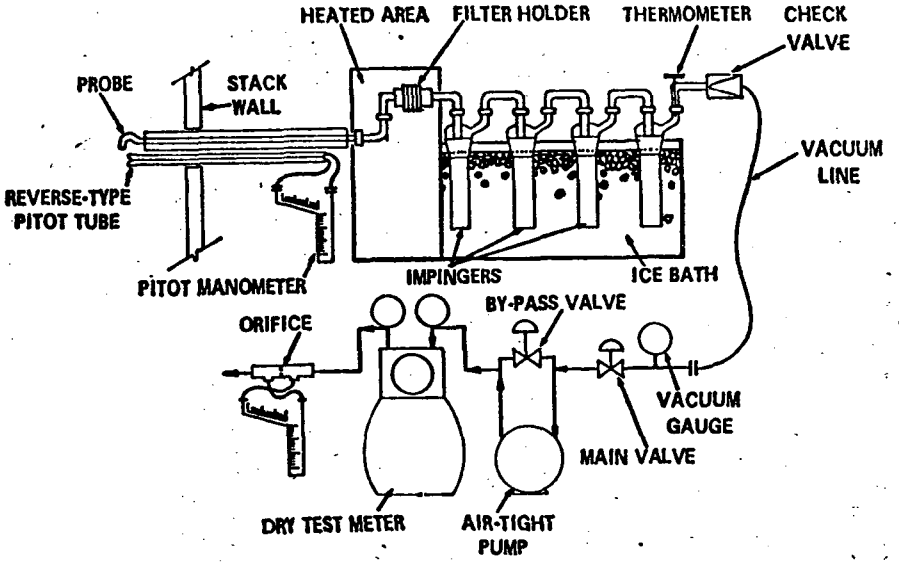

Figure 5-1. Particulate-sampling train.

2.1.7 Barometer—To measure atmospheric pressure to ±0.1 in. Hg.

2.2 Sample recovery.

2.2.1 Probe brush—At least as long as probe.

2.2.2 Glass wash bottles—Two.

2.2.3 Glass sample storage containers.

2.2.4 Graduated cylinder—250 ml.

2.3 Analysis.

2.3.1 Glass weighing dishes.

2.3.2 Desiccator.

2.3.3 Analytical balance—To measure to ±0.1 mg.

2.3.4 Beakers—250 ml.

2.3.5 Separatory funnels—500 ml. and 1,000 ml.

2.3.6 Trip balance—300 g. capacity, to measure to ±0.05 g.

2.3.7 Graduated cylinder—25 ml.

3. *Reagents.*

3.1 Sampling

3.1.1 Filters—Glass fiber, MSA 1106 BH, or equivalent, numbered for identification and preweighed.

3.1.2 Silica gel—Indicating type, 6 to 16 mesh, dried at 175° C. (350° F.) for 2 hours.

3.1.3 Water—Deionized, distilled.

3.1.4 Crushed ice.

3.2 Sample recovery

3.2.1 Water—Deionized, distilled.

3.2.2 Acetone—Reagent grade.

3.3 Analysis

3.3.1 Water—Deionized, distilled.

3.3.2 Chloroform—Reagent grade.

3.3.3 Ethyl ether—Reagent grade.

3.3.4 Desiccant—Drierite,[2] indicating.

4. *Procedure.*

4.1 Sampling.

4.1.1 After selecting the sampling site and the minimum number of sampling points, determine the stack pressure, temperature, moisture, and range of velocity head.

4.1.2 Preparation of collection train. Weigh to the nearest gram approximately 200 g. of silica gel. Label a filter of proper diameter, desiccate[2] for at least 24 hours and weigh to the nearest 0.5 mg. in a room where the relative humidity is less than 50 percent. Place 100 ml. of water in each of the first two impingers, leave the third impinger empty, and place approximately 200 g. of preweighed silica gel in the fourth impinger. Save a portion of the water for use as a blank in the sample analysis. Set up the train without the probe as in Figure 5-1. Leak check the sampling train at the sampling site by plugging the inlet to the filter holder and pulling a 15-in. Hg vacuum. A leakage rate not in excess of 0.02 c.f.m. at a vacuum of 15-in. Hg is acceptable. Attach the probe and adjust the heater to provide a gas temperature of about 250° F. at the probe outlet. Turn on the filter heating system. Place crushed ice around the impingers. Add more ice during the run to keep the temperature of the gases leaving the last impinger at 70° F. or less.

4.1.3 Particulate train operation. For each run record the data required on the example sheet shown in Figure 5-2. Take readings at each sampling point at least every 5 minutes and when significant changes in stack conditions necessitate additional adjustments in flow rate. To begin sampling, position the nozzle at the first traverse point with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Maintain isokinetic sampling throughout the sampling period. Nomographs are available which aid in the rapid adjustment of the sampling rate without other computations. APTD-0576 details the procedure for using these nomographs. Turn off the pump at the conclusion of each run and record the final readings. Remove the probe and nozzle from the stack and handle in accordance with the sample recovery process described in section 4.2.

[1] Trade name.

[2] Dry using Drierite[1] at 70° ± 10° F.

PLANT_____
LOCATION_____
OPERATOR_____
DATE_____
RUN NO._____
SAMPLE BOX NO._____
METER BOX NO._____
METER $\Delta H_@$ _____
C FACTOR_____

SCHEMATIC OF STACK CROSS SECTION

AMBIENT TEMPERATURE_____
BAROMETRIC PRESSURE_____
ASSUMED MOISTURE, %_____
HEATER BOX SETTING_____
PROBE LENGTH, in._____
NOZZLE DIAMETER, in._____
PROBE HEATER SETTING_____

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min,	STATIC PRESSURE (P_S), in. Hg.	STACK TEMPERATURE (T_S), °F	VELOCITY HEAD (ΔP_S),	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH), in. H_2O	GAS SAMPLE VOLUME (Vm), ft^3	GAS SAMPLE TEMPERATURE AT DRY GAS METER		SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
							INLET ($Tm_{in.}$), °F	OUTLET (Tm_{out}), °F		
TOTAL							Avg.	Avg.		
AVERAGE							Avg.			

Figure 5-2. Particulate field data.

4.2 Sample recovery. Exercise care in moving the collection train from the test site to the sample recovery area to minimize the loss of collected sample or the gain of extraneous particulate matter. Set aside portions of the water and acetone used in the sample recovery as blanks for analysis. Place the samples in containers as follows:

Container No. 1. Remove the filter from its holder, place in this container, and seal.

Container No. 2. Place loose particulate matter and acetone washings from all sample-exposed surfaces prior to the filter in this container and seal. Use a razor blade, brush, or rubber policeman to loosen adhering particles.

Container No. 3. Measure the volume of water from the first three impingers and place the water in this container. Place water rinsings of all sample-exposed surfaces between the filter and fourth impinger in this container prior to sealing.

Container No. 4. Transfer the silica gel from the fourth impinger to the original container and seal. Use a rubber policeman as an aid in removing silica gel from the impinger.

Container No. 5. Thoroughly rinse all sample-exposed surfaces between the filter and fourth impinger with acetone, place the washings in this container, and seal.

4.3 Analysis. Record the data required on the example sheet shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Transfer the filter and any loose particulate matter from the sample container to a tared glass weighing dish, desiccate, and dry to a constant weight. Report results to the nearest 0.5 mg.

Container No. 2. Transfer the acetone washings to a tared beaker and evaporate to dryness at ambient temperature and pressure. Dessicate and dry to a constant weight. Report results to the nearest 0.5 mg.

Container No. 3. Extract organic particulate from the impinger solution with three 25 ml. portions of chloroform. Complete the extraction with three 25 ml. portions of ethyl ether. Combine the ether and chloroform extracts, transfer to a tared beaker and evaporate at 70° F. until no solvent remains. Dessicate, dry to a constant weight, and report the results to the nearest 0.5 mg.

Container No. 4. Weigh the spent silica gel and report to the nearest gram.

PLANT_____

DATE_____

RUN NO._____

CONTAINER NUMBER	WEIGHT OF PARTICULATE COLLECTED, mg		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
1			
2			
3a*			
3b**			
5			
TOTAL			

*3a - ORGANIC EXTRACT FRACTION.
**3b - RESIDUAL WATER FRACTION.

	VOLUME OF LIQUID WATER COLLECTED		
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g	
FINAL			
INITIAL			
LIQUID COLLECTED			
TOTAL VOLUME COLLECTED		g*	ml

*CONVERT WEIGHT OF WATER TO VOLUME BY DIVIDING TOTAL WEIGHT INCREASE BY DENSITY OF WATER. (1 g/ml):

$$\frac{\text{INCREASE, g}}{\text{(1 g/ml)}} = \text{VOLUME WATER, ml}$$

Figure 5-3. Analytical data.

Container No. 5. Transfer the acetone washings to a tared beaker and evaporate to dryness at ambient temperature and pressure. Desiccate, dry to a constant weight, and report the results to the nearest 0.5 mg.

5. *Calibration.*

Use standard methods and equipment approved by the Administrator to calibrate the orifice meter, pitot tube, dry gas meter, and probe heater.

6. *Calculations.*

6.1 Sample concentration method.

6.1.1 Average dry gas meter temperature. See data sheet (Figure 5-2).

6.1.2 Dry gas volume. Correct the sample volume measured by the dry gas meter to standard conditions (70° F., 29.92 in. Hg) by using Equation 5-1.

$$V_{m_{std}} = V_m \left(\frac{T_{std}}{T_m}\right)\left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}}\right) = \left(17.71 \frac{^\circ R}{\text{in. Hg}}\right)(V_m)\left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}}\right)$$

equation 5-1

where:

$V_{m_{std}}$ = Volume of gas sample through the dry gas meter (standard conditions), cu. ft.

V_m = Volume of gas sample through the dry gas meter (meter conditions), cu. ft.

T_{std} = Absolute temperature at standard conditions, 530 °R.

T_m = Average dry gas meter temperature, °R.

P_{bar} = Barometric pressure at the orifice meter, in. Hg.

ΔH = Pressure drop across the orifice meter, in H_2O.

13.6 = Specific gravity of mercury.

P_{std} = Absolute pressure at standard conditions, 29.92 in. Hg.

6.1.3 Volume of Water vapor.

$$V_{w_{std}} = V_{l_c}\left(\frac{\rho_{H_2O}}{M_{H_2O}}\right)\left(\frac{RT_{std}}{P_{std}}\right) = \left(0.0474 \frac{\text{cu. ft.}}{\text{ml.}}\right)V_{l_c}$$

equation 5-2

where:

$V_{w_{std}}$ = Volume of water vapor in the gas sample (standard conditions), cu. ft.

V_{l_c} = Total volume of liquid collected in impingers and silica gel (see Figure 5-3), ml.

ρ_{H_2O} = Density of water, 1 g./ml.

M_{H_2O} = Molecular weight of water, 18 lb./lb. mole.

R = Ideal gas constant, 21.83 in Hg-cu. ft./lb. mole-°R.

T_{std} = Absolute temperature at standard conditions, 530° R.

P_{std} = Absolute pressure at standard conditions, 29.92 in. Hg.

6.1.4 Total gas volume.

$$V_{total} = V_{m_{std}} + V_{w_{std}}$$

equation 5-3

where:

V_{total} = Total volume of gas sample (standard conditions), cu. ft.

$V_{m_{std}}$ = Volume of gas through dry gas meter (standard conditions), cu. ft.

$V_{w_{std}}$ = Volume of water vapor in the gas sample (standard conditions), cu. ft.

6.1.5 Total particulate weight. Determine the total particulate catch from the sum of the weights on the analysis data sheet (Figure 5-3).

6.1.6 Concentration.

$$c_s' = \left(0.0154 \frac{\text{gr.}}{\text{mg.}}\right)\left(\frac{M_n}{V_{total}}\right)$$

equation 5-4

where:

c_s' = Concentration of particulate matter in stack gas (Sample Concentration Method), gr./s.c.f.

M_n = Total amount of particulate matter collected, mg.

V_{total} = Total volume of gas sample (standard conditions), cu. ft.

6.2 Ratio of area method.

6.2.1 Stack gas velocity. Collect the necessary data as detailed in Method 2. Correct the

stack gas velocity to standard conditions (29.92 in. Hg, 530° R.) as follows:

$$V_{s_{std}} = V_s\left(\frac{P_s}{P_{std}}\right)\left(\frac{T_{std}}{T_s}\right) = \left(17.71\,\frac{°R}{in.\ Hg}\right)\left(\frac{V_s P_s}{T_s}\right) \quad \text{equation 5-5}$$

where:

$V_{s_{std}}$ = Stack gas velocity at standard conditions, ft./sec.

V_s = Stack gas velocity calculated by Method 2, Equation 2-2, ft./sec.

P_s = Absolute stack gas pressure, in. Hg.

P_{std} = Absolute pressure at standard contions, 29.92 in. Hg.

T_{std} = Absolute temperature at standard conditions, 530° R.

T_s = Absolute stack gas temperature (average), °R.

6.2.2 Concentration.

$$c_s = \frac{M_s}{Q_s} = \frac{\frac{M_n}{\theta}\frac{A_s}{A_n}}{A_s V_{s_{std}}} = \left(2.57\times10^{-4}\,\frac{gr.=min.}{mg.=sec.}\right)\left(\frac{M_n}{\theta V_{s_{std}} A_n}\right) \quad \text{equation 5-6}$$

where:

c_s = Concentration of particulate matter in the stack gas (Ratio of Area Method), gr./s.c.f.

M_s = Particulate mass flow rate through the stack (standard conditions), mass/time.

Q_s = Volumetric flow rate of gas stream through the stack (standard conditions), volume/time.

M_n = Total amount of particulate matter collected by train, mg.

θ = Total sampling time, min.

A_s = Cross-sectional area of stack, sq. ft.

A_n = Cross-sectional area of nozzle, sq. ft.

$V_{s_{std}}$ = Stack gas velocity at standard conditions, ft./sec.

6.3 Isokinetic variation.

$$I = \frac{c_s}{c_s'}\times100 = \frac{T_s\left[\frac{V_{l_c}\rho_{H_2O}R}{M_{H_2O}} + \frac{V_m}{T_m}\left(P_{bar}+\frac{\Delta H}{13.6}\right)\right]}{\theta V_s P_s A_n}\times100 = \frac{\left(1.667\,\frac{min.}{sec.}\right)\left[\left(0.00267\,\frac{in.\ Hg\text{-}cu.\ ft.}{ml.\text{-}°R}\right)V_{lc} + \frac{V_m}{T_m}\left(P_{bar}+\frac{\Delta H}{13.6}\right)\right]T_s}{\theta V_s P_s A_n} \quad \text{equation 5-7}$$

where:

I = Percent of isokinetic sampling.

C_s = Concentration of particulate matter in the stack gas (Ratio of Area Method), gr./s.c.f.

C_s' = Concentration of particulate matter in the stack gas (Sample Concentration Method), gr./s.c.f.

V_{l_c} = Total volume of liquid collected in impingers and silica gel (see Figure 5-3), ml.

ρ_{H_2O} = Density of water, 1 g./ml.

R = Ideal gas constant, 21.83 in. Hg-cu. ft./lb. mole-°R.

M_{H_2O} = Molecular weight of water, 18 lb./lb. mole.

V_m = Volume of gas sample through the dry gas meter (meter conditions), cu. ft.

T_m = Absolute average dry gas meter temperature (see Figure 5-2), °R.

P_{bar} = Barometric pressure at sampling site, in Hg.

ΔH = Average pressure drop across the orifice (see Figure 5-2), in H_2O.

T_s = Absolute average stack gas temperature (see Figure 5-2), °R.

θ = Total sampling time, min.

V_s = Stack gas velocity calculated by Method 2, Equation 2-2, ft./sec.

P_s = Absolute stack gas pressure, in. Hg.

A_n = Cross-sectional area of nozzle, sq. ft.

6.4 Acceptable results. The following range sets the limit on acceptable isokinetic sampling results:

If 82 percent $<I<$120 percent, the results are acceptable; otherwise, reject the results and repeat the test.

6.5 Average particulate concentration. If the criteria for acceptability are met, calculate the average concentration of particulate in the stack from the following equation:

$$c_s = \frac{\bar{c}_s + c_s'}{2} \qquad \text{Equation 5-8}$$

where:

$\bar{c}_s$ = Average particulate concentration in the stack gas, gr./s.c.f.

c_s = Concentration of particulate matter in the stack gas (Ratio of Area Method), gr./s.c.f.

c_s' = Concentration of particulate matter in the stack gas (Sample Concentration Method), gr./s.c.f.

7. *References.*

Addendum to Specifications for Incinerator Testing at Federal Facilities. PHS, NCAPC. Dec. 6, 1967.

Martin, Robert M. Construction Details of Isokinetic Source Sampling Equipment. Environmental Protection Agency, APTD-0581.

Rom, Jerome J. Maintenance, Calibration, and Operation of Isokinetic Source Sampling Equipment. Environmental Protection Agency, APTD-0576.

Smith, W. S.; R. T. Shigehara, and W. F. Todd. A Method of Interpreting Stack Sampling Data. Paper presented at the 63d Annual Meeting of the Air Pollution Control Association, St. Louis. June 14–19, 1970.

Smith, W. S., et al. Stack Gas Sampling Improved and Simplified with New Equipment. APCA Paper No. 67–119. 1967.

Specifications for Incinerator Testing at Federal Facilities. PHS, NCAPC. 1967.

METHOD 6—DETERMINATION OF SULFUR DIOXIDE EMISSIONS FROM STATIONARY SOURCES

1. *Principle and applicability.*

1.1 Principle. A gas sample is extracted from the sampling point in the stack, and the acid mist including sulfur trioxide is separated from the sulfur dioxide. The sulfur dioxide fraction is measured by the barium-thorin titration method.

1.2 Applicability. This method is applicable for the determination of sulfur dioxide emissions from stationary sources only when specified by the test procedures for determining compliance with New Source Performance Standards.

2. *Apparatus.*

2.1 Sampling. See Figure 6-1

2.1.1 Probe—Pyrex[1] glass, approximately 5–6 mm. ID, with a heating system to prevent condensation and a filter to remove particulate matter including sulfuric acid mist.

2.1.2 Midget bubbler—One, with glass wool packed in top to prevent sulfuric acid mist carryover.

2.1.3 Glass wool.

2.1.4 Midget impingers—Three.

2.1.5 Drying tube—Packed with 6 to 16 mesh indicating-type silica gel, or equivalent, to dry the sample.

2.1.6 Pump—Leak-free, vacuum type.

2.1.7 Rate meter—Rotameter, or equivalent, to measure a 0–10 s.c.f.h. flow range.

2.1.8 Dry gas meter—Sufficiently accurate to measure the sample volume within 1 percent.

2.1.9 Pitot tube—Type S, or equivalent, necessary only if a sample traverse is required or if stack gas velocity varies with time.

2.2 Sample recovery.

2.2.1 Glass wash bottles—Two.

2.2.2 Polyethylene storage bottles—To store impinger samples.

2.3 Analysis.

[1] Trade name.

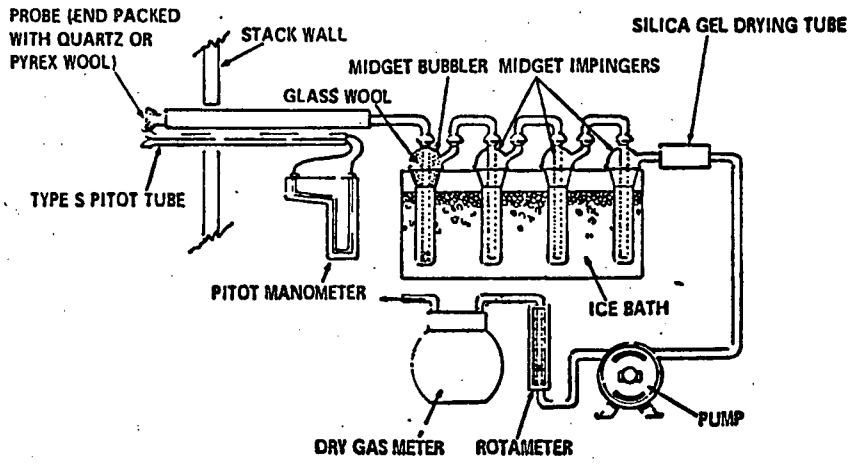

Figure 6-1. SO_2 sampling train.

CARBON MONOXIDE SAMPLING

Stack gas is drawn from the stack through a filter, into an MSA Lira* infrared analyzer. This instrument is mated to a Brush* Chart-strip recorder which reads out directly. The unit is calibrated on-site with a zero calibration gas (nitrogen) and a known span gas (238 ppm carbon monoxide).

SCRUBBER EFFLUENT WATER SAMPLING

Samples of scrubber water were composited in glass jars, as well as inlet (blanks) water samples, then total solids were measured by standard laboratory technique.

*Mention of a specific company or product does not constitute endorsement by EPA.

APPENDIX F

LABORATORY REPORT

Acetone Before

Total WT.

#035

SAMPLES Astabula W/C R/M

CR Beaker NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading / Blank	MG in ALIQ.		Weight - blank result	Result gms
16	ASE-1	75.9926 75.9275 0.0651	100 ml	75.9938 75.9275 0.0663	75.9938 75.9275 0.0663			0.0663 0.0009 0.0654	0.0654
17	ASE-2	78.5006 78.4153 0.0853	225 ml	78.5012 78.4153 0.0859	78.4982 78.4153 0.0829	78.4971 78.4153 0.0818	78.4961 78.4153 0.0808	78.4953 78.4153 0.0800	0.0791 0.0019 0.0772
18	ASE-3	78.6607 78.5876 0.0731	170 ml	78.6604 78.5876 0.0728	78.6595 78.5876 0.0719	78.6585 78.5876 0.0709	78.6585 78.5876 0.0709	0.0709 0.0014 0.0695	0.0695
19	SWH-1	80.5758 80.5031 0.0727	100 ml	80.5778 80.5031 0.0747	80.5770 80.5031 0.0739	80.5770 80.5031 0.0739		0.0739 0.0009 0.0730	0.0730
20	SWH-2	76.9103 76.8658 0.0445	80 ml	76.9113 76.8658 0.0455	76.9113 76.8658 0.0455			0.0455 0.0007 0.0448	0.0448
21	SWH-3	73.2081 73.1542 0.0539	240 ml	73.2094 73.1542 0.0552	73.2094 73.1542 0.0552			0.0552 0.0020 0.0532	0.0532
22	SEH-2	71.7508 71.7226 0.0282	50 ml	71.7518 71.7226 0.0292	71.7518 71.7226 0.0292			0.0292 0.0004 0.0288	0.0288
23	SEH-3	76.2699 76.2385 0.0314	60 ml	76.2710 76.2385 0.0325	76.2710 76.2385 0.0325			0.0325 0.0005 0.0320	0.0320
24	NEH-1	73.3224 73.2475 0.0749	75 ml	73.3243 73.2475 0.0768	73.3238 73.2475 0.0763	73.3238 73.2475 0.0763		0.0763 0.0006 0.0757	0.0757
25	NEH-2	78.6131 78.5551 0.0580	75 ml	78.6137 78.5551 0.0586	78.6137 78.5551 0.0586			0.0586 0.0006 0.0580	0.0580
26	NEH-3	72.0279 71.9765 0.0514	100 ml	72.0286 71.9765 0.0521	72.0286 71.9765 0.0521			0.0521 0.0009 0.0512	0.0512
27	NWH-1	71.4406 71.3798 0.0608	140 ml	71.4412 71.3798 0.0614	71.4408 71.3798 0.0610	71.4410 71.3798 0.0612	71.4408 71.3798 0.0610	0.0610 0.0012 0.0598	0.0598
28	NWH-2	70.8742 70.8467 0.0275	50 ml	70.8744 70.8467 0.0277	70.8745 70.8467 0.0278	70.8745 70.8467 0.0278		0.0278 0.0004 0.0274	0.0274
29	NWH-3	72.1920 72.1531 0.0389	50 ml	72.1922 72.1531 0.0391	72.1925 72.1531 0.0394	72.1920 72.1531 0.0389		0.0389 0.0004 0.0385	0.0385
30	BTF-1	77.3393 77.1988 0.1405	100 ml	77.3403 77.1988 0.1415	77.3399 77.1988 0.01411	77.3403 77.1988 0.1415		0.1415 0.0009 0.1406	0.1406

0.0772

Looks like some silica gel

Project No. 859 617

Collection Date ____________

Analysis Date ____________

#17 78.4944 / 78.4153 / 0.0791 — 78.4944 / 78.4153 / 0.0791

gra ICB

F-1

Acetone Before TOTal WT.

#035

SAMPLES Astatula U/C R/M

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading Blank	MG in ALIQ.			gms
31	BTE-2	74.7314 74.6704 0.0640	150 ml	74.7353 74.6704 0.0649	74.7353 74.6704 0.0649			0.0649 0.0013 0.0636	0.0636
32	BTE-3	75.2447 75.1540 0.0907	110 ml	75.2452 75.1540 0.0912	75.2448 75.1540 0.0909	75.2453 75.1540 0.0913	75.2447 75.1540 0.0907	0.0907 0.0009 0.0898	0.0898
33	BSE-1	81.2461 81.2184 0.0277	170 ml	81.2470 81.2184 0.0286	81.2465 81.2184 0.0281	81.2465 81.2184 0.0281		0.0281 0.0014 0.0267	0.0267
34	BSE-2	71.2850 71.2765 0.0085	70 ml	71.2857 71.2765 0.0092	71.2857 71.2765 0.0092			0.0092 0.0006 0.0086	0.0086
35	BSE-3	76.9278 76.9237 0.0041	50 ml	76.9289 76.9237 0.0052	76.9289 76.9237 0.0052			0.0052 0.0004 0.0048	0.0048

Project No. 859617

Collection Date _____

Analysis Date _____

JRA CCK

9 S Filters #035
Total Wt

SAMPLES Astabula W/C R/m

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading / Blank	MG in ALIQ.			gms.
1	SHE-1	27.8139	28.4082	28.4084	28.4080	28.4073	28.4069	20.4075	
		0.1770	28.1691	28.1691	28.1691	28.1691	28.1691	28.1691	
	000186	0.1782	0.2391	0.2393	0.2389	0.2388	0.2378	0.2384	0.2384
1	SHE-1	28.1691							
	000098								
2	SHE-2	27.9201	29.8868	29.8863	29.8860	29.8858	29.8854		
		0.6708	28.5909	28.5909	28.5909	28.5909	28.5909		
	000256	28.5909	1.2959	1.2954	1.2951	1.2949	1.2949		1.2949
3	SHE-2	26.9053	28.1380	28.1380					
		0.6991	27.6044	27.6044					
	000258	27.6044	0.5336	0.5336					0.5336
4	SHE-3	27.6956	30.0191	30.0191					
		0.6634	28.3590	28.3590					
	000251	28.3590	1.6601	1.6601					1.6601
5	SHE-4	25.5403	26.5559	26.5562	26.5356	26.5362			
		0.6542	26.1945	26.1945	26.1945	26.1945			
	000253	26.1945	0.3614	0.3617	0.3611	0.3617			0.3617
6	CHE-2	27.2661	28.8393	28.8393					
		0.6835	27.9496	27.9496					
	000255	27.9496	0.8897	0.8897					0.8897
7	CHE-3	24.7652	26.0697	26.0699	26.0691	26.0691			
		0.6749	25.4401	25.4401	25.4401	25.4401			
	000252	25.4401	0.6296	0.6298	0.6290	0.6290			0.6290
8	CHE-4	25.3394	26.1470	26.1470					
		0.6821	26.0215	26.0215					
	000257	26.0215	0.1255	0.1255					0.1255
9	NHE-1	25.6957	26.4013	26.4022	26.4013				
		0.1762	26.0452	26.0452	26.0452				
	000161	25.8719	0.3561	0.3570	0.3561				0.3561
9	NHE-1	0.1733							
		26.0452							
	000105								
10	NHE-2	27.8393	29.7694	29.7700	29.7681	29.7689	29.7681		
		0.6709	28.5102	28.5102	28.5102	28.5102	28.5102		
	000254	28.5102	1.2592	1.2598	1.2579	1.2587	1.2579		1.2579
11	NHE-3	28.6921	30.3760	30.3768	30.3768				
		0.6792	29.3713	29.3713	29.3713				
	000259	29.3713	1.0047	1.0055	1.0055				1.0055
12	NHE-4	28.2588	29.1103	29.1103					
		0.6821	28.9409	28.9409					
	000247	28.9409	0.1694	0.1694					0.1694
13	ATE-1	28.8060	29.1401	29.1403	29.1399	29.1399			
		0.1755	28.9815	28.9815	28.9815	28.9815			
	000115	28.9815	0.1586	0.1588	0.1584	0.1589			0.1584

Project No. 859612

Collection Date _____

Analysis Date _____

gnt 006

9 f filters
Total wt. #035

SAMPLES Astabula u/c R/m

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading / Blank	MG in ALIQ.			gms
14	ATE-2	28.4909	29.2502	29.2507	29.2507				
	000250	0.6782	29.1691	29.1691	29.1691				0.0816
		29.1691	0.0811	0.0816	0.0816				
15	ATE-3	26.2652	27.1370	27.1370					
	000231	0.6960	26.9612	26.9612					0.1758
		26.9612	0.1758	0.1758					
16	ASE-1	28.0737	28.2664	28.2660	28.2635	28.2632	28.2630	28.2632	
	000159	0.1787	28.2524	28.2524	28.2524	28.2524	28.2524	28.2524	0.0108
		28.2524	0.0140	0.0136	0.0111	0.0108	0.0106	0.0108	
17	ASE-2	30.4855	30.6608	30.6608					
	000217	0.1721	30.6576	30.6576					0.0032
		30.6576	0.0032	0.0032					
18	ASE-3	26.9317	27.1131	27.1136	27.1134	27.1136			
	000105	0.1775	27.1092	27.1092	27.1092	27.1092			0.0044
		27.1092	0.0039	0.0044	80042	0.0044			
19	SWH-1	27.4934	28.2752	28.2752					
	000232	0.6775	28.1709	28.1709					0.1043
		28.1709	0.1043	0.1043					
20	SWH-2	26.2622	26.9877	26.9875	26.9875				
	000236	0.6749	26.9371	26.9371	26.9371				0.0504
		26.9371	0.0506	0.0504	0.0504				
21	SWH-3	23.9231	24.6585	24.6585					
	000234	0.6662	24.5893	24.5893					0.0692
		24.5893	0.0692	0.0692					
22	SEH-2	27.8527	28.5703	28.5705	28.5698	28.5705			
	000233	0.6779	28.5306	28.5306	28.5306	28.5306			0.0399
		28.5306	0.0397	0.0399	0.0392	0.0399			
23	SEH-3	25.3177	26.0492	26.0487	26.0489	26.0487			
	000226	0.6762	25.9939	25.9939	25.9939	25.9939			0.0548
		25.9939	0.0553	0.0548	0.0550	0.0548			
24	NEH-1	26.6753	27.7082	27.7079	27.7076	27.7076			
	000237	0.6951	27.3704	27.3704	27.3704	27.3704			0.3372
		27.3704	0.3378	0.3375	0.3372	0.3372			
25	NEH-2	26.2335	27.0566	27.0566					
	000230	0.6770	26.9105	26.9105					0.1461
		26.9105	0.1461	0.1461					
26	NEH-3	27.2204	28.0557	28.0557					
	000227	0.6769	27.8973	27.8973					0.1584
		27.8973	0.1584	0.1584					
27	NWH-1	28.1453	28.8822	28.8824	28.8819	28.8824			
	000235	0.6666	28.8119	28.8119	28.8119	28.8119			0.0705
		28.8119	0.0703	0.0705	0.0700	0.0705			
28	NWH-2	27.8749	28.5861	28.5862	28.5859	28.5859			
	000246	0.6790	28.5539	28.5539	28.5539	28.5539			0.0320
		28.5539	0.0322	0.0323	0.0320	0.0320			

Project No. _____

Collection Date _____

Analysis Date _____

JRA CCF

G.F. Filters
Total Wt.
#035

SAMPLES Astabula W/C R/M

NO.	CR	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading / Blank	MG in ALIQ.			gms
	29	NWH-3	27.8708	28.5944	28.5938	28.5942	28.5942			
			0.6920	28.5628	28.5628	28.5628	28.5628			
		006229	28.5628	0.0316	0.0310	0.0314	0.0314			0.0314
	30	RTE-1	25.5526	26.6420	26.6412	26.6412				
			0.6932	26.2458	26.2458	26.2458				
		000239	26.2458	0.3962	0.3954	0.3954				0.3754
	31	RTE-2	25.7023	26.8037	26.8037					
			0.6840	26.3863	26.3863					
		000228	26.3863	0.4174	0.4174					0.4174
	32	RTE-3	28.4034	29.4474	29.4467	29.4474				
			0.6680	29.0714	29.0714	29.0714				
		000238	29.0714	0.3760	0.3753	0.3760				0.3760
	33	RSE-1	24.6626	24.9089	24.9093	24.9093				
			0.1753	24.8379	24.8379	24.8379				
		000119	24.8379	0.0710	0.0714	0.0714				0.0714
	34	RSE-2	26.1218	26.3351	26.3351					
			0.1726	26.2994	26.2994					
		000120	26.2994	0.0357	0.0357					0.0357
	35	RSE-3	25.6080	25.8479	25.8482	25.8482				
			0.1756	25.7836	25.7836	25.7836				
		000129	25.7836	0.0643	0.0646	0.0646				0.0646
	36	Blank	25.0441	25.2166	25.2171	25.2175	25.2175		25.2175	
			0.1728	25.2169	25.2169	25.2169	25.2169		25.0441	
		000142	25.2169	-0.0003	0.0002	+0.0006	0.0006		.1734	0.0006

Project No. 859617

Collection Date _____

Analysis Date _____

JM CCB

Acetone After Total WT

#035

SAMPLES Astabula [illegible]

CR Beaker NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading / Blank	MG in ALIQ.			gms
36	SHE-1	78.9490 78.9395 0.0095	125 ml	78.9497 78.9395 0.0102	78.9497 78.9395 0.0102			0.0102 0.0011 0.0091	0.0091
37	SHE-2	79.3314 79.3150 0.0164	150 ml	79.3325 79.3150 0.0175	79.3328 79.3150 0.0178	79.3328 79.3150 0.0178		0.0178 0.0013 0.0165	0.0165
38	SHE-3	71.9690 71.9605 0.0085	90 ml	71.9707 71.9605 0.0102	71.9705 71.9605 0.0100	71.9705 71.9605 0.0100		0.0100 0.0008 0.0092	0.0092
39	SHE-1	75.6351 75.6313 0.0038	60 ml	75.6365 75.6313 0.0052	75.6365 75.6313 0.0052			0.0052 0.0005 0.0047	0.0047
[illegible]	[illegible]-2	71.6018 71.5937 0.0081	80 ml	71.6030 71.5937 0.0093	71.6032 71.5937 0.0095	71.6032 71.5937 0.0095		0.0095 0.0007 0.0088	0.0088
41	[illegible]-3	80.1592 80.1346 0.0246	125 ml	80.1607 80.1346 0.0261	80.1607 80.1346 0.0261			0.0261 0.0011 0.0250	0.0250
42	[illegible]HE-4	80.0537 80.0448 0.0089	100 ml	80.0551 80.0448 0.0103	80.0554 80.0448 0.0106	80.0554 80.0448 0.0106		0.0106 0.0009 0.0097	0.0097
43	NHE-1	75.7711 75.7629 0.0082	140 ml	75.7730 75.7629 0.0101	75.7730 75.7629 0.0101			0.0101 0.0012 0.0089	0.0089
44	MHE-2	72.3501 72.3334 0.0167	110 ml	72.3513 72.3334 0.0179	72.3513 72.3334 0.0179			0.0179 0.0009 0.0170	0.0170
45	NHE-3	75.2070 75.2020 0.0050	80 ml	75.2081 75.2020 0.0061	75.2082 75.2020 0.0062	75.2084 75.2020 0.0064	75.2074 75.2020 0.0054	75.2074 75.2020 0.0054	0.0054 0.0007 0.0047 (0.0047)
46	NHE-4	77.9012 77.8970 0.0042	50 ml.	77.9027 77.8970 0.0057	77.9027 77.8970 0.0057			0.0057 0.0004 0.0053	0.0053
47	ATF-1	79.2909 79.2851 0.0058	75 ml	79.2923 79.2851 0.0072	79.2923 79.2851 0.0072			0.0072 0.0006 0.0066	0.0066
48	ATF-2	74.8533 74.8194 0.0339	110 ml	74.8544 74.8194 0.0350	74.8546 74.8194 0.0352	74.8546 74.8194 0.0352		0.0352 0.0009 0.0343	0.0343
49	ATF-3	73.3175 73.3145 0.0030	110 ml	73.3178 73.3145 0.0033	73.3178 73.3145 0.0033			0.0033 0.0009 0.0024	0.0024
50	ASE-1	78.0971 78.0789 0.0182	90 ml	78.0982 78.0789 0.0193	78.0979 78.0789 0.0190	78.0988 78.0789 0.0199	78.0982 78.0789 0.0193	0.0193 0.0008 0.0185	0.0185

Project No. 859617

Collection Date ____________

Analysis Date ____________

CCA

Acetone After
Tot. P
wt.

#035

SAMPLES Astabula ... P/m

NO.	CR	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading Blank	MG in ALIQ.			gms
X		ASE-2 NOT taken	X	X	X					X
X		ASE-3 Not taken	X	X	X					X
51		SWH-1	79.4487 79.4426 0.0061	110 ml	79.4490 79.4426 0.0064	79.4486 79.4426 0.0060	79.4492 79.4426 0.0066	79.4490 79.4426 0.0064	0.0064 0.0009 0.0055	0.0055
52		SWH-2	72.9987 72.9478 0.0509	90 ml	72.9993 72.9478 0.0515	72.9996 72.9478 0.0518	73.0000 72.9478 0.0522	72.9993 72.9478 0.0515	0.0515 0.0008 0.0507	0.0507
53		SWH-3	76.1793 76.1600 0.0193	180. ml	76.1793 76.1600 0.0193				0.0193 0.0015 0.0178	0.0178
54		SEH-2	78.0369 78.0327 0.0042	70 ml	78.0367 78.0327 0.0040	78.0369 78.0327 0.0042			0.0042 0.0006 0.0036	0.0036
55		SEH-3	71.2608 71.2566 0.0042	40 ml	71.2608 71.2566 0.0042				0.0042 0.0003 0.0039	0.0039
56		NEH-1	74.7106 74.7018 0.0088	140 ml	74.7106 74.7018 0.0088				0.0088 0.0012 0.0076	0.0076
57		NEH-2	78.0031 77.9918 0.0113	75 ml	78.0031 77.9918 0.0113				0.0113 0.0006 0.0107	0.0107
58		NEH-3	85.4331 85.4190 0.0141	175 ml	85.4339 85.4190 0.0149	85.4343 85.4190 0.0153	85.4339 85.4190 0.0149		0.0149 0.0015 0.0134	0.0134
59		NWH-1	79.2704 79.2629 0.0075	120 ml	79.2704 79.2629 0.0075				0.0075 0.0010 0.0065	0.0065
60		NWH-2	75.9970 75.9924 0.0046	30 ml	75.9968 75.9924 0.0044	75.9973 75.9924 0.0049	75.9973 75.9924 0.0049		0.0049 0.0003 0.0046	0.0046
61		NWH-3	68.1774 68.1667 0.0107	90 ml	68.1780 68.1667 0.0113	68.1791 68.1667 0.0124	68.1780 68.1667 0.0113		0.0113 0.0008 0.0105	0.0105
62		BTE-1	78.1037 78.0924 0.0113	110 ml	78.1045 78.0924 0.0121	78.1054 78.0924 0.0130	78.1045 78.0924 0.0121		0.0121 0.0009 0.0112	0.0112
63		BTE-2	84.7105 84.6840 0.0265	120 ml	84.7110 84.6840 0.0270	84.7115 84.6840 0.0275	84.7105 84.6840 0.0265		0.0265 0.0010 0.0255	0.0255

Project No. 559617

Collection Date ____________

Analysis Date ____________

CCK.

Acetone After Total Wt.

#035

SAMPLES A-Tabular W/e R/m

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading Blank	MG in ALIQ.			gms
64	BTE-3	86.0143 86.0043 0.0100	140ml	86.0147 86.0043 0.0104	86.0155 86.0043 0.0112	86.0144 86.0043 0.0101	86.0147 86.0043 0.0104	0.0104 0.0012 0.0092	0.0092
65	BSE-1	98.0975 98.0899 0.0076	160ml	98.0980 98.0899 0.0081	98.0989 98.0899 0.0081			0.0081 0.0014 0.0067	0.0067
66	BSE-2	89.0334 89.0084 0.0250	100ml	89.0338 89.0084 0.0254	89.0344 89.0084 0.0260	89.0336 89.0084 0.0252	89.0338 89.0084 0.0254	0.0254 0.0009 0.0245	0.0245
67	BSE-3	84.1001 84.0927 0.0074	60ml	84.1003 84.0927 0.0076	84.1010 84.0927 0.0083	84.1000 84.0927 0.0073	84.1006 84.0927 0.0079	84.1000 84.0927 0.0073	0.0073 0.0005 0.0068
33c	Control	87.5221 87.5214 +0.0007	87.5221 87.5222 −0.0001	87.5217 87.5222 87.5214					

0.0068

Project No. 559617

Collection Date _____

Analysis Date _____

Ck.

Silica gel
Total wt
gained

#035

SAMPLES Astabula W/C R/m

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading / Blank	MG in ALIQ.			gms
	SHE-1	413.1 387.9 25.2							25.2
	SHE-2	400.6 383.4 17.2							17.2
	SHE-3	403.2 385.5 17.7							17.7
	SHE-4	396.3 384.7 11.6							11.6
	CHE-2	393.0 378.2 14.8							14.8
	CHE-3	401.5 385.1 16.4							16.4
	CHE-4	400.7 390.7 10.0							10.0
	MHE-1	407.9 383.5 24.4							24.4
	MHE-2	403.7 386.4 17.3							17.3
	MHE-3	409.7 392.2 17.5							17.5
	MHE-4	404.7 389.5 15.2							15.2
	ATE-1	389.3 382.2 7.1							7.1
	ATE-2	393.1 389.2 3.9							3.9
	ATE-3	391.8 386.5 5.3							5.3
	ASE-1	381.8 379.0 2.8							2.8

Project No. 859617

Collection Date _____

Analysis Date _____

Silica gel
Total wt. gained

#035

SAMPLES Astabula W/C R/m

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading Blank	MG in ALIQ.			gms
	ACE-2	399.5 392.0 7.5							7.5
	ACE-3	397.5 387.3 10.2							10.2
	SWH-1	398.3 380.7 17.6							17.6
	SWH-2	393.0 377.6 15.4							15.4
	SWH-4	397.5 380.0 17.5							17.5
	SEH-2	399.1 392.2 6.9							6.9
	SEH-3	389.7 379.6 10.1							10.1
	NEH-1	386.1 376.7 9.4							9.4
	NEH-2	396.8 385.4 11.4							11.4
	NEH-3	398.7 385.5 13.2							13.2
	NWH-1	398.8 384.6 14.2							14.2
	NWH-2	396.5 382.5 14.0							14.0
	NWH-3	393.6 380.7 12.9							12.9
	BTE-1	391.8 379.0 12.8							12.8
	BTE-2	400.3 383.0 17.3							17.3

Project No. 859617

Collection Date _____

Analysis Date _____

PH @ C4

Silica gel #030

Total µ gained

SAMPLES Astabula U/c R/m

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading Blank	MG in ALIQ.			gm
	BTE-3	419.3 391.9 27.4							27.4
	BSE-1	395.6 381.6 14.0							14.0
	BSE-2	390.9 377.7 13.2							13.2
	BSE-3	405.6 386.5 19.1							19.1

Project No. 859617

Collection Date _____

Analysis Date _____

JPA 1C6.

035

SAMPLES Union Carbide – (EPA Contract)
Ashtabula, Ohio. – Water Samples

NO.	CR	LOCATION and SAMPLE NO.	Total Volume	SAMPLE WEIGHT	TIT. ALIQ.	Reading Blank	MG in ALIQ.			grams per liter / 100 mls.	
17	1	Inlet to Scrubber 2/17/72	460	230					18.0286 17.8302 0.1984	0.0863	
18	2	Inlet to Scrubber #13 1525 2/23/72	275	275					18.1823 18.1305 0.0518	0.0188	
19	3	NSW-1 1400-1420 After WEir plate 2/17/72	195	100					17.3482 17.2423 0.1059	0.1059	Black
20	4	NSW-2 1545-1630 Before WEir plate 2/17/72	320	100					17.0596 16.9187 0.1409	0.1409	"
23	5	SSW-1 1400-1420 Before WEir plate 2/17/72	200	100					17.8957 17.6527 0.2430	0.2430	"
24	6	SSW-2 1545-1630 Before WEir plate 2/17/72	395	100					17.7645 17.6102 0.1543	0.1543	"
25	7	BSE-2 Scrubber water #13	295	100					17.4373 17.0587 0.3786	0.3786	"
26	8	BSE-3 #13 Scrubber water	405	100					17.9663 17.7051 0.2612	0.2612	"
28	9	#13 Scrubber water 2/23/72 1525-1600	305	100					18.5207 18.1866 0.3341	0.3341	"

Project No. 8595-17

Collection Date _____

Analysis Date March 29, 1972

JME JRT

Acetone Before Total WT

SAMPLES Astaburg 1:1 R/M

±035

Beaker NO.	CR	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading / Blank	MG in ALIQ.		Weight - blank / result	gms
1		Acetone Blank	71.6396 71.6386 0.0010	200 ml	71.6403 71.6386 0.0017	71.6403 71.6386 0.0017			0.0017	0.0017
2		SHE-1	71.4307 71.4011 0.0296	160 ml	71.4312 71.4011 0.0301	71.4312 71.4011 0.0301			0.0301 0.0014 0.0287	0.0287
3		SHE-2	76.2093 75.9125 0.2968	450 ml	76.2106 75.9125 0.2980	76.2098 75.9125 0.2973	76.2102 75.9125 0.2977	76.2093 75.9125 0.2968	0.2968 0.0038 0.2930	0.2930
4		SHE-3	79.4508 79.2476 0.2032	200 ml	79.4515 79.2476 0.2039	79.4511 79.2476 0.2035	79.4515 79.2476 0.2039		0.2039 0.0017 0.3022	0.2022
5		SHE-4	79.9484 79.8805 0.0679	100 ml	79.9493 79.8805 0.0688	79.9493 79.8805 0.0688			0.0688 0.0009 0.0679	0.0679
6		CHE-2	79.3371 79.2602 0.0769	100 ml	79.3377 79.2602 0.0775	79.3377 79.2602 0.0775			0.0775 0.0009 0.0766	0.0766
7		CHE-3	71.2935 71.2057 0.0878	175 ml	71.2940 71.2057 0.0883	71.2944 71.2057 0.0887	71.2944 71.2052 0.0887		0.0887 0.0015 0.0872	0.0872
8		CHE-4	74.1666 74.1154 0.0512	125 ml	74.1672 74.1154 0.0518	74.1672 74.1154 0.0518			0.0518 0.0011 0.0507	0.0507
9		NHE-1	74.0100 73.9407 0.0693	210 ml	74.0101 73.9407 0.0694	74.0104 73.9407 0.0697	74.0110 73.9407 0.0703	74.0104 73.9407 0.0697	0.0697 0.0018 0.0679	0.0679
10		NHE-2	80.0851 79.8488 0.2363	175 ml	80.0856 79.8488 0.2368	80.0858 79.8488 0.2370	80.0863 79.8488 0.2375	80.0858 79.8488 0.2370	0.2370 0.0015 0.2355	0.2355
11		NHE-3	75.4144 75.2792 0.1352	175 ml	75.4151 75.2792 0.1359	75.4148 75.2792 0.1356	75.4151 75.2792 0.1359		0.1359 0.0015 0.1344	0.1344
12		NHE-4	75.8138 75.7645 0.0493	100 ml	75.8141 75.7645 0.0496	75.8141 75.7645 0.0496			0.0496 0.0009 0.0497	0.0497
13		ATE-1	75.7704 75.7577 0.0127	60 ml	75.7711 75.7577 0.0134	75.7719 75.7577 0.0142	75.7719 75.7577 0.0142		0.0142 0.0005 0.0137	0.0137
14		ATE-2	77.7567 77.7493 0.0074	90 ml	77.7568 77.7493 0.0075	77.7585 77.7493 0.0092	77.7577 77.7493 0.0084	77.7571 77.7493 0.0078	77.7571 77.7493 0.0078	0.0078 0.0008 0.0070 0.0070
15		ATE-3	75.9083 75.8888 0.0195	125 ml	75.9081 75.8888 0.0193	75.9092 75.8888 0.0204	75.9086 75.8885 0.0198	75.9086 75.8888 0.0198	0.0198 0.0011 0.0187	0.0187

Project No. 859617

Collection Date _____

Analysis Date _____

JPA 10/5

H_2O Imp
E/C extract
Total

SAMPLES Astabula U/C R/M

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading Blank	MG in ALIQ.		Weight - blank = result	gms
95	ASE-1	87.0765 87.0731 0.0034	100	87.0765 87.0731 0.0034				0.0034 0.0016 0.0018	0.0018
96	ASE-2	83.3194 83.2951 0.0243	150	83.3196 83.2951 0.0245	83.3185 83.2951 0.0234	83.3196 83.2951 0.0245		0.0245 0.0024 0.0221	0.0221
97	ASE-3	86.2004 86.1721 0.0283	150	86.1997 86.1721 0.0276	86.1997 86.1721 0.0270	86.2003 86.1721 0.0282	86.1993 86.1721 0.0272	86.1993 86.1721 0.0272	0.0272 0.0024 0.0248
98	SWH-1	82.5119 82.5094 0.0025	100	82.5119 82.5094 0.0025				0.0025 0.0016 0.0009	0.0009
99	SWH-2	81.6393 81.6367 0.0026	110	81.6393 81.6367 0.0026				0.0026 0.0018 0.0008	0.0008
100	SWH-3	81.7148 81.6998 0.0150	125	81.7153 81.6998 0.0155	81.7141 81.6998 0.0143	81.7146 81.6998 0.0148	81.7146 81.6998 0.0148	0.0148 0.0020 0.0128	0.0128
101	SEA-2	83.1211 83.1172 0.0039	125	83.1214 83.1172 0.0042	83.1200 83.1172 0.0028	83.1214 83.1172 0.0042		0.0042 0.0020 0.0022	0.0022
102	SFH-3	84.2722 84.2714 0.0008	110	84.2725 84.2714 0.0011	84.2710 84.2714 —	84.2725 84.2714 0.0011		0.0011 0.0018 —	0
103	-1	82.0410 82.0390 0.0020	100	82.0408 82.0390 0.0018	82.0395 82.0390 0.0005	82.0405 82.0390 0.0015	82.0405 82.0390 0.0015	0.0015 0.0016 —	0
104	-2	80.7699 80.7678 0.0021	100	80.7696 80.7678 0.0018	80.7689 80.7678 0.0011	80.7689 80.7678 0.0011		0.0011 0.0016 —	0
105	-3	85.5136 85.5120 0.0016	100	85.5134 85.5120 0.0014	85.5126 85.5120 0.0006	85.5134 85.5120 0.0014		0.0014 0.0016 —	0
106	-1	85.8148 85.8124 0.0024	115	85.8146 85.8124 0.0022	85.8137 85.8124 0.0013	85.8146 85.8124 0.0022		0.0022 0.0018 0.0004	0.0004
107	-2	89.3923 89.3906 0.0017	110	89.3923 89.3906 0.0017				0.0017 0.0018 —	0
108	-2	86.2284 86.2264 0.0020	100	86.2280 86.2264 0.0016	86.2269 86.2264 0.0005	86.2280 86.2264 0.0016		0.0016 0.0016 0.0000	0
109	-1	78.4910 78.4890 0.0020	100	78.4907 78.4890 0.0017	78.4898 78.4890 0.0008	78.4907 78.4890 0.0017		0.0017 0.0016 0.0001	0.0001

25ml extra of chloro

0.0248

Project No. 359617

Collection Date _____

Analysis Date _____

JDA
WAH

[illegible] PE/K [illegible]

SAMPLES [illegible]

CR Beaker NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	~~Reading Blank~~	MG in ALIQ.		Weight - blank / Result	gms
80	Water blank	86.7123 86.7107 0.0016	100	86.7123 86.7107 0.0016				0.0016	0.0016 / 100 ml
81	[illegible] -1	81.7446 81.7360 0.0086	125	81.7443 81.7360 0.0083	81.7450 81.7360 0.0090	81.7450 81.7360 0.0090		0.0090 0.0020 0.0070	0.0070
82	SHF-2	84.2740 84.2450 0.0290	130	84.2734 84.2450 0.0284	84.2740 84.2450 0.0290			0.0290 0.0021 0.0269	0.0269
83	SH[illegible]	81.0171 81.0124 0.0047	110	81.0168 81.0124 0.0044	81.0173 81.0124 0.0049	81.0168 81.0124 0.0044		0.0044 0.0018 0.0026	0.0026
84	SHF-4	85.6744 85.6718 0.0026	100	85.6741 85.6718 0.0023	85.6741 85.6718 0.0023			0.0023 0.0016 0.0007	0.0007
85	[illegible]HF-2	81.0016 80.9930 0.0086	125	81.0012 80.9930 0.0082	81.0009 80.9930 0.0069	81.0012 80.9930 0.0082		0.0082 0.0020 0.0062	0.0062
86	[illegible]HF-3	68.3202 68.3175 0.0027	95	68.3195 68.3175 0.0020	68.3190 68.3175 0.0015	68.3199 68.3175 0.0024	68.3190 68.3175 0.0015	0.0015 0.0015 0	0
87	[illegible]HF-4	81.7672 81.7645 0.0027	115	81.7672 81.7645 0.0027				0.0027 0.0018 0.0009	0.0009
88	MHF-1	78.8029 78.7986 0.0043	100	78.8029 78.7986 0.0043				0.0043 0.0016 0.0027	0.0027
89	[illegible]-2	83.0211 83.0181 0.0030	100	83.0209 83.0181 0.0028	83.0200 83.0181 0.0019	83.0209 83.0181 0.0028		0.0028 0.0016 0.0012	0.0012
90	[illegible]-3	85.8163 85.8125 0.0038	100	85.8163 85.8125 0.0038				0.0038 0.0016 0.0022	0.0022
91	[illegible]-4	80.6137 80.6116 0.0021	100	80.6141 80.6116 0.0025	80.6132 80.6116 0.0016	80.6141 80.6116 0.0025		0.0025 0.0016 0.0009	0.0009
92	AHF-1	81.3680 81.3657 0.0023	100	81.3680 81.3657 0.0023				0.0023 0.0016 0.0007	0.0007
93	[illegible]-2	85.1560 85.1538 0.0022	100	85.1556 85.1538 0.0018	85.1537 85.1538 —	85.1555 85.1538 0.0017	85.1556 85.1538 0.0018	0.0018 0.0016	0.0002
94	[illegible]-3	80.1755 80.1738 0.0017	100	80.1755 80.1738 0.0017				0.0017 0.0016 0.0001	0.0001

Project No. [illegible]

Collection Date ______

Analysis Date ______

JPA
WAH

SAMPLES Astabula W/C R/M

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading / Blank	MG in ALIQ.			gms
110	BTE-2	82.9580 82.9557 0.0023	110	82.9580 82.9567 0.0023				0.0023 0.0018 0.0005	0.0005
111	BTE-3	80.9750 80.9737 0.0013	100	80.9750 80.9737 0.0013				0.0013 0.0016	0
112	BSE-1	78.8769 78.8747 0.0022	100	78.8765 78.8747 0.0018	78.8757 78.8747 0.0010	78.8757 88.8747 0.0010		0.0010 0.0016	0
113	BSE-2	81.1960 81.1948 0.0012	115	81.1958 81.1948 0.0010	81.1950 81.1948 0.0008	81.1958 81.1948 0.0010		0.0010 0.0018	0
114	BSE-3	78.8223 78.8210 0.0013	105	78.8220 78.8210 0.0010	78.8214 78.8210 0.0004	78.8218 78.8210 0.0008	78.8218 78.8210 0.0008	0.0008 0.0017	0
76	Control	85.3019 85.3019		85.3029 85.3024	85.3035	85.3026	85.3036		

Project No. 857617

Collection Date _____

Analysis Date _____

JRA
WAH

SAMPLES [illegible]

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading Blank	MG in ALIQ.		weight -blank result	gms
115	Water Blank	80.4254 80.4206 0.0048	315	80.4245 80.4206 0.0039	80.4250 80.4206 0.0044	80.4243 80.4201 0.0042	80.4245 80.4206 0.0039	0.0039	0.0039
116	CHE-1	81.2652 81.2050 0.0602	385	81.2585 81.2050 0.0535	81.2648 81.2050 0.0598	81.2624 81.2050 0.0574	81.2596 81.2050 0.0546	0.0048	
117	CHE-2	85.2500 85.1543 0.0957	380	85.2373 85.1543 0.0830	85.2512 85.1543 0.0969	85.2383 85.1543 0.0840	85.2386 85.1543 0.0843	0.0047	
118	SHE-3	85.4222 85.3926 0.0296	400	85.4160 85.3926 0.0234	85.4223 85.3926 0.0297	85.4204 85.3926 0.0278	85.4169 85.3926 0.0243	0.0050	
119	SHE-4	83.5750 83.5535 0.0215	405	83.5708 83.5535 0.0173	83.5748 83.5535 0.0213	83.5742 83.5535 0.0207	83.5710 83.5535 0.0175	0.0050	
120	[illegible]-2	85.1385 85.1059 0.0326	395	85.1339 85.1059 0.0280	85.1395 85.1059 0.0336	85.1339 85.1059 0.0280		0.0280 0.0049 0.0231	0.0231
121	CHE-3	87.4313 87.3317 0.0996	395	87.4186 87.3317 0.0869	87.4394 87.3317 0.1077	87.4276 87.3317 0.0959		0.0049	
122	CHE-4	83.9246 83.8599 0.0647	385	83.9152 83.8599 0.0553	83.9264 83.8599 0.0665	83.9228 83.8599 0.0629	83.9152 83.8599 0.0553	0.0553 0.0048 0.0505	0.0505
123	NHE-1	82.1534 82.1227 0.0307	385	82.1502 82.1227 0.0275	82.1536 82.1227 0.0309	82.1534 82.1227 0.0307		0.0307 0.0048 0.0259	0.0259
124	NHE-2	82.3561 82.2742 0.0819	385	82.3486 82.2742 0.0744	82.3604 82.2742 0.0962	82.3582 82.2742 0.0840	82.3531 82.2742 0.0789	0.0048	
125	NHE-3	79.3437 79.1908 0.1529	390	79.3276 79.1908 0.1368	79.3562 79.1908 0.1654	79.3461 79.1908 0.1553	79.3406 79.1908 0.1498	0.0048	
126	NHE-4	82.2392 82.1552 0.0840	395	82.2312 82.1552 0.0760	82.2476 82.1552 0.0924	82.2358 82.1552 0.0806		0.0049	
127	ATE-1	83.6034 83.5987 0.0047	395	83.6021 83.5987 0.0034	83.6024 83.5987 0.0037	83.6024 83.5982 0.0037		0.0037 0.0049 —	0
128	ATE-2	80.3070 80.3032 0.0038	395	80.3059 80.3032 0.0027	80.3066 80.3032 0.0034	80.3055 80.3032 0.0023	80.3059 80.3032 0.0027	0.0027 0.0049 —	0
129	ATE-3	81.4346 81.4302 0.0044	395	81.4333 81.4302 0.0031	81.4339 81.4302 0.0037	81.4335 81.4302 0.0033	81.4333 81.4302 0.0031	0.0031 0.0049 —	0

Project No. 959617

Collection Date _____

Analysis Date _____

Imp H_2O Remainder (2 of 3)
Total wt.
(continued)

SAMPLES Astabula

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading Blank	MG in ALIQ.		Weight -blank result	gms
116	SHE-1	81.2594 81.2050 0.0544	81.2585 81.2050 0.0535					0.0535 0.0048 0.0487	0.0487
117	-2	85.2422 85.1543 0.0879	85.2378 85.1543 0.0835	85.2383 85.1543 0.0840	85.2378 85.1543 0.0835			0.0835 0.0047 0.0788	0.0788
118	-3	85.4184 85.3926 0.0258	85.4164 85.3926 0.0238	85.4164 85.3926 0.0238				0.0238 0.0050 0.0188	0.0188
119	-4	83.5712 83.5535 0.0177	83.5703 83.5535 0.0168	83.5708 83.5535 0.0173				0.0173 0.0050 0.0123	0.0123
120	CHE-2								
121	-3	87.4240 87.3317 0.0923	87.4201 87.3317 0.0884	87.4216 87.3317 0.0899	87.4214 87.3317 0.0897	87.4216 87.3317 0.0899		0.0899 0.0049 0.0850	0.0850
122	-4								
123	NHE-1								
124	-2	82.3481 82.2742 0.0739	82.3474 82.2742 0.0732	82.3496 82.2742 0.0754	82.3488 82.2742 0.0746	82.3500 82.2742 0.0758	82.3510 82.2742 0.0768		
125	-3	79.3532 79.1908 0.1424	79.3325 79.1908 0.1417	79.3344 79.1908 0.1436	79.3342 79.1908 0.1434	79.3364 79.1908 0.1456	79.3389 79.1908 0.1481		
126	-4	82.2310 82.1552 0.0758	82.2297 82.1552 0.0745	82.2323 82.1552 .0771	82.2306 82.1552 0.0754	82.2330 82.1552 0.0778	82.2348 82.1552 0.0796		
	control	85.3022 Start 85.3034	85.3036	85.3034	85.3036	85.3032	85.3012		

Project No. _____

Collection Date _____

Analysis Date _____

Imp Remainder (3 of 3)
Total wt.
(cont.)

SAMPLES Astabula

NO.	CR	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading / Blank	MG in ALIQ.		weight - blank = result	gms
124		NHE-2	82.3502 82.2742 0.0760	82.3502 82.2742 0.0760					0.0760 0.0048 0.0712	0.0712
125		NHE-3	79.3370 79.1908 0.1462	79.3359 79.1908 0.1451	79.3358 79.1908 0.1460	79.3366 79.1908 0.1458	79.3359 79.1908 0.1451		0.1451 0.0048 0.1403	0.1403
126		NHE-4	82.2342 82.1552 0.0790	82.2318 82.1552 0.0766	82.2323 82.1552 0.0771				0.0771 0.0049 0.0722	0.0722
		control	85.3032 85.2231	80.3032	85.3037	85.3032				

Project No. _____

Collection Date _____

Analysis Date _____

Imp H_2O remainder
Total ...

SAMPLES Astabula ... R/...

NO.	CR	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading / Blank	MG in ALIQ.			gms
130		ASE-1	88.3037 88.2970 0.0067	395	88.3032 88.2970 0.0062	88.3035 88.2970 0.0065	88.3032 88.2970 0.0062		0.0062 0.0049 0.0013	0.0013
131		ASE-2	79.7873 79.7787 0.0086	465	79.7867 79.7787 0.0080	79.7864 79.7787 0.0077	79.7864 79.7787 0.0077		0.0077 0.0058 0.0019	0.0019
132		ASE-3	83.2813 83.2722 0.0091	465	83.2805 83.2722 0.0083	83.2807 83.2722 0.0085	83.2807 83.2722 0.0085		0.0085 0.0058 0.0027	0.0027
133		SWH-1	81.8743 81.8702 0.0041	385	81.8732 81.8702 0.0030	81.8736 81.8702 0.0034	81.8736 81.8702 0.0034		0.0034 0.0048 —	0
134		SWH-2	79.5816 79.5762 0.0054	385	79.5806 79.5762 0.0044	79.5810 79.5762 0.0048	79.5810 79.5762 0.0048		0.0048 0.0048 0.0000	0
135		SWH-3	78.7089 78.6391 0.0698	390	78.7082 78.6391 0.0691	78.7086 78.6391 0.0695	78.7086 78.6391 0.0695		0.0695 0.0048 0.0647	0.0647
136		SEH-2	85.1968 85.1898 0.0070	385	85.1959 85.1898 0.0061	85.1963 85.1898 0.0065	85.1963 85.1898 0.0065		0.0065 0.0048 0.0017	0.0017
137		SEH-3	79.7285 79.7242 0.0043	390	79.7277 79.7242 0.0035	79.7283 79.7242 0.0041	79.7285 79.7242 0.0043		0.0043 0.0048 —	0
138		NEH-1	80.0206 80.0136 0.0070	385	80.0197 80.0136 0.0061	80.0208 80.0136 0.0072	80.0204 80.0136 0.0068	80.0197 80.0136 0.0061	0.0061 0.0048 0.0013	0.0013
139		NEH-2	85.7838 85.7707 0.0131	380	85.7826 85.7707 0.0119	85.7837 85.7707 0.0130	85.7828 85.7707 0.0121	85.7828 85.7707 0.0121	0.0121 0.0047 0.0074	0.0074
140		NEH-3	83.6020 83.5915 0.0105	390	83.6012 83.5915 0.0097	83.6018 83.5915 0.0103	83.6009 83.5915 0.0094	83.6006 83.5915 0.0091	83.6006 83.5915 0.0091	0.0091 0.0048 0.0043
141		NWH-1	85.4966 85.4838 0.0128	385	85.4951 85.4838 0.0113	85.4963 85.4838 0.0125	85.4958 85.4838 0.0120	85.4951 85.4838 0.0113	0.0113 0.0048 0.0065	0.0065
142		NWH-2	82.9639 82.9597 0.0042	380	82.9625 82.9597 0.0028	82.9629 82.9597 0.0032	82.9629 82.9597 0.0032		0.0032 0.0047 —	0
143		NWH-3	81.7884 81.7840 0.0044	395	81.7876 81.7840 0.0036	81.7882 81.7840 0.0042	81.7876 81.7840 0.0036		0.0036 0.0049 —	0
144		BTE-1	80.5338 80.5271 0.0067	395	80.5328 80.5271 0.0057	80.5334 80.5271 0.0063	80.5328 80.5271 0.0057		0.0057 0.0049 0.0008	0.0008

0.0043

Project No. 889 617

Collection Date ____________

Analysis Date ____________

JRA

Imp H_2O remainder
Total wt

SAMPLES Astoboda WC KM

CR NO.	LOCATION and SAMPLE NO.		SAMPLE WEIGHT	TIT. ALIQ.	Reading Blank	MG in ALIQ.		Weight -blank result	gms
145	BTE-2	79.6636 79.6531 0.0105	390	79.6626 79.6531 0.0095	79.6629 79.6531 0.0098	79.6626 79.6531 0.0095		0.0095 0.0048 0.0047	0.0047
146	BTE-3	85.3628 85.3600 0.0028	400	85.3615 85.3600 0.0015	85.3618 85.3600 0.0018	85.3615 85.3600 0.0015		0.0015 0.0050 —	0
147	BSE-1	79.8095 79.8052 0.0043	400	79.8079 79.8052 0.0027	79.8088 79.8052 0.0036	79.8084 79.8052 0.0032	79.8079 79.8052 0.0027	0.0027 0.0050 —	0
148	BSE-2	82.2115 82.2059 0.0056	395	82.2100 82.2059 0.0041	82.2112 82.2059 0.0053	82.2105 82.2059 0.0046	82.2100 82.2059 0.0041	0.0041 0.0049 —	0
149	BSE-3	87.0374 87.0344 0.0030	390	87.0364 87.0344 0.0020	87.0364 87.0344 0.0020			0.0020 0.0048 —	0
76	control	85.3022 85.3022		85.3038 85.3022	85.3032	85.3038 85.3029	85.3034 85.3038		

Project No. 859617

Collection Date _____

Analysis Date _____

JDA

APPENDIX G

TEST LOG

TEST LOGS

No. 20 Furnace

Date	Time	Activity
2/14/72		A.M. Travel
		P.M. Arrived, Safety Briefing, Unpack and prepare equipment, Furnace No. 20.
2/15/72		A.M. Placed Equipment
	1340-1700	P.M. First Sample - Hood Ducts
2/16/72		A.M. Furnace Down
	1100-1240	Second Sample - Hood Ducts
	1130-1500	Carbon Monoxide Sampling - Hood Duct
	1335-1450	P.M. Third and Fourth Sample - Hood Duct
	1650-1800	
2/17/72		A.M. Furnace Down
	1348-1405	P.M. First Sample - Tapping Exhaust
	1406-1410	First Sample - Scrubber Exhaust and Water Sample
	1639-1655	Second Sample - Tapping Exhaust
	1543-1606	Second and Third Sample - Scrubber
	1637-1707	Exhaust and Water Sample
2/18/72		A.M. Safety Briefing for No. 13 Furnace
		Orsat Analysis - Hood and Tapping Exhausts
	1014-1026	Third Sample - Tapping Exhaust
		Moved equipment to No. 13 Furnace
		P.M. Travel

No. 13 Furnace

Date	Time	Activity
2/21/72		P.M. Travel
2/22/72		A.M. Furnace Down
	1415-1535	P.M. First Sample - Hood Exhausts
2/23/72	0900-1020	A.M. Second Sample - Hood Exhausts
	1220-1340	Third Sample - Hood Exhausts

No. 13 Furnace (con't)

	1530-1630	P.M. First Sample - Tapping Exhaust
	1520-1620	First Sample - Scrubber Exhaust and Water
	1230-1600	Carbon Monoxide Sampling - Hood and Tapping Exhausts
2/24/72	0855-0955	A.M. Second and Third Samples - Scrubber Exhaust and Water
	1010-1110	
	0903-1003	Second and Third Samples - Tapping Exhaust
	1034-1134	P.M. Orsat Analysis - Hood, Tapping and Scrubber Exhausts
		Pack equipment
2/25/72		A.M. Travel

APPENDIX H

RELATED REPORTS

Related reports covering emissions from reactive metals furnaces, under this same contract for the Environmental Protection Agency, are as follows:

Test Number	Survey Location	Emission Control Device	Status
FA-1	Foote Mineral Co., Steubenville, Ohio	None	Issued August 1971
FA-2	Union Carbide Corp., Marietta, Ohio	Venturi Scrubber	Issued October 1971
FA-3	AIRCO, Alloys and Carbide, Niagara Falls, New York	Baghouse	Revised December 1971
FA-4	AIRCO, Alloys and Carbide, Charleston, South Carolina	Electrostatic Precipitator	Issued November 1971
FA-5	Union Carbide Corp., Alloy, W. Va.	Baghouse	Issued June 1972
FA-6	Chromasco Corp., Woodstock, Tennessee	Scrubber	Issued June 1972
FA-7	Union Carbide Corp., Ashtabula, Ohio	Scrubber	This Report

APPENDIX I

PROJECT PARTICIPANTS AND TITLES

R. N. Allen, P. E., Project Manager
T. E. Eggleston, Industrial Hygienist, Crew Leader
C. C. Gonzalez, Chemist
G. A. Cangiano, Engineer
G. B. Patchell, Senior Technician
J. R. Avery, Technician
L. W. Baxley, Technician
B. M. Brown, Technician
J. R. McReynolds, Technician