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Electric Arc Furnace - Revision Argon Oxygen Decarburization

Emission Test Report Altech Specialty Steel Corporation Albany, New York

EMISSION TEST REPORT
AL TECH SPECIALTY STEEL CORPORATION
WATERVLIET, NEW YORK
ESED NO. 79/9
EMB NO. 80-ELC-7

by

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Messrs. William Terry and Lalit Banker of Midwest Research Institute, the New Source Performance Standards contractor, monitored the process operation during the test series, assisted in the coordination of tests to process conditions, and provided most of the information contained in Section 2 of this report. Mr. Art Stienstra, Sr., of Al Tech Specialty Steel Corporation was available to coordinate plant activities, and Mr. Dennis Holzschuh, Task Manager for the U.S. Environmental Protection Agency, was on site to monitor the test series.

SECTION 1

INTRODUCTION

During the week of April 6, 1981, PEDCo Environmental personnel conducted an emission sampling program at the steel melt shop operated by Al Tech Specialty Steel Corporation (Al Tech) in Watervliet, New York. The purpose of this test program was to provide data for assessing the need for revising present New Source Performance Standards (NSPS) for electric arc furnaces (EAF) to include argon-oxygen decarburization (AOD) furnaces.

This plant was selected for source testing for the following reasons:

1) It exhibits best available control technology.

2) The emissions capture and control equipment is representative of the industry.

3) Both AOD and EAF furnaces are controlled by the same device.

4) Emission data could be obtained by nonstandard sampling techniques on the typical positive-pressure fabric filter.

Particulate matter concentrations and mass emission rates were measured at two inlet sites and one outlet site. Tests at the two inlet sites were conducted according to U.S. Environmental Protection Agency (EPA) Reference Method 5.* The sampling

*40 CFR 60, Appendix A, July 1, 1980.

train used for outlet tests was as described in Method 5, but procedures were adapted to the large exhaust area and corresponding low gas velocity.

Inlet and outlet tests for particulate matter were performed simultaneously to enable determination of control efficiency as well as values for controlled and uncontrolled emissions. Flue gas flow rates, temperature, and composition were measured in conjunction with these tests. In addition, particle size distribution samples were collected simultaneously at one inlet site and at the fabric filter outlet. Method 9* procedures were used to evaluate visible emissions (VE) from the melt shop and fabric filter outlet throughout the test. Visual determinations of fugitive emissions (FE) from the fabric filter dust handling system were recorded according to the proposed Method 22.** Samples of dust collected by the fabric filter were obtained for analysis of particle size distribution and elemental composition. Tests took place simultaneously at all sites, including visible and fugitive emission sites. A representative from the NSPS contractor assisted in coordinating the tests with process operations. Subsequent analyses were performed on two outlet particle size samples and two fabric filter dust samples to determine the concentration of fluoride, chromium, lead, and nickel.

This report documents the activities and results of the test program. Section 2 describes the processes that were tested and the operating conditions during the sampling period. Section 3

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*40 CFR 60, Appendix A, July 1, 1980.

**Federal Register, Vol. 45, No. 224, November 19, 1980.

presents the results and discusses them, whereas Section 4 describes the sampling sites and general test procedures used. Section 5 briefly outlines quality assurance measures and audit results. Section 6 details the particulate matter and particle size distribution sampling and analytical procedures. The appendices contain computer output and example calculations (Appendix A), field data (Appendix B), sample recovery and analytical data (Appendix C), MRI process summary (Appendix D), calibration procedures and results (Appendix E), a quality assurance summary (Appendix F), and a list of project participants (Appendix G).

SECTION 2

PROCESS OPERATION

Al Tech operates a total of two EAF's and two AOD's in the production of many different grades of steel, including stainless steel and high-temperature alloys. Each EAF and AOD has a rated capacity of 27.3 Mg (30 tons) and produces an average heat of 29 Mg (32 tons). The facility was operating 24 hours per day, 5 days per week, during the test series, but this schedule normally fluctuates between 3 and 5 days per week, depending on product demand.

The north AOD vessel and EAF No. 89 are located in the north end of the melt shop, and EAF No. 90 and the south AOD vessel are located in the south end of the shop. Typically, EAF No. 89 feeds the north AOD, and EAF No. 90 feeds the south AOD. If necessary, however, the north EAF can feed the south AOD vessel, and vice versa. Normal melt shop operation consists of charging and backcharging the EAF with cold scrap and fluxes; meltdown; tapping the EAF; charging molten metal, fluxes, and alloys into the AOD vessel; refining in the AOD vessel; and tapping the refined metal into a ladle, which is then transferred to the teeming aisle.

The EAF charge materials consists of 80 percent scrap and 20 percent additives. The scrap used at this plant is relatively clean, contains a high percentage of stainless steel, and is not pretreated. The initial additives are generally lime, charge chrome, ferronickel, and iron ore. Other materials may be added during the melting phase. A minimum amount of oxygen, if any, is blown into the molten metal while it is in the EAF, because refining is accomplished primarily in the AOD. Hot metal is tapped into a ladle, weighed, and transferred to the AOD vessel. The average EAF heat time (tap to tap) is 3.7 hours.

Hot metal from the EAF is charged into the AOD vessel, where major alloy additions are made. The additions include high-carbon magnesium, high-carbon chrome, nickel, silicon, molybdenum, and aluminum. The argon-oxygen-nitrogen gas mixture is blown into the molten bath through tuyeres located in the bottom of the vessel until the carbon in the metal has been oxidized to specification. Reduction mixes are added to remove sulfur and other impurities. The refined molten metal is tapped from the AOD into a ladle and transferred to the teeming area where the hot metal is poured into ingot molds. After it is tapped, the AOD remains idle until another hot metal charge from the EAF is ready. The AOD heat (charge through tap) takes about 1.5 to 2 hours, but can last longer if more refining is needed.

In the emission capture system, two hoods are provided above each electric furnace and each AOD vessel. The electric furnace hoods are situated so that one hood captures most of the

emissions from charging and melting, whereas the other captures most of the tapping emissions. The AOD hoods are situated so that each one captures half the refining emissions. A diverter stack directs the AOD refining emissions toward the hoods to avoid excessive drift of the emissions as a result of cross drafts. Each hood has a set of automatic dampers, which can be closed to direct more suction to another hood. The dampers on the hoods on the charging side of each EAF are always open. The dampers on the tapping side open automatically during tapping and remain closed the rest of the time. The dampers on the hood of the AOD vessels are always open because the automatic mechanism no longer functions.

Combined exhaust gases from all four furnaces are ducted to a Wheelabrator-Frye, positive-pressure fabric filter to remove particulate matter. The gas flows through the fabric filter at a rate of approximately 280 m^3/s (600,000 acfm) and exits via a monovent type of exhaust. Mechanical shakers clean the bags in each compartment at periodic intervals. Al Tech has assigned two people to the regular maintenance of the fabric filter. A periodic visual inspection is made, and broken bags are changed when needed.

Technical data on the process and control system are included in Table 1 of Appendix D.

The operations of the four furnaces and the fabric filter were monitored by Lalit Banker and William Terry of Midwest Research Institute (MRI). Table 2-1 presents a summary of

TABLE 2-1. EAF AND AOD PRODUCTION SUMMARY[a]

PEDCo run No., date	Furnace	Partial or completed heats tested				Tested production rate[d]	
		Heat No.	Heat time,[b] minutes	Metal produced[c] Mg	Metal produced[c] tons	Mg/h	tons/h
1	North AOD	98033	85	28.0	30.9	8.7	9.6
		08440	100	27.9	30.8		
4/7/81	89 EAF	98047	190	27.7	30.5	8.5	9.4
		98068	225	28.1	31.0		
	90 EAF	08440	440	25.4	28.0	6.5	7.2
		08444	240	30.2	33.2		
		08445	235	27.2	30.0		
	South AOD	98047	110	28.9	31.8	5.2	5.7
		08444	155	33.9	37.4		
				Total		28.9	31.9
2	North AOD	98045	90	27.9	30.8	8.5	9.4
		98064	65	30.8	34.0		
4/8/81	89 EAF	98064	210	29.9	33.0	7.1	7.8
		98039	299	29.9	33.0		
	90 EAF	08464	185	28.6	31.5	7.7	8.5
		08446	225	29.5	32.5		
		08447	300	28.8	31.8		
	South AOD	08464	150	32.7	36.1	6.9	7.6
		08446	230	32.2	35.5		
				Total		30.2	33.3
3	North AOD	98090	225	29.1	32.1	4.9	5.4
		98091	225	30.4	33.5		
4/9/81	89 EAF	98091	340	28.1	31.0	7.8	8.6
		98044	280	24.9	27.5		
	90 EAF	08451	350	30.4	33.5	9.8	10.8
		08465	225	32.5	35.8		
	South AOD	08452	e	-	-	5.7	6.3
		08451	160	35.0	38.6		
				Total		28.2	31.1

[a]Compiled from process data in Appendix D and field data (test times) in Appendix B.

[b] Charge-to-tap time for AOD's; tap-to-tap time for EAF's.

[c] EAF production is the weight of metal transferred to an AOD; AOD production is the final tap weight.

[d]Tested production rates were determined by dividing the total weight of metal produced during a test by the sampling time. The weight of metal produced by a given furnace during a test was calculated by first dividing the minutes of normal operation actually sampled (from charging through tapping, not including delays or patching) by the total minutes of normal operation in the heat, and then multiplying by the weight of metal produced during the entire heat.

[e]The only normal operation of this heat sampled was the tap.

production data for the test series. The EAF heat times varied from 3.1 to 7.3 hours (tap to tap), and the weight of metal produced per heat ranged from 24.9 to 32.5 Mg (27.5 to 35.8 tons). The AOD heat times varied between 1.1 and 3.8 hours (charge through tap), and the weight of metal produced per heat varied between 27.9 and 35.0 Mg (30.8 and 38.6 tons). The variations in heat times were related in part to delays caused by one or more cranes that did not operate properly.

Production rates were calculated to determine if the tests were conducted during representative operating conditions. The tested production rate for each furnace was determined by dividing the total weight of metal produced during a test by the sampling time. The metal produced by a given furnace during a test was calculated by first dividing the minutes of normal operation actually sampled (from charging through tapping, not including delays or patching) by the total minutes of normal operation in the heat, and then multiplying by the weight of metal produced during the entire heat. For comparison, the normal production rate for all four furnaces operating at once was calculated at 31.4 Mg/h (34.6 tons/h), based on an average heat time of 3.7 hours and an average metal production of 29 Mg (32 tons) per furnace. The same heat time was used for the EAF's and AOD's, because one AOD heat normally occurs for each EAF heat. The tested production rate and the normal production rate both include the effects of delays and intervals between heats and should therefore be comparable. The average equivalent

production rate for the test series was 29.1 Mg/h (32.1 tons/h), which indicated that the tests were conducted while the process was operating at 93 percent of normal production rate.

Tests were delayed at various times during the series to avoid sampling when emissions were not representative of normal operation. On April 7, the test was stopped for 10 minutes because EAF No. 89 was idle for 33 minutes waiting for the pit crane to clean the tap runner. At 3:00 p.m. on April 8, the test was stopped for approximately 15 minutes because two of the furnaces were not operating. On April 8, the test was stopped before the end of the heat in EAF No. 89 because the furnace bay crane lost power. On April 9, the start of the test was delayed for about 30 minutes because the furnace bay crane temporarily lost power again.

The fabric filter was operating normally during the test period. The fabric filter control panels were monitored hourly for the duration of the tests. Test personnel periodically closed off a baghouse compartment for a short period to move their sampling equipment. Because one compartment is always in the cleaning mode, this meant two compartments were not in operation during that short period of time. The pressure drop in each compartment, the inlet gas temperature, the fan amperage for each of the three fans, and the number of compartments cleaning or closed off were observed to assure normal fabric filter operation. The pressure drop varied between 1.0 and 1.5 kilopascals (4 and 6 in. H_2O) throughout the tests. All three fans were

operating at full power during the tests. The flue gas inlet temperature fluctuated from 43° to 54°C (100° to 130°F) during the test period.

The test conditions were representative of normal plant operation, and the data should be useful.

During the tests, emissions periodically filled the melt shop. Some of the emissions were deflected when cranes passed above the furnaces and vessels and when the cranes were in position for a charge or tap. The cross drafts that developed from open doors in the scrap bay and tapping pit also sometimes deflected emissions from the hood. The inoperable automatic dampers on the AOD hoods were always open and prevented their optimal use. Although these dampers could be operated manually, they were left open throughout the tests in line with normal operating procedure. Although the emissions were not always completely captured, the shop always cleared in 5 to 10 minutes. Plant workers indicated that emission capture was better when the capture and control system was new and the automatic AOD dampers were operating properly.

Emissions generated by the EAF's were greatest during meltdown, but emissions were also significant during tapping. Emissions from the AOD were greatest during the initial stages of the heat when the oxygen concentration in the blowing gases was the highest. Emissions from the AOD during blowing appeared to be equal to or greater than EAF meltdown emissions. For long periods of time, however, the AOD vessel is in a nonblowing position

while operators wait for sample results to determine what alloys are needed and how much more blowing is necessary to meet final specifications.

SECTION 3

SUMMARY OF RESULTS

This section details results obtained from the emission test program. Particulate matter tests were run simultaneously at two inlet sites and the fabric filter outlet, and particle size distribution tests were run at one inlet site and at the outlet. Visible emissions from the melt shop and fabric filter outlet were evaluated concurrently with particulate test runs, as were fugitive emissions from the fabric filter. Fabric filter dust samples were collected and analyzed for trace elements and particle size distribution. Table 3-1 summarizes the type and number of samples that were collected.

In brief, uncontrolled particulate matter concentrations averaged 245 milligrams per dry normal cubic meter (mg/dNm^3) at 20°C and 101 kilopascals (kPa), or 0.1076 grains per dry standard cubic foot (gr/dscf) at 68°F and 29.92 in.Hg. At the outlet, particulate concentration averaged 3.46 mg/dNm^3 (0.0015 gr/dscf), to yield a 98.6 percent control efficiency. Both levels of concentration were in the range of expected values, which were based on previously reported data on EAF's.[1,2]

Individual 6-minute set averages of visible emissions from the melt shop ranged from 0 to 15 percent opacity during charging

TABLE 3-1. SAMPLES COLLECTED AT AL TECH SPECIALTY STEEL

Sampling site	Sample type	Sampling method	Number[a] of samples	Time for each sample	Additional analysis		
					Type	No.	Method
No. 1 - North	Particulate Particle size	EPA 5 High-capacity impactor Impactor	3 3 3	~ 6 h ~ 3 h ~20 min	Condensibles b	3	Gravimetric
No. 2 - South	Particulate	EPA 5	3	~ 6 h	Condensibles	3	Gravimetric
No. 3 - Fabric filter outlet	Particulate Particle size VE	Modified EPA 5 Impactor EPA 9	3 3 2[c]	~ 5-1/2 h ~ 5 h ~ 7 h	Organic and inorganic condensibles	3	Back-half E/C extract
Shop exit	VE	EPA 9	2[c]	~ 7 h			
Fabric filter dust handling system	FE Dust	EPA 22 Grab	2[c] 3	~ 5 h 1 per day	Trace metals, particle size[b]	3	SSMS,[d] Coulter

[a]Does not include preliminary, blank, or duplicate runs.

[b]Two samples were analyzed later for fluoride by EPA Method 13B and for chromium, lead, and nickel by atomic absorption.

[c]The third run could not be performed because of unfavorable weather conditions.

[d]Spark source mass spectroscopy.

and tapping operations. Average opacities of individual sets ranged from 0 to 22 percent during refining and other process operations. Visible emissions from the fabric filter outlet were zero percent opacity, even after compartment cleaning cycles.

These and other results are presented and discussed in detail in the following sections. Results are grouped by emission type. The sections in each group describe the sampling scheme used at each site, summarize data and results, and discuss the results.

3.1 PARTICULATE MATTER

Two inlet sites and the fabric filter outlet were tested simultaneously. Site 1 represented emissions from the north EAF (designated by the plant as No. 89) and the north AOD; Site 2 represented emissions from the south pair of furnaces (including EAF No. 90); and Site 3 represented fabric filter outlet emissions.

3.1.1 Sampling Scheme

Tests at all sites commenced simultaneously and ran for approximately the same time until respective traverses were completed, about 5 to 6 hours. This procedure enabled calculation of control efficiencies and emission factors. Each test run at Site 1 was to have included two integral EAF heats (from initial charge through the final tap) of approximately 3 to 3.5 hours each and two complete AOD heats of approximately 1.5 to 2 hours each. Because a malfunctioning crane caused shifts in the

normal sequence of operation, the second and third tests were stopped prior to completion of the second EAF heat, and the third test included only portions of the AOD heats. Nevertheless, the actual tests were generally representative of integral EAF heats. So that tests at Site 2 could be conducted simultaneously with other tests, the sample times were not coordinated to include an integral number of heats, as the operating schedule of the south furnaces was staggered from that of the north furnaces. Outlet tests at Site 3 also could not be coordinated to represent an integral number of heats (because of the different furnace schedules), but they were conducted in conjunction with tests at other sites. Fabric filter cleaning cycles were sampled in the normal fashion as they occurred.

The NSPS contractor representative, who was on site to monitor process operations, assisted in the coordination of tests with process conditions. Based on his observations, tests were interrupted if one of the EAF's experienced an operational delay of longer than 20 minutes. Delays from 1 to 1.5 hours could be tolerated for the AOD's without interrupting tests, because that amount of AOD downtime would normally occur within the time frame of an EAF heat.

Particulate matter sampling and analytical procedures at both inlet sites followed those described in EPA Methods 1, 2, 3, and 5 of the Federal Register.* A Method 5 sampling train and

*40 CFR 60, Appendix A, July 1, 1980.

analytical procedures were used on the outlet tests, but the sampling procedures were modified by sampling at a constant rate, at a site that did not meet minimum Method 1 criteria, and at fewer points than specified by Method 1. The sampling rate was based on the estimated average velocity of the gas stream at the sampling location, which was calculated by dividing the total inlet flow rate measured by Method 2 by the total exhaust area represented by the sampling cross section. Three tests were run at each site. Integrated gas samples were collected once at each site (according to Method 3) to verify that the gas streams were essentially air. Additional molecular weight determinations were not made.

3.1.2 Gas Conditions and Particulate Emissions

Summaries of the measured stack gas and particulate emission data are presented in Tables 3-2 and 3-3. Volumetric flow rates are expressed in actual cubic meters per second (m^3/s) and actual cubic feet per minute (acfm) at stack conditions. Flow rates corrected to zero percent moisture and standard conditions [20°C and 101 kPa (68°F and 29.92 in.Hg)] are expressed as dry normal cubic meters per second (dNm^3/s) and dry standard cubic feet per minute (dscfm). Average stack gas velocities are expressed in actual meters per second (m/s) and actual feet per second (ft/s) at stack conditions. Particulate concentrations in Table 3-3 are reported in milligrams per dry normal cubic meter and grains per dry standard cubic foot. Emission rates are expressed in kilograms per hour and pounds per hour. The product of the

TABLE 3-2. SUMMARY OF GAS STREAM CHARACTERISTICS[a]

Run No.	Date (1981)	Flow rate[b] dNm3/s	Flow rate[b] dscfm	Temperature °C	Temperature °F	Moisture, %	Velocity[c] m/s	Velocity[c] ft/s	Flow rate[d] m3/s	Flow rate[d] acfm
AIP-1	4/7	130.0	275,500	43	110	0.81	19.1	62.8	139.6	295,800
AIP-2	4/8	121.8	258,200	47	117	0.89	18.2	59.8	133.0	281,900
AIP-3	4/9	127.2	269,600	42	107	1.25	19.0	62.2	138.4	293,300
Average		126.3	267,800	44	111	0.98	18.8	61.6	137.0	290,300
A2P-1	4/7	129.9	275,200	46	116	0.65	19.3	63.3	140.7	298,100
A2P-2	4/8	129.3	273,900	48	118	0.69	19.3	63.4	141.1	298,900
A2P-3	4/9	130.4	276,300	45	114	1.29	19.7	64.7	143.9	304,800
Average		129.9	275,100	46	116	0.88	19.4	63.8	141.9	306,600
A3P-1	4/7	259.9	550,700[e]	42	108	0.41	2.4	8.0[f]	275.7	584,100[f]
A3P-2	4/8	251.1	532,100	48	119	0.68	2.4	7.9	273.0	578,600
A3P-3	4/9	257.6	545,900	46	114	1.17	2.5	8.2	282.0	597,600
Average		256.2	542,900	45	114	0.75	2.4	8.0	276.9	586,800

[a]Average $CO_2 \leq 0.2\%$, $O_2 = 20.3\%$.

[b]Dry normal cubic meters per second at 20°C and 101 kPa, and dry standard cubic feet per minute at 68°F and 29.92 in.Hg.

[c]Velocity at stack conditions.

[d]Flow rate at stack conditions.

[e]The outlet standard flow rates were determined by summing flows at both inlet sites.

[f]Outlet gas velocities and actual flow rates are based on measured inlet flow rates converted to outlet conditions.

TABLE 3-3. SUMMARY OF FILTERABLE PARTICULATE EMISSIONS

Site	Run No.	Concentration[a]		Mass emission rate		Isokinetic rate, %
		mg/dNm^3	gr/dscf	kg/h	lb/h	
Inlet No. 1 north furnaces	A1P-1	217	0.0948	102	224	108
	A1P-2	182	0.0794	80	176	102
	A1P-3	523	0.2288	240	529	102
Average		307	0.1343	140	309	
Inlet No. 2 south furnaces	A2P-1	198	0.0867	93	205	104
	A2P-2	240	0.1047	111	246	104
	A2P-3	111	0.0485	52	115	105
Average		183	0.0800	86	188	
Combined inlets[b]	1	208	0.0908	194	428	
	2	212	0.0924	191	421	
	3	315	0.1397	292	643	
Average		245	0.1076	226	498	
Outlet No. 3[c]	A3P-1	3.27	0.00143	3.06	6.75	107[d]
	A3P-2	2.88	0.00126	2.61	5.75	106
	A3P-3	4.24	0.00185	3.94	8.68	102
Average		3.46	0.00151	3.20	7.06	

[a]Milligrams per dry normal cubic meter at 20°C and 101 kPa, and grains per dry standard cubic foot at 68°F and 29.92 in.Hg.

[b]Combined inlet mass emission rates represent the sum of results for Sites 1 and 2; concentrations are weighted averages based on standard flow rates.

[c]Outlet mass emission rates are based on measured outlet concentrations and total inlet standard flow rates.

[d]Isokinetic sampling rates for outlet runs were calculated by using average gas velocities that are based on inlet flow rates converted to outlet conditions.

concentration and the volumetric flow rate is the mass emission rate. The particulate data represent filterable material collected in the sample probe and on the filter, both of which were heated to approximately 121°C (250°F). The isokinetic rate is the ratio of the velocity of the sample gas stream entering the nozzle to the local stack gas velocity, expressed as a percentage.

The volumetric flow rates at inlet Sites 1 and 2 averaged 126 dNm^3/s (268,000 dscfm) and 130 dNm^3/s (275,000 dscfm). The outlet flow rate averaged 256 dNm^3/s (543,000 dscfm). The flow for each outlet run represents the sum of the standard flow rates measured at the two inlet sites.

The actual flow rate at inlet Site 1 averaged 137 m^3/s (290,000 acfm) at 44°C (111°F) and less than 1 percent moisture, and was equivalent to a gas velocity of 19 m/s (62 ft/s). The actual flow rate at inlet Site 2 averaged 142 m^3/s (301,000 acfm) at 46°C (116°F) and less than 1 percent moisture, which equalled a gas velocity of 19 m/s (64 ft/s). The outlet flow rate averaged 277 m^3/s (587,000 acfm) at 45°C (114°F) and less than 1 percent moisture, which represented an average gas velocity of 2.4 m/s (8.0 ft/s) at the sampling cross section. Outlet velocities and flow rates are based on inlet standard flows and measured outlet stack conditions of temperature, pressure, and moisture.

For calculation purposes the stack gases were essentially air. For one run at each site, the carbon dioxide (CO_2)

concentration averaged less than 0.2 percent, and the oxygen concentration was 20.3 percent by volume.

The combined inlet concentration of filterable particulate matter averaged 245 mg/dNm^3 (0.1076 gr/dscf). This is the average of concentrations measured at both inlet sites, weighted according to measured standard flow rates. At inlet Site 1 the average particulate concentration was 307 mg/dNm^3 (0.1343 gr/dscf), and at Site 2 the average particulate concentration was 183 mg/dNm^3 (0.0800 gr/dscf). These concentrations correspond to mass emission rates of 140 kg/h (309 lb/h) at Site 1, 86 kg/h (188 lb/h) at Site 2, and 226 kg/h (498 lb/h) total uncontrolled emissions.

The outlet particulate concentration averaged 3.46 mg/dNm^3 (0.00151 gr/dscf), with a corresponding mass emission rate of 3.20 kg/h (7.06 lb/h). The concentration results for each run are actually representative of the exhaust stream from four of the eight fabric filter compartments, but emission rates are based on the total system flow.

All isokinetic sampling rates were between 102 and 108 percent. The outlet values are based on average gas velocities at the sampling cross section, which were calculated from measured inlet flow rates and outlet stack conditions.

3.1.3 Control Efficiencies and Emission Factors

Control efficiencies were calculated by dividing the difference between the outlet and weighted inlet particulate concentrations by the weighted inlet value. Table 3-4 presents a

TABLE 3-4. FILTERABLE PARTICULATE COLLECTION EFFICIENCY

Run	Inlet concentration[a,b]		Outlet concentration[b]		% efficiency[c]
	mg/dNm^3	gr/dscf	mg/dNm^3	gr/dscf	
1	208	0.0908	3.27	0.00143	98.4
2	212	0.0924	2.88	0.00126	98.6
3	315	0.1397	4.24	0.00185	98.7
Average	245	0.1076	3.46	0.00151	98.6

[a]Weighted average from Sites 1 and 2.

[b]Milligrams per dry normal cubic meter at 20°C and 101 kPa, and grains per dry standard cubic foot at 68°F and 29.92 in.Hg.

[c]Percent efficiency = $\frac{C_{inlet} - C_{outlet}}{C_{inlet}} \times 100.$

summary of filterable particulate concentrations and indicates the fabric filter collection efficiency for each run. Control efficiencies were 98.4, 98.6, and 98.7 percent on the three test days.

Table 3-5 presents particulate emission factors for uncontrolled and controlled emissions, which were calculated by dividing the appropriate hourly mass emission rate by the corresponding furnace metal capacity. Results are reported in kilograms per hour per megagram of furnace capacity (kg/h per Mg) and in pounds per hour per ton (lb/h per ton). Based on a total capacity of 109 Mg (120 tons) for the four furnaces, the emission factor for uncontrolled emissions averaged 2.1 kg/h per Mg, or 4.2 lb/h per ton. It was possible for two runs at Site 1 to be conducted over an integral number of heats. Each run consisted of two EAF heats and two AOD heats. Emission factors for these tests should be more representative of uncontrolled emissions on a per-heat basis. Results for the two runs averaged 1.67 kg/h per Mg (3.33 lb/h per ton) based on a metal capacity of 54.5 Mg (60 tons). The average controlled emission factor for all four furnaces was 0.03 kg/h per Mg (0.06 lb/h per ton).

Emission factors shown in Table 3-6 are based on actual production data. Results were calculated by dividing the filterable mass emission rate by the corresponding equivalent tested production rate. Emission factors are reported in kilograms per megagram (pounds per ton) of metal produced. The average uncontrolled emission factor was 7.8 kg/Mg (15.6 lb/ton),

TABLE 3-5. PARTICULATE EMISSION FACTORS[a]

Run No.	Uncontrolled		Run No.	Controlled	
	kg/h per Mg	lb/h per ton		kg/h per Mg	lb/h per ton
AIP-1[b]	1.88	3.73	1	0.028	0.056
1	1.78	3.57			
AIP-2[b]	1.47	2.93	2	0.024	0.048
2	1.75	3.51			
3	2.08	5.36	3	0.036	0.072
Average[c]	2.07 (1.67)	4.15 (3.33)	Average	0.029	0.059

[a]Factors are based on emissions per unit of furnace metal capacity in kilograms per hour per megagram (pounds per hour per ton).

[b]Tests were conducted for an integral number of heats and represent emissions from the north furnaces at a metal capacity of 54.4 Mg (60 tons). All other runs represent total emissions from the four furnaces at a metal capacity of 109 Mg (120 tons).

[c]Values in parentheses ( ) are for the integral heat tests on the north furnaces.

TABLE 3-6. PARTICULATE EMISSION FACTORS BASED ON PRODUCTION[a]

Run No.	Metal production rate[b]		Emission factor[c]			
			Uncontrolled		Controlled	
	Mg/h	tons/h	kg/Mg	lb/ton	kg/Mg	lb/ton
1	28.9	31.9	6.7	13.4	0.11	0.21
2	30.2	33.3	6.3	12.6	0.09	0.17
3	28.2	31.1	10.4	20.7	0.14	0.28
Average	29.1	32.1	7.8	15.6	0.11	0.22

[a]Calculated by dividing the filterable mass emission rate by the corresponding average metal production rate.

[b]From Table 2-1.

[c]Kilograms per megagram (pounds per ton) of metal produced.

based on a production rate of 29.1 Mg/h (32.1 ton/h). At the same production rate, controlled emissions averaged 0.11 kg/Mg (0.22 lb/ton).

3.1.4 Discussion

In general, the particulate tests were conducted according to schedule. No problems were encountered with the sampling equipment, and the few problems associated with the process operation were considered minor. The report does not include the results of preliminary tests that were conducted at each site to compare particulate loadings with estimated sampling times and to eliminate any problems associated with test coordination or physical sampling maneuvers. This section discusses validity of results, deviations in test methods and calculations caused by the fabric filter site configuration, and effects of process operations.

The primary purpose of the long sampling time was twofold: (1) to collect approximately 25 to 50 mg in the front-half of the outlet sampling train so as to minimize handling and weighing errors; and (2) to satisfy NSPS minimum requirements for sample time and volume. The actual catch weights were between 17 and 25 mg, which were considered satisfactory. The actual minimum sampling time and volume were 5.3 hours and 5.9 dNm^3 (208 dscf). These met the minimum criteria of 4 hours and 4.5 dNm^3 (160 dscf) set forth in Subpart AA of the Federal Register.*

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*40 CFR 60, Subpart AA, July 1, 1980.

The back-halves of each inlet and outlet run were analyzed for condensible matter. These results are included in the computer printouts in Appendix A, but are not summarized here because they are considered to be biased. The results do not agree well with expected values based on previously reported tests at similar installations. Probable cause of the biases is believed to be the long sample line used between the heated filter and first impinger, even though it was Teflon-lined.

The inlet flow rates measured at Sites 1 and 2 were within 6 percent of each other, which indicated that the three induced-draft (I.D.) fans were operating effectively to promote the equal capture of emissions from each half of the melt shop. The sum of the inlet flows compared very well with the system design flow rate of 280 m^3/s (600,000 acfm), as all runs were within 4 percent of this value.

The outlet volumetric flow rates, dry and at standard conditions, were assumed to be equal to the sums of the inlet standard flow rates. This assumption was necessary because the site configuration made it impossible to obtain accurate velocity data at the outlet. Flows at stack conditions were calculated from the standard flow rates by use of measured values of temperature, pressure, and moisture at the outlet.

The procedure just described is typical for tests at positive-pressure fabric filters without stacks, and assumes no air leakage. Air inleakage at the I.D. fans was probably no more than 10 percent, as evidenced by the agreement between measured

and design flows. In addition, air leakage through the open grating at the bottom level of the fabric filter was minimized by covering the openings during the test period. At Al Tech these open gratings represented sources of dilution air. Comparison of inlet and outlet moisture contents seemed to indicate some dilution, but the limits of accuracy for the moisture determinations at the 1 to 2 percent level are probably greater than the reported differences. The close agreement between inlet and outlet gas temperatures indicated that any entry of dilution air was negligible. A significant inflow of ambient air would have caused a temperature decrease, which was not evident. For these reasons, the amount of dilution air that entered the system was considered to be minimal, and results reported for the outlet flow rates should be representative of actual conditions.

The fabric filter site configuration required that several modifications be made to EPA reference methods for their use in the outlet tests. Although they could not be analyzed precisely, the effects of these deviations on outlet particulate concentration results were considered to be relatively minimal. The two deviations from Method 1 were the use of a sampling location less than two equivalent duct diameters downstream from the nearest disturbance and sampling at fewer than the minimum number of points. The three deviations from Method 5 were the lack of velocity monitoring at individual sampling points, use of a constant sampling rate at all points during a given test, and traversing only half of the large exhaust area for each test.

These deviations, which generally would apply when testing positive-pressure fabric filters without stacks, are discussed in the following paragraphs.

The outlet site configuration did not provide any sampling location capable of meeting minimum Method 1 criteria. The throat of the monovent was selected as the sampling location, primarily because it was the smallest cross-sectional area available. This location would be less prone to concentration biases caused by faulty bags, and would provide the highest gas velocities.

The reason for sampling four rather than eight points per compartment was to lessen the possibility of biasing results. Because moving from one traverse point to another during sampling required test personnel to enter a compartment while the fabric filter was operating, extraneous dust could have been stirred up by bumping the probe against nearby beams or by personnel activity, and results could have been biased if any such dust had entered the nozzle during sampling. By sampling only four compartments and using extreme care during point changes, we were able to avoid these potential problems in all of the tests.

It should be noted that a better sampling approach for this type of fabric filter configuration would be to sample from outside on the baghouse roof and to use ports located in the monovent throat. This would reduce the possibility of sampling extraneous dust and shorten the time required to change traverse locations. More points and compartments per run could then be

sampled. Because safe access to the roof was not readily available, ports were not installed at this plant.

A constant sampling rate was used for the outlet tests because individual point velocities could not be accurately measured to make isokinetic sampling rate adjustments. The preliminary traverse of three compartments verified the inaccuracy of velocity measurement attempts. Most of the very low velocity heads were readable on an expanded scale manometer; however, turbulence at the low flows caused fluctuations and frequent negative readings. Thus, an average gas velocity at the outlet sampling location was calculated from previous data obtained at the two inlet sites and used to set a constant sampling rate. The two inlet flow rates were calculated and totaled; then the sum was converted from standard conditions of temperature and pressure to outlet conditions. This flow was then divided by the total cross-sectional area of all eight compartments represented by the sampling plane. The resultant average gas velocity was assumed to represent each traverse point. For each outlet test, inlet data obtained from the previous day's activities were used to estimate the average velocity. The constant isokinetic sampling rate to be used that day was then calculated from this estimated velocity. For data recording and computer calculation purposes, an equivalent velocity head was calculated and entered on the field data sheets for each traverse point as if it had actually been measured.

Other parameters entered on the data sheets were measured according to normal procedures.

All outlet computer calculations in Appendix A for flow rate, emission rate, velocity, and isokinetics are based on these estimated velocities; however, results reported in tables and text have been adjusted to reflect measured rather than estimated values. This was accomplished by dividing the measured total inlet flow rate by the flow rate used initially to estimate the outlet velocity. Results were adjusted by applying this ratio, either directly or inversely as appropriate, to computer outputs that were based on estimated values. These calculations are shown in Appendix A.

The average isokinetics indicated for the outlet tests were all within the acceptable range (100 $\pm$ 10 percent). These isokinetic calculations included the assumption that the average velocity for the four compartments tested per run was approximately equal to the average velocity for all eight compartments. We believe this is a reasonable assumption ($\pm$ 10 percent), although the middle compartments may have had slightly higher velocities than the end ones. Another factor affecting isokinetic and velocity results was the fabric filter cleaning cycle time. Reported results do not account for the time when only seven compartments were operating instead of eight, but the greatest effect would occur if one compartment were always off line. This would reduce reported outlet isokinetics by a factor of 0.875 and increase gas velocities by the inverse of this

factor. Isokinetics would be between 89 and 94 percent; therefore, emission results should not be affected significantly by this consideration.

Although average outlet isokinetics were acceptable, values at individual traverse points could be much different, depending on the local gas velocities. The range of actual isokinetic variation was difficult to gauge without valid point velocity data, but an estimate of plus or minus 50 percent seems realistic. The overall isokinetic rates, however, were within specified limits, and any point-specific biases should tend to be averaged. Even so, it is expected that the precision of the method used (constant sampling rate) is less than that of Method 5, which requires isokinetic sampling at each point. Results should be viewed in this light, even though they were fairly consistent and appear to be representative.

Evaluation of the process data furnished by MRI and actual sampling times indicated that operation conditions were representative during the tests. The equivalent tested production rate averaged 93 percent of the maximum production rate of the four furnaces. Although the metal production of individual furnaces varied considerably, the overall production rates for each test were within 10 percent of each other. A periodically malfunctioning crane caused a shift in the normal sequence of furnace operations and several extended furnace delays. Tests were interrupted when the emissions were considered to be significantly affected. The results of Tests 1 and 2 did not seem

to be affected by the delays or variation in furnace operations, but Test 3 results may have been. The concentration at Site 1 increased and the concentration at Site 2 decreased, but these changes could not be related to specific process activities. Indeed, the equivalent production rates for Test 3 showed the reverse: a decrease for Site 1 furnaces and an increase for Site 2 furnaces. The overall increase in uncontrolled emissions was verified by the corresponding increase in outlet emissions, but the overall production rate for Test 3 was slightly lower than the previous tests. The increase in Test 3 emissions caused a 12 percent increase in the average outlet concentration, which was considered relatively insignificant. Overall results were therefore taken as being representative of normal operating conditions.

3.2 PARTICLE SIZE

Tests for particle size distribution were conducted at Site 1 (the north furnaces) to represent uncontrolled emissions, and at Site 3 to represent controlled emissions. These tests were performed in conjunction with particulate matter tests.

3.2.1 Sampling Scheme

Inlet particle size tests were conducted over an entire heat cycle to represent average emissions, and during shorter intervals, to represent different process modes. Tests during integral heats were initiated at the beginning of a charge for either the North AOD or EAF No. 89, whichever occurred first.

Tests continued for one heat and concluded at the end of tapping operations at EAF No. 89, which yielded a sampling time of approximately 3 to 3.5 hours. This time should have included an entire AOD heat of between 1.5 and 2 hours. Because a malfunctioning crane caused as shift in the sequence of normal operations, the first test included almost two AOD heats, and the third test included portions of two different AOD heats. The shorter particle size runs were performed at various times during the second half of each particulate test. The sampling times for these shorter tests were approximately 20 minutes, adjusted as necessary to obtain proper loadings.

Outlet particle size distribution samples were collected simultaneously with each particulate test, which yielded a 5-hour sampling time for each run. Each test was conducted in the same four fabric filter compartments as the coinciding particulate tests, but at different times to minimize interferences. Because of the overlapping schedules between north and south furnaces, no attempt was made to represent integral heats. Fabric filter cleaning cycles were sampled as they occurred.

The integral heat runs at the inlet were coordinated with process operations with the assistance of the NSPS contractor representative. Based on his observations, tests were interrupted as necessary to avoid sampling during unrepresentative conditions.

Andersen Mark III Cascade Impactors were used to collect the shorter inlet samples and all of the outlet samples, and an

Andersen Heavy Grain Loading Impactor was used to obtain integral heat samples. All inlet samples were collected at an average velocity point in the north furnace duct. Velocity data were obtained periodically during each run by the use of Method 2 equipment. Outlet samples were run in duplicate, with each impactor positioned at one of the four sampling points per compartment. The sample time for each run was divided equally among the same four compartments in which the particulate tests were being conducted. Because accurate velocity data could not be obtained at the outlet site, estimated velocities calculated from previous inlet data were used to set approximate isokinetic sampling rates. The results of three runs for each type of sample are included in the report.

3.2.2 Particle Size Distributions and Fractional Efficiencies

Cumulative distribution curves represent the total weight percent of particulate matter smaller than the indicated aerodynamic particle diameter in micrometers. Each distribution curve was plotted manually and represents the best-fit curve through individual and average test data points. Each data point was plotted manually and indicates both the 50 percent effective cut-size of each impactor stage and the cumulative weight percent of material collected in subsequent stages.

The three cut-points for each Andersen Heavy Grain Loading Impactor test at Site 1 were determined graphically from information supplied by the manufacturer. Cut-points for the eight Mark III Impactor stages were calculated by computer programs

contained in "A Computer-Based Cascade Impactor Data Reduction System," (CIDRS) developed for EPA by Southern Research Institute (SRI).[3] All particle size results are based on a particle density of one gram per cubic centimeter. Data reduction and intermediate result calculations for both types of impactors were performed by the CIDRS programs with moisture contents obtained from simultaneous particulate tests. All calculations and results are included in Appendix A.

Figure 3-1 shows the average cumulative distribution curve for uncontrolled emissions over an entire heat cycle. Actual results were limited to three cut-points between 1.6 and 13 μm, but the curve was extrapolated down to a diameter of 0.5 μm for comparison purposes. The average distribution indicated that 50 percent by weight of uncontrolled particulate emissions consisted of particles with aerodynamic diameters of 0.55 μm or less. Eighty percent by weight had diameters less than or equal to 10 μm.

Figure 3-2 shows the results of three runs conducted at Site 1 during various times of process operation. The three cumulative distribution curves distinctly indicate a short-term variation of emissions. Run 1 represented EAF charging emissions, Run 2 represented emissions during the EAF melting phase, and Run 3 represented emissions from both an AOD and an EAF. The percent by weight of emissions that had diameters equal to or smaller than 10 μm varied among the three runs from 54 to 29 to 74 percent, respectively. Only the run representing AOD and EAF emissions was similar to average integral heat results.

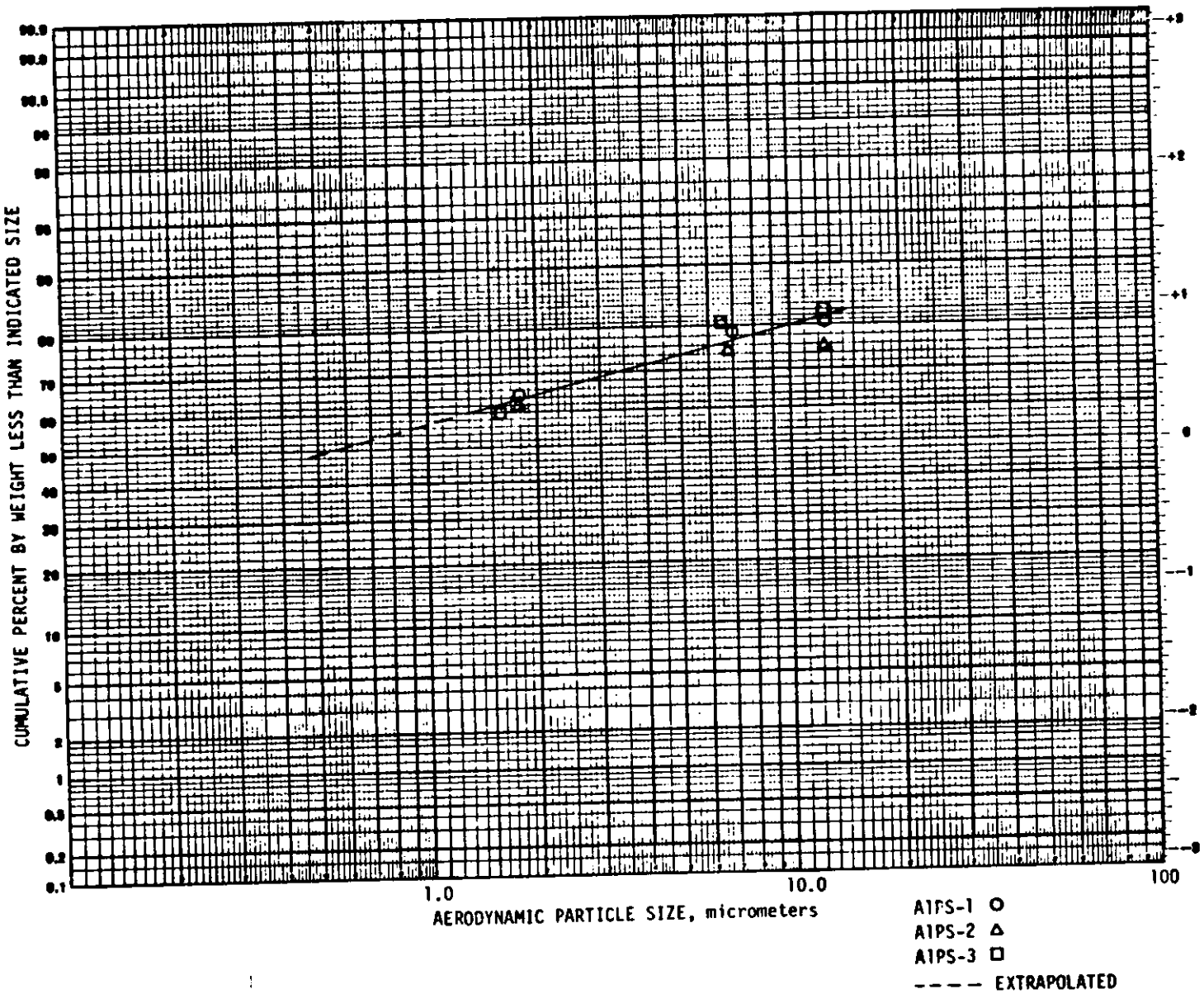


Figure 3-1. Average particle size results for uncontrolled emissions, Site No. 1.

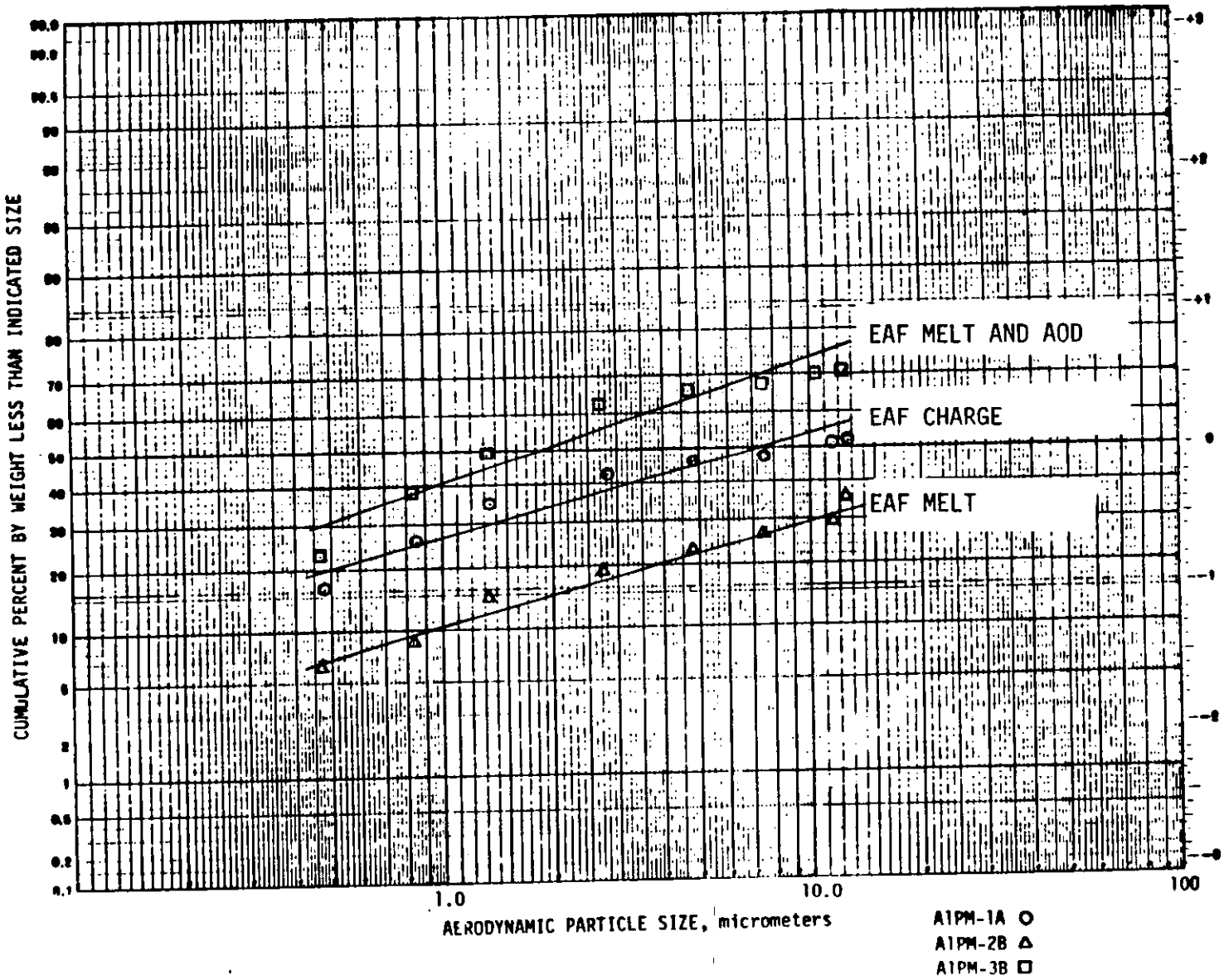


Figure 3-2. Particle size results for uncontrolled emissions during various furnace operations, Site No. 1.

Figure 3-3 shows the average distribution curve for the outlet samples. Results indicated that 50 percent of the mass emissions consisted of particles having aerodynamic diameters of 5 μm or less. Sixty-six percent by weight had diameters smaller than or equal to 10 μm.

Table 3-7 presents the fractional collection efficiencies for various size ranges. Weight percents in each size range were determined from the average inlet and outlet cumulative distribution curves plotted in Figures 3-1 and 3-3. These percentages were multiplied by the average inlet and outlet particulate concentrations shown in Table 3-3 to calculate controlled and uncontrolled mass loadings in the respective size ranges. Fractional efficiencies were calculated for each size range by dividing the difference between inlet and outlet concentrations by the inlet values. Efficiency ranged from a high of 99.7 percent for particles smaller than 0.5 μm in diameter to a minimum of 96.2 percent for particles between 5 and 10 μm in diameter; the overall efficiency was 98.6 percent.

3.2.3 Discussion of Results

Results of all the tests are not reported. Some runs were not included because of poor isokinetics, undesirable stage loadings, or problems related to impactor assembly.

When evaluating these results, one should remember that particle sizes are in terms of aerodynamic diameters based on a particle density of 1 g/cm^3. Cumulative distribution curves based on physical diameters and actual density would be shifted

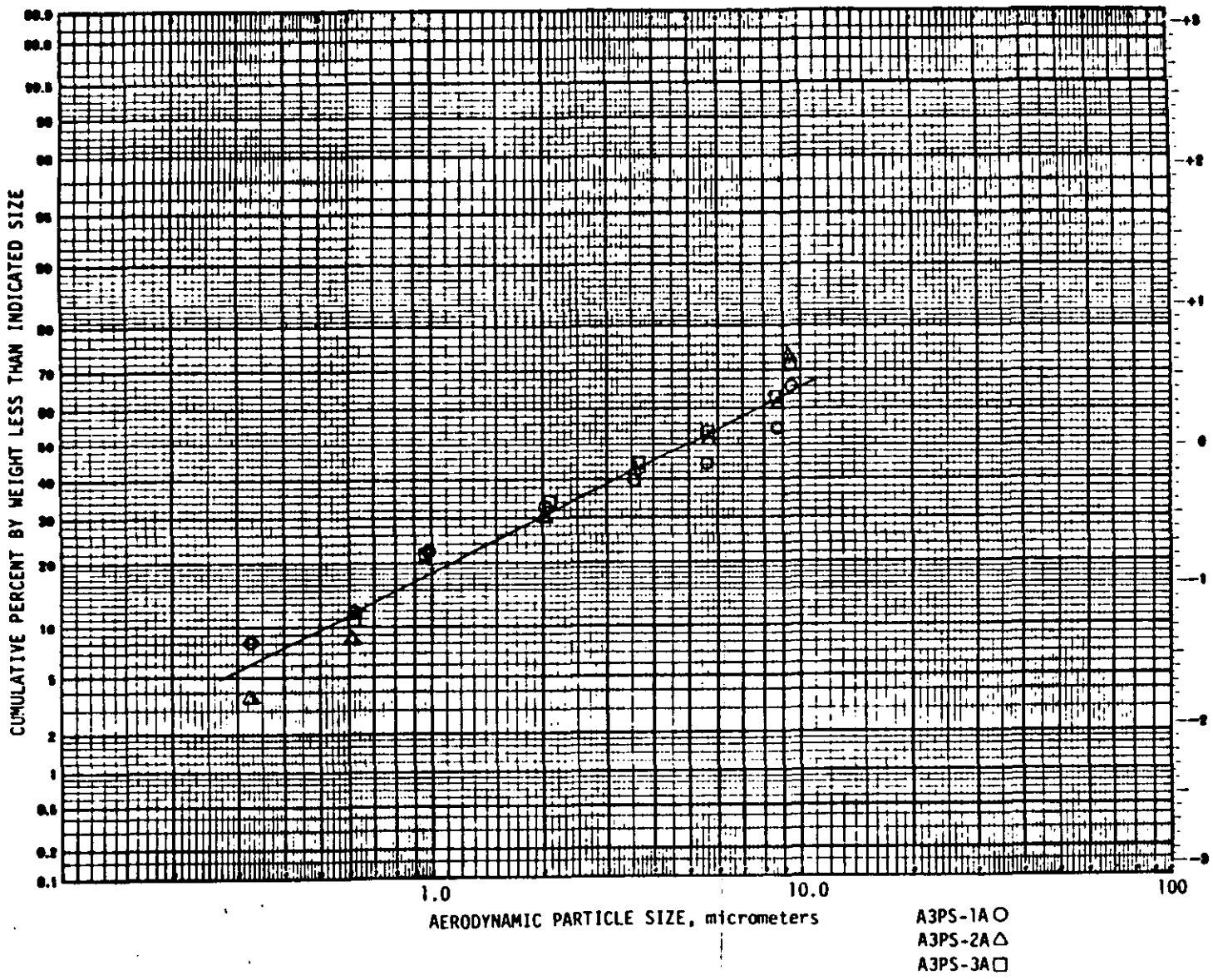


Figure 3-3. Average particle size results for controlled emissions, Site No. 3.

TABLE 3-7. SUMMARY OF PARTICLE SIZE DISTRIBUTION AND FRACTIONAL EFFICIENCY

		Aerodynamic particle size range, micrometers						
		D<0.5	0.5<D<1.0	1.0<D<2.5	2.5<D<5	5<D<10	D>10 μm	Total
Cumulative weight percent[a] less than larger stated size	Inlet	49	49-57	57-67	67-74	74-80	-	100
	Outlet	10	10-18	18-35	35-50	50-66	-	100
Weight percent in stated size range	Inlet	49	8	10	7	6	20	100
	Outlet	10	8	17	15	16	34	100
Particulate concentration[b] in stated size range, mg/dNm^3	Inlet	120	19.6	24.5	17.2	14.7	49.0	245
	Outlet	0.346	0.277	0.588	0.519	0.554	1.18	3.46
gr/dscf	Inlet	0.0527	0.0086	0.0108	0.0075	0.0065	0.0215	0.1076
	Outlet	0.0002	0.0001	0.0003	0.0002	0.0002	0.0005	0.0015
Fractional collection efficiency[c] in stated size range		99.7	98.6	97.6	97.0	96.2	97.6	98.6

[a] Weight percents are taken from plots of average distributions.

[b] Particulate concentration = total emissions x weight % in stated size range; concentrations given in terms of milligrams per dry standard cubic meter at 20°C and 101 kPa and grains per dry standard cubic foot at 68°F and 29.92 in. Hg. Total concentrations were taken from Method 5 test results.

[c] Collection efficiency = $\frac{\text{Inlet concentration - outlet concentration}}{\text{inlet concentration}} \times 100$

to the left toward smaller sizes if the actual density were greater than 1 g/cm^3, and vice versa. A quick approximation of the physical diameter can be obtained by dividing the reported aerodynamic diameter by the square root of the actual particle density. For example, the specific gravity of the fabric filter dust samples was about 3.3 g/cm^3. Using this particle density would increase the amount of controlled emissions smaller than 1 μm from roughly 20 to 30 cumulative weight percent.

As expected, results of the Mark III blank run at the outlet indicated that stack gases did not react with the glass fiber filter media to create false weight changes.

Results representing average uncontrolled emissions over an entire heat cycle generally agreed with expected distributions based on previous EAF data. Particulate concentrations indicated by the first two distribution tests compared favorably with the results of particulate tests conducted over similar time frames. Results of the third distribution test did not agree with the third particulate test, but this lack of agreement was believed to be representative of the short-term variation in emissions. The isokinetic sampling rates for the three runs (104, 100, and 112 percent, respectively) were considered acceptable. The Heavy Grain Loading Impactor sampling rates were all within the limits suggested by the manufacturer, and results are believed to be within generally expected limits of accuracy.

The particle size tests performed during various times of process operation show that uncontrolled emissions are not

consistent over the short term. Although these results generally can be related to process operations, one should remember that the actual sampling times do not precisely coincide with only one specific process mode. For example, Run 1 was conducted during an EAF charge, but the time required to obtain an adequate sample was longer than the charging operation. As a result, Run 1 overlapped into the melting phase of EAF operation. Also, the mode of AOD operation (and relative emission generation) during Run 3 was not clear. Evaluation of the appropriate heat sheet indicated that the AOD may not have been generating any emissions during the actual sampling period.

Comparison of particulate concentrations among the Mark III runs showed disagreement with the relative observation that emissions during EAF meltdown were greater than emissions during an EAF charge. For this reason, and because of the dilution effects when only one furnace was operating, particulate concentrations were not reported. The average isokinetic sampling rates (107, 110, and 106 percent) were all considered acceptable, and impactor sampling rates were within suggested operating limits. In addition, the distributions are not considered to be biased toward larger sizes by the use of glass fiber collection media. This possibility[4] was discounted, as the filter material did not seem to increase the collection efficiencies of upper impactor stages because most of the captured material was either in the cyclone precutter or on the lower stages. Results,

therefore, are taken to be representative of the variation in uncontrolled emissions.

Outlet particle size distributions showed a higher number of large particles than expected. It was expected that 80 to 90 cumulative weight percent of emissions would be of particles with aerodynamic diameters of approximately 2.5 μm or less. One of the several plausible explanations for the apparent discrepancy is the possible bias caused by increased efficiency of the upper impactor stages when glass fiber filters are used.[4] Examination of analytical results indicated that this may have occurred, but it could not be verified. The adjustment to outlet results for this type of bias would reduce the aerodynamic diameter from 5 to 3.5 μm at a cumulative weight of 50 percent; however, this adjustment would not completely account for the difference between actual and expected results.

A second explanation could be related to inaccuracies of the method at very low sample weights; however, results are considered to be acceptable, based on several observations. The particulate concentrations indicated by the particle size runs were between 65 and 85 percent of results from simultaneous particulate tests, which is good agreement for the two different methods. The increase in emissions indicated by the third particulate test is verified by a corresponding increase in particle size emission results. The close agreement among the three cumulative distribution curves is further evidence that particle size results are representative. If the stage sample weights had

been too low for accurate determinations, the three curves probably would have shown more variability and flatter slopes. All of these observations suggest that results were within expected limits of accuracy for particle size distributions tests.

The most likely explanation for the higher than expected number of large particles is related to electrostatic charge. Small charged particles could have agglomerated to form particles of larger diameter. Evidence of a high electrostatic charge inside the fabric filter was discovered while the open gratings at the bottom level of the filter were being covered. For this reason, results of particle size tests are considered to be representative of actual conditions during the tests and reflect possible particle agglomeration due to electrostatic charges.

The fractional efficiencies reported in Table 3-7 also could be affected by the possible particle agglomeration just described. Particle agglomeration would explain the relatively low control efficiencies indicated for the larger particle sizes compared with the abnormally higher efficiencies for smaller sizes. Large particles formed after filtration would indicate false filtering efficiencies for the different size classifications; however, the overall efficiency would be unaffected.

3.3 VISIBLE AND FUGITIVE EMISSIONS

Visible emissions from the melt shop and fabric filter monovent were evaluated simultaneously with particulate matter

tests. In accordance with Method 9* procedures, emissions were observed in 6-minute sets, and individual opacity readings were recorded at 15-second intervals. Fugitive emissions from the fabric filter were evaluated periodically throughout the test series according to procedures outlined in the proposed Method 22.** Fugitive emissions were recorded as the cumulative minutes of any emissions visually detectable during 20-minute observation periods.

3.3.1 Results

Table 3-8 summarizes the visible emissions detected during charging, tapping, and other furnace operations. The melt shop was divided into a north and a south segment for evaluation purposes. Visible emissions from the north segment were attributed to the north furnaces, and vice versa. When one of the north furnaces was charging, only the emissions from the north segment of the melt shop were considered. Tabulated emission data for each furnace type and process mode include the total number of data sets for both melt shop segments; for example, the five data sets during Run 1 for EAF charging represented three sets from the north furnaces and two from the south. During Run 1, individual 6-minute set averages ranged from 0 to 4 percent opacity for charging and tapping operations. Average opacities of individual sets ranged from 0 to 13 percent for refining and other operations. During Run 2, individual set averages during

*40 CFR 60, Appendix A, July 1, 1980.

**Federal Register, Vol. 45, No. 224, November 18, 1980.

TABLE 3-8. SUMMARY OF VISIBLE AND FUGITIVE EMISSIONS[a]

Melt shop[b]

Date (1981)	Run No.	Furnace type	Process mode	Number of sets	Range of readings, % opacity	Range of set averages, % opacity
4/7	1	EAF	Charge	5	0	0
			Tap	5	0	0
		AOD	Charge	4	0-5	0-3
			Tap	2	0	0
		EAF/AOD	Tap/Charge	1	0-10	4
			Charge/Tap	1	0	0
		EAF/AOD	Refining and other	60	0-25	0-13
4/8	2	EAF	Charge	8	0-20	0-12
			Tap	5	0-25	0-15
		AOD	Charge	4	0-20	0-8
			Tap	3	0-10	0-5
		EAF/AOD	Refining and other	74	0-25	0-22
Total		EAF/AOD	Charging and tapping	38	0-25	0-15
			Refining and other	134	0-25	0-22

Fabric filter outlet

Number of of sets	Range of readings, % opacity	Range of set averages, % opacity
73	0	0

Fugitive emissions from fabric filter

Accumulated observation period, minutes	Minutes	Accumulated emission time, % of observation period
595	0	0

[a] Data were collected during 7 hours of process operation on April 7, 7 hours on April 8, and 20 minutes on April 9. Unfavorable weather conditions prevented additional readings on April 9.

[b] Each set of readings represents emissions from either the north or south segment of the melt shop. Data for Run No. 3 could not be obtained because of unfavorable weather conditions on April 9.

charging and tapping ranged from 0 to 15 percent opacity. Average opacities of individual sets ranged from 0 to 22 percent during refining and other operations. No data were obtained during Run 3 because of adverse weather conditions.

Table 3-9 lists the time and average opacity for each 6-minute set of visible emissions data obtained at the melt shop. The heat sheets in Appendix D were used to determine the times of various process operations for comparison to emissions. None of the emissions seemed to be caused by abnormal operations.

No visible emissions from the fabric filter monovent exhaust were detected at any time during the test series, even after compartment cleaning cycles. A total of 73 six-minute sets of data were collected.

The fabric filter structure was observed for a total of 595 minutes. No fugitive emissions were detected at any time.

3.3.2 Discussion

The higher periods of melt shop emissions could be related to daily activities that normally occur during the first part of the day shift. No significant emissions were detected after 1130 hours on April 7 or 1230 hours on April 8, 1981. Examination of the available process information did not yield support for this hypothesis, however.

The low opacity data for the fabric filter outlet were supported by the low particulate concentration results.

TABLE 3-9. COMPARISON OF MELT SHOP VISIBLE EMISSIONS TO PROCESS OPERATION

Process mode[a]		Run number, date, set time	Average opacity, %	
EAF	AOD		North	South
		Run No. 1, 4/7/81		
		10:15 - 10:20 a.m.	0	0
N-T	N-C	10:27 - 10:32	4	4
	N-C	10:33 - 10:38	3	3
N-C		10:43 - 10:48	0	12
		10:49 - 10:54	0	11
		10:55 - 11:00	13	13
		11:01 - 11:06	9	0
		11:07 - 11:12	0	2
		11:13 - 11:18	1	1
		11:25 - 11:30	0	0
		11:37 - 11:42	0	0
		11:49 - 11:54	0	0
NC, ST_1	N-T[b]	12:01 - 12:06 p.m.	0	0
S-CTL		12:13 - 12:18	0	0
$S-T_2$[b]	N-C	12:25 - 12:30	0	0
		12:37 - 12:42	0	0
S-C[b]		12:49 - 12:54	0	0
		1:01 - 1:06	0	0
		1:13 - 1:18	0	0
		1:25 - 1:30	0	0
N-T		1:37 - 1:42	0	0
	S-C[b]	1:49 - 1:54	0	0
N-AE	N-T	2:01 - 2:06	0	0
N-C		2:13 - 2:18	0	0
		2:25 - 2:30	0	0
		2:37 - 2:42	0	0
		2:49 - 2:54	0	0
N-RT		3:01 - 3:06	0	0
N-RT		3:13 - 3:18	0	0
N-RT		3:25 - 3:30	0	0
	S-T[b]	3:37 - 3:42	0	0
		3:49 - 3:54	0	0
		4:01 - 4:06	0	0
NC, ST_1[b], SBB		4:13 - 4:18	0	0
$S-T_2$[b]		4:25 - 4:30	0	0
	S-C	4:37 - 4:42	0	0
		4:49 - 4:54	0	0
S-C[b]		5:01 - 5:06	0	0
		5:13 - 5:18	0	0

(continued)

TABLE 3-9 (continued)

Process mode[a]		Run number, date, set time	Average opacity, %	
EAF	AOD		North	South
		Run No. 2, 4/8/81		
	N-C[b]	9:45 - 9:50 a.m.	8	0
N-C		9:51 - 9:56	10	10
N-C		9:57 - 10:02	5	5
		10:03 - 10:08	12	12
		10:09 - 10:14	22	22
N-AE,S-T_1		10:15 - 10:20	15	15
N-AE,S-BB		10:21 - 10:26	5	5
S-BB		10:27 - 10:32	8	8
S-BB		10:33 - 10:38	10	10
S-T_2		10:39 - 10:44	6	6
		10:45 - 10:50	2	2
	S-C	10:51 - 10:56	1	0
		10:57 - 11:02	2	0
	N-T	11:09 - 11:14	5	0
		11:15 - 11:20	4	0
N-RWP		11:20 - 11:26	6	0
N-RWP,S-C		11:27 - 11:32	10	10
N-RWP,S-C		11:33 - 11:38	12	12
N-C		11:39 - 11:44	8	8
		11:45 - 11:50	0	8
		11:51 - 11:56	13	13
		11:57 - 12:02 p.m.	20	20
		12:03 - 12:08	12	12
		12:09 - 12:14	8	8
		12:19 - 12:24	12	12
		12:25 - 12:30	2	2
		12:37 - 12:42	0	0
		12:49 - 12:54	0	0
N-T		1:01 - 1:06	0	0
	N-C	1:13 - 1:18	0	0
N-C	S-T	1:25 - 1:30	0	0
		1:37 - 1:42	0	0
		1:49 - 1:54	0	0
S-T_1		2:01 - 2:06	0	0
S-BB		2:13 - 2:18	0	0
S-BB	N-T[b]	2:25 - 2:30	0	0
S-T_2		2:37 - 2:42	0	0
	S-C	2:49 - 2:54	0	0
		3:01 - 3:06	0	0
		3:15 - 3:20	0	2
S-C[b]		3:27 - 3:32	0	0
S-AE		3:39 - 3:44	0	0

(continued)

TABLE 3-9 (continued)

Process mode[a]		Run number, date, set time	Average opacity, %	
EAF	AOD		North	South
		Run No. 2, 4/8/81		
N-C[b]	S-PS	3:51 - 3:56 p.m.	0	0
	S-PS	4:03 - 4:08	0	0
		4:15 - 4:20	0	0
		4:27 - 4:32	0	0
		4:39 - 4:44	0	0

[a]N = North furnace, S = South furnace, C = Charge, T = Tap, CTL = Clean tap ladle, AE = Add or adjust electrode, RT = Repair tap spout, BB = Burn bottom, RWP = Repair water pipe, PS = Patch seam.

[b]Process mode actually began 3 to 6 minutes prior to indicated set time.

3.4 FABRIC FILTER DUST SAMPLES

Samples of dust collected by the fabric filter were obtained daily from the dust-handling system just below the central junction of the screw conveyors. Samples were collected in a manner that did not interfere with other ongoing tests. The laboratory split each sample into two fractions for separate analyses of trace elements by spark source mass spectroscopy (SSMS) and for particle size distribution by Coulter Counter.

3.4.1 Trace Elements

Table 3-10 summarizes the results of SSMS analyses on the three dust samples. Concentrations are given in micrograms of element per gram of sample. Less than (<) and greater than (>) marks are used to denote concentrations outside the quantification limits for the particular element and sample analysis. The minimum detection limits for the majority of elements ranged from 0.1 to 0.4 μg/g; major constituents are listed as >1000 μg/g. Results for several elements are not reported, and indium was added to each sample as an internal standard. Elements are listed alphabetically for convenience. The analytical results included in Appendix C are listed in order of decreasing atomic number.

3.4.2 Particle Size Distribution

Figure 3-4 shows the best-fit cumulative distribution curve for the three dust samples. This curve represents the weight percent of particulate matter smaller than the indicated physical particle diameter (in micrometers). Each data point was

TABLE 3-10. SUMMARY OF TRACE ELEMENT ANALYSES ON FABRIC FILTER DUST SAMPLES

Element	Concentration, μg/g (ppm weight)		
	Sample 1	Sample 2	Sample 3
Aluminum	>1000	>1000	>1000
Antimony	160	190	44
Arsenic	420	410	120
Barium	>1000	>1000	>1000
Beryllium	0.3	0.1	0.2
Bismuth	350	420	44
Boron	42	23	53
Bromine	170	94	43
Cadmiun	150	180	132
Calcium	>1000	>1000	>1000
Carbon	NR[a]	NR	NR
Cerium	21	19	6
Cesium	7	14	3
Chlorine	>1000	>1000	>1000
Chromium	>1000	>1000	>1000
Cobalt	340	190	430
Copper	>1000	>1000	>1000
Dysprosium	<0.4	<0.1	<0.2
Erbium	<0.4	<0.1	<0.2
Europium	<0.4	0.4	<0.2
Fluorine	>1000	>1000	>1000
Gadolinium	<0.4	<0.1	<0.2
Gallium	660	810	330
Germanium	100	55	41
Gold	<0.4	<0.1	<0.2
Hafnium	3	1	1
Holmium	<0.4	<0.1	<0.2
Hydrogen	NR	NR	NR
Indium	STD[b]	STD	STD
Iodine	2	3	3
Iridium	<0.4	<0.1	<0.2
Iron	>1000	>1000	>1000
Lanthanum	21	25	6
Lead	>1000	>1000	>1000
Lithium	160	9	79
Lutetium	<0.4	<0.1	<0.2
Magnesium	>1000	>1000	>1000
Manganese	>1000	>1000	>1000
Mercury	NR	NR	NR
Molybdenum	>1000	>1000	>1000
Neodymium	5	3	1

(continued)

TABLE 3-10 (continued)

Element	Concentration, μg/g (ppm weight)		
	Sample 1	Sample 2	Sample 3
Nickel	>1000	>1000	>1000
Niobium	190	56	52
Nitrogen	NR	NR	NR
Osmium	<0.4	<0.1	<0.2
Oyxgen	NR	NR	NR
Palladium	<0.4	<0.1	<0.2
Phosphorus	>1000	840	970
Platinum	<0.4	<0.1	<0.2
Potassium	>1000	>1000	>1000
Praseodymium	2	1	1
Rhenium	<0.4	<0.1	<0.2
Rhodium	<0.4	<0.1	<0.2
Rubidium	170	530	200
Ruthenium	<0.4	<0.1	<0.2
Samarium	4	2	2
Scandium	1	0.1	0.5
Selenium	120	66	28
Silicon	>1000	>1000	>1000
Silver	≤4	66	220
Sodium	>1000	>1000	>1000
Strontium	>1000	>1000	800
Sulfur	>1000	>1000	>1000
Tantalum	3	≤0.9	1
Tellurium	3	5	2
Terbium	<0.4	<0.1	<0.2
Thallium	12	<0.1	2
Thorium	8	5	2
Thulium	<0.4	<0.1	<0.2
Tin	410	220	82
Titanium	>1000	710	660
Tungsten	100	54	50
Uranium	6	3	2
Vanadium	850	>1000	>1000
Ytterbium	<0.4	<0.1	<0.2
Yttrium	15	8	16
Zinc	>1000	>1000	>1000
Zirconium	130	39	36

[a]Not reported.

[b]Internal standard.

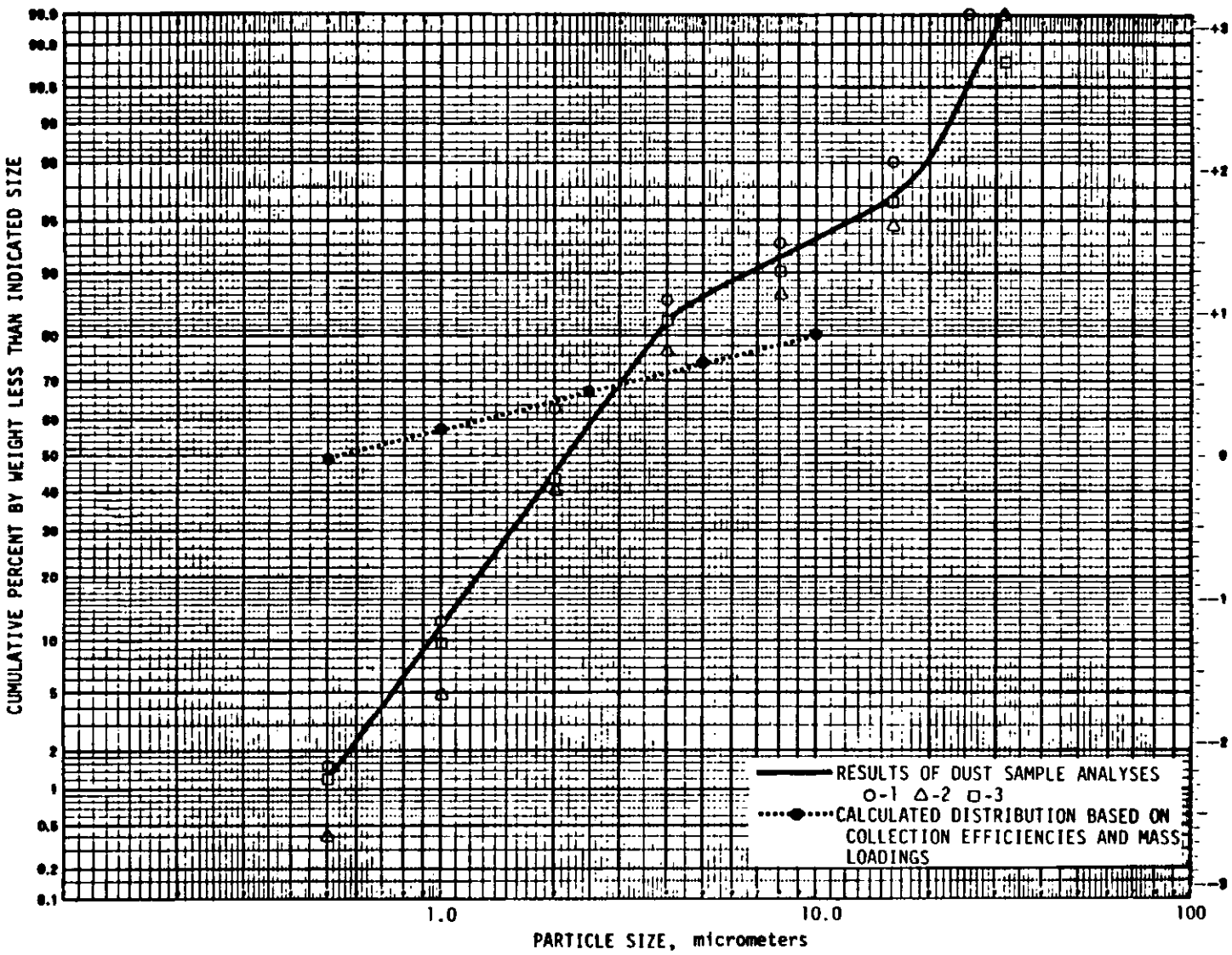


Figure 3-4. Average particle size distribution of fabric filter dust samples.

plotted manually from differential distribution data reported by the laboratory. The average curve indicated that 50 percent by weight of collected dust consisted of particles with physical diameters of 2.2 μm or less. Ninety-three percent by weight had diameters of less than 10 μm.

3.4.3 Discussion

The concentrations of several trace elements seem to vary considerably, and this could be related to different specifications of the metal in the furnaces. It should be noted, however, that SSMS is more of a qualitative than quantitative analytical technique. [The results of an audit sample (Section 5) bear this out; they indicate that reported element concentrations are only accurate within a factor of ± 3.]

When evaluating the particle size results, one should note that the cumulative distribution curves are based on physical diameters rather than aerodynamic diameters as reported for emission tests. If desired, an approximation of the aerodynamic diameters can be made by multiplying the reported physical diameters by the square root of the actual particle density. Using the specific gravity analysis results of 3.3 g/cm^3 would decrease the amount of dust smaller than 3 μm from approximately 70 to 35 cumulative weight percent.

The reported cumulative weight distributions also assume that all particles have the same density. This assumption was necessary to convert particle volume data measured by the Coulter Counter to a weight basis.

The Coulter Counter results were compared with a theoretical size distribution based on emission test results at the inlet and outlet sites. This theoretical cumulative weight curve was estimated from the average size distributions, fractional efficiencies, and mass loadings listed in Table 3-7. The Coulter Counter and theoretical curves both indicated that 75 cumulative weight percent of the collected dust consisted of particles with aerodynamic diameters of approximately 6 μm or less. The curves differed considerably at smaller sizes, but this may have resulted from the agglomeration of particles in the outlet gas stream.

The particle size distribution samples were originally subjected to Bahco analysis, but agglomeration of the particles during analysis prevented an accurate determination.

3.5 SUPPLEMENTAL ANALYSES FOR FLUORIDE, CHROMIUM, LEAD, AND NICKEL

Several outlet samples and fabric filter dust samples were analyzed for particulate fluoride content by procedures described in EPA Method 13B*, and for chromium, lead, and nickel content by Atomic Absorption Spectrophotometry. These analyses were performed subsequent to the completion of originally scheduled laboratory work to better quantify emission levels indicated as greater than 1000 μg/g by the SSMS analyses on the fabric filter dust samples.

*40 CFR 60, Appendix A, July 1, 1980.

Separate fluoride analyses were performed on two acetone rinses and one set of filters from the outlet particle size samples, two of the fabric filter dust samples, and appropriate blanks. Metal analyses were performed on two sets of outlet particle size samples (acetone rinse and filters combined), two dust samples, and appropriate blanks. The fourth outlet sample was obtained from a duplicate test run.

Laboratory results of fluoride and metal analyses on the outlet samples were reported as milligrams of pollutant. The species concentration (in micrograms per gram) was calculated by dividing the mass of pollutant by the mass of particulate matter reported in earlier gravimetric analyses. The laboratory results for dust samples were reported in concentrations of milligrams per gram, which were easily converted to micrograms per gram. The two concentration results of each species and sample type were averaged. Average concentrations were multiplied by average filterable particulate emission results to determine pollutant gas stream concentrations, mass emission rates, and emission factors. For this purpose, results of dust sample analyses were assumed to be representative of uncontrolled emissions. Results are summarized in Table 3-11.

The outlet fluoride results are based on acetone rinse analyses only because the filter analysis had a high blank value of fluoride. This was caused by the filter material, which was glass fiber instead of paper as specified by Method 13B. The total filter blank value was 2.3 times larger than the net

TABLE 3-11. SUMMARY OF SUPPLEMENTAL ANALYSES FOR FLUORIDE, CHROMIUM, LEAD, AND NICKEL

Pollutant species	Concentration			Emission rate		Emission factors			
	μg/g of solid	mg/dNm^3	gr/dscf	kg/h	lb/h	kg/h/Mg	lb/h/ton	kg/Mg	lb/ton
Uncontrolled emissions[a]									
Fluoride	47,200	12	0.0051	11	24	0.098	0.20	0.37	0.74
Chromium	39,200	9.6	0.0042	8.9	20	0.081	0.16	0.31	0.61
Lead	8,400	2.1	0.0009	1.9	4.2	0.017	0.035	0.066	0.13
Nickel	16,300	4.0	0.0018	3.7	8.1	0.034	0.068	0.13	0.25
Controlled emissions[b]									
Fluoride[c]	31,600	0.11	0.00005	0.10	0.22	0.0009	0.0019	0.0035	0.0070
Chromium	17,400	0.060	0.00003	0.056	0.12	0.0005	0.0010	0.0019	0.0038
Lead	5,800	0.020	0.000009	0.019	0.041	0.0002	0.0003	0.0006	0.0013
Nickel	7,600	0.026	0.00001	0.024	0.054	0.0002	0.0004	0.0008	0.0017

[a]Based on average uncontrolled particulate emissions and average of analyses on two dust samples, assuming that the concentration in the uncontrolled gas stream is the same as in the collected dust.

[b]Based on average controlled particulate emissions and an average of analyses on two outlet samples.

[c]Based on analyses of acetone rinses only; the glass fiber filter analysis had a high blank weight of fluoride and was not used.

fluoride on the filter, which increased the possibility of error in the results. Because the amount of fluoride in the acetone rinse was much smaller than that indicated by the filter analysis, a small error in the filter results would have a significant impact on total fluoride. For these reasons, and because the filter result indicated a much higher concentration of fluoride than did the acetone rinse results, the filter analysis was disregarded. If the filter result is correct, the outlet fluoride concentration would be 56,700 μg/g instead of the 31,600 μg/g indicated in the table. This would not compare favorably with the 47,200 μg/g of fluoride measured in the dust samples because it would contradict the trend of the other results, which indicate lower pollutant concentrations in the outlet samples than in the dust samples.

SECTION 4

SAMPLING SITES AND TEST METHODS

This section describes the sampling sites and outlines the various test methods that were used to characterize particulate matter emissions, particle size distributions, visible and fugitive emissions, and fabric filter dust samples. The schematics of the air pollution control system presented in Figures 4-1 and 4-2 identify the relative locations of each sampling site. Figure 4-3 presents several photographs of the control system configuration and sampling sites.

4.1 SITE 1--UNCONTROLLED NORTH EAF AND NORTH AOD

Uncontrolled emissions from the north furnaces were sampled for particulate matter and particle size distribution. Site 1 was located in the 3.0-m (10-ft) diameter duct between the point where the north EAF and AOD ducts meet and the junction of north and south ducts. Two sampling ports, 90 degrees apart, were located 2.9 diameters downstream and 1.3 diameters upstream of 45-degree bends, as shown in Figure 4-4. Forty-four traverse points were used to sample the cross-sectional area of the duct for particulate matter, with 22 points on each traverse diameter. Each particulate run covered two consecutive EAF heats. Tests were started at the beginning of charging operations and

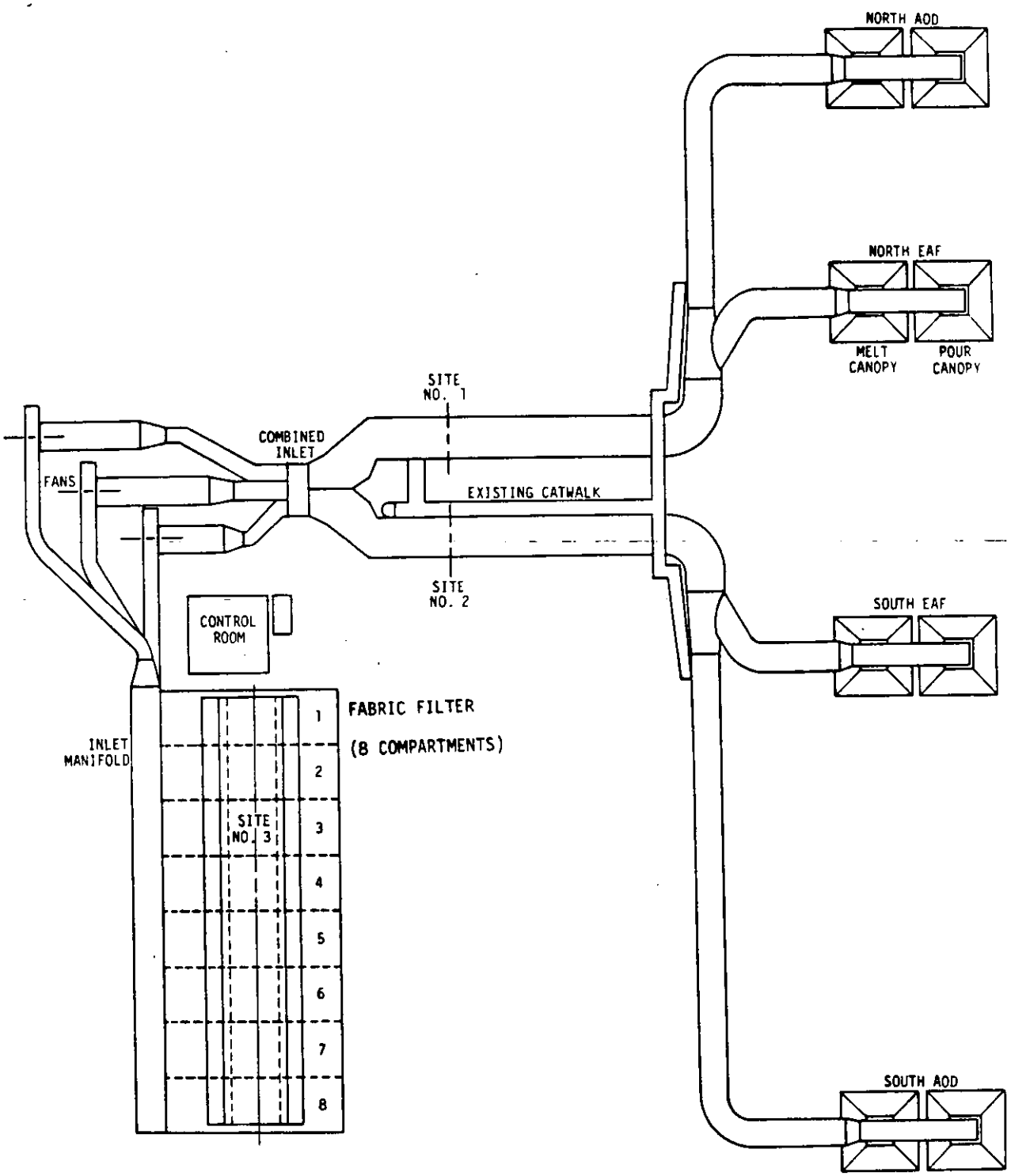


Figure 4-1. Control system schematic, top view.

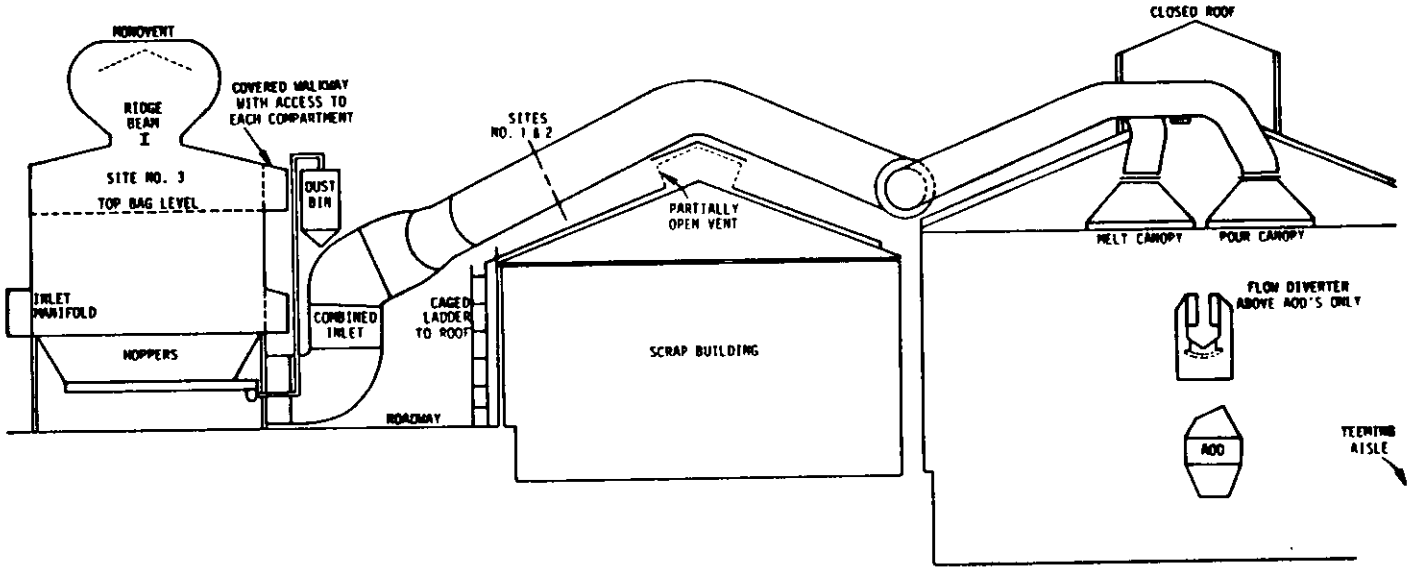
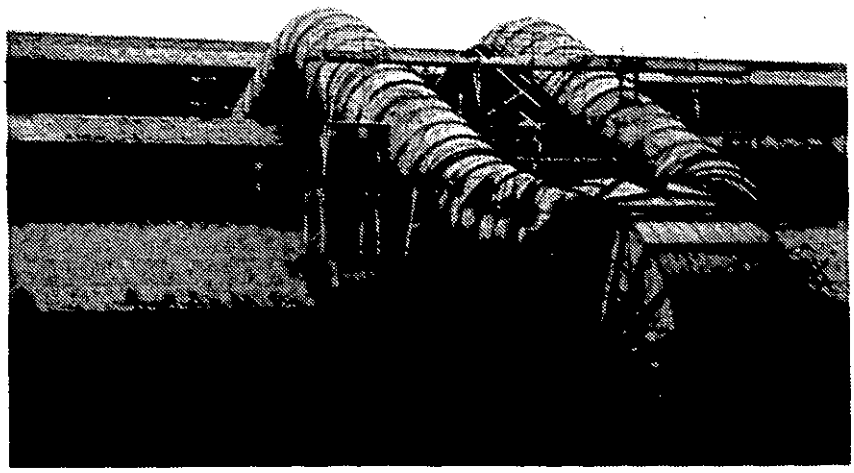


Figure 4-2. Control system schematic and location of sampling sites, elevation view.

NORTH AOD (LEFT) AND
NORTH EAF HOOD DUCTS

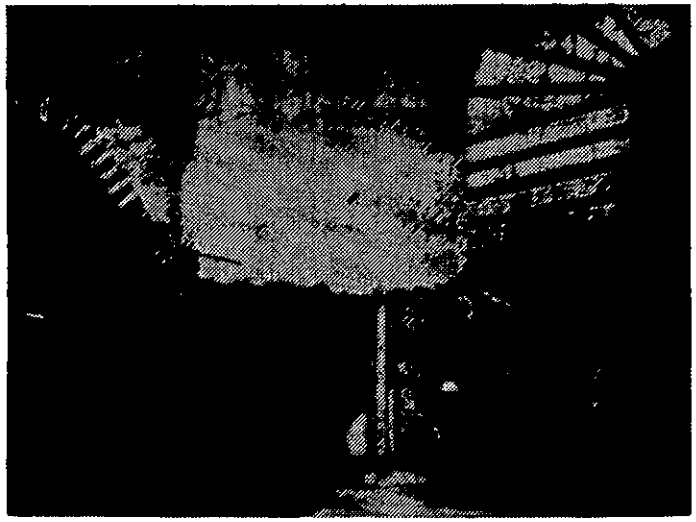
SOUTH EAF (LEFT) AND SOUTH
AOD HOOD DUCTS



SAMPLING LOCATIONS AT THE NORTH EAF/AOD DUCT
(LEFT, SITE NO. 1) AND THE SOUTH EAF/AOD DUCT
(SITE NO. 2)

Figure 4-3. Control system configuration and location of sampling sites.

FABRIC FILTER AND MONOVENT. SAMPLING LOCATIONS ARE INSIDE EACH COMPARTMENT NEAR THE BASE OF THE MONOVENT.



FANS AND COMBINED INLET DUCT

Figure 4-3. Control system configuration and location of sampling sites (continued).

TRAVERSE POINT NO.	DISTANCES cm	(in.)
1	15.0	(5.9)
2	22.4	(8.8)
3	30.0	(11.8)
4	38.1	(15.0)
5	46.7	(18.4)
6	55.9	(22.0)
7	66.3	(26.1)
8	77.7	(30.6)
9	91.4	(36.0)
10	107.6	(42.3)
11	131.1	(51.6)
12	196.6	(77.4)
13	220.5	(86.8)
14	236.2	(93.0)
15	249.9	(98.4)
16	261.4	(102.9)
17	271.8	(107.0)
18	280.9	(110.6)
19	289.6	(114.0)
20	297.9	(117.3)
21	305.6	(120.3)
22	312.7	(123.1)

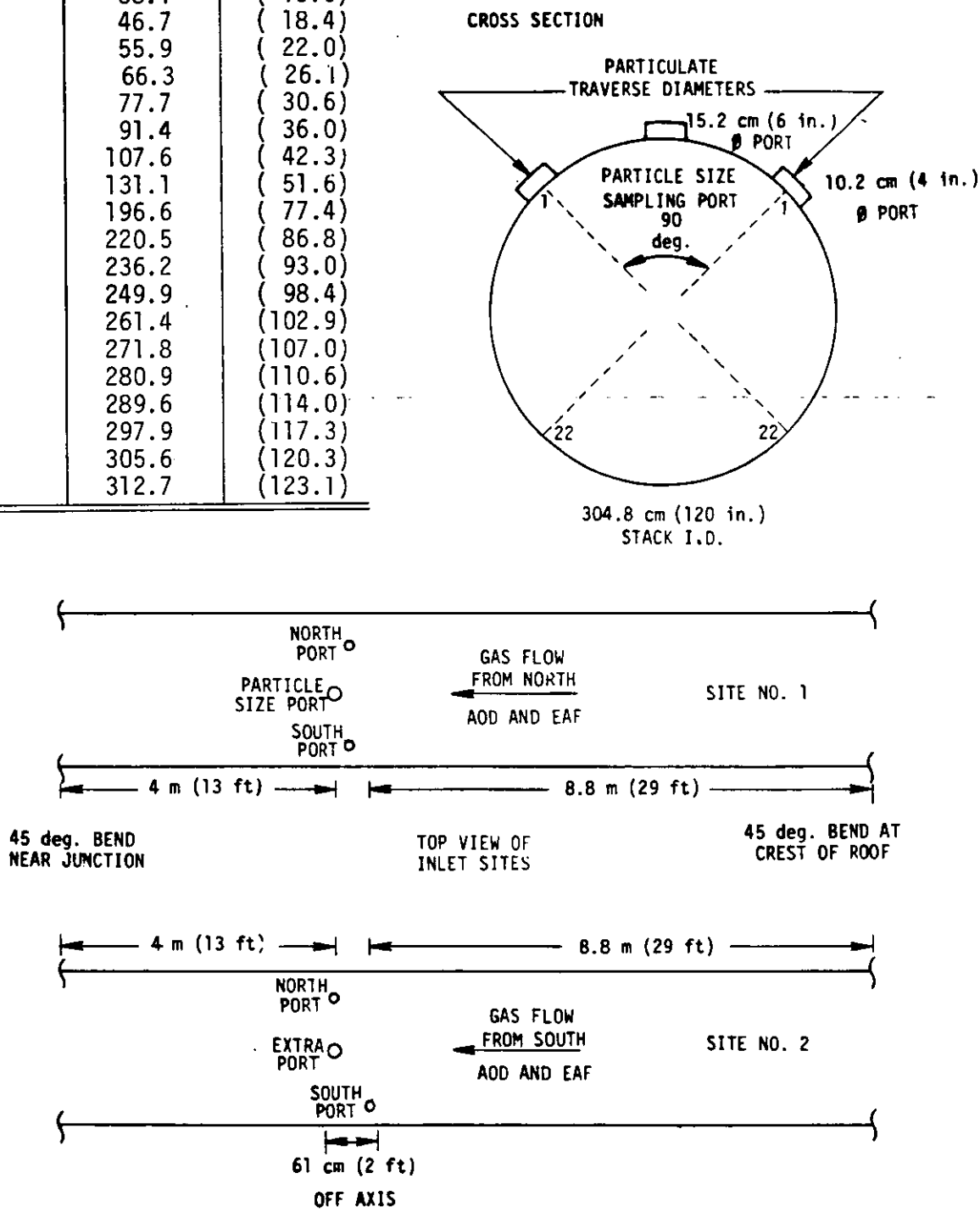


Figure 4-4. Inlet sampling locations.

continued through tapping. Initial sampling of each traverse point lasted 4 minutes. At the completion of a full traverse, the nozzle was positioned at a point of average velocity and sampling continued until the end of the first heat. A new traverse was then initiated for the second heat, and each point was sampled for 4 minutes. By the end of the second EAF heat, a minimum of two complete traverses had been conducted. Actual sampling time, which depended on heat times, ranged from 352 to 399 minutes.

Particle size distribution samples were collected at a point of average velocity near the centroid of the duct. A separate port was used to minimize interferences with the particulate matter tests. Sampling times ranged from 17.5 minutes for the Andersen Mark III samples to 207 minutes for the Andersen Heavy Grain Loading Impactor samples, which covered an integral heat.

4.2 SITE 2--UNCONTROLLED SOUTH EAF AND SOUTH AOD

Site 2 was similar to Site 1, but only particulate matter tests were conducted at this site. Forty-four traverse points were sampled for 8 minutes each, to yield a total sampling time of 352 minutes per run. These tests were coordinated with tests at Site 1, not with process conditions of the south furnaces.

4.3 SITE 3--FABRIC FILTER OUTLET

Controlled emissions from the fabric filter serving all four furnaces were sampled for particulate matter and particle size distribution. The cleaned gases from each compartment exit

through the common monovent located atop the fabric filter in a configuration typical of positive-pressure fabric filters. Method 1* criteria could not be met at this site; therefore, the throat of the monovent was chosen as an optimum sampling location because it represented the smallest cross-sectional area. This small area would not only provide the highest gas velocities, but also offer less chance for bias due to faulty bags.

Figure 4-5, a top view of the fabric filter arrangement, shows the general location of sampling points. Figure 4-6, an end view of the fabric filter, shows the location of the sampling plane used in each compartment with respect to the site configuration. Figure 4-7 gives specific dimensions for the sampling plane cross-sectional area and the location of sampling points in a typical compartment. It should be noted that the dimensions of the sampling plane were slightly different from those of the actual monovent throat because the tests were conducted just below the throat. Other dimensions are given for the compartment widths and panel offsets created by structural I beams. As the figure indicates, dimensions for the sampling cross section and the exhaust opening in the two end compartments were different from those in the six middle compartments. Based on these measurements, the total cross-sectional area of the sampling plane in all eight compartments was calculated to be 113.2 m^2 (1218.8 ft^2).

*40 CFR 60, Appendix A, July 1, 1980.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

DATE: 1/18/82

SUBJECT: Source Test Report

FROM: J. E. McCarley, Chief, Field Testing Section,
Emission Measurement Branch, ESED (MD-13)

TO: See Below

The enclosed final source test report is submitted for your information. Any questions regarding the test should be directed to the Project Officer (telephone: 8/629-5543). Additional copies of this report are available from the ERC Library, Research Triangle Park, North Carolina 27711.

Industry: Electric Arc Furnace - Revision

Process: Argon Oxygen Decarburization

Company: Altech Specialty Steel Corporation

Location: Albany, New York

Project Report Number: EMB 80-ELC-7

Project Officer: George W. Walsh

Enclosure

Addressees:
Ken Knapp, ESRL (MD-46)
Arch MacQueen, MDAD (MD-14)
Rodney Midgett, EMSL (MD-77)
Mark S. Siegler, DSSE (MD-EN-341)
Director, Air & Hazardous Materials Division, Region II
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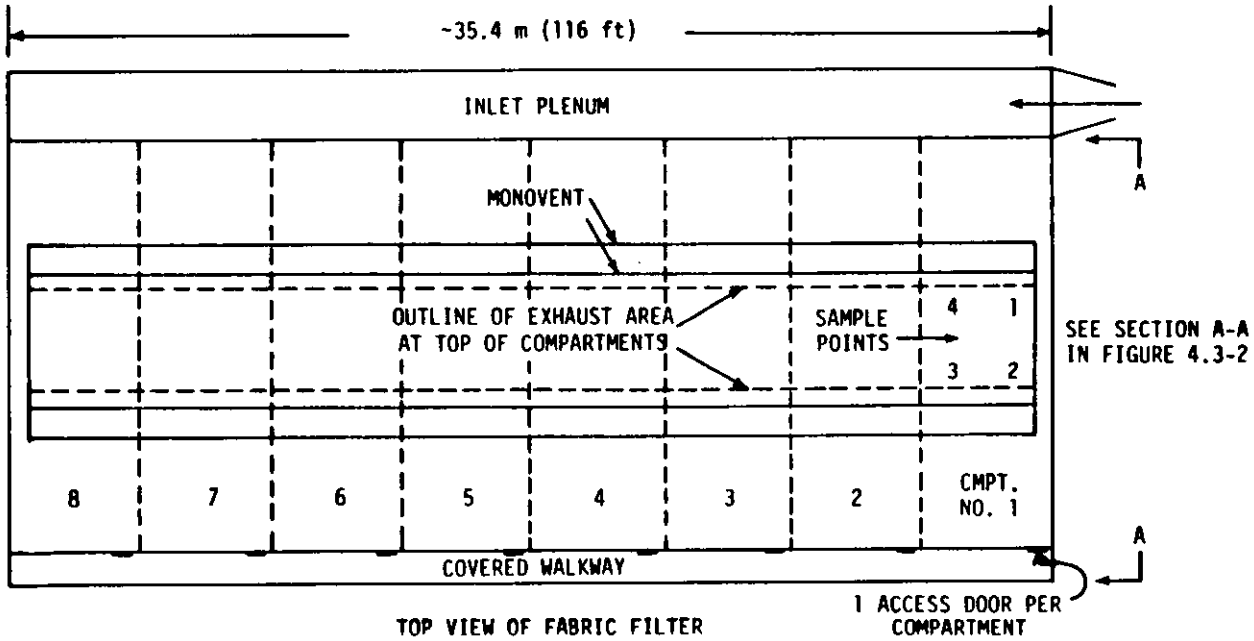
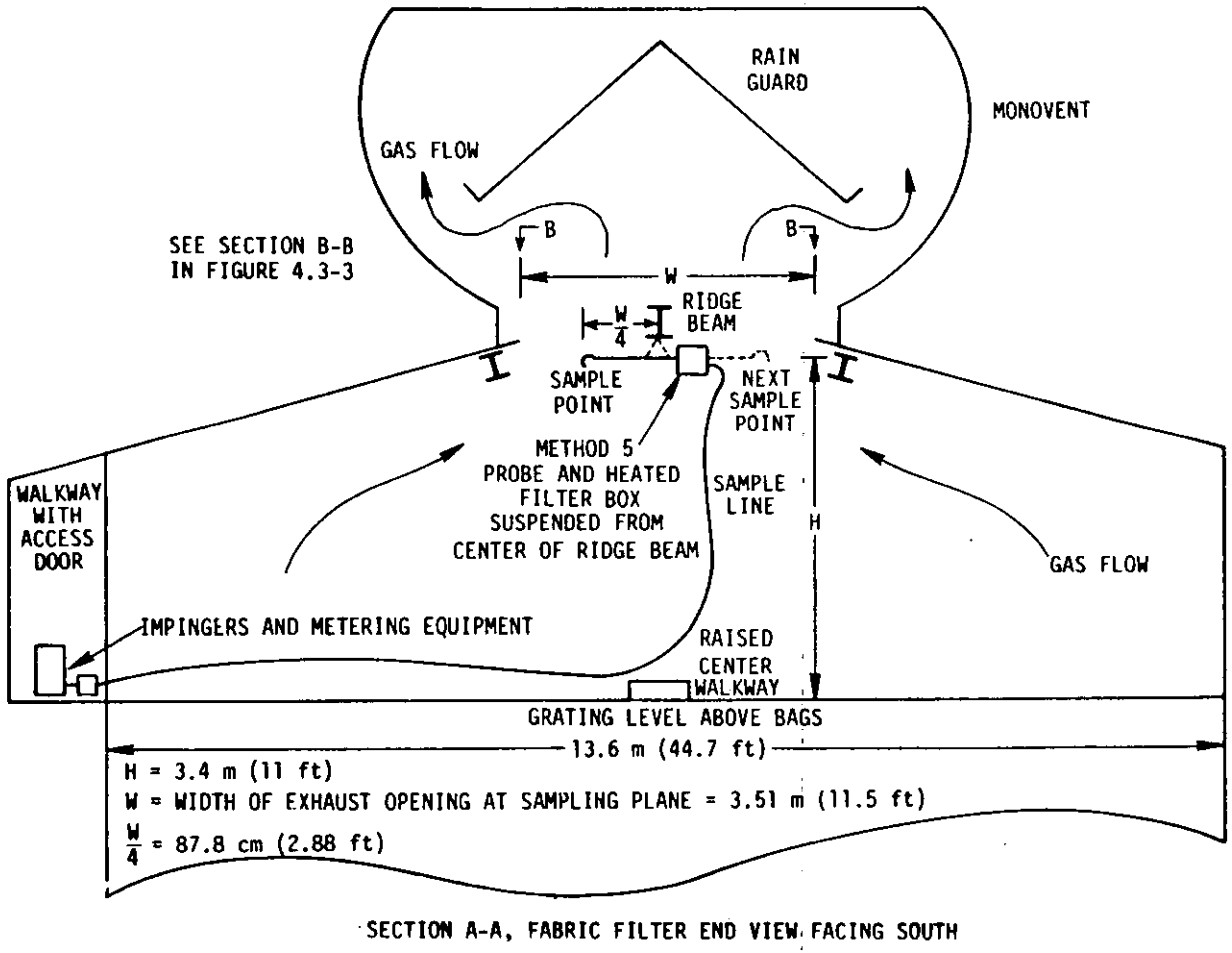


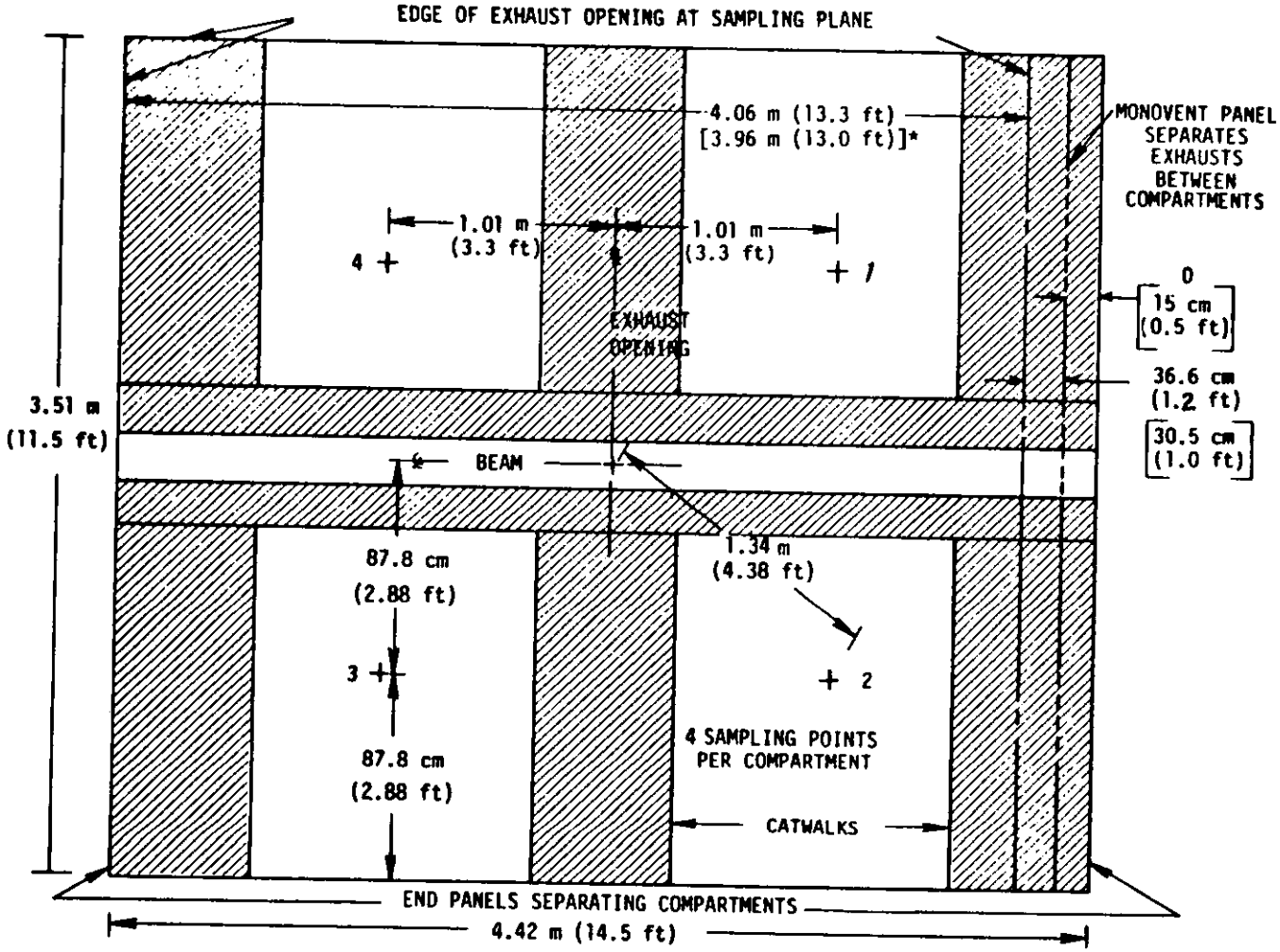
RUN 1 - COMPARTMENT NOS. 1 THROUGH 4
RUN 2 - COMPARTMENT NOS. 3 THROUGH 6
RUN 3 - COMPARTMENT NOS. 5 THROUGH 8

Figure 4-5. Sampling Site No. 3, the fabric filter outlet.



SECTION A-A, FABRIC FILTER END VIEW FACING SOUTH

Figure 4-6. Sampling location at Site No. 3, the fabric filter outlet.



*DIMENSIONS IN BRACKET [ ] ARE FOR THE TWO END COMPARTMENTS, IF DIFFERENT.

NOTE: BAG ROWS ARE IN OPEN AREAS BETWEEN CATWALKS.

TOP VIEW OF FABRIC FILTER EXHAUST AREA WITH MONOVENT NOT SHOWN. ONLY ONE OF EIGHT COMPARTMENTS IS SHOWN.

Figure 4-7. Location of sampling points at Site No. 3, the fabric filter outlet.

Each particulate test consisted of sampling four points in each of four compartments (for a total of 16 points); at 20 minutes per point, this yielded 320 minutes of sampling time. The tests began at the same time as the inlet tests and concluded at the end of the 16-point traverse. Figure 4-5 shows the specific compartments tested during each run. At the end of three runs, each compartment had been tested at least once.

Each particle size distribution sample was collected at one sampling point in each of four compartments, which yielded a total sampling time of 300 minutes. These samples were collected simultaneously with particulate matter tests and in the same compartments; however, both probes were not in the same compartment at the same time.

During each test, the entry of dilution air through the open grating at the bottom level of the fabric filter was minimized by covering the gratings with kraft paper and boards. The gratings in all four compartments to be tested on a given day were covered during the preceding day to allow fabric filter conditions to equilibrate.

4.4 VELOCITY AND GAS TEMPERATURE

A type S pitot tube and an inclined draft gauge manometer were used to measure the gas velocity pressures at the two inlets. Velocity pressures were measured at each sampling point across the duct to determine an average value. Measurements were taken in accordance with procedures outlined in Method 2 of

the Federal Register.* Velocities at the outlet site were calculated from inlet flow rates and the size of the outlet area. The temperature at each sampling point was measured by using a thermocouple and potentiometer.

4.5 MOLECULAR WEIGHT

Flue gas composition was determined in accordance with procedures described in Method 3.* An integrated bag sample was collected at each site during the preliminary runs on Monday, and an Orsat Gas Analyzer was used to analyze the bag contents for oxygen and carbon dioxide. Since these results verified that the gas streams were essentially air, additional samples were not collected.

4.6 PARTICULATE MATTER

Method 5* was used to measure particulate concentrations at the two inlet sites. All tests were conducted isokinetically by traversing the cross-sectional area of the stack and regulating the sample flow rate relative to the gas velocity in the duct as measured by the pitot tube and thermocouple attached to the sample probe. Each sampling train consisted of a heated, 316 stainless steel-lined probe, a heated 87-mm (3-in.) diameter glass fiber filter (Gelman Type AE), a Teflon sample line, and a series of Greenburg-Smith impingers followed by an umbilical line and metering equipment. At the end of each test, the nozzle, probe, and filter holder portions of the sample train were

*40 CFR 60, Appendix A, July 1, 1980.

acetone-rinsed. The acetone rinse and filter media were dried at room temperature, desiccated to a constant weight, and weighed on an analytical balance. Total filterable particulate matter was determined by adding the net weights of the two sample fractions. Any condensate in the sample line was drained into the impinger section of the sampling train. After the amount of water collected in the impingers was measured, the contents were recovered and gravimetrically analyzed for condensible matter by evaporating the solutions in an oven at 105°C.

Method 5 equipment and modified sampling procedures were used for particulate tests at the fabric filter outlet. The sampling train was similar to those used at the inlet sites except for the lack of a pitot tube and the use of a glass-lined probe. Tests were conducted at a constant sampling rate based on the estimated average velocity of the entire sampling area. This average velocity was calculated by first converting the total flow rate measured at the two inlet sites to outlet conditions of temperature, pressure, and moisture, and then dividing by the total outlet sampling area. The resultant average velocity was assumed to represent each sampling point and was used to calculate an average isokinetic sampling rate. The heated probe and filter assembly was suspended from the center of the ridge beam in a fabric filter compartment, as shown in Figure 4-6. The nozzle was positioned at each of the four sampling points in a compartment by rotating the probe and filter assembly. When the sampling points were changed, care was taken to avoid stirring up

any dust or bumping the probe against any structural members. Compartment cleaning cycles were sampled as they occurred. Compartment gas flows were interrupted while test equipment was moved from one compartment to another, but conditions were allowed to equilibrate for several minutes before sampling resumed. Outlet samples were recovered and analyzed in a manner similar to inlet particulate samples, except that the impinger solutions were analyzed for organic and inorganic matter by ether-chloroform extraction.

Sampling times and volumes for the outlet particulate tests exceeded the respective minimum requirements of 4 hours and 4.5 dNm^3 (160 dscf) specified in Subpart AA of the Federal Register.*

4.7 PARTICLE SIZE DISTRIBUTION

Particle size samples at the inlet site were collected with an Andersen Mark III Cascade Impactor and an Andersen Heavy Grain Loading Impactor (HGLI). The Mark III is an in-stack, multistage cascade impactor that yields a total of eight particle cut-sizes ranging, nominally, from 0.5 to 15 μm. Substrates for this impactor were 64-mm diameter glass fiber filters. The Mark III was used to collect samples over time intervals of approximately 20 minutes. The HGLI is an in-stack multistage impactor designed specifically to allow longer sampling times at high grain loadings. The three nominal cut-points are 2, 5, and 10 μm. The only filter in the HGLI is a glass fiber thimble used as the backup stage. This impactor was used to collect samples over an

*40 CFR 60, Subpart AA, July 1, 1980.

entire EAF heat, which was approximately 3.5 hours. A cyclone precutter was attached to the front of each type of impactor to remove larger particles and to avoid the use of buttonhook nozzles. Because the sampling rate could not be adjusted to obtain the 15-μm cut-point of the cyclone precutter, the weight of particulate collected by the cyclone was added to the weight in the first stage of the respective impactor.

All inlet samples were collected at a point of average velocity near the centroid of the duct. The isokinetic sampling rate was based on initial measurements of velocity pressure and temperature. Constant cut-point characteristics were maintained during sampling, but velocity pressures and temperatures were measured periodically at the sampling point to evaluate the actual variation in isokinetics. Nozzles were selected to keep sampling rates in the recommended range of 8.5 to 21 liters per minute (0.3 to 0.75 acfm). Each filter was recovered, desiccated, and weighed on an analytical balance. Acetone rinses of appropriate stages were evaporated, desiccated, and weighed.

Particle size samples at the outlet were collected by using a Mark III impactor fitted with a straight nozzle. The impactor and probe were suspended in a fabric filter compartment from the center of the ridge beam, in a manner similar to that used on particulate matter testing equipment. Each sample was collected for an equal amount of time at one point in four different compartments. The initial isokinetic sampling rate was based on the calculated average velocity of the entire sampling area.

Constant cut-point characteristics were maintained throughout each test, and gas temperatures were measured with a thermocouple attached to the impactor probe. Each filter was recovered, desiccated, and weighed on an analytical balance. The inlet chamber and nozzle were brushed and rinsed with acetone and the rinse was evaporated, desiccated, and weighed.

4.8 VISIBLE AND FUGITIVE EMISSIONS

Certified observers recorded visible emissions from the melt shop and fabric filter monovent according to procedures described in EPA Method 9.* Data were taken in 6-minute sets (simultaneously with particulate tests), and individual readings were recorded in percent opacity at 15-second intervals. Intermittent rest periods were taken to prevent eye fatigue; however, as long as emissions were visually detectable, readings were continued until a break was absolutely necessary. The emission points were casually monitored during break periods, and readings were resumed if emissions greater than zero opacity were noticed.

Fugitive emissions from the fabric filter dust-handling system were observed according to the proposed Method 22.** Emissions were recorded as the cumulative amount of time that any fugitive emissions were visually detectable during a 20-minute observation period. Several observation periods were recorded during the test series.

Observers were positioned on the side of a hill, approximately 75 meters (250 feet) southwest of the baghouse.

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*40 CFR 60, Appendix A, July 1, 1980.

**Federal Register, Vol. 45, No. 224, November 14, 1980.

Adverse weather conditions prevented visual emission observations during the third test.

4.9 FABRIC FILTER DUST SAMPLES

Samples from the dust-handling system were obtained just below the central junction of the screw conveyors that connect individual hoppers. Because the hoppers were emptied only once a day, a single grab sample was taken on each test day. For each sample, approximately 1 liter of dust was collected in a glass jar that had been rinsed with dilute nitric acid in the laboratory. Upon return to the laboratory, each sample was split into two fractions; one for trace element analysis, and one for particle size distribution analysis.

Spark Source Mass Spectroscopy was the analytical technique used for qualitative examination of the presence of approximately 70 elements. A known concentration on indium was added to each sample prior to ionization. All elements were ionized with approximately equal sensitivity. A photographic plate was used to record the mass spectra. The plate was examined and the response of each element was related to that of indium. Relative sensitivity factors based on previous analyses of standards were used to compensate for the variation in response of the photoplate for different elements.

The Coulter Counter technique was used to determine particle size distributions after problems associated with particle agglomeration prevented the initial attempts by Bacho analysis. For the Coulter analysis, particles in each sample were suspended

in a sodium chloride electrolytic solution. Electrical current passed from one immersed electrode through a small aperture to another electrode. As a particle passed through the aperture, it displaced a volume of electrolyte and changed the electrical current by an amount proportional to the size of the particle. The volume and number of particles were used to establish a differential distribution by volume. Assuming all particles were of equal density, the volume distribution also represented a weight distribution.

SECTION 5

QUALITY ASSURANCE

Quality assurance is one of the main facets of stack sampling because the end product of testing is to produce representative emission results. Quality assurance guidelines provide detailed procedures and actions necessary for defining and producing acceptable data. Four documents were used in this test program to provide the required guidance to help ensure the collection of acceptable data and determine when data quality is unacceptable. These documents are the source-specific test plan prepared by PEDCo and reviewed by the Emissions Measurement Branch; the EPA Quality Assurance Handbook Volume III, EPA-600/4-77-027b; the draft PEDCo Environmental Emission Test Quality Assurance Plan; and the PEDCo Environmental Laboratory Quality Assurance Plan. The last two quality assurance plans are PEDCo's general guideline manuals, which define the standard operating procedures followed by the company's emission testing and the laboratory groups.

Appendix F provides more detail on the Quality Assurance procedures, including QA objective; data reduction; quality control checks; performance and system audits; preventive maintenance; precision, accuracy, and completeness; corrective action; and quality assurance reports to management.

Relative to this specific test program, the following are the steps that were taken to ensure that quality data were obtained by the testing and analytical procedures.

- Calibration of field sampling equipment. (Calibration guidelines are described in more detail in Appendix E.)
- Train configuration and calculation checks.
- Onsite quality assurance checks, such as sample train, pitot tube, and Orsat line leak checks.
- Use of designated analytical equipment and sampling reagents.

Table 5-1 lists the sampling equipment used to conduct particulate and particle sizing tests, along with calibration guidelines and limits. In addition to the pre- and post-test calibration, a field audit was performed on the dry gas meters by the use of critical orifices calibrated and supplied by the EPA. The audit results in Table 5-2 show that all dry gas meters used for this test series were within limitations stipulated in EPA Method 5. Dry gas meter performance test procedures and field audit sheets are shown in Figures 5-1 through 5-6.

Between runs, onsite preliminary calculation checks were performed to verify isokinetic sampling rates and to compare moisture contents, flow rates, and other parameters with expected values. These checks indicated that the tests were being conducted properly.

As a check of the reliability of the method used to analyze the particulate matter and particle size filters, sets of blank filters that had been preweighed in the laboratory were resubmitted for replicate analysis. Table 5-3 summarizes the results

TABLE 5-1. FIELD EQUIPMENT CALIBRATION

Equipment	I.D. No.	Calibrated against	Allowable deviation	Actual deviation	Within allowable limits	Comments
Meter box	FB-3	Wet test meter	ΔY pre[a] ± 0.020	-0.003	✓	$\bar{Y}$ pre = 1.008
			ΔH@ ∓ 0.15	-0.09	✓	
			ΔY post[b] ± 0.05	+0.012	✓	$\bar{Y}$ post = 1.020
Meter box	FB-5			-0.008	✓	$\bar{Y}$ pre = 1.056
				-0.05	✓	
				+0.019	✓	$\bar{Y}$ post = 1.075
Meter box	FB-2			-0.007	✓	$\bar{Y}$ pre = 1.007
				-0.08	✓	
				-0.02	✓	$\bar{Y}$ post = 0.987
Meter box	FB-7			-0.009	✓	$\bar{Y}$ pre = 1.004
				-0.06	✓	
				+0.009	✓	$\bar{Y}$ post = 1.013
Meter box	FB-6			+0.001	✓	$\bar{Y}$ pre = 0.973
				-0.06	✓	
				+0.002	✓	$\bar{Y}$ post = 0.975
Meter box	FB-8			-0.010	✓	$\bar{Y}$ pre = 0.982
				+0.06	✓	
				+0.018	✓	$\bar{Y}$ post = 0.999
Pitot tube	251	Standard pitot tube	Δ Cp ± 0.01	0.003	✓	Cp = 0.81
Pitot tube	252			0.003	✓	Cp = 0.81
Pitot tube	253			0.001	✓	Cp = 0.80

(continued)

[a]Allowable deviation ΔY pretest = ±0.02 $\bar{Y}$ pretest.

[b]Allowable deviation ΔY post-test = ±0.05 $\bar{Y}$ pretest.

TABLE 5-1 (continued)

Equipment	I.D. No.	Calibrated against	Allowable deviation	Actual deviation	Within allowable limits	Comments
Thermocouple	149	ASTM reference thermometer	± 1.5%	-0.68	✓	
Thermocouple	138			-0.54	✓	
Thermocouple	129			+0.69	✓	
Thermocouple	128			-0.35	✓	
Thermocouple	254			-0.61	✓	
Digital indicator	219 222 208 207	Millivolt signals	0.5%	Avg. 0.1% Avg. 0.16% Avg. -0.10% 2.5°F	✓ ✓ ✓ ✓	Actual deviation is an average of eight temperature points; No. 207 tested and calibrated by manufacturer
Orsat analyzer	142	Standard gas	±0.5%	-0.2%	✓	CO is highest deviation
Trip balance	198	Type S weights	± 0.5 g	0.0 g	✓	
Barometer	227	NBS-traceable barometer	0.20 in. Hg post-test	0.00 in. Hg	✓	

(continued)

TABLE 5-1 (continued)

Equipment	I.D. No.	Calibrated against	Allowable deviation	Actual deviation	Within allowable limits	Comments
Dry gas thermometer	FB-2	Reference thermometer type ASTM 2F or 3F	±5°F	I 1.5°F O 1.7°F	✓ ✓	I = inlet thermometer O = outlet thermometer
	FB-3			I 1.2°F O 1.9°F	✓ ✓	
	FB-5			I 2.7°F O 1.6°F	✓ ✓	
	FB-6			I 0.6°F O 1.6°F	✓ ✓	
	FB-7			I 3.5°F O 1.4°F	✓ ✓	
	FB-8			I 1.0°F O 2.3°F	✓ ✓	
Probe nozzle	3-111	Caliper	Dn ± 0.004 in.	0.001	✓	
	2-101			0.002	✓	
	A2PS-P			0.001	✓	Nozzles for particle-size tests were labeled according to run numbers
	A1PS-2			0.001	✓	
	A1PM-2B			0.003	✓	
	A1PM-1B			0.003	✓	
	A1PM-2A			0.002	✓	
	A3PS-P			0.001	✓	
	A3PS-1B			0.001	✓	

TABLE 5-2. DRY GAS METER AUDIT RESULTS

Meter box No.	Calibrated against	Deviation, %
FB-2	Critical orifice No. 2	+ 3.3
FB-3	Critical orifice No. 2	+ 2.0
FB-5	Critical orifice No. 2	+ 0.4
FB-6	Critical orifice No. 1	- 0.3
FB-7	Critical orifice No. 1	+ 2.7
FB-8	Critical orifice No. 1	- 0.2

AUDIT REPORT SAMPLE METER BOX

Date 4-7-81

Barometeric pressure (P_{bar}, in Hg) 30.46

Orifice number 2

Orifice K factor 5.361×10^{-4}

Client U.S. EPA

Meter box number FB 2

Pretest Y 1.007

Auditor D. FITZGERALD

Orifice manometer reading ΔH in H_2O	Dry gas meter reading V_i/V_f ft^3	Dry gas meter volume V_m ft^3	Temperatures: Ambient T_{a_i}/T_{a_f} °F	Average T_a °F	Inlet T_{mi} °F	Outlet T_{mo} °F	Average T_m °F	Sampling time θ min	$V_{m_{std}}$ ft^3	$V_{m_{act}}$ ft^3	Percent error
2.4	068.000	14.000	54	54	64	54	59.25	16.4	14.68	14.21	+3.3%
	082.000		54		64	55					

$$V_{m_{std}} = (17.647)(V_m)(Y)(P_{bar} + \Delta H/13.6)/(T_m + 460)$$

$$V_{m_{act}} = (1203)(\theta)(K)(P_{bar})/(T_a + 460)^{\frac{1}{2}}$$

$$V_{m_{std}} = (17.647)(14.000)(1.007)(30.46 + \tfrac{2.4}{13.6})/(59.25 + 460) = 14.679$$

$$V_{m_{act}} = (1203)(14.21)(5.361 \times 10^{-4})(30.46)/(54 + 460)^{\frac{1}{2}}$$

$$\text{error} = (V_{m_{std}} - V_{m_{act}})(100)/(V_{m_{act}}) = (0.47)(100)/(14.21)$$

Figure 5-1. Audit report sample meter box.

AUDIT REPORT SAMPLE METER BOX

Date 4-7-81

Barometeric pressure (P_{bar}, in Hg) 30.46

Orifice number 2

Orifice K factor 5.361×10^{-4}

Client U.S. EPA 3530-2

Meter box number FB 3

Pretest Y 1.008

Auditor D FITZGERALD

Orifice manometer reading ΔH in H_2O	Dry gas meter reading V_i/V_f ft^3	Dry gas meter volume V_m ft^3	Temperatures: Ambient T_{a_i}/T_{a_f} °F	Average T_a °F	Inlet T_{mi} °F	Outlet T_{mo} °F	Average T_m °F	Sampling time θ min	$V_{m_{std}}$ ft^3	$V_{m_{act}}$ ft^3	Percent error
2.65	247.000	17.000	54	54	71	56	63.5	20.033	17.706	17.358	+2.00%
	264.000		54		69	58					

$V_{m_{std}}$ = (17.647)(V_m)(Y)(P_{bar} + ΔH/13.6)/(T_m + 460)

$V_{m_{act}}$ = (1203)(θ)(K)(P_{bar})/(T_a + 460)^{½}

$V_{m_{std}}$ = (17.647)(17.000)(1.008)(30.46 + 2.6/13.6)/(63.5 + 460) = 17.706

$V_{m_{act}}$ = (1203)(20.033)(5.361×10^{-4})(30.46)/(54 + 460)^{½} = 17.358

error = ($V_{m_{std}}$ - $V_{m_{act}}$)(100)/($V_{m_{act}}$) = ( )(100)/(17.358)

Figure 5-2. Audit report sample meter box.

AUDIT REPORT SAMPLE METER BOX

Date 4-8-81

Barometeric pressure (P_{bar}, in Hg) 30.39

Orifice number 2

Orifice K factor 5.361×10^{-4}

Client USEPA 3530-2

Meter box number FB 5

Pretest Y 1.056

Auditor R. Reinermann

Orifice manometer reading ΔH in H_2O	Dry gas meter reading V_i/V_f ft^3	Dry gas meter volume V_m ft^3	Temperatures: Ambient T_{a_i}/T_{a_f} °F	Average T_a °F	Inlet T_{mi} °F	Outlet T_{mo} °F	Average T_m °F	Sampling time Ø min	$V_{m_{std}}$ ft^3	$V_{m_{act}}$ ft^3	Percent error
2.6	758.000	12.000	60	60	68	65	67	15.033	12.976	12.921	+0.43%
	770.000		60		69	66					

$$V_{m_{std}} = (17.647)(V_m)(Y)(P_{bar} + \Delta H/13.6)/(T_m + 460)$$

$$V_{m_{act}} = (1203)(Ø)(K)(P_{bar})/(T_a + 460)^{\frac{1}{2}}$$

$$V_{m_{std}} = (17.647)(12.000)(1.056)(30.39 + 2.6/13.6)/(67 + 460) = 12.976$$

$$V_{m_{act}} = (1203)(15.033)(5.361 \times 10^{-4})(30.39)/(60 + 460)^{\frac{1}{2}} = 12.921$$

$$\text{error} = (V_{m_{std}} - V_{m_{act}})(100)/(V_{m_{act}}) = (\quad)(100)/(\quad)$$

Figure 5-3. Audit report sample meter box.

EPA METHOD 5 DRY GAS METER PERFORMANCE TEST DATA SHEET

Date 4/7/81

Barometric Pressure, P_{bar} 30.46 "Hg 773

Meter Box No. FB 6

Pretest Y 0.973

Pollutant Code

Survey Number

Participants ID

Orifice No. PEDCO 1 5.206×10^{-4}

Test No.	Orifice manometer reading ΔH, in. H_2O	Gas volume dry gas meter V_i/V_f ft^3	Gas volume dry gas meter Vm ft^3	Temperature: Ambient Ta °C	Temperature: Dry gas meter Inlet Tai °F	Temperature: Dry gas meter Outlet Tao °F	Temperature: Dry gas meter Average Ta °F	Sampling time θ, min.	Vacuum setting in. Hg	Corrected gas volume Vm(std) m^3	orif
1	1.9	725.000 / 735.902	14.9	60°F 15.5	88 / 84	78 / 78	82	17.32	20	.4098	.4102
2										⇒ -0.3%	
3											

Vi = initial reading of dry gas meter.
Vf = final reading of dry gas meter.
Vm = Vf - Vi = volume of gas passing through dry gas meter

$$Vm(std) = \frac{(0.4997)(Vm)(Y)(P_{bar} + \frac{\Delta H}{13.6})}{(Ta + 460)}$$

The value of 0.4997 is obtained from $\frac{Tstd}{Pstd} \times 0.028317$

where: 0.0287 is the conversion factor from ft^3 to m^3
Tstd = 528°R
Pstd = 29.92 in. Hg

P. Schwoy
Signature

Figure 5-4. EPA Method 5 dry gas meter performance test data sheet.

EPA METHOD 5 DRY GAS METER PERFORMANCE TEST DATA SHEET

Date 4/7/81

Barometric Pressure, P_{bar} 30.46 "Hg 773

Meter Box No. FB 7

Pretest Y 1.004

Pollutant Code

Survey Number

Participants ID

Orifice No. PEO Co 2 K = 5.206 x 10^{-4}

Test No.	Orifice manometer reading ΔH, in. H_2O	Gas volume dry gas meter V_i/V_f ft^3	Gas volume dry gas meter Vm ft^3	Ambient Ta °C °F	Temperature Dry gas meter Inlet Tmi °F	Outlet Tmo °F	Average Tm °F	Sampling time θ, min.	Vacuum setting in. Hg	Corrected gas volume Vm(std) m^3 Orifice
1	1.9	767.700 / 780.200	12.5	12.7 / 55 °F	63 / 64	58 / 61	61.5	15.25	21	.3726 (.3629)
2										⇒ + 2.7%
3										

Vi = initial reading of dry gas meter.
Vf = final reading of dry gas meter.
Vm = Vf - Vi = volume of gas passing through dry gas meter

$$Vm(std) = \frac{(0.4997)(Vm)(Y)(P_{bar} + \frac{\Delta H}{13.6})}{(Tm + 460)}$$

The value of 0.4997 is obtained from $\frac{Tstd}{Pstd} \times 0.028317$

where: 0.0287 is the conversion factor from ft^3 to m^3
Tstd = 528°R
Pstd = 29.92 in. Hg

P. Schuyler
Signature

Figure 5-5. EPA Method 5 dry gas meter performance test data sheet.

EPA METHOD 5 DRY GAS METER PERFORMANCE TEST DATA SHEET

Date 4/7/81

Barometric Pressure, P_{bar} 30.46 "Hg 773

Meter Box No. FB 8

Protest Y .982

Pollutant Code

Survey Number

Participants ID

Orifice No. PEDCo 1

Test No.	Orifice manometer reading ΔH, in. H_2O	Gas volume dry gas meter V_i/V_f ft^3	Gas volume dry gas meter Vm ft^3	Ambient Ta °C	Temperature Dry gas meter Inlet Tmi °F	Outlet Tmo °F	Average Tm °F	Sampling time θ, min.	Vacuum setting in. Hg	Corrected gas volume Vm(std) m^3
1	2.3	620.400 / 633.400	130	60°F 15.5	78 / 76	75 / 74	76	15 27/60 1545	19	.3652 .366
2										⇒ -0.2%
3										

Vi = initial reading of dry gas meter.
Vf = final reading of dry gas meter.
Vm = Vf - Vi = volume of gas passing through dry gas meter

$$Vm(std) = \frac{(0.4997)(Vm)(Y)(P_{bar} + \frac{\Delta H}{13.6})}{(Tm + 460)}$$

The value of 0.4997 is obtained from $\frac{Tstd}{Pstd} = 0.028317$

where: 0.0287 is the conversion factor from ft^3 to m^3
Tstd = 528°R
Pstd = 29.92 in. Hg

R. Schuster
Signature

Figure 5-6. EPA Method 5 dry gas meter performance test data sheet.

TABLE 5-3. FILTER BLANK ANALYSIS

Type of filter	Filter No.	Tare weight, mg	Blank weight, mg	Net weight, mg	Comments
Particulate: 87-mm Gelman A/E[a]	2165	362.3	362.6	+ 0.3	
Andersen Mark III Impactor[b]	Y94	127.8	127.8	0.0	
	Z51	136.0	136.3	+ 0.3	
	Y66	126.8	126.8	0.0	
	Y75	134.9	135.0	+ 0.1	
	Y88	127.2	127.4	+ 0.2	
	Z39	136.0	136.3	+ 0.3	
	Y76	127.4	127.4	0.0	
	Z53	136.6	136.8	+ 0.2	
	B179	180.5	180.6	+ 0.1	
Andersen Mark III Impactor Blank test run[b]	X31	148.9	149.1	+ 0.2	
	X32	137.6	137.8	+ 0.2	
	X33	145.6	146.0	+ 0.4	
	X34	138.6	139.0	+ 0.4	
	X35	151.1	151.3	+ 0.2	
	X36	138.9	139.2	+ 0.3	
	X37	150.2	150.4	+ 0.2	
	W60	135.2	135.4	+ 0.2	
	B222	188.0	188.7	+ 0.7	c
Andersen Heavy Grain Loading Impactor (HGLI) Thimble[d]	39	2470.6	2480.4	+ 9.8	
	61	2176.6	2178.6	+ 2.0	

[a]Expected deviation, ±0.5 mg.

[b]Expected deviation, ±0.3 mg.

[c]The high net weight is probably a result of very small particles leaking around the prefilter.

[d]Expected deviation, ±0.5 mg.

of the blank filter analyses. These results show good data reproducibility from an analytical standpoint.

A blank run was performed at the fabric filter outlet to determine whether stack gases reacted with the filter media to produce erroneous results. This was accomplished by placing a backup filter in front of a normally prepared impactor and then sampling in the usual manner. Table 5-3 lists results of the blank run, which shows that stack gases did not significantly affect filter media.

In addition, blanks were taken to check the quality of reagents used to recover and analyze particulate and particle size samples. Table 5-4 summarizes the results of these blank analyses, which show that most reagents met designated specifications for quality.

A trace element audit sample was analyzed, along with the fabric filter dust samples, to check the accuracy of the SSMS analytical procedures. The audit sample was taken from Standard Reference Material No. 1633, "Trace Elements in Coal Fly Ash," which was obtained from the National Bureau of Standards. The results (shown in Table 5-5) indicate that the analyses were within a factor of three of true values, which is the expected limit of SSMS accuracy.

Sampling equipment, reagents, and analytical procedures for this test series followed and met all necessary guidelines set forth for accurate test results in Volume III of the Quality

TABLE 5-4. REAGENT BLANK ANALYSIS

Type of blank	Container No.	Volume of blank, ml	Weight after evaporation and desiccation,[a] mg/g	Comments
Particulate blanks:				
Acetone	3982A	237	+ 0.01	
Acetone	3989A	227	+ 0.007	
Water	3983A	378	+ 0.004	
Particle size blanks:				
Acetone	2526A	382	+ 0.004	
Acetone	2531A	190	+ 0.02	0.01 used in calculations
Acetone	2549A	518	+ 0.005	
Analytical blanks:				
Ether/chloroform	BT459 (org)	150	+ 0.005	
Water	BT459 (aq)	250	+ 0.002	

[a]Tolerance: ±0.01 mg/g.

TABLE 5-5. TRACE ELEMENT AUDIT RESULTS

Element	Concentration, μg/g		Percent difference[b]
	NBS-certified[a]	Measured	
Arsenic	61 ± 6	120	+100
Cadmium	1.45 ± 0.06	1	- 30
Chromium	131 ± 2	150	+ 10
Copper	128 ± 5	71	- 40
Lead	70 ± 4	110	+ 60
Manganese	493 ± 7	170	- 70
Nickel	98 ± 3	54	- 40
Selenium	9.4 ± 0.5	16	+ 70
Uranium	11.6 ± 0.2	18	+ 60
Vanadium	214 ± 8	99	- 50
Zinc	210 ± 20	220	0

[a]SRM No. 1633, "Trace Elements in Coal Fly Ash".

[b]Percent difference = $\frac{\text{measured - actual}}{\text{actual}}$ x 100, to the nearest 10%. Expected deviation is +200%, -70% (± factor of 3).

Assurance Handbook.[5] Therefore, test results reported in this document should be within the expected accuracies of the method used.

SECTION 6

STANDARD SAMPLING AND ANALYTICAL PROCEDURES

This section describes the test methods, sampling equipment, and analytical techniques that were used in this test program for determination of particulate matter and particle size distribution.

6.1 DETERMINATION OF PARTICULATE EMISSIONS

In this test program, the sampling and analytical procedures used to determine particulate emissions at Sites 1 and 2 were those described in Method 5 of the Federal Register.*

6.1.1 Sampling Apparatus

The particulate sampling train used in these tests met design specifications established by the EPA. The sampling apparatus, which was assembled by PEDCo personnel, consisted of the following:

Nozzle - Stainless steel (316) with sharp, tapered leading edge and accurately measured round opening.

Probe - Stainless steel (316) with a heating system capable of maintaining a minimum gas temperature of 121°C (250°F) at the exit end during sampling.

Pitot Tube - A type S pitot tube that met all geometric standards was attached to a probe to monitor stack gas velocity pressure.

*40 CFR 60, Appendix A, July 1, 1980.

Temperature Gauge - A Chromel/Alumel type-K thermocouple (or equivalent) was attached to the pitot tube, in an interference-free arrangement, to monitor stack gas temperature within 1.5°C (5°F) using a digital readout.

Filter Holder - The filter holder was made of Pyrex glass, with heating system capable of maintaining a filter temperature of approximately 121°C (250°F).

Filter - An 87-mm (3-in.) diameter glass fiber filter (Gelman A/E) was used.

Draft Gauge - The draft was measured with an inclined manometer (made by Dwyer) with a readability of 0.25 mm (0.01 in.) H_2O in the 0 to 25 mm (0 to 1 in.) H_2O range.

Impingers - Four Greenburg-Smith design impingers were connected in series with glass ball joints. The first, third, and fourth impingers were modified by removing the tip and extending the tube to within 1.3 cm (0.5 in.) of the bottom of the flask.

Metering System - The metering system consisted of a vacuum gauge, a leak-free pump, thermometers capable of measuring temperature to within 1.5°C (5°F), a calibrated dry gas meter, and related equipment, to maintain an isokinetic sampling rate and to determine sample volume. The dry gas meter was made by Rockwell, and the fiber vane pump was made by Gast.

Barometer - An aneroid type barometer was used to measure atmospheric pressures to 0.3 kPa (±0.1 in.Hg).

6.1.2 Sampling Procedure

After the sampling site and minimum number of traverse points were selected, the stack pressure, temperature, moisture, and range of velocity head were measured according to procedures described in the Federal Register.*

Approximately 200 grams of silica gel were weighed and placed in a sealed impinger prior to each test. Glass fiber filters were desiccated for at least 24 hours to a constant

*40 CFR 60, Appendix A, Methods 1, 2, 3, or 4, July 1, 1980.

weight and weighed to the nearest 0.1 mg on an analytical balance. One hundred milliliters of distilled water was placed in each of the first two impingers; the third impinger was initially empty; and the impinger containing the silica gel was placed next in series. The train was set up as shown in Figure 6-1. The sampling train was leak-checked at the sampling site prior to each test run by plugging the inlet to the nozzle and pulling a 50-kPa (15-in.Hg) vacuum, and at the conclusion of the test by plugging the inlet to the nozzle and pulling a vacuum equal to the highest vacuum reached during the test run.

The pitot tube and lines were leak-checked at the test site prior to each test run and at the conclusion of each test run. The check was made by blowing into the impact opening of the pitot tube until 7.6 cm (3 in.) or more of water were recorded on the manometer and then capping the impact opening and holding it for 15 seconds to assure it was leak-free. The same procedure was used to leak-check the static pressure side of the pitot tube, except suction was used to obtain the 7.6-cm (3-in.) H_2O manometer reading. Crushed ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at 20°C (68°F) or less.

During sampling, stack gas and sampling train data were recorded at each sampling point and whenever significant changes in stack flow conditions occurred. Isokinetic sampling rates were set throughout the sampling period with the aid of a nomograph or calculator. All sampling data were recorded on the Emission Testing Field Data Sheet.

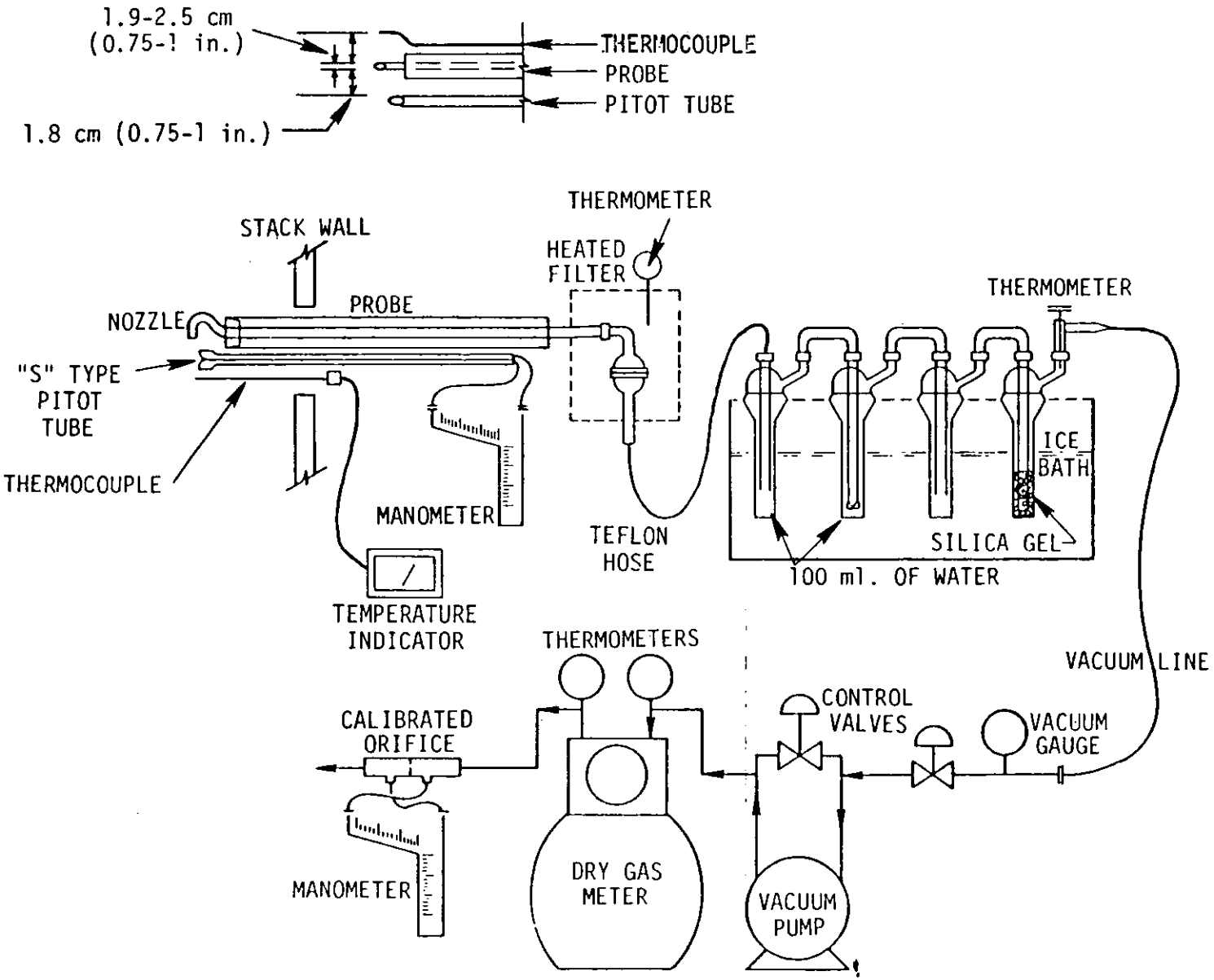

Figure 6-1. Schematic of particulate sampling train.

6.1.3 Sample Recovery Procedure

The sampling train was carefully moved from the test site to the cleanup area. The volume of water from the first three impingers was measured, and the silica gel from the fourth impinger was weighed to the nearest 0.1 gram. Sample fractions were recovered as follows:

Container No. 1 - The filter was removed from its holder, placed in a petri dish, and sealed.

Container No. 2 - Loose particulate and acetone washings from all sample-exposed surfaces prior to the filter were placed in a polyethylene jar, sealed, and labeled. Particulate was removed from the probe with the aid of a brush and acetone rinsing. The liquid level was marked after the container was sealed.

Container No. 3 - A minimum of 200 ml of acetone was taken for the blank analysis. The blank was obtained and treated in a similar manner as the acetone washing.

Container No. 4 - After being measured, distilled water in the impinger section of the sampling train was placed in a polyethylene container. The impingers and connecting glassware were rinsed with distilled H_2O, and this rinse was added to the container for shipment to the laboratory.

Container No. 5 - A minimum of 200 ml of distilled water was taken for the blank analysis. The blank was obtained and treated in a similar manner as the water rinse.

Container No. 6 - An unused glass fiber filter was taken for blank analysis.

All pertinent data were recorded on the Sample Recovery and Integrity Data Sheet.

6.1.4 Analytical Procedures

The analytical procedures used were those described in the Federal Register.*

Container No. 1 - The filter and any loose particulate matter were desiccated in the petri dish for 24 hours to a constant weight and then weighed to the nearest 0.1 mg.

*40 CFR 60, Appendix A, July 1, 1980.

Container No. 2 - The volume of acetone washings was measured and transferred to a tared beaker. The sample was evaporated to dryness at ambient temperature and pressure, desiccated for 24 hours to a constant weight, and weighed to the nearest 0.1 mg.

Container No. 3 - The volume of acetone blank was measured and transferred to a tared beaker. The blank was evaporated to dryness at ambient temperature and pressure, desiccated for 24 hours to a constant weight, and weighed to the nearest 0.1 mg.

Container No. 4 - The volume of the impinger contents and distilled water rinse was measured and transferred to a tared beaker. The sample was evaporated to dryness at 105°C, desiccated to a constant weight, and weighed to the nearest 0.1 mg.

Container No. 5 - The volume of distilled water blank was measured and transferred to a tared beaker. The blank was evaporated to dryness at 105°C, desiccated to a constant weight, and weighed to the nearest 0.1 mg.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings. All analytical data were recorded on the Analytical Particulate Data Sheet. Acetone and water blank data were recorded on respective blank data sheets.

6.1.5 Modifications to Standard Procedures for Site 3 Tests

Several modifications were made to the standard sampling and analytical procedures to conduct particulate matter tests at Site 3. Some sampling equipment and analytical procedures were also different, but were not method deviations. These modifications and differences are as follows:

Sampling Apparatus--

Probe - The probe was of borosilicate glass with a heating system capable of maintaining a minimum gas temperature of 121°C (250°F) at the exit end during sampling.

Pitot Tube - A pitot tube was not used.

Sampling Procedure--

The sampling site and number of sampling points did not meet minimum Method 1* criteria, but were selected according to practical considerations. The stack pressure, temperature, and moisture at this site were measured according to standard procedures, but accurate velocity pressures could not be determined at each point.

The sampling train was prepared, assembled, and leak-checked according to standard procedures, except that a pitot tube was not used.

During sampling, stack gas temperature and sampling train data were recorded at each sampling point. An average isokinetic sampling rate was set initially, based on the estimated average velocity for the entire sampling cross-sectional area. This estimated velocity was calculated from data that had been obtained at Sites 1 and 2 and adjusted for the differences in cross-sectional area, temperature, pressure, and moisture. The resultant value was assumed to represent the average velocity at each Site 3 sampling point. The average isokinetic sampling rate was held constant throughout the sampling period. All sampling

*40 CFR 60, Appendix A, July 1, 1980.

data, including the estimated average velocity pressure, were recorded on the Emission Testing Field Data Sheet.

Initial calculations of emission results were based on estimated velocities and later adjusted to reflect actual velocities measured at Sites 1 and 2 during simultaneous tests.

Sample Recovery Procedure--

The sample recovery procedures were the same as those for Sites 1 and 2.

Analytical Procedures--

Container No. 4 - The volume of distilled water and water rinse was measured and transferred to a separatory funnel. The sample was extracted three times with diethyl ether, and each time the water was drained back into the original sample container and the ether into a clean, tared beaker. The sample was then extracted three times with chloroform, and each time the chloroform was drained into the beaker with the ether. After the final extraction, the water portion was drained into a separate tared beaker, evaporated to dryness at 105°C, desiccated, and weighed to a constant weight to obtain the condensible inorganic content. The ether/chloroform portion was evaporated to dryness at ambient temperature, desiccated, and weighed to a constant weight to obtain the condensible organic content.

Container No. 5 - The distilled water blank was treated in an identical manner as Container No. 4. The aqueous fraction was used as a water blank, and the organic fraction was used as an ether/chloroform blank.

All other procedures for the determination of particulate emissions were as used in tests at Sites 1 and 2.

6.2 DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Three different configurations of in-stack cascade impactors were used to collect samples for particle size distribution

measurements. The following sampling and analytical procedures were used.

6.2.1 Sampling Apparatus

The source sampling train used in these tests met design specifications established by the EPA. Assembled by PEDCo personnel, it consisted of:

Nozzle - Stainless steel (316) with sharp tapered leading edge and accurately measured round opening.

Temperature Gauge - A Chromel/Alumel type-K thermocouple (or equivalent) was attached to the probe to monitor stack gas (impactor) temperature to within 1.5°C (5°F) using a digital readout.

Metering System - The metering system consisted of a vacuum gauge, a leak-free pump, thermometers capable of measuring temperature to within 1.5°C (5°F), a dry gas meter with 2 percent accuracy, and related equipment to maintain an isokinetic sampling rate and to determine sample volume. The dry gas meter was made by Rockwell, and the fiber vane pump was made by Gast.

Condenser - The condenser consisted of a moisture-removal device capable of maintaining a temperature less than 20°C (68°F) and an attached thermometer to monitor temperature.

Impactor - An Andersen Mark III with eight stages and a backup filter was used at Sites 1 and 3. An Andersen Heavy Grain Loading Impactor with three stages and a backup filter was used at Site 1. A cyclone precutter was attached to the front of each impactor used at Site 1.

Barometer - An aneroid type barometer was used to measure atmospheric pressures to 0.3 kPa (±0.1 in.Hg).

6.2.2 Sampling Procedure

The stack pressure, temperature, moisture, and velocity pressure of the selected sampling site were measured with Method 5 equipment according to procedures described in the Federal

Register.* One or more points representing average velocity were selected as sampling points.

Each type of impactor was assembled appropriately. Assembly of the Andersen Mark III (Mark III) involved alternating the stage plates, collection media, flat crossbars, and Inconel spacer rings so as to provide eight cut-sizes. The collection substrates were Reeve Angel 934 AH glass fiber filters that had been heated in a 204°C (400°F) oven for 1 to 2 hours, desiccated for 24 hours to a constant weight, and weighed to the nearest 0.1 mg on an analytical balance.

Assembly of the Andersen Heavy Grain Loading Impactor (HGLI) involved inserting a glass fiber thimble in the backup stage and threading together the various parts of the third-stage cyclone and first-and-second stage jet-impaction chambers. The glass fiber thimble had been desiccated for 24 hours to a constant weight and weighed to the nearest 0.1 mg on an analytical balance.

If used, the cyclone precutter was threaded together and attached to the front of the impactor.

The sampling train was assembled as shown in Figure 6-2 or 6-3. It was leak-checked at the sampling site prior to each test run by plugging the inlet to the impactor (or cyclone precutter, if used) and pulling a 50-kPa (15-in.Hg) vacuum. Once the desired vacuum was reached, the leakage rate was checked at the dry gas meter for 1 minute. If the leak rate was less than 0.6 liter/min (0.02 cfm), the train was considered ready for

*40 CFR 60, Appendix A, Methods 2, 3, or 4, July 1, 1980.

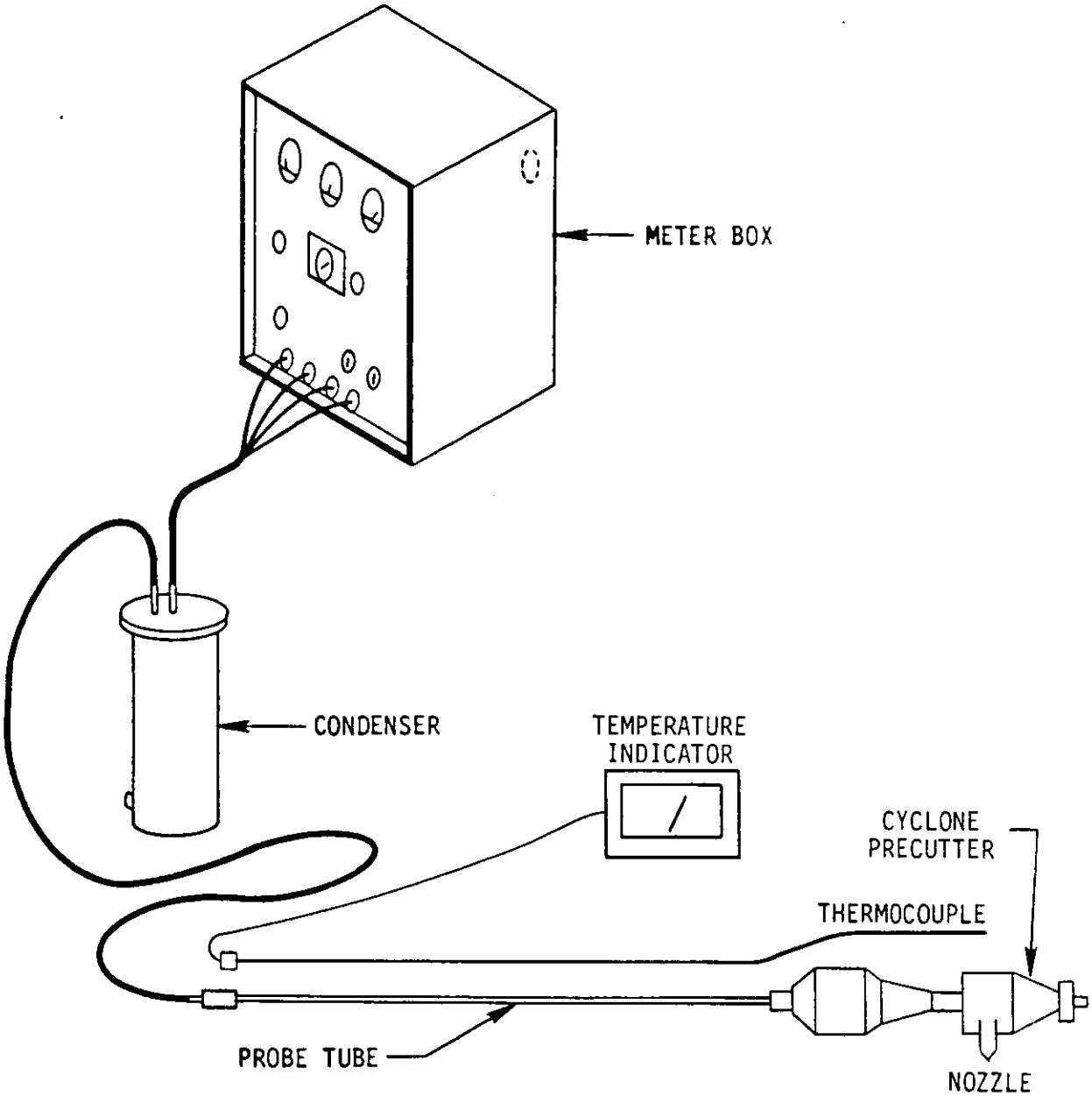

Figure 6-2. Particle size distribution sampling train at Site 1.

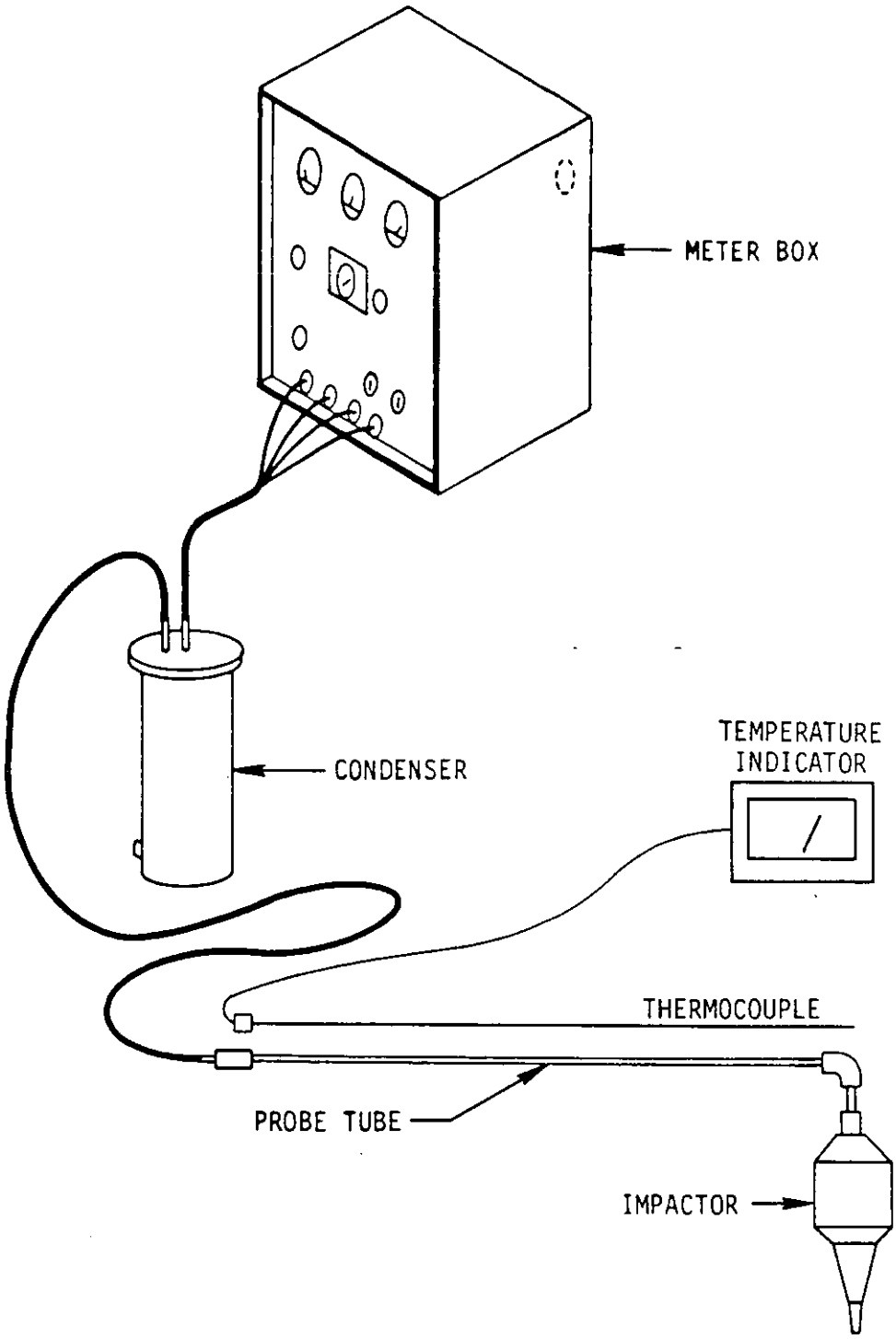

Figure 6-3. Particle size distribution sampling train at Site 3.

sampling. Any excessive leaks were corrected before the train was used. The impactor was then placed at the selected sampling point and allowed to preheat for several minutes before sampling began. While the impactor was preheating, the nozzle was capped or pointed away from the gas flow. A leak-check was not performed after the test run so as to avoid the possibility of dislodging the particles on individual stages.

During sampling, stack gas and sampling train data were recorded at regular intervals based on the length of the run. Velocity pressure data at Site 1 were obtained periodically using separate Method 5 equipment. Average velocities at Site 3 were estimated from previous data measured at Sites 1 and 2. The isokinetic sampling rate was set initially, and constant cut-point characteristics were maintained throughout the sampling period. Preliminary impactor runs were made at each site to determine the Mark III sampling times required to allow uniform loading on the backup filter and to prevent loadings of greater than 10 mg on any one stage. All sampling data were recorded on the Impactor Testing Field Data Sheet.

6.2.3 Sample Recovery Procedure

After the test was completed, the impactor was removed from the probe and carefully moved to a designated cleanup area while still in an upright position. The impactors were recovered as follows:

Mark III:

Container No. 1 - Particulate in the nozzle and inlet chamber was removed by brushing and rinsing with acetone into a polyethylene container, which was sealed and labeled.

Containers No. 2 through 10 - Each filter was removed from its stage and carefully placed in a petri dish. Loose particulate from the bottom side of the previous stage plate, the Inconel spacer, flat crossbar, and the top side of the plate directly under the filter were brushed into the same petri dish as the respective filter. Each petri dish was sealed and labeled.

Container No. 11 - If the cyclone precutter was used, particulate from all sample exposed surfaces except the interior of the cyclone exit tube was brushed and acetone-rinsed into a polyethylene container, which was sealed and labeled. Particulate from the interior of the cyclone exit tube was added to Container No. 1.

Heavy Grain Loading Impactor With Cyclone Precutter:

Containers No. 1 through 5 - Particulate from all sample-exposed surfaces after the cut-point of the preceding stage and prior to the cut-point of a given stage was brushed and rinsed with acetone into a polyethylene container. After the container was sealed and labeled, the liquid level was marked.

Container No. 6 - The glass fiber thimble was carefully removed from the holder and placed in a glass jar. The jar was then sealed and labeled.

All pertinent data were recorded on Sample Recovery and Integrity Data Sheets.

6.2.4 Analytical Procedures

Filters - Each glass fiber filter or thimble and any loose particulate matter were desiccated in respective sample containers for 24 hours to a constant weight and weighed to the nearest 0.1 mg on an analytical balance.

Acetone Rinses - The volume of each acetone washing was measured and transferred to a tared beaker. The sample was evaporated to dryness at ambient temperature and pressure, desiccated for 24 hours to a constant weight, and weighed to the nearest 0.1 mg.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater between two consecutive weighings, with no less than 6 hours of desiccation between weighings. All analytical data were recorded on Andersen Impactor or HGLI Particulate Analytical Data Sheets.

6.2.5 Blanks

Several unused glass fiber thimbles and a complete set of unused Mark III filters were returned to the laboratory in their respective containers. Approximately 200 ml of the acetone used for sample recovery was taken as a blank. In addition, a blank test run was conducted with the Mark III impactor to determine if stack gases had reacted with the filter media to cause false weight changes. In the blank run a backup filter was placed in front of a normally assembled impactor to filter out all particulate matter so that only the stack gases would contact the filter media.

All blanks were recovered and analyzed in the same manner as the actual samples. Data were recorded on the respective blank data sheets.

REFERENCES

1. U.S. Environmental Protection Agency. A Review of Standards of Performance for Electric Arc Furnaces in the Steel Industry. EPA 450/3-70-033, October 1979.

2. U.S. Environmental Protection Agency. Background Information for Standards of Performance: Electric Arc Furnaces in the Steel Industry. EPA 450/274017b, October 1974.

3. Southern Research Institute. A Computer-Based Cascade Impactor Data Reduction System. Prepared for U.S. Environmental Agency under Contract No. 68022131. March 1978.

4. University of Florida. Use and Limitations of In-Stack Impactors. Prepared by the Department of Environmental Sciences for U.S. Environmental Protection Agency under Grant No. R803692-02. February 1980.

5. U.S. Environmental Protection Agency. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III. EPA-600/4-77-027b, August 1977.

APPENDIX A

COMPUTER PRINTOUTS AND EXAMPLE CALCULATIONS

PARTICULATE

Site 1
Site 2
Site 3

PARTICLE SIZE

Site 1 Mark III
Site 3 Mark III
Site 1 HGLI

EXAMPLE CALCULATIONS FOR ADJUSTMENTS TO OUTLET RESULTS

Computer calculations for outlet tests are based on estimated velocities. Results listed in the text and tables for flow rates, emission rate, isokinetic rate, and gas velocity have been adjusted to reflect actual conditions. The computer calculations for dry, standard flow rate at the outlet represent the original estimated conditions. Actual outlet conditions of dry, standard flow rate are represented by the sum of corresponding inlet standard flow rates; therefore, outlet results were adjusted according to the ratio of the estimated and actual flow rates.

Example: For Run 1,

Actual outlet flow = Site 1 flow + Site 2 flow
= 468,163 dscmh + 467,517 dscmh
= 935,680 dscmh

Estimated outlet flow = flow indicated in computer output
= 956,891 dscmh

Ratio of actual to estimated flow = $R = \frac{935,680}{956,891}$

$R = 0.9778334$

Actual emission rate = R x emission rate indicated in computer output
= 0.9778334 x 3.13 kg/h
= 3.06 kg/h for filterable particulate

Actual isokinetic rate = $\frac{1}{R}$ x isokinetic rate indicated

$= \frac{1}{0.9778334} \times 104.9$

= 107.3%

(continued)

Actual gas velocity = R x indicated velocity
= 0.9778334 x 2.5 mps
= 2.44 mps

Actual flow rate at stack conditions = R x indicated flow rate at stack conditions
= 0.9778334 x 1014954 acmh x h/3600 sec
= 275.68 acms

FIELD DATA

PLANT	AL TECH STEEL, WATERVLIET NY	DATE	04/07/81
SAMPLING LOCATION	SITE #1	RUN NUMBER	A1P-1
SAMPLE TYPE	PARTICULATE	PROBE LENGTH & TYPE	12 FOOT STAINLESS
OPERATOR	DAN FITZGERALD	NOZZLE 2-101: I.D.	.122
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.50	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.20	METER BOX NUMBER	FB3
FILTER NUMBER(S)	#0002146	METER HEAD DIFF.	1.98
STACK INSIDE DIM.(IN)	120.00 .00		
PITOT TUBE COEFF.	.81	PROBE HEATER SETTING	250.
THERM. NO.		HEATER BOX SETTING	250.
LEAKAGE	.000 CFM @ 5.0 IN.HG		
METER CALIB. FACTOR	1.008	K FACTOR	133.3
READ & RECORD DATA EVERY	4.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	1035	265.422									
N-01	4.0	1039	266.640	1.200	.29	.29	98.	67.	58.	1.0	250.	46.
N-02	8.0	1043	267.795	1.200	.29	.29	95.	67.	57.	1.0	250.	46.
N-03	12.0	1047	268.955	1.300	.29	.29	140.	67.	57.	1.0	250.	44.
N-04	16.0	1051	270.110	1.350	.29	.29	151.	67.	57.	1.0	250.	44.
N-05	20.0	1055	271.355	1.450	.34	.34	105.	68.	57.	1.0	250.	44.
N-06	24.0	1059	272.605	1.400	.33	.33	112.	68.	57.	1.0	250.	44.
N-07	28.0	1103	273.680	1.200	.26	.26	152.	68.	57.	1.0	255.	44.
N-08	32.0	1107	274.825	1.300	.29	.29	152.	68.	57.	1.0	255.	44.
N-09	36.0	1111	275.985	1.250	.27	.27	149.	68.	57.	1.0	250.	44.
N-10	40.0	1115	277.150	1.250	.28	.28	139.	68.	57.	1.0	250.	44.
N-11	44.0	1119	278.305	1.250	.29	.29	107.	69.	57.	1.0	250.	44.
N-12	48.0	1123	279.415	1.150	.27	.27	111.	68.	57.	1.0	255.	44.
N-13	52.0	1127	280.515	1.150	.27	.27	110.	69.	57.	1.0	255.	44.
N-14	56.0	1131	281.635	1.200	.28	.28	101.	69.	57.	1.0	250.	46.
N-15	60.0	1135	282.800	1.250	.29	.29	101.	69.	57.	1.0	250.	46.
N-16	64.0	1139	283.965	1.250	.29	.29	105.	69.	57.	1.0	250.	46.
N-17	68.0	1143	285.120	1.250	.29	.29	107.	68.	57.	1.0	260.	46.
N-18	72.0	1147	286.285	1.250	.29	.29	104.	68.	57.	1.0	255.	46.
N-19	76.0	1151	287.435	1.250	.29	.29	107.	68.	57.	1.0	255.	46.
N-20	80.0	1155	288.550	1.100	.26	.26	109.	69.	57.	1.0	260.	44.
N-21	84.0	1159	289.660	1.100	.26	.26	105.	69.	57.	1.0	260.	44.
N-22	88.0	1203	290.592	.890	.21	.21	109.	69.	57.	1.0	255.	44.
S-01	92.0	1215	291.670	.860	.21	.21	94.	67.	57.	1.0	250.	44.
S-02	96.0	1219	292.730	1.000	.24	.24	99.	67.	58.	1.0	250.	44.
S-03	100.0	1223	293.865	1.100	.26	.26	98.	68.	59.	1.0	250.	48.
S-04	104.0	1227	294.995	1.150	.27	.27	102.	68.	59.	1.0	255.	48.
S-05	108.0	1231	296.145	1.100	.26	.26	105.	68.	59.	1.0	230.	48.
S-06	112.0	1235	297.280	1.100	.26	.26	104.	68.	59.	1.0	210.	48.
S-07	116.0	1239	298.410	1.100	.26	.26	106.	68.	58.	1.0	200.	48.
S-08	120.0	1243	299.555	1.100	.26	.26	110.	68.	58.	1.0	200.	48.

PLANT: AL TECH STEEL, WATERVLIET NY — DATE: 04/07/81

SAMPLING LOCATION: SITE #1 — RUN NUMBER: A1P-1

READ & RECORD DATA EVERY 4.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
S-09	124.0	1247	300.710	1.200	.28	.28	109.	68.	58.	1.0	200.	48.
S-10	128.0	1251	301.855	1.200	.28	.28	109.	68.	58.	1.0	200.	48.
S-11	132.0	1255	303.100	1.400	.32	.32	117.	69.	58.	1.0	190.	50.
S-12	136.0	1259	304.335	1.500	.33	.33	140.	69.	58.	1.5	180.	50.
S-13	140.0	1303	305.640	1.600	.35	.35	140.	69.	59.	1.5	170.	50.
S-14	144.0	1307	306.990	1.650	.38	.38	111.	69.	59.	1.5	165.	50.
S-15	148.0	1311	308.365	1.700	.40	.40	112.	69.	59.	1.5	190.	50.
S-16	152.0	1315	309.735	1.700	.40	.40	109.	69.	59.	1.5	210.	50.
S-17	156.0	1319	311.105	1.700	.39	.39	123.	69.	59.	1.5	210.	50.
S-18	160.0	1323	312.415	1.600	.37	.37	122.	70.	59.	1.5	210.	50.
S-19	164.0	1325	313.715	1.600	.37	.37	115.	70.	59.	1.5	210.	50.
S-20	168.0	1329	315.010	1.500	.35	.35	117.	70.	59.	1.5	210.	50.
S-21	172.0	1334	316.245	1.300	.30	.30	113.	70.	59.	1.5	210.	50.
S-22	176.0	1338	317.265	1.000	.23	.23	116.	70.	60.	1.5	210.	50.
S-11	179.0	1341	318.089	1.100	.26	.26	108.	70.	60.	1.5	210.	52.
S-01	183.0	1356	319.230	.900	.21	.21	98.	68.	60.	1.0	210.	52.
S-02	187.0	1400	320.320	.950	.22	.22	107.	68.	60.	1.0	210.	52.
S-03	191.0	1404	321.395	1.100	.26	.26	110.	68.	60.	1.0	210.	52.
S-04	195.0	1408	322.450	1.100	.26	.26	107.	68.	60.	1.5	210.	52.
S-05	199.0	1412	323.675	1.100	.26	.26	106.	68.	60.	1.5	200.	52.
S-06	203.0	1416	324.825	1.100	.26	.26	101.	69.	60.	1.5	200.	54.
S-07	207.0	1420	325.980	1.100	.26	.26	100.	70.	60.	1.5	200.	54.
S-08	211.0	1424	327.115	1.100	.26	.26	101.	70.	61.	1.5	205.	54.
S-09	215.0	1428	328.270	1.100	.26	.26	105.	70.	61.	1.5	205.	54.
S-10	219.0	1432	329.415	1.100	.26	.26	105.	70.	62.	1.5	200.	52.
S-11	223.0	1436	330.620	1.200	.28	.28	105.	71.	62.	1.5	200.	52.
S-12	227.0	1440	331.915	1.400	.33	.33	105.	72.	62.	2.0	215.	54.
S-13	231.0	1444	333.300	1.600	.38	.38	103.	72.	63.	2.0	210.	54.
S-14	235.0	1448	334.715	1.600	.38	.38	102.	72.	64.	2.0	215.	54.
S-15	239.0	1452	336.150	1.600	.38	.38	102.	73.	64.	2.0	215.	54.
S-16	243.0	1456	337.540	1.600	.38	.38	102.	74.	65.	2.0	205.	54.
S-17	247.0	1500	338.955	1.600	.38	.38	100.	75.	65.	2.0	210.	56.
S-18	251.0	1504	340.365	1.600	.38	.38	96.	75.	66.	2.0	210.	56.
S-19	255.0	1508	341.790	1.500	.35	.35	103.	75.	66.	2.0	210.	56.
S-20	259.0	1512	343.165	1.400	.33	.33	104.	76.	66.	2.0	210.	56.
S-21	263.0	1516	344.520	1.300	.31	.31	105.	76.	68.	2.0	210.	56.
S-22	267.0	1520	345.855	1.300	.31	.31	104.	76.	68.	2.0	210.	56.
N-01	271.0	1545	347.350	1.200	.29	.29	95.	75.	70.	2.0	210.	54.
N-02	275.0	1549	348.530	1.300	.31	.31	95.	75.	71.	2.0	210.	54.
N-03	279.0	1553	349.805	1.400	.34	.34	98.	75.	71.	2.0	210.	54.
N-04	283.0	1557	351.120	1.500	.36	.36	98.	76.	72.	2.0	200.	56.
N-05	287.0	1601	352.435	1.500	.36	.36	98.	76.	72.	2.0	200.	56.
N-06	291.0	1605	353.730	1.400	.34	.34	99.	77.	72.	2.0	210.	56.
N-07	295.0	1609	355.040	1.400	.33	.33	104.	78.	72.	2.0	210.	56.
N-08	299.0	1613	356.330	1.500	.35	.35	105.	79.	73.	2.0	220.	56.
N-09	303.0	1617	357.580	1.400	.33	.33	104.	80.	73.	2.0	220.	56.
N-10	307.0	1621	358.830	1.400	.33	.33	112.	81.	73.	2.0	250.	56.

N-11	311.0	1625	360.050	1.300	.31	.31	104.	81.	74.	2.0	250.	56.
N-12	315.0	1629	361.215	1.200	.28	.28	103.	82.	74.	2.0	265.	56.
N-13	319.0	1633	362.375	1.200	.28	.28	104.	82.	74.	2.0	260.	56.
N-14	323.0	1637	363.520	1.200	.28	.28	109.	82.	74.	2.0	265.	56.
N-15	327.0	1641	364.650	1.200	.28	.28	108.	82.	74.	2.0	260.	56.
N-16	331.0	1645	365.790	1.200	.28	.28	112.	81.	74.	2.0	260.	56.
N-17	335.0	1649	366.965	1.200	.28	.28	113.	81.	74.	2.0	250.	56.
N-18	339.0	1654	368.055	1.200	.28	.28	117.	81.	75.	2.0	260.	56.
N-19	343.0	1658	369.155	1.050	.24	.24	118.	82.	75.	2.0	260.	56.
N-20	347.0	1702	370.235	1.050	.24	.24	120.	81.	75.	2.0	260.	56.
N-21	351.0	1706	371.200	1.000	.23	.23	119.	82.	75.	1.5	260.	56.
N-22	355.0	1710	372.190	.950	.21	.21	121.	82.	75.	1.5	260.	56.
N-11	359.0	1714	373.320	1.100	.25	.25	118.	81.	75.	1.5	260.	56.
N-11	363.0	1718	374.420	1.100	.25	.25	115.	81.	75.	1.5	250.	56.
N-11	367.0	1722	375.480	1.100	.25	.25	116.	81.	75.	1.5	250.	56.
N-11	371.0	1726	376.550	1.100	.25	.25	113.	81.	75.	1.5	260.	56.
N-11	374.0	1729	377.371	1.100	.25	.25	114.	81.	75.	1.5	260.	56.
TOTALS	374.0		111.788									
AVERAGE					.30	.30	110.	72.	64.	1.5	229.	51.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS	TEST TEAM LEADER
AL TECH STEEL, WATERVLIET NY	DAN FITZGERALD

TEST A1P-1 SITE #1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/07/81	04/07/81
TB	TIME-START	1035	1035
TF	TIME-FINISH	1729	1729
TI	NET TIME OF TEST, MIN.	374.0	374.0
NP	NET SAMPLING POINTS	94	94
Y	METER CALIBRATION FACTOR	1.008	1.008
DN	SAMPLING NOZZLE DIAMETER	.122 IN	3.1 MM
CP	PITOT TUBE COEFFICIENT	.81	.81
PM	AVERAGE ORIFICE PRESSURE DROP	.30 IN-H2O	7.5 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	111.788 CU-FT	3.165 CU-M
TM	AVERAGE GAS METER TEMP	68.0 F	20.0 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	114.943 SCF	3.255 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	19.9	19.9
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	.937 SCF	.027 SCM
BWO	PERCENT MOISTURE BY VOLUME	.81	.81
FMD	MOLE FRACTION DRY GAS	.992	.992
PCO2	PERCENT CO2 BY VOL., DRY	.00	.00
PO2	PERCENT O2 BY VOL., DRY	20.33	20.33
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.67	79.67
MD	MOLECULAR WT-DRY STACK GAS	28.81	28.81
MWS	MOLECULAR WT-STACK GAS	28.73	28.73

PB	BAROMETRIC PRESSURE	30.50	IN-HG	774.70	MM-HG
PS1	STATIC PRES OF STACK GAS	-2.20	IN-H2O	-55.88	MM-H2O
PS	STACK PRES, ABS.	30.34	IN-HG	770.59	MM-HG
TS	AVERAGE STACK TEMP	110.	F	43.	C
VS	AVG STACK GAS VELOCITY	62.8	FPS	19.1	MPS
AS	STACK AREA	11310.	SQ-IN	7.297	SQ-M
QSSTD	STACK FLOW RATE, DRY*	16532938.	SCFH	468163.	SCMH
QS	ACTUAL STACK FLOW RATE	17750808.	ACFH	502650.	ACMH
ISO	PERCENT ISOKINETIC	107.9		107.9	
MN	FILTERABLE PART. MG. EPA 5	706.1		706.1	
CS	FILTERABLE PART.	.0948	GR/DSCF*	216.959	MG/DSCM
PMR	FILTERABLE PART. EMISSION RATE	223.903	LB/HR	101.56	KG/HR
MN	INORGANIC COND. MG. EPA 5	12.3		12.3	
CS	INORGANIC COND.	.0017	GR/DSCF*	3.779	MG/DSCM
PMR	INORGANIC COND. EMISSION RATE	3.900	LB/HR	1.77	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. A1P-1

SITE #1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

```
          17.647 *   111.788 * 1.008 * ( 30.50 +  .295 / 13.6)
VMSTD = ------------------------------------------------------ =    114.943 DSCF
                          (  68. + 460.)
```

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 20. = .94 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

```
          100. *    .94
BWO = ------------------------- =    .81 PERCENT
          114.943 +    .94
```

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

```
          100. -    .8
FMD = ---------------------- =    .992
                100.
```

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (.00*44/100) + (20.3*32/100) + ((79.7+ .0) * 28/100 = 28.81

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 28.81* (1. -(.81/100)) + 18. * (.81/100) = 28.75

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .81 * 2515.850 / (SQRT(28.73 * 30.34) * 94. = 62.78 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 62.78 * 11310. 3600/144 = 17750808. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 17750808. * 30.34 * (1. - (.81/100))}{(110. + 460.)} = 16532938. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(110.+460.))*((0.002669* 20.)+(111.788*1.008*(30.50+(.295/13.6))/(68.+460.)))}{374. * 62.78 * 30.34 * .122 * .122} = 107.91 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 706.1 * 15.43 / 114.943 = .095 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .095 * 16532938. / (15.43 * 453.6) = 223.90

FIELD DATA

PLANT	AL TECH STEEL, WATERVLIET, NY	DATE	04/08/81
SAMPLING LOCATION	SITE #1	RUN NUMBER	A1P-2
SAMPLE TYPE	PARTICULATE	PROBE LENGTH & TYPE	12 FOOT STAINLESS
OPERATOR	DAN FITZGERALD	NOZZLE 2-101: I.D.	.122
AMBIENT TEMP.(DEG.F)	65.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.39	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.30	METER BOX NUMBER	FB3
FILTER NUMBER(S)	#0002161	METER HEAD DIFF.	1.98
STACK INSIDE DIM.(IN)	120.00 .00		
PITOT TUBE COEFF.	.81	PROBE HEATER SETTING	250.
THERM. NO.	149	HEATER BOX SETTING	250.
LEAKAGE	.000 CFM @ 5.0 IN.HG		
METER CALIB. FACTOR	1.008	K FACTOR	133.2
READ & RECORD DATA EVERY	4.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	935	377.605									
N-01	4.0	939	378.630	.960	.23	.23	100.	61.	58.	1.0	250.	50.
N-02	8.0	943	379.700	1.050	.24	.24	110.	63.	58.	1.0	250.	52.
N-03	12.0	947	380.870	1.300	.31	.31	102.	64.	58.	1.0	250.	52.
N-04	16.0	951	382.010	1.300	.29	.29	143.	66.	58.	1.0	250.	52.
N-05	20.0	955	383.100	1.200	.26	.26	157.	67.	59.	1.0	250.	50.
N-06	24.0	959	384.350	1.450	.34	.34	106.	64.	59.	1.0	250.	50.
N-07	28.0	1003	385.615	1.450	.34	.34	106.	70.	60.	1.0	250.	52.
N-08	32.0	1007	386.825	1.400	.31	.31	144.	71.	60.	1.0	250.	52.
N-09	36.0	1011	387.935	1.300	.28	.28	155.	72.	61.	1.0	250.	52.
N-10	40.0	1015	389.035	1.200	.26	.26	161.	72.	62.	1.0	250.	52.
N-11	44.0	1019	390.115	1.200	.26	.26	157.	72.	62.	1.0	250.	52.
N-12	48.0	1023	391.160	1.050	.23	.23	149.	73.	62.	1.0	250.	52.
N-13	52.0	1027	392.185	1.000	.23	.23	130.	73.	63.	1.0	250.	52.
N-14	56.0	1031	393.405	1.100	.25	.25	127.	73.	63.	1.0	250.	52.
N-15	60.0	1035	394.360	1.100	.26	.26	121.	74.	63.	1.0	250.	52.
N-16	64.0	1039	395.525	1.200	.29	.29	111.	74.	63.	1.0	250.	52.
N-17	68.0	1043	396.680	1.200	.29	.29	110.	74.	63.	1.0	250.	52.
N-18	72.0	1047	397.855	1.200	.29	.29	111.	74.	64.	1.0	250.	52.
N-19	76.0	1051	398.975	1.300	.27	.27	111.	74.	64.	1.0	250.	54.
N-20	80.0	1055	400.065	1.200	.25	.25	115.	74.	64.	1.0	260.	54.
N-21	84.0	1059	401.065	1.000	.20	.20	120.	74.	65.	1.0	265.	54.
N-22	88.0	1103	401.943	.900	.19	.19	120.	74.	65.	1.0	260.	54.
S-01	92.0	1115	402.975	.800	.17	.17	115.	72.	66.	1.0	260.	54.
S-02	96.0	1119	403.920	.920	.19	.19	110.	72.	66.	1.0	260.	54.
S-03	100.0	1123	404.920	1.000	.21	.21	111.	72.	66.	1.0	250.	54.
S-04	104.0	1127	405.925	1.000	.21	.21	113.	72.	66.	1.0	250.	56.
S-05	108.0	1131	406.930	1.000	.21	.21	114.	73.	67.	1.0	250.	56.
S-06	112.0	1135	408.200	1.100	.23	.23	115.	73.	67.	1.0	250.	56.
S-07	116.0	1139	409.130	1.000	.21	.21	112.	73.	67.	1.0	250.	58.
S-08	120.0	1143	410.065	1.100	.23	.23	111.	74.	67.	1.0	250.	58.

PLANT AL TECH STEEL, WATERVLIET, NY

SAMPLING LOCATION SITE #1

DATE 04/08/81

RUN NUMBER A1P-2

READ & RECORD DATA EVERY 4.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
S-09	124.0	1147	411.120	1.100	.23	.23	113.	74.	67.	1.0	250.	58.
S-10	128.0	1151	412.230	1.100	.23	.23	111.	74.	67.	1.0	250.	58.
S-11	132.0	1155	413.245	1.100	.23	.23	110.	74.	67.	1.0	250.	58.
S-12	136.0	1159	414.310	1.100	.23	.23	109.	74.	67.	1.0	250.	58.
S-13	140.0	1203	415.375	1.100	.23	.23	109.	75.	67.	1.0	250.	58.
S-14	144.0	1207	416.515	1.300	.27	.27	109.	75.	67.	1.0	250.	60.
S-15	148.0	1211	417.665	1.300	.27	.27	110.	76.	68.	1.0	250.	60.
S-16	152.0	1215	418.805	1.300	.27	.27	111.	76.	68.	1.0	250.	60.
S-17	156.0	1219	420.000	1.400	.29	.29	111.	76.	68.	1.0	250.	60.
S-18	160.0	1223	421.185	1.400	.29	.29	112.	76.	68.	1.0	250.	62.
S-19	164.0	1227	422.340	1.300	.27	.27	112.	76.	68.	1.0	250.	62.
S-20	168.0	1231	423.450	1.100	.23	.23	114.	76.	68.	1.0	250.	62.
S-21	172.0	1235	424.440	.950	.20	.20	114.	76.	68.	1.0	250.	64.
S-22	176.0	1239	425.525	.880	.17	.17	116.	76.	68.	1.0	250.	64.
S-11	180.0	1243	426.410	1.000	.21	.21	116.	77.	68.	1.0	250.	64.
S-11	184.0	1247	427.420	1.000	.21	.21	115.	77.	68.	1.0	250.	64.
S-11	188.0	1251	428.430	1.000	.21	.21	116.	77.	68.	1.0	250.	66.
S-11	192.0	1255	429.440	1.000	.21	.21	118.	77.	68.	1.0	250.	66.
S-11	196.0	1259	430.535	1.100	.23	.23	115.	77.	68.	1.0	250.	66.
S-11	200.0	1303	431.545	1.100	.23	.23	115.	77.	68.	1.0	250.	64.
S-11	203.0	1306	432.357	1.100	.23	.23	114.	77.	68.	1.0	250.	64.
S-01	207.0	1315	433.310	.900	.18	.18	122.	77.	71.	1.0	250.	66.
S-02	211.0	1319	434.315	.960	.20	.20	130.	77.	71.	1.0	250.	66.
S-03	215.0	1323	435.325	1.000	.21	.21	119.	77.	71.	1.0	250.	66.
S-04	219.0	1327	436.345	1.000	.21	.21	111.	78.	71.	1.0	250.	66.
S-05	223.0	1331	437.420	1.100	.23	.23	110.	79.	71.	1.0	250.	66.
S-06	227.0	1335	438.485	1.100	.23	.23	109.	79.	71.	1.0	250.	66.
S-07	231.0	1339	439.515	.960	.20	.20	113.	80.	71.	1.0	250.	66.
S-08	235.0	1343	440.545	1.000	.21	.21	110.	80.	71.	1.0	255.	66.
S-09	239.0	1347	441.560	1.000	.21	.21	108.	80.	71.	1.0	260.	66.
S-10	243.0	1351	442.620	1.100	.23	.23	106.	80.	72.	1.0	260.	66.
S-11	247.0	1355	443.675	1.100	.23	.23	106.	81.	72.	1.0	260.	66.
S-12	251.0	1359	444.800	1.200	.25	.25	106.	81.	74.	1.0	260.	66.
S-13	255.0	1403	445.835	1.100	.23	.23	111.	81.	74.	1.0	260.	66.
S-14	259.0	1407	446.860	1.100	.23	.23	113.	81.	74.	1.0	260.	66.
S-15	263.0	1411	447.855	.920	.19	.19	121.	82.	74.	1.0	260.	68.
S-16	267.0	1415	448.860	.960	.20	.20	119.	83.	74.	1.0	250.	68.
S-17	271.0	1419	449.915	1.050	.21	.21	119.	83.	74.	1.0	250.	66.
S-18	275.0	1423	450.950	1.050	.21	.21	116.	84.	75.	1.0	250.	66.
S-19	279.0	1427	452.090	1.200	.25	.25	113.	84.	75.	1.0	250.	66.
S-20	283.0	1431	453.220	1.200	.25	.25	110.	84.	75.	1.0	250.	64.
S-21	287.0	1435	454.350	1.200	.25	.25	110.	84.	75.	1.0	250.	64.
S-22	291.0	1439	455.401	1.000	.21	.21	114.	85.	75.	1.0	250.	64.
N-01	295.0	1451	456.535	1.100	.23	.23	115.	85.	78.	1.0	250.	64.
N-02	299.0	1455	457.635	1.200	.25	.25	119.	86.	78.	1.0	250.	64.
N-03	303.0	1459	458.755	1.200	.25	.25	122.	86.	78.	1.0	250.	65.
N-04	305.0	1501	459.358	1.400	.29	.29	120.	86.	78.	1.0	250.	65.

N-04	307.0	1512	459.900	1.400	.29	.29	115.	85.	79.	1.5	250.	65.
N-05	311.0	1516	460.985	1.500	.31	.31	112.	85.	79.	1.5	250.	65.
N-06	315.0	1520	462.230	1.500	.31	.31	111.	85.	79.	1.5	250.	65.
N-07	319.0	1524	463.490	1.500	.31	.31	111.	86.	79.	1.5	250.	65.
N-08	323.0	1528	464.710	1.400	.29	.29	112.	86.	80.	1.5	250.	65.
N-09	327.0	1532	465.880	1.300	.27	.27	113.	87.	81.	1.5	250.	65.
N-10	331.0	1536	466.990	1.200	.25	.25	115.	87.	80.	1.5	250.	65.
N-11	335.0	1540	468.160	1.300	.27	.27	117.	88.	81.	1.5	250.	65.
N-12	339.0	1544	469.270	1.200	.25	.25	124.	88.	81.	1.5	250.	65.
N-13	343.0	1548	470.405	1.200	.25	.25	125.	89.	81.	1.5	250.	65.
N-14	347.0	1552	471.505	1.100	.23	.23	125.	89.	81.	1.5	250.	65.
N-15	351.0	1556	472.490	.920	.19	.19	120.	89.	81.	1.5	250.	65.
N-16	355.0	1600	473.475	.920	.19	.19	119.	90.	81.	1.5	250.	65.
N-17	359.0	1604	474.545	1.100	.23	.23	116.	90.	82.	1.5	250.	65.
N-18	363.0	1608	475.600	1.000	.21	.21	114.	90.	83.	1.5	250.	64.
N-19	367.0	1612	476.595	.960	.20	.20	120.	90.	83.	1.5	250.	64.
N-20	371.0	1616	477.620	1.050	.22	.22	118.	90.	83.	1.5	250.	64.
N-21	375.0	1620	478.600	.920	.19	.19	120.	90.	83.	1.5	250.	64.
N-22	379.0	1624	479.530	.850	.18	.18	120.	90.	83.	1.5	250.	64.
N-11	383.0	1628	480.535	1.000	.21	.21	122.	90.	83.	1.5	250.	64.
N-11	387.0	1632	481.630	1.200	.25	.25	119.	90.	83.	1.5	250.	64.
N-11	391.0	1636	482.760	1.200	.25	.25	120.	90.	83.	1.5	250.	64.
N-11	395.0	1640	483.885	1.200	.25	.25	118.	90.	84.	1.5	250.	64.
N-11	399.0	1644	485.001	1.200	.25	.25	115.	90.	84.	1.5	250.	64.
TOTALS	399.0		107.339									
AVERAGE					.24	.24	117.	79.	71.	1.1	251.	61.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS	TEST TEAM LEADER
AL TECH STEEL, WATERVLIET, NY	DAN FITZGERALD

TEST A1P-2 SITE #1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/08/81	04/08/81
TB	TIME-START	935	935
TF	TIME-FINISH	1644	1644
TT	NET TIME OF TEST, MIN.	399.0	399.0
NP	NET SAMPLING POINTS	101	101
Y	METER CALIBRATION FACTOR	1.008	1.008
DN	SAMPLING NOZZLE DIAMETER	.122 IN	3.1 MM
CP	PITOT TUBE COEFFICIENT	.81	.81
PM	AVERAGE ORIFICE PRESSURE DROP	.24 IN-H2O	6.1 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	107.339 CU-FT	3.039 CU-M
TM	AVERAGE GAS METER TEMP	75.0 F	23.9 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	108.519 SCF	3.073 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	20.6	20.6
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	.970 SCF	.027 SCM
BWO	PERCENT MOISTURE BY VOLUME	.89	.89
FMD	MOLE FRACTION DRY GAS	.991	.991
PCO2	PERCENT CO2 BY VOL., DRY	.00	.00
PO2	PERCENT O2 BY VOL., DRY	20.33	20.33
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.67	79.67
MD	MOLECULAR WT-DRY STACK GAS	28.81	28.81
MWS	MOLECULAR WT-STACK GAS	28.72	28.72

PB	BAROMETRIC PRESSURE	30.39	IN-HG	771.91	MM-HG
PSI	STATIC PRES OF STACK GAS	-2.30	IN-H2O	-58.42	MM-H2O
PS	STACK PRES, ABS.	30.22	IN-HG	767.61	MM-HG
TS	AVERAGE STACK TEMP	117.	F	47.	C
VS	AVG STACK GAS VELOCITY	59.8	FPS	18.2	MPS
AS	STACK AREA	11310.	SQ-IN	7.297	SQ-M
QSSTD	STACK FLOW RATE, DRY*	15489824.	SCFH	438625.	SCMH
QS	ACTUAL STACK FLOW RATE	16912368.	ACFH	478908.	ACMH
ISO	PERCENT ISOKINETIC	101.9		101.9	
MN	FILTERABLE PART. MG. EPA 5	558.2		558.2	
CS	FILTERABLE PART.	.0794	GR/DSCF*	181.668	MG/DSCM
PMR	FILTERABLE PART. EMISSION RATE	175.650	LB/HR	79.68	KG/HR
MN	INORGANIC COND. MG. EPA 5	3.0		3.0	
CS	INORGANIC COND.	.0004	GR/DSCF*	.976	MG/DSCM
PMR	INORGANIC COND. EMISSION RATE	.944	LB/HR	.43	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. A1P-2

SITE #1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

```
          17.647 *   107.339 * 1.008 * ( 30.39 +  .239 / 13.6)
VMSTD = ------------------------------------------------------ =    108.519 DSCF
                          (  75. + 460.)
```

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 21. = .97 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

```
          100. *    .97
BWO = ------------------------ =    .89 PERCENT
          108.519 +    .97
```

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

```
          100. -    .9
FMD = ---------------------- =    .991
                100.
```

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (.00*44/100) + (20.5*32/100) + ((79.7+ .0) * 28/100 = 28.81

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 28.81* (1. -(.89/100)) + 18. * (.89/100) = 28.72

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .81 * 2570.158 / (SQRT(28.72 * 30.22) * 101. = 59.82 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 59.82 * 11310. 3600/144 = 16912368. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 16912368. * 30.22 * (1. - (.89/100))}{(117. + 460.)} = 15489824. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(117.+460.))*((0.002669* 21.)+(107.339*1.008*(30.39+(.239/13.6))/(75.+460.)))}{349. * 59.82 * 30.22 * .122 * .122} = 101.93 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 558.2 * 15.43 / 108.519 = .079 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .079 * 15489824. / (15.43 * 453.6) = 175.65

FIELD DATA

PLANT	AL TECH STEEL, WATERVLIET, NY	DATE	04/09/81
SAMPLING LOCATION	SITE #1	RUN NUMBER	A1P-3
SAMPLE TYPE	PARTICULATE	PROBE LENGTH & TYPE	12 FOOT STAINLESS
OPERATOR	DAN FITZGERALD	NOZZLE 2-101: I.D.	.122
AMBIENT TEMP.(DEG.F)	56.	ASSUMED MOISTURE	1.0
BAR.PRESS.(IN.HG)	30.07	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.50	METER BOX NUMBER	F83
FILTER NUMBER(S)	X0002220	METER HEAD DIFF.	1.98
STACK INSIDE DIM.(IN)	120.00 .00		
PITOT TUBE COEFF.	.81	PROBE HEATER SETTING	250.
THERM. NO.	149	HEATER BOX SETTING	250.
LEAKAGE	.003 CFM @ 5.0 IN.HG		
METER CALIB. FACTOR	1.008	K FACTOR	122.4
READ & RECORD DATA EVERY	8.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	933	485.217									
N-01	8.0	941	486.175	.880	.19	.19	102.	61.	58.	1.0	255.	50.
N-02	16.0	949	489.235	1.100	.24	.24	102.	63.	58.	1.0	250.	50.
N-03	24.0	957	491.490	1.200	.26	.26	102.	64.	58.	1.0	250.	48.
N-04	32.0	1005	494.060	1.600	.35	.35	101.	66.	60.	1.0	250.	50.
N-05	40.0	1013	496.590	1.500	.33	.33	100.	69.	60.	1.0	250.	48.
N-06	48.0	1021	499.100	1.500	.33	.33	104.	70.	61.	1.0	250.	50.
N-07	56.0	1029	501.505	1.400	.30	.30	105.	71.	61.	1.0	250.	50.
N-08	64.0	1037	503.910	1.400	.30	.30	104.	72.	62.	1.0	250.	52.
N-09	72.0	1045	506.240	1.300	.28	.28	105.	73.	64.	1.0	250.	52.
N-10	80.0	1049	508.485	1.200	.26	.26	111.	73.	64.	1.0	250.	54.
N-11	88.0	1057	510.800	1.200	.26	.26	113.	75.	64.	1.0	250.	52.
N-12	96.0	1105	513.100	1.200	.26	.26	110.	75.	65.	1.0	250.	50.
N-13	104.0	1113	515.240	1.100	.23	.23	112.	75.	67.	1.0	250.	50.
N-14	112.0	1121	517.440	1.100	.24	.24	107.	76.	67.	1.0	250.	50.
N-15	120.0	1129	519.680	1.100	.24	.24	110.	76.	68.	1.0	260.	50.
N-16	128.0	1137	521.835	1.100	.24	.24	110.	77.	69.	1.0	260.	50.
N-17	136.0	1145	524.145	1.200	.26	.26	110.	77.	69.	1.0	265.	50.
N-18	144.0	1153	526.475	1.200	.26	.26	110.	77.	69.	1.0	265.	50.
N-19	152.0	1201	528.660	1.100	.23	.23	113.	77.	69.	1.0	265.	50.
N-20	160.0	1209	530.795	1.200	.26	.26	115.	77.	69.	1.0	260.	50.
N-21	168.0	1217	533.245	1.400	.30	.30	115.	77.	69.	1.0	260.	50.
N-22	176.0	1225	535.447	1.500	.31	.31	125.	77.	70.	1.0	260.	50.
S-01	184.0	1252	537.670	.960	.21	.21	111.	75.	70.	1.0	260.	52.
S-02	192.0	1300	539.915	.960	.22	.22	102.	75.	70.	1.0	260.	52.
S-03	200.0	1308	541.910	.960	.21	.21	111.	75.	70.	1.0	250.	50.
S-04	208.0	1316	543.885	1.000	.21	.21	108.	76.	70.	1.0	250.	50.
S-05	216.0	1324	545.860	1.000	.21	.21	105.	76.	70.	1.0	250.	50.
S-06	224.0	1332	547.990	1.100	.24	.24	105.	76.	70.	1.0	250.	50.
S-07	232.0	1340	550.135	1.100	.24	.24	103.	76.	70.	1.0	250.	48.
S-08	240.0	1348	552.215	1.100	.23	.23	110.	76.	70.	1.0	250.	48.

PLANT AL TECH STEEL, WATERVLIET, NY DATE 04/09/81
SAMPLING LOCATION SITE #1 RUN NUMBER A1P-3

READ & RECORD DATA EVERY 8.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
S-09	248.0	1356	554.225	1.000	.22	.22	102.	76.	70.	1.0	250.	48.
S-10	256.0	1404	556.235	1.050	.22	.22	110.	76.	70.	1.0	250.	48.
S-11	264.0	1412	558.250	1.050	.22	.22	107.	75.	69.	1.0	250.	48.
S-12	272.0	1420	560.395	1.100	.24	.24	105.	75.	69.	1.0	250.	48.
S-13	280.0	1428	562.690	1.300	.28	.28	103.	75.	69.	1.0	255.	46.
S-14	288.0	1436	565.140	1.400	.31	.31	100.	75.	69.	1.5	250.	46.
S-15	296.0	1444	567.585	1.500	.33	.33	103.	75.	69.	1.5	250.	46.
S-16	304.0	1452	570.050	1.500	.33	.33	100.	75.	69.	1.5	250.	46.
S-17	312.0	1500	572.520	1.500	.33	.33	102.	75.	69.	1.5	250.	46.
S-18	320.0	1508	574.975	1.500	.33	.33	108.	75.	69.	1.5	250.	46.
S-19	328.0	1516	577.500	1.500	.33	.33	107.	74.	68.	1.5	250.	46.
S-20	336.0	1524	579.870	1.450	.31	.31	106.	74.	68.	1.5	250.	46.
S-21	344.0	1532	582.185	1.300	.28	.28	104.	75.	68.	1.5	250.	46.
S-22	352.0	1540	584.501	1.300	.27	.27	110.	74.	68.	1.5	250.	46.
TOTALS	352.0		99.178									
AVERAGE					.27	.27	107.	74.	67.	1.1	253.	49.

A-22

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS	TEST TEAM LEADER
AL TECH STEEL, WATERVLIET, NY	DAN FITZGERALD

TEST A1P-3 SITE #1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/09/81	04/09/81
TB	TIME-START	933	933
TF	TIME-FINISH	1540	1540
TT	NET TIME OF TEST, MIN.	352.0	352.0
NP	NET SAMPLING POINTS	44	44
Y	METER CALIBRATION FACTOR	1.008	1.008
DN	SAMPLING NOZZLE DIAMETER	.122 IN	3.1 MM
CP	PITOT TUBE COEFFICIENT	.81	.81
PM	AVERAGE ORIFICE PRESSURE DROP	.27 IN-H2O	6.8 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	99.178 CU-FT	2.808 CU-M
TM	AVERAGE GAS METER TEMP	70.4 F	21.3 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	100.079 SCF	2.834 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	27.0	27.0
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	1.271 SCF	.036 SCM
BWO	PERCENT MOISTURE BY VOLUME	1.25	1.25
FMD	MOLE FRACTION DRY GAS	.987	.987
PCO2	PERCENT CO2 BY VOL., DRY	.00	.00
PO2	PERCENT O2 BY VOL., DRY	20.33	20.33
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.67	79.67
MD	MOLECULAR WT-DRY STACK GAS	28.81	28.81
MWS	MOLECULAR WT-STACK GAS	28.68	28.68

PB	BAROMETRIC PRESSURE	30.07	IN-HG	763.78	MM-HG
PSI	STATIC PRES OF STACK GAS	-2.30	IN-H2O	-58.42	MM-H2O
PS	STACK PRES, ABS.	29.90	IN-HG	759.48	MM-HG
TS	AVERAGE STACK TEMP	107.	F	42.	C
VS	AVG STACK GAS VELOCITY	62.2	FPS	19.0	MPS
AS	STACK AREA	11310.	SQ-IN	7.297	SQ-M
QSSTD	STACK FLOW RATE, DRY*	16173876.	SCFH	457996.	SCMH
QS	ACTUAL STACK FLOW RATE	17600404.	ACFH	498391.	ACMH
ISO	PERCENT ISOKINETIC	102.0		102.0	
MN	FILTERABLE PART. MG. EPA 5	1483.4		1483.4	
CS	FILTERABLE PART.	.2287	GR/DSCF*	523.493	MG/DSCM
PMR	FILTERABLE PART. EMISSION RATE	528.515	LB/HR	239.73	KG/HR
MN	INORGANIC COND. MG. EPA 5	4.2		4.2	
CS	INORGANIC COND.	.0006	GR/DSCF*	1.482	MG/DSCM
PMR	INORGANIC COND. EMISSION RATE	1.496	LB/HR	.68	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. A1P-3

SITE #1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 99.178 * 1.008 * (30.07 + .266 / 13.6)}{(70. + 460.)} = 100.079 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 27. = 1.27 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 1.27}{100.079 + 1.27} = 1.25 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 1.3}{100.} = .987$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (.00*44/100) + (20.3*32/100) + ((79.7+ .0) * 28/100 = 28.81

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 28.81* (1. -(1.25/100)) + 18. * (1.25/100) = 28.68

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .81 * 1156.234 / (SQRT(28.68 * 29.90) * 44. = 62.25 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 62.25 * 11310. 3600/144 = 17600404. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

```
          17.647 *   17600404. *  29.90 * (1. - ( 1.25/100))
QSSTD = ------------------------------------------------------ =   16173876. SCFM
                    ( 107. + 460.)
```

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

```
        (305.58*( 107.+460.))*((0.002669*   27.)+(   99.178*1.008*( 30.07+(    .266/13.6))/(   70.+460.)))
ISO = ------------------------------------------------------------------------------------------------------ = 102.04 PERCENT
                                  352. *     62.25 *   29.90 *  .122 *  .122
```

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 1483.4 * 15.43 / 100.079 = .229 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .229 * 16173876. / (15.43 * 453.6) = 528.51

FIELD DATA

PLANT	AL TECH STEEL, WATERVLIET NY	DATE	04/07/81
SAMPLING LOCATION	SIZE #2	RUN NUMBER	A2P-1
SAMPLE TYPE	PARTICULATE	PROBE LENGTH & TYPE	12 FOOT STAINLESS
OPERATOR	DAN FITZGERALD	NOZZLE 3-111: I.D.	.188
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.50	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.60	METER BOX NUMBER	FB2
FILTER NUMBER(S)	#0002199	METER HEAD DIFF.	1.76
STACK INSIDE DIM.(IN)	120.00 .00		
PITOT TUBE COEFF.	.81	PROBE HEATER SETTING	250.
THERM. NO.	149	HEATER BOX SETTING	250.
LEAKAGE	.004 CFM @ 11.0 IN.HG		
METER CALIB. FACTOR	1.007	K FACTOR	667.0
READ & RECORD DATA EVERY	4.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP. (DEG.F)	DRY GAS METER TEMP. (DEG.F) INLET	DRY GAS METER TEMP. (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	1037	82.912									
S-01	8.0	1045	88.205	1.200	1.44	1.44	96.	59.	57.	3.0	275.	42.
S-02	16.0	1053	93.670	1.300	1.56	1.56	96.	59.	57.	3.5	275.	42.
S-03	24.0	1101	99.520	1.500	1.80	1.80	97.	62.	57.	3.5	270.	42.
S-04	32.0	1109	105.480	1.500	1.77	1.77	105.	65.	57.	4.0	270.	44.
S-05	40.0	1117	111.390	1.550	1.85	1.85	100.	66.	57.	4.0	300.	42.
S-06	48.0	1125	117.375	1.500	1.80	1.80	97.	67.	57.	4.0	290.	44.
S-07	56.0	1133	123.345	1.450	1.74	1.74	96.	67.	57.	4.0	280.	44.
S-08	64.0	1141	129.435	1.550	1.86	1.86	97.	67.	57.	4.0	280.	44.
S-09	72.0	1149	135.210	1.450	1.73	1.73	100.	68.	57.	4.0	280.	44.
S-10	80.0	1156	140.995	1.450	1.69	1.69	120.	68.	57.	4.0	280.	44.
S-11	88.0	1205	146.450	1.200	1.41	1.41	106.	69.	57.	4.0	280.	44.
S-12	96.0	1213	151.640	1.100	1.30	1.30	105.	69.	58.	4.0	275.	44.
S-13	104.0	1221	156.750	1.100	1.31	1.31	99.	69.	58.	4.0	270.	44.
S-14	112.0	1229	161.495	1.200	1.46	1.46	97.	69.	58.	4.0	270.	44.
S-15	120.0	1237	167.395	1.200	1.45	1.45	103.	69.	58.	4.5	265.	44.
S-16	128.0	1245	172.785	1.200	1.45	1.45	103.	69.	58.	4.5	270.	46.
S-17	136.0	1253	177.835	.980	1.18	1.18	100.	69.	58.	4.0	270.	46.
S-18	144.0	1301	182.825	1.000	1.19	1.19	101.	69.	58.	4.0	270.	46.
S-19	152.0	1309	187.730	1.000	1.17	1.17	108.	69.	58.	4.0	275.	46.
S-20	160.0	1317	192.820	1.100	1.29	1.29	107.	70.	58.	4.5	275.	46.
S-21	168.0	1325	197.775	1.000	1.19	1.19	105.	70.	59.	4.5	270.	48.
S-22	176.0	1333	202.585	.940	1.11	1.11	104.	70.	59.	4.5	270.	48.
N-01	184.0	1341	207.545	1.000	1.18	1.18	106.	71.	60.	4.5	270.	48.
N-02	185.0	1342	208.109	1.000	1.18	1.18	106.	71.	60.	4.5	270.	48.
N-01	193.0	1402	212.840	.940	1.10	1.10	108.	67.	60.	4.5	270.	46.
N-02	201.0	1410	217.440	.900	.97	.97	161.	68.	60.	4.5	270.	46.
N-03	209.0	1418	222.715	1.300	1.48	1.48	127.	71.	60.	5.5	270.	48.
N-04	217.0	1426	227.975	1.300	1.38	1.38	166.	72.	62.	6.0	270.	50.
N-05	225.0	1434	233.480	1.300	1.54	1.54	109.	77.	63.	6.5	270.	52.
N-06	233.0	1442	238.850	1.300	1.42	1.42	151.	79.	64.	6.5	270.	52.

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PLANT AL TECH STEEL, WATERVLIET NY DATE 04/07/81

SAMPLING LOCATION SIZE #2 RUN NUMBER A2P-1

READ & RECORD DATA EVERY 8.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
N-07	241.0	1450	244.240	1.200	1.40	1.40	113.	80.	65.	6.5	260.	54.
N-08	249.0	1458	249.570	1.200	1.37	1.37	124.	81.	67.	7.0	255.	54.
N-09	257.0	1506	255.175	1.300	1.54	1.54	108.	82.	69.	7.5	250.	56.
N-10	265.0	1514	260.620	1.200	1.39	1.39	114.	83.	70.	7.0	250.	56.
N-11	273.0	1522	266.050	1.200	1.39	1.39	114.	83.	70.	7.0	280.	55.
N-12	275.0	1524	267.418	1.200	1.39	1.39	113.	84.	72.	7.0	250.	56.
N-12	281.0	1543	271.540	1.400	1.64	1.64	110.	80.	73.	8.0	250.	54.
N-13	289.0	1551	277.555	1.400	1.65	1.65	104.	80.	73.	8.0	250.	54.
N-14	297.0	1559	283.475	1.500	1.78	1.78	103.	82.	73.	8.5	250.	56.
N-15	305.0	1607	289.490	1.500	1.76	1.76	108.	84.	74.	8.5	250.	56.
N-16	313.0	1615	295.490	1.500	1.76	1.76	110.	86.	75.	8.5	250.	56.
N-17	321.0	1623	301.410	1.500	1.74	1.74	115.	88.	76.	8.5	250.	56.
N-18	329.0	1631	307.905	1.600	1.88	1.88	108.	89.	78.	9.5	250.	56.
N-19	337.0	1639	313.820	1.700	1.97	1.97	115.	89.	78.	10.0	250.	56.
N-20	345.0	1647	319.920	1.500	1.76	1.76	110.	89.	78.	9.5	250.	56.
N-21	353.0	1655	325.590	1.400	1.54	1.54	145.	89.	78.	9.0	260.	56.
N-22	361.0	1703	331.160	1.300	1.42	1.42	151.	89.	79.	9.0	255.	56.
N-11	369.0	1711	336.450	1.200	1.28	1.28	176.	89.	80.	8.5	255.	56.
N-11	377.0	1719	341.605	1.200	1.28	1.28	163.	88.	79.	8.5	250.	56.
N-11	385.0	1727	346.755	1.200	1.28	1.28	161.	87.	79.	8.5	250.	56.
N-11	386.0	1738	347.414	1.200	1.28	1.28	155.	87.	79.	8.5	250.	56.
TOTALS	386.0		264.438									
AVERAGE					1.48	1.48	116.	75.	65.	6.0	265.	50.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS	TEST TEAM LEADER
AL TECH STEEL, WATERVLIET NY	DAN FITZGERALD

TEST A2P-1 SIZE #2

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/07/81	04/07/81
TB	TIME-START	1037	1037
TF	TIME-FINISH	1738	1738
TT	NET TIME OF TEST, MIN.	386.0	386.0
NP	NET SAMPLING POINTS	51	51
Y	METER CALIBRATION FACTOR	1.007	1.007
DN	SAMPLING NOZZLE DIAMETER	.188 IN	4.8 MM
CP	PITOT TUBE COEFFICIENT	.81	.81
PM	AVERAGE ORIFICE PRESSURE DROP	1.48 IN-H2O	37.6 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	264.438 CU-FT	7.488 CU-M
TM	AVERAGE GAS METER TEMP	70.2 F	21.2 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	271.266 SCF	7.681 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	37.8	37.8
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	1.779 SCF	.050 SCM
BWO	PERCENT MOISTURE BY VOLUME	.65	.65
FMD	MOLE FRACTION DRY GAS	.993	.993
PCO2	PERCENT CO2 BY VOL., DRY	.20	.20
PO2	PERCENT O2 BY VOL., DRY	20.30	20.30
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.50	79.50
MD	MOLECULAR WT-DRY STACK GAS	28.84	28.84
MWS	MOLECULAR WT-STACK GAS	28.77	28.77

PB	BAROMETRIC PRESSURE	30.50	IN-HG	774.70	MM-HG
PSI	STATIC PRES OF STACK GAS	-2.60	IN-H2O	-66.04	MM-H2O
PS	STACK PRES, ABS.	30.31	IN-HG	769.84	MM-HG
TS	AVERAGE STACK TEMP	116.	F	46.	C
VS	AVG STACK GAS VELOCITY	63.3	FPS	19.3	MPS
AS	STACK AREA	11310.	SQ-IN	7.297	SQ-M
QSSTD	STACK FLOW RATE, DRY*	16510114.	SCFH	467517.	SCMH
QS	ACTUAL STACK FLOW RATE	17884472.	ACFH	506435.	ACMH
ISO	PERCENT ISOKINETIC	104.1		104.1	
MN	FILTERABLE PART. MG. EPA 5	1524.4		1524.4	
CS	FILTERABLE PART.	.0867	GR/DSCF*	198.472	MG/DSCM
PMR	FILTERABLE PART. EMISSION RATE	204.541	LB/HR	92.78	KG/HR
MN	INORGANIC COND. MG. EPA 5	21.2		21.2	
CS	INORGANIC COND.	.0012	GR/DSCF*	2.760	MG/DSCM
PMR	INORGANIC COND. EMISSION RATE	2.845	LB/HR	1.29	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. A2P-1

SIZE #2

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

```
          17.647 *   264.438 * 1.007 * ( 30.50 + 1.480 / 13.6)
VMSTD = ------------------------------------------------------ =    271.266 DSCF
                                ( 70. + 460.)
```

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 38. = 1.78 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

```
          100. *   1.78
BWO = ------------------------ =   .65 PERCENT
          271.266 +   1.78
```

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

```
          100. -    .7
FMD = ---------------------- =   .993
                100.
```

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (.20*44/100) + (20.3*32/100) + ((79.5+ .0) * 28/100 = 28.84

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 28.84* (1. -(.65/100)) + 18. * (.65/100) = 28.77

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .81 * 1375.731 / (SQRT(28.77 * 30.31) * 51. = 63.25 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 63.25 * 11310. 3600/144 = 17884472. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 17884472. * 30.31 * (1. - (.65/100))}{(116. + 460.)} = 16510114. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(116.+460.))*((0.002669* 38.)+(264.458*1.007*(30.50+(1.480/13.6))/(70.+460.)))}{386. * 63.25 * 30.31 * .188 * .188} = 104.05 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 1524.4 * 15.43 / 271.266 = .087 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .087 * 16510114. / (15.43 * 453.6) = 204.54

FIELD DATA

PLANT	AL TECH STEEL, WATERVLIET, NY	DATE	04/08/81
SAMPLING LOCATION	SITE #2	RUN NUMBER	A2P-2
SAMPLE TYPE	PARTICULATE	PROBE LENGTH & TYPE	12 FOOT STAINLESS
OPERATOR	DAN FITZGERALD	NOZZLE : I.D.	.188
AMBIENT TEMP.(DEG.F)	70.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.39	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.50	METER BOX NUMBER	F82
FILTER NUMBER(S)	#0002158	METER HEAD DIFF.	1.76
STACK INSIDE DIM.(IN)	120.00 .00		
PITOT TUBE COEFF.	.81	PROBE HEATER SETTING	250.
THERM. NO.	250	HEATER BOX SETTING	250.
LEAKAGE	.004 CFM @ 10.0 IN.HG		
METER CALIB. FACTOR	1.007	K FACTOR	667.6
READ & RECORD DATA EVERY	8.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	937	347.700									
S-01	8.0	945	352.625	.930	1.15	1.15	80.	62.	60.	2.0	200.	52.
S-02	16.0	953	358.310	1.400	1.66	1.66	103.	66.	60.	3.0	200.	60.
S-03	24.0	1001	364.005	1.400	1.62	1.62	116.	70.	60.	3.0	200.	58.
S-04	32.0	1009	369.875	1.400	1.66	1.66	105.	73.	61.	3.0	205.	61.
S-05	40.0	1017	375.575	1.350	1.59	1.59	106.	74.	62.	3.0	200.	61.
S-06	48.0	1025	381.020	1.400	1.63	1.63	111.	75.	63.	3.0	200.	62.
S-07	56.0	1033	387.000	1.500	1.75	1.75	112.	76.	64.	3.5	200.	62.
S-08	64.0	1041	393.030	1.600	1.85	1.85	118.	78.	66.	4.0	200.	62.
S-09	72.0	1049	399.265	1.600	1.83	1.83	124.	78.	66.	4.5	200.	62.
S-10	80.0	1057	405.500	1.500	1.74	1.74	115.	78.	67.	4.5	200.	62.
S-11	88.0	1105	410.900	1.200	1.39	1.39	117.	79.	67.	4.0	200.	60.
S-12	96.0	1113	415.860	1.050	1.15	1.15	152.	79.	68.	4.0	200.	60.
S-13	104.0	1121	421.500	1.300	1.52	1.52	109.	79.	68.	4.5	200.	60.
S-14	112.0	1129	427.320	1.400	1.65	1.65	107.	80.	70.	4.5	200.	60.
S-15	120.0	1137	432.780	1.250	1.42	1.42	129.	80.	70.	4.5	200.	60.
S-16	128.0	1145	437.965	1.200	1.33	1.33	140.	80.	70.	4.5	200.	60.
S-17	136.0	1153	443.110	1.200	1.36	1.36	129.	80.	71.	5.0	200.	60.
S-18	144.0	1201	448.620	1.300	1.49	1.49	122.	80.	71.	5.5	200.	60.
S-19	152.0	1209	453.995	1.200	1.40	1.40	111.	81.	71.	5.5	200.	60.
S-20	160.0	1217	459.330	1.200	1.40	1.40	113.	82.	72.	5.5	200.	60.
S-21	168.0	1225	464.470	1.100	1.28	1.28	114.	82.	72.	5.5	200.	60.
S-22	176.0	1233	469.139	.830	.97	.97	112.	82.	72.	5.0	200.	60.
N-01	184.0	1253	474.045	.830	.99	.99	98.	77.	73.	5.0	200.	60.
N-02	192.0	1301	478.990	.900	1.06	1.06	106.	78.	73.	6.0	200.	60.
N-03	200.0	1309	484.465	1.200	1.40	1.40	112.	80.	73.	6.5	200.	62.
N-04	208.0	1317	489.955	1.100	1.27	1.27	116.	81.	74.	6.5	200.	62.
N-05	216.0	1325	495.050	1.100	1.27	1.27	120.	81.	74.	6.5	200.	60.
N-06	224.0	1333	500.825	1.400	1.62	1.62	116.	82.	74.	7.5	200.	60.
N-07	232.0	1341	506.570	1.300	1.52	1.52	109.	83.	75.	8.0	200.	60.
N-08	240.0	1349	512.150	1.200	1.39	1.39	116.	83.	75.	8.0	200.	60.

PLANT AL TECH STEEL, WATERVLIET, NY DATE 04/08/81
SAMPLING LOCATION SITE #2 RUN NUMBER A2P-2

READ & RECORD DATA EVERY 8.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
N-09	248.0	1357	517.620	1.200	1.40	1.40	108.	85.	76.	8.0	200.	60.
N-10	256.0	1405	522.660	1.300	1.51	1.51	114.	85.	76.	8.0	200.	60.
N-11	264.0	1413	528.320	1.200	1.37	1.37	127.	85.	76.	8.0	200.	60.
N-12	272.0	1421	534.140	1.300	1.49	1.49	121.	86.	78.	8.5	200.	60.
N-13	280.0	1429	539.895	1.300	1.50	1.50	117.	88.	79.	8.5	200.	60.
N-14	288.0	1437	545.620	1.300	1.50	1.50	114.	90.	80.	9.0	200.	60.
N-15	296.0	1445	551.200	1.300	1.50	1.50	116.	92.	80.	9.0	200.	60.
N-16	304.0	1453	556.925	1.300	1.48	1.48	125.	94.	82.	9.0	200.	60.
N-17	312.0	1501	562.557	1.300	1.48	1.48	127.	95.	83.	9.0	210.	60.
N-18	320.0	1526	568.510	1.500	1.44	1.44	115.	89.	85.	9.5	200.	60.
N-19	328.0	1534	574.565	1.500	1.75	1.75	112.	90.	85.	9.5	200.	60.
N-20	336.0	1542	580.570	1.500	1.69	1.69	131.	91.	85.	9.5	210.	62.
N-21	344.0	1550	586.420	1.400	1.52	1.52	153.	94.	85.	9.5	210.	62.
N-22	352.0	1558	591.600	1.100	1.19	1.19	159.	95.	87.	8.5	210.	62.
TOTALS	352.0		243.746									
AVERAGE					1.46	1.46	118.	82.	73.	8.1	201.	60.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS	TEST TEAM LEADER
AL TECH STEEL, WATERVLIET, NY	DON FITZGERALD

TEST A2P-2 SITE #2

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/08/81	04/08/81
TH	TIME-START	937	937
TF	TIME-FINISH	1558	1558
TT	NET TIME OF TEST, MIN.	352.0	352.0
NP	NET SAMPLING POINTS	44	44
Y	METER CALIBRATION FACTOR	1.007	1.007
DN	SAMPLING NOZZLE DIAMETER	.188 IN	4.8 MM
CP	PITOT TUBE COEFFICIENT	.81	.81
PM	AVERAGE ORIFICE PRESSURE DROP	1.46 IN-H2O	37.0 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	243.746 CU-FT	6.902 CU-M
TM	AVERAGE GAS METER TEMP	77.2 F	25.1 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	245.885 SCF	6.963 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	36.4	36.4
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	1.713 SCF	.049 SCM
BWO	PERCENT MOISTURE BY VOLUME	.69	.69
FMD	MOLE FRACTION DRY GAS	.993	.993
PCO2	PERCENT CO2 BY VOL., DRY	.20	.20
PO2	PERCENT O2 BY VOL., DRY	20.30	20.30
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.50	79.50
MD	MOLECULAR WT-DRY STACK GAS	28.84	28.84
MWS	MOLECULAR WT-STACK GAS	28.77	28.77

PB	BAROMETRIC PRESSURE	30.39	IN-HG	771.91	MM-HG
PSI	STATIC PRES OF STACK GAS	-2.50	IN-H2O	-63.50	MM-H2O
PS	STACK PRES, ABS.	30.21	IN-HG	767.24	MM-HG
TS	AVERAGE STACK TEMP	118.	F	48.	C
VS	AVG STACK GAS VELOCITY	63.4	FPS	19.3	MPS
AS	STACK AREA	11310.	SQ-IN	7.297	SQ-M
QSSTD	STACK FLOW RATE, DRY*	16433574.	SCFH	465350.	SCMH
QS	ACTUAL STACK FLOW RATE	17945808.	ACFH	507888.	ACMH
ISO	PERCENT ISOKINETIC	103.9		103.9	
MN	FILTERABLE PART. MG. EPA 5	1668.3		1668.3	
CS	FILTERABLE PART.	.1047	GR/DSCF*	239.628	MG/DSCM
PMR	FILTERABLE PART. EMISSION RATE	245.811	LB/HR	111.50	KG/HR
MN	INORGANIC COND. MG. EPA 5	14.5		14.5	
CS	INORGANIC COND.	.0009	GR/DSCF*	2.083	MG/DSCM
PMR	INORGANIC COND. EMISSION RATE	2.136	LB/HR	.97	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. A2P-2

SITE #2

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 243.746 * 1.007 * (30.39 + 1.459 / 13.6)}{(77. + 460.)} = 245.885 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 36. = 1.71 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 1.71}{245.885 + 1.71} = .69 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - .7}{100.} = .993$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (.20*44/100) + (20.3*32/100) + ((79.5+ .0) * 28/100 = 28.84

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 28.84* (1. -(.69/100)) + 18. * (.69/100) = 28.77

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .81 * 1188.205 / (SQRT(28.77 * 30.21) * 44. = 63.43 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 63.43 * 11310. 3600/144 = 17935808. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 17935808. * 30.21 * (1. - (.69/100))}{(118. + 460.)} = 16433574. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(118.+460.))*((0.002669* 36.)+(243.746*1.007*(30.59+(1.459/13.6))/(77.+460.)))}{352. * 63.43 * 30.21 * .188 * .188} = 103.91 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 1668.3 * 15.43 / 245.885 = .105 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .105 * 16433574. / (15.43 * 453.6) = 245.81

FIELD DATA

PLANT	AL TECH STEEL, WATERVLIET, NY	DATE	04/09/81
SAMPLING LOCATION	SITE #2	RUN NUMBER	A2P-3
SAMPLE TYPE	PARTICULATE	PROBE LENGTH & TYPE	12 FOOT STAINLESS
OPERATOR	DAN FITZGERALD	NOZZLE 3-111: I.D.	.188
AMBIENT TEMP.(DEG.F)	56.	ASSUMED MOISTURE	1.0
BAR.PRESS.(IN.HG)	30.07	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-5.00	METER BOX NUMBER	FB2
FILTER NUMBER(S)	#0002197	METER HEAD DIFF.	1.76
STACK INSIDE DIM.(IN)	120.00 .00		
PITOT TUBE COEFF.	.81	PROBE HEATER SETTING	250.
THERM. NO.	254	HEATER BOX SETTING	250.
LEAKAGE	.002 CFM @ 12.5 IN.HG		
METER CALIB. FACTOR	1.007	K FACTOR	680.3
READ & RECORD DATA EVERY	8.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	929	591.862									
S-01	8.0	937	596.570	.830	1.02	1.02	92.	58.	58.	2.0	225.	49.
S-02	16.0	945	601.691	1.100	1.32	1.32	106.	62.	58.	3.0	220.	50.
S-03	24.0	953	607.471	1.300	1.57	1.57	104.	68.	59.	3.0	220.	50.
S-04	32.0	1001	613.284	1.500	1.82	1.82	102.	73.	60.	3.0	220.	50.
S-05	40.0	1009	619.580	1.550	1.89	1.89	99.	76.	63.	3.0	215.	50.
S-06	48.0	1017	625.772	1.500	1.82	1.82	100.	78.	64.	3.0	215.	52.
S-07	56.0	1025	631.975	1.500	1.82	1.82	102.	80.	65.	3.0	210.	52.
S-08	64.0	1033	637.134	1.450	1.75	1.75	105.	81.	66.	3.5	215.	50.
S-09	72.0	1037	644.155	1.400	1.69	1.69	103.	82.	68.	3.5	215.	50.
S-10	80.0	1045	650.085	1.400	1.68	1.68	107.	83.	79.	3.5	215.	50.
S-11	88.0	1053	656.005	1.400	1.67	1.67	111.	84.	80.	3.5	215.	50.
S-12	96.0	1101	661.755	1.300	1.56	1.56	106.	85.	72.	3.5	210.	50.
S-13	104.0	1109	667.490	1.300	1.56	1.56	104.	85.	73.	3.5	210.	50.
S-14	112.0	1117	673.150	1.200	1.45	1.45	103.	85.	74.	3.5	210.	50.
S-15	120.0	1125	678.650	1.200	1.44	1.44	106.	85.	74.	3.5	210.	50.
S-16	128.0	1133	684.165	1.200	1.43	1.43	108.	86.	74.	3.5	210.	50.
S-17	136.0	1141	689.840	1.200	1.44	1.44	107.	86.	75.	4.0	210.	50.
S-18	144.0	1149	695.400	1.200	1.43	1.43	110.	87.	75.	4.0	220.	51.
S-19	152.0	1157	700.880	1.050	1.27	1.27	105.	87.	76.	4.0	220.	51.
S-20	160.0	1205	705.725	1.050	1.19	1.19	139.	86.	76.	4.0	220.	51.
S-21	168.0	1213	710.740	.960	1.15	1.15	110.	86.	76.	4.0	220.	51.
S-22	176.0	1221	715.597	.860	1.03	1.03	107.	86.	76.	4.0	220.	51.
N-01	184.0	1248	720.675	.950	1.19	1.19	85.	80.	75.	4.0	220.	52.
N-02	192.0	1256	726.255	1.300	1.51	1.51	127.	80.	75.	5.0	220.	52.
N-03	200.0	1304	731.485	1.200	1.29	1.29	173.	80.	75.	5.0	220.	52.
N-04	208.0	1312	736.715	1.200	1.29	1.29	171.	81.	75.	5.0	220.	52.
N-05	216.0	1320	742.310	1.300	1.54	1.54	114.	82.	75.	6.0	220.	52.
N-06	224.0	1328	748.035	1.400	1.54	1.54	157.	82.	75.	6.0	220.	52.
N-07	232.0	1336	753.815	1.400	1.62	1.62	126.	82.	74.	6.5	220.	52.
N-08	240.0	1344	759.415	1.500	1.72	1.72	132.	82.	74.	7.0	220.	52.

PLANT AL TECH STEEL, WATERVLIET, NY DATE 04/09/81
SAMPLING LOCATION SITE #2 RUN NUMBER A2P-3

READ & RECORD DATA EVERY 8.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
N-09	248.0	1352	765.570	1.300	1.47	1.47	140.	82.	74.	7.0	220.	52.
N-10	256.0	1400	770.860	1.300	1.47	1.47	139.	81.	74.	7.0	220.	52.
N-11	264.0	1408	776.625	1.400	1.62	1.62	125.	81.	73.	8.0	220.	52.
N-12	272.0	1416	782.160	1.200	1.41	1.41	119.	81.	73.	8.0	220.	52.
N-13	280.0	1424	787.785	1.300	1.56	1.56	106.	80.	73.	8.0	220.	52.
N-14	288.0	1432	793.930	1.450	1.74	1.74	107.	80.	73.	9.5	220.	50.
N-15	296.0	1440	799.980	1.500	1.81	1.81	104.	80.	73.	9.5	220.	50.
N-16	304.0	1448	806.100	1.500	1.82	1.82	101.	80.	72.	10.0	220.	50.
N-17	312.0	1456	812.230	1.500	1.82	1.82	101.	80.	72.	10.0	220.	50.
N-18	320.0	1504	818.645	1.650	1.99	1.99	105.	78.	71.	11.0	220.	50.
N-19	328.0	1512	824.895	1.550	1.85	1.85	110.	78.	71.	11.0	220.	50.
N-20	336.0	1520	831.085	1.550	1.85	1.85	112.	78.	71.	11.5	220.	50.
N-21	344.0	1528	837.300	1.450	1.74	1.74	107.	77.	70.	11.5	220.	50.
N-22	352.0	1536	842.980	1.350	1.62	1.62	108.	77.	70.	11.0	220.	50.
TOTALS	352.0		251.001									
AVERAGE					1.56	1.56	114.	80.	72.	5.8	218.	51.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

AL TECH STEEL, WATERVLIET, NY — DAN FITZGERALD

TEST A2P-3 SITE #2

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/09/81	04/09/81
TB	TIME-START	929	929
TF	TIME-FINISH	1536	1536
TT	NET TIME OF TEST, MIN.	352.0	352.0
NP	NET SAMPLING POINTS	44	44
Y	METER CALIBRATION FACTOR	1.007	1.007
DN	SAMPLING NOZZLE DIAMETER	.188 IN	4.8 MM
CP	PITOT TUBE COEFFICIENT	.81	.81
PM	AVERAGE ORIFICE PRESSURE DROP	1.56 IN-H2O	39.5 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	251.001 CU-FT	7.108 CU-M
TM	AVERAGE GAS METER TEMP	75.9 F	24.4 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	251.228 SCF	7.114 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	69.7	69.7
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	3.281 SCF	.093 SCM
BWO	PERCENT MOISTURE BY VOLUME	1.29	1.29
FMD	MOLE FRACTION DRY GAS	.987	.987
PCO2	PERCENT CO2 BY VOL., DRY	.20	.20
PO2	PERCENT O2 BY VOL., DRY	20.30	20.30
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.50	79.50
MD	MOLECULAR WT-DRY STACK GAS	28.84	28.84
MWS	MOLECULAR WT-STACK GAS	28.70	28.70

PB	BAROMETRIC PRESSURE	30.07	IN-HG	763.78	MM-HG
PSI	STATIC PRES OF STACK GAS	-3.00	IN-H2O	-76.20	MM-H2O
PS	STACK PRES, ABS.	29.85	IN-HG	758.18	MM-HG
TS	AVERAGE STACK TEMP	114.	F	45.	C
VS	AVG STACK GAS VELOCITY	64.7	FPS	19.7	MPS
AS	STACK AREA	11310.	SQ-IN	7.297	SQ-M
QSSTD	STACK FLOW RATE, DRY*	16578872.	SCFH	469464.	SCMH
QS	ACTUAL STACK FLOW RATE	18290980.	ACFH	517946.	ACMH
ISO	PERCENT ISOKINETIC	105.2		105.2	
MN	FILTERABLE PART. MG. EPA 5	789.6		789.6	
CS	FILTERABLE PART.	.0485	GR/DSCF*	111.003	MG/DSCM
PMR	FILTERABLE PART. EMISSION RATE	114.874	LB/HR	52.11	KG/HR
MN	INORGANIC COND. MG. EPA 5	10.5		10.5	
CS	INORGANIC COND.	.0006	GR/DSCF*	1.476	MG/DSCM
PMR	INORGANIC COND. EMISSION RATE	1.528	LB/HR	.69	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. A2P-3

SITE #2

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 251.001 * 1.007 * (30.07 + 1.556 / 13.6)}{(76. + 460.)} = 251.228 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 70. = 3.28 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 3.28}{251.228 + 3.28} = 1.29 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 1.3}{100.} = .987$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (.20*44/100) + (20.3*32/100) + ((79.5+ .0) * 28/100 = 28.84

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 28.84* (1. -(1.29/100)) + 18. * (1.29/100) = 28.70

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .81 * 1203.200 / (SQRT(28.70 * 29.85) * 44. = 64.69 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 64.69 * 11310. 3600/144 = 18290980. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

QSSTD = (17.647 * 18290980. * 29.85 * (1. - (1.29/100)) / (114. + 460.)) = 16578872. SCFH

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

ISO = ((305.58*(114.+460.))*((0.002669* 70.)+(251.001*1.007*(30.07+(1.556/13.6))/(76.+460.)))) / (552. * 64.69 * 29.85 * .188 * .188) = 105.24 PERCENT

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 789.6 * 15.43 / 251.228 = .048 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .048 * 16578872. / (15.43 * 453.6) = 114.87

FIELD DATA

PLANT	AL TECH SPECIALTY STEEL, ALBANY	DATE	04/08/81
SAMPLING LOCATION	BAGHOUSE OUTLET	RUN NUMBER	A3P-1
SAMPLE TYPE	PARTICULATE	PROBE LENGTH & TYPE	5 FT GLASS
OPERATOR	R ANTESBERGER	NOZZLE A-1071 I.D.	.510
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	1.6
BAR.PRESS.(IN.HG)	30.46	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	.00	METER BOX NUMBER	FB7
FILTER NUMBER(S)	0002205	METER HEAD DIFF.	1.71
STACK INSIDE DIM.(IN)	418.94 418.94	C FACTOR	1.00
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	250.
THERM. NO.		HEATER BOX SETTING	250.
LEAKAGE	.000 CFM @ 4.0 IN.HG	REFERENCE PRESS. DIFF.	.03
METER CALIB. FACTOR	1.004		

READ & RECORD DATA EVERY 20.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	1030	784.255									
1-01	20.0	1050	797.700	.020	1.25	1.25	101.	70.	66.	3.0	230.	44.
1-02	40.0	1110	811.200	.020	1.25	1.25	105.	74.	66.	3.0	230.	44.
1-03	60.0	1130	824.800	.020	1.25	1.25	105.	76.	69.	3.0	235.	45.
1-04	80.0	1150	838.420	.020	1.25	1.25	107.	78.	70.	3.0	240.	45.
2-01	100.0	1225	851.900	.020	1.25	1.25	100.	77.	72.	3.0	240.	46.
2-02	120.0	1245	865.450	.020	1.25	1.25	103.	77.	72.	3.0	245.	48.
2-03	140.0	1305	878.950	.020	1.25	1.25	102.	77.	72.	3.0	245.	48.
2-04	160.0	1325	892.415	.020	1.25	1.25	103.	78.	72.	3.5	245.	48.
3-01	180.0	1405	905.950	.020	1.25	1.25	100.	78.	72.	3.5	245.	49.
3-02	200.0	1425	919.500	.020	1.25	1.25	105.	80.	72.	3.5	245.	50.
3-03	220.0	1445	933.150	.020	1.25	1.25	110.	82.	73.	3.5	250.	50.
3-04	240.0	1505	946.820	.020	1.25	1.25	120.	82.	73.	3.5	250.	50.
4-01	260.0	1550	960.600	.020	1.25	1.25	110.	80.	72.	3.5	250.	53.
4-02	280.0	1610	974.400	.020	1.25	1.25	114.	82.	72.	3.5	250.	53.
4-03	300.0	1630	988.150	.020	1.25	1.25	117.	84.	74.	3.5	250.	55.
4-04	320.0	1650	1.835	.020	1.25	1.25	123.	86.	76.	3.5	250.	58.
TOTALS	320.0		217.580									
AVERAGE					1.25	1.25	108.	79.	71.	3.3	244.	49.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS	TEST TEAM LEADER
AL TECH SPECIALTY STEEL, ALBANY	R ANTESBERGER

TEST A3P-1 BAGHOUSE OUTLET

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/08/81	04/08/81
TB	TIME-START	1030	1030
TF	TIME-FINISH	1650	1650
TT	NET TIME OF TEST, MIN.	320.0	320.0
NP	NET SAMPLING POINTS	16	16
Y	METER CALIBRATION FACTOR	1.004	1.004
DN	SAMPLING NOZZLE DIAMETER	.510 IN	13.0 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.25 IN-H2O	31.8 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	217.580 CU-FT	6.161 CU-M
TM	AVERAGE GAS METER TEMP	75.1 F	24.0 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	220.093 SCF	6.232 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	19.2	19.2
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	.904 SCF	.026 SCM
BWO	PERCENT MOISTURE BY VOLUME	.41	.41
FMD	MOLE FRACTION DRY GAS	.996	.996
PCO2	PERCENT CO2 BY VOL., DRY	.20	.20
PO2	PERCENT O2 BY VOL., DRY	20.60	20.60
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.20	79.20
MD	MOLECULAR WT-DRY STACK GAS	28.86	28.86
MWS	MOLECULAR WT-STACK GAS	28.81	28.81

PB	BAROMETRIC PRESSURE	30.46	IN-HG	773.68	MM-HG
PSI	STATIC PRES OF STACK GAS	.00	IN-H2O	.00	MM-H2O
PS	STACK PRES, ABS.	30.46	IN-HG	773.68	MM-HG
TS	AVERAGE STACK TEMP	108.	F	42.	C
VS	AVG STACK GAS VELOCITY	8.2	FPS	2.5	MPS
AS	STACK AREA	######	SQ-IN	113.232	SQ-M
QSSTD	STACK FLOW RATE, DRY*	33792104.	SCFH	956891.	SCMH
QS	ACTUAL STACK FLOW RATE	35842560.	ACFH	1014954.	ACMH
ISO	PERCENT ISOKINETIC	104.9		104.9	
MN	FILTERABLE PART. MG. EPA 5	20.4		20.4	
CS	FILTERABLE PART.	.0014	GR/DSCF*	3.274	MG/DSCM
PMR	FILTERABLE PART. EMISSION RATE	6.905	LB/HR	3.13	KG/HR
MN	INORGANIC COND. MG. EPA 5	.3		.3	
CS	INORGANIC COND.	.0000	GR/DSCF*	.048	MG/DSCM
PMR	INORGANIC COND. EMISSION RATE	.102	LB/HR	.05	KG/HR
MN	ORGANIC COND. MG. EPA 5	2.6		2.6	
CS	ORGANIC COND.	.0002	GR/DSCF*	.417	MG/DSCM
PMR	ORGANIC COND. EMISSION RATE	.880	LB/HR	.40	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. A3P-1

BAGHOUSE OUTLET

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 217.580 * 1.004 * (30.46 + 1.250 / 13.6)}{(75. + 460.)} = 220.093 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 19. = .90 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * .90}{220.093 + .90} = .41 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - .4}{100.} = .996$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (.20*44/100) + (20.6*32/100) + ((79.2+ .0) * 28/100 = 28.86

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 28.86* (1. -(.41/100)) + 18. * (.41/100) = 28.81

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 53.917 / (SQRT(28.81 * 30.46) * 16. = 8.17 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 8.17 * ###### 3600/144 = 35842560. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 35842560. * 30.46 * (1. - (.41/100))}{(108. + 460.)} = 33792104. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(108.+460.))*((0.002669* 19.)+(217.580*1.004*(30.46+(1.250/13.6))/(75.+460.)))}{320. * 8.17 * 30.46 * .510 * .510} = 104.92 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 20.4 * 15.43 / 220.093 = .001 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .001 * 33792104. / (15.43 * 453.6) = 6.91

FIELD DATA

PLANT	AL TECH SPECIALTY STEEL, ALBANY	DATE	04/08/81
SAMPLING LOCATION	BAGHOUSE OUTLET	RUN NUMBER	A3P-2
SAMPLE TYPE	PARTICULATE	PROBE LENGTH & TYPE	5 FT GLASS
OPERATOR	R ANTESBERGER	NOZZLE 8-1071 I.D.	.510
AMBIENT TEMP.(DEG.F)	70.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.38	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	.05	METER BOX NUMBER	FB7
FILTER NUMBER(S)	0002147	METER HEAD DIFF.	1.71
STACK INSIDE DIM.(IN)	418.94 418.94	C FACTOR	1.00
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	250.
THERM. NO.		HEATER BOX SETTING	250.
LEAKAGE	.000 CFM @ 3.0 IN.HG	REFERENCE PRESS. DIFF.	.03
METER CALIB. FACTOR	1.004		
READ & RECORD DATA EVERY 20.0 MINUTES			

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	935	2.000									
3-01	20.0	955	15.450	.020	1.25	1.25	88.	74.	69.	3.0	235.	42.
3-02	40.0	1015	28.900	.020	1.25	1.25	99.	80.	72.	3.0	240.	43.
3-03	60.0	1035	42.250	.020	1.15	1.15	115.	82.	74.	3.0	250.	44.
3-04	80.0	1055	55.275	.020	1.15	1.15	132.	84.	74.	3.0	255.	44.
4-01	100.0	1130	68.330	.020	1.15	1.15	109.	82.	76.	3.0	250.	45.
4-02	120.0	1150	81.400	.020	1.15	1.15	128.	84.	76.	3.0	250.	44.
4-03	140.0	1210	94.400	.020	1.15	1.15	132.	86.	78.	3.0	250.	45.
4-04	160.0	1230	107.615	.020	1.15	1.15	120.	88.	80.	3.0	255.	45.
5-01	180.0	1305	120.750	.020	1.15	1.15	121.	86.	80.	3.0	250.	48.
5-02	200.0	1325	133.850	.020	1.15	1.15	124.	86.	80.	3.0	250.	49.
5-03	220.0	1345	147.050	.020	1.15	1.15	120.	88.	80.	3.0	250.	50.
5-04	240.0	1405	160.200	.020	1.15	1.15	120.	88.	82.	3.0	250.	50.
6-01	260.0	1445	173.550	.020	1.15	1.15	115.	86.	80.	3.0	250.	51.
6-02	280.0	1505	186.828	.020	1.15	1.15	124.	88.	82.	3.0	250.	51.
6-03	300.0	1525	200.100	.020	1.15	1.15	134.	86.	82.	3.0	250.	53.
6-04	320.0	1545	213.271	.020	1.15	1.15	124.	88.	82.	3.0	250.	54.
TOTALS	320.0		211.271									
AVERAGE					1.16	1.16	119.	85.	78.	3.0	249.	47.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

AL TECH SPECIALTY STEEL, ALBANY — R ANTESBERGER

TEST A3P-2 BAGHOUSE OUTLET

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/08/81	04/08/81
TB	TIME-START	935	935
TF	TIME-FINISH	1545	1545
TT	NET TIME OF TEST, MIN.	320.0	320.0
NP	NET SAMPLING POINTS	16	16
Y	METER CALIBRATION FACTOR	1.004	1.004
DN	SAMPLING NOZZLE DIAMETER	.510 IN	13.0 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.16 IN-H2O	29.5 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	211.271 CU-FT	5.983 CU-M
TM	AVERAGE GAS METER TEMP	81.3 F	27.4 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	210.659 SCF	5.965 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	30.7	30.7
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	1.445 SCF	.041 SCM
BWO	PERCENT MOISTURE BY VOLUME	.68	.68
FMD	MOLE FRACTION DRY GAS	.993	.993
PCO2	PERCENT CO2 BY VOL., DRY	.20	.20
PO2	PERCENT O2 BY VOL., DRY	20.60	20.60
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.20	79.20
MD	MOLECULAR WT-DRY STACK GAS	28.86	28.86
MWS	MOLECULAR WT-STACK GAS	28.78	28.78

PB	BAROMETRIC PRESSURE	30.38	IN-HG	771.65	MM-HG
PSI	STATIC PRES OF STACK GAS	.05	IN-H2O	1.27	MM-H2O
PS	STACK PRES, ABS.	30.38	IN-HG	771.75	MM-HG
TS	AVERAGE STACK TEMP	119.	F	48.	C
VS	AVG STACK GAS VELOCITY	8.3	FPS	2.5	MPS
AS	STACK AREA	######	SQ-IN	113.232	SQ-M
QSSTD	STACK FLOW RATE, DRY*	33344884.	SCFH	944227.	SCMH
QS	ACTUAL STACK FLOW RATE	36258712.	ACFH	1026738.	ACMH
ISO	PERCENT ISOKINETIC	101.8		101.8	
MN	INORGANIC COND MG. EPA 5	.0		.0	
CS	INORGANIC COND	.0000	GR/DSCF*	.000	MG/DSCM
PMR	INORGANIC COND EMISSION RATE	.000	LB/HR	.00	KG/HR
MN	FILTERABLE PART MG. EPA 5	17.2		17.2	
CS	FILTERABLE PART	.0013	GR/DSCF*	2.884	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	6.002	LB/HR	2.72	KG/HR
MN	ORGANIC COND. MG. EPA 5	.6		.6	
CS	ORGANIC COND.	.0000	GR/DSCF*	.101	MG/DSCM
PMR	ORGANIC COND. EMISSION RATE	.209	LB/HR	.09	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. A3P-2

BAGHOUSE OUTLET

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 211.271 * 1.004 * (30.38 + 1.163 / 13.6)}{(81. + 460.)} = 210.659 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 31. = 1.45 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 1.45}{210.659 + 1.45} = .68 \text{ PERCENT}$$

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MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - .7}{100.} = .993$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (.20*44/100) + (20.6*32/100) + ((79.2+ .0) * 28/100 = 28.86

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 28.86* (1. -(.68/100)) + 18. * (.68/100) = 28.78

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM, OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 54.447 / (SQRT(28.78 * 30.38) * 16. = 8.26 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 8.26 * ##### 3600/144 = 36258712. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

```
          17.647 *   36258712. *  30.38 * (1. - (  .68/100))
QSSTD = ------------------------------------------------- =   33344884. SCFH
                    ( 119. + 460.)
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A-54

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

```
       (305.58*( 119.+460.))*((0.002669*   31.)+(  211.271*1.004*( 30.38+(   1.163/13.6))/(  81.+460.)))
ISO = ------------------------------------------------------------------------------------------------ = 101.77 PERCENT
                                  320. *      8.26 *   30.38 *  .510 *  .510
```

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * .0 * 15.43 / 210.659 = .000 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .000 * 33344884. / (15.43 * 453.6) = .00

FIELD DATA

PLANT	AL TECH SPECIALTY STEEL ALBANY, N	DATE	04/09/81
SAMPLING LOCATION	BAGHOUSE OUTLET	RUN NUMBER	A3P-3
SAMPLE TYPE	PARTICULATE	PROBE LENGTH & TYPE	5 FT GLASS
OPERATOR	R ANTESBERGER	NOZZLE 8-1071 I.D.	.510
AMBIENT TEMP.(DEG.F)	65.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.06	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	.05	METER BOX NUMBER	F87
FILTER NUMBER(S)	0002200	METER HEAD DIFF.	1.71
STACK INSIDE DIM.(IN)	418.94 418.94	C FACTOR	1.00
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	250.
THERM. NO.		HEATER BOX SETTING	250.
LEAKAGE	.000 CFM @ 3.0 IN.HG	REFERENCE PRESS. DIFF.	.03
METER CALIB. FACTOR	1.004		
READ & RECORD DATA EVERY	20.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	930	213.680									
5-01	20.0	950	226.650	.020	1.15	1.15	110.	71.	68.	3.0	250.	42.
5-02	40.0	1010	239.800	.020	1.15	1.15	111.	80.	70.	3.0	250.	43.
5-03	60.0	1030	252.750	.020	1.15	1.15	110.	84.	74.	3.0	250.	44.
5-04	80.0	1050	265.980	.020	1.15	1.15	109.	86.	77.	3.0	250.	45.
6-01	100.0	1125	279.200	.020	1.15	1.15	98.	84.	75.	3.0	250.	47.
6-02	120.0	1145	292.400	.020	1.15	1.15	115.	85.	78.	3.0	250.	47.
6-03	140.0	1205	305.700	.020	1.15	1.15	118.	88.	80.	3.0	250.	48.
6-04	160.0	1225	318.800	.020	1.15	1.15	119.	88.	80.	3.0	250.	48.
7-01	180.0	1305	331.850	.020	1.15	1.15	120.	82.	79.	3.0	250.	49.
7-02	200.0	1325	345.000	.020	1.15	1.15	132.	83.	79.	3.0	250.	50.
7-03	220.0	1345	358.200	.020	1.15	1.15	109.	84.	77.	3.0	250.	51.
7-04	240.0	1405	371.315	.020	1.15	1.15	121.	84.	78.	3.0	250.	52.
8-01	260.0	1445	384.600	.020	1.15	1.15	100.	84.	78.	3.0	250.	52.
8-02	280.0	1505	397.750	.020	1.15	1.15	110.	86.	79.	3.0	250.	53.
8-03	300.0	1525	410.900	.020	1.15	1.15	121.	86.	77.	3.0	250.	54.
8-04	320.0	1545	424.035	.020	1.15	1.15	121.	82.	74.	3.0	250.	55.
TOTALS	320.0		210.355									
AVERAGE					1.15	1.15	114.	84.	76.	3.0	250.	49.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

AL TECH SPECIALTY STEEL ALBANY, N — R ANTESBERGER

TEST A3P-3 BAGHOUSE OUTLET

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/09/81	04/09/81
TB	TIME-START	930	930
TF	TIME-FINISH	1545	1545
TT	NET TIME OF TEST, MIN.	320.0	320.0
NP	NET SAMPLING POINTS	16	16
Y	METER CALIBRATION FACTOR	1.004	1.004
DN	SAMPLING NOZZLE DIAMETER	.510 IN	13.0 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.15 IN-H2O	29.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	210.355 CU-FT	5.957 CU-M
TM	AVERAGE GAS METER TEMP	80.0 F	26.7 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	208.052 SCF	5.891 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	52.4	52.4
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	2.466 SCF	.070 SCM
BWO	PERCENT MOISTURE BY VOLUME	1.17	1.17
FMD	MOLE FRACTION DRY GAS	.988	.988
PCO2	PERCENT CO2 BY VOL., DRY	.20	.20
PO2	PERCENT O2 BY VOL., DRY	20.60	20.60
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.20	79.20
MD	MOLECULAR WT-DRY STACK GAS	28.86	28.86
MWS	MOLECULAR WT-STACK GAS	28.73	28.73

PB	BAROMETRIC PRESSURE	30.06	IN-HG	763.52	MM-HG
PSI	STATIC PRES OF STACK GAS	.05	IN-H2O	1.27	MM-H2O
PS	STACK PRES, ABS.	30.06	IN-HG	763.62	MM-HG
TS	AVERAGE STACK TEMP	114.	F	46.	C
VS	AVG STACK GAS VELOCITY	8.3	FPS	2.5	MPS
AS	STACK AREA	######	SQ-IN	113.232	SQ-M
QSSTD	STACK FLOW RATE, DRY*	33181884.	SCFH	939611.	SCMH
QS	ACTUAL STACK FLOW RATE	36326048.	ACFH	1028645.	ACMH
ISO	PERCENT ISOKINETIC	101.0		101.0	
MN	FILTERABLE PART. MG. EPA 5	25.0		25.0	
CS	FILTERABLE PART.	.0019	GR/DSCF*	4.244	MG/DSCM
PMR	FILTERABLE PART. EMISSION RATE	8.790	LB/HR	3.99	KG/HR
MN	INORGANIC COND. MG. EPA 5	1.6		1.6	
CS	INORGANIC COND.	.0001	GR/DSCF*	.272	MG/DSCM
PMR	INORGANIC COND. EMISSION RATE	.563	LB/HR	.26	KG/HR
MN	ORGANIC COND. MG. EPA 5	2.3		2.3	
CS	ORGANIC COND.	.0002	GR/DSCF*	.390	MG/DSCM
PMR	ORGANIC COND. EMISSION RATE	.809	LB/HR	.37	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. A3P-3

BAGHOUSE OUTLET

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 210.355 * 1.004 * (30.06 + 1.150 / 13.6)}{(80. + 460.)} = 208.052 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 52. = 2.47 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 2.47}{208.052 + 2.47} = 1.17 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 1.2}{100.} = .988$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (.20*44/100) + (20.6*32/100) + ((79.2+ .0) * 28/100 = 28.86

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 28.86* (1. -(1.17/100)) + 18. * (1.17/100) = 28.73

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 54.210 / (SQRT(28.73 * 30.06) * 16. = 8.28 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 8.28 * ###### 3600/144 = 36326048. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

```
          17.647 *   36326048. *  30.06 * (1. - ( 1.17/100))
QSSTD = ------------------------------------------------------ =   33181884. SCFH
                    ( 114. + 460.)
```

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

```
        (305.58*( 114.+460.))*((0.002669*   52.)+(  210.355*1.004*( 30.06+(   1.150/13.6))/(  80.+460.)))
ISO = ------------------------------------------------------------------------------------------------------ = 101.01 PERCENT
                                  320. *      8.28 *   30.06 *  .510 *  .510
```

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 25.0 * 15.43 / 208.052 = .002 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .002 * 33181884. / (15.43 * 453.6) = 8.79

FIELD DATA

PLANT	AL TECH ALBANY	DATE	04/07/81
SAMPLING LOCATION	SITE NO 1	RUN NUMBER	A1PM1A
SAMPLE TYPE	PARTICLE SIZE	PROBE LENGTH & TYPE	12 FT
OPERATOR	MASON	NOZZLE : I.D.	.135
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.50	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.20	METER BOX NUMBER	F85
FILTER NUMBER(S)	ANDERSEN MARK III	METER HEAD DIFF.	2.03
STACK INSIDE DIM.(IN)	120.00 .00		
PITOT TUBE COEFF.	.80	PROBE HEATER SETTING	0.
THERM. NO.	138	HEATER BOX SETTING	0.
LEAKAGE	.008 CFM @ 10.0 IN.HG		
METER CALIB. FACTOR	1.056		
READ & RECORD DATA EVERY	5.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	OUTLET	PUMP VACUUM (IN.HG)	IMPACTOR TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	1405	582.152									
	5.0	1410	583.740	1.100	.41	.41	103.	62.	62.	.0	103.	60.
	10.0	1415	585.350	1.100	.41	.41	98.	62.	62.	.0	98.	60.
	15.0	1420	587.035	1.100	.41	.41	102.	62.	62.	.0	102.	60.
	20.0	1425	588.505	1.100	.41	.41	105.	63.	62.	.0	105.	60.
	25.0	1430	590.118	1.100	.41	.41	104.	64.	63.	.0	104.	60.
TOTALS	25.0		7.966									
AVERAGE					.41	.41	102.	63.	62.	.0	102.	60.

PERCENT ISOKINETIC 106.9

A-60

PLANT & CITY	AL TECH ALBANY	IMPACTOR FLOWRATE(ACFM)	.368
		AT IMPACTOR CONDITIONS	
SAMPLING LOCATION	SITE NO 1	IMPACTOR TEMP.	102.4F 39.1C
DATE	04/07/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A1PM1A	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	MASON	GAS COMPOSITION(PERCENT): CO2	.00
STACK TEMP.	102.4F 39.1C	CO	.00
BAR.PRESS.(IN. HG)	30.50	N2	79.02
STACK PRESS.(IN. HG)	30.34	O2	20.17
NOZZLE:I.D.(IN.)	.135	H2O	.81
METER HEAD DIFF.	.410	SAMPLING DURATION(MIN.)	25.00

CALC. MASS LOADING = 4.3334E-02 GR/ACF 4.5896E-02 GR/DSCF 9.9164E+01 MG/ACM 1.0503E+02 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	12.72	11.77	7.61	4.87	2.81	1.35	.86	.48	
MASS (MILLIGRAMS)	12.60	.00	.60	.60	1.00	1.80	2.40	2.60	4.20
MG/DSCM/STAGE	5.11E+01	0.00E+00	2.43E+00	2.43E+00	4.06E+00	7.30E+00	9.74E+00	1.05E+01	1.70E+01
CUM. PERCENT OF MASS SMALLER THAN D50	51.16	51.16	48.84	46.51	42.64	35.66	26.36	16.28	
CUM. (MG/ACM) SMALLER THAN D50	5.07E+01	5.07E+01	4.84E+01	4.61E+01	4.23E+01	3.54E+01	2.61E+01	1.61E+01	
CUM. (MG/DSCM) SMALLER THAN D50	5.37E+01	5.37E+01	5.13E+01	4.88E+01	4.48E+01	3.75E+01	2.77E+01	1.71E+01	
CUM. (GR/ACF) SMALLER THAN D50	2.22E-02	2.22E-02	2.12E-02	2.02E-02	1.85E-02	1.55E-02	1.14E-02	7.05E-03	
CUM. (GR/DSCF) SMALLER THAN D50	2.35E-02	2.35E-02	2.24E-02	2.13E-02	1.96E-02	1.64E-02	1.21E-02	7.47E-03	
GEO. MEAN DIA. (MICROMETERS)	2.52E+01	1.22E+01	9.47E+00	6.09E+00	3.70E+00	1.95E+00	1.08E+00	6.42E-01	3.40E-01
DM/DLOGD (MG/DSCM)	8.60E+01	0.00E+00	1.28E+01	1.26E+01	1.70E+01	2.29E+01	4.91E+01	4.22E+01	5.66E+01
DN/DLOGD (NO. PARTICLES/DSCM)	1.02E+07	0.00E+00	2.89E+07	1.06E+08	6.40E+08	5.92E+09	7.55E+10	3.05E+11	2.74E+12

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

PLANT & CITY	AL TECH ALBANY	IMPACTOR FLOWRATE(ACFM) AT IMPACTOR CONDITIONS	.368
SAMPLING LOCATION	SITE NO 1	IMPACTOR TEMP.	102.4F 39.1C
DATE	04/07/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A1PM1A	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	MASON	GAS COMPOSITION(PERCENT): CO2	.00
STACK TEMP.	102.4F 39.1C	CO	.00
BAR.PRESS.(IN. HG)	30.50	N2	79.02
STACK PRESS.(IN. HG)	30.34	O2	20.17
NOZZLE:I.D.(IN.)	.135	H2O	.81
METER HEAD DIFF.	.410	SAMPLING DURATION(MIN.)	25.00

CALC. MASS LOADING = 4.3334E-02 GR/ACF 4.5896E-02 GR/DSCF 9.9164E+01 MG/ACM 1.0503E+02 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	12.81	11.86	7.69	4.96	2.90	1.43	.94	.56	
MASS (MILLIGRAMS)	12.60	.00	.60	.60	1.00	1.80	2.40	2.60	4.20
MG/DSCM/STAGE	5.11E+01	0.00E+00	2.43E+00	2.43E+00	4.06E+00	7.30E+00	9.74E+00	1.05E+01	1.70E+01
CUM. PERCENT OF MASS SMALLER THAN D50	51.16	51.16	48.84	46.51	42.64	35.66	26.36	16.28	
CUM. (MG/ACM) SMALLER THAN D50	5.07E+01	5.07E+01	4.84E+01	4.61E+01	4.23E+01	3.54E+01	2.61E+01	1.61E+01	
CUM. (MG/DSCM) SMALLER THAN D50	5.37E+01	5.37E+01	5.13E+01	4.88E+01	4.48E+01	3.75E+01	2.77E+01	1.71E+01	
CUM. (GR/ACF) SMALLER THAN D50	2.22E-02	2.22E-02	2.12E-02	2.02E-02	1.85E-02	1.55E-02	1.14E-02	7.05E-03	
CUM. (GR/DSCF) SMALLER THAN D50	2.35E-02	2.35E-02	2.24E-02	2.13E-02	1.96E-02	1.64E-02	1.21E-02	7.47E-03	
GEO. MEAN DIA. (MICROMETERS)	2.53E+01	1.23E+01	9.55E+00	6.18E+00	3.79E+00	2.04E+00	1.16E+00	7.26E-01	3.97E-01
DM/DLOGD (MG/DSCM)	8.64E+01	0.00E+00	1.30E+01	1.27E+01	1.74E+01	2.39E+01	5.28E+01	4.74E+01	5.66E+01
DN/DLOGD (NO. PARTICLES/DSCM)	1.02E+07	0.00E+00	2.84E+07	1.03E+08	6.11E+08	5.40E+09	6.48E+10	2.37E+11	1.73E+12

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

IMPACTOR FIELD DATA TABULATION

PLANT-NAME AND ADDRESS — TEST TEAM LEADER

AL TECH ALBANY — MASON

TEST A1PM1A SITE NO 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/07/81	04/07/81
TB	TIME-START	1405	1405
TF	TIME-FINISH	1430	1430
TT	NET TIME OF TEST, MIN.	25.0	25.0
Y	METER CALIBRATION FACTOR	1.056	1.056
DN	SAMPLING NOZZLE DIAMETER	.135 IN	3.4 MM
CP	PITOT TUBE COEFFICIENT	.80	.80
PM	AVERAGE ORIFICE PRESSURE DROP	.41 IN-H2O	10.4 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	7.966 CU-FT	.226 CU-M
TM	AVERAGE GAS METER TEMP	62.4 F	16.9 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	8.676 SCF	.246 SCM
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	.071 SCF	.000 SCM
BWO	PERCENT MOISTURE BY VOLUME	.81	.81
FMD	MOLE FRACTION DRY GAS	.992	.992
PCO2	PERCENT CO2 BY VOL., DRY	.00	.00
PO2	PERCENT O2 BY VOL., DRY	20.33	20.33
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.67	79.67
MD	MOLECULAR WT-DRY STACK GAS	28.81	28.81
MWS	MOLECULAR WT-STACK GAS	28.73	28.73
PB	BAROMETRIC PRESSURE	30.50 IN-HG	774.70 MM-HG
PSI	STATIC PRES OF STACK GAS	-2.20 IN-H2O	-55.88 MM-H2O
PS	STACK PRES, ABS.	30.34 IN-HG	770.59 MM-HG

TS	AVERAGE STACK TEMP	102.	F	39.	C
IF	GAS SAMPLED AT STACK CONDITIONS	9.19	ACF	.26	ACM
AS	STACK AREA	11310.	SQ-IN	7.297	SQ-M
ISO	PERCENT ISOKINETIC	106.9		106.9	
MT	TOTAL MASS OF PARTICLES	.398	GR	25.800	MG
PD	PARTICLE DENSITY	.06	GR/CI	1.00	GM/CC

* 68 DEG F, 29.92 IN.HG.

IMPACTOR RESULTS AND EXAMPLE CALCULATIONS

PLANT-NAME AND CITY	TEST TEAM LEADER	RUN NO	SAMPLE LOCATION
AL TECH ALBANY	MASON	A1PM1A	SITE NO 1
TEST DATE 04/07/81			

CALC. MASS LOADING — TOTAL MASS OF PARTICLES DIVIDED BY A VOLUME. UNITS GIVEN ARE GRAINS PER ACTUAL* CUBIC FOOT(GR/ACF),GRAINS PER DRY STANDARD** CUBIC FOOT(GR/DSCF), MILLIGRAMS PER ACTUAL CUBIC METER(MG/ACM) AND MILLIGRAMS PER DRY STANDARD CUBIC METER(MG/DSCM.)

EXAMPLE CALCULATIONS

```
CML(GR/ACF) = MT(GR) / IF(ACF)

        CML =          .398 /      9.188 =       .0433  GR/ACF

CML(GR/DSCF) = MT(GR) / VMSTD(DSCF)

        CML =          .398 /      8.676 =       .0459  GR/DSCF

CML(MG/ACM) = MT(MG) / IF(ACM)

        CML =        25.800 /       .260 =     99.1638  MG/ACM

CML(MG/DSCM) = MT(MG) / VMSTD(DSCM)

        CML =        25.800 /       .246 =    105.0263  MG/DSCM
```

D50 (MICROMETERS) — THE SIZE OF THE PARTICLES ON EACH STAGE ASSUMING A 50 PERCENT COLLECTION EFFICIENCY DEFINITION

MASS (MILLIGRAMS) — THE MASS ON EACH STAGE COLLECTED

MG/DSCM/STAGE — THE MASS LOADING FOR EACH STAGE. UNITS GIVEN ARE MILLIGRAMS PER DRY STANDARD CUBIC METER FOR EACH STAGE(MG/DSCM/STAGE)

EXAMPLE CALCULATIONS

```
MG/DSCM/STAGE(1) =   MASS(1) / VMSTD(DSCM)

MG/DSCM/STAGE(1) =     12.60 /       .246 =      51.12
```

CUM. PERCENT OF MASS — THE PERCENTAGE OF THE TOTAL MASS SAMPLED SMALLER IN DIAMETER THAN THE CORRESPONDING D50 INDICATED FOR THAT STAGE

EXAMPLE CALCULATIONS

```
CUM % (6) = MASS(7) + MASS(8) + MASS(9)
            ---------------------------  * 100  =
                      MT (MG)

CUM % (6) =      2.40 +       2.60 +       4.20
            ---------------------------------- * 100  =  42.64
                          25.80  (MG)
```

CUM.(MASS/VOLUME) THE CUMULATIVE MASS LOADING OF PARTICLES SMALLER IN DIAMETER THAN THE CORRESPONDING D50. MASS/VOLUME UNITS ARE MG/ACM, MG/DSCM, GR/ACF, GR/DSCF.

EXAMPLE CALCULATIONS

```
CUM.(MG/ACM) (5) = MASS(6) + MASS(7) + MASS(8) + MASS(9)
                   ----------------------------------
                                IF(ACM)

CUM.(MG/ACM) (5) =     1.80 +      2.40 +      2.60 +      4.20
                   ----------------------------------------------  =      42.28
                                     .26   (ACM)
```

GEO.MEAN DIA.(MICROMETERS) THE GEOMETRIC MEAN DIAMETER IN MICROMETERS FOR A PARTICULAR STAGE.

EXAMPLE CALCULATION

```
GEO.MEAN DIA.(J) = SQRT( D50(J) * D50(J-1))

GEO.MEAN DIA.(6) = SQRT(     1.43 *      2.90)  =      2.04
```

DM/DLOGD(MG/DSCM) DM IS MG/DSCM/STAGE(J) AND DLOGD IS LOG10(D50(J-1) / D50(J)) WHERE J IS THE CORRESPONDING STAGE NUMBER. FOR STAGE 1 THE MAXIMUM PARTICLE DIAMETER IS USED. FOR STAGE 9 (BACKUP FILTER) THE D50 IS ASSUMED AS .5 * D50 OF STAGE 8.

EXAMPLE CALCULATION

```
DM/DLOGD(J) =   MG/DSCM/STAGE(J)
                --------------------
                LOG( D50(J-1) / D50(J))

DM/DLOGD (3) =              2.43
                ------------------------  =      12.96
                LOG(     11.86 /      7.69 )
```

DN/DLOGD THE NUMBER OF PARTICLES PER UNIT VOLUME FOR A STAGE.

EXAMPLE CALCULATION

```
DN/DLOGD(J) =          DM/DLOGD(J)
              ----------------------------------------
              5.23599E-10 * PD(GM/CC) * GEO.MEAN DIA.(J)

DN/DLOGD (3) =              12.96
               ----------------------------------  =      28401784.00
               5.235999E-10 *      1.00  *      9.55
```

* CALCULATED AT STACK CONDITIONS
** CALCULATED AT STANDARD CONDITIONS
68 DEG.F AND 29.92 INCHES OF HG (760 MMHG)

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FIELD DATA

PLANT	AL TECH ALBANY	DATE	04/08/81
SAMPLING LOCATION	SITE NO 1	RUN NUMBER	A1PM2B
SAMPLE TYPE	PARTICLE SIZE	PROBE LENGTH & TYPE	12 FOOT
OPERATOR	MASON	NOZZLE : I.D.	.135
AMBIENT TEMP.(DEG.F)	65.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.39	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.30	METER BOX NUMBER	F85
FILTER NUMBER(S)		METER HEAD DIFF.	2.03
STACK INSIDE DIM.(IN)	120.00 .00		
PITOT TUBE COEFF.	.80	PROBE HEATER SETTING	0.
THERM. NO.	138	HEATER BOX SETTING	0.
LEAKAGE	.000 CFM @ 10.0 IN.HG		
METER CALIB. FACTOR	1.056		
READ & RECORD DATA EVERY	2.5 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	OUTLET	PUMP VACUUM (IN.HG)	IMPACTOR TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	1448	711.482									
	2.5	0	712.325	1.100	.41	.41	119.	80.	81.	.0	119.	58.
	5.0	1453	713.160	1.100	.41	.41	121.	81.	81.	.0	121.	58.
	7.5	0	714.092	1.100	.41	.41	127.	81.	82.	.0	127.	60.
	10.0	1458	714.884	1.100	.41	.41	127.	81.	82.	.0	127.	60.
	12.5	0	715.745	1.100	.41	.41	127.	81.	82.	.0	127.	62.
	15.0	1504	716.500	1.100	.41	.41	117.	81.	82.	.0	117.	62.
	17.5	0	717.347	1.100	.41	.41	117.	81.	82.	.0	117.	64.
TOTALS	17.5		5.865									
AVERAGE					.41	.41	122.	81.	82.	.0	122.	61.

PERCENT ISOKINETIC 110.3

PLANT & CITY	AL TECH ALBANY	IMPACTOR FLOWRATE(ACFM)	.387
		AT IMPACTOR CONDITIONS	
SAMPLING LOCATION	SITE NO 1	IMPACTOR TEMP.	122.1F 50.1C
DATE	04/08/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A1PM2B	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	MASON	GAS COMPOSITION(PERCENT): CO2	.00
STACK TEMP.	122.1F 50.1C	CO	.00
BAR.PRESS.(IN. HG)	30.39	N2	78.96
STACK PRESS.(IN. HG)	30.22	O2	20.15
NOZZLE:I.D.(IN.)	.135	H2O	.89
METER HEAD DIFF.	.410	SAMPLING DURATION(MIN.)	17.50

CALC. MASS LOADING = 2.3953E-02 GR/ACF 2.6383E-02 GR/DSCF 5.4812E+01 MG/ACM 6.0374E+01 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	12.55	11.61	7.51	4.80	2.77	1.33	.84	.47	
MASS (MILLIGRAMS)	7.30	.10	.30	.40	.40	.50	.60	.20	.70
MG/DSCM/STAGE	4.18E+01	5.73E-01	1.72E+00	2.29E+00	2.29E+00	2.87E+00	3.44E+00	1.15E+00	4.01E+00
CUM. PERCENT OF MASS SMALLER THAN D50	30.48	29.52	26.67	22.86	19.05	14.29	8.57	6.67	
CUM. (MG/ACM) SMALLER THAN D50	1.67E+01	1.62E+01	1.46E+01	1.25E+01	1.04E+01	7.83E+00	4.70E+00	3.65E+00	
CUM. (MG/DSCM) SMALLER THAN D50	1.84E+01	1.78E+01	1.61E+01	1.38E+01	1.15E+01	8.62E+00	5.17E+00	4.02E+00	
CUM. (GR/ACF) SMALLER THAN D50	7.30E-03	7.07E-03	6.39E-03	5.47E-03	4.56E-03	3.42E-03	2.05E-03	1.60E-03	
CUM. (GR/DSCF) SMALLER THAN D50	8.04E-03	7.79E-03	7.04E-03	6.03E-03	5.03E-03	3.77E-03	2.26E-03	1.76E-03	
GEO. MEAN DIA. (MICROMETERS)	2.51E+01	1.21E+01	9.34E+00	6.00E+00	3.65E+00	1.92E+00	1.06E+00	6.28E-01	3.32E-01
DM/DLOGD (MG/DSCM)	6.97E+01	1.70E+01	9.07E+00	1.18E+01	9.59E+00	8.98E+00	1.73E+01	4.55E+00	1.33E+01
DN/DLOGD (NO. PARTICLES/DSCM)	8.47E+06	1.84E+07	2.13E+07	1.04E+08	3.77E+08	2.43E+09	2.80E+10	3.50E+10	6.92E+11

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

PLANT & CITY	AL TECH ALBANY	IMPACTOR FLOWRATE(ACFM)	.387
SAMPLING LOCATION	SITE NO 1	AT IMPACTOR CONDITIONS IMPACTOR TEMP.	122.1F 50.1C
DATE	04/08/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A1PM28	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	MASON	GAS COMPOSITION(PERCENT): CO2	.00
STACK TEMP.	122.1F 50.1C	CO	.00
BAR.PRESS.(IN. HG)	30.39	N2	78.96
STACK PRESS.(IN. HG)	30.22	O2	20.15
NOZZLE:I.D.(IN.)	.135	H2O	.89
METER HEAD DIFF.	.410	SAMPLING DURATION(MIN.)	17.50

CALC. MASS LOADING = 2.3953E-02 GR/ACF 2.6383E-02 GR/DSCF 5.4812E+01 MG/ACM 6.0374E+01 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	12.64	11.70	7.59	4.89	2.86	1.41	.92	.55	
MASS (MILLIGRAMS)	7.30	.10	.30	.40	.40	.50	.60	.20	.70
MG/DSCM/STAGE	4.18E+01	5.73E-01	1.72E+00	2.29E+00	2.29E+00	2.87E+00	3.44E+00	1.15E+00	4.01E+00
CUM. PERCENT OF MASS SMALLER THAN D50	30.48	29.52	26.67	22.86	19.05	14.29	8.57	6.67	
CUM. (MG/ACM) SMALLER THAN D50	1.67E+01	1.62E+01	1.46E+01	1.25E+01	1.04E+01	7.83E+00	4.70E+00	3.65E+00	
CUM. (MG/DSCM) SMALLER THAN D50	1.84E+01	1.78E+01	1.61E+01	1.38E+01	1.15E+01	8.62E+00	5.17E+00	4.02E+00	
CUM. (GR/ACF) SMALLER THAN D50	7.30E-03	7.07E-03	6.39E-03	5.47E-03	4.56E-03	3.42E-03	2.05E-03	1.60E-03	
CUM. (GR/DSCF) SMALLER THAN D50	8.04E-03	7.79E-03	7.04E-03	6.03E-03	5.03E-03	3.77E-03	2.26E-03	1.76E-03	
GEO. MEAN DIA. (MICROMETERS)	2.51E+01	1.22E+01	9.43E+00	6.10E+00	3.74E+00	2.01E+00	1.14E+00	7.16E-01	3.92E-01
DM/DLOGD (MG/DSCM)	7.00E+01	1.71E+01	9.15E+00	1.20E+01	9.82E+00	9.38E+00	1.86E+01	5.15E+00	1.33E+01
DN/DLOGD (NO. PARTICLES/DSCM)	8.42E+06	1.82E+07	2.09E+07	1.01E+08	3.59E+08	2.20E+09	2.38E+10	2.68E+10	4.23E+11

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

IMPACTOR FIELD DATA TABULATION

PLANT-NAME AND ADDRESS	TEST TEAM LEADER
AL TECH ALBANY	MASON

TEST A1PM2B SITE NO 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/08/81	04/08/81
TB	TIME-START	1448	1448
TF	TIME-FINISH	0	0
TT	NET TIME OF TEST, MIN.	17.5	17.5
Y	METER CALIBRATION FACTOR	1.056	1.056
DN	SAMPLING NOZZLE DIAMETER	.135 IN	3.4 MM
CP	PITOT TUBE COEFFICIENT	.80	.80
PM	AVERAGE ORIFICE PRESSURE DROP	.41 IN-H2O	10.4 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	5.865 CU-FT	.166 CU-M
TM	AVERAGE GAS METER TEMP	81.3 F	27.4 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	6.142 SCF	.174 SCM
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	.055 SCF	.000 SCM
BWO	PERCENT MOISTURE BY VOLUME	.89	.89
FMD	MOLE FRACTION DRY GAS	.991	.991
PCO2	PERCENT CO2 BY VOL., DRY	.00	.00
PO2	PERCENT O2 BY VOL., DRY	20.33	20.33
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.67	79.67
MD	MOLECULAR WT-DRY STACK GAS	28.81	28.81
MWS	MOLECULAR WT-STACK GAS	28.72	28.72
PB	BAROMETRIC PRESSURE	30.39 IN-HG	771.91 MM-HG
PSI	STATIC PRES OF STACK GAS	-2.30 IN-H2O	-58.42 MM-H2O
PS	STACK PRES, ABS.	30.22 IN-HG	767.61 MM-HG

TS	AVERAGE STACK TEMP	122.	F	50.	C
IF	GAS SAMPLED AT STACK CONDITIONS	6.77	ACF	.19	ACM
AS	STACK AREA	11310.	SQ-IN	7.297	SQ-M
ISO	PERCENT ISOKINETIC	110.3		110.3	
MT	TOTAL MASS OF PARTICLES	.162	GR	10.500	MG
PD	PARTICLE DENSITY	.06	GR/CI	1.00	GM/CC

* 68 DEG F, 29.92 IN.HG.

IMPACTOR RESULTS AND EXAMPLE CALCULATIONS

PLANT-NAME AND CITY	TEST TEAM LEADER	RUN NO	SAMPLE LOCATION
AL TECH ALBANY	MASON	A1PM2B	SITE NO 1
TEST DATE 04/08/81			

CALC. MASS LOADING — TOTAL MASS OF PARTICLES DIVIDED BY A VOLUME. UNITS GIVEN ARE GRAINS PER ACTUAL* CUBIC FOOT(GR/ACF),GRAINS PER DRY STANDARD** CUBIC FOOT(GR/DSCF), MILLIGRAMS PER ACTUAL CUBIC METER(MG/ACM) AND MILLIGRAMS PER DRY STANDARD CUBIC METER(MG/DSCM.)

EXAMPLE CALCULATIONS

CML(GR/ACF) = MT(GR) / IF(ACF)

CML = .162 / 6.765 = .0240 GR/ACF

CML(GR/DSCF) = MT(GR) / VMSTD(DSCF)

CML = .162 / 6.142 = .0264 GR/DSCF

CML(MG/ACM) = MT(MG) / IF(ACM)

CML = 10.500 / .192 = 54.8116 MG/ACM

CML(MG/DSCM) = MT(MG) / VMSTD(DSCM)

CML = 10.500 / .174 = 60.3742 MG/DSCM

D50 (MICROMETERS) — THE SIZE OF THE PARTICLES ON EACH STAGE ASSUMING A 50 PERCENT COLLECTION EFFICIENCY DEFINITION

MASS (MILLIGRAMS) — THE MASS ON EACH STAGE COLLECTED

MG/DSCM/STAGE — THE MASS LOADING FOR EACH STAGE. UNITS GIVEN ARE MILLIGRAMS PER DRY STANDARD CUBIC METER FOR EACH STAGE(MG/DSCM/STAGE)

EXAMPLE CALCULATIONS

MG/DSCM/STAGE(1) = MASS(1) / VMSTD(DSCM)

MG/DSCM/STAGE(1) = 7.30 / .174 = 41.83

CUM. PERCENT OF MASS — THE PERCENTAGE OF THE TOTAL MASS SAMPLED SMALLER IN DIAMETER THAN THE CORRESPONDING D50 INDICATED FOR THAT STAGE

EXAMPLE CALCULATIONS

$$\text{CUM \% (6)} = \frac{\text{MASS(7)} + \text{MASS(8)} + \text{MASS(9)}}{\text{MT (MG)}} * 100 =$$

$$\text{CUM \% (6)} = \frac{.60 + .20 + .70}{10.50 \text{ (MG)}} * 100 = 19.05$$

CUM.(MASS/VOLUME) THE CUMULATIVE MASS LOADING OF PARTICLES SMALLER IN DIAMETER THAN THE CORRESPONDING D50. MASS/VOLUME UNITS ARE MG/ACM, MG/DSCM,GR/ACF,GR/DSCF.

EXAMPLE CALCULATIONS

```
CUM.(MG/ACM) (5) = MASS(6) + MASS(7) + MASS(8) + MASS(9)
                   ------------------------------------
                                IF(ACM)

CUM.(MG/ACM) (5) =      .50 +      .60 +      .20 +      .70
                   ------------------------------------------  =      10.44
                                  .19  (ACM)
```

GEO.MEAN DIA.(MICROMETERS) THE GEOMETRIC MEAN DIAMETER IN MICROMETERS FOR A PARTICULAR STAGE.

EXAMPLE CALCULATION

```
GEO.MEAN DIA.(J) = SQRT( D50(J) * D50(J-1))

GEO.MEAN DIA.(6) = SQRT(     1.41 *      2.86)  =      2.01
```

DM/DLOGD(MG/DSCM) DM IS MG/DSCM/STAGE(J) AND DLOGD IS LOG10(D50(J-1) / D50(J)) WHERE J IS THE CORRESPONDING STAGE NUMBER. FOR STAGE 1 THE MAXIMUM PARTICLE DIAMETER IS USED. FOR STAGE 9 (BACKUP FILTER) THE D50 IS ASSUMED AS .5 * D50 OF STAGE 8.

EXAMPLE CALCULATION

```
DM/DLOGD(J) =   MG/DSCM/STAGE(J)
              --------------------
              LOG( D50(J-1) / D50(J))

DM/DLOGD (3) =            1.72
               ------------------------  =      9.15
               LOG(     11.70 /      7.59 )
```

DN/DLOGD THE NUMBER OF PARTICLES PER UNIT VOLUME FOR A STAGE.

EXAMPLE CALCULATION

```
DN/DLOGD(J) =          DM/DLOGD(J)
              ----------------------------------------
               5.23599E-10 * PD(GM/CC) * GEO.MEAN DIA.(J)

DN/DLOGD (3) =              9.15
               ----------------------------------  =      20863436.00
               5.235999E-10 *      1.00  *      9.43
```

* CALCULATED AT STACK CONDITIONS
** CALCULATED AT STANDARD CONDITIONS
68 DEG.F AND 29.92 INCHES OF HG (760 MMHG)

FIELD DATA

PLANT	AL TECH ALBANY	DATE	04/09/81
SAMPLING LOCATION	SITE NO 1 INLET	RUN NUMBER	A1PM3B
SAMPLE TYPE	PARTICLE SIZE	PROBE LENGTH & TYPE	12 FOOT
OPERATOR	MASON	NOZZLE : I.D.	.135
AMBIENT TEMP.(DEG.F)	56.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.07	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.30	METER BOX NUMBER	FB5
FILTER NUMBER(S)		METER HEAD DIFF.	2.03
STACK INSIDE DIM.(IN)	120.00 .00	PROBE HEATER SETTING	0.
PITOT TUBE COEFF.	.80	HEATER BOX SETTING	0.
THERM. NO.	138		
LEAKAGE	.000 CFM @ 10.0 IN.HG		
METER CALIB. FACTOR	1.056		
READ & RECORD DATA EVERY	5.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	IMPACTOR TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	1445	851.070									
	5.0	1450	852.775	1.200	.44	.44	101.	65.	68.	.0	101.	60.
	10.0	1455	854.425	1.200	.44	.44	106.	65.	68.	.0	106.	60.
	15.0	1300	856.080	1.200	.44	.44	107.	65.	68.	.0	107.	60.
	20.0	1305	857.746	1.200	.44	.44	112.	66.	68.	.0	112.	59.
TOTALS	20.0		6.676									
AVERAGE					.44	.44	107.	65.	68.	.0	107.	60.

PERCENT ISOKINETIC 106.4

PLANT & CITY	AL TECH ALBANY		IMPACTOR FLOWRATE(ACFM)	.387
SAMPLING LOCATION	SITE NO 1 INLET		AT IMPACTOR CONDITIONS	
			IMPACTOR TEMP.	106.5F 41.4C
DATE	04/09/81		PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A1PM38		MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	MASON		GAS COMPOSITION(PERCENT): CO2	.00
STACK TEMP.	106.5F 41.4C		CO	.00
BAR.PRESS.(IN. HG)	30.07		N2	78.67
STACK PRESS.(IN. HG)	29.90		O2	20.08
NOZZLE:I.D.(IN.)	.135		H2O	1.25
METER HEAD DIFF.	.440		SAMPLING DURATION(MIN.)	20.00

CALC. MASS LOADING = 3.9322E-02 GR/ACF 4.2754E-02 GR/DSCF 8.9983E+01 MG/ACM 9.7836E+01 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	12.42	11.49	7.43	4.75	2.74	1.32	.83	.47	
MASS (MILLIGRAMS)	5.80	.10	.40	.30	.80	2.60	2.10	3.10	4.50
MG/DSCM/STAGE	2.87E+01	4.95E-01	1.98E+00	1.48E+00	3.96E+00	1.29E+01	1.04E+01	1.53E+01	2.23E+01
CUM. PERCENT OF MASS SMALLER THAN D50	70.56	70.05	68.02	66.50	62.44	49.24	38.58	22.84	
CUM. (MG/ACM) SMALLER THAN D50	6.35E+01	6.30E+01	6.12E+01	5.98E+01	5.62E+01	4.43E+01	3.47E+01	2.06E+01	
CUM. (MG/DSCM) SMALLER THAN D50	6.90E+01	6.85E+01	6.65E+01	6.51E+01	6.11E+01	4.82E+01	3.77E+01	2.23E+01	
CUM. (GR/ACF) SMALLER THAN D50	2.77E-02	2.75E-02	2.67E-02	2.61E-02	2.46E-02	1.94E-02	1.52E-02	8.98E-03	
CUM. (GR/DSCF) SMALLER THAN D50	3.02E-02	2.99E-02	2.91E-02	2.84E-02	2.67E-02	2.11E-02	1.65E-02	9.77E-03	
GEO. MEAN DIA. (MICROMETERS)	2.49E+01	1.19E+01	9.24E+00	5.94E+00	3.61E+00	1.90E+00	1.05E+00	6.23E-01	3.30E-01
DM/DLOGD (MG/DSCM)	4.75E+01	1.47E+01	1.04E+01	7.66E+00	1.66E+01	4.03E+01	5.23E+01	6.10E+01	7.40E+01
DN/DLOGD (NO. PARTICLES/DSCM)	5.86E+06	1.64E+07	2.53E+07	6.97E+07	6.72E+08	1.12E+10	8.72E+10	4.82E+11	3.94E+12

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

PLANT & CITY	AL TECH ALBANY		IMPACTOR FLOWRATE(ACFM)	.387
SAMPLING LOCATION	SITE NO 1 INLET		AT IMPACTOR CONDITIONS	
			IMPACTOR TEMP.	106.5F 41.4C
DATE	04/09/81		PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A1PM3B		MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	MASON		GAS COMPOSITION(PERCENT): CO2	.00
STACK TEMP.	106.5F 41.4C		CO	.00
BAR.PRESS.(IN. HG)	30.07		N2	78.67
STACK PRESS.(IN. HG)	29.90		O2	20.08
NOZZLE:I.D.(IN.)	.135		H2O	1.25
METER HEAD DIFF.	.440		SAMPLING DURATION(MIN.)	20.00

CALC. MASS LOADING = 3.9322E-02 GR/ACF 4.2754E-02 GR/DSCF 8.9983E+01 MG/ACM 9.7836E+01 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	12.51	11.58	7.51	4.84	2.83	1.40	.92	.55	
MASS (MILLIGRAMS)	5.80	.10	.40	.30	.80	2.60	2.10	3.10	4.50
MG/DSCM/STAGE	2.87E+01	4.95E-01	1.98E+00	1.48E+00	3.96E+00	1.29E+01	1.04E+01	1.53E+01	2.23E+01
CUM. PERCENT OF MASS SMALLER THAN D50	70.56	70.05	68.02	66.50	62.44	49.24	38.58	22.84	
CUM. (MG/ACM) SMALLER THAN D50	6.35E+01	6.30E+01	6.12E+01	5.98E+01	5.62E+01	4.43E+01	3.47E+01	2.06E+01	
CUM. (MG/DSCM) SMALLER THAN D50	6.90E+01	6.85E+01	6.65E+01	6.51E+01	6.11E+01	4.82E+01	3.77E+01	2.23E+01	
CUM. (GR/ACF) SMALLER THAN D50	2.77E+02	2.75E-02	2.67E-02	2.61E-02	2.46E-02	1.94E-02	1.52E-02	8.98E-03	
CUM. (GR/DSCF) SMALLER THAN D50	3.02E-02	2.99E-02	2.91E-02	2.84E-02	2.67E-02	2.11E-02	1.65E-02	9.77E-03	
GEO. MEAN DIA. (MICROMETERS)	2.50E+01	1.20E+01	9.33E+00	6.03E+00	3.70E+00	1.99E+00	1.13E+00	7.08E-01	3.88E-01
DM/DLOGD (MG/DSCM)	4.77E+01	1.48E+01	1.05E+01	7.77E+00	1.70E+01	4.21E+01	5.63E+01	6.90E+01	7.40E+01
DN/DLOGD (NO. PARTICLES/DSCM)	5.83E+06	1.62E+07	2.48E+07	6.77E+07	6.40E+08	1.02E+10	7.42E+10	3.71E+11	2.42E+12

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

IMPACTOR FIELD DATA TABULATION

PLANT-NAME AND ADDRESS	TEST TEAM LEADER
AL TECH ALBANY	MASON

TEST A1PM3B SITE NO 1 INLET

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/09/81	04/09/81
TB	TIME-START	1445	1445
TF	TIME-FINISH	1305	1305
TT	NET TIME OF TEST, MIN.	20.0	20.0
Y	METER CALIBRATION FACTOR	1.056	1.056
DN	SAMPLING NOZZLE DIAMETER	.135 IN	3.4 MM
CP	PITOT TUBE COEFFICIENT	.80	.80
PM	AVERAGE ORIFICE PRESSURE DROP	.44 IN-H2O	11.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	6.676 CU-FT	.189 CU-M
TM	AVERAGE GAS METER TEMP	66.6 F	19.2 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	7.111 SCF	.201 SCM
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	.090 SCF	.000 SCM
BWO	PERCENT MOISTURE BY VOLUME	1.25	1.25
FMD	MOLE FRACTION DRY GAS	.987	.987
PCO2	PERCENT CO2 BY VOL., DRY	.00	.00
PO2	PERCENT O2 BY VOL., DRY	20.33	20.33
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.67	79.67
MD	MOLECULAR WT-DRY STACK GAS	28.81	28.81
MWS	MOLECULAR WT-STACK GAS	28.68	28.68
PB	BAROMETRIC PRESSURE	30.07 IN-HG	763.78 MM-HG
PSI	STATIC PRES OF STACK GAS	-2.30 IN-H2O	-58.42 MM-H2O
PS	STACK PRES, ABS.	29.90 IN-HG	759.48 MM-HG

TS	AVERAGE STACK TEMP	107.	F	41.	C
IF	GAS SAMPLED AT STACK CONDITIONS	7.73	ACF	.22	ACM
AS	STACK AREA	11310.	SQ-IN	7.297	SQ-M
ISO	PERCENT ISOKINETIC	106.4		106.4	
MT	TOTAL MASS OF PARTICLES	.304	GR	19.700	MG
PD	PARTICLE DENSITY	.06	GR/CI	1.00	GM/CC

* 68 DEG F, 29.92 IN.HG.

IMPACTOR RESULTS AND EXAMPLE CALCULATIONS

PLANT NAME AND CITY	TEST TEAM LEADER	RUN NO	SAMPLE LOCATION
AL TECH ALBANY	MASON	A1PM3B	SITE NO 1 INLET
TEST DATE 04/09/81			

CALC. MASS LOADING — TOTAL MASS OF PARTICLES DIVIDED BY A VOLUME. UNITS GIVEN ARE GRAINS PER ACTUAL* CUBIC FOOT(GR/ACF),GRAINS PER DRY STANDARD** CUBIC FOOT(GR/DSCF), MILLIGRAMS PER ACTUAL CUBIC METER(MG/ACM) AND MILLIGRAMS PER DRY STANDARD CUBIC METER(MG/DSCM.)

EXAMPLE CALCULATIONS

CML(GR/ACF) = MT(GR) / IF(ACF)

CML = .304 / 7.731 = .0393 GR/ACF

CML(GR/DSCF) = MT(GR) / VMSTD(DSCF)

CML = .304 / 7.111 = .0428 GR/DSCF

CML(MG/ACM) = MT(MG) / IF(ACM)

CML = 19.700 / .219 = 89.9830 MG/ACM

CML(MG/DSCM) = MT(MG) / VMSTD(DSCM)

CML = 19.700 / .201 = 97.8364 MG/DSCM

D50 (MICROMETERS) — THE SIZE OF THE PARTICLES ON EACH STAGE ASSUMING A 50 PERCENT COLLECTION EFFICIENCY DEFINITION

MASS (MILLIGRAMS) — THE MASS ON EACH STAGE COLLECTED

MG/DSCM/STAGE — THE MASS LOADING FOR EACH STAGE. UNITS GIVEN ARE MILLIGRAMS PER DRY STANDARD CUBIC METER FOR EACH STAGE(MG/DSCM/STAGE)

EXAMPLE CALCULATIONS

MG/DSCM/STAGE(1) = MASS(1) / VMSTD(DSCM)

MG/DSCM/STAGE(1) = 5.80 / .201 = 28.71

CUM. PERCENT OF MASS — THE PERCENTAGE OF THE TOTAL MASS SAMPLED SMALLER IN DIAMETER THAN THE CORRESPONDING D50 INDICATED FOR THAT STAGE

EXAMPLE CALCULATIONS

$$\text{CUM \% (6)} = \frac{\text{MASS(7)} + \text{MASS(8)} + \text{MASS(9)}}{\text{MT (MG)}} * 100 =$$

$$\text{CUM \% (6)} = \frac{2.10 + 3.10 + 4.50}{19.70 \text{ (MG)}} * 100 = 62.44$$

CUM.(MASS/VOLUME) THE CUMULATIVE MASS LOADING OF PARTICLES SMALLER IN DIAMETER THAN THE CORRESPONDING D50. MASS/VOLUME UNITS ARE MG/ACM, MG/DSCM,GR/ACF,GR/DSCF.

EXAMPLE CALCULATIONS

```
CUM.(MG/ACM) (5) = MASS(6) + MASS(7) + MASS(8) + MASS(9)
                   ------------------------------------
                                IF(ACM)

CUM.(MG/ACM) (5) =      2.60 +      2.10 +      3.10 +      4.50
                   ------------------------------------------------  =      56.18
                                      .22  (ACM)
```

GEO.MEAN DIA.(MICROMETERS) THE GEOMETRIC MEAN DIAMETER IN MICROMETERS FOR A PARTICULAR STAGE.

EXAMPLE CALCULATION

```
GEO.MEAN DIA.(J) = SQRT( D50(J) * D50(J-1))

GEO.MEAN DIA.(6) = SQRT(     1.40 *      2.83)  =      1.99
```

DM/DLOGD(MG/DSCM) DM IS MG/DSCM/STAGE(J) AND DLOGD IS LOG10(D50(J-1) / D50(J)) WHERE J IS THE CORRESPONDING STAGE NUMBER. FOR STAGE 1 THE MAXIMUM PARTICLE DIAMETER IS USED. FOR STAGE 9 (BACKUP FILTER) THE D50 IS ASSUMED AS .5 * D50 OF STAGE 8.

EXAMPLE CALCULATION

```
DM/DLOGD(J) =   MG/DSCM/STAGE(J)
              -------------------
              LOG( D50(J-1) / D50(J))

DM/DLOGD (3) =              1.98
              ------------------------  =      10.54
              LOG(     11.58 /      7.51 )
```

DN/DLOGD THE NUMBER OF PARTICLES PER UNIT VOLUME FOR A STAGE.

EXAMPLE CALCULATION

```
DN/DLOGD(J) =            DM/DLOGD(J)
              ------------------------------------------
              5.23599E-10 * PD(GM/CC) * GEO.MEAN DIA.(J)

DN/DLOGD (3) =              10.54
              ------------------------------------------  =      28808880.00
              5.235999E-10 *      1.00  *      9.33
```

* CALCULATED AT STACK CONDITIONS
** CALCULATED AT STANDARD CONDITIONS
68 DEG.F AND 29.92 INCHES OF HG (760 MMHG)

FIELD DATA

PLANT	AL TECH ALBANY	DATE	04/07/81
SAMPLING LOCATION	BAGHOUSE OUTLET	RUN NUMBER	A3PS1A
SAMPLE TYPE	PART SIZE	PROBE LENGTH & TYPE	
OPERATOR	SCHWURER	NOZZLE : I.D.	.500
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	.0
BAR.PRESS.(IN.HG)	30.50	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	.00	METER BOX NUMBER	FB8
FILTER NUMBER(S)	ANDERSON	METER HEAD DIFF.	1.91
STACK INSIDE DIM.(IN)	418.94 418.94		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	0.
THERM. NO.	129	HEATER BOX SETTING	0.
LEAKAGE	.000 CFM @ .0 IN.HG		
METER CALIB. FACTOR	.982		

READ & RECORD DATA EVERY 15.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	IMPACTOR TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	1029	420.360									
2-01	15.0	1044	429.400	.020	1.30	1.30	101.	62.	62.	1.5	101.	58.
2-01	30.0	1059	438.700	.020	1.30	1.30	103.	65.	62.	1.5	103.	50.
2-01	45.0	1114	448.000	.020	1.30	1.30	113.	70.	62.	1.5	113.	50.
2-01	60.0	1129	457.200	.020	1.30	1.30	107.	72.	64.	1.5	107.	54.
2-01	75.0	1144	466.590	.020	1.30	1.30	101.	73.	66.	1.5	101.	56.
1-01	90.0	1222	476.000	.020	1.30	1.30	101.	68.	66.	1.5	101.	55.
1-01	105.0	1237	485.500	.020	1.30	1.30	103.	70.	66.	1.5	103.	56.
1-01	120.0	1252	494.600	.020	1.30	1.30	107.	70.	66.	1.5	107.	54.
1-01	135.0	1307	504.000	.020	1.30	1.30	107.	71.	66.	1.5	107.	54.
1-01	150.0	1322	513.415	.020	1.30	1.30	111.	71.	66.	1.5	111.	52.
4-01	165.0	1359	523.000	.020	1.30	1.30	117.	69.	66.	1.0	117.	52.
4-01	180.0	1414	532.200	.020	1.30	1.30	127.	71.	68.	1.0	127.	53.
4-01	195.0	1429	541.600	.020	1.30	1.30	125.	73.	68.	1.0	125.	50.
4-01	220.0	1444	551.000	.020	1.30	1.30	131.	76.	70.	1.0	131.	48.
4-01	225.0	1459	560.900	.020	1.30	1.30	119.	80.	72.	1.0	119.	46.
3-04	240.0	1549	570.200	.020	1.30	1.30	113.	74.	74.	1.0	113.	48.
3-04	255.0	1604	579.700	.020	1.30	1.30	109.	75.	72.	1.0	109.	48.
3-04	270.0	1619	589.200	.020	1.30	1.30	103.	78.	72.	1.0	103.	48.
3-04	285.0	1634	598.800	.020	1.30	1.30	113.	80.	74.	1.0	113.	50.
3-04	300.0	1649	608.380	.020	1.30	1.30	119.	80.	74.	1.0	119.	50.
TOTALS	300.0		188.020									
AVERAGE					1.30	1.30	112.	72.	68.	1.3	112.	52.

PERCENT ISOKINETIC 99.7

PLANT & CITY	AL TECH ALBANY	IMPACTOR FLOWRATE(ACFM) AT IMPACTOR CONDITIONS	.668
SAMPLING LOCATION	BAGHOUSE OUTLET	IMPACTOR TEMP.	111.5F 44.2C
DATE	04/07/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A3PS1@	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	SCHWORER	GAS COMPOSITION(PERCENT): CO2	.20
STACK TEMP.	111.5F 44.2C	CO	.00
BAR.PRESS.(IN. HG)	30.50	N2	78.88
STACK PRESS.(IN. HG)	30.50	O2	20.52
NOZZLE:I.D.(IN.)	.500	H2O	.41
METER HEAD DIFF.	1.300	SAMPLING DURATION(MIN.)	300.00

CALC. MASS LOADING = 8.6205E-04 GR/ACF 9.1918E-04 GR/DSCF 1.9727E+00 MG/ACM 2.1034E+00 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	9.48	8.77	5.66	3.62	2.08	.98	.62	.33	
MASS (MILLIGRAMS)	3.80	1.30	1.10	.50	.80	1.20	1.20	.40	.90
MG/DSCM/STAGE	7.11E-01	2.43E-01	2.06E-01	9.36E-02	1.50E-01	2.25E-01	2.25E-01	7.49E-02	1.68E-01
CUM. PERCENT OF MASS SMALLER THAN D50	66.07	54.46	44.64	40.18	33.04	22.32	11.61	8.04	
CUM. (MG/ACM) SMALLER THAN D50	1.30E+00	1.07E+00	8.81E-01	7.93E-01	6.52E-01	4.40E-01	2.29E-01	1.59E-01	
CUM. (MG/DSCM) SMALLER THAN D50	1.39E+00	1.15E+00	9.39E-01	8.45E-01	6.95E-01	4.70E-01	2.44E-01	1.69E-01	
CUM. (GR/ACF) SMALLER THAN D50	5.70E-04	4.70E-04	3.85E-04	3.46E-04	2.85E-04	1.92E-04	1.00E-04	6.93E-05	
CUM. (GR/DSCF) SMALLER THAN D50	6.07E-04	5.01E-04	4.10E-04	3.69E-04	3.04E-04	2.05E-04	1.07E-04	7.39E-05	
GEO. MEAN DIA. (MICROMETERS)	2.18E+01	9.11E+00	7.04E+00	4.52E+00	2.74E+00	1.43E+00	7.79E-01	4.53E-01	2.35E-01
DM/DLOGD (MG/DSCM)	9.85E-01	7.20E+00	1.08E+00	4.81E-01	6.22E-01	6.93E-01	1.10E+00	2.80E-01	5.60E-01
DN/DLOGD (NO. PARTICLES/DSCM)	1.82E+05	1.82E+07	5.92E+06	9.92E+06	5.78E+07	4.52E+08	4.45E+09	5.77E+09	8.21E+10

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

PLANT & CITY	AL TECH ALBANY	IMPACTOR FLOWRATE(ACFM) AT IMPACTOR CONDITIONS	.668
SAMPLING LOCATION	BAGHOUSE OUTLET	IMPACTOR TEMP.	111.5F 44.2C
DATE	04/07/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A3PS1A	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	SCHWORER	GAS COMPOSITION(PERCENT): CO2	.20
STACK TEMP.	111.5F 44.2C	CO	.00
BAR.PRESS.(IN. HG)	30.50	N2	78.88
STACK PRESS.(IN. HG)	30.50	O2	20.52
NOZZLE:I.D.(IN.)	.500	H2O	.41
METER HEAD DIFF.	1.300	SAMPLING DURATION(MIN.)	300.00

CALC. MASS LOADING = 8.6205E-04 GR/ACF 9.1918E-04 GR/DSCF 1.9727E+00 MG/ACM 2.1034E+00 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	9.56	8.85	5.74	3.70	2.16	1.07	.70	.42	
MASS (MILLIGRAMS)	3.80	1.30	1.10	.50	.80	1.20	1.20	.40	.90
MG/DSCM/STAGE	7.11E-01	2.43E-01	2.06E-01	9.36E-02	1.50E-01	2.25E-01	2.25E-01	7.49E-02	1.68E-01
CUM. PERCENT OF MASS SMALLER THAN D50	66.07	54.46	44.64	40.18	33.04	22.32	11.61	8.04	
CUM. (MG/ACM) SMALLER THAN D50	1.30E+00	1.07E+00	8.81E-01	7.93E-01	6.52E-01	4.40E-01	2.29E-01	1.59E-01	
CUM. (MG/DSCM) SMALLER THAN D50	1.39E+00	1.15E+00	9.39E-01	8.45E-01	6.95E-01	4.70E-01	2.44E-01	1.69E-01	
CUM. (GR/ACF) SMALLER THAN D50	5.70E-04	4.70E-04	3.85E-04	3.46E-04	2.85E-04	1.92E-04	1.00E-04	6.93E-05	
CUM. (GR/DSCF) SMALLER THAN D50	6.07E-04	5.01E-04	4.10E-04	3.69E-04	3.04E-04	2.05E-04	1.07E-04	7.39E-05	
GEO. MEAN DIA. (MICROMETERS)	2.19E+01	9.20E+00	7.13E+00	4.61E+00	2.83E+00	1.52E+00	8.63E-01	5.38E-01	2.93E-01
DM/DLOGD (MG/DSCM)	9.90E-01	7.27E+00	1.10E+00	4.90E-01	6.41E-01	7.34E-01	1.21E+00	3.32E-01	5.60E-01
DN/DLOGD (NO. PARTICLES/DSCM)	1.81E+05	1.78E+07	5.77E+06	9.55E+06	5.42E+07	3.99E+08	3.61E+09	4.07E+09	4.23E+10

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

IMPACTOR FIELD DATA TABULATION

PLANT-NAME AND ADDRESS: AL TECH ALBANY

TEST TEAM LEADER: SCHNOREN

TEST A3PS1A BAGHOUSE OUTLET

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/07/81	04/07/81
TB	TIME-START	1029	1029
TF	TIME-FINISH	1649	1649
TT	NET TIME OF TEST, MIN.	300.0	300.0
Y	METER CALIBRATION FACTOR	.982	.982
DN	SAMPLING NOZZLE DIAMETER	.500 IN	12.7 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.30 IN-H2O	33.0 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	188.020 CU-FT	5.324 CU-M
TM	AVERAGE GAS METER TEMP	70.1 F	21.2 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	188.056 SCF	5.325 SCM
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	.774 SCF	.000 SCM
BWO	PERCENT MOISTURE BY VOLUME	.41	.41
FMD	MOLE FRACTION DRY GAS	.996	.996
PCO2	PERCENT CO2 BY VOL., DRY	.20	.20
PO2	PERCENT O2 BY VOL., DRY	20.60	20.60
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.20	79.20
MD	MOLECULAR WT-DRY STACK GAS	28.86	28.86
MWS	MOLECULAR WT-STACK GAS	28.81	28.81
PB	BAROMETRIC PRESSURE	30.50 IN-HG	774.70 MM-HG
PSI	STATIC PRES OF STACK GAS	.00 IN-H2O	.00 MM-H2O
PS	STACK PRES, ABS.	30.50 IN-HG	774.70 MM-HG

TS	AVERAGE STACK TEMP	112.	F	44.	C
IF	GAS SAMPLED AT STACK CONDITIONS	200.50	ACF	5.68	ACM
AS	STACK AREA	######	SQ-IN	113.232	SQ-M
ISO	PERCENT ISOKINETIC	99.7		99.7	
MT	TOTAL MASS OF PARTICLES	.173	GR	11.200	MG
PD	PARTICLE DENSITY	.06	GR/CI	1.00	GM/CC

* 68 DEG F, 29.92 IN.HG.

IMPACTOR RESULTS AND EXAMPLE CALCULATIONS

PLANT-NAME AND CITY	TEST TEAM LEADER	RUN NO	SAMPLE LOCATION
AL TECH ALBANY	SCHWORER	A3PS1A	BAGHOUSE OUTLET
TEST DATE 04/07/81			

CALC. MASS LOADING — TOTAL MASS OF PARTICLES DIVIDED BY A VOLUME. UNITS GIVEN ARE GRAINS PER ACTUAL* CUBIC FOOT(GR/ACF),GRAINS PER DRY STANDARD** CUBIC FOOT(GR/DSCF), MILLIGRAMS PER ACTUAL CUBIC METER(MG/ACM) AND MILLIGRAMS PER DRY STANDARD CUBIC METER(MG/DSCM.)

EXAMPLE CALCULATIONS

```
CML(GR/ACF) = MT(GR) / IF(ACF)

        CML =          .173 /    200.501 =       .0009  GR/ACF

CML(GR/DSCF) = MT(GR) / VMSTD(DSCF)

        CML =          .173 /    188.056 =       .0009  GR/DSCF

CML(MG/ACM) = MT(MG) / IF(ACM)

        CML =        11.200 /      5.678 =      1.9727  MG/ACM

CML(MG/DSCM) = MT(MG) / VMSTD(DSCM)

        CML =        11.200 /      5.325 =      2.1034  MG/DSCM
```

D50 (MICROMETERS) — THE SIZE OF THE PARTICLES ON EACH STAGE ASSUMING A 50 PERCENT COLLECTION EFFICIENCY DEFINITION

MASS (MILLIGRAMS) — THE MASS ON EACH STAGE COLLECTED

MG/DSCM/STAGE — THE MASS LOADING FOR EACH STAGE. UNITS GIVEN ARE MILLIGRAMS PER DRY STANDARD CUBIC METER FOR EACH STAGE(MG/DSCM/STAGE)

EXAMPLE CALCULATIONS

```
MG/DSCM/STAGE(1) =   MASS(1) / VMSTD(DSCM)

MG/DSCM/STAGE(1) =      3.80 /      5.325 =        .71
```

CUM. PERCENT OF MASS — THE PERCENTAGE OF THE TOTAL MASS SAMPLED SMALLER IN DIAMETER THAN THE CORRESPONDING D50 INDICATED FOR THAT STAGE

EXAMPLE CALCULATIONS

```
CUM % (6) = MASS(7) + MASS(8) + MASS(9)
            ---------------------------  * 100  =
                      MT (MG)

CUM % (6) =      1.20 +       .40 +       .90
            ------------------------------- * 100  =  33.04
                        11.20  (MG)
```

```
CUM.(MASS/VOLUME)              THE CUMULATIVE MASS LOADING OF PARTICLES SMALLER IN DIAMETER
                               THAN THE CORRESPONDING D50. MASS/VOLUME UNITS ARE MG/ACM,
                               MG/DSCM,GR/ACF,GR/DSCF.

     EXAMPLE CALCULATIONS

          CUM.(MG/ACM) (5) = MASS(6) + MASS(7) + MASS(8) + MASS(9)
                             ------------------------------------
                                          IF(ACM)

          CUM.(MG/ACM) (5) =      1.20 +      1.20 +       .40 +       .90
                             ------------------------------------------------   =        .65
                                          5.68  (ACM)


GEO.MEAN DIA.(MICROMETERS)     THE GEOMETRIC MEAN DIAMETER IN MICROMETERS
                               FOR A PARTICULAR STAGE.

     EXAMPLE CALCULATION

          GEO.MEAN DIA.(J) = SQRT( D50(J) * D50(J-1))

          GEO.MEAN DIA.(6) = SQRT(     1.07 *      2.16)  =      1.52

DM/DLOGD(MG/DSCM)              DM IS MG/DSCM/STAGE(J) AND DLOGD IS LOG10(D50(J-1) /
                               D50(J)) WHERE J IS THE CORRESPONDING STAGE NUMBER.
                               FOR STAGE 1 THE MAXIMUM PARTICLE DIAMETER IS USED.
                               FOR STAGE 9 (BACKUP FILTER) THE D50 IS ASSUMED AS
                               .5 * D50 OF STAGE 8.

     EXAMPLE CALCULATION

          DM/DLOGD(J) =   MG/DSCM/STAGE(J)
                        --------------------
                        LOG( D50(J-1) / D50(J))

          DM/DLOGD (3) =              .21
                        -------------------------   =       1.10
                        LOG(      8.85 /      5.74 )


DN/DLOGD                       THE NUMBER OF PARTICLES PER UNIT VOLUME FOR A STAGE.

     EXAMPLE CALCULATION

          DN/DLOGD(J) =            DM/DLOGD(J)
                        ------------------------------------------
                        5.23599E-10 * PD(GM/CC) * GEO.MEAN DIA.(J)

          DN/DLOGD (3) =                1.10
                        ---------------------------------   =        5773360.00
                        5.235999E-10 *      1.00  *       7.13

*   CALCULATED AT STACK CONDITIONS
**  CALCULATED AT STANDARD CONDITIONS
68 DEG.F AND 29.92 INCHES OF HG (760 MMHG)
```

FIELD DATA

PLANT	AL TECH STEEL	DATE	04/08/81
SAMPLING LOCATION	BAGHOUSE OUTLET	RUN NUMBER	A3P82A
SAMPLE TYPE	PART SIZE	PROBE LENGTH & TYPE	
OPERATOR	SCHWORER	NOZZLE : I.D.	.500
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.38	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	.00	METER BOX NUMBER	FB8
FILTER NUMBER(S)	ANDERSON	METER HEAD DIFF.	1.91
STACK INSIDE DIM.(IN)	418.94 418.94		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	0.
THERM. NO.	129	HEATER BOX SETTING	0.
LEAKAGE	.000 CFM @ .0 IN.HG		
METER CALIB. FACTOR	.982		
READ & RECORD DATA EVERY 15.0 MINUTES			

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	OUTLET	PUMP VACUUM (IN.HG)	IMPACTOR TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	935	634.230									
4-02	15.0	950	643.500	.020	1.30	1.30	111.	64.	64.	.5	111.	50.
4-02	30.0	1005	652.800	.020	1.30	1.30	117.	68.	64.	.5	117.	52.
4-02	45.0	1020	662.200	.020	1.30	1.30	117.	72.	66.	.5	117.	52.
4-02	60.0	1035	672.400	.020	1.30	1.30	123.	78.	69.	.5	123.	54.
4-02	75.0	1050	681.315	.020	1.30	1.30	127.	80.	70.	.5	127.	52.
3-01	90.0	1125	690.800	.020	1.30	1.30	119.	76.	72.	.5	119.	55.
3-01	105.0	1140	700.300	.020	1.30	1.30	111.	78.	73.	.5	111.	56.
3-01	120.0	1155	709.700	.020	1.30	1.30	133.	80.	74.	.5	133.	54.
3-01	135.0	1210	719.700	.020	1.30	1.30	127.	80.	75.	.5	127.	55.
3-01	150.0	1225	728.850	.020	1.30	1.30	117.	81.	76.	.5	117.	56.
6-04	165.0	1305	738.000	.020	1.30	1.30	113.	78.	76.	.5	113.	55.
6-04	180.0	1320	747.700	.020	1.30	1.30	119.	80.	76.	.5	119.	58.
6-04	195.0	1335	754.000	.020	1.30	1.30	127.	82.	79.	.5	127.	60.
6-04	210.0	1350	766.400	.020	1.30	1.30	121.	86.	80.	.5	121.	61.
6-04	225.0	1405	776.280	.020	1.30	1.30	117.	86.	84.	.5	117.	60.
5-	240.0	1440	785.600	.020	1.30	1.30	101.	81.	80.	.5	101.	60.
5-	255.0	1455	795.000	.020	1.30	1.30	119.	83.	80.	.5	119.	60.
5-	270.0	1516	804.000	.020	1.30	1.30	123.	84.	80.	.5	123.	62.
5-	285.0	1521	814.000	.020	1.30	1.30	135.	82.	80.	.5	135.	62.
5-	300.0	1546	823.660	.020	1.30	1.30	125.	83.	80.	.5	125.	60.
TOTALS	300.0		189.430									
AVERAGE					1.30	1.30	120.	79.	75.	.5	120.	57.

PERCENT ISOKINETIC 100.0

PLANT & CITY	AL TECH STEEL	IMPACTOR FLOWRATE(ACFM)	.677
SAMPLING LOCATION	BAGHOUSE OUTLET	AT IMPACTOR CONDITIONS IMPACTOR TEMP.	120.1F 48.9C
DATE	04/08/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A3PS2A	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	SCHWORER	GAS COMPOSITION(PERCENT): CO2	.20
STACK TEMP.	120.1F 48.9C	CO	.00
BAR.PRESS.(IN. HG)	30.38	N2	78.66
STACK PRESS.(IN. HG)	30.38	O2	20.46
NOZZLE:I.D.(IN.)	.500	H2O	.68
METER HEAD DIFF.	1.300	SAMPLING DURATION(MIN.)	300.00

CALC. MASS LOADING = 1.0113E-03 GR/ACF 1.1018E-03 GR/DSCF 2.3141E+00 MG/ACM 2.5214E+00 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	9.46	8.75	5.65	3.61	2.07	.98	.61	.33	
MASS (MILLIGRAMS)	3.50	1.60	1.40	1.20	1.40	1.40	1.70	.60	.50
MG/DSCM/STAGE	6.61E-01	3.02E-01	2.65E-01	2.27E-01	2.65E-01	2.65E-01	3.21E-01	1.13E-01	9.45E-02
CUM. PERCENT OF MASS SMALLER THAN D50	73.68	61.65	51.13	42.11	31.58	21.05	8.27	3.76	
CUM. (MG/ACM) SMALLER THAN D50	1.71E+00	1.43E+00	1.18E+00	9.74E-01	7.31E-01	4.87E-01	1.91E-01	8.70E-02	
CUM. (MG/DSCM) SMALLER THAN D50	1.86E+00	1.55E+00	1.29E+00	1.06E+00	7.96E-01	5.31E-01	2.09E-01	9.48E-02	
CUM. (GR/ACF) SMALLER THAN D50	7.45E-04	6.23E-04	5.17E-04	4.26E-04	3.19E-04	2.13E-04	8.36E-05	3.80E-05	
CUM. (GR/DSCF) SMALLER THAN D50	8.12E-04	6.79E-04	5.63E-04	4.64E-04	3.48E-04	2.32E-04	9.11E-05	4.14E-05	
GEO. MEAN DIA. (MICROMETERS)	2.17E+01	9.10E+00	7.03E+00	4.51E+00	2.73E+00	1.43E+00	7.76E-01	4.50E-01	2.34E-01
DM/DLOGD (MG/DSCM)	9.15E-01	8.95E+00	1.39E+00	1.16E+00	1.10E+00	8.15E-01	1.57E+00	4.22E-01	3.14E-01
DN/DLOGD (NO. PARTICLES/DSCM)	1.70E+05	2.27E+07	7.64E+06	2.42E+07	1.03E+08	5.36E+08	6.42E+09	8.85E+09	4.70E+10

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

PLANT & CITY	AL TECH STEEL	IMPACTOR FLOWRATE(ACFM)	.677
SAMPLING LOCATION	BAGHOUSE OUTLET	AT IMPACTOR CONDITIONS IMPACTOR TEMP.	120.1F 48.9C
DATE	04/08/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A3PS2A	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	SCHWORER	GAS COMPOSITION(PERCENT): CO2	.20
STACK TEMP.	120.1F 48.9C	CO	.00
BAR.PRESS.(IN. HG)	30.38	N2	78.66
STACK PRESS.(IN. HG)	30.38	O2	20.46
NOZZLE:I.D.(IN.)	.500	H2O	.68
METER HEAD DIFF.	1.300	SAMPLING DURATION(MIN.)	300.00

CALC. MASS LOADING = 1.0113E-03 GR/ACF 1.1018E-03 GR/DSCF 2.3141E+00 MG/ACM 2.5214E+00 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	9.55	8.84	5.74	3.69	2.16	1.07	.70	.41	
MASS (MILLIGRAMS)	3.50	1.60	1.40	1.20	1.40	1.40	1.70	.60	.50
MG/DSCM/STAGE	6.61E-01	3.02E-01	2.65E-01	2.27E-01	2.65E-01	2.65E-01	3.21E-01	1.13E-01	9.45E-02
CUM. PERCENT OF MASS SMALLER THAN D50	73.68	61.65	51.13	42.11	31.58	21.05	8.27	3.76	
CUM. (MG/ACM) SMALLER THAN D50	1.71E+00	1.43E+00	1.18E+00	9.74E-01	7.31E-01	4.87E-01	1.91E-01	8.70E-02	
CUM. (MG/DSCM) SMALLER THAN D50	1.86E+00	1.55E+00	1.29E+00	1.06E+00	7.96E-01	5.31E-01	2.09E-01	9.48E-02	
CUM. (GR/ACF) SMALLER THAN D50	7.45E-04	6.23E-04	5.17E-04	4.26E-04	3.19E-04	2.13E-04	8.36E-05	3.80E-05	
CUM. (GR/DSCF) SMALLER THAN D50	8.12E-04	6.79E-04	5.63E-04	4.64E-04	3.48E-04	2.32E-04	9.11E-05	4.14E-05	
GEO. MEAN DIA. (MICROMETERS)	2.18E+01	9.19E+00	7.12E+00	4.60E+00	2.82E+00	1.52E+00	8.62E-01	5.37E-01	2.93E-01
DM/DLOGD (MG/DSCM)	9.20E-01	9.03E+00	1.41E+00	1.19E+00	1.13E+00	8.64E-01	1.74E+00	5.03E-01	3.14E-01
DN/DLOGD (NO. PARTICLES/DSCM)	1.68E+05	2.22E+07	7.45E+06	2.32E+07	9.61E+07	4.72E+08	5.18E+09	6.19E+09	2.38E+10

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

IMPACTOR FIELD DATA TABULATION

PLANT-NAME AND ADDRESS	TEST TEAM LEADER
AL TECH STEEL	SCHWORER

TEST A3PS2A BAGHOUSE OUTLET

		ENGLISH UNITS		METRIC UNITS	
TEST DATE		04/08/81		04/08/81	
TB	TIME-START	935		935	
TF	TIME-FINISH	1546		1546	
TT	NET TIME OF TEST, MIN.	300.0		300.0	
Y	METER CALIBRATION FACTOR	.982		.982	
DN	SAMPLING NOZZLE DIAMETER	.500	IN	12.7	MM
CP	PITOT TUBE COEFFICIENT	.84		.84	
PM	AVERAGE ORIFICE PRESSURE DROP	1.30	IN-H2O	33.0	MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	189.430	CU-FT	5.364	CU-M
TM	AVERAGE GAS METER TEMP	77.0	F	25.0	C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	186.298	SCF	5.275	SCM
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	1.276	SCF	.000	SCM
BWO	PERCENT MOISTURE BY VOLUME	.68		.68	
FMD	MOLE FRACTION DRY GAS	.993		.993	
PCO2	PERCENT CO2 BY VOL., DRY	.20		.20	
PO2	PERCENT O2 BY VOL., DRY	20.60		20.60	
PCO	PERCENT CO BY VOL., DRY	.00		.00	
PN2	PERCENT N2 BY VOL., DRY	79.20		79.20	
MD	MOLECULAR WT-DRY STACK GAS	28.86		28.86	
MWS	MOLECULAR WT-STACK GAS	28.78		28.78	
PB	BAROMETRIC PRESSURE	30.38	IN-HG	771.65	MM-HG
PSI	STATIC PRES OF STACK GAS	.00	IN-H2O	.00	MM-H2O
PS	STACK PRES, ABS.	30.38	IN-HG	771.65	MM-HG

TS	AVERAGE STACK TEMP	120.	F	49.	C
IF	GAS SAMPLED AT STACK CONDITIONS	202.96	ACF	5.75	ACM
AS	STACK AREA	######	SQ-IN	113.232	SQ-M
ISO	PERCENT ISOKINETIC	100.0		100.0	
MT	TOTAL MASS OF PARTICLES	.205	GR	13.300	MG
PD	PARTICLE DENSITY	.06	GR/CI	1.00	GM/CC

* 68 DEG F, 29.92 IN.HG.

IMPACTOR RESULTS AND EXAMPLE CALCULATIONS

PLANT-NAME AND CITY	TEST TEAM LEADER	RUN NO	SAMPLE LOCATION
AL TECH STEEL	SCHWORER	A3PS2A	BAGHOUSE OUTLET
TEST DATE 04/08/81			

CALC. MASS LOADING — TOTAL MASS OF PARTICLES DIVIDED BY A VOLUME. UNITS GIVEN ARE GRAINS PER ACTUAL* CUBIC FOOT(GR/ACF),GRAINS PER DRY STANDARD** CUBIC FOOT(GR/DSCF), MILLIGRAMS PER ACTUAL CUBIC METER(MG/ACM) AND MILLIGRAMS PER DRY STANDARD CUBIC METER(MG/DSCM.)

EXAMPLE CALCULATIONS

CML(GR/ACF) = MT(GR) / IF(ACF)

CML = .205 / 202.962 = .0010 GR/ACF

CML(GR/DSCF) = MT(GR) / VMSTD(DSCF)

CML = .205 / 186.298 = .0011 GR/DSCF

CML(MG/ACM) = MT(MG) / IF(ACM)

CML = 13.300 / 5.747 = 2.3141 MG/ACM

CML(MG/DSCM) = MT(MG) / VMSTD(DSCM)

CML = 13.300 / 5.275 = 2.5214 MG/DSCM

D50 (MICROMETERS) — THE SIZE OF THE PARTICLES ON EACH STAGE ASSUMING A 50 PERCENT COLLECTION EFFICIENCY DEFINITION

MASS (MILLIGRAMS) — THE MASS ON EACH STAGE COLLECTED

MG/DSCM/STAGE — THE MASS LOADING FOR EACH STAGE. UNITS GIVEN ARE MILLIGRAMS PER DRY STANDARD CUBIC METER FOR EACH STAGE(MG/DSCM/STAGE)

EXAMPLE CALCULATIONS

MG/DSCM/STAGE(1) = MASS(1) / VMSTD(DSCM)

MG/DSCM/STAGE(1) = 3.50 / 5.275 = .66

CUM. PERCENT OF MASS — THE PERCENTAGE OF THE TOTAL MASS SAMPLED SMALLER IN DIAMETER THAN THE CORRESPONDING D50 INDICATED FOR THAT STAGE

EXAMPLE CALCULATIONS

$$\text{CUM \% (6)} = \frac{\text{MASS(7)} + \text{MASS(8)} + \text{MASS(9)}}{\text{MT (MG)}} * 100 =$$

$$\text{CUM \% (6)} = \frac{1.70 + .60 + .50}{13.30 \text{ (MG)}} * 100 = 31.58$$

CUM.(MASS/VOLUME) THE CUMULATIVE MASS LOADING OF PARTICLES SMALLER IN DIAMETER THAN THE CORRESPONDING D50. MASS/VOLUME UNITS ARE MG/ACM, MG/DSCM,GR/ACF,GR/DSCF.

EXAMPLE CALCULATIONS

```
CUM.(MG/ACM) (5) = MASS(6) + MASS(7) + MASS(8) + MASS(9)
                   ------------------------------------
                                IF(ACM)

CUM.(MG/ACM) (5) =      1.40 +      1.70 +       .60 +       .50
                   ------------------------------------------------  =       .73
                                   5.75  (ACM)
```

GEO.MEAN DIA.(MICROMETERS) THE GEOMETRIC MEAN DIAMETER IN MICROMETERS FOR A PARTICULAR STAGE.

EXAMPLE CALCULATION

```
GEO.MEAN DIA.(J) = SQRT( D50(J) * D50(J-1))

GEO.MEAN DIA.(6) = SQRT(     1.07 *      2.16)  =      1.52
```

DM/DLOGD(MG/DSCM) DM IS MG/DSCM/STAGE(J) AND DLOGD IS LOG10(D50(J-1) / D50(J)) WHERE J IS THE CORRESPONDING STAGE NUMBER. FOR STAGE 1 THE MAXIMUM PARTICLE DIAMETER IS USED. FOR STAGE 9 (BACKUP FILTER) THE D50 IS ASSUMED AS .5 * D50 OF STAGE 8.

EXAMPLE CALCULATION

```
DM/DLOGD(J) =  MG/DSCM/STAGE(J)
               --------------------
               LOG( D50(J-1) / D50(J))

DM/DLOGD (3) =              .26
               -------------------------  =      1.41
               LOG(      8.84 /      5.74 )
```

DN/DLOGD THE NUMBER OF PARTICLES PER UNIT VOLUME FOR A STAGE.

EXAMPLE CALCULATION

```
DN/DLOGD(J) =          DM/DLOGD(J)
               ------------------------------------------
               5.23599E-10 * PD(GM/CC) * GEO.MEAN DIA.(J)

DN/DLOGD (3) =              1.41
               ---------------------------------  =      7448505.00
               5.235999E-10 *      1.00  *      7.12
```

* CALCULATED AT STACK CONDITIONS
** CALCULATED AT STANDARD CONDITIONS
68 DEG.F AND 29.92 INCHES OF HG (760 MMHG)

FIELD DATA

PLANT	AL TECH STEEL	DATE	04/09/81
SAMPLING LOCATION	BAGHOUSE OUTLET	RUN NUMBER	A3PS3A
SAMPLE TYPE	PART SIZE	PROBE LENGTH & TYPE	
OPERATOR	SCHWORER	NOZZLE : I.D.	.500
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.06	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	.00	METER BOX NUMBER	F88
FILTER NUMBER(S)	ANDERSON	METER HEAD DIFF.	1.91
STACK INSIDE DIM.(IN)	418.94 418.94		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	0.
THERM. NO.	126	HEATER BOX SETTING	0.
LEAKAGE	.000 CFM @ 10.0 IN.HG		
METER CALIB. FACTOR	.982		

READ & RECORD DATA EVERY 15.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	OUTLET	PUMP VACUUM (IN.HG)	IMPACTOR TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	930	823.850									
6-03	15.0	945	833.200	.020	1.30	1.30	107.	63.	62.	.5	107.	60.
6-03	30.0	1000	842.200	.020	1.30	1.30	111.	70.	64.	.5	111.	55.
6-03	45.0	1015	852.000	.020	1.30	1.30	107.	76.	67.	.5	107.	56.
6-03	60.0	1030	861.600	.020	1.30	1.30	107.	80.	70.	.5	107.	56.
6-03	75.0	1045	871.352	.020	1.30	1.30	107.	80.	71.	.5	107.	56.
5-01	90.0	1120	881.000	.020	1.30	1.30	105.	75.	74.	.5	105.	58.
5-01	105.0	1135	891.500	.020	1.30	1.30	111.	75.	72.	.5	111.	56.
5-01	120.0	1150	900.300	.020	1.30	1.30	113.	79.	73.	.5	113.	56.
5-01	135.0	1205	910.000	.020	1.30	1.30	115.	80.	73.	.5	115.	58.
5-01	150.0	1220	919.815	.020	1.30	1.30	111.	80.	75.	.5	111.	50.
8-04	165.0	1300	929.300	.020	1.30	1.30	105.	74.	73.	.5	105.	52.
8-04	180.0	1315	938.850	.020	1.30	1.30	115.	75.	73.	.5	115.	50.
8-04	195.0	1330	948.700	.020	1.30	1.30	117.	76.	72.	.5	117.	48.
8-04	210.0	1345	958.300	.020	1.30	1.30	109.	76.	72.	.5	109.	50.
8-04	225.0	1400	967.925	.020	1.30	1.30	115.	76.	71.	.5	115.	52.
7-04	240.0	1445	977.400	.020	1.30	1.30	105.	70.	69.	.5	105.	54.
7-04	255.0	1500	986.900	.020	1.30	1.30	107.	71.	68.	.5	107.	56.
7-04	270.0	1515	996.500	.020	1.30	1.30	105.	72.	68.	.5	105.	56.
7-04	285.0	1530	6.500	.020	1.30	1.30	105.	73.	68.	.5	105.	56.
7-04	300.0	1545	15.702	.020	1.30	1.30	111.	74.	68.	.5	111.	56.
TOTALS	300.0		191.852									
AVERAGE					1.30	1.30	109.	75.	70.	.5	109.	55.

PERCENT ISOKINETIC 101.1

PLANT & CITY	AL TECH STEEL	IMPACTOR FLOWRATE(ACFM)	.682
		AT IMPACTOR CONDITIONS	
SAMPLING LOCATION	BAGHOUSE OUTLET	IMPACTOR TEMP.	109.4F 43.0C
DATE	04/09/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A3PS3A	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	SCHWORER	GAS COMPOSITION(PERCENT): CO2	.20
STACK TEMP.	109.4F 43.0C	CO	.00
BAR.PRESS.(IN. HG)	30.06	N2	78.27
STACK PRESS.(IN. HG)	30.06	O2	20.36
NOZZLE:I.D.(IN.)	.500	H2O	1.17
METER HEAD DIFF.	1.300	SAMPLING DURATION(MIN.)	300.00

CALC. MASS LOADING = 1.1846E-03 GR/ACF 1.2867E-03 GR/DSCF 2.7109E+00 MG/ACM 2.9445E+00 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	9.35	8.65	5.58	3.57	2.05	.97	.61	.33	
MASS (MILLIGRAMS)	4.40	1.40	1.50	1.40	1.70	2.00	1.60	.80	.90
MG/DSCM/STAGE	8.22E-01	2.62E-01	2.80E-01	2.62E-01	3.18E-01	3.74E-01	2.99E-01	1.50E-01	1.68E-01
CUM. PERCENT OF MASS SMALLER THAN D50	71.97	63.06	53.50	44.59	33.76	21.02	10.83	5.73	
CUM. (MG/ACM) SMALLER THAN D50	1.95E+00	1.71E+00	1.45E+00	1.21E+00	9.15E-01	5.70E-01	2.94E-01	1.55E-01	
CUM. (MG/DSCM) SMALLER THAN D50	2.12E+00	1.86E+00	1.58E+00	1.31E+00	9.94E-01	6.19E-01	3.19E-01	1.69E-01	
CUM. (GR/ACF) SMALLER THAN D50	8.53E-04	7.47E-04	6.34E-04	5.28E-04	4.00E-04	2.49E-04	1.28E-04	6.79E-05	
CUM. (GR/DSCF) SMALLER THAN D50	9.26E-04	8.11E-04	6.88E-04	5.74E-04	4.34E-04	2.70E-04	1.39E-04	7.38E-05	
GEO. MEAN DIA. (MICROMETERS)	2.16E+01	8.99E+00	6.95E+00	4.46E+00	2.70E+00	1.41E+00	7.67E-01	4.45E-01	2.31E-01
DM/DLOGD (MG/DSCM)	1.13E+00	7.74E+00	1.47E+00	1.34E+00	1.32E+00	1.15E+00	1.46E+00	5.57E-01	5.59E-01
DN/DLOGD (NO. PARTICLES/DSCM)	2.13E+05	2.03E+07	8.39E+06	2.89E+07	1.28E+08	7.85E+08	6.19E+09	1.21E+10	8.68E+10

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

PLANT & CITY	AL TECH STEEL	IMPACTOR FLOWRATE(ACFM) AT IMPACTOR CONDITIONS	.682
SAMPLING LOCATION	BAGHOUSE OUTLET	IMPACTOR TEMP.	109.4F 43.0C
DATE	04/09/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A3PS3A	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	SCHWORER	GAS COMPOSITION(PERCENT): CO2	.20
STACK TEMP.	109.4F 43.0C	CO	.00
BAR.PRESS.(IN. HG)	30.06	N2	78.27
STACK PRESS.(IN. HG)	30.06	O2	20.36
NOZZLE:I.D.(IN.)	.500	H2O	1.17
METER HEAD DIFF.	1.300	SAMPLING DURATION(MIN.)	300.00

CALC. MASS LOADING = 1.1846E-03 GR/ACF 1.2867E-03 GR/DSCF 2.7109E+00 MG/ACM 2.9445E+00 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	9.44	8.74	5.67	3.65	2.13	1.05	.69	.41	
MASS (MILLIGRAMS)	4.40	1.40	1.50	1.40	1.70	2.00	1.60	.80	.90
MG/DSCM/STAGE	8.22E-01	2.62E-01	2.80E-01	2.62E-01	3.18E-01	3.74E-01	2.99E-01	1.50E-01	1.68E-01
CUM. PERCENT OF MASS SMALLER THAN D50	71.97	63.06	53.50	44.59	33.76	21.02	10.83	5.73	
CUM. (MG/ACM) SMALLER THAN D50	1.95E+00	1.71E+00	1.45E+00	1.21E+00	9.15E-01	5.70E-01	2.94E-01	1.55E-01	
CUM. (MG/DSCM) SMALLER THAN D50	2.12E+00	1.86E+00	1.58E+00	1.31E+00	9.94E-01	6.19E-01	3.19E-01	1.69E-01	
CUM. (GR/ACF) SMALLER THAN D50	8.53E-04	7.47E-04	6.34E-04	5.28E-04	4.00E-04	2.49E-04	1.28E-04	6.79E-05	
CUM. (GR/DSCF) SMALLER THAN D50	9.26E-04	8.11E-04	6.88E-04	5.74E-04	4.34E-04	2.70E-04	1.39E-04	7.38E-05	
GEO. MEAN DIA. (MICROMETERS)	2.17E+01	9.08E+00	7.04E+00	4.55E+00	2.79E+00	1.50E+00	8.52E-01	5.31E-01	2.90E-01
DM/DLOGD (MG/DSCM)	1.14E+00	7.82E+00	1.49E+00	1.37E+00	1.36E+00	1.22E+00	1.62E+00	6.62E-01	5.59E-01
DN/DLOGD (NO. PARTICLES/DSCM)	2.12E+05	1.99E+07	8.18E+06	2.78E+07	1.20E+08	6.91E+08	4.99E+09	8.45E+09	4.40E+10

STANDARD CONDITIONS ARE 20 DEGC AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

IMPACTOR FIELD DATA TABULATION

PLANT-NAME AND ADDRESS	TEST TEAM LEADER
AL TECH STEEL	SCHWORER

TEST A3PS3A BAGHOUSE OUTLET

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/09/81	04/09/81
TB	TIME-START	930	930
TF	TIME-FINISH	1545	1545
TT	NET TIME OF TEST, MIN.	300.0	300.0
Y	METER CALIBRATION FACTOR	.982	.982
DN	SAMPLING NOZZLE DIAMETER	.500 IN	12.7 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.30 IN-H2O	33.0 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	191.852 CU-FT	5.433 CU-M
TM	AVERAGE GAS METER TEMP	72.4 F	22.4 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	188.312 SCF	5.332 SCM
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	2.229 SCF	.000 SCM
BWO	PERCENT MOISTURE BY VOLUME	1.17	1.17
FMD	MOLE FRACTION DRY GAS	.988	.988
PCO2	PERCENT CO2 BY VOL., DRY	.20	.20
PO2	PERCENT O2 BY VOL., DRY	20.60	20.60
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.20	79.20
MD	MOLECULAR WT-DRY STACK GAS	28.86	28.86
MWS	MOLECULAR WT-STACK GAS	28.73	28.73
PB	BAROMETRIC PRESSURE	30.06 IN-HG	763.52 MM-HG
PSI	STATIC PRES OF STACK GAS	.00 IN-H2O	.00 MM-H2O
PS	STACK PRES, ABS.	30.06 IN-HG	763.52 MM-HG

TS	AVERAGE STACK TEMP	109.	F	43.	C
IF	GAS SAMPLED AT STACK CONDITIONS	204.52	ACF	5.79	ACM
AS	STACK AREA	######	SQ-IN	113.232	SQ-M
ISO	PERCENT ISOKINETIC	101.1		101.1	
MT	TOTAL MASS OF PARTICLES	.242	GR	15.700	MG
PD	PARTICLE DENSITY	.06	GR/CI	1.00	GM/CC

* 68 DEG F, 29.92 IN.HG.

IMPACTOR RESULTS AND EXAMPLE CALCULATIONS

PLANT-NAME AND CITY	TEST TEAM LEADER	RUN NO	SAMPLE LOCATION
AL TECH STEEL TEST DATE 04/09/81	SCHWURER	A3PS3A	BAGHOUSE OUTLET

CALC. MASS LOADING — TOTAL MASS OF PARTICLES DIVIDED BY A VOLUME. UNITS GIVEN ARE GRAINS PER ACTUAL* CUBIC FOOT(GR/ACF),GRAINS PER DRY STANDARD** CUBIC FOOT(GR/DSCF), MILLIGRAMS PER ACTUAL CUBIC METER(MG/ACM) AND MILLIGRAMS PER DRY STANDARD CUBIC METER(MG/DSCM.)

EXAMPLE CALCULATIONS

CML(GR/ACF) = MT(GR) / IF(ACF)

CML = .242 / 204.525 = .0012 GR/ACF

CML(GR/DSCF) = MT(GR) / VMSTD(DSCF)

CML = .242 / 188.312 = .0013 GR/DSCF

CML(MG/ACM) = MT(MG) / IF(ACM)

CML = 15.700 / 5.792 = 2.7109 MG/ACM

CML(MG/DSCM) = MT(MG) / VMSTD(DSCM)

CML = 15.700 / 5.332 = 2.9445 MG/DSCM

D50 (MICROMETERS) — THE SIZE OF THE PARTICLES ON EACH STAGE ASSUMING A 50 PERCENT COLLECTION EFFICIENCY DEFINITION

MASS (MILLIGRAMS) — THE MASS ON EACH STAGE COLLECTED

MG/DSCM/STAGE — THE MASS LOADING FOR EACH STAGE. UNITS GIVEN ARE MILLIGRAMS PER DRY STANDARD CUBIC METER FOR EACH STAGE(MG/DSCM/STAGE)

EXAMPLE CALCULATIONS

MG/DSCM/STAGE(1) = MASS(1) / VMSTD(DSCM)

MG/DSCM/STAGE(1) = 4.40 / 5.332 = .82

CUM. PERCENT OF MASS — THE PERCENTAGE OF THE TOTAL MASS SAMPLED SMALLER IN DIAMETER THAN THE CORRESPONDING D50 INDICATED FOR THAT STAGE

EXAMPLE CALCULATIONS

$$\text{CUM \% (6)} = \frac{\text{MASS(7)} + \text{MASS(8)} + \text{MASS(9)}}{\text{MT (MG)}} * 100 =$$

$$\text{CUM \% (6)} = \frac{1.60 + .80 + .90}{15.70 \text{ (MG)}} * 100 = 33.76$$

CUM.(MASS/VOLUME) THE CUMULATIVE MASS LOADING OF PARTICLES SMALLER IN DIAMETER THAN THE CORRESPONDING D50. MASS/VOLUME UNITS ARE MG/ACM, MG/DSCM,GR/ACF,GR/DSCF.

EXAMPLE CALCULATIONS

```
CUM.(MG/ACM) (5) = MASS(6) + MASS(7) + MASS(8) + MASS(9)
                   ------------------------------------
                                IF(ACM)

CUM.(MG/ACM) (5) =      2.00 +      1.60 +       .80 +       .90
                   ---------------------------------------------  =       .92
                                   5.79  (ACM)
```

GEO.MEAN DIA.(MICROMETERS) THE GEOMETRIC MEAN DIAMETER IN MICROMETERS FOR A PARTICULAR STAGE.

EXAMPLE CALCULATION

```
GEO.MEAN DIA.(J) = SQRT( D50(J) * D50(J-1))

GEO.MEAN DIA.(6) = SQRT(     1.05 *      2.13)  =      1.50
```

DM/DLOGD(MG/DSCM) DM IS MG/DSCM/STAGE(J) AND DLOGD IS LOG10(D50(J-1) / D50(J)) WHERE J IS THE CORRESPONDING STAGE NUMBER. FOR STAGE 1 THE MAXIMUM PARTICLE DIAMETER IS USED. FOR STAGE 9 (BACKUP FILTER) THE D50 IS ASSUMED AS .5 * D50 OF STAGE 8.

EXAMPLE CALCULATION

```
DM/DLOGD(J) =   MG/DSCM/STAGE(J)
              --------------------
              LOG( D50(J-1) / D50(J))

DM/DLOGD (3) =              .28
              -------------------------  =      1.49
              LOG(      8.74 /      5.67 )
```

DN/DLOGD THE NUMBER OF PARTICLES PER UNIT VOLUME FOR A STAGE.

EXAMPLE CALCULATION

```
DN/DLOGD(J) =          DM/DLOGD(J)
              ------------------------------------------
              5.23599E-10 * PD(GM/CC) * GEO.MEAN DIA.(J)

DN/DLOGD (3) =              1.49
              ----------------------------------  =      8176502.00
              5.235999E-10 *      1.00  *      7.04
```

* CALCULATED AT STACK CONDITIONS
** CALCULATED AT STANDARD CONDITIONS
68 DEG.F AND 29.92 INCHES OF HG (760 MMHG)

FIELD DATA

PLANT	AL TECH ALBANY	DATE	04/07/81
SAMPLING LOCATION	SITE NO 1	RUN NUMBER	A1P8-1
SAMPLE TYPE	PARTICLE SIZE	PROBE LENGTH & TYPE	12 FT
OPERATOR	MASON	NOZZLE : I.D.	.135
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.50	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.20	METER BOX NUMBER	FB5
FILTER NUMBER(S)	HIGH CAPACITY	METER HEAD DIFF.	2.03
STACK INSIDE DIM.(IN)	120.00 .00	PROBE HEATER SETTING	0.
PITOT TUBE COEFF.	.80	HEATER BOX SETTING	0.
THERM. NO.	138		
LEAKAGE	.009 CFM @ 10.0 IN.HG		
METER CALIB. FACTOR	1.056		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	IMPACTOR TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	1035	526.581									
	10.0	1045	529.529	1.050	.40	.40	97.	58.	60.	.0	97.	48.
	20.0	1055	532.510	1.050	.40	.40	106.	58.	60.	.0	106.	48.
	30.0	1105	535.540	.970	.40	.40	142.	58.	60.	.0	142.	48.
	40.0	1115	538.560	.970	.40	.40	109.	59.	60.	.0	109.	48.
	50.0	1125	541.580	.970	.40	.40	103.	60.	60.	.0	103.	48.
	60.0	1135	544.580	.970	.40	.40	101.	60.	60.	.0	101.	48.
	70.0	1145	547.590	.970	.40	.40	106.	60.	60.	.0	106.	48.
	80.0	1155	550.600	.970	.40	.40	105.	60.	60.	.0	105.	50.
	90.0	1205	553.615	.970	.40	.40	105.	61.	60.	.0	105.	50.
	100.0	1215	556.620	.970	.40	.40	100.	61.	60.	.0	100.	50.
	110.0	1225	559.630	.970	.40	.40	102.	61.	60.	.0	102.	50.
	120.0	1235	562.640	1.200	.40	.40	110.	61.	60.	.0	110.	50.
	130.0	1245	565.650	1.200	.40	.40	110.	61.	60.	.0	110.	51.
	140.0	1255	568.660	1.200	.40	.40	116.	61.	60.	.0	116.	51.
	150.0	1305	571.670	1.200	.40	.40	141.	62.	60.	.0	141.	51.
	160.0	1315	574.740	1.200	.40	.40	109.	62.	60.	.0	109.	52.
	170.0	1325	577.800	1.200	.40	.40	122.	62.	60.	.0	122.	52.
	180.0	1335	580.850	1.200	.40	.40	115.	63.	60.	.0	115.	52.
	183.9	0	582.045	1.200	.40	.40	114.	64.	61.	.0	114.	52.
TOTALS	183.9		55.464									
AVERAGE					.40	.40	111.	61.	60.	.0	111.	50.

PERCENT ISOKINETIC 103.7

A-102

PLANT & CITY	AL TECH ALBANY	IMPACTOR FLOWRATE(ACFM) AT IMPACTOR CONDITIONS	.355
SAMPLING LOCATION	SITE NO 1	IMPACTOR TEMP.	111.2F 44.0C
DATE	04/07/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	A1P3-1	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	MASON	GAS COMPOSITION(PERCENT): CO2	.00
STACK TEMP.	111.2F 44.0C	CO	.00
BAR.PRESS.(IN. HG)	30.50	N2	79.02
STACK PRESS.(IN. HG)	30.34	O2	20.17
NOZZLE:I.D.(IN.)	.135	H2O	.81
METER HEAD DIFF.	.400	SAMPLING DURATION(MIN.)	183.90

CALC. MASS LOADING = 1.0370E-01 GR/ACF 1.1155E-01 GR/DSCF 2.3729E+02 MG/ACM 2.5526E+02 MG/DSCM

ANDERSEN HEAVY GRAIN LOADING IMPACTOR RESULTS

Run No. AIPS-1 Date 4/7/81

Impactor stage	Total	0	1	2	3	Backup
Stage 50% cut[a] diameter, μm	-	NA	12.6	7.0	1.81	-
Mass collected, mg	438.3	NA	84.3	9.3	65.4	279.3
Percent of total mass	100	NA	19.3	2.1	14.9	63.7
Cumulative percent of mass less than cut diameter	100	100	80.7	78.6	63.7	-
Particulate[b] concentration, mg/dscm	255.3	NA	49.3	5.4	38.0	163.0
gr/dscf	0.1116	NA	0.0215	0.0023	0.0166	0.0711

Impactor flowrate[c] 0.17 alps 0.36 acfm

Impactor temperature 44.0°C 111°F

Isokinetic sampling rate 104 %

[a]Particulate sizes are aerodynamic diameters in micrometers at unit density, 1 gm/cc. Fifty percent effective cut diameters are determined by graphical interpolation of cut size data supplied by the manufacturer. See Table A-1.

[b]Concentrations are reported in milligrams per dry standard cubic meter at 20°C and 101 kPa and in grains per dry standard cubic foot at 68°F and 29.92 in. Hg.

[c]Flow rates are reported at impactor conditions in actual liters per second and actual cubic feet per minute.

IMPACTOR FIELD DATA TABULATION

PLANT-NAME AND ADDRESS	TEST TEAM LEADER
AL TECH ALBANY	MASON

TEST A1PS-1 SITE NO 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/07/81	04/07/81
TB	TIME-START	1035	1035
TF	TIME-FINISH	0	0
TT	NET TIME OF TEST, MIN.	183.9	183.9
Y	METER CALIBRATION FACTOR	1.056	1.056
DN	SAMPLING NOZZLE DIAMETER	.135 IN	3.4 MM
CP	PITOT TUBE COEFFICIENT	.80	.80
PM	AVERAGE ORIFICE PRESSURE DROP	.40 IN-H2O	10.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	55.464 CU-FT	1.571 CU-M
TM	AVERAGE GAS METER TEMP	60.3 F	15.7 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	60.642 SCF	1.717 SCM
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	.495 SCF	.000 SCM
BWO	PERCENT MOISTURE BY VOLUME	.81	.81
FMD	MOLE FRACTION DRY GAS	.992	.992
PCO2	PERCENT CO2 BY VOL., DRY	.00	.00
PO2	PERCENT O2 BY VOL., DRY	20.33	20.33
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.67	79.67
MD	MOLECULAR WT-DRY STACK GAS	28.81	28.81
MWS	MOLECULAR WT-STACK GAS	28.73	28.73
PB	BAROMETRIC PRESSURE	30.50 IN-HG	774.70 MM-HG
PSI	STATIC PRES OF STACK GAS	-2.20 IN-H2O	-55.88 MM-H2O
PS	STACK PRES, ABS.	30.34 IN-HG	770.59 MM-HG

TS	AVERAGE STACK TEMP	111. F	44. C
IF	GAS SAMPLED AT STACK CONDITIONS	65.23 ACF	1.85 ACM
AS	STACK AREA	11310. SQ-IN	7.297 SQ-M
ISO	PERCENT ISOKINETIC	103.7	103.7
MT	TOTAL MASS OF PARTICLES	6.764 GR	438.300 MG
PD	PARTICLE DENSITY	.06 GR/CI	1.00 GM/CC

* 68 DEG F, 29.92 IN.HG.

FIELD DATA

PLANT	AL TECH ALBANY	DATE	04/08/81
SAMPLING LOCATION	SITE NO 1	RUN NUMBER	A1P8-2
SAMPLE TYPE	PARTICLE SIZE	PROBE LENGTH & TYPE	12 FOOT
OPERATOR	MASON	NOZZLE : I.D.	.134
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.39	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.30	METER BOX NUMBER	FB5
FILTER NUMBER(S)	HIGH CAPACITY	METER HEAD DIFF.	2.03
STACK INSIDE DIM.(IN)	120.00 .00		
PITOT TUBE COEFF.	.80	PROBE HEATER SETTING	0.
THERM. NO.	138	HEATER BOX SETTING	0.
LEAKAGE	.012 CFM @ 10.0 IN.HG		
METER CALIB. FACTOR	1.056		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	DRY GAS METER TEMP (DEG.F) OUTLET	PUMP VACUUM (IN.HG)	IMPACTOR TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	940	641.920									
	10.0	950	645.020	1.000	.38	.38	108.	70.	68.	.0	108.	50.
	20.0	1000	648.270	1.000	.38	.38	147.	72.	68.	.0	147.	50.
	30.0	1010	651.135	1.000	.38	.38	107.	75.	70.	.0	107.	50.
	40.0	1020	654.423	1.000	.38	.38	155.	76.	71.	.0	155.	51.
	50.0	1030	657.240	1.000	.38	.38	151.	77.	72.	.0	151.	52.
	60.0	1040	660.310	1.100	.38	.38	129.	78.	72.	.0	129.	52.
	70.0	1050	663.485	1.100	.38	.38	110.	78.	72.	.0	110.	52.
	80.0	1100	666.595	1.100	.38	.38	112.	77.	72.	.0	112.	52.
	90.0	1110	669.650	1.100	.38	.38	121.	77.	72.	.0	121.	53.
	100.0	1120	672.710	1.100	.38	.38	118.	76.	72.	.0	118.	53.
	110.0	1130	675.845	1.400	.38	.38	113.	76.	73.	.0	113.	53.
	120.0	1140	679.080	1.400	.38	.38	121.	77.	72.	.0	121.	54.
	130.0	1150	682.085	1.400	.38	.38	112.	77.	72.	.0	112.	54.
	140.0	1200	685.225	1.400	.38	.38	110.	77.	72.	.0	110.	56.
	150.0	1210	688.475	1.400	.38	.38	109.	77.	73.	.0	109.	56.
	160.0	1220	691.500	1.300	.38	.38	111.	78.	74.	.0	111.	56.
	170.0	1230	694.645	1.300	.38	.38	113.	78.	73.	.0	113.	56.
	180.0	1240	698.290	1.300	.38	.38	117.	78.	74.	.0	117.	56.
	190.0	1250	701.940	1.300	.38	.38	116.	79.	74.	.0	116.	56.
	200.0	1300	704.110	1.300	.38	.38	116.	80.	75.	.0	116.	56.
	206.8	1307	706.203	1.300	.38	.38	115.	81.	76.	.0	115.	56.
TOTALS	206.8		64.283									
AVERAGE					.38	.38	120.	77.	72.	.0	120.	54.

PERCENT ISOKINETIC 100.5

PLANT & CITY	AL TECH ALBANY	IMPACTOR FLOWRATE(ACFM)	.361
SAMPLING LOCATION	SITE NO 1	AT IMPACTOR CONDITIONS IMPACTOR TEMP.	119.6F 48.7C
DATE	04/08/81	PARTICLE DENSITY(GM/CC)	1.00
RUN NUMBER	AIPS-2	MAX.PARTICLE DIAM.MICROS	50.0
OPERATOR	MASON	GAS COMPOSITION(PERCENT): CO2	.00
STACK TEMP.	119.6F 48.7C	CO	.00
BAR.PRESS.(IN. HG)	30.39	N2	78.96
STACK PRESS.(IN. HG)	30.22	O2	20.15
NOZZLE:I.D.(IN.)	.134	H2O	.89
METER HEAD DIFF.	.380	SAMPLING DURATION(MIN.)	206.80

CALC. MASS LOADING = 8.0584E-02 GR/ACF 8.8369E-02 GR/DSCF 1.8440E+02 MG/ACM 2.0222E+02 MG/DSCM

ANDERSEN HEAVY GRAIN LOADING IMPACTOR RESULTS

Run No. AIPS-2 Date 4/8/81

Impactor stage	Total	0	1	2	3	Backup
Stage 50% cut[a] diameter, μm	-	NA	12.5	6.9	1.79	-
Mass collected, mg	390.3	NA	96.7	3.6	44.9	245.1
Percent of total mass	100	NA	24.7	0.9	11.5	62.8
Cumulative percent of mass less than cut diameter	100	100	75.2	74.3	62.8	-
Particulate[b] concentration, mg/dscm	202.2	NA	49.9	1.83	23.3	127.1
gr/dscf	0.0884	NA	0.0218	0.0008	0.0102	0.0555

Impactor flowrate[c] 0.17 alps 0.36 acfm

Impactor temperature 48.7 °C 120 °F

Isokinetic sampling rate 100 %

[a]Particulate sizes are aerodynamic diameters in micrometers at unit density, 1 gm/cc. Fifty percent effective cut diameters are determined by graphical interpolation of cut size data supplied by the manufacturer. See Table A-1.

[b]Concentrations are reported in milligrams per dry standard cubic meter at 20°C and 101 kPa and in grains per dry standard cubic foot at 68°F and 29.92 in. Hg.

[c]Flow rates are reported at impactor conditions in actual liters per second and actual cubic feet per minute.

IMPACTOR FIELD DATA TABULATION

PLANT-NAME AND ADDRESS	TEST TEAM LEADER
AL TECH ALBANY	MASON

TEST A1PS-2 SITE NO 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/08/81	04/08/81
TB	TIME-START	940	940
TF	TIME-FINISH	1307	1307
TT	NET TIME OF TEST, MIN.	206.8	206.8
Y	METER CALIBRATION FACTOR	1.056	1.056
DN	SAMPLING NOZZLE DIAMETER	.134 IN	3.4 MM
CP	PITOT TUBE COEFFICIENT	.80	.80
PM	AVERAGE ORIFICE PRESSURE DROP	.38 IN-H2O	9.7 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	64.283 CU-FT	1.820 CU-M
TM	AVERAGE GAS METER TEMP	74.5 F	23.6 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	68.167 SCF	1.930 SCM
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	.612 SCF	.000 SCM
BWO	PERCENT MOISTURE BY VOLUME	.89	.89
FMD	MOLE FRACTION DRY GAS	.991	.991
PCO2	PERCENT CO2 BY VOL., DRY	.00	.00
PO2	PERCENT O2 BY VOL., DRY	20.33	20.33
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.67	79.67
MD	MOLECULAR WT-DRY STACK GAS	28.81	28.81
MWS	MOLECULAR WT-STACK GAS	28.72	28.72
PB	BAROMETRIC PRESSURE	30.39 IN-HG	771.91 MM-HG
PSI	STATIC PRES OF STACK GAS	-2.30 IN-H2O	-58.42 MM-H2O
PS	STACK PRES, ABS.	30.22 IN-HG	767.61 MM-HG

TS	AVERAGE STACK TEMP	120. F	49. C
IF	GAS SAMPLED AT STACK CONDITIONS	74.75 ACF	2.12 ACM
AS	STACK AREA	11310. SQ-IN	7.297 SQ-M
ISO	PERCENT ISOKINETIC	100.5	100.5
MT	TOTAL MASS OF PARTICLES	6.023 GR	390.300 MG
PD	PARTICLE DENSITY	.06 GR/CI	1.00 GM/CC

* 68 DEG F, 29.92 IN.HG.

FIELD DATA

PLANT	AL TECH ALBANY	DATE	04/09/81
SAMPLING LOCATION	SITE NO 1 INLET	RUN NUMBER	A1PS-3
SAMPLE TYPE	PARTICLE SIZE	PROBE LENGTH & TYPE	12 FOOT
OPERATOR	MASON	NOZZLE : I.D.	.135
AMBIENT TEMP.(DEG.F)	56.	ASSUMED MOISTURE	2.0
BAR.PRESS.(IN.HG)	30.05	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-2.30	METER BOX NUMBER	FB5
FILTER NUMBER(S)		METER HEAD DIFF.	2.03
STACK INSIDE DIM.(IN)	120.00 .00		
PITOT TUBE COEFF.	.80	PROBE HEATER SETTING	0.
THERM. NO.	138	HEATER BOX SETTING	0.
LEAKAGE	.010 CFM @ 10.0 IN.HG		
METER CALIB. FACTOR	1.056		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	OUTLET	PUMP VACUUM (IN.HG)	IMPACTOR TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	1010	780.553									
	10.0	1020	784.075	1.300	.48	.48	103.	72.	68.	.0	103.	62.
	20.0	1030	787.592	1.300	.48	.48	104.	73.	69.	.0	104.	62.
	30.0	1040	791.120	1.300	.48	.48	105.	74.	70.	.0	105.	62.
	40.0	1050	794.700	1.300	.48	.48	106.	75.	70.	.0	106.	62.
	50.0	1100	798.217	1.300	.48	.48	111.	76.	71.	.0	111.	62.
	60.0	1110	801.718	1.100	.48	.48	111.	76.	71.	.0	111.	62.
	70.0	1120	805.300	1.100	.48	.48	110.	77.	72.	.0	110.	63.
	80.0	1130	808.835	1.100	.48	.48	108.	76.	72.	.0	108.	62.
	90.0	1140	812.380	1.100	.48	.48	109.	78.	73.	.0	109.	62.
	100.0	1150	815.975	1.200	.48	.48	109.	78.	73.	.0	109.	62.
	110.0	1200	819.535	1.200	.48	.48	108.	79.	74.	.0	108.	62.
	120.0	1210	823.075	1.200	.48	.48	112.	79.	74.	.0	112.	62.
	130.0	1220	826.650	1.200	.48	.48	114.	79.	74.	.0	114.	62.
	140.0	1230	830.205	1.200	.48	.48	115.	79.	75.	.0	115.	62.
	150.0	1240	833.760	1.200	.48	.48	115.	79.	75.	.0	115.	62.
	160.0	1250	837.317	1.200	.48	.48	115.	79.	75.	.0	115.	62.
	170.0	1300	840.900	1.200	.48	.48	105.	77.	75.	.0	105.	60.
	180.0	1310	844.446	1.200	.48	.48	114.	77.	74.	.0	114.	60.
TOTALS	180.0		63.893									
AVERAGE					.48	.48	110.	77.	73.	.0	110.	62.

PERCENT ISOKINETIC 111.6

PLANT & CITY	AL TECH ALBANY	IMPACTOR FLOWRATE(ACFM)	.407
SAMPLING LOCATION	SITE NO 1 INLET	AT IMPACTOR CONDITIONS	
DATE	04/09/81	IMPACTOR TEMP.	109.7F 43.1C
RUN NUMBER	AIPS-3	PARTICLE DENSITY(GM/CC)	1.00
OPERATOR	MASON	MAX.PARTICLE DIAM.MICROS	50.0
STACK TEMP.	109.7F 43.1C	GAS COMPOSITION(PERCENT): CO2	.00
BAR.PRESS.(IN. HG)	30.05	CO	.00
STACK PRESS.(IN. HG)	29.88	N2	78.41
NOZZLE:I.D.(IN.)	.135	O2	20.34
METER HEAD DIFF.	.480	H2O	1.25
		SAMPLING DURATION(MIN.)	180.00

CALC. MASS LOADING = 4.2089E-02 GR/ACF 4.6049E-02 GR/DSCF 9.6314E+01 MG/ACM 1.0538E+02 MG/DSCM

ANDERSEN HEAVY GRAIN LOADING IMPACTOR RESULTS

Run No. AIPS-3 Date 4/9/81

Impactor stage	Total	0	1	2	3	Backup
Stage 50% cut[a] diameter, μm	-	NA	12.2	6.6	1.6	-
Mass collected, mg	199.9	NA	34.6	4.7	40.3	120.3
Percent of total mass	100	NA	17.3	2.3	20.2	60.2
Cumulative percent of mass less than cut diameter	100	100	82.7	80.4	60.2	-
Particulate[b] concentration, mg/dscm	202.2	NA	18.2	2.42	21.3	63.5
gr/dscf	0.0461	NA	0.0080	0.0011	0.0093	0.0277

Impactor flowrate[c] 0.19 alps 0.41 acfm

Impactor temperature 43.1 °C 110 °F

Isokinetic sampling rate 112 %

[a]Particulate sizes are aerodynamic diameters in micrometers at unit density, 1 gm/cc. Fifty percent effective cut diameters are determined by graphical interpolation of cut size data supplied by the manufacturer. See Table A-1.

[b]Concentrations are reported in milligrams per dry standard cubic meter at 20°C and 101 kPa and in grains per dry standard cubic foot at 68°F and 29.92 in. Hg.

[c]Flow rates are reported at impactor conditions in actual liters per second and actual cubic feet per minute.

IMPACTOR FIELD DATA TABULATION

PLANT-NAME AND ADDRESS	TEST TEAM LEADER
AL TECH ALBANY	MASON

TEST A1P3-3 SITE NO 1 INLET

		ENGLISH UNITS	METRIC UNITS
TEST DATE		04/09/81	04/09/81
TB	TIME-START	1010	1010
TF	TIME-FINISH	1310	1310
TT	NET TIME OF TEST, MIN.	180.0	180.0
Y	METER CALIBRATION FACTOR	1.056	1.056
DN	SAMPLING NOZZLE DIAMETER	.135 IN	3.4 MM
CP	PITOT TUBE COEFFICIENT	.80	.80
PM	AVERAGE ORIFICE PRESSURE DROP	.48 IN-H20	12.2 MM-H20
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	63.893 CU-FT	1.809 CU-M
TM	AVERAGE GAS METER TEMP	74.7 F	23.7 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	66.998 SCF	1.897 SCM
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	.848 SCF	.000 SCM
BWO	PERCENT MOISTURE BY VOLUME	1.25	1.25
FMD	MOLE FRACTION DRY GAS	.987	.987
PCO2	PERCENT CO2 BY VOL., DRY	.00	.00
PO2	PERCENT O2 BY VOL., DRY	20.60	20.60
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	79.40	79.40
MD	MOLECULAR WT-DRY STACK GAS	28.82	28.82
MWS	MOLECULAR WT-STACK GAS	28.69	28.69
PB	BAROMETRIC PRESSURE	30.05 IN-HG	763.27 MM-HG
PSI	STATIC PRES OF STACK GAS	-2.30 IN-H20	-58.42 MM-H20
PS	STACK PRES, ABS.	29.88 IN-HG	758.97 MM-HG

TS	AVERAGE STACK TEMP	110.	F	43.	C
IF	GAS SAMPLED AT STACK CONDITIONS	73.30	ACF	2.08	ACM
AS	STACK AREA	11310.	SQ-IN	7.297	SQ-M
ISO	PERCENT ISOKINETIC	111.6		111.6	
MT	TOTAL MASS OF PARTICLES	3.085	GR	199.900	MG
PD	PARTICLE DENSITY	.06	GR/CI	1.00	GM/CC

* 68 DEG F, 29.92 IN.HG.

TABLE A-1[a]
50% EFFECTIVE CUT DIAMETER (MIRCOMETERS)
PARTICLE DENSITY = 1.0 g/cc

FLOW RATE ACFM	STAGE 1	STAGE 2	CYCLONE
AIR TEMP = 70°F			
0.3	13.0	7.6	2.1
0.4	12.3	6.5	1.6
0.5	11.0	5.9	1.3
0.6	10.0	5.4	1.1
0.7	9.3	4.9	0.94
AIR TEMP = 100°F			
0.3	13.1	7.6	2.1
0.4	12.4	6.6	1.6
0.5	11.1	5.9	1.3
0.6	10.1	5.4	1.1
0.7	9.4	5.0	0.98
AIR TEMP = 300°F			
0.3	14.5	8.5	2.6
0.4	13.7	7.3	2.2
0.5	12.3	6.5	1.9
0.6	11.2	6.0	1.7
0.7	10.4	5.5	1.5
AIR TEMP = 500°F			
0.3	15.8	9.2	3.2
0.4	15.0	8.0	2.7
0.5	13.4	7.1	2.4
0.6	12.2	6.5	2.2
0.7	11.3	6.0	2.0
AIR TEMP = 1000°F			
0.3	18.6	10.8	4.5
0.4	17.6	9.3	4.0
0.5	15.8	8.3	3.7
0.6	14.4	7.6	3.5
0.7	13.3	7.0	3.3

[a]Operating Manual for Andersen Samplers, Inc., Heavy Grain Loading Impactor Particle Size Stack Samplers; January 1, 1980, Table II, p. 41.

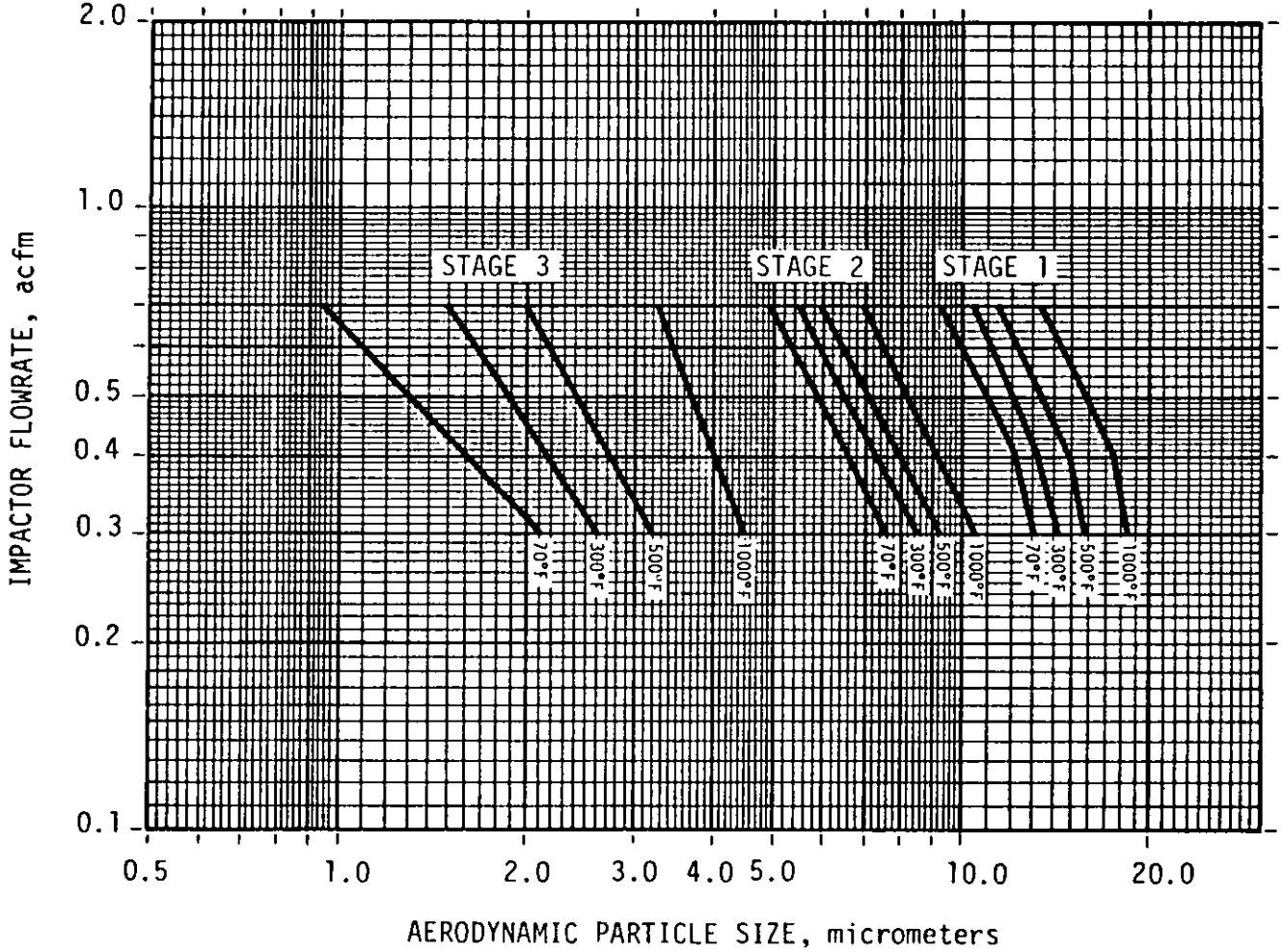


Figure A-1. Graphical presentation of data supplied by the manufacturer to determine cut diameters for the Andersen Heavy Grain Loading Impactor.

APPENDIX B

FIELD DATA

PARTICULATE

Site 1
Site 2
Site 3

PARTICLE SIZE

Site 1 Mark III
Site 3 Mark III
Site 1 HGLI

VISIBLE EMISSIONS

Baghouse outlet
Melt shop
Fugitive

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant AL TECH SPECIALTY STEEL

Date 4/5/81

Sampling location SITE 1+2 INLET

Inside of far wall to outside of nipple 10' 4.5" (124.5")

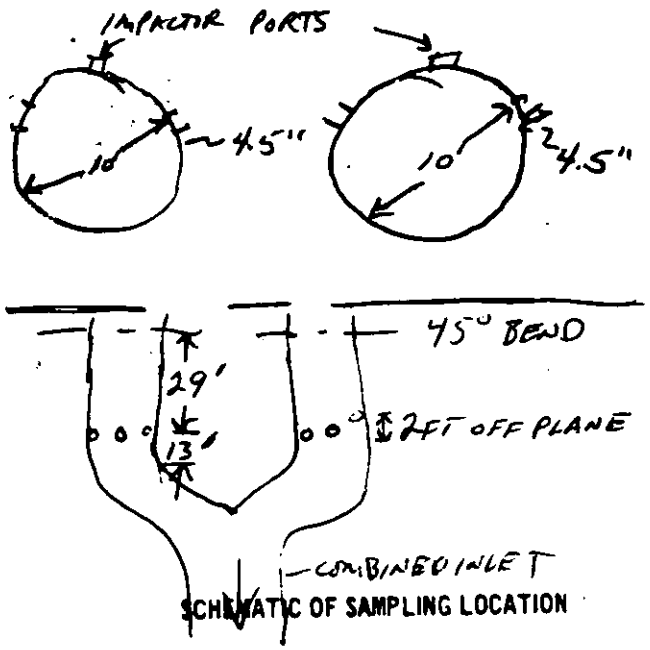
Inside of near wall to outside of nipple (nipple length) 4.5"

Stack I.D. 120"

Nearest upstream disturbance 2.9 ~~2.9 1/3~~ dd

Nearest downstream disturbance ~~2.9~~ 1.3 dd

Calculated by PSR



SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	NIPPLE LENGTH	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.011	120"		4.5"	~~5.8~~ 5 7/8"
2	.035				8 3/4"
3	.060				11 3/4"
4	.087				15"
5	.116				18 3/8"
6	.146				22"
7	.180				26 1/8"
8	.219				30 5/8"
9	.262				36"
10	.315				42 1/4"
11	.393				51 5/8"
12	.607				77 3/8"
13	.685				86 3/4"
14	.738				93"
15	~~.780~~ .820				98 3/8"
16	~~.820~~ .854				~~101 3/8~~ 102 7/8"
17	~~.854~~ .884				107"
18	~~.884~~ .915				110 5/8"
19	.913				114"
20	.940				117 1/4"
21	.965				120 1/4"
22	.989				123 1/8"

GAS VELOCITY AND VOLUME DATA

	PLANT AND CITY	RUN DATE
1.	ALTECH SPECIALTY STEEL, WATERVLIET	4/16/81

SAMPLING LOCATION	CLOCK TIME
SITE 1 - PARTICLE SIZE PORT	1050

RUN NUMBER	OPERATOR	AMB. TEMP. (°F)	BAR. PRESS (in. Hg)	STATIC PRESS (in. H_2O)
2.	D. FITZGERALD	35		-2.50

MOLECULAR WT.	STACK INSIDE DIMENSION (in.)		PITOT TUBE Cp	MOISTURE %
	DIAM OR SIDE 1	SIDE 2		
	120.0		0.84	

FIELD DATA

TRAVERSE POINT NUMBER	POSITION (in.)	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMP, °F
7,8,9,10	11,12,13,14	25,26,27,28,29	38,39,40,41
1		0.82	112
2		0.96	114
3		0.99	119
4		1.05	120
5		1.10	119
6		1.10	119
7		1.05	119
8		1.10	117
9		1.05	116
10		1.10	115
11		1.05	114
12		1.20	113
13		1.45	111
14		1.45	109
15		1.50	109
16		1.50	109
17		1.45	106
18		1.50	104
19		1.60	100
20		1.60	101
21		1.30	101
22		1.25	102

PARTICLE SIZE PORT

P_{bar} = 30.11 at truck level

$\overline{\Delta p}$ = 1.20

$\sqrt{\Delta p}$ = 1.096

$\bar{T}_s \approx 565$

PITOT #253
Cp = 0.80

GAS VELOCITY AND VOLUME DATA

PLANT AND CITY	RUN DATE
1. ALTECH SPECIALTY STEEL, WATERVLIET, N.Y.	4/16/81

SAMPLING LOCATION	CLOCK TIME
SITE #1 (INLET)	0920

RUN NUMBER	OPERATOR	AMB. TEMP. (°F)	BAR. PRESS (in. Hg)	STATIC PRESS (in. H_2O)
2. IV-1	D. FITZGERALD	35	30.1	-2.80

MOLECULAR WT.	STACK INSIDE DIMENSION (in.) DIAM OR SIDE 1	SIDE 2	PITOT TUBE Cp	MOISTURE %
	120.0	→	0.84	

$\overline{\sqrt{\Delta P}} = 1.230$

$\bar{T}_s \approx 545°R$

$P_s = 29.9$

$D_N \approx$ same

$\overline{\Delta P} = 1.5$

PITOT #253

$C_p = 0.80$

FIELD DATA

TRAVERSE POINT NUMBER	POSITION (in.)	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMP, °F
7,8,9,10	11,12,13,14	25,26,27,28,29	38,39,40,41
SOUTH PORT			
1		0.94	80
2		1.05	81
3		1.10	83
4		1.20	84
5		1.20	84
6		1.20	85
7		1.10	85
8		1.10	85
9		1.10	85
10		1.10	86
11		1.30	86
12		1.30	86
13		1.45	85
14		1.50	85
15		1.60	85
16		1.70	86
17		1.70	86
18		1.70	86
19		1.65	86
20		1.65	85
21		1.60	85
22		1.40	87
NORTH PORT			
1		1.15	92
2		1.30	91
3		1.60	91
4		1.60	93
5		1.60	93
6		1.60	94
7		1.45	95
8		1.40	95
9		1.50	95
10		1.40	95
11		1.40	94
12		1.35	95
13		1.35	95
14		1.30	95
15		1.40	95
16		1.40	95
17		1.25	95
18		1.30	94
19		1.25	94
20		1.40	93
21		1.30	92
22		1.20	92

STATIC -2.80" H_2O

STATIC -2.80" H_2O

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
AL TECH STEEL, WATERVLIET, NY	9/7/91	SITE #1	PARTICULATES

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
AIP-1	DAN FITZGERALD	59	30.59	-2.20	H0002146	120	0.84		10 of 8

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER Δ H @	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 5097 STAINLESS	0.122	3-1P1	20		FB3	1.78	1.008	5	0.099	1.333		250°F	250°F		40

DIGITAL # 207
PITOT # 251

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	1035	265.422									
N-1	4.0	1039	266.640	1.20	0.29	0.29	98	67	58	10	250	46
2	8.0	1043	267.995	1.20	0.29	0.29	95	67	57	10	250	46
3	12.0	1047	268.955	1.30	0.29	0.29	140	67	57	10	250	44
W 4	16.0	1051	270.110	1.35	0.29	0.29	151	67	57	10	250	44
5	20.0	1055	271.355	1.45	0.34	0.34	105	68	57	10	250	44
6	24.0	1059	272.605	1.40	0.33	0.33	112	68	57	10	250	44
7	28.0	1103	273.680	1.20	0.26	0.26	152	68	57	10	255	44
8	32.0	1107	274.825	1.30	0.29	0.29	152	68	57	10	255	44
9	36.0	1111	275.985	1.25	0.27	0.27	149	68	57	10	250	44
10	40.0	1115	277.150	1.25	0.29	0.29	139	68	57	10	250	44
11	44.0	1119	278.305	1.25	0.29	0.29	107	69	57	10	250	44
12	48.0	1123	279.415	1.15	0.27	0.27	111	68	57	10	255	44
13	52.0	1127	280.515	1.15	0.27	0.27	110	69	57	10	255	44
14	56.0	1131	281.635	1.20	0.28	0.28	101	69	57	10	250	46
15	60.0	1135	282.800	1.25	0.29	0.29	101	69	57	10	250	46
16	64.0	1139	283.965	1.25	0.29	0.29	105	69	57	10	250	46
17	68.0	1143	285.100	1.25	0.29	0.29	107	68	57	10	260	46
18	72.0	1147	286.285	1.25	0.29	0.29	104	68	57	10	255	46
19	76.0	1151	287.435	1.25	0.29	0.29	107	68	57	10	255	46
20	80.0	1155	288.550	1.10	0.26	0.26	109	69	57	10	260	44
21	84.0	1159	289.660	1.10	0.26	0.26	105	69	57	10	260	44
22	88.0	1203	290.592	0.99	0.21	0.21	109	69	57	10	255	44
S-1	92.0	1215	291.670	0.86	0.21	0.21	94	67	57	10	250	44
2	96.0	1219	292.739	1.90	0.24	0.24	99	67	58	10	250	44

* Clean of Probe Sampling Ht. — 290 Lat Room @ 1211

3988 A&B RUN NO. AIP-1

3985 A&B RUN NO. AIP-1

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
AG TECH STEEL WATERLOO, IA	4/7/81	SITE #1	PART. LOAD

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIAM. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
A/P-1	DAN FLUTZGERALD	60	30.50	-.230	#00021146	120	0.84 0.81		20 of 6

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER Δ H@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FOOT STAINLESS	0.122	2-1-01	20		683/98	1.008		5	0.000	1333		250°	250°		10

☐ Leak Check Between heats - begin Volume - 318,207 @ 1352

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0											
5-3	100.0	1223	293.865	1.10	0.26	0.26	98	68	59	10	250	48
4	104.0	1227	294.995	1.15	0.27	0.27	102	68	59	10	255	48
5	108.0	1231	296.145	1.10	0.26	0.26	105	68	59	10	230	48
6	112.0	1235	297.280	1.10	0.26	0.26	109	68	59	10	210	48
7	116.0	1239	298.410	1.10	0.26	0.26	106	68	58	10	200	48
8	120.0	1243	299.555	1.10	0.26	0.26	110	68	58	10	200	48
9	124.0	1247	300.710	1.20	0.28	0.28	109	68	58	10	200	48
10	128.0	1251	301.855	1.20	0.28	0.28	109	68	58	10	190	48
11	132.0	1255	303.100	1.40	0.32	0.32	117	69	58	10	190	50
12	136.0	1259	304.335	1.50	0.33	0.33	140	69	58	15	180	50
13	140.0	1303	305.640	1.60	0.35	0.35	140	69	59	15	190	50
14	144.0	1307	306.990	1.65	0.38	0.38	111	69	59	15	185	50
15	148.0	1311	308.365	1.70	0.40	0.40	112	69	59	15	190	50
16	152.0	1315	309.735	1.70	0.40	0.40	109	69	59	15	210	50
17	156.0	1319	311.105	1.70	0.39	0.39	123	69	59	15	210	50
18	160.0	1323	312.415	1.60	0.37	0.37	122	70	59	15	210	50
19	164.0	1325	313.715	1.60	0.37	0.37	115	70	59	15	210	50
20	168.0	1329	315.010	1.50	0.35	0.35	117	70	59	15	210	50
21	172.0	1334	316.245	1.30	0.30	0.30	113	70	59	15	210	50
22	176.0	1338	317.265	1.00	0.23	0.23	116	70	60	15	210	50
11	179.0	1341	318.089	1.10	0.26	0.26	108	70	60	15	210	52
5-1	183.0	1358	319.230	0.90	0.21	0.21	98	68	60	10	210	52
5-2	187.0	1400	320.320	0.95	0.22	0.22	107	68	60	10	210	52
3	191.0	1404	321.395	1.10	0.26	0.26	110	68	60	10	210	52

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
AL TECH STEEL, WATERVILLIET, NY	9/7/91	SITE #1	PARTICULATE

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
ALP-1	DAN FITZGERALD	60	30.50	-.330	#00021146	120°	0.84 0.81		30 of 8

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA HRS
12' PORT, STAINLESS	0.214	2-101	20		FB3	1.98	1.098	5	0.000	1.333		250°	250°		1 to

*Change of Ports – leak check – begin Volume – 345.898 @ 1541

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0											
5-4	195.0	1408	322.450	1.10	0.26	0.26	107	68	60	15	210	52
5	199.0	1412	323.675	1.10	0.26	0.26	106	68	60	15	200	52
6	203.0	1416	324.825	1.10	0.26	0.26	101	69	60	15	200	54
7	207.0	1420	325.980	1.10	0.26	0.26	100	70	60	15	200	54
8	211.0	1424	327.115	1.10	0.26	0.26	101	70	61	16	205	54
B 9	215.0	1428	328.270	1.10	0.26	0.26	105	70	61	15	205	54
10	219.0	1432	329.415	1.10	0.26	0.26	105	70	62	15	200	52
11	223.0	1436	330.620	1.20	0.28	0.28	105	71	62	15	200	52
12	227.0	1440	331.915	1.40	0.33	0.33	105	72	62	20	215	54
13	231.0	1444	333.300	1.60	0.38	0.38	103	72	63	20	210	54
14	335.0	1448	334.715	1.60	0.38	0.38	102	72	64	20	215	54
15	339.0	1452	336.150	1.60	0.38	0.38	102	73	64	20	215	54
16	343.0	1456	337.540	1.60	0.38	0.38	102	74	65	20	205	54
17	247.0	1500	338.955	1.60	0.38	0.38	100	75	65	20	210	56
18	251.0	1504	340.365	1.60	0.38	0.38	98	75	66	20	210	56
19	255.0	1508	341.790	1.50	0.35	0.35	103	75	66	20	210	56
20	259.0	1512	343.165	1.40	0.33	0.33	104	76	66	20	210	56
21	263.0	1516	344.520	1.30	0.31	0.31	105	76	68	20	210	56
22	267.0	1520	345.955	1.30	0.31	0.31	104	76	68	20	210	56
N-1	271.0	1545	347.350	1.20	0.29	0.29	95	75	70	20	210	54
2	275.0	1549	348.530	1.30	0.31	0.31	95	75	71	20	210	54
3	279.0	1553	349.805	1.40	0.34	0.34	98	75	71	20	210	54
4	283.0	1557	351.120	1.50	0.36	0.36	98	76	72	20	200	56
5	287.0	1601	352.435	1.50	0.36	0.36	98	76	72	20	200	56

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
AL FRESH STEEL, WATERVLIET, NY	6/17/81	SITE #1	PARTICULATE

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	TUBE NO.	PAGE
1	DAN FITZGERALD	66	30.50	-2.20	#19993/186	1299	0.84 0.81		1 of 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER Δ H @	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
13 FOOT STAINLESS	0.233	3-1.0	20		693	1.98	1.998	50	0.009	1.333		250°F	250°F		40

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0											
N-6	291.0	1605	353.730	1.40	0.34	0.34	99	77	72	2.0	210	56
7	295.0	1609	355.040	1.40	0.33	0.33	104	78	72	2.0	210	56
8	299.0	1613	356.330	1.50	0.35	0.35	103	79	73	2.0	220	56
9	303.0	1617	357.580	1.40	0.33	0.33	104	80	73	2.0	220	56
10	307.0	1621	358.830	1.40	0.33	0.33	112	81	73	2.0	250	56
11	311.0	1625	360.050	1.30	0.31	0.31	104	81	74	2.0	250	56
12	315.0	1629	361.215	1.20	0.28	0.28	103	82	74	2.0	265	56
13	319.0	1633	362.375	1.20	0.28	0.28	104	82	74	2.0	260	56
14	323.0	1637	363.520	1.20	0.28	0.28	109	82	74	2.0	265	56
15	327.0	1641	364.650	1.20	0.28	0.28	108	82	74	2.0	260	56
16	331.0	1645	365.790	1.20	0.28	0.28	112	81	74	2.0	260	56
17	335.0	1649	366.965	1.20	0.28	0.28	113	81	74	2.0	250	56
18	339.0	1654	368.055	1.20	0.28	0.28	117	81	75	2.0	260	56
19	343.0	1658	369.155	1.05	0.24	0.24	118	82	75	2.0	260	56
20	347.0	1702	370.235	1.05	0.24	0.24	120	81	75	2.0	260	56
21	351.0	1706	371.200	1.00	0.23	0.23	119	82	75	1.5	260	56
22	355.0	1710	372.190	0.95	0.21	0.21	121	82	75	1.5	260	56
11	359.0	1714	373.320	1.10	0.25	0.25	118	81	75	1.5	260	56
11	363.0	1718	374.420	1.10	0.25	0.25	115	81	75	1.5	250	56
11	367.0	1722	375.480	1.10	0.25	0.25	116	81	75	1.5	250	56
11	371.0	1726	376.550	1.10	0.25	0.25	113	81	75	1.5	260	56
11	374.	1729	377.371	1.10	0.25	0.25	114	81	75	1.5	260	56

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Al Tech Specialty Steel
DATE 4-6-81 TEST NO AIP-P
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION Site #1
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 35
OPERATOR Dan Fitzgerald
ORSAT LEAK CHECKED

COMMENTS:

GAS \ RUN	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	0.0	0.0	0.0	0.0	0.0	0.0		44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.4	20.4	20.2	20.2	20.4	20.4		32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALLTECH STEEL, WATERVILLE, MX	4/9/91	FILTER #1	PARTICULATES

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS. (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE C_p	THERM NO.	PAGE
1 P-12	DIAN FILTIZG GRAND	65	30.39	-2.30	#0002161	12.99	0.84 0.81	147	1 of 5

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 GOOT STAINLESS	0.224	2-1/04	28		FB3	1.98	1.908	50	9999	1.332		250	250		60

PITOT - #252
DIGITAL - #207

119.9

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	0935	377.605									
N-1	4.0	0939	378.630	0.96	0.23	0.23	100	61	58	10	250	50
2	8.0	0943	379.700	1.05	0.24	0.24	110	63	58	10	250	52
3	12.0	0947	380.870	1.30	0.31	0.31	102	64	58	10	250	52
4	16.0	0951	382.010	1.30	0.29	0.29	143	66	58	10	250	52
5	20.0	0955	383.100	1.20	0.26	0.26	157	67	59	10	250	50
6	24.0	0959	384.350	1.45	0.34	0.34	106	69	59	10	250	50
7	28.0	1003	385.615	1.45	0.34	0.34	106	70	60	10	250	52
8	32.0	1007	386.825	1.40	0.31	0.31	144	71	60	10	250	52
9	36.0	1011	387.935	1.30	0.28	0.28	155	72	61	10	250	52
10	40.0	1015	389.035	1.20	0.26	0.26	161	72	62	10	250	52
11	44.0	1019	390.115	1.20	0.26	0.26	157	72	62	10	250	52
12	48.0	1023	391.160	1.05	0.23	0.23	149	73	62	10	250	52
13	52.0	1027	392.185	1.00	0.23	0.23	130	73	63	10	250	52
14	56.0	1031	393.405	1.10	0.25	0.25	127	73	63	10	250	52
15	60.0	1035	394.360	1.10	0.26	0.26	121	74	63	10	250	52
16	64.0	1039	395.525	1.20	0.29	0.29	111	74	63	10	250	52
17	68.0	1043	396.680	1.20	0.29	0.29	110	74	63	10	250	52
18	72.0	1047	397.855	1.20	0.29	0.29	111	74	64	10	250	52
19	76.0	1051	398.975	1.30	0.27	0.27	111	74	64	10	250	54
20	80.0	1055	400.065	1.20	0.25	0.25	115	74	64	10	260	54
21	84.0	1059	401.065	1.00	0.20	0.20	120	74	65	10	265	54
22	88.0	1103	401.973	0.90	0.19	0.19	120	74	65	10	260	54
S-1	☆ 92.0	1115	402.975	0.90	0.17	0.17	115	72	66	10	260	54
2	96.0	1119	403.920	0.92	0.19	0.19	119	72	66	10	260	54

☆ Change of Pentra Helium begin - 402.076 @ 1111

New K

EMISSION TEST FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALTECH STEEL, WATERVILLE, MX	9/8/91	SITE #1	PARTICULATE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	TIME RUN NO.	PAGE
4/P-12	DAN FITZGERALD	65	30.38	-23.0	#00021161	1299	0.84	1.99	20 of 20

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FOOT STAINLESS	0.333	2-101	20		F93	1.98	1.908	5	0.000	~~1.000~~ 1.195		250°	250°		40

Traverse Point Number	Sampling Time, min	Clock Time (24 hr Clock)	Gas Meter Reading (V_m), ft^3	Velocity Head (Δp_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Orifice Pressure Differential (ΔH), in. H_2O Actual	Stack Temperature (T_s), °F	Dry Gas Meter Temperature Inlet ($T_{m_{in}}$), °F	Dry Gas Meter Temperature Outlet ($T_{m_{out}}$), °F	Pump Vacuum, in. Hg	Sample Box Temperature °F	Impinger Temperature °F
5-3	100.0	1123	404.920	1.00	0.21	0.21	111	72	66	10	250	54
4	104.0	1127	405.925	1.00	0.21	0.21	113	72	66	10	250	56
5	109.0	1131	406.930	1.00	0.21	0.21	114	73	67	10	250	56
6	112.0	1135	408.200	1.10	0.23	0.23	115	73	67	10	250	56
7	116.0	1139	409.130	1.00	0.21	0.21	112	73	67	10	250	58
8	120.0	1143	410.065	1.10	0.23	0.23	111	74	67	10	250	58
9	124.0	1147	411.120	1.10	0.23	0.23	113	74	67	10	250	58
10	128.0	1151	412.230	1.10	0.23	0.23	111	74	67	10	250	58
11	132.0	1155	413.245	1.10	0.23	0.23	110	74	67	10	250	58
12	136.0	1159	414.310	1.10	0.23	0.23	109	74	67	10	250	58
13	140.0	1203	415.375	1.10	0.23	0.23	109	75	67	10	250	58
14	144.0	1207	416.515	1.30	0.27	0.27	109	75	67	10	250	60
15	148.0	1211	417.665	1.30	0.27	0.27	110	76	68	10	250	60
16	152.0	1215	418.805	1.30	0.27	0.27	111	76	68	10	250	60
17	156.0	1219	420.000	1.40	0.29	0.29	111	76	68	10	250	60
18	160.0	1223	421.185	1.40	0.29	0.29	112	76	68	10	250	62
19	164.0	1227	422.440	1.30	0.27	0.27	112	76	68	10	250	62
20	168.0	1231	423.450	1.10	0.23	0.23	114	76	69	10	250	62
21	172.0	1235	424.440	0.95	0.20	0.20	114	76	68	10	250	64
22	176.0	1239	425.325	0.84	0.17	0.17	116	76	69	10	250	64
11	180.0	1243	426.410	1.00	0.21	0.21	116	77	68	10	250	64
11	184.0	1247	427.420	1.00	0.21	0.21	115	77	68	10	250	64
11	188.0	1251	428.430	1.00	0.21	0.21	116	77	68	10	250	66
11	192.0	1255	429.440	1.00	0.21	0.21	118	77	68	10	250	66

TT-B

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
AG TECH STEEL, WATERVLIET, NY	4/8/91	SITE #1	PARTICULATE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
A1A-R4	DAN FITZGERALD	70	30.39	-.239	000316	120	84.149	80.5	

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
1/2 INCONEL STAINLESS	0.122	2-1/0	20		FB3	1.58	1.008	500	0.009	19.9		250	250		60

Δ Begin of New Heat @ 1311

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0											
S-11	196.0	1259	430.535	1.10	0.23	0.23	115	77	68	10	250	66
11	200.0	1303	431.545	1.10	0.23	0.23	115	77	68	10	250	64
11	203.0	1306	432.357	1.10	0.23	0.23	114	77	68	10	250	64
Δ S-1	207.0	1315	433.310	0.90	0.18	0.18	122	77	71	10	250	66
2	211.0	1319	434.315	0.96	0.20	0.20	130	77	71	10	250	66
3	215.0	1323	435.325	1.00	0.21	0.21	119	77	71	10	250	66
4	219.0	1327	436.345	1.00	0.21	0.21	118	78	71	10	250	66
5	223.0	1331	437.420	1.10	0.23	0.23	110	79	71	10	250	66
6	227.0	1335	438.485	1.10	0.23	0.23	109	79	71	10	250	66
7	231.0	1339	439.515	0.96	0.20	0.20	113	80	71	10	250	66
8	235.0	1343	440.545	1.00	0.21	0.21	110	80	71	10	255	66
9	239.0	1347	441.560	1.00	0.21	0.21	108	80	71	10	260	66
10	243.0	1351	442.620	1.10	0.23	0.23	106	80	72	10	260	66
11	247.0	1355	443.675	1.10	0.23	0.23	106	81	72	10	260	66
12	251.0	1359	444.800	1.20	0.25	0.25	106	81	74	10	260	66
13	255.0	1403	445.835	1.10	0.23	0.23	111	81	74	10	260	66
14	259.0	1407	446.860	1.10	0.23	0.23	113	81	74	10	260	66
15	263.0	1411	447.855	0.92	0.19	0.19	121	82	74	10	260	68
16	267.0	1415	448.860	0.96	0.20	0.20	119	83	74	10	250	68
17	271.0	1419	449.915	1.05	0.21	0.21	119	83	74	10	250	68
18	275.0	1423	450.950	1.05	0.21	0.21	116	84	75	10	250	66
19	279.0	1429	452.090	1.20	0.25	0.25	113	84	75	10	250	66
20	283.0	1431	453.220	1.20	0.25	0.25	110	84	75	10	250	64
21	287.0	1435	454.359	1.20	0.25	0.25	110	84	75	10	250	64

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALL TISCH STEAM, WATERVILLE, NY	9/8/81	SITE #1	PARTICULATE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS. (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
A/P-2	DAN BLUTZGERALD	70	30.39	-.23P	#0993/91	1299	.84/.84	40, FS	

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FOOT STAINLESS	.0133	2-1/P1	20		FB3	1.88	1.903	0.00	0.00	1.139		250P	250P		40

*Change of Ports leak check begin Volume – 455.458 @ 1447 5°

☐ Process Shutdown begin @ 1510

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0		•									
S-22	291.0	1439	455.901	1.00	0.21	0.21	114	75	75	1.0	250	64
N-1	295.0	1451	456.535	1.10	0.23	0.23	115	85	78	1.0	250	64
2	299.0	1455	457.635	1.20	0.25	0.25	119	86	78	1.0	250	64
3	303.0	1459	458.755	1.20	0.25	0.25	122	86	78	1.0	250	65
4	308.0	1503	459.358	1.40	0.29	0.29	120	86	78	1.0	250	65
5	310.0	1512	459.900	1.40	0.29	0.29	115	85	79	1.5	250	65
6	315.0	1516	460.995	1.50	0.31	0.31	112	85	79	1.5	250	65
7	315.0	1520	462.230	1.50	0.31	0.31	111	85	79	1.5	250	65
8	319.0	1524	463.490	1.50	0.31	0.31	111	86	79	1.5	250	65
9	323.0	1528	464.710	1.40	0.29	0.29	112	86	80	1.5	250	65
10	327.0	1532	465.890	1.30	0.27	0.27	113	87	81	1.5	250	65
11	331.0	1536	466.990	1.20	0.25	0.25	115	87	80	1.5	250	65
12	335.0	1540	468.160	1.30	0.27	0.27	117	88	81	1.5	250	65
13	339.0	1544	469.270	1.20	0.25	0.25	124	88	81	1.5	250	65
14	343.0	1548	470.405	1.20	0.25	0.25	125	89	81	1.5	250	65
15	347.0	1552	471.505	1.10	0.23	0.23	125	89	81	1.5	250	65
16	351.0	1556	472.490	0.92	0.19	0.19	120	89	81	1.5	250	65
17	355.0	1600	473.475	0.92	0.19	0.19	119	90	81	1.5	250	65
18	359.0	1604	474.545	1.10	0.23	0.23	116	90	82	1.5	250	65
19	363.0	1608	475.600	1.00	0.21	0.21	114	90	83	1.5	250	64
20	367.0	1612	476.595	0.96	0.20	0.20	120	90	83	1.5	250	64
21	371.0	1616	477.620	1.05	0.22	0.22	118	90	83	1.5	250	64
22	375.0	1620	478.600	0.92	0.19	0.19	120	90	83	1.5	250	64
23	379.0	1624	479.539	0.85	0.18	0.18	129	90	83	1.5	250	64

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALLTECH, STEEL CORP, WATERVILLE, MX	8/18/91	SITE #1	PARTICULATES

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
ALP-3	DAN FITZGERALD	70	30.39	30.39	#99931	1200	[illegible]		50.5

PROBE LENGTH AND TYPE	NOZZLE I.D	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER Δ H @	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
1/2 FOOT, STAINLESS	0.123	2-10	20		FA3	1.88	1.008	50	0.099	1.99		250	250		60

8 9 10 TRAVERSE POINT NUMBER	11 12 13 14 SAMPLING TIME, min	15 16 17 18 CLOCK TIME (24 hr CLOCK)	19 20 21 22 23 24 GAS METER READING (V_m), ft^3	25 26 27 28 29 VELOCITY HEAD (Δp_s), in. H_2O	30 31 32 33 34 35 36 37 ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	38 39 40 41 STACK TEMPERATURE (T_s), °F	42 43 44 45 46 47 DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	48 49 50 51 PUMP VACUUM, in. Hg	52 53 54 SAMPLE BOX TEMPERATURE °F	55 56 57 IMPINGER TEMPERATURE °F
	0											
N-11	393.0	1628	480.535	1.00	0.21	0.21	122	90	83	15	250	64
11	397.0	1632	481.630	1.20	0.25	0.25	119	90	83	15	250	64
11	391.0	1636	482.760	1.20	0.25	0.25	120	90	83	15	250	64
11	395.0	1640	483.885	1.20	0.25	0.25	118	90	84	15	250	64
11	399.0	1644	485.001	1.20	0.25	0.25	115	90	84	15	250	64

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALL TECH STEEL, WATERVLIET, NY	4/9/81	SITE #1	PARTICULATE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
A1P-3	DAN FITZGERALD	56	29.97	-.23	#0002220	120	0.84/1.00	10	1 of 2

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FOOT STAINLESS	0.122	2-1P1	1P		FB3	1.98	1.008	5	0.003	1.224		250	250		80

DIGITAL #207
PITOT #252

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPING TEMPERA °F
	0	0933	485.217									
N-1	8.0	0941	486.175	0.88	0.19	0.19	102	61	58	10	255	50
2	16.0	0949	489.235	1.10	0.24	0.24	102	63	58	10	250	50
3	24.0	0957	491.490	1.20	0.26	0.26	102	64	58	10	250	48
4	32.0	1005	494.060	1.60	0.35	0.35	101	66	60	10	250	50
5	40.0	1013	496.590	1.50	0.33	0.33	100	69	60	10	250	48
6	48.0	1021	499.100	1.50	0.33	0.33	104	70	61	10	250	50
7	56.0	1029	501.505	1.40	0.30	0.30	105	71	61	10	250	50
8	64.0	1037	503.910	1.40	0.30	0.30	104	72	62	10	250	52
9	72.0	1045	506.240	1.30	0.28	0.28	105	73	64	10	250	52
10	80.0	1049	508.485	1.20	0.26	0.26	111	73	64	10	250	54
11	88.0	1057	510.800	1.20	0.26	0.26	113	75	64	10	250	52
12	96.0	1105	513.100	1.20	0.26	0.26	110	75	65	10	250	50
13	104.0	1113	515.240	1.10	0.23	0.23	112	75	67	10	250	50
14	112.0	1121	517.440	1.10	0.24	0.24	107	76	67	10	250	50
15	120.0	1129	519.640	1.10	0.24	0.24	110	76	68	10	260	50
16	128.0	1137	521.835	1.10	0.24	0.24	110	77	69	10	260	50
17	136.0	1145	524.145	1.20	0.26	0.26	110	77	69	10	265	50
18	144.0	1153	526.475	1.20	0.26	0.26	110	77	69	10	265	50
19	152.0	1201	528.660	1.10	0.23	0.23	113	77	69	10	265	50
20	160.0	1209	530.795	1.20	0.26	0.26	115	77	69	10	260	50
21	168.0	1217	533.245	1.40	0.30	0.30	115	77	69	10	260	50
22	176.0	1225	535.747	1.50	0.31	0.31	125	77	70	10	260	50
*S-1	184.0	1252	537.870	0.96	0.21	0.21	111	75	70	10	260	52
2	192.0	1300	539.915	0.96	0.22	0.22	102	75	70	10	260	52

* Port Change leak check begin Volume 535.853 @ 1244

3965 A RUN NO. A1P-3

3964 A&B RUN NO. A1P-3

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALL TECH STEEL, WATERVILLET, NY	4/8/81	SITE #1	PARTICULATE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
ALP03	DAN FITZGERALD	60	30.07	-.330	#00026539	12.99	0.84	1412	0.F2

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O, (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
1/2 FOOT STAINLESS	0.484	2-1.91	10		FA3	1.98	1.098	50	.0093	1.224		259	259		60

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0											
S-3	200.0	1308	541.910	0.96	0.21	0.21	111	75	70	10	250	50
4	208.0	1316	543.885	1.00	0.21	0.21	108	76	70	10	250	50
5	216.0	1324	545.860	1.00	0.21	0.21	105	76	70	10	250	50
6	224.0	1332	547.990	1.10	0.24	0.24	105	76	70	10	250	50
7	232.0	1340	550.135	1.10	0.24	0.24	103	76	70	10	250	48
8	240.0	1348	552.215	1.10	0.23	0.23	110	76	70	10	250	48
9	248.0	1356	554.225	1.00	0.22	0.22	102	76	70	10	250	48
10	256.0	1404	556.235	1.05	0.22	0.22	110	76	70	10	250	48
11	264.0	1412	558.250	1.05	0.22	0.22	107	75	69	10	250	48
12	272.0	1420	560.395	1.10	0.24	0.24	105	75	69	10	250	48
13	280.0	1428	562.690	1.30	0.28	0.28	103	75	69	10	235	46
14	288.0	1436	565.140	1.40	0.31	0.31	100	75	69	15	250	46
15	296.0	1444	567.585	1.50	0.33	0.33	103	75	69	15	250	46
16	304.0	1452	570.050	1.50	0.33	0.33	100	75	69	15	250	46
17	312.0	1500	572.520	1.50	0.33	0.33	102	75	69	15	250	46
18	320.0	1508	574.975	1.50	0.33	0.33	108	75	69	15	250	46
19	328.0	1516	577.500	1.50	0.33	0.33	107	74	68	15	250	46
20	336.0	1524	579.870	1.45	0.31	0.31	106	74	68	15	250	46
21	344.0	1532	582.185	1.30	0.28	0.28	104	75	68	15	250	46
22	352.0	1540	584.501	1.30	0.27	0.27	110	74	68	15	250	46

GAS VELOCITY AND VOLUME DATA

	PLANT AND CITY	RUN DATE
1.	AL TECH SPECIALTY STEEL, WATERVLIET, NY	4/16/81

SAMPLING LOCATION	CLOCK TIME
SITE #2 (INLET)	0955

RUN NUMBER	OPERATOR	AMB. TEMP. (°F)	BAR. PRESS (in. Hg)	STATIC PRESS (in. H_2O)
2. ZV-1	D. FITZGERALD	35	30.1	-2.60

MOLECULAR WT.	STACK INSIDE DIMENSION (in.) DIAM OR SIDE 1	SIDE 2	PITOT TUBE Cp	MOISTURE %
	120.0		0.84	

$\overline{\sqrt{\Delta p}} = 1.198$

$\bar{T}_s \approx 560$

$P_s = 29.9$

$D_N = 0.133$

$\theta q_{NOZZLE} = 0.4$

$\overline{\Delta P} = 1.44$

PITOT # 253

$C_p = 0.80$

FIELD DATA

TRAVERSE POINT NUMBER	POSITION (in.)	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMP, °F
7,8,9,10	11,12,13,14	25,26,27,28,29	38,39,40,41
1		0.97	82
2		1.40	84
3		1.50	85
4		1.55	90
5		1.50	91
6		1.35	92
7		1.50	92
8		1.60	92
9		1.60	92
10		1.60	92
11		1.65	92
12		1.50	92
13		1.40	92
14		1.40	92
15		1.40	93
16		1.30	93
17		1.25	92
18		1.25	92
19		1.30	92
20		1.40	93
21		1.20	92
22		1.05	92
1		0.91	89
2		1.20	90
3		1.50	83
4		1.50	86
5		1.50	87
6		1.45	88
7		1.45	88
8		1.50	89
9		1.40	89
10		1.45	90
11		1.40	91
12		1.50	92
13		1.50	93
14		1.60	93
15		1.55	93
16		1.65	92
17		1.60	92
18		1.60	92
19		1.70	92
20		1.55	91
21		1.75	91
22		1.50	91

STATIC −2.60" H_2O

STATIC −2.60" H_2O

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALTISCH STEEL, WATERVILLE OH	4/7/81	SITE #2	PARTICULATES

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS. (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	TIME BOX NO.	PAGE
A2P-1	DAVE FITZGERALD	59	29.59	-.349	#0P021AA	129	0.84	1.0	1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FOOT STAINLESS	0.188	3/4	2.0	295	FA2	1.76	1.007	1/2	0.004	16.639		250°F	250°F		80

PITOT #252

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	1027	082.912									
S-1	8.0	1045	088.205	1.20	1.44	1.44	96	59	57	3.0	275	42
2	16.0	1053	093.670	1.30	1.56	1.56	96	59	57	3.5	275	42
3	24.0	1101	099.520	1.50	1.80	1.80	97	62	57	3.5	270	42
4	32.0	1109	105.480	1.50	1.77	1.77	105	63	57	4.0	270	44
5	40.0	1117	111.390	1.55	1.85	1.85	100	66	57	4.0	300	42
6	48.0	1125	117.375	1.50	1.80	1.80	97	67	57	4.0	290	44
7	56.0	1133	123.345	1.45	1.74	1.74	96	67	57	4.0	280	44
8	64.0	1141	129.435	1.55	1.86	1.86	97	67	57	4.0	280	44
9	72.0	1149	135.210	1.45	1.73	1.73	100	68	57	4.0	280	44
10	80.0	1157	140.995	1.45	1.69	1.69	120	68	57	4.0	280	44
11	88.0	1205	146.950	1.20	1.41	1.41	106	69	57	4.0	280	44
12	96.0	1213	151.640	1.10	1.30	1.30	105	69	58	4.0	275	44
13	104.0	1221	156.450	1.10	1.31	1.31	99	69	58	4.0	270	44
14	112.0	1229	161.995	1.20	1.46	1.46	97	69	58	4.0	270	44
15	120.0	1237	167.395	1.20	1.45	1.45	103	69	58	4.5	265	44
16	128.0	1245	192.785	1.20	1.45	1.45	103	69	58	4.5	270	46
17	136.0	1253	177.835	0.98	1.18	1.18	100	69	58	4.0	270	46
18	144.0	1301	182.825	1.00	1.19	1.19	101	69	58	4.0	270	46
19	152.0	1309	187.780	1.00	1.17	1.17	108	69	58	4.0	275	46
20	160.0	1317	192.820	1.10	1.29	1.29	107	70	58	4.5	275	46
21	168.0	1325	197.775	1.00	1.19	1.19	105	70	59	4.5	270	48
22	176.0	1333	202.585	0.94	1.11	1.11	104	70	59	4.5	270	48
23	184.0	1341	207.545	1.00	1.18	1.18	106	71	60	4.5	270	48
24	192.0	1349	208.109	1.00	1.18	1.18	96	71	60	4.5	270	48

3993 A&B RUN NO. A2P-1

3986 A&B RUN NO. A2P-1

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
AL TECH STEEL, WATERVLIET, NY	4/7/81	SITE #2	PARTICULATE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
A2P-1	DAN FITZGERALD	60	29.50	-1.29	#1990, 1991	139	0.84	1.49	70 of 73

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK In. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FOOT STAINLESS	0.188	3-1	20	295	F82	1.76	1.007			16679		250°F	250°F		30

Change of Ports leak check begin Volume — 208.173
Shut down — no furnace operation; start back @ 1537

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0		•									
* N-1	193.0	1402	212.840	0.94	1.10	1.10	108	67	60	45	270	46
2	201.0	1410	217.440	0.90	0.97	0.97	161	68	60	45	270	46
3	209.0	1418	222.715	1.30	1.48	1.48	127	71	60	55	270	48
4	217.0	1426	227.975	1.30	1.38	1.38	166	72	62	6.0	270	50
5	225.0	1434	233.480	1.30	1.54	1.54	109	77	63	6.5	270	52
B 6	233.0	1442	238.850	1.30	1.42	1.42	151	79	64	6.5	270	52
7	241.0	1450	244.240	1.20	1.40	1.40	113	80	66	6.5	260	54
8	249.0	1458	249.570	1.20	1.37	1.37	124	81	67	7.0	255	54
9	257.0	1506	255.175	1.30	1.54	1.54	108	82	69	7.5	250	56
10	265.0	1514	260.620	1.20	1.39	1.39	114	83	70	7.0	250	56
11	273.0	1522	266.050	1.20	1.39	1.39	114	83	70	7.0	240	55
A 12	285	1524	267.418	1.20	1.39	1.39	113	84	72	7.0	250	56
12	289.	1543	271.540	1.40	1.64	1.64	110	80	73	8.0	250	54
13 14	297.	1551	277.555	1.40	1.65	1.65	104	80	73	8.0	250	54
14 15	305.	1559	283.475	1.50	1.78	1.78	103	82	73	8.5	250	56
15 16	305.0	1607	289.490	1.50	1.76	1.76	108	84	74	8.5	250	56
16 17	313.0	1615	295.490	1.50	1.76	1.76	110	86	75	8.5	250	56
17	321.0	1623	301.410	1.50	1.74	1.74	115	88	76	8.5	250	56
18	329.0	1631	307.905	1.60	1.88	1.88	108	89	78	9.5	250	56
19	337.0	1639	313.820	1.70	1.97	1.97	115	89	78	10.0	250	56
20	345.0	1647	319.920	1.50	1.76	1.76	110	89	78	9.5	250	56
21	353.0	1655	325.590	1.40	1.54	1.54	145	89	78	9.0	260	56
22	361.0	1703	331.160	1.30	1.42	1.42	151	89	79	9.0	255	56
23	369.0	1711	336.450	1.29	1.28	1.28	176	89	80	8.5	255	56

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALTECH STEEL, WATERVILLIET, NY	9/7/81	SITE #2	PARTICULATE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THE BOX NO.	PAGE
A2P-1	DAN BURGERAGA	65	30.60	-2.90	A00P3197	12.90	0.84	1/49	30 of 33

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (S)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA REMS
1/2 FGGT GLASS	0.188	3/1	20	2.75	5B2	1.79	1.907			1.6670		250°F	250°F		80

7 8 9 10 TRAVERSE POINT NUMBER	11 12 13 14 SAMPLING TIME, min (0)	15 16 17 18 CLOCK TIME (24 hr CLOCK)	19 20 21 22 23 24 GAS METER READING (V_m), ft^3	25 26 27 28 29 VELOCITY HEAD (Δp_s), in. H_2O	30 31 32 33 34 35 36 37 ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	38 39 40 41 STACK TEMPERATURE (T_s), °F	42 43 44 DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	45 46 47 OUTLET ($T_{m_{out}}$), °F	48 49 50 51 PUMP VACUUM, in. Hg	52 53 54 SAMPLE BOX TEMPERATURE °F	55 56 57 IMPINGER TEMPERATURE °F
11	377.0	1719	341.605	1.20	1.28	1.28	163	84	79	8.5	360	56
11	385.0	1727	346.755	1.20	1.28	1.28	161	87	79	8.5	250	56
11	386.0	1738	347.414	1.20	1.28	1.28	155	87	79	8.5	250	56

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Al Tech Specialty Steel Corp
DATE 4-6-81 TEST NO A2P-P
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION SITE#2
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 35
OPERATOR Dan Fitzgerald
ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	0.2	0.2	0.2	0.2				44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.6	20.4	20.4	20.2				32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
AIG TECH STEEL, WATERBURY CT	4/8/91	SITE #12	PARTICULATE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS. (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	NOZZLE
A2P-2	DAN FITZGERALD	79	30.39	-.35	[illegible]	12.00	0.84	5.8	10.F2

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA FROM
12 FOOT STAINLESS	0.188		20		FB2	1.76	1.007	10	0.004	6676		250°F	250°F		C

PITOT #251

DIGITAL #207

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	0937	347.700									
S-1	8.0	0945	352.625	0.93	1.15	1.15	80	62	60	20	200	52
2	16.0	0953	358.310	1.40	1.66	1.66	103	66	60	3.0	200	58
3	24.0	1001	364.005	1.40	1.62	1.62	116	70	60	3.0	200	61
4	32.0	1009	369.875	1.40	1.66	1.66	105	73	61	3.0	205	61
5	40.0	1017	375.575	1.35	1.59	1.59	108	74	62	3.0	200	61
6	48.0	1025	381.020	1.40	1.63	1.63	111	75	63	3.0	200	62
7	56.0	1033	387.000	1.50	1.75	1.75	112	76	64	3.5	200	62
8	64.0	1041	393.030	1.60	1.85	1.85	118	78	66	4.0	200	62
9	72.0	1049	399.265	1.60	1.83	1.83	124	78	66	4.5	200	62
10	80.0	1057	405.500	1.50	1.74	1.74	115	78	67	4.5	200	62
11	88.0	1105	410.900	1.20	1.39	1.39	117	79	67	4.0	200	60
12	96.0	1113	415.860	1.05	1.15	1.15	152	79	68	4.0	200	60
13	104.0	1121	421.500	1.30	1.52	1.52	109	79	68	4.5	200	60
14	112.0	1129	427.320	1.40	1.65	1.65	107	80	70	4.5	200	60
15	120.0	1137	432.780	1.25	1.42	1.42	129	80	70	4.5	200	60
16	128.0	1145	437.965	1.20	1.33	1.33	140	80	70	4.5	200	60
17	136.0	1153	443.110	1.20	1.36	1.36	129	80	71	5.0	200	60
18	144.0	1201	448.620	1.30	1.49	1.49	122	80	71	5.5	200	60
19	152.0	1209	453.995	1.20	1.40	1.40	111	81	71	5.5	200	60
20	160.0	1217	459.330	1.20	1.40	1.40	113	82	72	5.5	200	60
21	168.0	1225	464.470	1.10	1.28	1.28	114	82	72	5.5	200	60
22	176.0	1233	469.139	0.83	0.97	0.97	112	82	72	5.0	200	60
~~23~~	184.0	1253	474.045	0.83	0.99	0.99	98	77	76	5.0	200	60
24	192.0	1301	478.990	0.90	1.06	1.06	98	78	73	6.0	200	60

Change of DGTA leak check begin Volume 469.235 @ 1295

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
AL TECH STEEL, WATERVLIET, NY	8/18/81	STACK #12	PARTICULATE

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (in Hg)	STATIC PRESS (in H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE C_p	THERM NO.	PAGE
A2P-2	DAN FITZGERALD	70	30.39	-2.50	A0002158	120.0	0.84		2 of 2

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER Δ H @	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FOOT STAINLESS	0.188	3-11	20		F02	1.79	1.997			6676		250°F	250°F		8.0

☐ Process Shutdown begin @ 1518

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0											
N-3	200.0	1309	484.465	1.20	1.80	1.80	112	80	73	6.5	200	62
4	208.0	1317	489.955	1.10	1.27	1.27	116	81	74	6.5	200	62
5	216.0	1325	495.050	1.10	1.27	1.27	120	81	74	6.5	200	60
6	224.0	1333	500.825	1.40	1.62	1.62	116	82	74	7.5	200	60
7	232.0	1341	506.570	1.30	1.52	1.52	109	83	75	8.0	200	60
8	240.0	1349	512.150	1.20	1.39	1.39	116	83	75	8.0	200	60
9	248.0	1357	517.620	1.20	1.40	1.40	108	85	76	8.0	200	60
10	256.0	1405	522.860	1.30	1.51	1.51	114	85	76	8.0	200	60
11	264.0	1413	528.320	1.20	1.37	1.37	127	85	76	8.0	200	60
12	272.0	1421	533.140	1.30	1.49	1.49	121	86	78	8.5	200	60
13	280.0	1429	539.895	1.30	1.50	1.50	117	88	79	8.5	200	60
14	288.0	1437	545.620	1.30	1.50	1.50	114	90	90	9.0	200	60
15	296.0	1445	551.200	1.30	1.50	1.50	116	92	80	9.0	200	60
16	304.0	1453	556.925	1.30	1.48	1.48	125	94	82	9.0	200	60
17	312.0	1501	562.557	1.30	1.49	1.49	127	95	83	9.0	210	60
18	☐320.0	1526	568.510	1.50	1.44	1.44	115	89	85	9.5	200	60
19	328.0	1534	574.565	1.50	1.75	1.75	112	90	85	9.5	200	60
20	336.0	1542	580.570	1.50	1.69	1.69	131	91	85	9.5	210	62
21	344.0	1550	586.420	1.40	1.52	1.52	153	94	85	9.5	210	62
22	352.0	1558	591.600	1.0	1.19	1.19	159	95	87	8.5	210	62

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
AL TECH STEEL, WATERVLIET, NY	4/8/81	SITE #2	PARTICULATE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS. (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIAM. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
A2P-3	DAN FITZGERALD	56	30.27	-.30	#99971971	120.9	0.84	254	1 OF 2

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
1/2 FOOT STAINLESS	0.189	3-T-11	10		FB3	1.76	1.007	12	0.0992	6.803		250°	250°		80

DIGITAL # 207
PITOT # 251

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F #2	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPING TEMPERA °F
	0	0929	591.862									
S-1	8.0	0937	596.570	0.83	1.02	1.02	92	58	58	20	235	49
2	16.0	0945	601.691	1.10	1.32	1.32	106	62	58	3.0	220	50
3	24.0	0953	607.471	1.30	1.57	1.57	104	68	59	3.0	220	50
4	32.0	1001	613.284	1.50	1.82	1.82	102	78	60	3.0	220	50
5	40.0	1009	619.580	1.55	1.89	1.89	99	76	63	3.0	215	50
6	48.0	1017	625.772	1.50	1.82	1.82	100	78	64	3.0	215	52
7	56.0	1025	631.975	1.60	1.82	1.82	102	80	65	3.0	210	52
8	64.0	1033	637.134	1.45	1.75	1.75	103	81	66	3.5	215	50
9	72.0	1037	644.155	1.40	1.69	1.69	103	82	68	3.5	215	50
10	80.0	1045	650.085	1.40	1.68	1.68	107	83	79	35	215	50
11	88.0	1053	656.005	1.40	1.67	1.67	111	84	80	35	215	50
12	96.0	1101	661.756	1.30	1.56	1.56	106	85	72	35	210	50
13	104.0	1109	667.490	1.30	1.56	1.56	104	85	73	35	210	50
14	112.0	1117	673.150	1.20	1.45	1.45	103	85	74	35	210	50
15	120.0	1125	678.650	1.20	1.44	1.44	106	85	74	35	210	50
16	128.0	1133	684.165	1.20	1.43	1.43	108	86	74	35	210	50
17	136.0	1141	689.840	1.20	1.44	1.44	107	86	75	40	210	50
18	144.0	1149	695.400	1.20	1.43	1.43	110	87	75	40	220	51
19	152.0	1157	700.890	1.05	1.27	1.27	103	87	76	40	220	51
20	160.0	1205	705.725	1.05	1.19	1.19	139	86	76	40	220	51
21	168.0	1213	710.740	0.96	1.15	1.15	110	86	76	40	220	51
22	176.0	1221	715.597	0.86	1.03	1.03	107	86	76	40	220	51
*N-1	184.0	1249	720.675	0.95	1.14	1.14	85	80	75	4.0	220	52
2	192.0	1256	726.255	1.00	1.51	1.51	127	80	75	50	220	52

* Port Change leak check begin Volume 715.692 @ 1240

3966 A&B RUN NO. A2P-3

3967 A RUN NO. A2P-3

EMISSION TESTING FIELD DATA

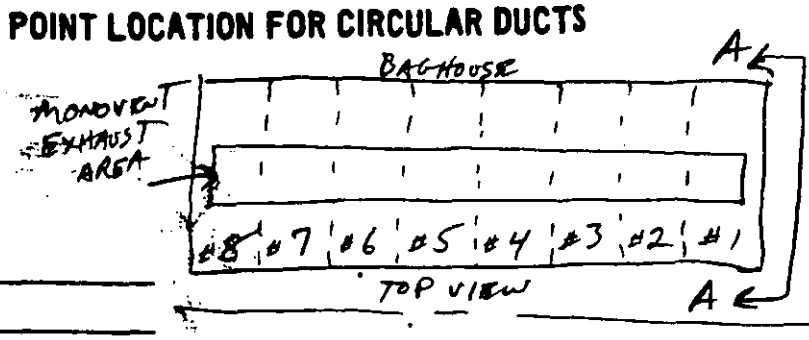
PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
A.L. TECH STIGER, WATERVLIET, NY	4/9/91	SITE #4	PARTICULATE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS. (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
A2A-3	DAN FITZGERALD	60	30.07	-.300	#0992197	1290	.84		20 of 23

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK (IN. Hg)	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
1.4 FORT STAINLESS	0.192	B-111	.18		FB3	1.76	1.017	1.25	0.002	16893		250°F	250°F		18.0

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0											
A-3	200.0	1304	731.485	1.20	1.29	1.29	173	80	75	5.0	220	52
4	208.0	1312	736.715	1.20	1.29	1.29	171	81	75	5.0	220	52
5	216.0	1320	742.310	1.30	1.54	1.54	114	82	75	6.0	220	52
6	224.0	1328	748.035	1.40	1.54	1.54	157	82	75	6.0	220	52
7	232.0	1336	753.815	1.40	1.62	1.62	126	82	74	6.5	220	52
8	240.0	1344	759.415	1.50	1.72	1.72	132	82	74	7.0	220	52
9	248.0	1352	765.370	1.30	1.47	1.47	140	82	74	7.0	220	52
10	256.0	1400	770.860	1.30	1.47	1.47	139	81	74	7.0	220	52
11	264.0	1408	776.625	1.40	1.62	1.62	125	81	73	8.0	220	52
12	272.0	1416	782.160	1.20	1.41	1.41	119	81	73	8.0	220	52
13	280.0	1424	787.785	1.30	1.56	1.56	106	80	73	8.0	220	52
14	288.0	1432	793.930	1.45	1.74	1.74	107	80	73	9.5	220	50
15	296.0	1440	799.980	1.50	1.81	1.81	104	80	73	9.5	220	50
16	304.0	1448	806.100	1.50	1.82	1.82	101	80	72	10.0	220	50
17	312.0	1456	812.230	1.50	1.82	1.82	101	80	72	10.0	220	50
18	320.0	1504	818.645	1.65	1.99	1.99	105	78	71	11.0	220	50
19	328.0	1512	824.995	1.55	1.85	1.85	110	78	71	11.0	220	50
20	336.0	1520	831.085	1.55	1.85	1.85	112	78	71	11.5	220	50
21	344.0	1528	837.300	1.45	1.74	1.74	107	77	70	11.5	220	50
22	352.0	1536	843.980	1.35	1.62	1.62	108	77	70	11.0	220	50

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS



Plant AL TECH

Date 4/5/81

Sampling location SITE 3 - OUTLET

Inside of far wall to outside of nipple NA

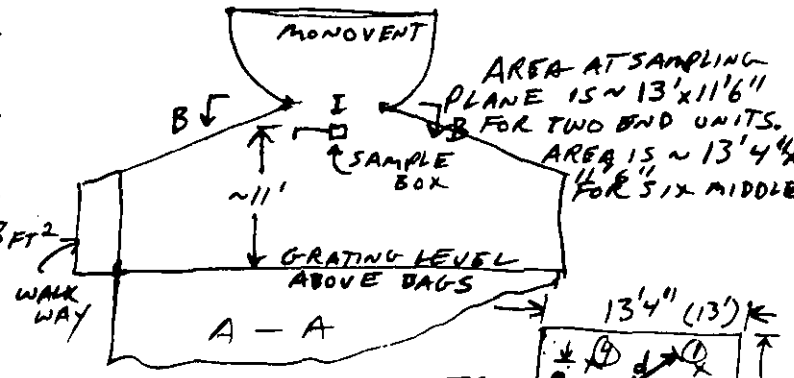
Inside of near wall to outside of nipple (nipple length) NA

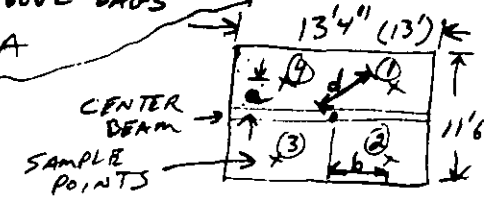
Stack ~~I.D.~~ 11'6" x [6(13'4") + 2(13')] = 1218.8 FT²

Nearest upstream disturbance 0 dd

Nearest downstream disturbance 0 dd

Calculated by PROHASKA





SCHEMATIC OF SAMPLING LOCATION B-B

$a = \frac{11'6''}{4} = 2'10\frac{1}{2}'' =$

$b = 13'4''/4 = 40''$ $(b) = (\frac{13'}{4}) = (39'')$

$d = (34.5^2 + 39.5^2)^{1/2} = 52\frac{1}{2}''$

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	NIPPLE LENGTH	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	"d"	NA	52 ½"	0	
2			"		
3			"		
4			"		

GAS VELOCITY AND VOLUME DATA

	PLANT AND CITY	RUN DATE
1.	AL Tech	4/16/81

SAMPLING LOCATION	CLOCK TIME
Baghouse Outlet	

	RUN NUMBER	OPERATOR	AMB. TEMP. (°F)	BAR. PRESS (in. Hg)	STATIC PRESS (in. H_2O)
2.	VEL	Schwerer	50		

MOLECULAR WT.	STACK INSIDE DIMENSION (in.) DIAM OR SIDE 1	SIDE 2	PITOT TUBE Cp	MOISTURE %
29.0			0.84	20

FIELD DATA

TRAVERSE POINT NUMBER	POSITION (in.)	VELOCITY HEAD (Δp_s), in.H_2O	STACK TEMP, °F
1-1		0.010	96
1-2		0.010	96
1-3		0.015	96
1-4		0.010	96
2-1		0.020	104
2-2		0.020	103
2-3		0.025	103
2-4		0.015	102
4-1		–	104
4-2		–	
4-3		–	
4-4		–	

COMPARTMENT

4	1
3	2

N

8 ← 1 DOOR

486
69
417

TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
[illegible] SPECIALTY STEEL [illegible]	04/08/81	BAGHOUSE OUTLET	[illegible]

RUN NO.	OPERATOR	AMB. TEMP. (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK-TESTER DIMEN. (INCHES)	PITOT TUBE C_p	THERM NO.	PAGE
ASP-1	R. ANTINSBERGER	623	24.00	0.00	0000205		0.84/28	60.6	

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	ORIFICE Δ H @	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS.
5 FT GLASS	5/8	87/97	16	T	FB7/171	1.004	[illegible]			1.0	[illegible]	[illegible]	300	0.3	300

+START – 12:05
+START – 13:45
+START – 15:30

★ BAG RAPPER (1 min)

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	10:30	784.255									
-1	200	10:50	797.700	★ .02	1.25	1.25	101	70	66	30	230	44
-2	400	11:10	811.200	.02	1.25	1.25	105	74	66	30	230	44
-3	600	11:30	824.800	★ .02	1.25	1.25	105	76	69	30	235	45
-4	800	11:50	838.420	.02	1.25	1.25	107	78	70	30	240	45
-1	+ 1000	12:25	851.900	★ .02	1.25	1.25	100	77	72	30	240	46
-2	1200	12:45	865.450	.02	1.25	1.25	103	77	72	30	245	48
-3	1400	13:05	878.950	★ .02	1.25	1.25	102	77	72	30	245	48
-4	1600	13:25	892.415	.02	1.25	1.25	103	78	72	35	245	48
-1	+ 1800	14:05	905.950	.02	1.25	1.25	100	78	72	35	245	49
-2	2000	14:25	919.500	★ .02	1.25	1.25	105	80	72	35	245	50
-3	2200	14:45	933.150	.02	1.25	1.25	110	82	73	35	250	50
-4	2400	15:05	946.820	★ .02	1.25	1.25	120	82	73	35	250	50
-1	+ 2600	15:50	960.600	.02	1.25	1.25	110	80	72	35	250	53
-2	2800	16:10	974.402	★ .02	1.25	1.25	114	82	72	35	250	53
-3	3000	16:30	988.150	.02	1.25	1.25	117	84	74	35	250	55
-4	3200	16:50	001.835	★ .02	1.25	1.25	123	86	76	35	250	58

DRY MOLECULAR WEIGHT DETERMINATION

PLANT AL TECH SPECIALTY STEEL CORP
DATE 4-6-81 TEST NO A3P-P
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION SITE #3
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD ORSAT
AMBIENT TEMPERATURE 50
OPERATOR DAN FITZGERALD
ORSAT LEAK CHECKED ✓

COMMENTS:

GAS \ RUN	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	0.2	0.2						44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.8	20.6						32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

29

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALLIED SPECIALTY, STATESVILLE	04/08/81	BAGHOUSE OUTLET	PARTICULATE

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H2O)	FILTER NUMBER(S)	STACK DIAM. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
A2P-2	R. ANDERSON	70	30.38	+.05	0002147	14 1/4"	0.84	88	0.F.1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H2O (%)	SAMPLE BOX NO	METER BOX NO	METER Δ H @	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA FILES
GLASS	.0519	8-197	22	T	FB7/171	1.9014	3.0000	LESS THAN			1.0	250	250	.03	390

+ START - 11:10
+ START - 13:45
+ START - 14:25

★ BAG RAPPER (1 min)

.032

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	09:35	002.000									
3-1	200	09:55	015.450	.02	1.25	1.25	88	74	69	30	235	42
3-2	400	10:15	028.900	★.02	1.25	1.25	99	80	72	30	240	43
3-3	600	10:35	042.250	.02	1.15	1.15	115	82	74	30	250	44
3-4	800	10:55	055.275	★.02	1.15	1.15	132	84	74	30	255	44
4-1	+ 1000	11:30	068.330	★.02	1.15	1.15	109	82	76	30	250	45
4-2	1200	11:50	081.400	.02	1.15	1.15	128	84	76	30	250	44
4-3	1400	12:10	094.400	★.02	1.15	1.15	132	86	78	30	250	45
4-4	1600	12:30	107.615	.02	1.15	1.15	180	88	80	30	255	45
5-1	+ 1800	13:05	120.250	★.02	1.15	1.15	121	86	80	30	250	48
5-2	2000	13:25	133.850	★.02	1.15	1.15	124	86	80	30	250	49
5-3	2200	13:45	147.050	.02	1.15	1.15	120	88	80	30	250	50
5-4	2400	14:05	160.020	★.02	1.15	1.15	120	88	82	30	250	50
6-1	+ 2600	14:45	173.550	★.02	1.15	1.15	115	86	80	30	250	51
6-2	2800	15:05	186.828	.02	1.15	1.15	124	88	82	30	250	51
6-3	3000	15:25	200.100	.02	1.15	1.15	134	86	82	30	250	53
6-4	3200	15:45	213.271	★.02	1.15	1.15	124	88	82	30	250	54

NOTE: TESTS WERE STOPPED FROM [illegible] TO 15:[illegible] FOR [illegible] DEBAG. [illegible] times
[illegible]

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALLTECH SPECIALTY STEEL ALBANY, NY	09/09/91	BAGHOUSE OUTLET	PARTICULATE

Run No.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIAM. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
A30-3	A. WHITE	65	29.94	-.05	00009200	14.40	0.84	28	1 of 1

907172
ES
084

PORT LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (B)	SAMPLE BOX NO.	METER BOX NO.	METER Δ H@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
GLASS	0.510	8-7107	20	□	FB7	1.71	1.004	30	0.0		1.0	250	250	0.032	90

1st START = 11:05
2nd START = 13:45
3rd START = 14:25

★ BAG RAPPER (1 min)

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	09:30	213.680									
5-1	20.0	09:50	226.650	★.02	1.15	1.15	110	71	68	30	250	42
5-2	40.0	10:10	239.800	.02	1.15	1.15	111	80	70	30	250	43
5-3	60.0	10:30	252.750	★.02	1.15	1.15	110	84	74	30	250	44
5-4	80.0	10:50	265.980	.02	1.15	1.15	109	86	77	30	250	45
6-1	4 100.0	11:25	279.200	.02	1.15	1.15	98	84	75	30	250	47
6-2	120.0	11:45	292.400	★.02	1.15	1.15	115	85	78	30	250	47
6-3	140.0	12:05	305.700	.02	1.15	1.15	118	88	80	30	250	48
6-4	160.0	12:25	318.900	★.02	1.15	1.15	119	88	80	30	250	48
7-1	4 180.0	13:05	331.850	★.02	1.15	1.15	120	82	79	30	250	49
7-2	200.0	13:25	345.020	★.02	1.15	1.15	132	83	79	30	250	50
7-3	220.0	13:45	358.200	.02	1.15	1.15	109	84	77	30	250	51
7-4	240.0	14:05	371.315	★.02	1.15	1.15	121	84	78	30	250	52
8-1	4 260.0	14:45	384.600	★.02	1.15	1.15	100	84	78	30	250	52
8-2	280.0	15:05	397.780	.02	1.15	1.15	110	86	79	30	250	53
8-3	300.0	15:25	410.9[illegible]	★.02	1.15	1.15	121	86	77	30	250	54
8-4	320.0	15:45	424.0[illegible]	.02	1.15	1.15	121	82	74	30	250	55

IMPACTOR EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
AL TECH ALBANY	4/19/81	SITE NO 1	PARTICLE SIZE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	IMPACTOR TYPE	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
AIPMIA	ANDERSON	60	30.5	-2.2	ANDERSEN MARK III	120.0	0.84	138	1 of 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FTA	0.135		2.9		FB5	2.03	1.056	1.00	0.008						50

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	IMPACTOR TEMPERATURE °F	CONDENSER TEMPERATURE °F
	0	1405	582.157									
	5.0	1410	583.74	1.10	0.41	0.41	103	62	62	0.0	103	60
	10.0	1415	585.35	1.10	0.41	0.41	98	62	62	0.0	98	60
	15.0	1420	587.035	1.10	0.41	0.41	102	62	62	0.0	102	60
	20.0	1425	588.505	1.10	0.41	0.41	105	63	62	0.0	105	60
	25.0	1430	590.118	1.10	0.41	0.41	104	64	63	0.0	104	60

2530 A RUN NO. [redacted]

2529 A RUN NO. AIPMIA

[redacted] E[redacted]IC[redacted]ES[redacted]G F[redacted]D [redacted]A [redacted]

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALL TIGCH, ALBANY	4/08/81	SITE NO 1	PARTICLE SIZE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS. (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE C_p	THERM NO.	PAGE
P.1.P.M.2.B	MASON	65	30.39	-2.3		1290	[redacted]	[redacted]	[redacted]

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FOOT	0.136		20		FB5	2.03	1.956	10	0.00						25

* PROCESS DOWN 6 MINUTES TO CHANGE SHIFTS.

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	1348	711.482									
	2.5	M	712.325	1.1	0.41	0.41	119	80	81	0.0	119	58
	5.0	1453	713.260	1.1	0.41	0.41	121	81	81	0.0	121	58
	7.5		714.092	1.1	0.41	0.41	127	81	82	0.0	127	60
	10.0	1458	714.884	1.1	0.41	0.41	127	81	82	0.0	127	60
	* 12.5		715.745	1.1	0.41	0.41	127	81	82	0.0	127	62
	15.0	[redacted] 1509	716.500	1.1	0.41	0.41	117	81	82	0.0	117	62
	17.5		717.347	1.1	0.41	0.41	117	81	82	0.0	117	64
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EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALL TECH ALBANY	4/09/81	SITE NO. 1 INLET	PARTICULATE SIZE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
ALPMS	BASON	56	30.97	-2.3		12.99		138	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FOOT	0.335		20		FB5	2.03	1.956	1PP	0.09						5.0

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	1445	851.070									
	5.0	1450	852.775	1.2	0.44	0.44	101	65	68	0.0	101	60
	10.0	1455	854.425	1.2	0.44	0.44	106	65	68	0.0	106	60
	15.0	~~1300~~	856.080	1.2	0.44	0.44	107	65	68	0.0	107	60
	20.0	~~1305~~	857.746	1.2	0.44	0.44	112	66	68	0.0	112	59
		1505	MP 6-4-81									

IMPACTOR EMISSION TESTING FIELD DATA

[redacted]	[redacted]	DATE	[redacted]	SAMPLING LOCATION	[redacted]	SAMPLE TYPE	[redacted]
[redacted]		4/17/81		BAGHOUSE OUTLET		PART. S/29	

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	IMPACTOR TYPE	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
ASPSIA	Schwarcia	55	30.15	00	ANDERSON	4/1.89H 4/1.89H	0.84	1	0.F 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
	0.500				FB18/A1		0.982								15.0

① START 1207 ★ BAG CLEANING (RAP)
② START 1344
③ START 1534

$T_s = 100$ $\Delta p = .02$ ΔH 1.30

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	IMPACTOR TEMPERATURE °F	CONDENSER TEMPERATURE °F
	0	1029	420.360									
2-1	15.	1044	429.400	★0.02	1.30	1.30	101	62	62	1.5	101	58
2-1	30.	1059	438.700	0.02	1.30	1.30	103	65	62	1.5	103	50
2-1	45.	1114	448.000	★0.02	1.30	1.30	113	70	62	1.5	113	50
2-1	60.	1129	457.200	★0.02	1.30	1.30	107	72	64	1.5	107	54
2-1	75.	1144	466.590	0.02	1.30	1.30	101	73	66	1.5	101	56
1-1	90.	1223 ①	476.000	★0.02	1.30	1.30	101	68	66	1.5	101	55
1-1	105.	1237	485.500	0.02	1.30	1.30	103	70	66	1.5	103	56
1-1	120.	1252	494.600	0.02	1.30	1.30	107	70	66	1.5	107	54
1-1	135.	1307	504.000	★0.02	1.30	1.30	107	71	66	1.5	107	54
1-1	150.	1322	513.415	★0.02	1.30	1.30	111	71	66	1.5	111	52
4-1	165.	1359 ②	523.000	0.02	1.30	1.30	117	69	66	1.0	117	52
4-1	180.	1414	532.200	★0.02	1.30	1.30	127	71	68	1.0	127	53
4-1	195.	1429	541.600	0.02	1.30	1.30	125	73	68	1.0	125	50
4-1	210.	1444	551.000	0.02	1.30	1.30	131	76	70	1.0	131	48
4-1	225.	1459	560.900	★0.02	1.30	1.30	119	80	72	1.0	119	46
3-4	240.	1549 ③	570.200	0.02	1.30	1.30	113	74	74	1.0	113	48
3-4	255.	1604	579.700	★0.02	1.30	1.30	109	75	72	1.0	109	48
3-4	270.	1619	589.200	0.02	1.30	1.30	103	78	72	1.0	103	48
3-4	285.	1634	598.800	0.02	1.30	1.30	113	80	74	1.0	113	50
3-4	300.	1649	608.380	★0.02	1.30	1.30	119	80	74	1.0	119	50

IMPACTOR EMISSION TESTING FIELD DATA

PLANT	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALTECH	4/8/81	BAGHOUSE OUTLET	PART SIZE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	IMPACTOR TYPE	STACK INSIDE DIAM. (INCHES)	PITOT TUBE Cp	TEST RUN NO.	PAGE
43PS2A	Schmorea	60	30.38	DA	ANDERSON	41.84	0.84	125	1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	DEF. ΔP	RECORD DATA MINS
	0.50A		20		FB8191	0.982									15

4 DOWN 1505 UP 1511 @ 1110 START @ 1250 @ 1425 ★ BAG CLEANING 1.30 pre test 10 in's 0.000 DIGITAL READOUT 222

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	IMPACTOR TEMPERATURE °F	CONDENSER TEMPERATURE °F
	0	0935	634.230									
4-2	15.	0950	643.500	★ .02	1.30	1.30	111	64	64	0.5	111	50
4-2	30.	1005	652.800	.02	1.30	1.30	117	68	64	0.5	117	52
4-2	45.	1020	662.200	★ .02	1.30	1.30	117	72	66	0.5	117	52
4-2	60.	1035	672.400	★ .02	1.30	1.30	123	78	69	0.5	123	54
4-2	75.	1050	681.315	.02	1.30	1.30	127	80	70	0.5	127	58
3-1	90.	1125 ①	690.800	★ .02	1.30	1.30	119	76	72	0.5	119	55
3-1	105.	1140	700.300	.02	1.30	1.30	111	78	73	0.5	111	56
3-1	120.	1155	709.700	.02	1.30	1.30	133	80	74	0.5	133	54
3-1	135.	1210	719.700	★ .02	1.30	1.30	127	80	75	0.5	127	55
3-1	150.	1225	728.850	.02	1.30	1.30	117	81	76	0.5	117	56
6-4	165.	1305 ②	738.000	.02	1.30	1.30	113	78	76	0.5	113	55
6-4	180.	1320	747.700	★ .02	1.30	1.30	119	80	76	0.5	119	58
6-4	195.	1335	754.000	★ .02	1.30	1.30	127	82	79	0.5	127	60
6-4	210.	1350	766.400	.02	1.30	1.30	121	86	80	0.5	121	61
6-4	225.	1405	776.280	★ .02	1.30	1.30	117	86	84	0.5	117	60
5	240.	1440 ③	785.600	★ .02	1.30	1.30	101	81	80	0.5	101	60
5	255.	1455	795.000	.02	1.30	1.30	119	83	80	0.5	119	60
5	270.	1510 ④	804.000	.02	1.30	1.30	123	84	80	0.5	123	62
5	285.	1525	814.000	.02	1.30	1.30	135	82	80	0.5	135	68
5	300.	1540	823.660	★ .02	1.30	1.30	125	85	80	0.5	125	60

35

IMPACTOR EMISSION TESTING FIELD DATA

[redacted] CI[redacted] [redacted] DATE [redacted] [redacted] PLE[redacted] TION [redacted] [redacted] SAM[redacted] [redacted]

ALLTIGCH | 4/8/81 | BAGHOUSE OUTLET | PART 3/RA

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	IMPACTOR TYPE	STACK INSIDE DIMEN. (INCHES)		PITOT TUBE Cp	THERM NO.	PAGE
ASPS3A	Schwarzen	60	30.06	.00	ANDERSEN	4/18.94	4/18.94	.84/12.94	0.5/1	

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
N/A	0.500		20		FB8	1.91	0.984	VP	0.090						15

① START 1105
② START 1245
③ START 1450

* BAG CLEANING

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	IMPACTOR TEMPERATURE °F	CONDENSER TEMPERATURE °F
	0	0930	823.850									
6-3	15.	0945	833.200	0.02	1.30	1.30	107	63	62	0.5	107	60
6-3	30.	1000	842.200	*0.02	1.30	1.30	111	70	64	0.5	111	55
6-3	45.	1015	852.000	0.02	1.30	1.30	107	76	67	0.5	107	52
6-3	60.	1030	861.600	*0.02	1.30	1.30	107	80	70	0.5	107	56
6-3	75.	1045	871.352	0.02	1.30	1.30	107	80	71	0.5	107	56
5-1	90.	1120 ①	881.000	0.02	1.30	1.30	105	75	74	0.5	105	58
5-1	105.	1135	891.500	*0.02	1.30	1.30	111	75	72	0.5	111	56
5-1	120.	1150	900.300	0.02	1.30	1.30	113	79	73	0.5	113	56
5-1	135.	1205	910.000	*0.02	1.30	1.30	115	80	73	0.5	115	58
5-1	150.	1220	919.815	0.02	1.30	1.30	111	80	73	0.5	111	50
8-4	165.	1300 ②	929.300	*0.02	1.30	1.30	105	74	73	0.5	105	52
8-4	180.	1315	938.850	0.02	1.30	1.30	115	75	73	0.5	115	50
8-4	195.	1330	948.700	*0.02	1.30	1.30	117	76	72	0.5	117	48
8-4	210.	1345	958.300	0.02	1.30	1.30	109	76	72	0.5	109	50
8-4	225.	1400	967.925	*0.02	1.30	1.30	115	76	71	0.5	115	52
7-4	240.	1445 ③	977.400	*0.02	1.30	1.30	105	70	69	0.5	105	54
7-4	255.	1500	986.900	0.02	1.30	1.30	107	71	68	0.5	107	56
7-4	270.	1515	996.500	*0.02	1.30	1.30	105	72	68	0.5	105	56
7-4	285.	1530	1006.500	0.02	1.30	1.30	105	73	68	0.5	105	56
7-4	300.	1545	1015.702	0.02	1.30	1.30	111	74	68	0.5	111	56

IMPACTOR EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALTEK	4/16/81	BAGHOUSE OUTLET	PART SIZE

RUN NO.	OPERATOR	AVG. TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS. (in. H_2O)	IMPACTOR TYPE	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	I N P	PAGE
ASPS-B	Schwomer	610	30.10	00	Anderson	4/1 89x4 / 4/1 89x4	0.841	28	1	0.5

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
	0.509		20		FB-81	1.91	0.982	15	0.000	36.743					10

^ ① START 1643
② START 1758

1.31 * clean

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	IMPACTOR TEMPERATURE °F	CONDENSER TEMPERATURE °F
	0	1535	343.430									
4-2	10.0	1545	348.800	0.02	1.31	1.31	91	46	46	15.0	91	40
4-2	20.0	1555	354.000	0.02	1.31	1.31	89	48	44	20.0	89	42
4-2	30.0	1605	360.000	0.02	1.31	0.95	89	49	45	22.0	89	45
4-2	40.0	1615	364.500	0.02	1.31	0.96	97	51	46	22.0	97	46
4-2	50.0	1625	369.890	0.02	1.31	0.96	97	52	46	22.0	97	45
1-3	60.0	1653	374.400	0.02	1.31	1.31	91	52	45	20.0	91	40
1-3	70.0	1703	379.600	0.02	1.31	1.10	91	50	48	21.	91	42
1-3	80.0	1713	384.800	0.02	1.31	0.98	95	50	46	22.0	95	50
1-3	90.0	1723	389.500	0.02	1.31	0.98	85	52	47	22.0	85	50
1-3	100.	1733	395.400	0.02	1.31	0.97	95	50	48	22.0	95	50
2-3	110.	1808	400.500	0.02	1.31	1.00	90	50	45	22.0	90	50
2-3	120.	1818	404.200	0.02	1.31	0.94	95	52	46	22.0	95	50
2-3	130.	1828	410.100	0.02	1.31	0.91	93	53	46	22.0	93	50
2-3	140.	1838	415.600	0.02	1.31	0.94	93	54	48	22.0	93	50
	149.	1847	420.210	0.02	1.31	0.94	93	54	50	22.0	93	50

IMPACTOR EMISSION TESTING FIELD DATA

[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	DATE	SAMPLING LOCATION	[redacted]
ALLIED CHEM ALBANY	4/07/81	SITE NO 1	PARTICLE SIZE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	IMPACTOR TYPE	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
1	PSI / ANDISON	50	30.5	-.22	HIGH CAPACITY	120	0.84	138	1 of 1

@ SAMPLING LEVEL

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FT	0.35		20		FB5	2.03	1.056	10	0.009						100

7 8 9 10	11 12 13 14	15 16 17 18	19 20 21 22 23 24	25 26 27 28 29	30 31 32 33 34 35 36 37		38 39 40 41	42 43 44 45 46 47		48 49 50 51	52 53 54	55 56 57
TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	IMPACTOR TEMPERATURE °F	CONDENSER TEMPERATURE °F
	0	1035	526.581									
	10.0	1045	529.529	1.05 (A.R.)	0.40	0.40	97	58	60	0.0	97	48
	20.0	1055	532.51	1.05	0.40	0.40	106	58	60	0.0	106	48
	30.0	1105	535.54	0.97 (A.R.)	0.40	0.40	142	58	60	0.0	142	48
	40.0	1115	538.56	0.97	0.40	0.40	109	59	60	0.0	109	48
	50.0	1125	541.58	0.97	0.40	0.40	103	60	60	0.0	103	48
	60.0	1135	544.58	0.97	0.40	0.40	101	60	60	0.0	101	48
	70.0	1145	547.59	0.97	0.40	0.40	106	60	60	0.0	106	48
	80.0	1155	550.60	0.97	0.40	0.40	105	60	60	0.0	105	50
	90.0	1205	553.615	0.97	0.40	0.40	105	61	60	0.0	105	50
	100.0	1215	556.62	0.97	0.40	0.40	100	61	60	0.0	100	50
	110.0	1225	559.63	0.97	0.40	0.40	102	61	60	0.0	102	50
	120.0	1235	562.64	1.20 (A.R.)	0.40	0.40	110	61	60	0.0	110	50
	130.0	1245	565.65	1.20	0.40	0.40	110	61	60	0.0	110	51
	140.0	1255	568.66	1.20	0.40	0.40	116	61	60	0.0	116	51
	150.0	1305	571.67	1.20	0.40	0.40	141	62	60	0.0	141	51
	160.0	1315	574.74	1.20	0.40	0.40	109	62	60	0.0	109	52
	170.0	1325	577.80	1.20	0.40	0.40	122	62	60	0.0	122	52
	180.0	1335	580.85	1.20	0.40	0.40	115	63	60	0.0	115	52
	~~189~~ 183.9	S	582.045	1.20	0.40	0.40	114	64	61	0.0	114	52

IMPACTOR EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
NL TECH, ALBANY	4/08/81	SITE NO. 1	PARTICLE SIZE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	IMPACTOR TYPE	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
AVIAS-2	MASON	60	30.39	-2.3	HIGH CAPACITY	12.00	0.84	1.38	1 of 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	OBH HEAT SET	REF. ΔP	RECORD DATA MINS
1.8 FOOT	0.138		2.0		665	2.93	1.956	10	0.013						10.0

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	IMPACTOR TEMPERATURE °F	CONDENSER TEMPERATURE °F
	0	940	642.920									
	10.0	950	645.02	1.0 (A.R.)	0.38	0.38	108	70	68	0.0	108	50
	20.0	1000	648.27	1.0	0.38	0.38	147	72	68	0.0	147	50
	30.0	1010	651.135	1.0	0.38	0.38	107	75	70	0.0	107	50
	40.0	1020	654.423	1.0	0.38	0.38	155	76	71	0.0	155	51
	50.0	1030	657.24	1.0	0.38	0.38	151	77	72	0.0	151	52
	60.0	1040	660.31	1.0 (A.R.)	0.38	0.38	129	78	72	0.0	129	52
	70.0	1050	663.485	1.1	0.38	0.38	110	78	72	0.0	110	52
	80.0	1100	666.595	1.1	0.38	0.38	112	77	72	0.0	112	52
	90.0	1110	669.65	1.1	0.38	0.38	121	77	72	0.0	121	53
	100.0	1120	672.71	1.1	0.38	0.38	118	76	72	0.0	118	53
	110.0	1130	675.845	1.4 (A.R.)	0.38	0.38	113	76	73	0.0	113	53
	120.0	1140	679.08	1.4	0.38	0.38	121	77	72	0.0	121	54
	130.0	1150	682.085	1.4	0.38	0.38	112	77	72	0.0	112	54
	140.0	1200	685.225	1.4	0.38	0.38	110	77	72	0.0	110	56
	150.0	1210	688.475	1.4	0.38	0.38	109	77	73	0.0	109	56
	160.0	1220	691.50	1.3 (A.R.)	0.38	0.38	111	78	74	0.0	111	56
	170.0	1230	694.645	1.3	0.38	0.38	113	78	73	0.0	113	56
	180.0	1240	698.29	1.3	0.38	0.38	117	78	74	0.0	117	56
	190.0	1250	701.94	1.3	0.38	0.38	116	79	74	0.0	116	56
	200.0	1300	704.11	1.3 (A.R.)	0.38	0.38	116	80	75	0.0	116	56
	210.0	1307	706.203	1.3 (A.R.)	0.38	0.38	115	81	76	0.0	115	56

[redacted] E[redacted]IO[redacted]ES[redacted] F[redacted]D [redacted]

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ALTECH ALBANY	11/09/81	SITE NO 1 / INLET	PARTICULATE SIZE

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS. (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
1/PS-3	MASON	56	30.05	-23		120	[illegible]	138	1 of 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
12 FOOT	0.375		12.0		PB5	2.03	1.956	10.0	0.01						10.0

PRETEST

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	1010	780.553									
	10.0	1020	784.075	1.3 (AR.)	0.48	0.48	103	72	68	0.0	103	62
	20.0	1030	787.592	1.3	0.48	0.48	104	73	69	0.0	104	62
	30.0	1040	791.12	1.3	0.48	0.48	105	74	70	0.0	105	62
	40.0	1050	794.7	1.3	0.48	0.48	106	75	70	0.0	106	62
	50.0	1100	798.217	1.3	0.48	0.48	111	76	71	0.0	111	62
	60.0	1110	801.719	1.1 (AR.)	0.48	0.48	111	76	71	0.0	111	62
	70.0	1120	805.3	1.1	0.48	0.48	110	77	72	0.0	110	63
	80.0	1130	808.835	1.1	0.48	0.48	108	76	72	0.0	108	62
	90.0	1140	812.38	1.1	0.48	0.48	109	78	73	0.0	109	62
	100.0	1150	815.975	1.2 (AR.)	0.48	0.48	109	78	73	0.0	109	62
	110.0	1200	819.535	1.2	0.48	0.48	108	79	74	0.0	108	62
	120.0	1210	823.075	1.2	0.48	0.48	112	79	74	0.0	112	62
	130.0	1220	826.650	1.2	0.48	0.48	114	79	74	0.0	114	62
	140.0	1230	830.205	1.2	0.48	0.48	115	79	75	0.0	115	62
	150.0	1240	833.760	1.2 (A.R.)	0.48	0.48	115	79	75	0.0	115	62
	160.0	1250	837.317	1.2	0.48	0.48	115	79	75	0.0	115	62
	170.0	1300	840.9	1.2	0.48	0.48	105	77	75	0.0	105	60
	180.0	1310	844.446	1.2	0.48	0.48	114	77	74	0.0	114	60

RECORD OF VISUAL DETERMINATION OF OPACITY PAGE 10 OF 9

COMPANY Al Tech Specialty Steel
LOCATION Albany
TEST NO. AB-1
DATE 4/7/81
TYPE FACILITY EAF/LAD
CONTROL DEVICE Baghouse

HOURS OF OBSERVATION 10:15 - 17:20
OBSERVER S J Howison
OBSERVER CERTIFICATION DATE 4/1/81
OBSERVER AFFILIATION PEDCo Environmental
POINT OF EMISSIONS Baghouse
HEIGHT OF DISCHARGE POINT 250'

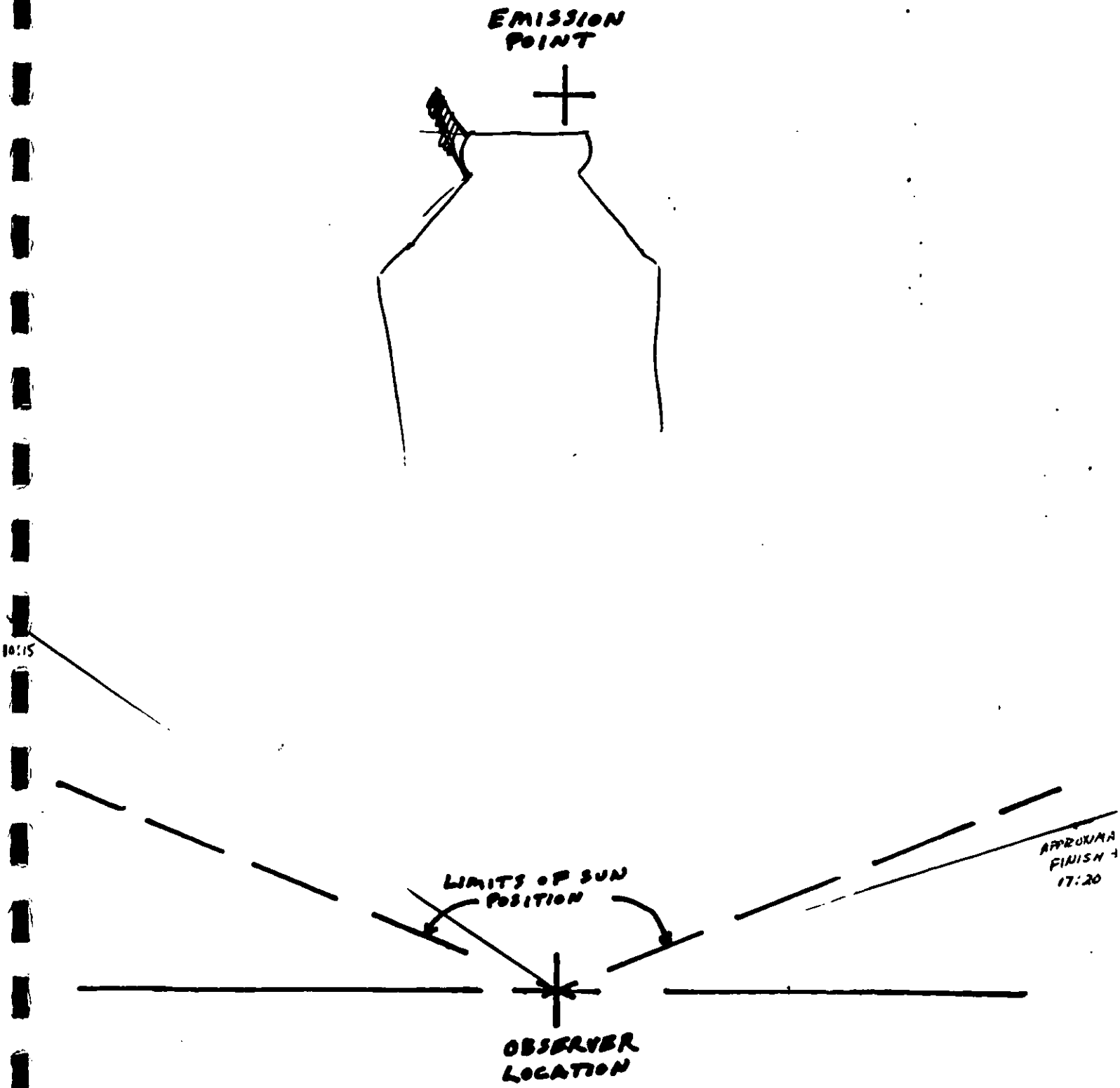
	Initial			Final
CLOCK TIME	10:15			17:20
OBSERVER LOCATION Distance to Discharge	250'			250'
Direction from Discharge	S			S
Height of Observation Point	30'			30'
BACKGROUND DESCRIPTION	Sky			Sky
WEATHER CONDITIONS Wind Direction	E			E
Wind Speed	0-3			0-3
Ambient Temperature	60			60
SKY CONDITIONS (clear, overcast, % clouds, etc.) Sun position - see reverse	Clear			Clear
PLUME DESCRIPTION Color	N/A			N/A
Distance Visible	N/A			N/A
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End	Opactity Sum	Opactity Average
1	10:15-10:20	0	0
2	10:27-10:32	0	0
3	10:39-10:44	0	0
4	10:51-10:56	0	0
5	11:03-11:08	0	0
6	11:15-11:20	0	0
7	11:27-11:32	0	0
8	11:39-11:44	0	0
9	11:51-11:56	0	0
10	12:03-12:08	0	0
11	12:15-12:20	0	0
12	12:27-12:32	0	0
13	12:39-12:44	0	0
14	12:51-12:56	0	0
15	13:03-13:08	0	0
16	13:15-13:20	0	0
17	13:27-13:32	0	0
18	13:39-13:44	0	0
19	13:51-13:56	0	0
20	14:03-14:08	0	0

Readings ranged from 0 to 0 % opacity

The source was/was not in compliance with _____ at the time evaluation was made.



ORIENT THE PAGE TOWARD THE EMISSION POINT. POSITION THE TIP OF A STANDARD SIZE PEN ON THE OBSERVER LOCATION. INDICATE THE DIRECTION AND LENGTH OF THE SHADOW CAST BY THE PEN WHEN IT IS IN A VERTICAL POSITION. THE SHADOW MUST BE WITHIN THE INDICATED LIMITS. WIND AND PLUME DIRECTION CAN ALSO BE SHOWN.

* SUN WAS DOWN BEHIND HILL AT THE FINISH.

RECORD OF VISUAL DETERMINATION OF OPACITY PAGE 16 OF 9

COMPANY Al Tech Specialty Steel
LOCATION Albany
TEST NO. AR-1
DATE 4/7/81
TYPE FACILITY EAF/AOD
CONTROL DEVICE Baghouse

HOURS OF OBSERVATION 10:15-12:20
OBSERVER S.J. Howison
OBSERVER CERTIFICATION DATE 9/1/81
OBSERVER AFFILIATION PEDCo Environmental
POINT OF EMISSIONS Baghouse
HEIGHT OF DISCHARGE POINT 50'

	Initial			Final
CLOCK TIME	10:15			12:20
OBSERVER LOCATION Distance to Discharge	250'			250'
Direction from Discharge	S			S
Height of Observation Point	30'			30'
BACKGROUND DESCRIPTION	Sky			Sky
WEATHER CONDITIONS Wind Direction	E			E
Wind Speed	0-3			0-3
Ambient Temperature	60			60
SKY CONDITIONS (clear, overcast, % clouds, etc.) Sun position - see reverse	Clear			Clear
PLUME DESCRIPTION Color	N/A			N/A
Distance Visible	N/A			N/A
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End	Opacity Sum	Opacity Average
21	14:15-14:20	0	0
22	14:27-14:32	0	0
23	14:35-14:44	0	0
24	14:51-14:56	0	0
25	15:03-15:08	0	0
26	15:15-15:20	0	0
27	15:27-15:32	0	0
28	15:39-15:44	0	0
29	15:51-15:56	0	0
30	16:03-16:08	0	0
31	16:15-16:20	0	0
32	16:27-16:32	0	0
33	16:39-16:44	0	0
34	16:51-16:56	0	0
35	17:03-17:08	0	0
36	17:15-17:20	0	0

Readings ranged from 0 to 0 % opacity

The source was/was not in compliance with _____ at the time evaluation was made.

OBSERVATION RECORD PAGE 2 OF 9

COMPANY Al Tech Specialty Steel
LOCATION Albany
TEST NO. AB-1
DATE 4/7/81

OBSERVER S.J. Hawkson
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Baghouse

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
10	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
11	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			

OBSERVATION RECORD PAGE 3 OF 9

COMPANY Al Tech Specialty Steel
LOCATION Albany
TEST NO. AB-1
DATE 4/7/81

OBSERVER S.J. Hawkson
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Baghouse

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
11	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
12	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			

OBSERVATION RECORD PAGE 4 OF 9

COMPANY Al Tech Specialty Steel
OBSERVER S J Hewison
LOCATION Albany
TYPE FACILITY EAF/AOD
TEST NO. AB-1
POINT OF EMISSIONS Baghouse
DATE 4/7/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
12	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
13	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			

OBSERVATION RECORD PAGE 5 OF 9

COMPANY Al Tech Specialty Steel
LOCATION Albany
TEST NO. A8-1
DATE 4/7/81

OBSERVER SJ Howlison
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Baghouse

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
13	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
14	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			

OBSERVATION RECORD PAGE 6 OF 9

COMPANY AL TECH SPECIALTY STEEL
LOCATION ALBANY
TEST NO. AB-1
DATE 4/7/81

OBSERVER S J HOWSON
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS BAGHOUSE

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
14	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
15	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			

OBSERVATION RECORD PAGE 2 OF 9

COMPANY AL TECH SPECIALTY STEEL
OBSERVER S J HOWISON
LOCATION ALBANY
TYPE FACILITY EAF/AOD
TEST NO. AB-1
POINT OF EMISSIONS BAGHOUSE
DATE 4/7/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
15	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
16	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			

OBSERVATION RECORD PAGE 2 OF 9

COMPANY Al Tech Specialty Steel
OBSERVER S J Howison
LOCATION Albany
TYPE FACILITY EAF/AOD
TEST NO. AB-1
POINT OF EMISSIONS Baghouse
DATE 4/7/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
16	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
17	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			

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OBSERVATION RECORD PAGE 9 OF 9

COMPANY Al Tech Specialty Steel
OBSERVER SJ Howlison
LOCATION Albany
TYPE FACILITY EAF/AOD
TEST NO. AB-1
POINT OF EMISSIONS Baghouse
DATE 4/7/91

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
17	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			

RECORD OF VISUAL DETERMINATION OF OPACITY PAGE 1 OF 9

COMPANY ALTECH SPECIALTY STEEL
LOCATION ALBANY
TEST NO. AB-2
DATE 4/8/81
TYPE FACILITY EAF/AOD
CONTROL DEVICE BAGHOUSE

HOURS OF OBSERVATION 0940-16:41
OBSERVER S J HOWISON
OBSERVER CERTIFICATION DATE 4/1/81
OBSERVER AFFILIATION PEDCO ENVIRONMENTAL
POINT OF EMISSIONS BAGHOUSE
HEIGHT OF DISCHARGE POINT 50'

	Initial			Final
CLOCK TIME	0940			16:41
OBSERVER LOCATION Distance to Discharge	250'			250'
Direction from Discharge	S			S
Height of Observation Point	30'			30'
BACKGROUND DESCRIPTION	Sky			Sky
WEATHER CONDITIONS Wind Direction	E			E
Wind Speed	3-5			5-7
Ambient Temperature	60			60
SKY CONDITIONS (clear, overcast, % clouds, etc.) Sun position - see reverse	Clear ~~Sky~~			Clear ~~Sky~~
PLUME DESCRIPTION Color	N/A			N/A
Distance Visible	N/A			N/A
OTHER INFORMATION				

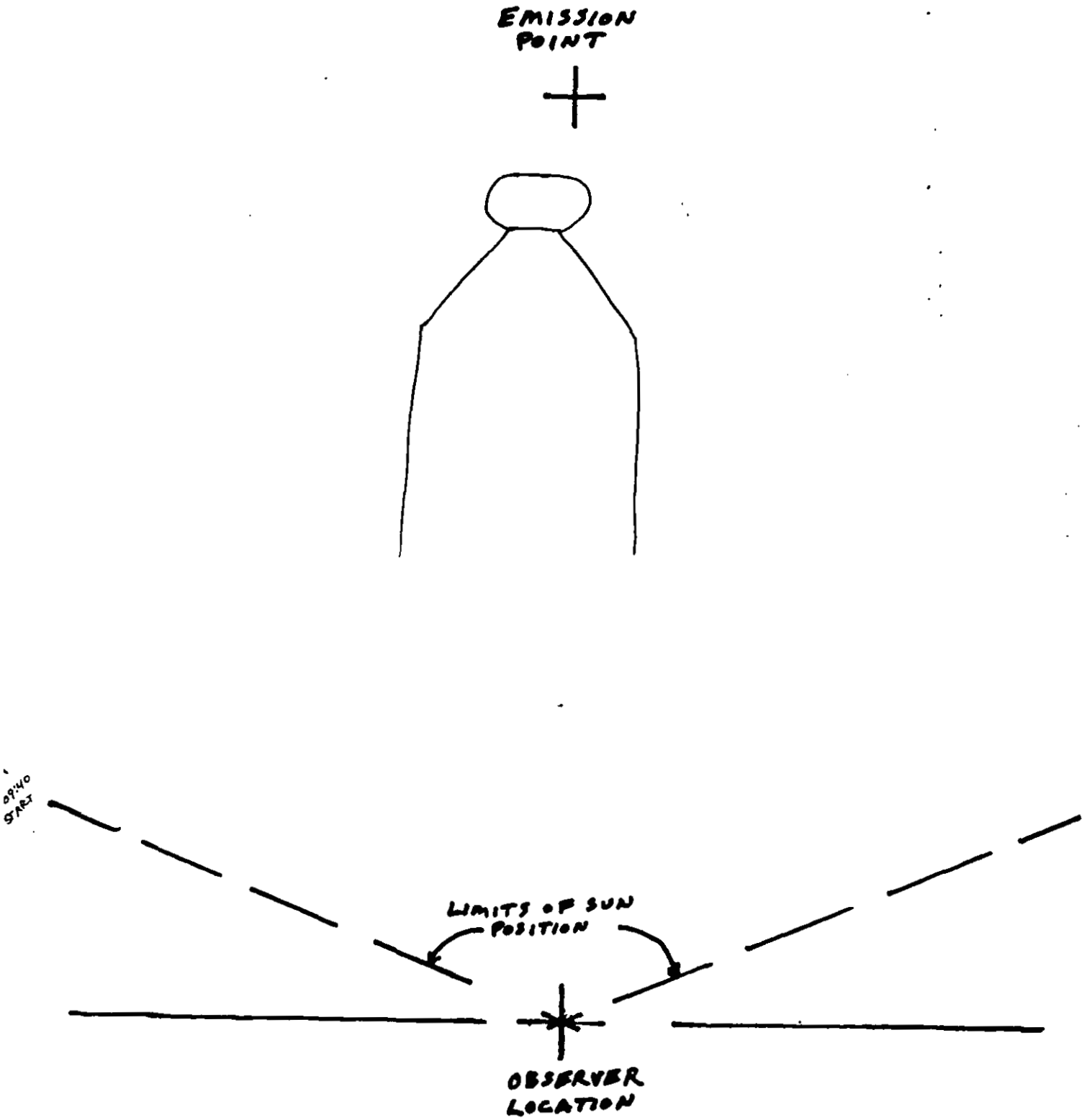
SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End	Opactity Sum	Opactity Average
1	9:40-9:45	0	0
2	9:52-9:57	0	0
3	10:04-10:09	0	0
4	10:16-10:21	0	0
5	10:28-10:33	0	0
6	10:40-10:45	0	0
7	10:52-10:57	0	0
8	11:04-11:09	0	0
9	11:16-11:21	0	0
10	11:28-11:33	0	0
11	11:40-11:45	0	0
12	11:52-11:57	0	0
13	12:04-12:09	0	0
14	12:16-12:21	0	0
15	12:28-12:33	0	0
16	12:40-12:45	0	0
17	12:52-12:57	0	0
18	13:04-13:09	0	0
19	13:16-13:21	0	0
20	13:28-13:33	0	0

Readings ranged from 0 to 0 % opacity

The source was/was not in compliance with _____ at the time evaluation was made.

51



ORIENT THE PAGE TOWARD THE EMISSION POINT. POSITION THE TIP OF A STANDARD SIZE PEN ON THE OBSERVER LOCATION. INDICATE THE DIRECTION AND LENGTH OF THE SHADOW CAST BY THE PEN WHEN IT IS IN A VERTICAL POSITION. THE SHADOW MUST BE WITHIN THE INDICATED LIMITS. WIND AND PLUME DIRECTION CAN ALSO BE SHOWN.

RECORD OF VISUAL DETERMINATION OF OPACITY PAGE 2 OF 9

COMPANY Al Tech Specialty Steel
LOCATION Albany
TEST NO. AB-2
DATE 4/8/81
TYPE FACILITY EAF/AOD
CONTROL DEVICE Baghouse

HOURS OF OBSERVATION 0940 - 16:41
OBSERVER SJ Hewison
OBSERVER CERTIFICATION DATE 4/1/81
OBSERVER AFFILIATION PEDCO Environmental
POINT OF EMISSIONS Baghouse
HEIGHT OF DISCHARGE POINT 50'

	Initial			Final
CLOCK TIME	09:40			16:41
OBSERVER LOCATION Distance to Discharge	250'			250'
Direction from Discharge	S			S
Height of Observation Point	30'			30'
BACKGROUND DESCRIPTION	Sky			Sky
WEATHER CONDITIONS Wind Direction	E			E
Wind Speed	3-5			5-7
Ambient Temperature	60			60
SKY CONDITIONS (clear, overcast, % clouds, etc.) Sun position - see reverse.	Clear			Clear
PLUME DESCRIPTION Color	N/A			N/A
Distance Visible	N/A			N/A
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End	Opactity Sum	Opactity Average
21	13:40-13:45	0	0
22	13:52-13:57	0	0
23	14:04-14:09	0	0
24	14:16-14:21	0	0
25	14:28-14:33	0	0
26	14:40-14:45	0	0
27	14:52-14:57	0	0
28	15:12-15:17	0	0
29	15:24-15:29	0	0
30	15:36-15:41	0	0
31	15:48-15:53	0	0
32	16:00-16:05	0	0
33	16:12-16:17	0	0
34	16:24-16:29	0	0
35	16:36-16:41	0	0

Readings ranged from 0 to 0 % opacity

The source was/was not in compliance with _____ at the time evaluation was made.

OBSERVATION RECORD PAGE 3 OF 9

COMPANY Al Tech Specialty Steel
OBSERVER S J Howison
LOCATION Albany
TYPE FACILITY EAF/AOD
TEST NO. AB-2
POINT OF EMISSIONS Baghouse
DATE 4/8/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
09	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			
10	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			
	09	0	0	0	0			
10	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			

OBSERVATION RECORD PAGE 4 OF 9

COMPANY AL TECH SPECIALTY STEEL
LOCATION ALBANY
TEST NO. AB-2
DATE 4/8/81

OBSERVER SJ HOWLSON
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS BAGHOUSE

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
10	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			
11	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			
	09	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			

OBSERVATION RECORD PAGE 5 OF 9

COMPANY Al Tech Specialty Steel
LOCATION Albany
TEST NO. AB-2
DATE 4/8/81

OBSERVER SJ Hounson
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Baghouse

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
11	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			
12	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			
	09	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			

OBSERVATION RECORD PAGE 6 OF 9

COMPANY Al Tech Specialty Steel
LOCATION Albany
TEST NO. AB-2
DATE 4/8/81

OBSERVER S J Hodson
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Baghouse

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
12	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			
13	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			
	09	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			

OBSERVATION RECORD PAGE 7 OF 9

COMPANY ALTECH SPECIALTY STEEL
LOCATION ALBANY
TEST NO. AB-2
DATE 4/8/81

OBSERVER SJ HOWISON
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS BAGHOUSE

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
13	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			
14	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			
	09	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			

OBSERVATION RECORD PAGE 8 OF 9

COMPANY ALTECH SPECIALTY STEEL
OBSERVER S.J. HOWSON
LOCATION ALBANY
TYPE FACILITY EAF/AOD
TEST NO. AB-2
POINT OF EMISSIONS BAGHOUSE
DATE 4/8/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
14	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			PROCESS DOWN (>) FOR ABOUT 10
15	12	0	0	0	0			MINUTES
	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	36	0	0	0	0			
	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			

OBSERVATION RECORD PAGE 9 OF 9

COMPANY Al Tech Specialty Steel
LOCATION Albany
TEST NO. AB-2
DATE 4/8/81

OBSERVER SJ Howison
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Baghouse

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
15	48	0	0	0	0			
	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
16	00	0	0	0	0			
	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	36	0	0	0	0			
	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			

RECORD OF VISUAL DETERMINATION OF OPACITY PAGE 1 OF 2

COMPANY Al Tech Specialty Steel
LOCATION Albany
TEST NO. AB-3
DATE 4/9/81
TYPE FACILITY EAF/AOD
CONTROL DEVICE Baghouse

HOURS OF OBSERVATION 11:00 - 11:17
OBSERVER S J Hawkson
OBSERVER CERTIFICATION DATE 4/1/81
OBSERVER AFFILIATION PERCo Environmental
POINT OF EMISSIONS Baghouse
HEIGHT OF DISCHARGE POINT 50'

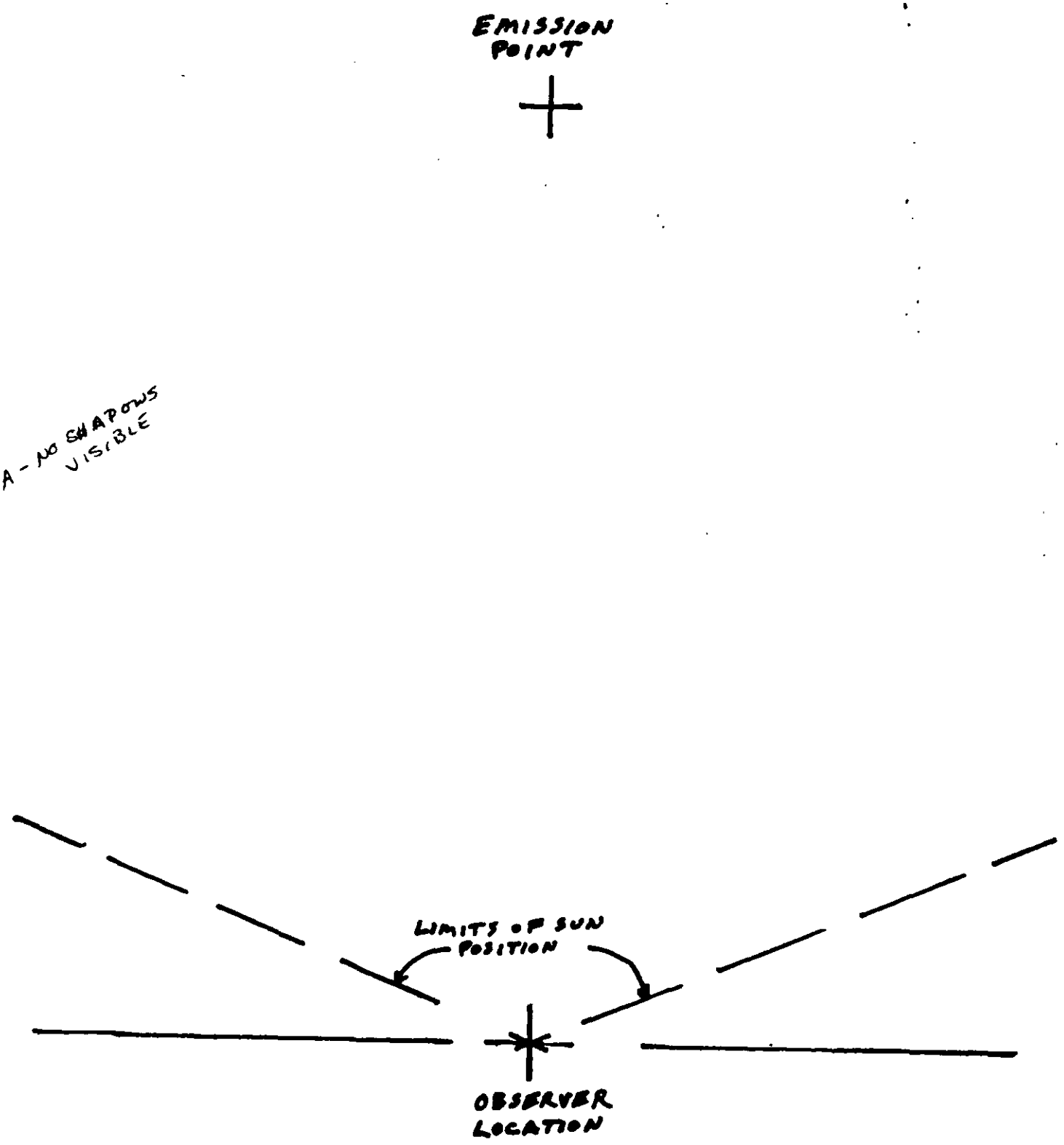
	Initial			Final
CLOCK TIME	11:00			11:17
OBSERVER LOCATION Distance to Discharge	250'			250'
Direction from Discharge	S			S
Height of Observation Point	30'			30'
BACKGROUND DESCRIPTION	Overcast Sky			Sky
WEATHER CONDITIONS Wind Direction	SE			SE
Wind Speed	0-3			0-3
Ambient Temperature	60			60
SKY CONDITIONS (clear, overcast, % clouds, etc.) Sun position - see reverse	Overcast			Overcast
PLUME DESCRIPTION Color	N/A			N/A
Distance Visible	N/A			N/A
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End	Opactity Sum	Opactity Average
1	11:00-11:05	0	0
2	11:12-11:17	0	0

Readings ranged from 0 to 0 % opacity

The source was/was not in compliance with _____ at the time evaluation was made.



ORIENT THE PAGE TOWARD THE EMISSION POINT. POSITION THE TIP OF A STANDARD SIZE PEN ON THE OBSERVER LOCATION. INDICATE THE DIRECTION AND LENGTH OF THE SHADOW CAST BY THE PEN WHEN IT IS IN A VERTICAL POSITION. THE SHADOW MUST BE WITHIN THE INDICATED LIMITS. WIND AND PLUME DIRECTION CAN ALSO BE SHOWN.

OBSERVATION RECORD PAGE 2 OF 2

COMPANY Altech Specialty Steel
LOCATION Albany
TEST NO. AB-3
DATE 4/9/91

OBSERVER S.J. Howlett
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Baghouse

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
11	00	0	0	0	0			
	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			

RECORD OF VISUAL DETERMINATION OF OPACITY PAGE 1A OF 9

COMPANY AL Tech Specialty Steel
LOCATION Watervliet, N.Y.
TEST NO. AMS - 1
DATE 4/7/81
TYPE FACILITY EAF/AOD
CONTROL DEVICE

HOURS OF OBSERVATION 10: 5: 8
OBSERVER Thomas R. Clark
OBSERVER CERTIFICATION DATE 4/2/81
OBSERVER AFFILIATION PEDCo Environmental
POINT OF EMISSIONS Melt shop
HEIGHT OF DISCHARGE POINT 50-60 feet

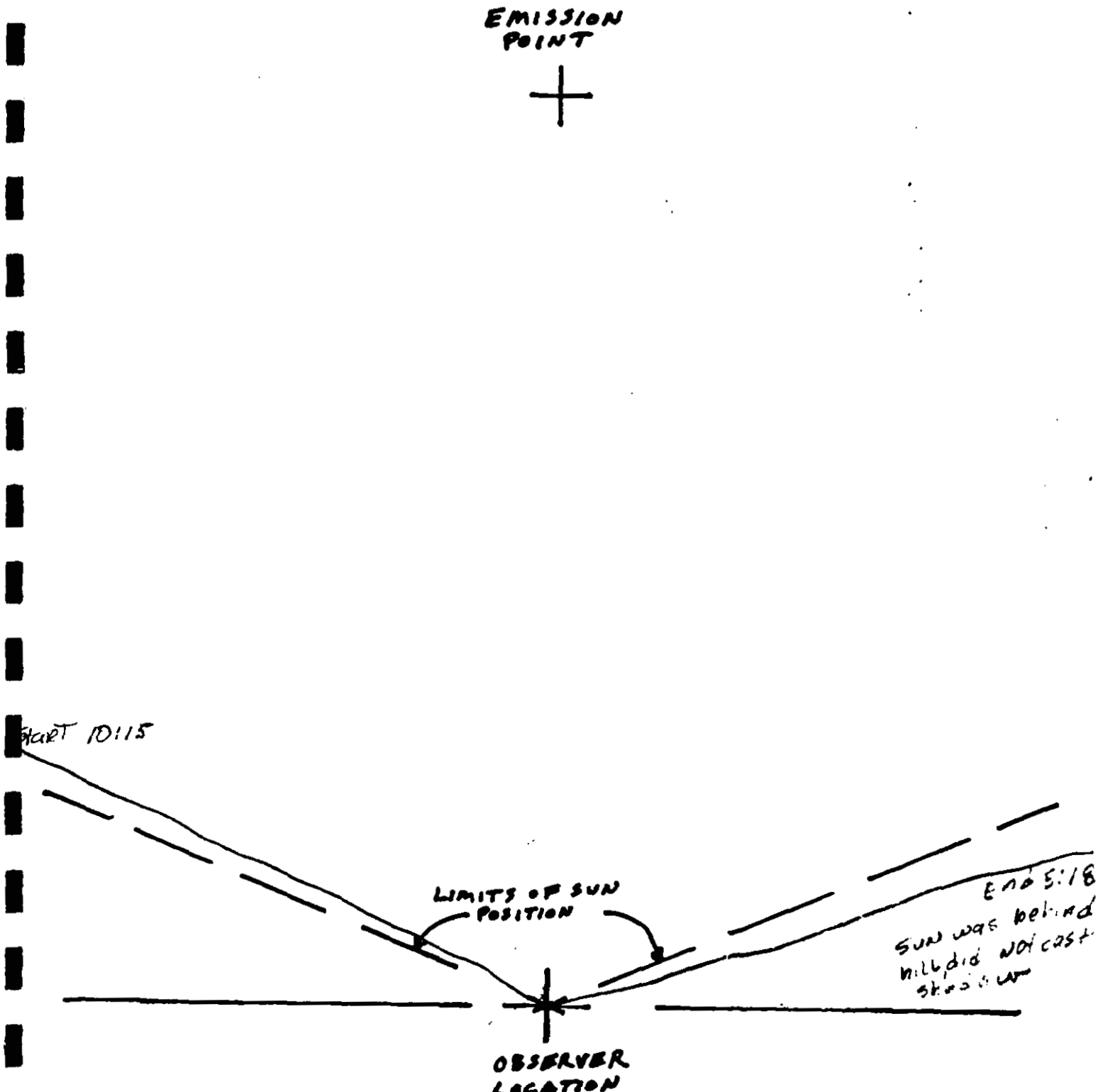
	Initial			Final
CLOCK TIME	10:15			5:18
OBSERVER LOCATION Distance to Discharge	200'			200'
Direction from Discharge	SW			SW
Height of Observation Point	30'			30'
BACKGROUND DESCRIPTION	sky			sky
WEATHER CONDITIONS Wind Direction	E			E
Wind Speed	0-5			0-5
Ambient Temperature	45°F			50°
SKY CONDITIONS (clear, overcast, % clouds, etc.) Sun position - see reverse	Clear			[illegible]
PLUME DESCRIPTION Color	Reddish brown			[illegible] (brown)
Distance Visible	420'			[illegible]
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End	Opactity Sum	Opactity Average	
1	10:15-10:20	0	0	A
2	10:27-10:32	95	7	
3	10:33-10:38	80	3	
4	10:43-10:48	380	12.5	B
5	10:49-10:54	265	11	
6	10:55-11:00	310	13	
7	11:01-11:06	220	9	A
8	11:07-11:12	35	1.5	
9	11:13-11:18	25	1	A
10	11:25-11:30	0	0	
11	11:37-11:42	0	0	
12	11:49-11:54	0	0	
13	12:01-12:06	0	0	
14	12:13-12:18	0	0	
15	12:25-12:30	0	0	
16	12:37-12:42	0	0	
17	12:49-12:54	0	0	
18	1:01-1:06	0	0	
19	1:13-1:18	0	0	
20	1:25-1:30	0	0	

Readings ranged from 0 to 25 % opacity

The source was/was not in compliance with _____ at the time evaluation was made.



ORIENT THE PAGE TOWARD THE EMISSION POINT. POSITION THE TIP OF A STANDARD SIZE PEN ON THE OBSERVER LOCATION. INDICATE THE DIRECTION AND LENGTH OF THE SHADOW CAST BY THE PEN WHEN IT IS IN A VERTICAL POSITION. THE SHADOW MUST BE WITHIN THE INDICATED LIMITS. WIND AND PLUME DIRECTION CAN ALSO BE SHOWN.

RECORD OF VISUAL DETERMINATION OF OPACITY PAGE 1B OF 9

COMPANY AL Tech specialty steel
LOCATION Watervliet, N.Y.
TEST NO. Ams - 1
DATE 4/7/81
TYPE FACILITY Melt Shop
CONTROL DEVICE

HOURS OF OBSERVATION 10:15 - 5:18
OBSERVER Thomas M. Clark
OBSERVER CERTIFICATION DATE 4/2/81
OBSERVER AFFILIATION PEDCo Environmental
POINT OF EMISSIONS Melt shop
HEIGHT OF DISCHARGE POINT 50-60'

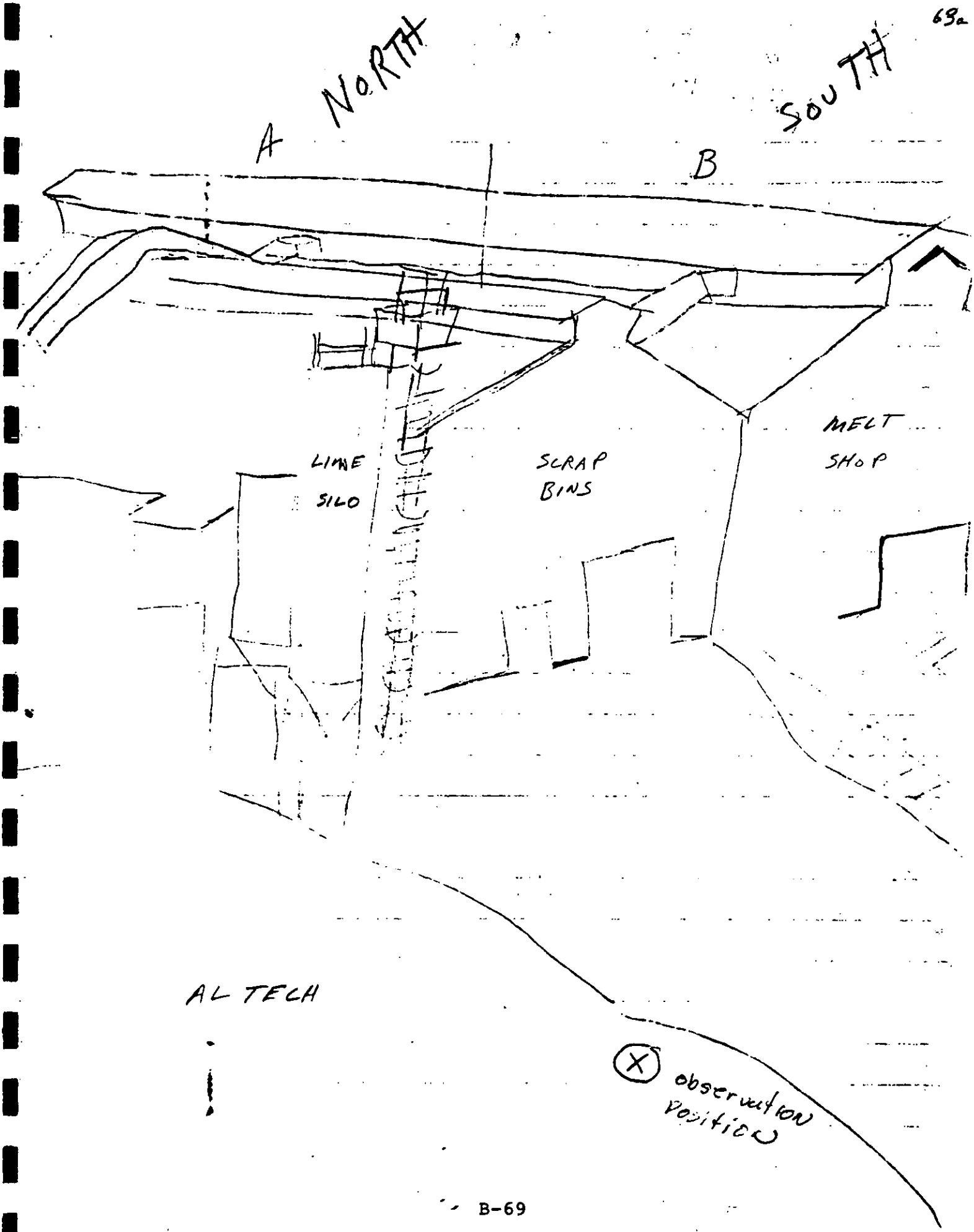
	Initial			Final
CLOCK TIME	10:15			5:18
OBSERVER LOCATION Distance to Discharge	200'			200'
Direction from Discharge	SW			SW
Height of Observation Point	30'			30'
BACKGROUND DESCRIPTION	Sky			Sky
WEATHER CONDITIONS Wind Direction	E			E
Wind Speed	0-5			0-5
Ambient Temperature	45 °F			50 °F
SKY CONDITIONS (clear, overcast, % clouds, etc.) Sun position - see reverse	Clear			Clear
PLUME DESCRIPTION Color	Reddish Brown			Reddish Brown
Distance Visible	≈ 20'			≈ 20'
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End	Opactity Sum	Opactity Average
21	1:37 - 1:42	0	0
22	1:49 - 1:54	0	0
23	2:01 - 2:06	0	0
24	2:13 - 2:18	0	0
25	2:25 - 2:30	0	0
26	2:37 - 2:42	0	0
27	2:49 - 2:54	0	0
28	3:01 - 3:06	0	0
29	3:13 - 3:18	0	0
30	3:25 - 3:30	0	0
31	3:37 - 3:42	0	0
32	3:49 - 3:54	0	0
33	4:01 - 4:06	0	0
34	4:13 - 4:18	0	0
35	4:25 - 4:30	0	0
36	4:37 - 4:42	0	0
37	4:49 - 4:54	0	0
38	5:01 - 5:06	0	0
39	5:13 - 5:18	0	0
40			

Readings ranged from _____ to _____ % opacity

The source was/was not in compliance with _____ at the time evaluation was made.


A
NORTH
B
SOUTH
LIME
SILO
SCRAP
BINS
MELT
SHOP
AL TECH
observation
position

OBSERVATION RECORD PAGE 2 OF 9

COMPANY AL Tech Specialty Steel OBSERVER T. Clark
LOCATION Watervliet, N.Y TYPE FACILITY EAF/AOD
TEST NO. AMS - 1 POINT OF EMISSIONS Melt shop
DATE 4/7/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
10	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
10	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	10	10	10	10			
	31	10	10	10	10			
	32	5	5	5	0			
10	33	0	5	5	5			
	34	5	5	5	5			A, B,
	35	5	5	5	0			(A = North side
	36	0	0	5	5			of Melt shop; B =
	37	5	5	5	5			South side of Melt)
	38	0	0	0	0			
10	43	15	15	15	15			
	44	15	15	15	15			B only
	45	15	10	10	10			
	46	10	10	10	10			
	47	10	10	10	10			A, B
	48	10	10	15	20			
10	49	20	20	20	20			
	50	15	15	15	15			B only
	51	15	10	10	10			
	52	5	5	5	5			
	53	5	5	10	10			A & B
	54	10	10	5	5			

OBSERVATION RECORD PAGE 3 OF 9

COMPANY AL Tech specialty Steel
LOCATION Watervliet, N.Y
TEST NO. AMS - 1
DATE 4/7/81

OBSERVER T. Clark
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Melt Shop

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
10	55	10	10	10	10			
	56	10	10	15	15			
	57	15	15	15	15			
	58	15	15	15	15			A & B
	59	10	10	10	20			
11	00	15	10	10	15			
11	01	15	20	25	25			
	02	10	10	10	5			A only
	03	10	10	10	10			
	04	5	5	5	5			
	05	5	5	5	5			A & B
	06	5	5	5	5			
11	07	5	5	0	5			
	08	10	5	0	0			
	09	0	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	5			B only
11	13	5	5	5	5			
	14	5	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
11	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			

OBSERVATION RECORD PAGE 4 OF 9

COMPANY AL Tech Specialty Steel
LOCATION Watervliet, N.Y
TEST NO. AMS -1
DATE 4/7/81

OBSERVER T. Clark
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Melt shop

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
11	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
11	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
12	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
12	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
12	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			

OBSERVATION RECORD PAGE 5 OF 9

COMPANY AL Tech Specialty Steel
LOCATION Watervliet, N.Y.
TEST NO. AMS -1
DATE 4/7/81

OBSERVER T. Clark
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Melt Shop

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
12	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
12	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
1	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
1	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
1	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			

OBSERVATION RECORD PAGE 6 OF 9

COMPANY ALTech Specialty Steel
LOCATION Watervliet, N.Y.
TEST NO. AMS-1
DATE 4/7/81

OBSERVER T. Clark
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Melt Shop

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
1	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
1	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
2	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
2	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
2	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			

OBSERVATION RECORD PAGE 7 OF 9

COMPANY AL Tech specialty steel OBSERVER T. Clark
LOCATION Watervliet, N.J. TYPE FACILITY EAF/AOD
TEST NO. AMS - 1 POINT OF EMISSIONS Melt shop
DATE 4/7/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
2	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
2	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
3	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
3	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
3	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			

OBSERVATION RECORD PAGE 8 OF 9

COMPANY AL Tech Specialty Steel OBSERVER T. Clark
LOCATION Watervliet, N.J. TYPE FACILITY EAF/AOD
TEST NO. AMS -1 POINT OF EMISSIONS Melt shop
DATE 4/7/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
3	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
3	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
4	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
4	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
4	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			

OBSERVATION RECORD PAGE 9 OF 9

COMPANY Al Tech Specialty Steel OBSERVER T. Clark
LOCATION Watervliet, N. J. TYPE FACILITY EAF/AOD
TEST NO. AMS -1 POINT OF EMISSIONS Melt Shop
DATE 4/7/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
4	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
4	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
5	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
5	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
5	25							

RECORD OF VISUAL DETERMINATION OF OPACITY PAGE 1A OF 11

COMPANY Al Tech Specialty Steel
LOCATION Watervliet, N.Y.
TEST NO. AMS -2
DATE 4/8/81
TYPE FACILITY EAF/AOD
CONTROL DEVICE

HOURS OF OBSERVATION 9:40 - 4:44
OBSERVER [illegible] Clark
OBSERVER CERTIFICATION DATE 4/2/81
OBSERVER AFFILIATION LFDCo Environmental
POINT OF EMISSIONS Roof vent
HEIGHT OF DISCHARGE POINT 50-60 feet

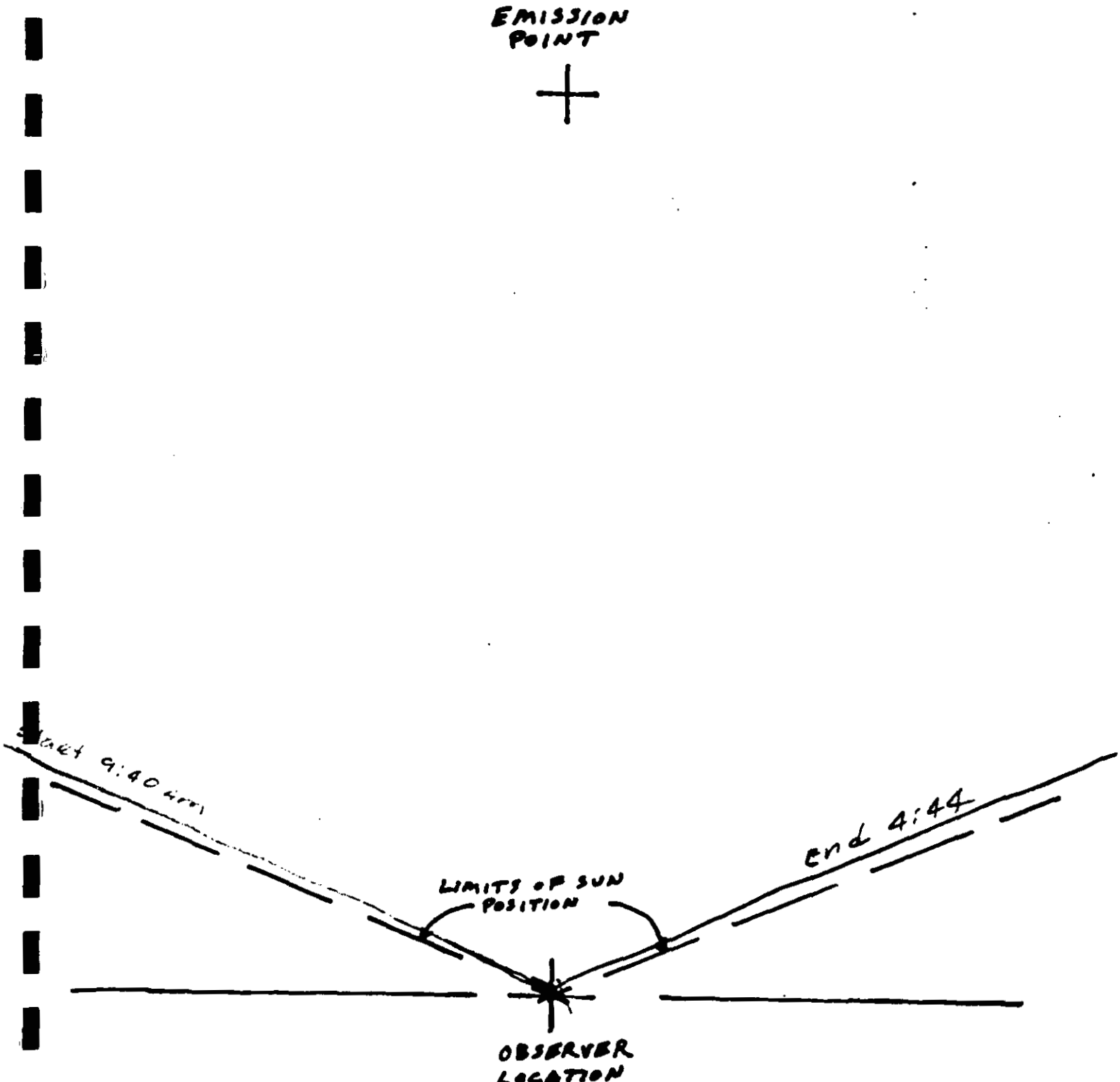
	Initial			Final
CLOCK TIME	9:40			4:44
OBSERVER LOCATION Distance to Discharge	300'			300'
Direction from Discharge	S			S
Height of Observation Point	≈30'			≈30'
BACKGROUND DESCRIPTION	sky			sky
WEATHER CONDITIONS Wind Direction	E			E
Wind Speed	7-10			≈7-10
Ambient Temperature	45°			55°
SKY CONDITIONS (clear, overcast, % clouds, etc.) Sun position - see reverse	Clear			Clear
PLUME DESCRIPTION Color	reddish brown			[illegible]
Distance Visible	[illegible]			[illegible]
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End	Opactity Sum	Opactity Average	
1	9:45-9:50	180	7.5	A
2	9:51-9:56	250	10	A+B
3	9:57-10:02	120	5	
4	10:03-10:08	280	11.7	
5	10:09-10:14	525	21.9	
6	10:15-10:20	360	15	
7	10:21-10:26	120	5	
8	10:27-10:32	181	7.5	
9	10:33-10:38	240	10	
10	10:39-10:44	135	5.6	
11	10:45-10:50	35	1.5	
12	10:51-10:56	30	1.3	A
13	10:57-11:02	50	2.1	
14	11:09-11:14	130	5.4	
15	11:15-11:20	100	4.2	
16	11:20-11:26	140	5.8	
17	11:27-11:32	230	9.6	
18	11:33-11:38	285	11.9	A+B
19	11:39-11:44	180	7.5	
20	11:45-11:50	180	7.5	B

Readings ranged from 0 to 25 % opacity

The source was/was not in compliance with _____ at the time evaluation was made.



ORIENT THE PAGE TOWARD THE EMISSION POINT. POSITION THE TIP OF A STANDARD SIZE PEN ON THE OBSERVER LOCATION. INDICATE THE DIRECTION AND LENGTH OF THE SHADOW CAST BY THE PEN WHEN IT IS IN A VERTICAL POSITION. THE SHADOW MUST BE WITHIN THE INDICATED LIMITS. WIND AND PLUME DIRECTION CAN ALSO BE SHOWN.

RECORD OF VISUAL DETERMINATION OF OPACITY PAGE 18 OF 11

COMPANY AL Tech Specialty Steel
LOCATION Watervliet, N.Y.
TEST NO. Ams - 2
DATE 4/8/81
TYPE FACILITY EAF/ADD
CONTROL DEVICE

HOURS OF OBSERVATION 9:40 - 4:44
OBSERVER Thomas R. Clark
OBSERVER CERTIFICATION DATE 4/2/81
OBSERVER AFFILIATION PEDCo Environmental
POINT OF EMISSIONS Melt Shop
HEIGHT OF DISCHARGE POINT 50-60 feet

	Initial			Final
CLOCK TIME	9:40			4:44
OBSERVER LOCATION Distance to Discharge	300'			300'
Direction from Discharge	S			S
Height of Observation Point	≈30'			≈30'
BACKGROUND DESCRIPTION	Sky			Sky
WEATHER CONDITIONS Wind Direction	E			E
Wind Speed	≈7-10			≈7-10
Ambient Temperature	48°			55°
SKY CONDITIONS (clear, overcast, % clouds, etc.)	Clear			Clear
PLUME DESCRIPTION Color	Redish Brown			Redish Brown
Distance Visible	≈20'			≈20'
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End	Opactity Sum	Opactity Average
21	11:51 - 11:56	305	12.7
22	11:57 - 12:02	480	20
23	12:03 - 12:08	295	12.3
24	12:09 - 12:14	200	8.3
25	12:19 - 12:24	300	12.5
26	12:25 - 12:30	60	2.5
27	12:37 - 12:42	0	0
28	12:49 - 12:54	0	0
29	1:01 - 1:06	0	0
30	1:13 - 1:18	0	0
31	1:25 - 1:30	0	0
32	1:37 - 1:42	0	0
33	1:49 - 1:54	0	0
34	2:01 - 2:06	0	0
35	2:13 - 2:18	0	0
36	2:25 - 2:30	0	0
37	2:37 - 2:42	0	0
38	2:49 - 2:54	0	0
39	3:01 - 3:06	0	0
40	3:15 - 3:20	50	2

Readings ranged from 0 to 25 % opacity

The source was/was not in compliance with _____ at the time evaluation was made.

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RECORD OF VISUAL DETERMINATION OF OPACITY PAGE 1C OF 11

COMPANY AL Tech Specialty Steel
LOCATION Watervliet, N.Y.
TEST NO. AMS-2
DATE 4/8/81
TYPE FACILITY EAF/AOD
CONTROL DEVICE

HOURS OF OBSERVATION 9:40 - 4:44
OBSERVER Thomas R. Clark
OBSERVER CERTIFICATION DATE 4/2/81
OBSERVER AFFILIATION PEDCo Environmental
POINT OF EMISSIONS Melt Shop
HEIGHT OF DISCHARGE POINT 50-60 feet

	Initial			Final
CLOCK TIME	9:40			4:44
OBSERVER LOCATION Distance to Discharge	300'			300'
Direction from Discharge	S			S
Height of Observation Point	≈ 30'			≈30'
BACKGROUND DESCRIPTION	Sky			Sky
WEATHER CONDITIONS Wind Direction	E			E
Wind Speed	≈7-10			≈7-10
Ambient Temperature	48°			55°
SKY CONDITIONS (clear, overcast, % clouds, etc.) Sun position - see reverse	Clear			Clear
PLUME DESCRIPTION Color	Redish Brown			Redish Brown
Distance Visible	≈20'			≈20'
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End	Opactity Sum	Opactity Average
41	3:27-3:32	0	0
42	3:39-3:44	0	0
43	3:51-3:56	0	0
44	4:03-4:08	0	0
45	4:15-4:20	0	0
46	4:27-4:32	0	0
47	4:39-4:44	0	0

Readings ranged from 0 to 25 % opacity

The source was/was not in compliance with _____ at the time evaluation was made.

COMPANY Al Tech Specialty Steel
LOCATION Watervliet, N.Y.
TEST NO. Ams-2
DATE 4/8/81

OBSERVER T. Clark
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Melt Shop

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
8	45	0	0	0	0			
	46	0	0	0	0			
	47	0	0	10	10			
	48	10	10	10	10			
	49	10	10	15	10			
	50	15	[illegible]	20	20			
9	51	20	20	20	15			
	52	15	13	10	10			
	53	10	10	10	10			
	54	10	10	10	10			
	55	10	10	5	5			
	56	5	5	5	5			
9	57	5	5	5	5			
	58	5	5	5	5			
	59	5	5	5	5			
10	00	5	5	5	5			
	01	5	5	5	5			
	02	5	5	5	5			
10	03	5	5	5	5			
	04	5	5	5	5			
	05	10	10	10	10			
	06	10	10	15	15			
	07	15	15	20	20			
	08	20	20	20	20			
10	09	20	20	20	20			
	10	20	20	20	20			
	11	20	20	20	20			
	12	20	20	20	25			
	13	25	25	25	25			
	14	25	25	25	25			

OBSERVATION RECORD PAGE 3 OF 11

COMPANY AL Tech Specialty Steel OBSERVER T. Clark
LOCATION Watervliet, N.Y. TYPE FACILITY EAF/AOD
TEST NO. AMS -2 POINT OF EMISSIONS melt shop
DATE 4/8/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
10	15	25	25	25	20			
	16	20	20	20	20			
	17	20	15	15	15			
	18	15	15	15	15			
	19	10	10	10	10			
	20	5	5	5	5			
10	21	5	5	5	5			
	22	5	5	5	5			
	23	5	5	5	5			
	24	5	5	5	5			
	25	5	5	5	5			
	26	5	5	5	5			
10	27	5	5	5	5			
	28	5	5	5	5			
	29	5	5	5	5			
	30	10	10	10	10			
	31	10	10	10	10			
	32	10	10	10	10			
10	33	10	10	10	10			
	34	10	10	10	10			
	35	10	10	10	10			
	36	10	10	10	10			
	37	10	10	10	10			
	38	10	10	10	10			
10	39	10	10	10	10			
	40	5	5	5	5			
	41	5	5	5	5			
	42	5	5	5	5			
	43	5	5	5	5			
	44	0	5	5	5			

OBSERVATION RECORD PAGE 4 OF 11

COMPANY Allegheny Ludlum Specialty Steel
LOCATION Watervliet, N.Y.
TEST NO. AMS-2
DATE 4/8/81

OBSERVER T. Clark
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Melt Shop

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
10	45	0	0	0	0			
	46	0	0	0	0			
	47	0	0	0	0			
	48	0	0	0	0			
	49	5	5	0	5			
	50	5	5	5	5			
10	51	5	0	0	0			
	52	5	5	5	5			
	53	5	5	5	5			
	54	5	5	5	5			A only
	55	5	5	5	5			
	56	5	5	5	5			
10	57	5	5	5	5			
	58	5	5	5	5			
	59	5	0	0	0			
1		5	0	0	0			
	01	0	0	0	0			
	02	0	0	0	0			
11	09	10	10	10	10			
	10	10	5	5	5			
	11	5	5	5	5			
	12	5	5	5	5			
	13	5	5	0	5			
	14	5	0	0	5			4 only
11	15	5	0	0	0			
	16	5	5	5	5			
	17	5	0	5	5			
	18	5	5	5	5			
	19	5	5	5	5			
	20	5	5	5	5			

OBSERVATION RECORD PAGE 5 OF 11

COMPANY KL Tech specialty Shop OBSERVER T. Clark
LOCATION Watervliet, N.Y. TYPE FACILITY SAF/WOD
TEST NO. AMS - 2 POINT OF EMISSIONS [illegible]
DATE 4/8/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
11	21	5	5	5	5			
	22	5	5	5	5			Hood
	23	5	5	5	5			
	24	5	5	5	5			
	25	5	5	5	5			
	26	10	10	10	10			
	27	10	10	10	10			
	28	5	10	5	10			
	29	10	10	10	10			
	30	10	10	10	10			
	31	10	10	10	10			
	32	10	10	10	10			
11	33	10	10	10	10			
	34	10	10	10	10			Hood
	35	15	15	15	15			
	36	15	15	15	15			
	37	15	10	10	10			
	38	10	10	10	10			
11	39	10	10	10	10			
	40	10	10	10	10			
	41	10	10	10	10			
	42	5	5	5	5			
	43	5	5	5	5			
	44	5	5	5	5			
11	45	5	5	5	5			
	46	5	5	10	5			
	47	5	5	5	5			Hood
	48	10	10	10	5			
	49	10	10	10	10			
	50	10	10	10	10			

OBSERVATION RECORD PAGE 10 OF 11

COMPANY AL Tech Specialty steel
LOCATION Watervliet, NY
TEST NO. AMS - 2
DATE 4/9/[illegible]

OBSERVER J. CLARK
TYPE FACILITY EAF/MOD
POINT OF EMISSIONS [illegible]

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	[illegible]	[illegible]	[illegible]	[illegible]	0			
	[illegible]	[illegible]	[illegible]	[illegible]	10			
	[illegible]	10	10	10	10			
	[illegible]	15	15	15	15			
	[illegible]	15	15	10	[illegible]			
	[illegible]	15	[illegible]	10	[illegible]			
11	[illegible]	[illegible]	20	20	20			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	20	20	[illegible]			
	00	20	[illegible]	20	20			
	[illegible]	[illegible]	20	20	20			
	[illegible]	[illegible]	20	20	20			
[illegible]	[illegible]	[illegible]	20	20	[illegible]			
	04	15	15	15	15			
	05	15	15	15	15			
	[illegible]	10	10	10	10			AEB
	[illegible]	10	10	10	10			
	08	5	5	5	5			
12	09	5	5	5	5			
	10	5	5	5	5			
	11	10	10	10	10			
	12	10	10	10	10			
	13	10	10	10	10			
	14	10	10	10	10			
12	19	15	15	15	15			
	20	15	15	15	15			
	21	15	15	15	15			
	22	10	10	10	10			
	23	10	10	10	10			
	24	10	10	10	10			

OBSERVATION RECORD PAGE 7 OF 11

COMPANY Al Tech Specialty Steel
LOCATION Watervliet, N.Y
TEST NO. Ams - 2
DATE 4/8/81

OBSERVER T. Clark
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Melt Shop

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
12	25	5	5	5	5			
	26	5	5	5	5			
	27	5	5	5	5			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
12	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
12	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
1	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
1	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			

OBSERVATION RECORD PAGE 8 OF 11

COMPANY AL Tech Specialty Steel
LOCATION Watervliet, N.Y
TEST NO. Ams - 2
DATE 4/8/81

OBSERVER T. Clark
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Melt shop

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
1	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
1	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
1	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
2	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
2	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			

OBSERVATION RECORD PAGE 9 OF 11

COMPANY Altech Specialty Steel
LOCATION Watervliet, N.Y.
TEST NO. Ams-2
DATE 9/8/81

OBSERVER T. Clark
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Melt shop

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
2	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
2	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
2	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
3	01	0	0	0	0			
	02	0	0	0	0			
	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
3	15	5	5	5	5			
	16	5	5	5	5			B only
	17	5	5	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			

OBSERVATION RECORD PAGE 10 OF 11

COMPANY AL Tech specialty steel OBSERVER T. Clark
LOCATION Watervliet, N.Y. TYPE FACILITY EAF/AOD
TEST NO. AMS-2 POINT OF EMISSIONS Melt-hop
DATE 4/8/81

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
3	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
3	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
3	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
4	03	0	0	0	0			
	04	0	0	0	0			
	05	0	0	0	0			
	06	0	0	0	0			
	07	0	0	0	0			
	08	0	0	0	0			
4	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			

OBSERVATION RECORD PAGE 11 OF 11

COMPANY AL Tech Specialty Steel
LOCATION Watervliet, N.Y
TEST NO. Ams-2
DATE 4/8/81

OBSERVER T. Clark
TYPE FACILITY EAF/AOD
POINT OF EMISSIONS Melt Shop

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
4	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
4	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			

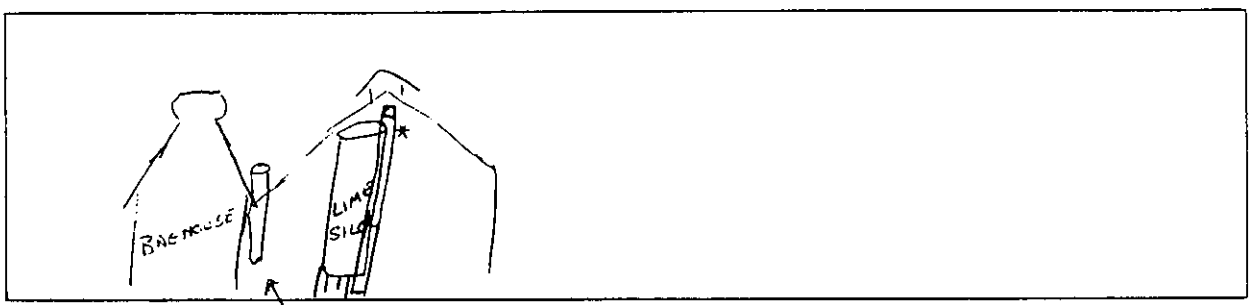
85

ABF-1

FUGITIVE EMISSION INSPECTION

Company AL TECH SPECIALTY STEEL	Inspector S J HOWISON
Location ALBANY	Affiliation PEDCO ENVIRONMENTAL
Company Rep.	Date 4/7/81
Sky Conditions CLEAR	Wind Direction E
Precipitation NONE	Wind Speed 0-3
Facility Type EAF/AOD	Emission Source DUST COLLECTION SILO

Sketch emission source, indicate observer position relative to source; indicate potential emission points and/or actual emission points.



OBSERVATIONS

	Time	Accumulated Observation Period (Min:Sec)	Accumulated Emission Time (Min:Sec)
Begin Observation	10:20 - 10:40	20:00	0:00
	10:50 - 12:00	70:00	47:56 * (FROM LIME SILO)
	12:10 - 12:30	20:00	0:00
	12:40 - 13:00	20:00	0:00
	13:10 - 13:30	20:00	0:00
	13:40 - 14:00	20:00	0:00
	14:10 - 14:30	20:00	0:00
	14:40 - 15:00	20:00	0:00
	15:10 - 15:30	20:00	0:00
	15:40 - 16:00	20:00	0:00
	16:10 - 16:30	20:00	0:00
End Observation	16:40 - 17:00	20:00	0:00
	17:10 - 17:30	20:00	0:00
TOTALS		300:00	47:56

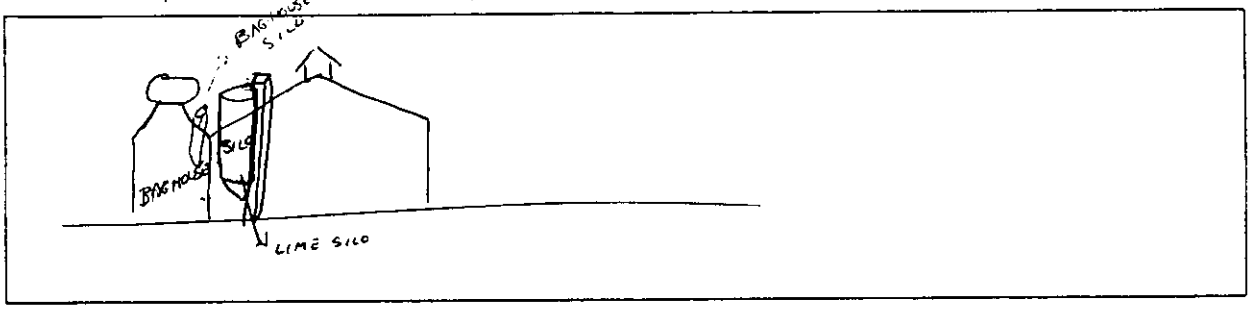
15.9%

ABF-2 81

FUGITIVE EMISSION INSPECTION

Company ALTECH SPECIALTY STEEL	Inspector S J HOWISON
Location ALBANY	Affiliation PEDCO ENVIRONMENTAL
Company Rep.	Date 4/8/81
Sky Conditions Clear	Wind Direction E
Precipitation N/A	Wind Speed 3-7
Facility Type EAF/AOD	Emission Source DUST COLLECTION

Sketch emission source, indicate observer position relative to source; indicate potential emission points and/or actual emission points.



OBSERVATIONS

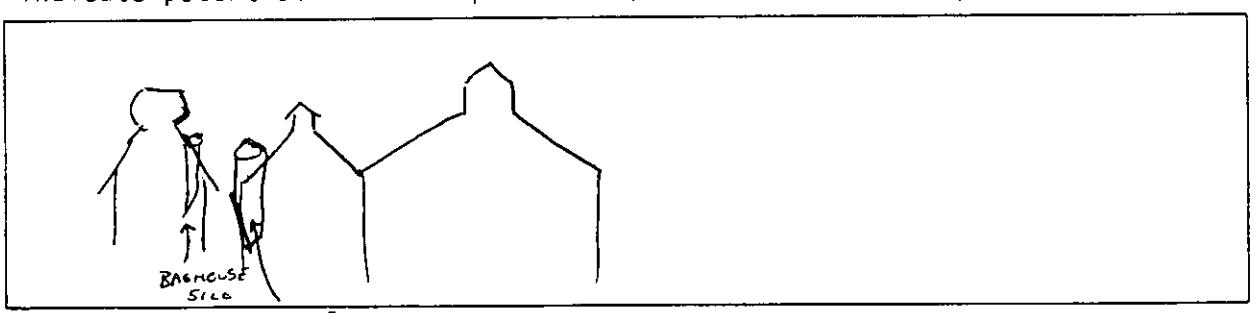
	Time	Accumulated Observation Period (Min:Sec)	Accumulated Emission Time (Min:Sec)
Begin Observation	09:50 - 10:10	20:00	0:00
	10:20 - 10:40	20:00	0:00
	10:50 - 11:10	20:00	0:00
	11:20 - 11:46	20:00	0:00
	11:50 - 12:10	20:00	0:00
	12:20 - 12:40	20:00	0:00
	12:50 - 13:10	20:00	0:00
	13:20 - 13:40	20:00	0:00
	13:50 - 14:10	20:00	0:00
	14:20 - 14:40	20:00	0:00
	14:50 - 15:00	10:00	0:00
	15:10 - 15:30	20:00	0:00
	15:40 - 16:00	20:00	0:00
	16:10 - 16:30	20:00	0:00
End Observation	16:40 - 16:45	5:00	0:00
Total		275:00	0:00

ABF-3

FUGITIVE EMISSION INSPECTION

Company AL TECH SPECIALTY STEEL	Inspector S. J. MONISOM
Location ALBANY	Affiliation PEDCO ENVIRONMENTAL
Company Rep.	Date 4/9/81
Sky Conditions OVERCAST	Wind Direction SE
Precipitation	Wind Speed 0-3
Facility Type EAF/AOD	Emission Source BAGHOUSE

Sketch emission source, indicate observer position relative to source; indicate potential emission points and/or actual emission points.



OBSERVATIONS

	Time	Accumulated Observation Period (Min:Sec)	Accumulated Emission Time (Min:Sec)
Begin Observation	11:00-11:20	20:00	0:00
End Observation	TOTAL	20:00	0:00

APPENDIX C

SAMPLE RECOVERY AND ANALYTICAL DATA

PARTICULATE

Site 1
Site 2
Site 3

PARTICLE SIZE

Site 1 Mark III
Site 3 Mark III
Site 1 HGLI

BLANKS

DUST SAMPLES

Trace elements
Particle size
Specific gravity

PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant A. TECH B Sample date 4/7/81
Sample location ALBANY INLET Recovery date "
Run number A1P-1 Recovered by SJH/PR/DE/TC
Filter number(s) 0002146

MOISTURE

Impingers			Silica gel		
Final volume (wt)	188.0	ml(g)	Final wt	431.9	g
Initial volume (wt)	200.0	ml(g)	Initial wt	400	g
Net volume (wt)	-12.0	ml(g)	Net wt	31.9	g
Description of impinger water	Clear			50	% spent

Total moisture 19.9 g

RECOVERED SAMPLE

Filter container number(s) 3985 B Sealed ✓
Description of particulate on filter Brown

Probe rinse container no.	3985 A	Liquid level marked	✓
Acetone blank container no.	3989 A	Liquid level marked	✓
Impinger contents container no.	3988 A	Liquid level marked	✓
Water blank container no.	3983 A	Liquid level marked	✓

Samples stored and locked ✓
Remarks

LABORATORY CUSTODY

Received by Richard Sittmann Date 4-13-81
Remarks

31.9
-12
19.9

4930
61.1
43 1.9

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant U.S. EPA / Electric Arc Steel Run No. AIP-1

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	yes	yes
filter(s)	yes	yes

Acetone rinse container no. BT 437

Acetone rinse volume (Vaw) 458 ml

Acetone blank residue concentration (Ca) .007 mg/g

Wa = Ca Vaw ρa = (.007)(458)(.7908) = 2.5 mg

Date and time of wt 4-21-81 9:15am Gross wt 111096.6 mg

Date and time of wt 4-21-81 3:30 pm Gross wt 111096.8 mg

Average gross wt 111096.7 mg

Tare wt 110864.1 mg

Less acetone blank wt (Wa) 2.5 mg

Weight of particulate in acetone rinse 230.1 mg

Filter(s) container no. BT463*0002146

Date and time of wt 4-15-81 3:30pm Gross wt 836.0 mg

Date and time of wt 4-16-81 8:45am Gross wt 835.8 mg

Average gross wt 835.9 mg

Tare wt 359.9 mg

Weight of particulate on filter(s) 476.0 mg

Weight of particulate in acetone rinse 230.1 mg

Total weight of particulate 706.1 mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.W.

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METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA
IMPINGER CONTENTS AND WATER RINSE

Plant U.S. EPA / Electric Arc Steel Run No. A1P-1

Sample location

Relative humidity 50%

Density of water (ρw) 1.0 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Water Rinse	yes	yes

Water rinse container no. BT 438

Water rinse volume (Vww) 188 ml

Water blank residue concentration (Ca) .004 mg/g

Ww = Cw Vww ρw = (.004) (188) (1.0) = 0.8 mg ✓

Date and time of wt 4-17-81 8:45am Gross wt 100838.2 mg

Date and time of wt 4-21-81 9:50am Gross wt 100838.1 mg

Average gross wt 100838.2 mg ✓

Tare wt 100825.1 mg

Less water blank wt (Ww) 0.8 mg ✓

Weight of particulate in water rinse 12.3 mg ✓

TOTALS:

Weight of particulate on filter(s) 476.0 mg ✓

Weight of particulate in acetone rinse 230.1 mg ✓

Weight of particulate in water rinse 12.3 mg ✓

Total weight of particulate 718.4 mg ✓

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Barnett T.J.N.

PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant AL TECH Sample date 4/8/81
Sample location ALBANY Recovery date "
Run number AIP-2 Recovered by SJH/DF/PR/TC
Filter number(s) 0002161

MOISTURE

Impingers			Silica gel		
Final volume (wt)	188	ml(g)	Final wt	432.6	g
Initial volume (wt)	200	ml(g)	Initial wt	400	g
Net volume (wt)	-12	ml(g)	Net wt	32.6	g
Description of impinger water	Clear			20	% spent

Total moisture 20.6 g

RECOVERED SAMPLE

Filter container number(s) 3958B Sealed ✓
Description of particulate on filter Dark brown

Probe rinse container no. 3958 A Liquid level marked ✓
ACETONE blank container no. 3989A Liquid level marked ✓
Impinger contents container no. 3959A Liquid level marked ✓
WATER blank container no. 3983A Liquid level marked ✓
Samples stored and locked ✓
Remarks

LABORATORY CUSTODY

Received by Richard Lettmann Date 4-13-81
Remarks

491.4
-58.8
432.6

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant U.S. EPA / Electric Arc Steel Run No. AIP-2

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	yes	yes
filter(s)	yes	yes

Acetone rinse container no. BT 439

Acetone rinse volume (Vaw) 488 ml

Acetone blank residue concentration (Ca) .007 mg/g

Wa = Ca Vaw ρa = (.007)(488)(.7908) = 2.7 mg

Date and time of wt 4-21-81 9:15 am Gross wt 102022.7 mg

Date and time of wt 4-21-81 3:30 pm Gross wt 102022.6 mg

Average gross wt 102022.6 mg

Tare wt 101796.1 mg

Less acetone blank wt (Wa) 2.7 mg

Weight of particulate in acetone rinse 223.8 mg

Filter(s) container no. BT 464 #0002161

Date and time of wt 4-15-81 3:30 pm Gross wt 698.2 mg

Date and time of wt 4-16-81 8:45 am Gross wt 698.3 mg

Average gross wt 698.2 mg

Tare wt 363.8 mg

Weight of particulate on filter(s) 334.4 mg

Weight of particulate in acetone rinse 223.8 mg

Total weight of particulate 558.2 mg

Note: In no case shall a blank residue greater than ~~(.01~~ mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.W.

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA
IMPINGER CONTENTS AND WATER RINSE

Plant U.S. EPA / Electric Arc Steel Run No. AIP-2

Sample location

Relative humidity 50%

Density of water (ρw) 1.0 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Water Rinse	yes	yes

Water rinse container no. BT 440

Water rinse volume (Vww) 189 ml

Water blank residue concentration (Ca) .004 mg/g

Ww = Cw Vww ρw = (.004) (189) (1.0) = 0.8 mg

Date and time of wt 4-17-81 8:45am Gross wt 102605.0 mg

Date and time of wt 4-20-81 2:10pm Gross wt 102604.7 mg

Average gross wt 102604.8 mg

Tare wt 102601.0 mg

Less water blank wt (Ww) 0.8 mg

Weight of particulate in water rinse 3.0 mg

TOTALS:

Weight of particulate on filter(s) 334.4 mg

Weight of particulate in acetone rinse 223.8 mg

Weight of particulate in water rinse 3.0 mg

Total weight of particulate 561.2 mg

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.N.

1

PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant AL TECH ALBANY Sample date 4/9/81
Sample location INLET Recovery date "
Run number AIP-3 Recovered by SJH/TC/DF/PR
Filter number(s) ~~0002280~~ 0002220

MOISTURE

Impingers			Silica gel		
Final volume (wt)	195	ml(g)	Final wt	432	g
Initial volume (wt)	200	ml(g)	Initial wt	400	g
Net volume (wt)	-5	ml(g)	Net wt	32	g
Description of impinger water	Clear			35	% spent

Total moisture 27.0 g

RECOVERED SAMPLE

Filter container number(s) 3964B Sealed ✓
Description of particulate on filter Very dark brown

Probe rinse container no. 3964A Liquid level marked ✓
ACETONE blank container no. 3989 A Liquid level marked ✓
Impinger contents container no. 3965 Liquid level marked ✓
WATER blank container no. 3983 A Liquid level marked ✓
Samples stored and locked ✓
Remarks

LABORATORY CUSTODY

Received by Richard Lettmann Date 4-13-81
Remarks

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant U.S. EPA / Electric Arc Steel Run No. AIP-3

Sample location

Relative humidity 50%

Density of acetone (pa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	yes	yes
filter(s)	yes	yes

Acetone rinse container no. BT 441

Acetone rinse volume (Vaw) 203 ml

Acetone blank residue concentration (Ca) .007 mg/g

Wa = Ca Vaw pa = (.007)(203)(.7908) = 1.1 mg

Date and time of wt 4-21-81 3:30pm Gross wt 108954.9 mg

Date and time of wt 4-22-81 9:00am Gross wt 108954.9 mg

Average gross wt 108954.9 mg

Tare wt 108764.6 mg

Less acetone blank wt (Wa) 1.1 mg

Weight of particulate in acetone rinse 189.2 mg

Filter(s) container no. BT465 #0002220

Date and time of wt 4-15-81 3:30pm Gross wt 1656.5 mg

Date and time of wt 4-16-81 8:45am Gross wt 1656.2 mg

Average gross wt 1656.4 mg *

Tare wt 362.2 mg

Weight of particulate on filter(s) 1294.2 mg

Weight of particulate in acetone rinse 189.2 mg

Total weight of particulate 1483.4 mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks: * HIGH GROSS WEIGHT VERIFIED 5-14-81 @ 1.63g BY TW and P.

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett I.J.B.

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METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA
IMPINGER CONTENTS AND WATER RINSE

Plant U.S. EPA / Electric Arc Steel Run No. AIP-3✓

Sample location

Relative humidity 50%

Density of water (ρw) 1.0 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Water Rinse	yes	yes

Water rinse container no. BT 442

Water rinse volume (Vww) 369 ml

Water blank residue concentration (Ca) .004 mg/g

Ww = Cw Vww ρw = (.004) (369) (1.0) = 1.5 mg ✓

Date and time of wt 4-17-81 8:45 am Gross wt 102099.0 mg

Date and time of wt 4-21-81 9:50 am Gross wt 102099.1 mg

Average gross wt 102099.0 mg ✓

Tare wt 102093.3 mg

Less water blank wt (Ww) 1.5 mg ✓

Weight of particulate in water rinse 4.2 mg ✓

TOTALS:

Weight of particulate on filter(s) 1294.2 mg ✓

Weight of particulate in acetone rinse 189.2 mg ✓

Weight of particulate in water rinse 4.2 mg ✓

Total weight of particulate 1487.6 mg ✓

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.V.

10

PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Ac Tech Sample date 4/7/81
Sample location Albany Inlet Recovery date "
Run number A2P-1 Recovered by SJH/BF/PR/TC
Filter number(s) 0002199

MOISTURE

Impingers			Silica gel		
Final volume (wt)	162.0	ml(g)	Final wt	475.8	g
Initial volume (wt)	200.0	ml(g)	Initial wt	400	g
Net volume (wt)	-38.0	ml(g)	Net wt	75.8	g
Description of impinger water	Clear			60	% spent

Total moisture 37.8 g

RECOVERED SAMPLE

Filter container number(s) 3986B Sealed ✓
Description of particulate on filter Dark brown

Probe rinse container no.	3986A	Liquid level marked	✓
Acetone blank container no.	3989A	Liquid level marked	✓
Impinger contents container no.	3993A	Liquid level marked	✓
Water blank container no.	3983A	Liquid level marked	✓

Samples stored and locked ✓
Remarks

LABORATORY CUSTODY

Received by Richard Hettmann Date 4-13-81
Remarks

75.8
-38.0
37.8

535.6
-59.8
475.8

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant U.S. EPA / Electric Arc Steel Run No. A2P-1

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	yes	yes
filter(s)	yes	yes

Acetone rinse container no. BT 445

Acetone rinse volume (Vaw) 557 ml

Acetone blank residue concentration (Ca) .007 mg/g

Wa = Ca Vaw ρa = (.007)(557)(.7908) = 3.1 mg

Date and time of wt 4-22-81 8:30am Gross wt 106201.4 mg

Date and time of wt 4-22-81 4:00pm Gross wt 106201.7 mg

Average gross wt 106201.6 mg

Tare wt 105529.2 mg

Less acetone blank wt (Wa) 3.1 mg

Weight of particulate in acetone rinse 669.3 mg

Filter(s) container no. BT467 #0002199

Date and time of wt 4-15-81 3:30pm Gross wt 1215.3 mg

Date and time of wt 4-16-81 8:45am Gross wt 1215.1 mg

Average gross wt 1215.2 mg

Tare wt 360.1 mg

Weight of particulate on filter(s) 855.1 mg

Weight of particulate in acetone rinse 669.3 mg

Total weight of particulate 1524.4 mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.N.

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA
IMPINGER CONTENTS AND WATER RINSE

Plant U.S. EPA / Electric Arc Steel Run No. A2P-1

Sample location

Relative humidity 50 %

Density of water (ρw) 1.0 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Water Rinse	yes	yes

Water rinse container no. BT 446

Water rinse volume (Vww) 166 ml

Water blank residue concentration (Ca) .004 mg/g

Ww = Cw Vww ρw = (.004) (166) (1.0) = 0.7 mg

Date and time of wt 4-17-81 8:45am Gross wt 1099786 mg

Date and time of wt 4-21-81 9:50am Gross wt 109978.7 mg

Average gross wt 109978.6 mg

Tare wt 109956.7 mg

Less water blank wt (Ww) 0.7 mg

Weight of particulate in water rinse 21.2 mg

TOTALS:

Weight of particulate on filter(s) 855.1 mg

Weight of particulate in acetone rinse 669.3 mg

Weight of particulate in water rinse 21.2 mg

Total weight of particulate 1545.6 mg

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Jon Bennett T.J.N.

13

PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant AL TECH Sample date 4/8/81
Sample location ALBANY Recovery date "
Run number A2P-2 Recovered by SJH/PR/TC/DF
Filter number(s) 0002158

MOISTURE

Impingers			Silica gel		
Final volume (wt)	154	ml(g)	Final wt	482.4	g
Initial volume (wt)	200	ml(g)	Initial wt	400	g
Net volume (wt)	46	ml(g)	Net wt	82.4	g
Description of impinger water	Clear			50 % spent	

Total moisture 36.4 g

RECOVERED SAMPLE

Filter container number(s) 3960 B Sealed ✓
Description of particulate on filter Dark brown

Probe rinse container no. 3960 A Liquid level marked ✓
~~ACETONE~~ blank container no. 3989 A Liquid level marked ✓
Impinger contents container no. 3961 A Liquid level marked ✓
WATER blank container no. 3983 A Liquid level marked ✓
Samples stored and locked ✓
Remarks

LABORATORY CUSTODY

Received by Richard Lettmann Date 4-13-81
Remarks

544.5
62.1
482.4

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant U.S. EPA / Electric Arc Steel Run No. A2P-2

Sample location

Relative humidity 50%

Density of acetone (pa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	yes	yes
filter(s)	yes	yes

Acetone rinse container no. BT 447

Acetone rinse volume (Vaw) 362 ml

Acetone blank residue concentration (Ca) .007 mg/g

Wa = Ca Vaw pa = (.007)(362)(.7908) = 2.0 mg

Date and time of wt 4-21-81 3:30pm Gross wt 97621.4 mg

Date and time of wt 4-22-81 9:00am Gross wt 97621.2 mg

Average gross wt 97621.3 mg

Tare wt 97138.6 mg

Less acetone blank wt (Wa) 2.0 mg

Weight of particulate in acetone rinse 480.7 mg

Filter(s) container no. BT468 #0002158

Date and time of wt 4-15-81 3:30pm Gross wt 1550.6 mg

Date and time of wt 4-16-81 8:45am Gross wt 1550.2 mg

Average gross wt 1550.4 mg

Tare wt 362.8 mg

Weight of particulate on filter(s) 1187.6 mg

Weight of particulate in acetone rinse 480.7 mg

Total weight of particulate 1668.3 mg

Note: In no case shall a blank residue greater than ~~(.01~~ mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.R.

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METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA
IMPINGER CONTENTS AND WATER RINSE

Plant U.S. EPA / Electric Arc Steel Run No. A2P-2

Sample location

Relative humidity 50%

Density of water (ρw) 1.0 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Water Rinse	yes	yes

Water rinse container no. BT 448

Water rinse volume (Vww) 327 ml

Water blank residue concentration (Ca) .004 mg/g

Ww = Cw Vww ρw = (.004) (327) (1.0) = 1.3 mg ✓

Date and time of wt 4-17-81 8:45am Gross wt 100064.5 mg

Date and time of wt 4-21-81 9:50 am Gross wt 100064.5 mg

Average gross wt 100064.5 mg ✓

Tare wt 100048.7 mg

Less water blank wt (Ww) 1.3 mg ✓

Weight of particulate in water rinse 14.5 mg ✓

TOTALS:

Weight of particulate on filter(s) 1187.6 mg ✓

Weight of particulate in acetone rinse 480.7 mg ✓

Weight of particulate in water rinse 14.5 mg ✓

Total weight of particulate 1682.8 mg ✓

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.W.

PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant AL TECH - ALBANY Sample date 4/9/81
Sample location INLET Recovery date "
Run number A2P-3 Recovered by SJH/~~[illegible]~~ PR/DF/TC
Filter number(s) 0002197

MOISTURE

Impingers			Silica gel		
Final volume (wt)	199	ml(g)	Final wt	470.7	g
Initial volume (wt)	200	ml(g)	Initial wt	400	g
Net volume (wt)	~1	ml(g)	Net wt	70.7	g
Description of impinger water	Clear			60	% spent

Total moisture 59~70 g

RECOVERED SAMPLE

Filter container number(s) 3966 B Sealed ✓
Description of particulate on filter Dark brown

Probe rinse container no. 3966 A Liquid level marked ✓
ACETONE blank container no. 3989 A Liquid level marked ✓
Impinger contents container no. 3967A Liquid level marked ✓
WATER blank container no. 3988A Liquid level marked ✓
Samples stored and locked ✓
Remarks

LABORATORY CUSTODY

Received by Richard Gettmann Date 4-13-81
Remarks

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METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant U.S. EPA / Electric Arc Steel Run No. A2P-3

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	yes	yes
filter(s)	yes	yes

Acetone rinse container no. BT 449

Acetone rinse volume (Vaw) 228 ml

Acetone blank residue concentration (Ca) .007 mg/g

Wa = Ca Vaw ρa = (.007)(228)(.7908) = 1.3 mg

Date and time of wt 4-21-81 9:15am Gross wt 107076.2 mg

Date and time of wt 4-22-81 9:00am Gross wt 107076.2 mg

Average gross wt 107076.2 mg

Tare wt 106537.8 mg

Less acetone blank wt (Wa) 1.3 mg

Weight of particulate in acetone rinse 537.1 mg

Filter(s) container no. BT 469 #0002197

Date and time of wt 4-15-81 3:30pm Gross wt 612.3 mg

Date and time of wt 4-16-81 8:45am Gross wt 611.8 mg

Average gross wt 612.0 mg

Tare wt 359.5 mg

Weight of particulate on filter(s) 252.5 mg

Weight of particulate in acetone rinse 537.1 mg

Total weight of particulate 789.6 mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.N.

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA
IMPINGER CONTENTS AND WATER RINSE

Plant U.S. EPA / Electric Arc Steel Run No. A2P-3

Sample location

Relative humidity 50%

Density of water (ρw) 1.0 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Water Rinse	yes	yes

Water rinse container no. BT 450

Water rinse volume (Vww) 423 ml

Water blank residue concentration (Ca) .004 mg/g

Ww = Cw Vww ρw = (.004) (423) (1.0) = 1.7 mg

Date and time of wt 4-17-81 8:45 am Gross wt 105500.5 mg

Date and time of wt 4-21-81 9:50 am Gross wt 105500.2 mg

Average gross wt 105500.4 mg

Tare wt 105488.2 mg

Less water blank wt (Ww) 1.7 mg

Weight of particulate in water rinse 10.5 mg

TOTALS:

Weight of particulate on filter(s) 252.5 mg

Weight of particulate in acetone rinse 537.1 mg

Weight of particulate in water rinse 10.5 mg

Total weight of particulate 800.1 mg

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.W.

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PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Al Tech Sample date 4/7/81

Sample location Albany Outlet Recovery date "

Run number ASP-1 Recovered by SJH/TC/PR/DF

Filter number(s) 0002205

MOISTURE

Impingers			Silica gel		
Final volume (wt)	153.0	ml(g)	Final wt	466.2	g
Initial volume (wt)	200.0	ml(g)	Initial wt	400	g
Net volume (wt)	-47.0	ml(g)	Net wt	66.2	g
Description of impinger water	Clear			60	% spent

Total moisture 19.2 g

RECOVERED SAMPLE

Filter container number(s) 3992B Sealed ✓

Description of particulate on filter Lt brown

Probe rinse container no.	3991 A	Liquid level marked	✓
Acetone blank container no.	3989 A	Liquid level marked	✓
Impinger contents container no.	3992 A	Liquid level marked	✓
Water blank container no.	3983 A	Liquid level marked	✓

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Gettmann Date 4-13-81

Remarks

5280
61.8
466.2

66.2
-47.0
19.2

Analytical Organic Particulate Data

Plant U.S. EPA / Electric Arc Steel Run No. A3P-1

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	yes	yes
Impinger rinse	yes	yes
Filter (s)	yes	yes

FRONT HALF

Acetone wash of nozzle, probe, cyclone (bypass), flask, front half of filter holder. Container no. BT 453 (Volume 263 ml)

Date and time of wt. 4-21-81 9:15am Gross wt. 102033.4 mg

Date and time of wt. 4-21-81 3:30pm Gross wt. 102033.6 mg

(.007) (263) (.7908) = 1.5 Average gross wt. 102033.5 mg

Tare wt. 102017.6 mg

Less acetone blank wt. (Wa) 1.5 mg

Weight of particulate in acetone rinse 14.4 mg

Filter(s) container no. BT 471 # 0002205

Date and time of wt. 4-15-81 3:30pm Gross wt. 362.6 mg

Date and time of wt. 4-16-81 8:45am Gross wt. 362.5 mg

Average gross wt. 362.6 mg

Tare wt. 356.6 mg

Weight of particulate on filter (s) 6.0 mg

Weight of particulate in acetone rinse 14.4 mg

Total weight of particulate 20.4 mg

FRONT HALF SUBTOTAL 20.4 mg

T.J.W.
2/3/B

BACK HALF ETHER-CHLOROFORM EXTRACTION

Impinger contents and water wash of impingers, connectors, and back half of filter holder. Container no. BT454 A3P-1

Inorganic fraction container no. BT 454 "aq" (Volume 154ml)

Date and time of wt. 4-21-81 9:30am Gross wt. 104880.8 mg

Date and time of wt. 4-21-81 4:10pm Gross wt. 104880.8 mg

(.002)(154)(1.0) = 0.3 Average gross wt. 104880.8 mg

Tare wt. 104880.2 mg

Less water blank wt. 0.3 mg

Total weight of inorganic phase 0.3 mg

Organic fraction container no. BT 454 "org"

Date and time of wt. 4-21-81 9:30am Gross wt. 64163.7 mg

Date and time of wt. 4-21-81 4:10pm Gross wt. 64164.1 mg

(.005)(150)(1.098) = 0.8 Average gross wt. 64163.9 mg

Tare wt. 64160.8 mg

Less ether-chloroform blank wt. 0.8 mg

Total weight of organic phase 2.3 mg

BACK HALF SUBTOTAL 2.6 mg

TOTAL WEIGHT 23.0 mg

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.N.

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PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Al Tech Sample date 4/8/81
Sample location Albany Recovery date "
Run number A3P-2 Recovered by SJH/PR/DF/TC
Filter number(s) 0002147

MOISTURE

Impingers			Silica gel		
Final volume (wt)	180	ml(g)	Final wt	450.7	g
Initial volume (wt)	200	ml(g)	Initial wt	400	g
Net volume (wt)	-20	ml(g)	Net wt	50.7	g
Description of impinger water	Clear			40	% spent

Total moisture 30.7 g

RECOVERED SAMPLE

Filter container number(s) 3962B Sealed ✓
Description of particulate on filter Lt Brown

Probe rinse container no. 3962A Liquid level marked ✓
Acetone blank container no. 3989A Liquid level marked ✓
Impinger contents container no. 3963A Liquid level marked ✓
Water blank container no. 3983A Liquid level marked ✓
Samples stored and locked ✓
Remarks

LABORATORY CUSTODY

Received by Richard Settmann Date 4-13-81
Remarks

509.1
-58.4
450.7

Analytical Organic Particulate Data

Plant U.S. EPA / Electric Arc Steel Run No. A3P-2

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	yes	yes
Impinger rinse	yes	yes
Filter (s)	yes	yes

FRONT HALF

Acetone wash of nozzle, probe, cyclone (bypass), flask, front half of filter holder. Container no. BT 455 (Volume 182 ml)

Date and time of wt. 4-21-81 9:15 am Gross wt. 105227.0 mg

Date and time of wt. 4-21-81 3:30 pm Gross wt. 105227.4 mg

(.007) (182) (.7908) = 1.0 ✓ Average gross wt. 105227.2 mg ✓

Tare wt. 105216.4 mg

Less acetone blank wt. (Wa) 1.0 mg ✓

Weight of particulate in acetone rinse 9.8 mg ✓

Filter(s) container no. BT 472 # 0002147

Date and time of wt. 4-15-81 3:30 pm Gross wt. 369.5 mg

Date and time of wt. 4-16-81 8:45 am Gross wt. 369.6 mg

Average gross wt. 369.6 mg ✓

Tare wt. 3622 mg

Weight of particulate on filter (s) 7.4 mg ✓

Weight of particulate in acetone rinse 9.8 mg

Total weight of particulate 17.2 mg ✓

FRONT HALF SUBTOTAL 17.2 mg ✓

27B

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BACK HALF ETHER-CHLOROFORM EXTRACTION

Impinger contents and water wash of impingers, connectors, and back half of filter holder. Container no. BT 456 A3P-2

Inorganic fraction container no. BT 456 "aq" (Volume 179 ml)

Date and time of wt. 4-21-81 9:30am Gross wt. 106978.2 mg

Date and time of wt. 4-21-81 4:10pm Gross wt. 106977.8 mg

(.002)(179)(1.0) = 0.4 Average gross wt. 106978.0 mg

Tare wt. 106977.6 mg

Less water blank wt. 0.4 mg

Total weight of inorganic phase 0.0 mg

Organic fraction container no. BT 456 "org"

Date and time of wt. 4-21-81 9:30am Gross wt. 67325.2 mg

Date and time of wt. 4-21-81 4:10pm Gross wt. 67325.6 mg

(.005)(150)(1.098) = 0.8 Average gross wt. 67325.4 mg

Tare wt. 67324.0 mg

Less ether-chloroform blank wt. 0.8 mg

Total weight of organic phase 0.6 mg

BACK HALF SUBTOTAL 0.6 mg

TOTAL WEIGHT 17.8 mg

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.N.

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PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Ac Tech - Albany Sample date 4/9/81
Sample location Outlet Recovery date "
Run number A3P-3 Recovered by SJH/DF/TC/PR
Filter number(s) 0002296

MOISTURE

Impingers			Silica gel		
Final volume (wt)	203	ml(g)	Final wt	449.4	g
Initial volume (wt)	200	ml(g)	Initial wt	400.0	g
Net volume (wt)	3	ml(g)	Net wt	49.4	g
Description of impinger water	Clear		25-30	% spent	

Total moisture 52.4 g

RECOVERED SAMPLE

Filter container number(s) 3968B Sealed ✓
Description of particulate on filter Brown

Probe rinse container no. 3968A Liquid level marked ✓
Acetone blank container no. 3989A Liquid level marked ✓
Impinger contents container no. 3969A Liquid level marked ✓
Water blank container no. 3983A Liquid level marked ✓
Samples stored and locked ✓
Remarks

LABORATORY CUSTODY

Received by Richard Gettman Date 4-13-81
Remarks

Analytical Organic Particulate Data

Plant U.S. EPA / Electric Arc Steel Run No. A3P-3

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	yes	yes
Impinger rinse	yes	yes
Filter (s)	yes	yes

FRONT HALF

Acetone wash of nozzle, probe, cyclone (bypass), flask, front half of filter holder. Container no. BT 457 (Volume 106 ml)

Date and time of wt. 4-21-81 3:30pm Gross wt. 107579.7 mg

Date and time of wt. 4-22-81 9:00am Gross wt. 107579.6 mg

(.007)(106)(.7908) = 0.6 Average gross wt. 107579.6 mg

Tare wt. 107565.6 mg

Less acetone blank wt. (Wa) 0.6 mg

Weight of particulate in acetone rinse 13.4 mg

Filter(s) container no. BT 473 # 0002200

Date and time of wt. 4-15-81 3:30pm Gross wt. 369.4 mg

Date and time of wt. 4-16-81 8:45am Gross wt. 369.1 mg

Average gross wt. 369.2 mg

Tare wt. 357.6 mg

Weight of particulate on filter (s) 11.6 mg

Weight of particulate in acetone rinse 13.4 mg

Total weight of particulate 25.0 mg

FRONT HALF SUBTOTAL 25.0 mg

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BACK HALF ETHER-CHLOROFORM EXTRACTION

Impinger contents and water wash of impingers, connectors, and back half of filter holder. Container no. BT 458 A3P-3

Inorganic fraction container no. BT 458 "aq" (Volume 314 ml)

Date and time of wt. 4-21-81 9:30am Gross wt. 105317.7 mg

Date and time of wt. 4-21-81 4:10 pm Gross wt. 105317.2 mg

(.002)(314)(1.0) = 0.6 Average gross wt. 105317.4 mg

Tare wt. 105315.2 mg

Less water blank wt. 0.6 mg

Total weight of inorganic phase 1.6 mg

Organic fraction container no. BT 458 "org"

Date and time of wt. 4-21-81 9:30am Gross wt. 79782.4 mg

Date and time of wt. 4-21-81 4:10pm Gross wt. 79782.8 mg

(.005)(150)(1.098) = 0.8 Average gross wt. 79782.6 mg

Tare wt. 79779.5 mg

Less ether-chloroform blank wt. 0.8 mg

Total weight of organic phase 2.3 mg

BACK HALF SUBTOTAL 3.9 mg

TOTAL WEIGHT 28.9 mg

Signature of analyst Cheryl Jones

Signature of reviewer Ida Barnett T.J.K.

ANDERSEN IMPACTOR RECOVERY AND INTEGRITY SHEET

Plant AL TECH
Sample date 4-7-81
Sample location INLET No. 1
Recovery date 4-7-81
Run number A1PM-1A
Recovered by PROHASKA

RECOVERY SAMPLE

Cyclone particulate container number NA
Liquid level marked NA

Cyclone and nozzle rinse container number 2529 A
Liquid level marked ✓

Nozzle (or inlet chamber) rinse container number 2530 A
Liquid level marked ✓

Acetone blank container number 2526 A
Liquid level marked ✓

Filters

Stage	Filter number	Container number	Container sealed	Comments
0	Z37	2491	✓	BROWN RING
1	X94	2492	✓	"
2	Z33	2493	✓	RING + LIGHT SPOTS
3	Z48	2494	✓	LIGHT SPOTS
4	Z29	2495	✓	OK
5	Z36	2496	✓	OK
6	Y91	2497	✓	HEAVY LOADING
7	Y04	2498	✓	"
Backup	B214	2499	✓	"

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Stettmann Date 4-13-81

Remarks

ANDERSON IMPACTOR ANALYTICAL DATA

Plant USEPA / Electric Arc Steel / Run No. A1PM-1A cyclone precutter

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	yes	yes
filter(s)		

Acetone rinse container no. 2529 Lab no. BT510

Acetone rinse volume (Vaw) 19 ml ✓

Acetone blank residue concentration (Ca) .004 mg/g ✓

Wa = Ca Vaw ρa = (.004) (19) (.7908) = .1 mg ✓

Date and time of wt 4-22-81 1000 Gross wt 68044.7 mg

Date and time of wt 4-23-81 1730 Gross wt 68044.6 mg

Average gross wt 68044.6 mg ✓

Tare wt 68035.6 mg ✓

Less acetone blank wt (Wa) .1 mg

Weight of particulate in acetone rinse 8.9 mg ✓

Filters

Stage	Filter No.	Lab No.	Gross, mg	Tare, mg	Net, mg
0					
1					
2					
3					
4					
5					
6					
7					
Backup					

Weight of particulate in acetone rinse

Total

Signature of analyst Mike Kulh

Signature of reviewer Ida Bennett T.J.R.

ANDERSON IMPACTOR ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. AIPM-1A inlet chamber

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	Yes	Yes
filter(s)	Yes	Yes

Acetone rinse container no. 2530 Lab no. BT 511

Acetone rinse volume (Vaw) 24 ml ✓

Acetone blank residue concentration (Ca) .004 mg/g ✓

Wa = Ca Vaw ρa = (.004) (24) (.7908) = .1 mg ✓

Date and time of wt 4-22-81 1000 Gross wt 63557.4 mg ✓

Date and time of wt 4-22-81 1600 Gross wt 63557.7 mg ✓

Average gross wt 63557.6 mg ✓

Tare wt 63553.9 mg ✓

Less acetone blank wt (Wa) .1 mg ✓

Weight of particulate in acetone rinse 3.6 mg ✓

Filters

Stage	Filter No.	Lab No.	Gross, mg	Tare, mg	Net, mg
			WEIGHT	CAUGHT IN PRECUTTER	8.9 ✓
0	Z 37	BT 501	134.6 ✓	134.5 ✓	.1 ✓
1	X 94	502	128.8	128.8 ✓	0 ✓
2	Z 33	503	142.8 ✓	142.2 ✓	.6 ✓
3	Z 48	504	129.6 ✓	129.0 ✓	.6 ✓
4	Z 29	505	137.6 ✓	136.6 ✓	1.0 ✓
5	Z 36	506	127.6 ✓	125.8 ✓	1.8 ✓
6	Y 91	507	139.1 ✓	136.7 ✓	2.4 ✓
7	Y 04	508	128.2 ✓	125.6 ✓	2.6 ✓
Backup	B 214	509	190.8 ✓	186.6 ✓	4.2 ✓

STAGE 0 - Weight of particulate in acetone rinse 3.6 ✓

Total 25.8 ✓

Signature of analyst Mike Kuehl

Signature of reviewer Ida Bennett T.J.N.

ANDERSEN IMPACTOR RECOVERY AND INTEGRITY SHEET

Plant AL TECH Sample date 4-8-81
Sample location SITE No. 1 - INLET Recovery date 4-8-81
Run number A1PM2B Recovered by PROHASKA

RECOVERY SAMPLE

Cyclone particulate container number NA Liquid level marked

Cyclone and nozzle rinse container number 2556A Liquid level marked ✓

~~Nozzle (or~~ inlet chamber) rinse container number 2557A Liquid level marked ✓

Acetone blank container number 2531 A Liquid level marked ✓

Filters

Stage	Filter number	Container number	Container sealed	Comments
0	Y39	2550	✓	NO LOADING
1	X68	2551	✓	"
2	Y51	2552	✓	VERY LIGHT
3	X60	2553	✓	LIGHT
4	Y69	2554	✓	VERY LIGHT
5	~~Y69~~ X62	2555	✓	OK
6	Y37	2556	✓	OK
7	Y14	2558	✓	OK
Backup	B216	2557	✓	OK

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Lettmann Date 4/13/81
Remarks

ANDERSON IMPACTOR ANALYTICAL DATA

37

Plant USEPA/ Electric Arc Steel Run No. A1PM-2B cyclone precutter

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	Yes	Yes
filter(s)		

Acetone rinse container no. 2556 Lab no. BT 513

Acetone rinse volume (Vaw) 20 ml ✓

Acetone blank residue concentration (Ca) .01 mg/g ✓

Wa = Ca Vaw ρa = (.01) (20) (.7908) = .2 mg ✓

Date and time of wt 4-22-81 1000 Gross wt 68710.8 mg ✓

Date and time of wt 4-22-81 1600 Gross wt 68711.0 mg ✓

Average gross wt 68710.9 mg ✓

Tare wt 68706.4 mg ✓

Less acetone blank wt (Wa) .2 mg ✓

Weight of particulate in acetone rinse 4.3 mg ✓

Filters

Stage	Filter No.	Lab No.	Gross, mg	Tare, mg	Net, mg
0					
1					
2					
3					
4					
5					
6					
7					
Backup					

Weight of particulate in acetone rinse

Total

Signature of analyst Mike Kuhl

Signature of reviewer John Bennett T.J.N.

ANDERSON IMPACTOR ANALYTICAL DATA

Plant USEPA/ Electric Arc Steel Run No. AIPM-2B

Sample location inlet chamber

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	Yes	Yes
filter(s)	Yes	Yes

Acetone rinse container no. 2557 Lab no. BT 544

Acetone rinse volume (Vaw) 15 ml ✓

Acetone blank residue concentration (Ca) .01 mg/g ✓

Wa = Ca Vaw ρa = (.01) (15) (.7908) = .1 mg ✓

Date and time of wt 4-22-81 1000 Gross wt 67 548.8 mg ✓

Date and time of wt 4-23-81 1730 Gross wt 67 549.0 mg ✓

Average gross wt 67 548.9 mg ✓

Tare wt 67 545.8 mg ✓

Less acetone blank wt (Wa) .1 mg ✓

Weight of particulate in acetone rinse 3.0 mg ✓

Filters

Stage	Filter No.	Lab No.	Gross, mg	Tare, mg	Net, mg
			WEIGHT	CAUGHT IN PRECUTTER	4.3 ✓
0	Y 39	BT 534	135.8 ✓	135.8 ✓	0 ✓
1	X 68	535	127.4 ✓	127.3 ✓	.1 ✓
2	Y 51	536	137.3 ✓	137.0 ✓	.3 ✓
3	X 60	537	128.7 ✓	128.3 ✓	.4 ✓
4	Y 69	538	136.4 ✓	136.0 ✓	.4 ✓
5	X 62	539	127.3 ✓	126.8 ✓	.5 ✓
6	Y 37	540	137.2 ✓	136.6 ✓	.6 ✓
7	Y 14	541	128.0 ✓	127.8 ✓	.2 ✓
Backup	B 216	542	189.6 ✓	188.9 ✓	.7 ✓

STAGE-0 -Weight of particulate in acetone rinse 3.0 ✓

Total 10.5 ✓

Signature of analyst Mike Knoll

Signature of reviewer John Bennett T.J.W.

ANDERSEN IMPACTOR RECOVERY AND INTEGRITY SHEET

Plant ALTECH
Sample date 4-9-81
Sample location INLET SITE 1
Recovery date 4-9-81
Run number A1PM3B
Recovered by PROHASKA

RECOVERY SAMPLE

Cyclone particulate container number NA
Liquid level marked

Cyclone and nozzle rinse container number 2570 A
Liquid level marked ✓

~~Nozzle (or~~ inlet chamber) rinse container number 2569A
Liquid level marked ✓

Acetone blank container number 2549 A
Liquid level marked ✓

Filters

Stage	Filter number	Container number	Container sealed	Comments
0	Y79	2598	✓	LIGHT RING
1	X96	2597	✓	NO LOADING
2	Y59	2596	✓	LIGHT RING
3	X90	2595	✓	LIGHT
4	Y65	2594	✓	OK
5	X84	2593	✓	OK
6	Y57	2592	✓	HEAVY LOADING
7	Y96	2591	✓	HEAVY
Backup	B178	2590	✓	OK

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Gottmann
Date 4-13-81

Remarks

ANDERSON IMPACTOR ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. A1PM-3B
MIII cyclone precutter

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	Yes	Yes
filter(s)		

Acetone rinse container no. 2570 Lab no. BT 565

Acetone rinse volume (Vaw) 41 ml ✓

Acetone blank residue concentration (Ca) .005 mg/g ✓

Wa = Ca Vaw ρa = (.005) (41) (.7908) = .2 mg ✓

Date and time of wt 4-22-81 1000 Gross wt 62506.2 mg ✓

Date and time of wt 4-23-81 1730 Gross wt 62505.8 mg ✓

Average gross wt 62506.0 mg ✓

Tare wt 62502.0 mg ✓

Less acetone blank wt (Wa) .2 mg ✓

Weight of particulate in acetone rinse 3.8 mg ✓

Filters

Stage	Filter No.	Lab No.	Gross, mg	Tare, mg	Net, mg
0					
1					
2					
3					
4					
5					
6					
7					
Backup					

Weight of particulate in acetone rinse

Total

Signature of analyst Mike Kuelh

Signature of reviewer Ida Bennett T.J.W.

ANDERSON IMPACTOR ANALYTICAL DATA

36

Plant USEPA | Electric Arc Steel Run No. A1PM-3B
inlet chamber M III

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	Yes	Yes
filter(s)	Yes	Yes

Acetone rinse container no. 2569 Lab no. BT 566

Acetone rinse volume (Vaw) 15 ml ✓

Acetone blank residue concentration (Ca) .005 mg/g ✓

Wa = Ca Vaw ρa = (.005) (15) (.7908) = .1 mg ✓

Date and time of wt 4-23-81 1730 Gross wt 67220.3 mg ✓

Date and time of wt 4-24-81 1400 Gross wt 67220.2 mg ✓

Average gross wt 67220.2 mg ✓

Tare wt 67218.1 mg ✓

Less acetone blank wt (Wa) .1 mg ✓

Weight of particulate in acetone rinse 2.0 mg ✓

Filters

Stage	Filter No.	Lab No.	Gross, mg WEIGHT	Tare, mg CAUGHT IN PRECUTTER	Net, mg 3.8 ✓
0	Y79	BT 556	136.0 ✓	136.1 ✓	0 (-.1) ✓
1	X96	557	126.8 ✓	126.9 ✓	.1 ✓
2	Y59	558	136.2 ✓	135.8 ✓	.4 ✓
3	X90	559	128.0 ✓	127.7 ✓	.3 ✓
4	Y65	560	137.0 ✓	136.2 ✓	.8 ✓
5	X84	561	130.4 ✓	127.8 ✓	2.6 ✓
6	Y57	562	138.1 ✓	136.0 ✓	2.1 ✓
7	Y96	563	131.3 ✓	128.2 ✓	3.1 ✓
Backup	B178	564	187.5 ✓	183.0 ✓	4.5 ✓

Weight of particulate in acetone rinse 2.0 ✓

Total 19.7 ✓

Signature of analyst Mike Kuelln

Signature of reviewer Ida Bennett T.J.W.

ANDERSEN IMPACTOR RECOVERY AND INTEGRITY SHEET

Plant AL TECH
Sample date 4-7-81
Sample location OUTLET-SITE 3
Recovery date 4-7-81
Run number A3PS-1A
Recovered by PROHASKA

RECOVERY SAMPLE

Cyclone particulate container number NA
Liquid level marked

Cyclone and nozzle rinse container number NA
Liquid level marked

Nozzle ~~(or inlet chamber)~~ rinse container number 2532 A
Liquid level marked ✓

Acetone blank container number 2531 A
Liquid level marked ✓

Filters

Stage	Filter number	Container number	Container sealed	Comments
0	Z05	2509	✓	LIGHT
1	Y00	2510	✓	OK
2	Z07	2511	✓	OK
3	Z20	2512	✓	OK
4	Z15	2513	✓	OK
5	X74	2514	✓	OK
6	Z03	2515	✓	OK
7	226 ~~Z05~~	2516	✓	OK
Backup	B201	2517	✓	LIGHT

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Hellmann
Date 4-13-81

Remarks

ANDERSON IMPACTOR ANALYTICAL DATA

Plant USEPA | Electric Arc Steel Run No. A3PS-1A

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	Yes	Yes
filter(s)	Yes	Yes

Acetone rinse container no. 2532 Lab no. BT586

Acetone rinse volume (Vaw) 31 ml ✓

Acetone blank residue concentration (Ca) .01 mg/g ✓

Wa = Ca Vaw ρa = (.01) (31) (.7908) = .2 mg ✓

Date and time of wt 4-22-81 1600 Gross wt 63734.4 mg ✓

Date and time of wt 4-23 81 1730 Gross wt 63733.9 mg ✓

Average gross wt 63734.2 mg ✓

Tare wt 63731.0 mg ✓

Less acetone blank wt (Wa) .2 mg ✓

Weight of particulate in acetone rinse 3.0 mg ✓

Filters

Stage	Filter No.	Lab No.	Gross, mg	Tare, mg	Net, mg
0	Z05	BT577	137.4	136.6	.8
1	Y00	578	129.1	127.8	1.3
2	[illegible]07	579	138.2	137.1	1.1
3	Z20	580	128.5	128.0	.5
4	Z15	581	137.0	136.2	.8
5	Y74	582	129.4	128.2	1.2
6	Z03	583	137.6	136.4	1.2
7	Z26	584	130.1	129.7	.4
Backup	B201	585	188.6	187.7	.9

Weight of particulate in acetone rinse 3.0 ✓ 3.7 @ 0.0 [illegible]

Total 11.2 ✓ 10.9

Signature of analyst Mike Kuelh

Signature of reviewer Ida Bennett T.J.N.

ANDERSEN IMPACTOR RECOVERY AND INTEGRITY SHEET

Plant AL TECH
Sample date 4-8-81
Sample location SITE 3 - OUTLET
Recovery date 4-8-81
Run number A3 PS2A
Recovered by PROHASKA

RECOVERY SAMPLE

Cyclone particulate container number NA
Liquid level marked

Cyclone and nozzle rinse container number NA
Liquid level marked

Nozzle ~~(or inlet chamber)~~ rinse container number 2558A
Liquid level marked ✓

Acetone blank container number 2549 A
Liquid level marked ✓

Filters

Stage	Filter number	Container number	Container sealed	Comments
0	Z35	2560	✓	LIGHT
1	Z58	2561	✓	OK
2	Z13	2562	✓	OK
3	Z08	2563	✓	OK
4	Z23	2564	✓	OK
5	~~Z23~~ Z34	2565	✓	OK
6	Y63	2566	✓	OK
7	Z14	2567	✓	OK
Backup	B199	2568	✓	OK

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Heitmann
Date 4/13/81
Remarks

ANDERSON IMPACTOR ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. A3PS-2A

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	Yes	Yes
filter(s)	Yes	Yes

Acetone rinse container no. 2558 Lab no. BT 606

Acetone rinse volume (Vaw) 37 ml

Acetone blank residue concentration (Ca) .005 mg/g

Wa = Ca Vaw ρa = (.005) (37) (.7908) = .1 mg

Date and time of wt 11-22-81 1000 Gross wt 66 452.9 mg

Date and time of wt 11-23-81 1730 Gross wt 66 453.0 mg

Average gross wt 66 453.0 mg

Tare wt 66450.4 mg

Less acetone blank wt (Wa) .1 mg

Weight of particulate in acetone rinse 2.5 mg

Filters

Stage	Filter No.	Lab No.	Gross, mg	Tare, mg	Net, mg
0	Z 35	BT 597	137.2	136.2	1.0
1	Z 38	598	129.4	127.8	1.6
2	Z 13	599	137.2	135.8	1.4
3	Z 08	600	129.0	127.8	1.2
4	Z 23	601	137.6	136.2	1.4
5	Z 34	602	130.0	128.6	1.4
6	Y 63	603	137.9	136.2	1.7
7	Z 14	604	128.4	127.8	.6
Backup	B 199	605	183.8	183.3	.5

Weight of particulate in acetone rinse 2.5

Total 13.3

Signature of analyst Mike Kuell T.J.N.

Signature of reviewer Ida Bennett

ANDERSEN IMPACTOR RECOVERY AND INTEGRITY SHEET

Plant AL TECH Sample date 4-9-81
Sample location SITE 3 - OUTLET Recovery date 4-9-81
Run number A3P53A Recovered by PROHASKA

RECOVERY SAMPLE

Cyclone particulate container number NA Liquid level marked

Cyclone and nozzle rinse container number NA Liquid level marked

Nozzle ~~(or inlet chamber)~~ rinse container number 2959A Liquid level marked ✓

Acetone blank container number 2549A Liquid level marked ✓

Filters

Stage	Filter number	Container number	Container sealed	Comments
0	Y49	2600	✓	SEVERAL LOOSE PARTICLES
1	Y44	2601	✓	OK
2	Y13	2602	✓	OK
3	Y48	2603	✓	OK
4	X91	2604	✓	OK
5	Y46	2605	✓	OK
6	X79	2606	✓	OK
7	Y50	2607	✓	OK
Backup	B180	2608	✓	LIGHT

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Stellmann Date 4-13-81
Remarks

ANDERSON IMPACTOR ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. A3PS-3A nozzle rinse

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse	Yes	Yes
filter(s)	Yes	Yes

Acetone rinse container no. 2959 Lab no. BT 626

Acetone rinse volume (Vaw) 24 ml ✓

Acetone blank residue concentration (Ca) .005 mg/g ✓

Wa = Ca Vaw ρa = (~~.002~~ .005) (24) (.7908) = .1 mg ✓

Date and time of wt 4-21-81 1000 Gross wt 61165.1 mg

Date and time of wt 4-23-81 1730 Gross wt 61165.5 mg

Average gross wt 61165.3 mg

Tare wt 61162.2 mg

Less acetone blank wt (Wa) .1 mg

Weight of particulate in acetone rinse 3.0 mg ✓

Filters

Stage	Filter No.	Lab No.	Gross, mg	Tare, mg	Net, mg
0	Y49	BT 617	137.8	136.4	1.4
1	Y44	618	129.2	127.8	1.4
2	Y13	619	137.0	135.5	1.5
3	Y48	620	129.6	128.2	1.4
4	X91	621	137.4	135.7	1.7
5	Y46	622	130.2	128.2	2.0
6	X79	623	137.5	135.9	1.6
7	Y50	624	129.6	128.8	.8
Backup	B180	625	181.7	180.8	.9

Weight of particulate in acetone rinse 3.0 ✓

Total 15.7 ✓

Signature of analyst Mike Krall

Signature of reviewer John Bennett T.J.N.

ANDERSEN HEAVY GRAIN LOADING IMPACTOR RECOVERY AND INTEGRITY SHEET

Plant: Al TECH
Sample date: 4-7-81
Sample location: Site No. 1
Recovery date: 4-7-81
Run number: AIPS-1
Recovered by: MASON

RECOVERED SAMPLE

Stage	Particulate container number	Container sealed comments	Rinse container number	Liquid level marked
Cyclone precutter	~~2541A~~		2541A	✓
1			2542A	✓
2			2543A	✓
Cyclone			2544A	✓
Backup	37	2535B	2535A	✓

Samples stored and locked: ✓

Remarks:

LABORATORY CUSTODY

Received by: Richard Gettman Date: 4-13-81

Remarks:

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. AIPS-1

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Particulate	Yes	Yes

Acetone rinse container no. 2541 / BT483 Stage 0 cyclone precutter

Acetone rinse volume (Vaw) 30 ml ✓

Acetone blank residue concentration (Ca) .004 mg/g ✓

Wa = Ca Vaw ρa = (.004)(30)(.7908) = .1 mg ✓

Date and time of wt 4-22-81 1030 Gross wt 63.0504 g ✓

Date and time of wt 4-27-81 1730 Gross wt 63.0508 g ✓

Average gross wt 63.0506 g ✓

Tare wt 62.9744 g ✓

Less acetone blank wt (Wa) .1 mg ✓

Weight of particulate in acetone rinse 76.1 mg ✓

Particulate container no. _____

Date and time of wt _____ Gross wt _____ g

Date and time of wt _____ Gross wt _____ g

Average gross wt _____ g

Tare wt _____ g

Stage _____

Weight of particulate _____ mg

Weight of particulate in acetone rinse _____ mg

Total weight of particulate stage _____ mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks: _____

Signature of analyst Mike Kuehl

Signature of reviewer Ida Bennett T.J.W.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. A1PS-1

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Particulate		

Acetone rinse container no. 2542 / BT481 Stage 1

Acetone rinse volume (Vaw) 75 ml ✓

Acetone blank residue concentration (Ca) .004 mg/g ✓

Wa = Ca Vaw ρa = (.004)(75)(.7908) = .2 mg ✓

Date and time of wt 4-22-81 1030 Gross wt 65.9642 g ✓

Date and time of wt 4-22-81 1630 Gross wt 65.9647 g ✓

Average gross wt 65.9644 g ✓

Tare wt 65.9560 g ✓

Less acetone blank wt (Wa) .2 mg ✓

Weight of particulate in acetone rinse 8.2 mg ✓

Particulate container no. _____

Date and time of wt _____ Gross wt _____ g

Date and time of wt _____ Gross wt _____ g

Average gross wt _____ g

Tare wt _____ g

Stage _____

Weight of particulate _____ mg

Weight of particulate in acetone rinse _____ mg

Total weight of particulate stage _____ mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst Mike Kuell

Signature of reviewer Ida Bennett T.J.N.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. 4PS-1

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Thimble		

Acetone rinse container no. 2543 / BT 482 Stage 2

Acetone rinse volume (Vaw) 110 ✓ ml

Acetone blank residue concentration (Ca) .01 mg/g ✓

Wa = Ca Vaw ρa = (.01)(110)(.7908) = .9 mg ✓

Date and time of wt 4-22-81 1630 Gross wt 67.0488 g ✓

Date and time of wt 4-23-81 1730 Gross wt 67.0488 g ✓

Average gross wt 67.0488 g ✓

Tare wt 67.0386 g ✓

Less acetone blank wt (Wa) .9 mg ✓

Weight of particulate in acetone rinse 9.3 mg ✓

Thimble container no.

Date and time of wt Gross wt g

Date and time of wt Gross wt g

Average gross wt g

Tare wt g

Weight of particulate in Thimble mg

Weight of particulate in acetone rinse mg

Total weight of particulate in stage 4 mg

Total stage 0 mg

Total stage 1 mg

Total stage 2 mg

Total stage 3 mg

Total stage 4 mg

Total particulate mg

Signature of analyst Mike Kuehl

Signature of reviewer Ida Bennett I.J.W.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. A-1PS-1

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Particulate		

Acetone rinse container no. 2544 / BT 484 Stage 3 cyclone

Acetone rinse volume (Vaw) 235 ml ✓

Acetone blank residue concentration (Ca) .01 mg/g ✓

Wa = Ca Vaw ρa = (.01)(235)(.7908) = 1.9 mg ✓

Date and time of wt 4-22-81 1630 Gross wt 104.083 7 g ✓

Date and time of wt 4-23-81 1730 Gross wt 104.033 4 g ✓

Average gross wt 104.083 6 g ✓

Tare wt 104.016 3 g

Less acetone blank wt (Wa) 1.9 mg ✓

Weight of particulate in acetone rinse 65.4 mg ✓

Particulate container no. _____

Date and time of wt _____ Gross wt _____ g

Date and time of wt _____ Gross wt _____ g

Average gross wt _____ g

Tare wt _____ g

Stage _____

Weight of particulate _____ mg

Weight of particulate in acetone rinse _____ mg

Total weight of particulate stage _____ mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks: _____

Signature of analyst Mike Kuell

Signature of reviewer Ida Bennett T.J.N.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. AMPS-1

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Y(✓)	Y(✓)
Thimble		

Acetone rinse container no. 2535 / BT 485 Stage 4 back-up rinse

Acetone rinse volume (Vaw) 215 ml ✓

Acetone blank residue concentration (Ca) .01 mg/g ✓

Wa = Ca Vaw ρa = (.01)(215)(.7908) = 1.7 mg ✓

Date and time of wt 4-22-81 1030 Gross wt 104.1590 g ✓

Date and time of wt 4-23-81 1730 Gross wt 104.1595 g ✓

Average gross wt 104.1592 g ✓

Tare wt 104.1508 g ✓

Less acetone blank wt (Wa) 1.7 mg ✓

Weight of particulate in acetone rinse 6.7 mg ✓

Thimble container no. 2535B (BT 486) #37

Date and time of wt 4-21-81 1900 Gross wt 2.4372 g ✓

Date and time of wt 4-22-81 1100 Gross wt 2.4387 g ✓

Average gross wt 2.4380 g ✓

Tare wt 2.1654 g ✓

Weight of particulate in Thimble 272.6 mg ✓

Weight of particulate in acetone rinse 6.7 mg ✓

Total weight of particulate in stage 4 279.3 mg ✓

Total stage 0 76.1 mg ✓

Total stage 1 8.2 mg ✓

Total stage 2 9.3 mg ✓

Total stage 3 65.4 mg ✓

Total stage 4 279.3 mg ✓

Total particulate 438.3 mg ✓

Signature of analyst Mla Kuoth

Signature of reviewer Jan Bennett T.J.R.

ANDERSEN HEAVY GRAIN LOADING IMPACTOR RECOVERY AND INTEGRITY SHEET

Plant AL TECH Sample date 4-8-81

Sample location SITE No. 1 - INLET Recovery date 4-8-81

Run number A1PS-2 Recovered by PROTASKA/MASON

RECOVERED SAMPLE

Stage	Particulate container number	Container sealed comments	Rinse container number	Liquid level marked
Cyclone precutter	NA		2551A	✓
1	NA		2552A	✓
2	NA		2553A	✓
Cyclone	NA		2554A	✓
Backup	38	2555 B	2555A	✓

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Hettmann Date 4-13-81

Remarks

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. AIPS-2

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Particulate		

Acetone rinse container no. 2551 / BT 490 Stage 0 cyclone precutter

Acetone rinse volume (Vaw) 35 ml ✓

Acetone blank residue concentration (Ca) .01 mg/g ✓

Wa = Ca Vaw ρa = (.01)(35)(.7908) = .3 mg ✓

Date and time of wt 4-22-81 1030 Gross wt 63.7171 g ✓

Date and time of wt 4-23-81 1730 Gross wt 63.7175 g ✓

Average gross wt 63.7173 g ✓

Tare wt 63.6240 g ✓

Less acetone blank wt (Wa) .3 mg ✓

Weight of particulate in acetone rinse 93.0 mg ✓

Particulate container no. _____

Date and time of wt _____ Gross wt _____ g

Date and time of wt _____ Gross wt _____ g

Average gross wt _____ g

Tare wt _____ g

Stage _____

Weight of particulate _____ mg

Weight of particulate in acetone rinse _____ mg

Total weight of particulate stage _____ mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks: _____

Signature of analyst Mike Kuehl

Signature of reviewer Ida Bennett T.J.N.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. A1PS-2

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Particulate		

Acetone rinse container no. 2552 / BT 487 Stage 1

Acetone rinse volume (Vaw) 190 ml

Acetone blank residue concentration (Ca) .01 mg/g

Wa = Ca Vaw ρa = (.01)(190)(.7908) = 1.5 mg

Date and time of wt 4-22-81 1030 Gross wt 63.6822 g

Date and time of wt 4-23-81 1730 Gross wt 63.6823 g

Average gross wt 63.6822 g

Tare wt 63.6770 g

Less acetone blank wt (Wa) 1.5 mg

Weight of particulate in acetone rinse 3.7 mg

Particulate container no. _____

Date and time of wt _____ Gross wt _____ g

Date and time of wt _____ Gross wt _____ g

Average gross wt _____ g

Tare wt _____ g

Stage _____

Weight of particulate _____ mg

Weight of particulate in acetone rinse _____ mg

Total weight of particulate stage _____ mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks: _____

Signature of analyst Mike Kuelh

Signature of reviewer Ida Barrett T.J.N.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA/ Electric Arc Steel Run No. AIPS-2

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Particulate		

Acetone rinse container no. 2553 / BT 488 Stage 2

Acetone rinse volume (Vaw) 370 ml ✓

Acetone blank residue concentration (Ca) .01 mg/g ✓

Wa = Ca Vaw ρa = (.01)(370)(.7908) = 2.9 mg ✓

Date and time of wt 4-25-81 1300 Gross wt 103.9897 g ✓

Date and time of wt 4-27-81 0930 Gross wt 103.9897 g ✓

Average gross wt 103.9897 g ✓

Tare wt 103.9832 g ✓

Less acetone blank wt (Wa) 2.9 mg ✓

Weight of particulate in acetone rinse 3.6 mg ✓

Particulate container no.

Date and time of wt Gross wt g

Date and time of wt Gross wt g

Average gross wt g

Tare wt g

Stage

Weight of particulate mg

Weight of particulate in acetone rinse mg

Total weight of particulate stage mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst Mike Kuelb

Signature of reviewer Gda Bennett T.J.N.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. A1PS-2

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Particulate		

Acetone rinse container no. 2554 / BT 489 Stage 3 cyclone

Acetone rinse volume (Vaw) 132 ml ✓

Acetone blank residue concentration (Ca) .01 mg/g ✓

Wa = Ca Vaw ρa = (.01)(132)(.7908) = 1.0 mg ✓

Date and time of wt 4-22-81 1630 Gross wt 103.1961 g ✓

Date and time of wt 4-23-81 1730 Gross wt 103.1957 g ✓

Average gross wt 103.1959 g ✓

Tare wt 103.1500 g ✓

Less acetone blank wt (Wa) 1.0 mg ✓

Weight of particulate in acetone rinse 44.9 mg ✓

Particulate container no. _____

Date and time of wt _____ Gross wt _____ g

Date and time of wt _____ Gross wt _____ g

Average gross wt _____ g

Tare wt _____ g

Stage _____

Weight of particulate _____ mg

Weight of particulate in acetone rinse _____ mg

Total weight of particulate stage _____ mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks: _____

Signature of analyst Mike Kuehl

Signature of reviewer John Barrett T.J.R.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. AIPS-2

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Thimble		

Acetone rinse container no. 2555 / BT 491 Stage 4 back-up rinse

Acetone rinse volume (Vaw) 130 ml

Acetone blank residue concentration (Ca) .01 mg/g

Wa = Ca Vaw ρa = (.01)(130)(.7908) = 1.0 mg

Date and time of wt 4-22-81 1030 Gross wt 104.7444 g

Date and time of wt 4-23-81 1730 Gross wt 104.7439 g

Average gross wt 104.7442 g

Tare wt 104.7381 g

Less acetone blank wt (Wa) 1.0 mg

Weight of particulate in acetone rinse 5.1 mg

Thimble container no. (AIPS-2 | BT 492) 2555 B #38

Date and time of wt 4-21-81 1900 Gross wt 2.4225 g

Date and time of wt 4-22-81 1100 Gross wt 2.4239 g

Average gross wt 2.4232 g

Tare wt 2.1832 g

Weight of particulate in Thimble 240.0 mg

Weight of particulate in acetone rinse 5.1 mg

Total weight of particulate in stage 4 245.1 mg

Total stage 0 93.0 mg

Total stage 1 3.7 mg

Total stage 2 3.6 mg

Total stage 3 44.9 mg

Total stage 4 245.1 mg

Total particulate 390.3 mg

Signature of analyst Mike Kuehl

Signature of reviewer Ida Bennett T.J.N.

55

ANDERSEN HEAVY GRAIN LOADING IMPACTOR RECOVERY AND INTEGRITY SHEET

Plant AL TECH Sample date 4-9-81

Sample location SITE 1 - INLET Recovery date 4-9-81

Run number A1PS-3 Recovered by MASON

RECOVERED SAMPLE

Stage	Particulate container number	Container sealed comments	Rinse container number	Liquid level marked
Cyclone precutter	NA		2560A	✓
1	NA		2561A	✓
2	NA		2562A	✓
Cyclone	NA		2563A	✓
Backup	43	2564B	2564A	✓

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Geltmann Date 4-13-81

Remarks

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. A1PS-3

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Particulate		

Acetone rinse container no. 2560 / BT 496 Stage 0 cyclone precutter

Acetone rinse volume (Vaw) 34 ml ✓

Acetone blank residue concentration (Ca) .005 mg/g ✓

Wa = Ca Vaw ρa = (.005)(34)(.7908) = .1 mg ✓

Date and time of wt 4-22-81 1030 Gross wt 66.3361 g ✓

Date and time of wt 4-23-81 1730 Gross wt 66.3362 g ✓

Average gross wt 66.3362 g ✓

Tare wt 66.3059 g ✓

Less acetone blank wt (Wa) .1 mg ✓

Weight of particulate in acetone rinse 30.2 mg ✓

Particulate container no.

Date and time of wt Gross wt g

Date and time of wt Gross wt g

Average gross wt g

Tare wt g

Stage

Weight of particulate mg

Weight of particulate in acetone rinse mg

Total weight of particulate stage mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst Mike Kuelb

Signature of reviewer Ida Bennett T.J.N.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA | Electric Arc Steel Run No. AIPS-3

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Particulate		

Acetone rinse container no. 2561 | BT 493 Stage 1

Acetone rinse volume (Vaw) 128 ml ✓

Acetone blank residue concentration (Ca) .005 mg/g ✓

Wa = Ca Vaw ρa = (.005)(128)(.7908) = .5 mg ✓

Date and time of wt 4-22-81 1630 Gross wt 102.9118 g ✓

Date and time of wt 4-23-81 1730 Gross wt 102.9114 g ✓

Average gross wt 102.9116 g ✓

Tare wt 102.9067 g ✓

Less acetone blank wt (Wa) .5 mg ✓

Weight of particulate in acetone rinse 4.4 mg ✓

Particulate container no.

Date and time of wt Gross wt g

Date and time of wt Gross wt g

Average gross wt g

Tare wt g

Stage

Weight of particulate mg

Weight of particulate in acetone rinse mg

Total weight of particulate stage mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst [illegible]

Signature of reviewer Ida Bennett T.J.N.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA | Electric Arc Steel Run No. AIPS-3

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Particulate		

Acetone rinse container no. 2562 | BT494 Stage 2

Acetone rinse volume (Vaw) 127 ml ✓

Acetone blank residue concentration (Ca) .005 mg/g ✓

Wa = Ca Vaw ρa = (.005)(127)(.7908) = .5 mg ✓

Date and time of wt 4-22-81 1030 Gross wt 103.4777 g

Date and time of wt 4-23-81 1730 Gross wt 103.4780 g ✓

Average gross wt 103.4778 g ✓

Tare wt 103.4726 g ✓

Less acetone blank wt (Wa) .5 mg ✓

Weight of particulate in acetone rinse 4.7 mg ✓

Particulate container no. _____

Date and time of wt _____ Gross wt _____ g

Date and time of wt _____ Gross wt _____ g

Average gross wt _____ g

Tare wt _____ g

Stage _____

Weight of particulate _____ mg

Weight of particulate in acetone rinse _____ mg

Total weight of particulate stage _____ mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst Mike Kuehl

Signature of reviewer John Bennett T.J.W.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. ALPS-3

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse		
Particulate		

Acetone rinse container no. 2563 / B1495 Stage 3 cyclone

Acetone rinse volume (Vaw) 218 ✓ ml

Acetone blank residue concentration (Ca) .005 mg/g ✓

Wa = Ca Vaw ρa = (.005)(218)(.7908) = .9 mg ✓

Date and time of wt 4-22-81 1030 Gross wt 104.8767 g ✓

Date and time of wt 4-23-81 1730 Gross wt 104.8771 g ✓

Average gross wt 104.8769 g ✓

Tare wt 104.8357 g ✓

Less acetone blank wt (Wa) .9 mg ✓

Weight of particulate in acetone rinse 40.3 mg ✓

Particulate container no.

Date and time of wt Gross wt g

Date and time of wt Gross wt g

Average gross wt g

Tare wt g

Stage

Weight of particulate mg

Weight of particulate in acetone rinse mg

Total weight of particulate stage mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks:

Signature of analyst Mike Kuelh

Signature of reviewer Ida Bennett T.J.N.

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA / Electric Arc Steel Run No. A1 PS-3

Sample location

Relative humidity 50 %

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	Yes	Yes
Thimble		

Acetone rinse container no. 2564 / BT497 Stage 4 back-up

Acetone rinse volume (Vaw) 245 ml ✓

Acetone blank residue concentration (Ca) .005 mg/g ✓

Wa = Ca Vaw ρa = (.005)(245)(.7908) = 1.0 mg ✓

Date and time of wt 4-22-81 1030 Gross wt 101.6531 g ✓

Date and time of wt 4-23-81 1730 Gross wt 101.6529 g ✓

Average gross wt 101.6530 g ✓

Tare wt 101.6471 g ✓

Less acetone blank wt (Wa) 1.0 mg ✓

Weight of particulate in acetone rinse 4.9 mg ✓

Thimble container no. 2567 B (BT 498) #43

Date and time of wt 4-21-81 1900 Gross wt 2.6636 g ✓

Date and time of wt 4-22-81 1100 Gross wt 2.6649 g ✓

Average gross wt 2.6642 g ✓

Tare wt 2.5488 g ✓

Weight of particulate in Thimble 115.4 mg ✓

Weight of particulate in acetone rinse 4.9 mg ✓

Total weight of particulate in stage 4 120.3 mg ✓

Total stage 0 30.2 mg ✓

Total stage 1 4.4 mg ✓

Total stage 2 4.7 mg ✓

Total stage 3 40.3 mg ✓

Total stage 4 120.3 mg ✓

Total particulate 199.9 mg ✓

Signature of analyst Mike Kuelh

Signature of reviewer John Bennett T.J.N.

BLANK ANALYTICAL DATA FORM

ACETONE BLANK (PARTICULATE)

Plant U.S. EPA / Electric Arc Steel

Sample location BT 460 3982A

Relative humidity 50%

Liquid level marked and container sealed yes

Density of acetone (ρ_a) .7908 g/ml

Blank volume (V_a) 237 ml

Date and time of wt 4-21-81 3:30 pm Gross wt 106449.5 mg

Date and time of wt 4-22-81 9:00 am Gross wt 106449.2 mg

Average gross wt 106449.4 mg

Tare wt 106447.4 mg

Weight of blank (m_a) 2.0 mg

$$C_a = \frac{m_a}{V_a \rho_a} = \frac{(2.0)}{(237)(.7908)} = .01 \text{ mg/g}$$

Note: In no case should a blank residue greater than 0.01 mg/g) or 0.001% of the blank weight be subtracted from the sample weight.

Filters BLANK Filter number BT 474 0002165

Date and time of wt 4-15-81 3:30pm Gross wt 362.6 mg

Date and time of wt 4-16-81 8:45am Gross wt 362.6 mg

Average gross wt 362.6 mg

Tare wt 3623 mg

Difference wt 0.3 mg

Note: Average difference must be less than ±5 mg or 2% of total sample weight whichever is greater.

Remarks

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.N.

Quality Assurance Handbook M5-5.4

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BLANK ANALYTICAL DATA FORM Acetone Blank (Particulate)

Plant U.S. EPA / Electric Arc Steel

Sample location BT 461 3989A

Relative humidity 50%

Liquid level marked and container sealed yes

Density of acetone (ρ_a) .7908 g/ml

Blank volume (V_a) 227 ml

Date and time of wt 4-21-81 9:15am Gross wt 99874.7 mg

Date and time of wt 4-21-81 3:30pm Gross wt 99875.1 mg

Average gross wt 99874.9 mg

Tare wt 99873.7 mg

Weight of blank (m_a) 1.2 mg

$$C_a = \frac{m_a}{V_a \rho_a} \quad \frac{(1.2)}{(227)(.7908)} \quad .007 \text{ mg/g}$$

Note: In no case should a blank residue greater than 0.01 mg/g) or 0.001% of the blank weight be subtracted from the sample weight.

Filters Filter number

Date and time of wt Gross wt mg

Date and time of wt Gross wt mg

Average gross wt mg

Tare wt mg

Difference wt mg

Note: Average difference must be less than ±5 mg or 2% of total sample weight whichever is greater.

Remarks

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.N.

BLANK ANALYTICAL DATA PARTICULATE H_2O BLANK

Plant U.S. EPA / Electric Arc Steel

Sample location BT 459 3983A

Relative humidity 50%

Type of blank water

Liquid level at mark and container sealed yes

Density of blank (ρa) 1.0 g/ml

Blank volume (Va) 378 ml

Date and time of wt. 4-17-81 8:45am Gross wt. 111168.4 mg

Date and time of wt. 4-21-81 9:50am Gross wt. 111168.4 mg

Average gross wt. 111168.4 mg

Tare wt. 111166.7 mg

Weight of blank (ma) 1.7 mg

$$Ca = \frac{ma}{Va\ \rho a} = \frac{(1.7)}{(378)(1.0)} = .004 \text{ mg/g}$$

Note: In no case shall a blank residue greater than (0.01 mg/g) or 0.001% of the weight of blank used be subtracted from the sample weight.

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.N.

BLANK ANALYTICAL DATA

Plant U.S. EPA / Electric Arc Steel

Sample location BT 459 "aq" ✓

Relative humidity 50%

Type of blank water

Liquid level at mark and container sealed yes

Density of blank (ρa) 1.0 g/ml

Blank volume (Va) 250 ml ✓

Date and time of wt. 4-21-81 4:10 pm Gross wt. 96694.9 mg

Date and time of wt. 4-22-81 8:00 am Gross wt. 96695.4 mg

Average gross wt. 96695.2 mg ✓

Tare wt. 96694.6 mg

Weight of blank (ma) 0.6 mg ✓

$$Ca = \frac{ma}{Va\ \rho a} = \frac{(0.6)}{(250)(1.0)} = .002 \text{ mg/g} \checkmark$$

Note: In no case shall a blank residue greater than (0.01 mg/g) or 0.001% of the weight of blank used be subtracted from the sample weight.

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Bennett T.J.W.

BLANK ANALYTICAL DATA

Plant U.S. EPA / Electric Arc Steel

Sample location BT 459 "org" ✓

Relative humidity 50%

Type of blank ether / chloroform

Liquid level at mark and container sealed yes

Density of blank (ρa) 1.098 g/ml

Blank volume (Va) 150 ml ✓

Date and time of wt. 4-21-81 9:30am Gross wt. 65761.5 mg

Date and time of wt. 4-21-81 4:10 pm Gross wt. 65761.2 mg

Average gross wt. 65761.4 mg ✓

Tare wt. 65760.5 mg

Weight of blank (ma) 0.9 mg ✓

$$Ca = \frac{ma}{Va\ \rho a} = \frac{(0.9)}{(150)(1.098)} = .005 \text{ mg/g} \checkmark$$

Note: In no case shall a blank residue greater than (0.01 mg/g) or 0.001% of the weight of blank used be subtracted from the sample weight.

Remarks:

Signature of analyst Cheryl Jones

Signature of reviewer Ida Barrett T.J.W.

BLANK ANALYTICAL DATA FORM Acetone Blank (Particle Size) 66

Plant USEPA Electric Arc Steel BT 656

Sample location C# 2526

Relative humidity 50%

Liquid level marked and container sealed Yes

Density of acetone (ρ_a) .7908 g/ml

Blank volume (V_a) 382 ml ✓

Date and time of wt 4-24-81 1400 Gross wt 105432.4 mg ✓

Date and time of wt 4-25-81 1300 Gross wt 105432.6 mg ✓

Average gross wt 105432.5 mg ✓

Tare wt 105431.4 mg ✓

Weight of blank (m_a) 1.1 mg ✓

$$C_a = \frac{m_a}{V_a \rho_a} \quad \frac{(1.1)}{(382)(.7908)} \quad .004 \text{ mg/g} \checkmark$$

Note: In no case should a blank residue greater than 0.01 mg/g) or 0.001% of the blank weight be subtracted from the sample weight.

Filters Filter number

Date and time of wt Gross wt mg

Date and time of wt Gross wt mg

Average gross wt mg

Tare wt mg

Difference wt mg

Note: Average difference must be less than ±5 mg or 2% of total sample weight whichever is greater.

Remarks

Signature of analyst Mike Kuehn

Signature of reviewer Ida Bennett T.J.N

BLANK ANALYTICAL DATA FORM Acetone Blank (Particle Size) 67

Plant US EPA / Electric Mfg Site

Sample location BT 646

Relative humidity 50% C # 2531

Liquid level marked and container sealed Yes

Density of acetone (ρ_a) .7908 g/ml

Blank volume (V_a) 190 ml ✓

Date and time of wt 4-22-81 1000 Gross wt 103058.8 mg ✓

Date and time of wt 4-23-81 1730 Gross wt 103058.7 mg ✓

Average gross wt 103058.8 mg ✓

Tare wt 103055.8 mg

Weight of blank (m_a) 3.0 mg ✓

$$C_a = \frac{m_a}{V_a \rho_a} \quad \frac{(3.0)}{(190)(.7908)} \quad .02 \text{ mg/g} \checkmark$$

Note: In no case should a blank residue greater than 0.01 mg/g) or 0.001% of the blank weight be subtracted from the sample weight.

Filters Filter number

Date and time of wt Gross wt mg

Date and time of wt Gross wt mg

Average gross wt mg

Tare wt mg

Difference wt mg

Note: Average difference must be less than ±5 mg or 2% of total sample weight whichever is greater.

Remarks Used .01 in Calculations. ✓

Signature of analyst Mike Kuhl

Signature of reviewer Ida Bennett T.J.W.

BLANK ANALYTICAL DATA FORM Acetone Blank (Particle Size)

Plant USEPA / Electric Arc Steel BT 500

Sample location C # 2549

Relative humidity 50%

Liquid level marked and container sealed Yes

Density of acetone (ρ_a) .7908 g/ml

Blank volume (V_a) 518 ml ✓

Date and time of wt 4-25-81 1300 Gross wt 102620.5 mg ✓

Date and time of wt 4-27-81 0930 Gross wt 102620.9 mg ✓

Average gross wt 102620.7 mg ✓

Tare wt 102618.8 mg ✓

Weight of blank (m_a) 1.9 mg ✓

$$C_a = \frac{m_a}{V_a \rho_a} \quad \frac{(1.9)}{(518)(.7908)} \quad .005 \text{ mg/g}$$ ✓

Note: In no case should a blank residue greater than 0.01 mg/g) or 0.001% of the blank weight be subtracted from the sample weight.

Filters Filter number

Date and time of wt Gross wt mg

Date and time of wt Gross wt mg

Average gross wt mg

Tare wt mg

Difference wt mg

Note: Average difference must be less than ±5 mg or 2% of total sample weight whichever is greater.

Remarks

Signature of analyst Mike Koehler

Signature of reviewer Ida Bennett T.J.K.

ANDERSEN IMPACTOR RECOVERY AND INTEGRITY SHEET
IMPACTOR FILTER BLANKS

Plant AL TECH
Sample date NA
Sample location NA
Recovery date
Run number A3P5BF
Recovered by

RECOVERY SAMPLE

Cyclone particulate container number NA
Liquid level marked

Cyclone and nozzle rinse container number NA
Liquid level marked

Nozzle (or inlet chamber) rinse container number NA
Liquid level marked

Acetone blank container number NA
Liquid level marked

Filters

Stage	Filter number	Container number	Container sealed	Comments
0	Y94	2245		
1	Z51	2244	✓	
2	Y66	2243	✓	
3	Y75	2242	✓	
4	Y88	2241	✓	
5	Z39	2240	✓	
6	Y76	2239	✓	
7	Z53	2238	✓	
Backup	B129	2237	✓	

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Hettmann Date 4-13-81

Remarks

ANDERSON IMPACTOR ANALYTICAL DATA (Filter Blanks)

Plant USEPA Run No. A3PS-BF

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse		
filter(s)	Yes	Yes

Acetone rinse container no. _____ Lab no. _____

Acetone rinse volume (Vaw) _____ ml

Acetone blank residue concentration (Ca) _____ mg/g

Wa = Ca Vaw ρa = ( ) ( ) ( ) = _____ mg

Date and time of wt _____ Gross wt _____ mg

Date and time of wt _____ Gross wt _____ mg

Average gross wt _____ mg

Tare wt _____ mg

Less acetone blank wt (Wa) _____ mg

Weight of particulate in acetone rinse _____ mg

Filters

Stage	Filter No.	Lab No.	Gross, mg	Tare, mg	Net, mg
0	Y94	BJ637	127.8	127.8	0
1	Z51	638	136.3	136.0	.3
2	Y66	639	126.8	126.8	0
3	Y75	640	135.0	134.9	.1
4	Y88	641	127.4	127.2	.2
5	Z39	642	136.3	136.0	.3
6	Y76	643	127.4	127.4	0
7	Z53	644	136.8	136.6	.2
Backup	D179	645	180.6	180.5	.1

Weight of particulate in acetone rinse —

Total 1.2

Signature of analyst Mike Kuelle

Signature of reviewer Jon Bennett T.J.H.

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ANDERSEN IMPACTOR RECOVERY AND INTEGRITY SHEET (FILTER BLANK)

Plant AL TECH Sample date 4-6-81
Sample location SITE 3 - OUTLET Recovery date 4-6-81
Run number A3PSB Recovered by PROHASKA

RECOVERY SAMPLE

Cyclone particulate container number NA Liquid level marked

Cyclone and nozzle rinse container number NA Liquid level marked

Nozzle (or inlet chamber) rinse container number NA Liquid level marked

Acetone blank container number NA Liquid level marked

Filters Prefilter B-197 47mm: 1000634

Stage	Filter number	Container number	Container sealed	Comments
0	X-31	2462	✓	NO LOADING
1	X-32	2463	✓	"
2	X-33	2464	✓	"
3	X-34	2465	✓	"
4	X-35	2466	✓	"
5	X-36	2467	✓	"
6	X-37	2468	✓	"
7	W-60	2469	✓	"
Backup	B 222	2470	✓	"

Samples stored and locked ✓

Remarks PREFILTER DISCARDED.

LABORATORY CUSTODY

Received by Richard Stettmann Date 4-13-81
Remarks

ANDERSON IMPACTOR ANALYTICAL DATA (Filter Blank)

Plant USEPA | Electric Arc Steel Run No. A3PS-B

Sample location

Relative humidity 50%

Density of acetone (ρa) .7908 g/ml

Sample type	Sample identifiable	Liquid level at mark and/or container sealed
Acetone rinse		
filter(s)	✓	✓

Acetone rinse container no. _____ Lab no. _____

Acetone rinse volume (Vaw) _____ ml

Acetone blank residue concentration (Ca) _____ mg/g

Wa = Ca Vaw ρa = ( ) ( ) ( ) = _____ mg

Date and time of wt _____ Gross wt _____ mg

Date and time of wt _____ Gross wt _____ mg

Average gross wt _____ mg

Tare wt _____ mg

Less acetone blank wt (Wa) _____ mg

Weight of particulate in acetone rinse _____ mg

Filters

Stage	Filter No.	Lab No.	Gross, mg	Tare, mg	Net, mg
0	X31	BT647	149.1	148.9	.2 ✓
1	X32	648	137.8	137.6	.2 ✓
2	X33	649	146.0	145.6	.4 ✓
3	X34	650	139.0	138.6	.4 ✓
4	X35	651	151.3	151.1	.2 ✓
5	X36	652	139.2	138.9	.3 ✓
6	X37	653	150.4	150.2	.2 ✓
7	W60	654	135.4	135.2	.2 ✓
Backup	B222	655	188.7	188.0	.7 ✓

Weight of particulate in acetone rinse —

Total 2.8 ✓

Signature of analyst Mike Kuhlen T.J.W.

Signature of reviewer Ida Bennett

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(Thimble BLANK)

ANDERSEN HEAVY GRAIN LOADING IMPACTOR RECOVERY AND INTEGRITY SHEET

Plant ALTECH

Sample date NA

Sample location —

Recovery date

Run number AIPSBF

Recovered by NA

RECOVERED SAMPLE

Stage	Particulate container number	Container sealed comments	Rinse container number	Liquid level marked
Cyclone precutter	NA			
1	NA			
2	NA			
Cyclone	NA			
Backup	39	2236 ✓		

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by Richard Lettmann Date 4-13-81

Remarks

(Thimble Blank)

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA/Electric Arc Steel Run No. A IPS-BF

Sample location _____

Relative humidity _____

Density of acetone (ρa) _____ g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse		
Thimble		

Acetone rinse container no. _____ Stage _____

Acetone rinse volume (Vaw) _____ ml

Acetone blank residue concentration (Ca) _____ mg/g

Wa = Ca Vaw ρa = ( )( )( ) = _____ mg

Date and time of wt _____ Gross wt _____ g

Date and time of wt _____ Gross wt _____ g

Average gross wt _____ g

Tare wt _____ g

Less acetone blank wt (Wa) _____ mg

Weight of particulate in acetone rinse _____ mg

Thimble container no. #39 (BT499) 2236

Date and time of wt 4-22-81 11:00 Gross wt 2.4805 g ✓

Date and time of wt 4-24-81 12:00 Gross wt 2.4801 g ✓

Average gross wt 2.4804 g ✓

Tare wt 2.4706 g ✓

Weight of particulate in Thimble 9.8 mg ✓

Weight of particulate in acetone rinse _____ mg

Total weight of particulate in stage 4 _____ mg

Total stage 0 _____ mg

Total stage 1 _____ mg

Total stage 2 _____ mg

Total stage 3 _____ mg

Total stage 4 _____ mg

Total particulate _____ mg

Signature of analyst Ida Bennett

Signature of reviewer Thomas J. Wagner

(Thimble Blank)

HGLI PARTICULATE ANALYTICAL DATA

Plant USEPA - Electric Arc Steel Run No. _____

Sample location _____

Relative humidity _____

Density of acetone (ρa) _____ g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse		
Thimble		

Acetone rinse container no. _____ Stage _____

Acetone rinse volume (Vaw) _____ ml

Acetone blank residue concentration (Ca) _____ mg/g

Wa = Ca Vaw ρa = ( )( )( ) = _____ mg

Date and time of wt _____ Gross wt _____ g

Date and time of wt _____ Gross wt _____ g

Average gross wt _____ g

Tare wt _____ g

Less acetone blank wt (Wa) _____ mg

Weight of particulate in acetone rinse _____ mg

Thimble container no. #61 (BU024)

Date and time of wt 4-28-81 10:00 AM Gross wt 2178.2 g ✓

Date and time of wt 4-29-81 10:30 AM Gross wt 2179.1 g ✓

Average gross wt 2178.6 g ✓

Tare wt 2176.6 g ✓

Weight of particulate in Thimble 2.0 mg ✓

Weight of particulate in acetone rinse _____ mg

Total weight of particulate in stage 4 _____ mg

Total stage 0 _____ mg

Total stage 1 _____ mg

Total stage 2 _____ mg

Total stage 3 _____ mg

Total stage 4 _____ mg

Total particulate _____ mg

Signature of analyst Zola Bennett T.J.B.

Signature of reviewer Roy H Lobdell

pedco

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

To:
Mr. Thomas J. Wagner
PEDCo Enviromental, Inc.
11499 Chester Road
Cincinnati, Ohio 45246

Date: May 26, 1981

Analyst: J. Oldham

P. O. No.: PEI-81-3918-3530-2

Sample No.: BT 431
DUST SAMPLE
ATM-1 4-7-81

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS

IAD No.: 97-G425-515-04

CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium	6	Terbium		Ruthenium		Vanadium	850
Thorium	8	Gadolinium		Molybdenum	MC	Titanium	MC
Bismuth	350	Europium		Niobium	190	Scandium	1
Lead	MC	Samarium	4	Zirconium	130	Calcium	MC
Thallium	12	Neodymium	5	Yttrium	15	Potassium	MC
Mercury	NR	Praseodymium	2	Strontium	MC	Chlorine	MC
Gold		Cerium	21	Rubidium	170	Sulfur	MC
Platinum		Lanthanum	21	Bromine	170	Phosphorus	MC
Iridium		Barium	MC	Selenium	120	Silicon	MC
Osmium		Cesium	7	Arsenic	420	Aluminum	MC
Rhenium		Iodine	2	Germanium	100	Magnesium	MC
Tungsten	100	Tellurium	3	Gallium	660	Sodium	MC
Tantalum	*3	Antimony	160	Zinc	MC	Fluorine	MC
Hafnium	3	Tin	410	Copper	MC	Oxygen	NR
Lutetium		Indium	STD	Nickel	MC	Nitrogen	NR
Ytterbium		Cadmium	150	Cobalt	340	Carbon	NR
Thulium		Silver	≤4	Iron	MC	Boron	42
Erbium		Palladium		Manganese	MC	Beryllium	0.3
Holmium		Rhodium		Chromium	MC	Lithium	160
Dysprosium		*Heterogeneous				Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.4ppm
MC — Major Component
INT — Interference

Approved: M. L. Jacobs by P. L. Taylor
26 May 81.

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

To: Mr. Thomas J. Wagner
PEDCo. Enviromental, Inc.
11499 Chester Road
Cincinnati, Ohio 45246

Date: May 26, 1981

Analyst: J. Oldham

P. O. No.: PEI-81-3918-3530-2

Sample No.: BT 432
DUST SAMPLE
ATM-2 4-8-81

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

IAD No.: 97-G425-515-04

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium	3	Terbium		Ruthenium		Vanadium	MC
Thorium	5	Gadolinium		Molybdenum	MC	Titanium	710
Bismuth	420	Europium	0.4	Niobium	56	Scandium	0.1
Lead	MC	Samarium	2	Zirconium	39	Calcium	MC
Thallium		Neodymium	3	Yttrium	8	Potassium	MC
Mercury	NR	Praseodymium	1	Strontium	MC	Chlorine	MC
Gold		Cerium	19	Rubidium	530	Sulfur	MC
Platinum		Lanthanum	25	Bromine	94	Phosphorus	840
Iridium		Barium	MC	Selenium	66	Silicon	MC
Osmium		Cesium	14	Arsenic	410	Aluminum	MC
Rhenium		Iodine	3	Germanium	55	Magnesium	MC
Tungsten	54	Tellurium	5	Gallium	810	Sodium	MC
Tantalum	≤0.9	Antimony	190	Zinc	MC	Fluorine	MC
Hafnium	1	Tin	220	Copper	MC	Oxygen	NR
Lutetium		Indium	STD	Nickel	MC	Nitrogen	NR
Ytterbium		Cadmium	180	Cobalt	190	Carbon	NR
Thulium		Silver	190	Iron	MC	Boron	23
Erbium		Palladium		Manganese	MC	Beryllium	0.1
Holmium		Rhodium		Chromium	MC	Lithium	9
Dysprosium						Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.1ppm
MC — Major Component
INT — Interference

Approved: M.L. Jacobs by R.L. Taylor
26 May 81

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

To: Mr. Thomas J. Wagner
PEDCo Enviromental, Inc.
11499 Chester Road
Cincinnati, Ohio 45246

Date: May 26, 1981

Analyst: J. Oldham

P. O. No.: PEI-81-3918-3530-2

Sample No.: BT 433
DUST SAMPLE
ATM-3 4-9-81

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

IAD No.: 97-425-515-04

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium	2	Terbium		Ruthenium		Vanadium	MC
Thorium	2	Gadolinium		Molybdenum	MC	Titanium	660
Bismuth	44	Europium		Niobium	52	Scandium	0.5
Lead	MC	Samarium	2	Zirconium	36	Calcium	MC
Thallium	2	Neodymium	1	Yttrium	16	Potassium	MC
Mercury	NR	Praseodymium	1	Strontium	800	Chlorine	MC
Gold		Cerium	6	Rubidium	200	Sulfur	MC
Platinum		Lanthanum	6	Bromine	43	Phosphorus	970
Iridium		Barium	MC	Selenium	28	Silicon	MC
Osmium		Cesium	3	Arsenic	120	Aluminum	MC
Rhenium		Iodine	3	Germanium	41	Magnesium	MC
Tungsten	50	Tellurium	2	Gallium	330	Sodium	MC
Tantalum	*1	Antimony	44	Zinc	MC	Fluorine	MC
Hafnium	1	Tin	82	Copper	MC	Oxygen	NR
Lutetium		Indium	STD	Nickel	MC	Nitrogen	NR
Ytterbium		Cadmium	132	Cobalt	430	Carbon	NR
Thulium		Silver	220	Iron	MC	Boron	53
Erbium		Palladium		Manganese	MC	Beryllium	0.2
Holmium		Rhodium		Chromium	MC	Lithium	79
Dysprosium		*Heterogeneous				Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.2ppm
MC — Major Component
INT — Interference

Approved: M. L. Jacobs by P. B. Taylor
26 May 81

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434
Reply to INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

To: Mr. Thomas J. Wagner
PEDCo Enviromental, Inc.
11499 Chester Road
Cincinnati, Ohio 45246

Date: May 26, 1981

Analyst: J. Oldham

P. O. No.: PEI-81-3918-3580-2

Sample No.: BT 434 Std
NBS 1633a

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS

IAD No.: 97-G425-515-04

CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium	18	Terbium	1	Ruthenium		Vanadium	99
Thorium	56	Gadolinium	4	Molybdenum	15	Titanium	MC
Bismuth	0.5	Europium	2	Niobium	19	Scandium	19
Lead	110	Samarium	11	Zirconium	210	Calcium	MC
Thallium	6	Neodymium	15	Yttrium	96	Potassium	MC
Mercury	NR	Praseodymium	15	Strontium	940	Chlorine	30
Gold		Cerium	170	Rubidium	110	Sulfur	MC
Platinum		Lanthanum	140	Bromine	11	Phosphorus	MC
Iridium		Barium	MC	Selenium	16	Silicon	MC
Osmium		Cesium	19	Arsenic	120	Aluminum	MC
Rhenium		Iodine	0.3	Germanium	12	Magnesium	MC
Tungsten	7	Tellurium	0.2	Gallium	43	Sodium	MC
Tantalum	*11	Antimony	4	Zinc	220	Fluorine	46
Hafnium	3	Tin	3	Copper	71	Oxygen	NR
Lutetium	0.3	Indium	STD	Nickel	54	Nitrogen	NR
Ytterbium	1	Cadmium	1	Cobalt	10	Carbon	NR
Thulium	0.2	Silver	0.4	Iron	MC	Boron	10
Erbium	1	Palladium		Manganese	170	Beryllium	2
Holmium	2	Rhodium		Chromium	150	Lithium	>370
Dysprosium	3	* Heterogeneous				Hydrogen	NR

STD — Internal Standard
NR — Not Reported
All elements not detected < 0.1ppm
MC — Major Component
INT — Interference

Approved: M. L. Jacobs by R. Flaughn
26 May 81

4111-4

COULTER COUNTER™ Model T&TA — **PARTICLE SIZE ANALYSIS**

.15 – 200 μ
X PERCENT

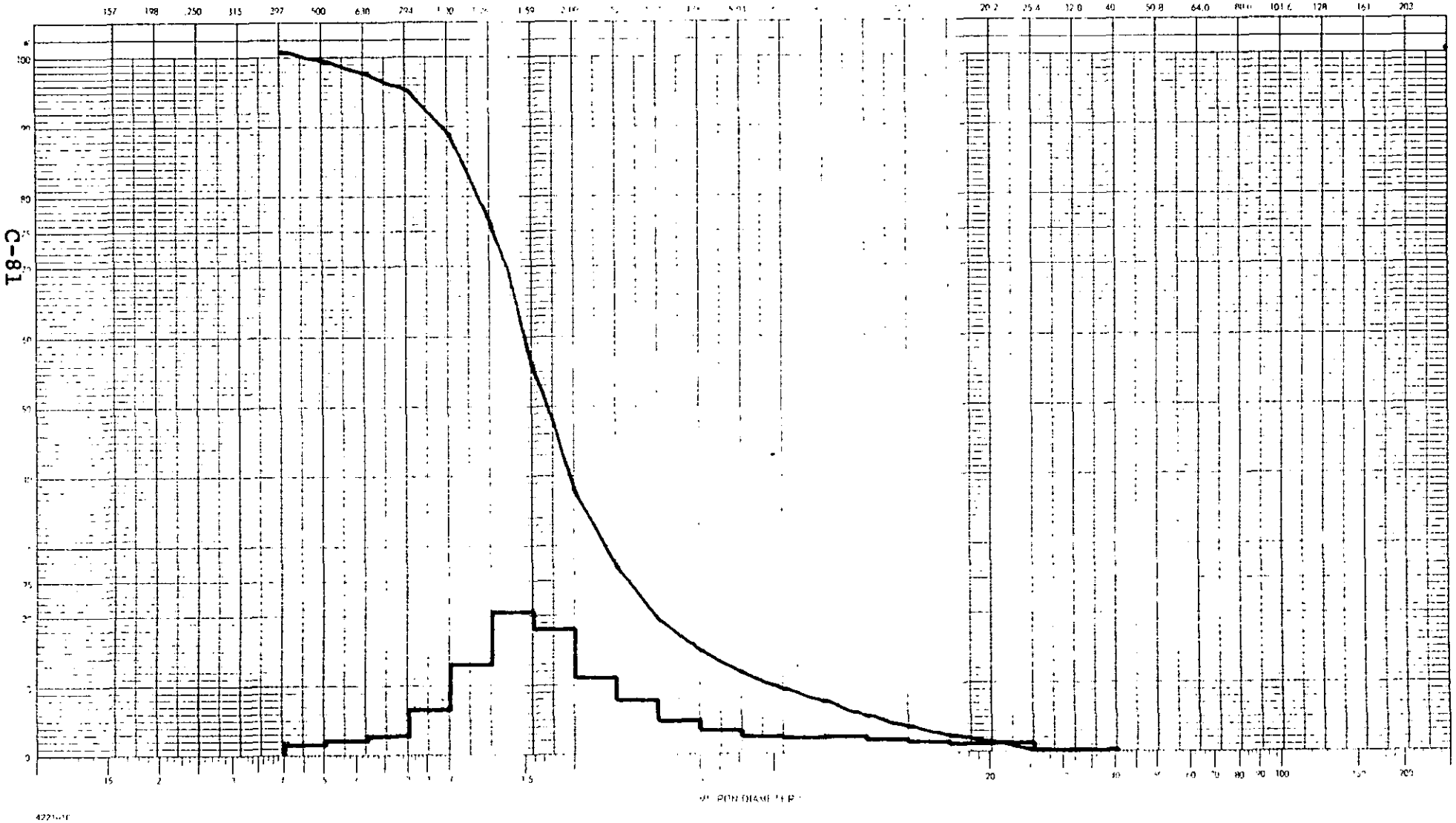
COULTER ELECTRONICS INC.
590 W 20 ST.
HIALEAH, FLA. 33010

ORGANIZATION: PEDCO
OPERATOR: KK
EQUIPMENT: TAII

SAMPLE: BT431 DUST — ELECTROLYTE: ISOTON, 4% NACL/H20 — DISPERSANT: IA, 1 MIN. ULTRASONICS
GRAB SAMPLE BACHOATM-1

$d = d\sqrt[3]{\frac{A_2}{A}}$ FOR MODEL T — $\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$ — $\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 \neq W_1$ FOR MODEL TA

APER. SIZE	SERIAL		PART DIA.	W	± IA	A	SAMPLE SETTINGS DIA.	W	± IA	A
70UM	40292	MICROSPHERES	506	8	1680	338	504	8	1680	253
30UM		LATEX	202	7	1680	266	20	7	1680	130
19UM	58266	LATEX	202	9	1680	522	20	9	1680	157



C-81

4111-B

COULTER COUNTER® Model T&TA — **PARTICLE SIZE ANALYSIS**

.15 – 200 μ
X PERCENT

COULTER ELECTRONICS INC.
590 W 20 ST.
HIALEAH, FLA. 33010

ORGANIZATION: PEDCO
OPERATOR: KK
EQUIPMENT: TAII

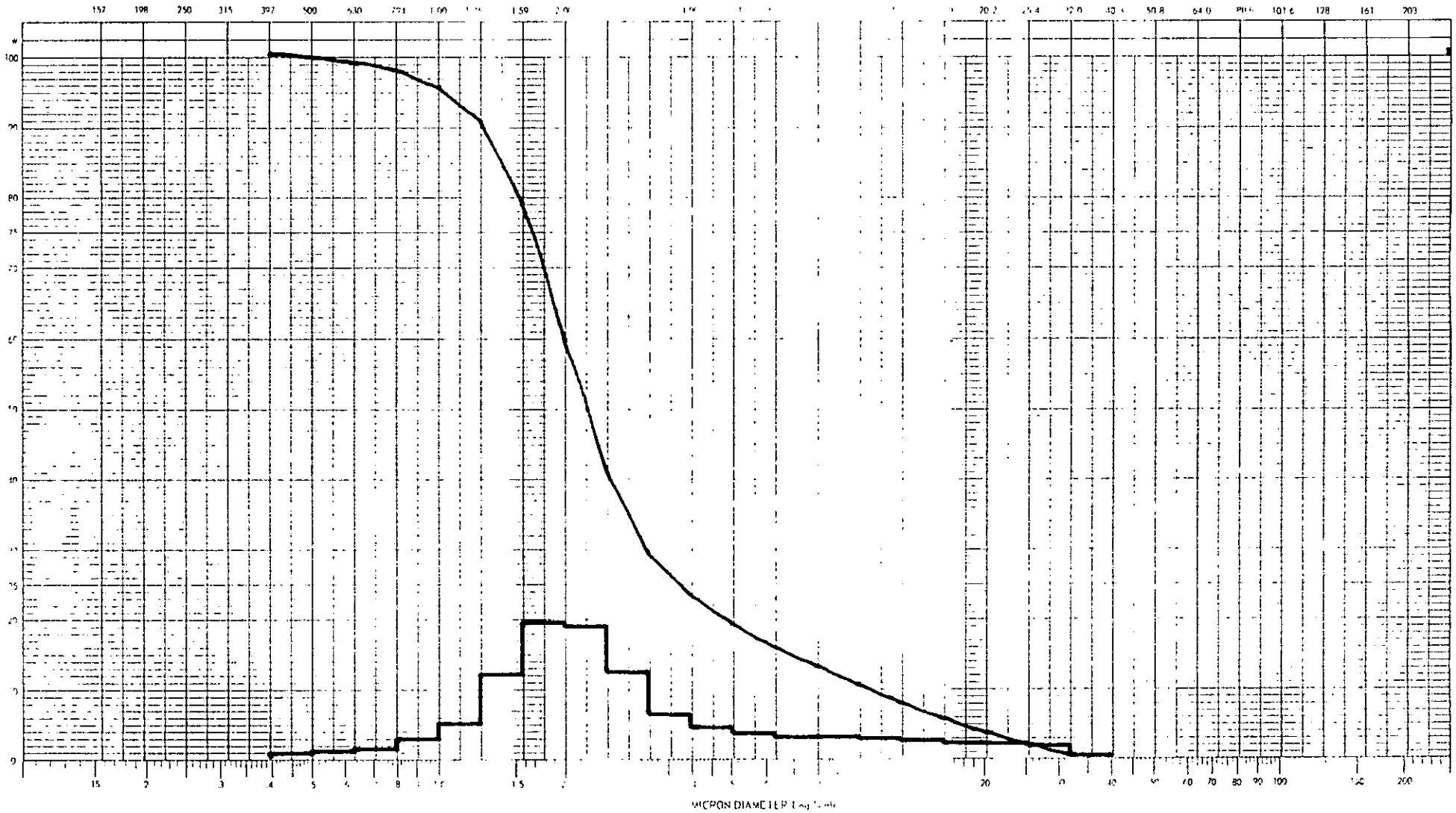
$V = d\sqrt[3]{2^n}$ FOR MODEL T; $\frac{A2}{A1} = \left(\frac{d1}{d2}\right)^3$ when W2 = W1; $\frac{A2}{A1} = \left(\frac{d1}{d2}\right)^1$ when W2 ≠ W1 FOR MODEL TA

SAMPLE: BT432 DUST GRAB
SAMPLE BACHO ATM-2

ELECTROLYTE: ISOTON, 4% NACL/H20

DISPERSANT: IA, 1 MIN. ULTRASONIC

APER. SIZE	SERIAL		PART DIA.	W	± TA	A	SAMPLE SETTINGS DIA.	W	± TA	A
70UM	40292	MICROSPHERES	506	8	1680	1238	504	8	1680	1253
30UM		LATEX	202	7	1680	1222	20	7	1680	130
19UM	58266	LATEX	202	9	1680	1528	20	9	1680	157



C-82

4111-C

COULTER COUNTER® Model T&TA — **PARTICLE SIZE ANALYSIS**

.15 – 200 μ
X PERCENT

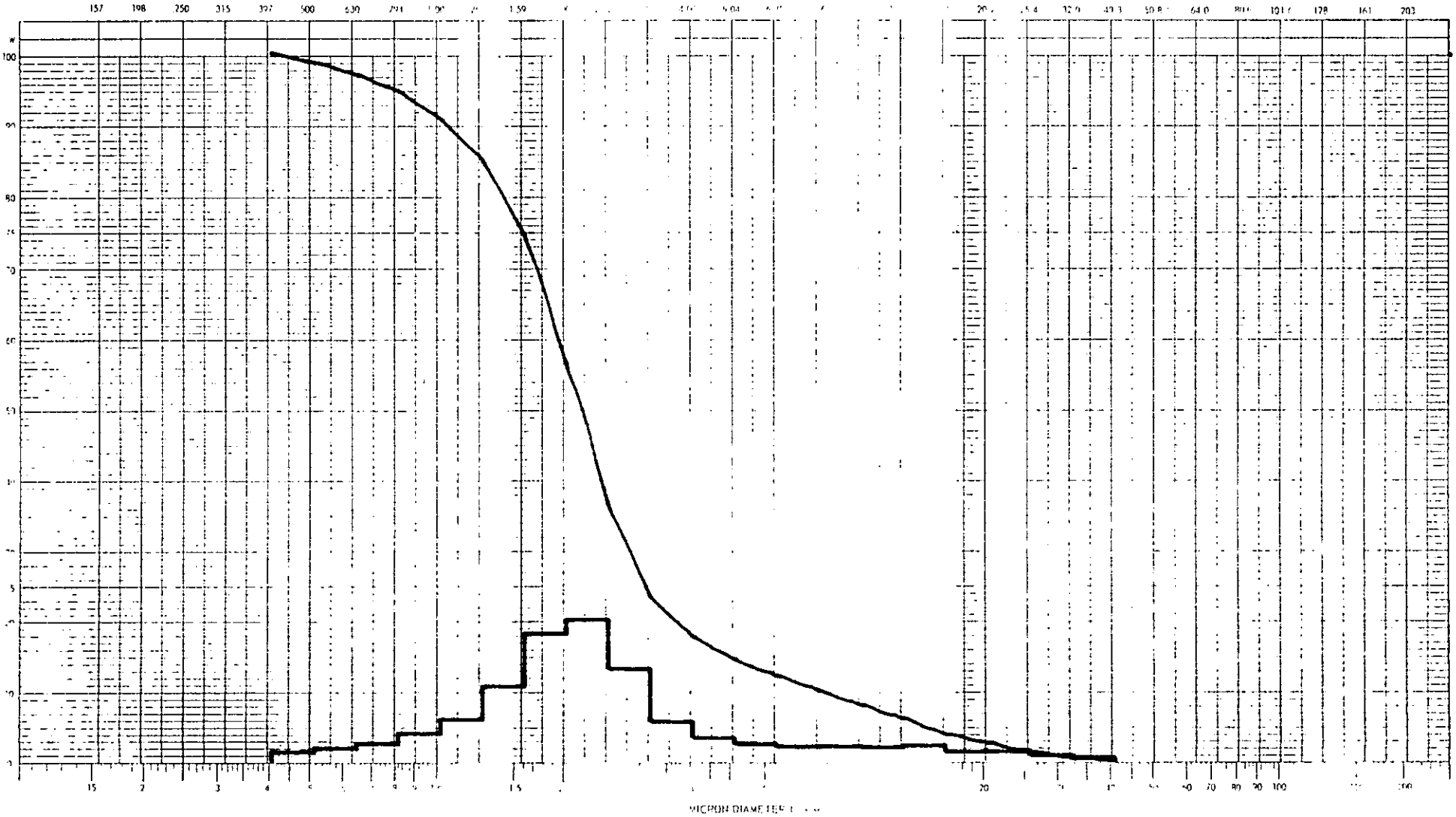
COULTER ELECTRONICS INC.
590 W 20 ST.
HIALEAH, FLA. 33010

ORGANIZATION: PEDCO
OPERATOR: KK
EQUIPMENT: TAII

SAMPLE: BT433 ATM-3 — ELECTROLYTE: ISOTON, 4% NACL/H20 — DISPERSANT: IA, 1 MINUTE ULTRASONICS

$t = d\sqrt{\frac{2}{\ }}$ FOR MODEL T $\quad \frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$ $\quad \frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$ FOR MODEL TA

APER. SIZE	SERIAL		PART DIA.	W	± IA	A	SAMPLE SETTINGS DIA.	W	± IA	A
70UM	40292	MICROSPHERES	506	8	1680	1338	504	8	1680	1253
19UM	58266	LATEX	202	7	1680	1367	20	7	1680	130
30UM		LATEX	202	9	1680	1528	20	9	1680	157



C-83

CE #4111-A DATE: 5/22/81Z
ORGANIZATION: PEDCO
SAMPLE: BT431BUST GRAB SAMPLE BACHOATM-1
ELECTROLYTE: ISOTON,4%NACL/H2O
DISPERSANT: IA1 MIN ULTRASONICS
EQUIPMENT: TAII
OPERATOR: KK
APERTURES: 70,30,19UM

VOL. %

SIZE	CUM	DIF
.397	100.	1.3
.5	98.7	1.8
.63	96.9	2.4
.794	94.5	6.3
1.	88.2	12.7
1.26	75.5	20.3
1.587	55.2	17.7
2.	37.5	10.8
2.52	26.7	7.5
3.175	19.2	4.6
4.	14.6	3.2
5.04	11.4	2.3
6.35	9.1	2.
8.	7.1	2.1
10.079	5.1	1.6
12.699	3.4	1.3
16.	2.2	1.
20.159	1.2	1.1
25.398	0.	0.
32.	0.	0.

VOL.GEO MEAN 1.983 STANDARD DEV. 2.111

MEDIAN 1.699 MODE 1.497

CE #4111-B DATE: 5/22/81
ORGANIZATION: PEDCO
SAMPLE: BT432 DUST GRAB SAMPLE BACKO ATM-2
ELECTROLYTE: ISOTON,4%NACL*H2O
DISPERSANT: IA,1 MIN ULTRASONICS
EQUIPMENT: TAII
OPERATOR: KK
APERTURES: 70,30,19UM

VOL. %

SIZE	CUM	DIF
.397	100.	.4
.5	99.6	.7
.63	98.8	1.1
.794	97.7	2.6
1.	95.2	4.7
1.26	90.5	11.8
1.587	78.7	19.2
2.	59.5	18.6
2.52	40.9	12.
3.175	28.9	5.9
4.	23.	4.1
5.04	18.9	3.3
6.35	15.6	2.7
8.	12.9	2.7
10.079	10.1	2.5
12.699	7.6	2.2
16.	5.4	1.9
20.159	3.4	1.9
25.398	1.6	1.6
32.	0.	0.

VOL.GEO MEAN 2.752 STANDARD DEV. 2.254

MEDIAN 2.251 MODE 1.968

CE #41111-C DATE: 5/22/81Z
ORGANIZATION: PEDCO
SAMPLE: BT433 ATN-3
ELECTROLYTE: ISOTON,4%NACL/H2O
DISPERSANT: IA,1MIN ULTRASONICS
EQUIPMENT: TAII
OPERATOR: KK
APERTURES: 70,30,19UM

VOL. %

SIZE	CUM	DIF
.397	100.	1.2
.5	98.8	1.7
.63	97.1	2.4
.794	94.7	3.9
1.	90.8	5.9
1.26	84.9	10.5
1.587	74.4	18.1
2.	56.2	20.
2.52	36.2	13.1
3.175	23.2	5.6
4.	17.6	3.2
5.04	14.3	2.3
6.35	12.	2.1
8.	9.9	2.1
10.079	7.9	1.9
12.699	6.	2.2
16.	3.8	1.4
20.159	2.4	1.3
25.398	1.2	.8
32.	.4	.4

VOL.GEO MEAN 2.415 STANDARD DEV. 2.219

MEDIAN 2.15 MODE 2.102

PEDCo ENVIRONMENTAL
11499 CHESTER ROAD
CINCINNATI, OHIO 45246
(513) 782-4700

ANALYTICAL RESULTS

Client: U.S.E.P.A.
PN 3530-2

Sample received: 4/13/81
Results reported: 7/9/81
Attn:

Parameter	Units	Sample number				
		Dust AM2	Dust AM3			
PEDCo Sample Number	-	BT432	BT433			
Specific gravity	-	3.35	3.34			

Comments: BAGHOUSE DUST SAMPLES.

Submitted by: Roy H Caldwell

CHESTER TOWERS

BRANCH OFFICES

Crown Center
Kansas City, Mo.

Professional Village
Chapel Hill, N.C.

PEDCo ENVIRONMENTAL, INC.
11499 CHESTER ROAD
CINCINNATI, OHIO 45246
(513) 782-4700
TELEX (513) 782-4807

LABORATORY REPORT

FLUORIDE ANALYSES

Run No.	F^- in rinse (mg)	F^- on filter(s) (mg)	Total F^-
A3PS-1A	0.06	*	0.06
A3PS-3A	0.13	0.76	0.89

* Not analyzed

Run No.	Total F^-, mg/g
ATM-2	43.7
ATM-3	50.7

Samples corrected for blanks.

Reagent blank for rinses = <0.04 mg F^-/flask
Reagent blank for filters = 0.24 mg F^-/flask
Andersen filter blank = 1.52 mg F^-

Submitted By: Ida Bennett

Date: 9-15-81

CHESTER TOWERS

BRANCH OFFICES

DALLAS, TEXAS
KANSAS CITY, MISSOURI
COLUMBUS, OHIO
DURHAM, NORTH CAROLINA

PEDCo ENVIRONMENTAL, INC.
11499 CHESTER ROAD
CINCINNATI, OHIO 45246
(513) 782-4700
TELEX (513) 782-4807

PARTICULATE RUNS

Run No.	Total µg metal Chromium	Lead	Nickel
A3PS2A (Anderson set)	274	91	120
A3PS3B (Anderson set)	214	74	92

All blanks: Non-detectable

BULK SAMPLES

Run No.	mg/g metal Chromium	Lead	Nickel
ATM-2	42.6	11.5	9.6
ATM-3	35.8	5.31	23.0

Date: September 9, 1981

Submitted By: Ray H Caldwell

Comments TOTAL PARTICULATE SAMPLE WEIGHTS WERE AS FOLLOWS: (IN mg) A3PS2A = 13.3, A3PS3B = 15.1

BRANCH OFFICES

CHESTER TOWERS

DALLAS, TEXAS
KANSAS CITY, MISSOURI

COLUMBUS, OHIO
DURHAM, NORTH CAROLINA

APPENDIX D

MRI PROCESS SUMMARY

MIDWEST RESEARCH INSTITUTE
4505 Creedmoor Road
Raleigh, N.C. 2761
Telephone (919) 781-575

FINAL

Date: May 8, 1981

Subject: Source Test Report--Electric Arc Furnaces in the Steel Industry:
AL Tech Specialty Steel Company, Watervliet, New York
EPA Contract No. 68-02-3059; ESED Project No. 79/9
MRI Project No. 4663-L

From: William Terry, MRI

To: Reid Iversen, Lead Engineer
ESED/ISB/SSAS
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

I. Purpose

To monitor the operation of the electric arc furnaces (EAF's), argon-oxygen decarburization (AOD) furnaces, and associated environmental control systems during the source test at the AL Tech Specialty Steel plant.

II. Place and Date

AL Tech Specialty Steel
Spring Street
Watervliet, New York 12189
Telephone: (518) 273-4110
April 6-9, 1981

III. Attendees

A. AL Tech Specialty Steel

Arthur Stienstra, Mechanical Engineer
Paul Larkin, First Melter
Chuck Irwin, First Melter

B. U.S. Environmental Protection Agency (EPA)

Dennis Holzschuh, EPA/EMB

C. PEDCo Environmental, Inc. (PEDCo)

John Prohaska, Test Team Leader

Principal Laboratories 425 Volker Boulevard, Kansas City, Missouri 641

D. Midwest Research Institute (MRI)

Lalit Banker, MRI/Raleigh
William Terry, MRI/Raleigh

IV. Discussion

A. Background

AL Tech Specialty Steel (AL Tech) employs about 1,100 people at this plant which produces approximately 113,750 megagrams (Mg) (125,000 tons) of specialty steel per year. Recently the plant has been operating from three to five days per week depending upon the demand for their products. AL Tech produces many different grades of steel, including stainless steel and high temperature alloys.

AL Tech operates two EAF's and two AOD's. Table 1 lists the specifications for the EAF's, AOD's, and the associated control system. Each EAF and AOD has a rated capacity of 27.3 Mg (30 tons). Figure 1 presents the general plant layout. The north AOD vessel and EAF No. 89 are located in the north end of the building, and EAF No. 90 and the south AOD vessel are located in the southern end of the building. The test observer could see from one end of the building to the other to determine the stage of the heat for each furnace and vessel. Typically, furnace No. 89 feeds the north AOD and furnace No. 90 feeds the south AOD. However, the north EAF can feed the south AOD vessel, and vice versa, if necessary.

The objective of the trip was to monitor the process during the source test on April 6 through 9, 1981. Particulate matter (PM) concentration, particle size distribution (PSD), visible emissions (VE), and fugitive emission (FE) tests were performed at the common ductwork and the control system for all the furnaces. These tests were conducted by PEDCo. AL Tech was selected for emission testing for several reasons: the capture and control of PM from the AOD vessels and EAF's appeared to be good during MRI's first visit; the capture and control equipment were representative of current technology; and the ductwork was amenable to obtaining uncontrolled emission data from the AOD and EAF operations. These tests were performed primarily to establish an emission data base to aid in the review of the existing new source performance standards (NSPS) for the EAF's in the steel industry.

B. Process

Normal meltshop operation consists of charging and backcharging the EAF with cold scrap and fluxes; meltdown; tapping the EAF; charging molten metal, fluxes, and alloys into the AOD vessel; refining in the AOD vessel; and tapping the refined metal into a ladle which is then transferred to the teeming aisle. Each of the two EAF's has a 4.1-meter (m) [13.5-foot (ft)] diameter shell. The average production per heat is 29 Mg (32 tons) of

TABLE 1. TECHNICAL DATA FOR PROCESS AND CONTROL SYSTEMS
AL TECH SPECIALITY STEEL COMPANY

A.	Electric arc furnaces	
1.	Capacity: design/actual	27.3 Mg (30 tons)/29 Mg (32 tons)
2.	Shell diameter	4.1 m (13.5 ft)
3.	Electrode diameter	43.1 cm (17 in.)
4.	Tapping temperature	1866°K (2900°F)
5.	Transformer rating	10,000 kVA
6.	Heat time (tap-to-tap)	3.7 hours
B.	Argon-oxygen decarburization vessels	
1.	Capacity:design/actual	27.3 Mg (30 tons)/29 Mg (32 tons)
2.	Shell diameter	3.0 m (10 ft)
3.	Tapping temperature	1839°K (2850°F)
4.	Heat time	1.5-2 hours
C.	Control system--Baghouse	
1.	Capture system	2 canopy hoods per furnace
2.	Manufacturer	Wheelabrator-Frye
3.	Type/cleaning	positive pressure/shaker on timer
4.	Design flow rate	282 m^3/s (600,000 acfm)
5.	Compartments	8
6.	Total number of bags	5,376
7.	Bag dimensions	20.3 cm (8 in.) diameter
		6.1 m (20 ft) length
8.	Air-to-cloth ratio (net)	2.96 to 1
9.	Fans (3)	522.2 kW (700 hp) each
10.	Pressure drop	1.0 to 1.5 kPa (4-6 in.)
11.	Inlet temperature	339°K (150°F)

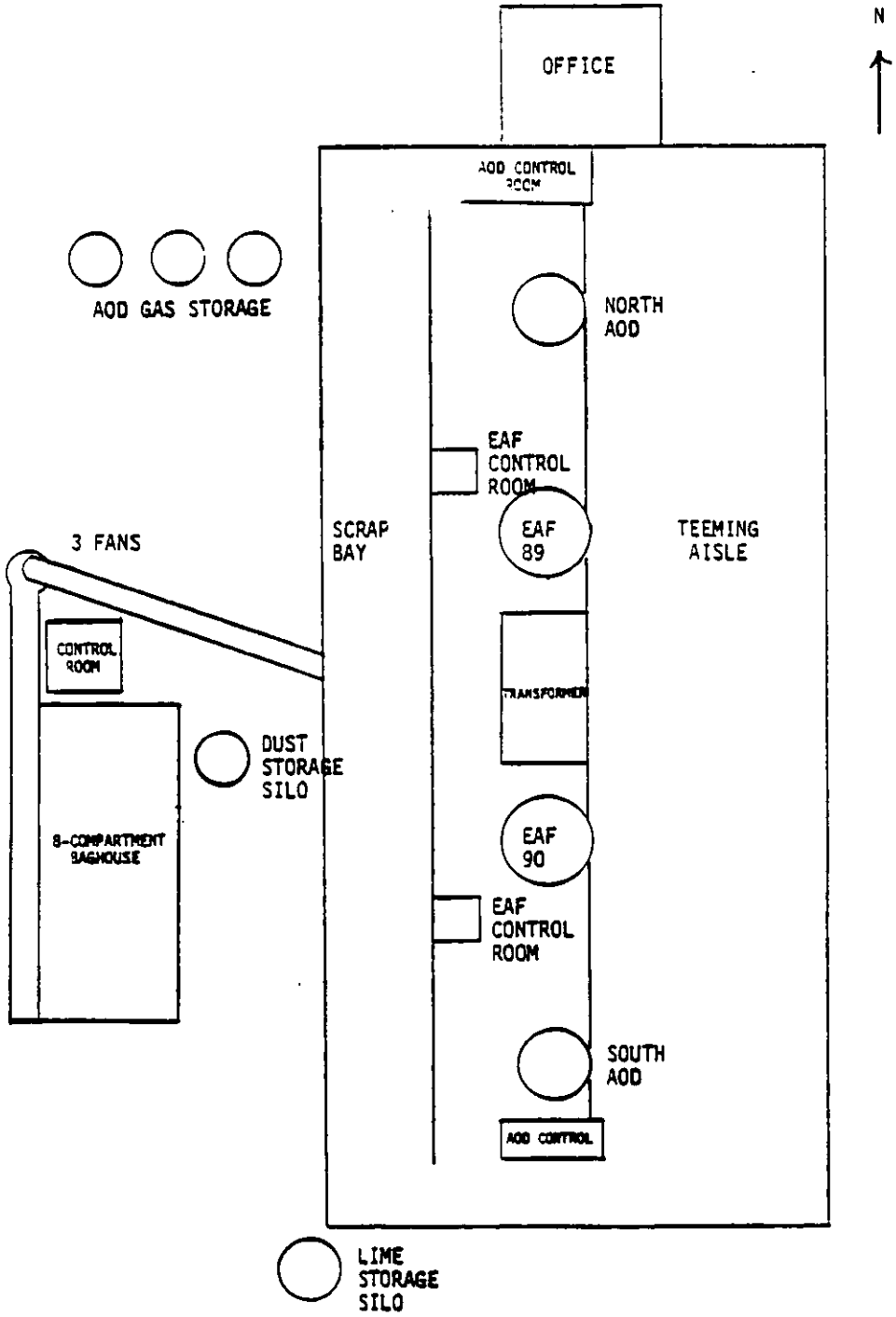


Figure 1. Melt shop layout, AL Tech Specialty Steel Company

molten metal per EAF compared to a rated capacity of 27.3 Mg (30 tons). Table 2 indicates the charge and tap weights for the EAF's and AOD's during the source test. The scrap used at this plant is relatively clean and contains a high percentage of stainless steel. This would result in lower emissions. However, the large amounts of alloys and high carbon alloys utilized may cause an increase in the amount of emissions generated by the furnaces and vessels. The charge material consists of 80 percent scrap [such as low phosphorous scrap, 18-8 scrap (18 percent chrome and 8 percent nickel), and Murray iron*] and 20 percent additives (such as lime, charge chrome, ferronickel, and iron ore). The scrap is not subjected to any pretreatment. Additional additives, if needed, are added during melting. The refining is primarily done in the AOD vessel; therefore, a minimum amount of oxygen, if any, is blown into the molten bath in the EAF's. Hot metal is tapped into a ladle, which is then transferred to the AOD vessel. The transformer rating on each furnace is 10,000 kilovolt amperes (kVA). Average EAF heat times (tap-to-tap) are 3.7 hours.

The hot metal from the EAF's is charged into the AOD vessel where major alloy additions are made. The additions include high carbon magnesium, high carbon chrome, nickel, silicon, molybdenum, and aluminum. The argon-oxygen-nitrogen gas mixture is blown into the molten bath through tuyeres located in the bottom of the vessel until the carbon in the metal has been oxidized to specification. Reduction mixes are added to remove sulfur and other impurities. The refining process in the AOD vessel takes about 1.5 to 2 hours and produces approximately 29 Mg (32 tons) of steel per heat. Some AOD heats are longer if more refinement is necessary. The refined molten metal is tapped from the AOD into a ladle and transferred to the teeming area where the hot metal is poured into ingot molds. The ingots are transferred to the finishing section where they are rolled into the desired finished products. After it is tapped, the AOD remains idle until another hot metal charge from the EAF is ready.

C. Air Pollution Control System

The capture system involves two hoods above each electric furnace and each AOD vessel. The electric furnace hoods are situated so that one hood captures a majority of the emissions from charging and melting while the other canopy captures a majority of the tapping emissions. The AOD hoods are situated so that each hood captures half the refining emissions. A diverter stack directs the AOD refining emissions toward the canopies to avoid excessive drift of the emissions due to cross-drafts. Each canopy hood has a set of automatic dampers which can be closed to direct more suction to another hood. The dampers on the hoods located on the charging side of each EAF are always open. The dampers on the tapping side open automatically during tapping and remain closed the rest of the

*Murray iron consists of C--0.50% max., P--0.01% max., S--0.04% max., Si--0.50% max., Cr--0.20% max., Ni--0.20% max., Mo--0.20% max., Cu--0.20% max., and the balance Fe.

TABLE 2. CHARGE WEIGHTS FOR ELECTRIC FURNACES AND AOD VESSELS DURING SOURCE TEST
AL TECH SPECIALTY STEEL CORPORATION

Furnace	Heat	Metal		Alloys and fluxes		Total input		Tap weight	
		Mg	(ton)	Kg	(lb)	Mg	(ton)	Mg	(ton)
Apirl 6, 1981									
North AOD	98071	24.9	(27.5)	6,767.7	(14,920)	31.7	(35.0)	29.7	(32.8)[a]
EAF 89	98071	25.8	(28.4)	1,270.1	(2,800)	27.0	(29.8)	--	--
EAF 89	98065	29.1	(32.1)	1,406.2	(3,100)	30.5	(33.6)	--	--
EAF 90	08438	29.4	(32.4)	1,451.5	(3,200)	30.8	(34.0)	--	--
South AOD	08436	34.0	(37.5)	3,573.9	(7,879)	37.6	(41.4)	36.3	(40.0)[a]
April 7, 1981									
North AOD	90833	27.2	(30.0)	1,900.6	(4,190)	29.1	(32.1)	28.0	(30.9)[a]
North AOD	08440	25.4	(28.0)	3,913.2	(8,627)	29.3	(32.3)	27.9	(30.8)[a]
EAF 89	98047	29.4	(32.4)	1,859.8	(4,100)	31.2	(34.4)	--	--
EAF 89	98068	29.7	(32.7)	1,451.5	(3,200)	31.1	(34.3)	--	--
EAF 90	08440	30.0	(33.1)	1,542.2	(3,400)	31.6	(34.8)	--	--
EAF 90	08444	29.4	(32.5)	3,220.6	(7,100)	32.7	(36.1)	--	--
EAF 90	08445	29.2	(32.2)	2,404.1	(5,300)	31.6	(34.8)	--	--
South AOD	98047	27.7	(30.5)	2,527.4	(5,572)	30.2	(33.3)	28.8	(31.7)[a]
South AOD	08444	30.2	(33.3)	5,858.2	(12,915)	36.0	(39.7)	33.9	(37.4)[a]
April 8, 1981									
North AOD	90845	25.9	(28.5)	3,677.8	(8,108)	29.5	(32.6)	27.9	(30.8)[a]
North AOD	98064	29.9	(33.0)	1,071.9	(2,363)	31.0	(34.2)	30.8	(34.0)[a]
EAF 89	98064	30.0	(33.1)	1,270.1	(2,800)	31.3	(34.5)	--	--
EAF 89	98039	30.0	(33.0)	1,224.7	(2,700)	31.1	(34.4)	--	--
EAF 90	08464	30.6	(33.7)	1,950.5	(4,300)	32.5	(35.9)	--	--
EAF 90	08446	29.4	(32.4)	1,451.5	(3,200)	30.8	(34.0)	--	--
EAF 90	08447	29.9	(33.0)	2,404.1	(5,300)	32.3	(35.6)	--	--
South AOD	08464	28.6	(31.5)	6,850.7	(15,103)	35.4	(39.1)	32.8	(36.1)[a]
South AOD	08446	29.5	(32.5)[b]	4,295.6	(9,470)	33.8	(37.2)	32.2	(35.5)[a]

TABLE 2. CHARGE WEIGHTS FOR ELECTRIC FURNACES AND AOD VESSELS DURING SOURCE TEST
AL TECH SPECIALTY STEEL CORPORATION
(concluded)

Furnace		Heat	Metal		Alloys and fluxes		Total input		Tap weight	
			Mg	(ton)	Kg	(lb)	Mg	(ton)	Mg	(ton)
April 9, 1981										
North	AOD	98090	28.1	(31.0)	3,363.0	(7,414)	31.5	(34.7)	29.2	(32.1)
North	AOD	98091	25.4	(28.0)	8,627.4	(19,020)	34.0	(37.5)	30.4	(33.5)[a]
EAF	89	98091	25.4	(28.0)	1,270.1	(2,800)	26.7	(29.4)	--	--
EAF	89	98044	29.2	(32.2)	1,905.1	(4,200)	31.1	(34.3)	--	--
EAF	90	08451	29.9	(33.0)	2,358.7	(5,200)	32.3	(35.6)	--	--
EAF	90	08465	29.5	(32.5)	1,451.5	(3,200)	30.9	(34.1)	--	--
South	AOD	08452	27.7	(30.5)	4,621.7	(10,189)	32.3	(35.6)	31.0	(34.2)[a]
South	AOD	08451	30.4	(33.5)	7,137.4	(15,735)	37.5	(41.4)	35.0	(38.6)[a]

[a]Difference between total input weight and tap weight is lost as slag and fumes.
[b]Estimated.

time. The dampers on the canopy hood for the AOD vessels are open all the time because the automatic mechanism no longer functions.

The emissions generated by the EAF's were greatest during meltdown, but emissions were significant during tapping also. Because the tapping emissions are deflected by the crane holding the tapping ladle, all the emissions during tapping were not captured. The emissions from the AOD were greatest during the initial stages of the heat when the oxygen concentration was the highest in the blowing gases. The emissions from the AOD during blowing were equal to or greater than the EAF meltdown emissions. However, for long periods of time, the vessel is in a non-blowing position while operators wait for sample results to determine what alloys are needed and how much more blowing is necessary to meet final specifications.

The emissions evolved during refining from each AOD vessel are ducted to the same baghouse which controls the EAF emissions. The baghouse is a positive-pressure, shaker-type Wheelabrator-Frye unit consisting of eight compartments. The air flow through the baghouse is about 282 cubic meters per second (m^3/s) [600,000 actual cubic feet per minute (acfm)]. The technical specifications for the baghouse are summarized in Table 1. AL Tech has assigned two people to the regular maintenance of the baghouse. A periodic visual inspection is made, and the broken bags are changed when needed.

The dust collected from the baghouse is screw-conveyed to a storage silo and then trucked to a metal recovery firm (Inmetco, Elwood City, Pennsylvania). AL Tech buys back the reclaimed metal from Inmetco in bar form at a percentage of the current market price.

D. Emission Tests

The primary interest of the emission tests was to determine the baghouse inlet and outlet PM concentrations and observe VE's. In addition, the exhaust gas was analyzed for PSD. Baghouse dust samples were being collected for PSD and trace metal analysis. Attachment 1 contains copies of the AL Tech heat sheets for the furnace and vessel operations for the duration of the tests. Attachment 2* contains copies of the logsheets of the process operation observation. The sampling plan is presented in Table 3, and sampling points are identified on the control system schematic diagram in Figure 2. The proposed sampling plan was to conduct the tests over an integral number of heats based on the operation of one of the EAF's. The corresponding AOD was also to be tested for an integral number of heats, but tests on the other furnace and vessel were to be staggered over portions of different heats, as each EAF-AOD pair operates independently. One complete test run would consist of two complete EAF heat cycles. On April 6, sampling started in the late afternoon; therefore, only a partial test over one complete EAF (No. 90) heat cycle was conducted. On April 7 and 8, emissions from two complete EAF (No. 89) heat cycles were sampled. On April 9, tests were conducted for 6 hours beginning

*Attachment 2 was not included.

TABLE 3. SAMPLING PLAN--AL TECH SPECIALTY STEEL COMPANY

Sampling site	Sample type	Sampling method	No. of samples	Time for each sample
No. 1	Particulate	EPA 5	3	~ 6 hours
	Particle size	High capacity impactor	3	~ 3 hours
		Impactor	3	~ 1/2 hour
No. 2	Particulate	EPA 5	3	~ 6 hours
No. 3	Particulate	Modified EPA 5	3	~ 6 hours
	Particle size	Impactor	6	~ 6 hours
	VE	EPA 9	3	~ 6 hours
Shop exit	VE	EPA 9	3	~ 6 hours
Baghouse dust handling system (No. 4)	FE	EPA 22	3	~ 6 hours
	Dust	Grab	3 Composites	3 grab/day = 1 composite

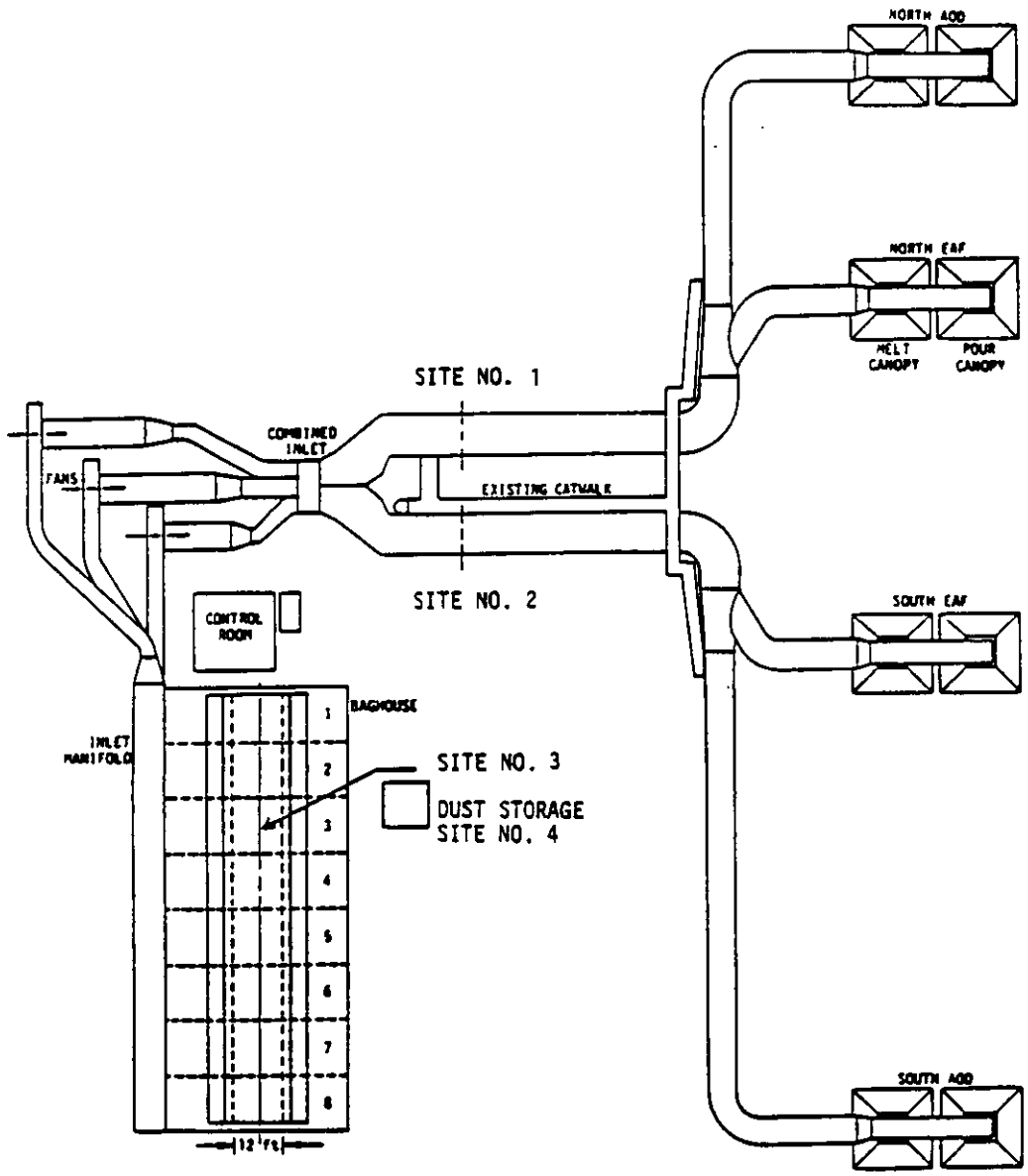


Figure 2. Control system schematic, top view, AL Tech Specialty Steel Company.

after the charge of furnace No. 90. PEDCo believed that this 6-hour test on April 9 provided an adequate sample. Figure 3 is a chart showing when the heats occurred during the test period. The only sampling problem reported by PEDCo occurred on the first day when some glassware broke and invalidated one of the inlet runs.

On April 7 and 8, VE observations (6-minute averages) were made at the baghouse and the meltshop, and fugitive emissions observations were made of the dust handling system. The weather conditions were favorable to record VE's on these two days. On April 9, inclement weather permitted only 15 minutes of VE readings. PEDCo's test report should include an evaluation of the VE readings during the test.

During the tests, emissions periodically filled the building. Some of the emissions were deflected by cranes when they passed above the furnaces and vessels and when they were in position for a charge or a tap. The cross drafts that developed from open doors in the scrap bay and tapping pit sometimes deflected emissions from the canopy. The inoperable automatic dampers on the AOD canopies were always open and prevented the optimal use of the canopy hoods and baghouse. Although these dampers could be operated manually, they were left open for the duration of the tests. The emissions were not always completely captured; however, the shop always cleared in 5 to 10 minutes.

During the test period, the meltshop was operating at full capacity. Some delays on all four test days were caused by one or more of the cranes not operating properly. On April 7, the test was stopped for 10 minutes because furnace No. 89 was idle for too long waiting for the pit crane to clean the tap runner. On April 8, the test was stopped for approximately 15 minutes starting at 3:00 p.m. because emissions were reduced since all the furnaces were not operating. On April 8, the test was stopped before the end of the heat in furnace No. 89 because the furnace bay crane lost power. PEDCo determined that adequate sampling had been performed. On April 9, the start of the test was delayed for about 30 minutes because the furnace bay crane temporarily lost power again.

The baghouse was operating normally during the test period. The baghouse control panels were monitored hourly for the duration of the tests. During the test, PEDCo personnel periodially closed off a baghouse compartment for a short period to move their sampling equipment. Since one compartment was cleaning, this meant two compartments were not in operation during that short period of time. The pressure drop in each compartment, the inlet gas temperature, the fan amperage for each of the three fans, and the number of compartments cleaning or closed by PEDCo were observed to assure normal baghouse operation. The pressure drop varied between 1.0 and 1.5 kilopascals (kPa) (4 and 6 inches) of water throughout the tests. All three fans were operating at full power during the tests. The flue gas inlet temperature fluctuated from 316°K (110°F) to 327°K (130°F) during the test period.

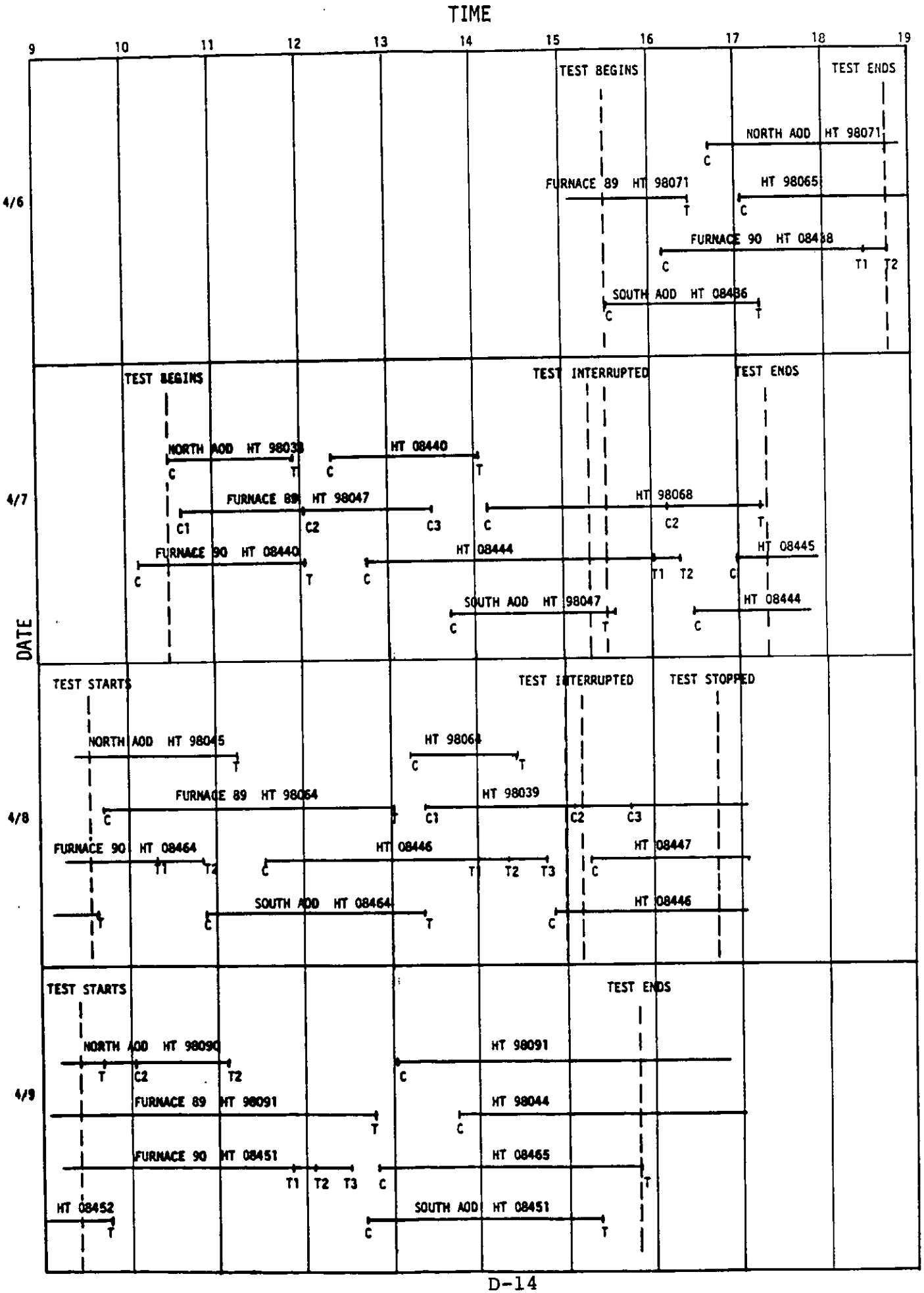


Figure 3. Times of heats during source test, AL Tech Specialty Steel.

V. Conclusions and Recommendations

The test conditions were representative of normal plant operation, and the data should be useful. The results from the sampling tests should be correlated with the charging, melting, and tapping times of the heats to determine if the high opacity readings are associated with charging and tapping.

With all fans working, the flow through the system appeared to capture most of the emissions. If the automatic dampers on the individual canopy hoods above the AOD vessels had been working properly, there is an excellent chance that the emission capture would have improved and the VE's would have been reduced. Plant workers indicated that the emission capture was better when the capture and control system was new and the automatic AOD dampers were operating properly.

The emissions from the AOD vessels during blowing appeared to be equal to or greater than the emissions from the EAF's during meltdown. However, the AOD vessel is not constantly blowing since the blowing stops when the vessel is turned down for sample taking or temperature readings and for alloy/flux additions.

ATTACHMENT 1

Operator: Deapres

Operator: SMI

Foreman: McEWEN

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

12490

26.V

AT 8800

Heat No: N98071 Grade: 32-0 AOD No: 5023

Vessel No.	4	Prev. Tap AOD:	1450	4-6-81	Reladle No.	B	Reladle Full: 97400
Heats on Vessel	28	Charge AOD:	1640	4-6-81	Heats on Reladle:	5	Reladle Empty: 42000
Dome No.	5	Tap AOD:	1905	4-6-81	Tap Ladle No.	9	Gross 55400
Heats on Dome	28	Time in AOD:	2:25	2.41	Ladleman:	Chandler	Net Metal 55000

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	34563	29753	47481
START	32932	29576	46381
USED	1631	177	1100
LEFT	498	54	336

ADDITIONS

Acct. Code	Material	Weight	Time
42-100	GRAPHITE	300	
	~~FINE SI~~	~~80~~	~~1640~~
42-003	BAR AL	100	
4101-01	MURRY FE	4000	
	~~FINE SI~~	~~250~~	~~1727~~
42-100	GRAPHITE	50	
	~~LIME~~	~~500~~	
42-003	BAR AL	250	
42-457	HIC MN	1660	~~#~~
42-504	MO OX	~~40 CANS~~	~~1750~~ → 1405 #
4101-01	MURRY FE	4000	~~1775~~
	~~LIME~~	~~750~~	~~1750~~
42-003	BAR AL	300	
42-458	MN SI	40	
42-504	MO OX	~~60 CANS~~	→ 211 #
	~~FINE SI~~	~~210~~	~~1844~~
42-100	GRAPHITE	20	
	~~LIME~~	~~20~~	
42-003	BAR AL	100	
42-003	BAR AL	50	~~1844~~
	FINE SI	~~80~~	~~1905~~
42-100	GRAPHITE	4	~~LADLE~~

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge	1640	1644		2965		177	
1st add	1727	1729	STIR		173		
BLOW	1731	1732	3:1		244		100
STIR	1732	1733	STIR	2745	301		
BLOW	1737	1738	3:1		348		200
STIR	1738	1739	STIR	2800	417		
BLOW	1741	1742	3:1		448		250
STIR	1742	1743	STIR		521		
BLOW	1746	1749	3:1		662		500
STIR	1749	1750	STIR	2820	745		
BLOW	1758	1802	3:1		892		800
STIR	1802	1803	STIR		965		
BLOW	1805	1808	3:1		1163		950
STIR	1808	1810	STIR	2805	1280		
Delay	1822	1825					
add blow	1841	1846	3:1	2805	1473		1100
STIR	1901	1903	STIR	2795	1631		
TAP	1905			2795			
Temp Range	2775	2825	ITC →	2770	LADLE	Temp	

ANALYSIS

Sample	Received		C	Mn	P	S	Si	Cr	Ni	Mo	N
846	1850	1854	.550	.17	.005	.019	.02	1.19	.024	<.01	
814	1820	1821	.697	2.06		.002	.22	1.01	.021	1.05	
50	1857		.713				.31				
Limits			.72	2.10		.010	.40	.95		1.22	
Specification			.67	1.85			.25	.90		1.20	
			.73	2.15	.030	.030	.45	1.10	.25	1.40	

Final

Alloys

Remarks: LADLE Temp 2770°

Blow Calculation

lb. C X 16.1

lb. Si X 13.75

3/4 % Mets X 4.75

TEO

Chg N2 → TEO Switch ARGON

Reduction Slag

Slag No. Spar No:

Condition: (Fluid) Sluggish

Color: Sh. Bk (Lt. Gr) Dk. Gr. Dk. Br

Other:

Patch Vessel

Tap Wt. 65500 lb. 32.7 T.

Yield (Office Use):

~~12490~~ 2430

~~12490~~ 14920

DJW-62100

Cbtt-3000

4156-01

69270, 70715, 76345   56780, 70715, 63855   N 98071

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. ~~[illegible]~~ ~~[illegible]~~
GRADE ~~[illegible]~~ 32-0
MELTING PRACTICE Ao
SERIAL NO. 9P096

ELECTRIC FURNACE RECORD   START DATE 4/6   FIN. DATE 4-6

MELTER	IRW	FIRST HELPER	LIBURDI	OBSERVER	QUALITY CONTROL NO.
MELTER	IRW	FIRST HELPER	Santoro	OBSERVER	QUALITY CONTROL NO. C

ANALYSIS – METAL / SLAG

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	Co	Cu	Cb	Ti
SPEC.			.67	1.85	.036	.03	.25	.90	.25	1.20						
AIM			.73	2.15		.07	.45	1.10		1.40						
FINAL											Diverted					
#1 PREL.	4:03		.078	.14	.004	.013	.02	.68	.13	.03	to No South					
#2 PREL.											P.T. Crane				60000	
#3 PREL.																
#4 PREL.																
#5 PREL.																

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
105	4 26		29	ROOF FCE.	36332	36179	153

TIME	VOLT	REGULATOR SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
				LEFT IN FCE.	
1 P.M.				START CHARGE	
[illegible]			4101-01	[illegible] ①	38720
				[illegible]	
130	450			[illegible]	
300			43-350	FE ORE	1000
					(1800)
			43-961	LIME	~~[illegible]~~
			4101-01	MURRAY FE	18060
305			43-950	P. ON	~~575~~
			43-115		~~500~~
402			43-703	IA	~~500~~
426				TAP	
503				FIN PATCH	
Wt. TRANS				S+a 56780	
55000				F ~~7075~~	(2800)
				~~63855~~	(59580)
				S+a 69270	
				F ~~7075~~	5230
				~~76345~~	(74500)

705 PM

DELAYS: TIME FROM	TO	TOTAL	APP.	REASON
				Rod [illegible]
				[illegible]
				[illegible]

OXYGEN: MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O2

TEST FINAL
TEMP. AT TAP.
TAPPING CONDITION

COND. FINAL SLAG OK
COND. OF FCE. AFTER TAP. Re. Slag line
STOPPER SET BY
NOZZLE SIZE 2 1/1   SET BY
TEMP. AT TAP
TIME HELD IN LADLE
TEEMING CONDITION Good
TEMP. OF LADLE AT TAP
LADLE - AG   TEEMED BY Chandler

ACC. CODE · TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
18	16S	

TOTAL WEIGHT GOOD INGOTS - 62100

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	16S	BUTTS	3000
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL	None
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: HT. 40 min
1102

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS AS...

68092 74167 64100 70175 N98065

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. 82-1
GRADE
MELTING PRACTICE AO
SERIAL NO. 9P097

ELECTRIC FURNACE RECORD

START DATE 4-6 FIN. DATE 4-7/81

MELTER Desfaes FIRST HELPER A. Liberti OBSERVER QUALITY CONTROL NO. D
MELTER FIRST HELPER OBSERVER QUALITY CONTROL NO.

ANALYSIS — METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	N2	Cu	Co	Ti			
SPEC.			.37/	.20/	.030/	.030/	.85/	5.00/	.50/	1.20/	.35	.50/	.04%						
AIM			.42	.50			1.10	5.50		1.50	MAL	1.10							
FINAL																			
#1 PREL.	7:37	7:45	.58	.28	.012	.002	.07	3.6	.11	.86	.01	.11	.04	.04					
#2 PREL.																			
#3 PREL.																6 000			
#4 PREL.																			
#5 PREL.																			

SLAG

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
4 3/4 HR	7 54 AM	HR	2:7 HR	ROOF FCE	36495	36322	163

TIME	VOLT BANK	RESISTOR SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
				LEFT IN FCE.	
503	M.H.			START CHARGE	
			4133-01	176	18,220
			4101-01	MURRAY FE	20,820
			43-703	FE SI FINE 400 ~~[illegible]~~	
			42-181	H.C.CR-53	3,000
			43-961	LIME 2700 ~~[illegible]~~	
			43-710	~~[illegible]~~	
520			43-115	P. ON ~~[illegible]~~	
635			4101-01	MURRAY FE	22,060
640				P. ON	
742				IA	
732				TAP	
828				FIN PATCH	
				110 AM	
LIT. TRANSF				Acc 64100	
	68050			F ~~[illegible]~~ 3100 ~~70175~~ 67200	
				Acc 68092 ~~[illegible]~~ NO D	
				F ~~[illegible]~~ ~~74167~~	

TIME FROM	TO	TOTAL	APP.	REASON
500	507	4		WAIT TO CHARGE CRANE ON N. 400
TOTAL TIME		24		RED + YELLOW LIGHT

DELAYS

OXYGEN	MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O_2

FCE.

TEST FINAL
TEMP. AT TAP
TAPPING CONDITION OK
COND. FINAL SLAG OK
COND. OF FCE. AFTER TAP OK Bri Sl Wall.
STOPPER SET BY
NOZZLE SIZE 1 SET BY Cuse

LADLE

TEMP. AT TAP
TIME HELD IN LADLE
TEEMING CONDITION OK
TEMP. OF LADLE AT TAP
LADLE - 9 TEEMED BY Fillis

ACC. CODE

TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
2	29H	21700
13	16S	44850

TOTAL WEIGHT GOOD INGOTS - 66550

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
none		BUTTS	
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL/2 ~~[illegible]~~	
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS:

AUTHORIZED SIGNATURE — ALSO APPROVE ALLOWED DELAYS AB

73340 64740
79415 70815

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. 508438
GRADE 304-0
MELTING PRACTICE AO
SERIAL NO. 0P348

ELECTRIC FURNACE RECORD

START DATE 4/6 FIN. DATE 4/6/81

MELTER	Lennon	FIRST HELPER	Kelly	OBSERVER	QUALITY CONTROL NO.
MELTER		FIRST HELPER		OBSERVER	QUALITY CONTROL NO. E

ANALYSIS – METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	Co	Cu	Co	Ti
SPEC.			.075	2.00	.030	.017	.75	18.00	8.00	.50		.10	Cbon	.50		
AIM						.030		18.25	9.00							
FINAL																
∞ PREL.																
∞ PREL.																
∞ PREL.																
∞ PREL.																
∞ PREL.																

SLAG: .60000

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
5:00 P	6:30 P	HR.	2.3 HR.	ROOF FCE.	82594	82384	210

TIME	VOLT BANK	RESISTOR SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
				LEFT IN FCE.	
				START CHARGE	
415			4103-01	SLAG POT	12900
			4141-01	SKULL	8000
				(COAL	500)
			4141-02	18-8 TOS CR	16500
				(FLUX	2700)
			4119-03	CS	9440
			42-181	H. C. CR 53	14800
			42-552	100% Ni	3100
			43-961		4500
415			43-950	POWER ON	575
			43-115		500
			43-703		500
695				1A PRELIM	
630				TAP #1 WASH TAP LADLE BLAST BOTTOM	
640				TAP #2	
655				FINISH PATCH	
LIT. TRANSIT				Sta 64740	
59500				1F 6000	3200
				70815	67940
				Sta 73340	
				F 6075 HOD	
				79415	

DELAYS	TIME FROM	TIME TO	TOTAL	APP.	REASON
	320				DROP WORK CYL BROKEN WIRES
	355		35	(LL)	REPAIR
			8		TOTAL RESTRICTION LTS. DURING NIGHTS

OXYGEN	MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O_2

FCE	TEST FINAL
TEMP. AT TAP	
TAPPING CONDITION	OK
COND. FINAL SLAG	OK
COND. OF FCE. AFTER TAP	OK (Bri S.L + Wall brick – No hot spots)

LADLE	
STOPPER SET BY	
NOZZLE SIZE	21 SET BY
TEMP. AT TAP	
TIME HELD IN LADLE	
TEEMING CONDITION	GOOD
TEMP. OF LADLE AT TAP	
LADLE #	8 TEEMED BY McKinnon

ACC. CODE

TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
18	16S	

840PM

TOTAL WEIGHT GOOD INGOTS 62100

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	16S	BUTTS	2900
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL	1000
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: HT 15min Ladle was out 110

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS ABO

Operator: LaRiv.
Operator: ANCOLANO
Helper: MCAllister

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

6479 1.9 V AT 8800

Heat No: 508436 Grade: 304-0 AOD No: 12,292

Vessel No.	6	Prev. Tap AOD:	10:05 4/6/81	Reladle No.	B	Reladle Full:	
Heats on Vessel	3	Charge AOD:	15:30 4-6-81	Heats on Reladle:		Reladle Empty:	44 000
Dome No.	4	Tap AOD:	17 20 4-6-81	Tap Ladle No.	8	Gross	77 680
Heats on Dome	3	Time in AOD:	1:50 .	Ladleman: McKinnon		Net Metal	75 000

L# 376

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	24133	39989	45816
START	23374	37884	43985
USED	739	~~38614~~	1831
LEFT	18.4	51.5	45.

ADDITIONS

Acct. Code	Material	Weight	Time
42-178	HC Cr	1170	~~1655~~
42 458	Mn Si	1420	
42-701	Lumps Si	1100	~~1655~~
4101-01	Murry	700	
4141-01	18-8	2000	
	~~Lime~~	~~1400~~ 1400	
42-450	MnTm	75	~~1705~~
42-100	Graphite	10	
42-353	Sal	4	~~Ladle~~

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge	15:30	15:32		2925		221	
Standard	15:56	15:58	S			365	
Blow	15:59	16:15	3-1	3040		832	1180
Blow	16:16	16:33	2-2			1939	1700 C
Blow	16:35	16:38	1-2		40	211.5	1780
Reduce	16:42	16:48	S	2825	380		
Adds	17:14	17:17	S				
Blow	17:18	17:19	3-1		182		1830
Tap		17:20			759		
	Ladle Temp			2765			
Range	2800	2825	ITC →				

ANALYSIS

Sample	Received	C	Mn	P	S	Si	Cr	Ni	Mo	Cu				N
						05								
33	1537 1543	777	78	028	023	04	18.00	8.90	46	35				
		062												
53	170 2170 2	048	1.72		025	52	18.21	9.19						116
		065	1.80		03	40	18.15	8.10						07
modification					015		18.00	8.00						
		075	200	03	03	75	18.75	9.00	50	50				10

Blow Calculation

619	lb. C X 16.1	997
52	lb. Si X 13.75	72
2.0	% Mets X 4.75	890
	TEO	1960
	% TEO-Switch	100 B-4 TAO

Reduction Slag

Slag No. 2 + 5 Spar No.

Condition: (Fluid) Sluggish

Color: Sh. Bk. Lt. Gr. (Dk. Gr.) Dk. Br

Other:

Patch Vessel

Tap Wt. 80000 lb., 40. T.

Yield (Office Use):

Sta 6479
1- (14000)
~~6479~~
(7879)
Dow - 69000
Burt - 3000
4141-01

Remarks:

Melter: Lew
Operator: Collins
Helper: PARKER

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

AT 8900

1.5 ✓ 2415

Heat No: N 98033 Grade: 403-4 AOD No: 5028

Vessel No.	4	Prev. Tap AOD:	0935	4/7/81	Reladle No.	A	Reladle Full: 10:30:00
Heats on Vessel	33	Charge AOD:	1030	4/7	Heats on Reladle:		Reladle Empty: 04:10:00
Dome No.	5	Tap AOD:	1155	4/7	Tap Ladle No.	7	Gross 61200
Heats on Dome	33	Time in AOD:	1:25	1.4	Ladleman:	PARKER	Net Metal 60000

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	38355	35387	58076
START	37820	34268	56171
USED	568	1119	1905
CF/T	184	363	618

ADDITIONS

Acct. Code	Material	Weight	Time
42-457	HCMN	35	~~1055~~
42-178	HCCR	1690	
		1200	
	~~Lime~~	~~700~~	
	~~Fine Si~~	~~1400~~	~~1122~~
42-178	HCCR	290	
	~~Fine Si~~	~~175~~	~~1149~~
4151-01	400	400	

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge	1030	1035		2810		180	
Blow	1041	1047	3-1			359	500
" "	1055	1110	3-1	3650		853	1700
" "	1110	1113	1-1			980	1800
" "	1117	1120	1-1			1119	1905
Reduce	1122	1128	5	3030	357		
No Slag	1129	1131					
Adds 9	1149	1151	5	2925	498		
Tap	1155				568		
Tap Range	2940	2925	ITC →	2925			

Ladle Temp 2870

ANALYSIS

Sent	Received		C	Mn	P	S	Si	Cr	Ni	Mo	Cu	Co	Al		N
		H	1.44				.09		.09	<.01	.10	.027			
1030	1033	1040	1.38	.41	.017	.016	.01	10.08	.09	<.01	.10	.024			
1111	1114		1.85												
1128	1133	1136	10.9	.45		.014	.19	11.52	.11	<.01	.10				.038

Blow Calculation

876	lb. C X 16.1	1410
6	lb. Si X 13.75	8
13/4	% Mets X 4.75	499
	TEO	1917
	% TEO-Switch	N2 To Ar

Reduction Slag

Slag No. Spar No.

1775

4190

Melter: IRW

Operator: Collins

Helper: PARKER

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

1.7 V 5202

AT 8900

Heat No: N08440 Grade: 304-11 AOD No: 5029

Vessel No.	4	Prev. Tap AOD:	1155	4/7/81	Reladle No.	A	Reladle Full: 101550
Heats on Vessel	34	Charge AOD:	1205	4/7/81	Heats on Reladle:		Reladle Empty: 044000
Dome No.	5	Tap AOD:	1405	4/7/81	Tap Ladle No.	7	Gross 57550
Heats on Dome	34	Time in AOD:	1:40	1.7	Ladleman:	Lewis	Net Metal 56000

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	39424	36577	59417
START	38388	35387	58076
USED	1036	1190	1341
PIT	337	387	436

ADDITIONS

Acct. Code	Material	Weight	Time
42-457	H.C.MN	835	
42-178	H.C.CR.	1000	~~1246~~
	~~Lime~~	~~1500~~	1500
	~~Fine S.~~	~~836~~	1330
42-552	Ni	300	
4141-01	18/8	3000	
	~~Fine S.~~	~~900~~	1323
	~~Lime~~	~~800~~ 2000	
	~~Lime~~	~~200~~ 100	
	~~Spar~~	~~100~~	
42-457	HCMN	55	~~1354~~
42-100	Graph	~~500~~	
	~~Fine S.~~	~~200~~	
42-353	Sil.	4	~~Ladle~~

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge	1225	1230		2875		199	
Blow	1246	1301	3-1	3050		665	700
" "	1302	1306	1-2			905	1000 C
" "	1312	1321	1-2		435	1190	1341
Reduce	1323	1329	5	2975	810		
Do Slag	1332	1334					
Adds	1354	1356	5	2825	962		
Tap	1405				1036		

Tap Range 2800 / 2825 ITC → 2825

Ladle Temp 2840

ANALYSIS

Heat	Received		C	Mn	P	S	Si	Cr	Ni	Mo	Cu				N
		H					03								
1223	1229	1234	576	84	029	043	03	1771	785	47	61				
1303	1307		219												
1339	1337	1339	046	174		0.36	15	1836	817						067
1357	1400					023									
Limits			065	100		030	40	1415	810						07
Specification						015		1600	800						
			075	200	040	030	75	1875	900	75	75				.10

Blow Calculation

433	lb. C X 16.1	697
17	lb. Si X 13.75	23
2	% Mets X 4.75	532
	TEO	1252
	% TEO-Switch	200 B4 TAP

Reduction Slag

Slag No. 2 – 5 Spar No.

Condition: (Fluid) Sluggish

Color: Sh. Bk. (Lt. Gr. Dk. Gr. Dk. Br

Other:

Patch Vessel

Tap Wt. 61550 lb. 307 T.

Yield (Office Use):

~~Aa~~ 5202 ~~3425~~

F ~~400~~

~~5202~~ 8627

Remarks:

HSW - 58650

Butt - 1500

4141-01

67792 74367 64760 65775 71335 N

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

ELECTRIC FURNACE RECORD

START DATE 4/7 FIN. DATE 4/7/81

HEAT NO. 898047
GRADE 423-a
MELTING PRACTICE Fa
SERIAL NO. 9P102

MELTER Larkin FIRST HELPER OBSERVER QUALITY CONTROL NO.
MELTER (RW) FIRST HELPER Santoro OBSERVER QUALITY CONTROL NO. D

ANALYSIS – METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	Al	N2	Sn	Co	Cu	Cb	Ti		
SPEC.			.10	.60	.030	.030	.20	12.25	.50	.30	.030	.080	.05	.50					
AIM			.15	.80			.30	12.75											
FINAL	1250																		
PREL.																	60000		
PREL.																			
PREL.																			
PREL.																			
PREL.																			

SLAG

TAP. PREV. HEAT	TAPPER	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
10:35 A.M.	1351 M.	HR.	2.2 HR.	GOOD FCE.	37265	37111	154

TIME	VOLT BANK	ACTUAL SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
1045 A.M.				LEFT IN FCE.	
				START CHARGE	
1st Buckle			4183-01	Low-Ther D	28180
			43-350	FeCr	500
				Coal	400
1-13-4			42-181	HCFeSi 53%	15500
					3200
			43-961	Lime	~~1600~~
			43-950		~~50~~
1151	5	100	43-115	Burn	~~500~~
			~~43-103~~		~~500~~
2nd Buckle			4183-01	Low-Ther	21080
1203	4	100		Burn	
				~~HCr 2740~~	
1256				Lt. Sample	
135				Tap	
200				Finished Pouring	
Wt. Trans				Sta 64760	
				~~6500~~ 4100	
61000				~~71335~~ 68860	
				Sta 67792	
				~~6775~~ 6640	
				~~74367~~ 74632	

TIME FROM	TO	TOTAL	APP.	REASON
100	1330			Unexplained

OXYGEN	MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O_2

TEST FINAL
TEMP. AT TAP.
TAPPING CONDITION
TAPPING CONDITION
COND. FINAL SLAG
COND. OF FCE. AFTER TAP
STOPPER SET BY
NOZZLE SIZE 2" SET BY
TEMP. AT TAP
TIME HELD IN LADLE
TEEMING CONDITION Good
TEMP. OF LADLE AT TAP
LADLE # 7 TEEMED BY McKinnon

ACC. CODE	TOTAL NO. OF INGOTS	NO. OF INGOTS	SIZE	WEIGHT
		18	16S	

3:35 PM

TOTAL WEIGHT GOOD INGOTS - 62100

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	16S	BUTTS	1200
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL	None
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: H.T. 30min 1100

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS ABO

67434 73509 65480 71555 WAS 98348.

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. 98068
GRADE 3-0
MELTING PRACTICE
SERIAL NO. 9 103

ELECTRIC FURNACE RECORD

START DATE 4/7 FIN. DATE 4-7-81

MELTER Irwin FIRST HELPER LIBURDI OBSERVER QUALITY CONTROL NO.
MELTER Irwin FIRST HELPER SALTORO OBSERVER QUALITY CONTROL NO. D

ANALYSIS – METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	Co	Cu	Ce	Ti
SPEC.			1.50	.34	.025	.025	.24	11.50	.50	.70	.35	.25				
AIM			1.60	.50			.40	12.50		.75		1.00				
FINAL																
#1 PREL.	5:00	5:05	1.47				.19		.17		.11					
#2 PREL.																
#3 PREL.																
#4 PREL.																
#5 PREL.																

SLAG

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
1:35	5:20	HR.	1:7 HR.	ROOF FCE.	37421	37265	156

TIME	VOLT TAP	RESISTANCE SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
9:00				LEFT IN FCE.	
				START CHARGE	
			4155-03	8)	28680
			4103-01	Lime	12140
			42-181	Hot Fill 5	11500
			43-961	Fluor	2700
2:20				Fluorico	
3:10			4163-01	L.P.	13,160
3:20					
				Coal 500	
4:50				IA	
5:20				TAP	
				TILT NOT WORKING	
6:33				FIN PATCH	
LITE RINSE				Acc 65480	
62000				3200	
				68680	
				Acc 62431	
				3200	
				70634	

TIME FROM	TO	TOTAL	APP.	REASON
9:00	11:11			[illegible]
11:20	9			Straight Fe
3:00	3:33	33	KD	PULL STEEL OFF TAP SPOUT WITH CRANE AND REPAIR
5:27	5:35	8	KD	FCE WONT TILT STUCK AT TAP.
5:33	6:07	35	KD	TILT NOT WORKING

OXYGEN	MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O_2

FCE

TEST FINAL
TEMP. AT TAP.
TAPPING CONDITION X
COND. FINAL SLAG Green
COND. OF FCE. AFTER TAP Bc Slag line

LADLE

STOPPER SET BY
NOZZLE SIZE 211 SET BY
TEMP. AT TAP
TIME HELD IN LADLE
TEEMING CONDITION Good
TEMP. OF LADLE AT TAP
LADLE # 7 TEEMED BY Chandler
ACC. CODE TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
17	165	

7:05 PM

TOTAL WEIGHT GOOD INGOTS - 58650

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	165	BUTTS	3000
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL	
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: Hot 15min
110

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS ABOVE

71322 77357 66120 72195 S

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. N08440
GRADE 304-11
MELTING PRACTICE AD
SERIAL NO. OP351

ELECTRIC FURNACE RECORD

START DATE 4-7-81 FIN. DATE 4/7/81

MELTER Fairfield — FIRST HELPER Minett — OBSERVER — QUALITY CONTROL NO.
MELTER Rea — FIRST HELPER Fowl — OBSERVER — QUALITY CONTROL NO. D

ANALYSIS – METAL	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	N2	Co	Cu	Ca	Ti
SPEC.			.075	2.00	.045	.030	.75	18.00	8.00	.75		.10	Check	.75		
AIM						.030		18.75	9.00							
FINAL																
▫: PREL.																
▫: PREL.																6000
▫: PREL.																
▫: PREL.																
▫: PREL.																

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
4	1205 PM	HR.	2.6 HR.	ROOF · FCE.	83205	83026	179

TIME	VOLT BANK	RESISTAT SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
				LEFT IN FCE.	
				START CHARGE	
0945			4141-02	18/8 Scrap	15540
			4141-01	18/8	12320
			4151-01	400 (CPH)	4020 (100)
			42-181	Mn C Cr 53	4800
			43-961	Lime ~~2700 LBS 27.00~~	
855				Power On	
1010			4141-01	18/8	23240
			4119-03	663	3460
			42-558	25% Ni Pig	2740
1015			43-950		575
			43-115	Power On	500
			43-703		500
1150				1A Prel	
				To	
1205 PM				Tap. North Vessel	
				Wash out Tap Ladle	
1220				Tap.	
				Fin Patch	
145					
Wt. Transf.				Sea 66120 ~~5460~~	
56000				~~6075~~	
				~~72195~~	~~69720~~
				Sea 71322	
				~~6025~~	~~71322~~
				~~77347~~	~~[illegible]~~
					~~72147~~
				To	
				No. Vessel	

TIME FROM	TO	TOTAL	APP.	REASON
3:52				#1 WATERLINE BURSTED. PIPEFITT WAITING FOR WAT. TO CLEAN OUT THE F. HOT STEAM COMING THROUGH PIPE. HAS. HOSE.
				CHANGE ROOF
				2 #1 elts PULL #2 Elts Burnt replace 3 elec in #2
				Lext. pickup line.
				1102 - 1135 - 2 Power off Wait AOD

OXYGEN	MINUTES	PRESSURE	PIPE
	845	140	

FCE.	
TEST FINAL	
TEMP. AT TAP.	
TAPPING CONDITION	
COND. FINAL SLAG	
COND. OF FCE. AFTER TAP	Bottom High!

LADLE	
STOPPER SET BY	Lewis
NOZZLE SIZE 2	SET BY Lewis
TEMP. AT TAP	
TIME HELD IN LADLE	
TEEMING CONDITION	OK
TEMP. OF LADLE AT TAP	1400
LADLE 8	TEEMED BY Lewis

ACC. CODE	TOTAL NO. OF INGOTS	NO. OF INGOTS	SIZE	WEIGHT
		17	11.5	

205 PM

TOTAL WEIGHT GOOD INGOTS · 58650

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	11.5	BUTTS	1500
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL	200
		PANCAKES	1000
		PILOTS	
		SLAG POT	

REMARKS: The side bulged out on #2. Had to pull it out & replace.

AUTHORIZED SIGNATURE — ALSO APPROVE ALLOWED DELAYS ABL

75485 93560 64920 50775 72955

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. S 08444
GRADE 310-S
MELTING PRACTICE
SERIAL NO. 0P352

ELECTRIC FURNACE RECORD

START DATE 4/7/81 FIN. DATE 4/7/81

MELTER LARKINS FIRST HELPER Kelley OBSERVER QUALITY CONTROL NO.
MELTER - FIRST HELPER Miller OBSERVER QUALITY CONTROL NO. D

ANALYSIS – METAL / SLAG

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	Co	Cu	Co	Ti		
SPEC.			.10	1.50	.025	.025	.30	26.00	21.00	.50				.50	.50			
AIM			.15	2.00			.60	27.00	22.50									
FINAL							.23											
#1 PREL.																		
#2 PREL.																		
#3 PREL.																		
#4 PREL.																		
#5 PREL.																		

TAP. PREV. HEAT	TAPPED	START ENG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
1205 P.M.	4:05 P.M.	HR.	2.3 HR.	POOR FCE.	93400	83205	195

TIME	VOLT BANK	RESISTOR SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
				LEFT IN FCE.	
				START CHARGE	
1245			4141-08	308	20840
				Coal 500	
			4151-01	400	6980
			42-552	100% Ni	11800
			42-181	HC Cross	24900
			43-961	Lime (1 bag) 500 ~~4400~~	
			43-350	Air	20-00
			42-552	100% Ni	960
1255			43-950	Power On. 525	
			43-115	500	
			43-703	500	
300				1st Prel.	
105				Tap #1	
				Blue Bottom	
420				Tap #2	
455				In Patch	
WT. TRANSF				Add 64920 ~~8025~~ 7100 ~~72955~~ ~~72020~~	
165500					
				Add 75485 ~~8025~~ 2350 ~~83560~~ ~~84025~~	

TIME FROM	TIME TO	TOTAL	ACC.	REASON
312	4:06	55	WL	WAIT FOR ADD

OXYGEN	MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O_2

TEST FINAL
FCE: TEMP. AT TAP; TAPPING CONDITION OK; COND. FINAL SLAG OK; COND. OF FCE. AFTER TAP OK Fair Slag + Lime
STOPPER SET BY Bottom ½ Diameter; NOZZLE SIZE 21; SET BY
LADLE: TEMP. AT TAP; TIME HELD IN LADLE; TEEMING CONDITION GOOD; TEMP. OF LADLE AT TAP; LADLE # 8; TEEMED BY McKinney

ACC. CODE | TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
16	165	

710PM

TOTAL WEIGHT GOOD INGOTS 165551

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	165	BUTTS	2600
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	~~[illegible]~~
		LDL. SKULL	~~[illegible]~~
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: Heat Stuck 1102

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS AB.

83041
90316

64380
7775
71655

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. 508445
GRADE 309-7
MELTING PRACTICE AO
SERIAL NO. 08353

ELECTRIC FURNACE RECORD

START DATE 4/7/81 FIN. DATE 4/8/81

MELTER | FIRST HELPER | OBSERVER | QUALITY CONTROL NO.
MELTER Lorraine | FIRST HELPER R. Olsen | OBSERVER TB | QUALITY CONTROL NO. D

ANALYSIS – METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	Co	Cu	Ca	Ti	N2
SPEC.			.061	1.561	.0381	.0302	.301	22.54	12.561	.501	check	Check	Check	.501	Check	Check	.05%
AIM			.115	2.30			.60	25.00	13.80								
FINAL																	
#1 PREL.																	
#2 PREL.																60000	
#3 PREL.																	
#4 PREL.																	
#5 PREL.																	

SLAG

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
4:05P	8:00P	HR.	2.3 HR.	ROOF FCE	83623	83400	223

TIME	VOLT BANK	RESISTAT SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
				LEFT IN FCE.	
				START CHARGE	
4:55			4142-01	309	20080
			4101-01	MURRAY FE	16800
				Cont	600
5:00				Power on	
6:05			42-181	Hi C. CR 53	21300
				[illegible]	[illegible]
			43-350	FE ORE	1200
			43-961	LIME 3500	~~[illegible]~~
			43-950		575
			43-115		500
6:15			43-763	POWER ON.	500
7:10				1 A PROBIM	
8:00				TAP	
8:20				FINISH PATCH	
WT. TRANSF				Sta 64380	
60000				F ~~7775~~ 5300	
				71655 64080	
				Sta 83041	
				F 7775 Adj	
				90316	

TIME FROM	TO	TOTAL	APP.	REASON
7:20	8:00	40	WL	WAIT FOR MOD

MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O_2

TEST FINAL
TEMP. AT TAP.
TAPPING CONDITION OK
COND. FINAL SLAG OK
COND. OF FCE. AFTER TAP OK
STOPPER SET BY Bottom down [illegible]
NOZZLE SIZE 1 SET BY [illegible]
TEMP. AT TAP
TIME HELD IN LADLE
TEEMING CONDITION OK
TEMP. OF LADLE AT TAP
LADLE # 8 TEEMED BY Lillis

ACC. CODE	TOTAL NO. OF INGOTS	SIZE	WEIGHT
	22	12H	

10 AM

TOTAL WEIGHT GOOD INGOTS = 64410

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	12H	BUTTS	1200
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL 3/	
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS:

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS ADL

Operator: FARKAS
Operator: ARCOLANO
Operator: MCALLISTER

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

1.9 V 303V

AT 8000

Heat No: S 98047 Grade: 403-0 AOD No: 12,296

Vessel No.	6	Prev. Tap AOD:	0700	4/2/81	Reladle No.	Reladle Full:	7 1 2
Heats on Vessel	7	Charge AOD:	1345	" " "	Heats on Reladle:	Reladle Empty:	
Dome No.	4	Tap AOD:	1535	4-7-81	Tap Ladle No. 7	Gross	63680
Heats on Dome	7	Time in AOD:	1:50	.	Ladleman:	Net Metal	61 000

L=376

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	28208	47137	55021
START	27556	45685	52721
USED	652	1452	2300
PCT	20.5	45.8	72.5

ADDITIONS

Acct. Code	Material	Weight	Time
42-457	F.C. Mn	160	
4101-01	Murray	1500	1405
4101-01	Murray	1240	
	~~Fe Si~~	710	1445
	~~Lime~~	950	
	~~Fe Si~~	20	
	~~Lime~~	250	
42-458	Mn Si	130	~~1524~~
	~~Fe Si Mn~~	310	
42-100	Graphite	1	
42-353	Sil	1	
	~~Lime~~	250	~~1530~~
	~~Fe Si~~	100	

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge		1345	Stir	2900		98	
Blow	1351	1359	2-1			376	450
Blow Add	1405	1407	Stir			497	
Blow	1407	1426	3-1	3050		963	1700
Blow	1428	1433	1-1			1251	1960
Blow	1441	1444	1-1			1452	2111
Reduction	1445	1457	Stir	2920	221		
Add	1524	1526	3-1		415		2200
Sheet	1530	1532	3-1	2895	501		2300
Tap		1535			652		
	Ladle Temp			2850			
Tap Range	2875	2900	ITC →				

ANALYSIS

Sample	Received		C	Mn	P	S	Si	Cr	Ni	Mo	Cu		Al	Sn	N
43	1347	1354	.72	.47	.021	.017	.03	13.14	.13	.01	.13				
36	1440		.700												
57	1505	1507	118	.57		.016	.21	12.67	.16	<.01	.12				.056
Limits			.12	.70		.015	.40	12.50							.05
Specification			.10	.60			.00	12.25							
			.15	.80	.03	.03	.50	12.75	.50	.30	.50		.03	.05	.08

Blow Calculation

999	lb. C X 16.1	1609
18	lb. Si X 13.75	25
1½	% Mets X 4.75	435
	TEO	2068
	% TEO-Switch	N2 To Rod

Reduction Slag

Slag No. L5 Spar No.:

Condition: (Fluid) Sluggish

Color: Sh. Bk. Lt. Gr. (Dk. Gr) Dk. Br

Other:

Patch Vessel

Tap Wt. 63446 lb. 31.7 T.

Yield (Office Use):

S-Q 3032
F ~~2549~~
~~3022~~ 5572

D-W - 62100

Bud - 1200

4151-01

Remarks:

Melter: Kennon
Operator: Yuzenko
Helper: Bullock

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

10565 2.6 ✓ AT 8900

Heat No: 502444 Grade: 310-S AOD No: 12292

Vessel No.	6	Prev. Tap AOD:	15:35 4-7-81	Reladle No.	A	Reladle Full:	24 [illegible]
Heats on Vessel	8	Charge AOD:	16:35 4-7-81	Heats on Reladle:	2	Reladle Empty:	37 [illegible]
Dome No.	4	Tap AOD:	19 10 4-7-81	Tap Ladle No.	85	Gross	68700
Heats on Dome	8	Time in AOD:	2:35	Ladleman:	McKinnon	Net Metal	66500

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	30751	48720	58671
START	28208	47137	55021
USED	2543	1583	3650
F/T	679	423	975

ADDITIONS

Acct. Code	Material	Weight	Time
42-178	HCCr	3300	~~1745~~
42-552	Ni	275	
42-458	Mn Si	1300	
42-701	Lumpsi	900	~~1740~~
4101-01	Murry	1050	
4141-01	18-8	2000	
	~~Lime~~	~~1450~~ 1490	
42-552	Ni	600	
42-458	~~Mn~~ Si	40	~~1845~~
42-701	Lumpsi	400	
42-358	Pig Fe	450	
	~~Lime~~	~~200~~	
	~~Spar~~	~~100~~ 100	
42-993	NiMg	250	~~1810~~

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge	1635	1637		2785		115	
Blow	1640	1702	2-1			982	1561
Blow add	1703	1705	5			1060	
Blow	1705	1717	2-1			1583	2400
Blow	1717	1725	2-1	3040	258	1583	2866
Blow	1726	1740	1-2		1073		3250
Blow	1742	1747	1-2		1523		3450
Reduce	1748	1754	5		1928		
" "	1757	1800	5	2785	2053		
[illegible]	[illegible]	[illegible]					
Adds	1845	1851	3-1	2775	2195		3650
STIR	1900	1902	5		2346		
Tap		1910			2543		
	Ladle Temp			2690			
Tap Range	2690	2715	ITC →				

ANALYSIS

Sent	Received	C	Mn	P	S	Si	Cr	Ni	Mo	Cu	Co		Mg	N
1731	1635	1641	2.30	67	024	013	01	2564	2249	.11	.12	002	Just Tap	
1741	1744		193											
1806	1810	1814	105	1.71		017	38	2766	2093					060
1854	1857	1858				013	45							
Limits		13	1.70		015	45	2640	2150					05	035
Specification		10	1.50			30	26.00	2100						
		15	2.20	025	025	60	28.00	2252	50	50	50			
Final														
Delays														

Blow Calculation

1666	lb. C X 16.1	2682
67	lb. Si X 13.75	92
13/4	% Mets X 4.75	711
	TEO	3485
60	% TEO-Switch	2400

Reduction Slag

Slag No. 2.5 Spar No.

Condition: Fluid Sluggish

Color: Sh. Bk. Lt. Gr. Dk. Gr. Dk. Br

Other:

Patch Vessel

Tap Wt. 74800 lb. 37.4 T.

Yield (Office Use):

84 10565 ~~3350~~ ~~10545~~ ~~1294~~

DDW-65550

Bull-2600

4141-1

Remarks: Reduction slag Tuesday add 200# Spar - No spar reduction

…ter: Irew
Operator: Collins
…per: Parker

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

5253
1.5 V

AT 8900

Heat No: N9R045 Grade: 403-0 AOD No: 5035

…essel No.	4	Prev. Tap AOD:	0740 4/8/81	Reladle No.	A	Reladle Full:	100400
Heats on Vessel	40	Charge AOD:	0940 4/8/81	Heats on Reladle:	9	Reladle Empty:	042300
…e No.	5	Tap AOD:	1110 4/8/81	Tap Ladle No.	2	Gross	58100
…s on Dome	40	Time in AOD:	1:30 1.5	Ladleman:	Lewis	Net Metal	57000

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
…ISH	43746	43674	70727
…TART	43134	41898	68327
…SED	612	1776	2400
…T	199	578	781

ADDITIONS

Acct. Code	Material	Weight	Time
42-178	H.C.CR	1450	
42-457	HCMN	235	~~1003~~
	~~Lime~~	~~1200~~ 1200	
4101-01	Murry Fe	850	
	~~Fine Si~~	~~115~~ 115	
4151-01	400	1500	~~1044~~
	~~Fine Si~~	~~240~~	
	~~Lime~~	~~600~~ 1100	
42-178	H.CCR	150	
42-458	MNSi	50	
	~~Fine Si~~	~~140~~ 14	~~1105~~
42-100	Graphite	18	
	~~Lime~~	~~200~~ 200	

LOG

Operation	Start	End	Ratio	Temp.	Ar	N_2	O_2
…ge	0940	0945		2750		154	
Blow	0948	0950	2-1			435	500
" "	1003	1024	2-1	3050		1174	2000 C
" "	1025	1033	1-2			1776	2300
Reduce	1041	1047	5	2900	440		
DeSlag	1048	1049					
Add Red	1105	1109	3-1	2885	553		2400
Tap	1110				612		

…p Range 2875/2900 ITC → 2885

Ladle Temp 2850

ANALYSIS

…t	Received		C	Mn	P	S	Si	Cr	Ni	Mo	CU	AL	SN		N
		A	1.62				.34		.21	<.01	12				
39	0944	0948	162	42	020	016	11	1151	20	<01	12				
22	1025		29.3												
253	1050	1052	075	65		017	33	1225	24	01	12				052
…s			12	70		015	40	1250							05
Specification			10	60			20	1225							
			15	80	.030	030	50	1275	50	30	.50	0.3	05		08
…al															
…ays															

Blow Calculation

- 967 lb. C X 16.1 1557
- 92 lb. Si X 13.75 127
- 11/2 % Mets X 4.75 406
- TEO 2090
- % TEO-Switch N2 to Reduc

Reduction Slag

Slag No. 2-5 Spar No.

Condition: (Fluid) Sluggish

Color: Sh. Bk (Lt. Gr.) Dk. Gr. Dk. Br

Other:

Patch Vessel

Tap Wt. 61530 lb., 30.7 T.

Yield (Office Use):

S+C/F 5253
~~…~~ 2855
~~5253~~ 8108

…marks:

BBW - 58650

Butt - 250

4151-01

Melter: Jew

Operator: Collins

Helper: PARKER

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

1573 1.1. V

AT 6900

Heat No: N98064 Grade: 132-4 AOD No: 5036

Vessel No.	4	Prev. Tap AOD:	1110	4/8/81	Reladle No.	A	Reladle Full: 107950.
Heats on Vessel	41	Charge AOD:	1315	4/8/81	Heats on Reladle:	10	Reladle Empty: 040150.
Dome No.	5	Tap AOD:	1420	4/8/81	Tap Ladle No.	2	Gross 67800
Heats on Dome	41	Time in AOD:	1:5	1.0	Ladleman:	LEWIS	Net Metal 66000

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	44070	43924	71127
START	43746	43674	70727
USED	324	250	400
CF/T	095	073	117

ADDITIONS

Acct. Code	Material	Weight	Time
42-178	H.C.CR	940	
42-100	Graph	225	
	~~Lime~~	~~300~~	~~1335~~
42-003	BAR AL	300	
	~~Fine Si~~	~~240~~ 240	
42-100	GRAPHITE	101	~~1404~~
	~~Lime~~	~~250~~	
42-100	Graphite	7~~[illegible]~~	~~Ladle~~

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge	1315	1320		2910		250	
Blow	1335	1340	3-1	2885	175		300
Sold Point	1409	1416	3-1	2825	269		400
TAP	1420				324		
Tap Range	2775	2880	ITC →	2800			

Ladle Temp 2775

ANALYSIS

Sent	Received		C	Mn	P	S	Si	Cr	Ni	Mo	AL	CU			N
			~~Ashford~~ 067			016									
1314	1318	1322	041	08	004	014	02	39	051	01		06			
1340	1346	1353	861	41	005	005	15	1.43	040	02	022	06			
1412	1417		1.02			003	3.3								
Aims			103	40		LAP	30	140			103				%
Specification			94	30			20	135							%
			105	45	015	006	35	155	15	06	03	10			%

Final

Delays

Remarks:

Blow Calculation

lb. C X 16.1

lb. Si X 13.75

% Mets X 4.75

TEO

% TEO-Switch

Reduction Slag

Slag No. Spar No?

Condition: (Fluid) Sluggish

Color: Sh. Bk. Lt. Gr. (Dk. Gr.) Dk. Br.

Other:

Patch Vessel

Tap Wt. 67900 lb., 339 T.

Yield (Office Use):

1573

~~680~~ 792

1573 2363

HSW - 64400

Butt - 4400

4/19-03

67813 74988 66240 7021 733 15

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. N98164
GRADE 13J-4
MELTING PRACTICE A1
SERIAL NO. 9P109

ELECTRIC FURNACE RECORD

START DATE 4/8 FIN. DATE 4/8

MELTER		FIRST HELPER	OBSERVER	QUALITY CONTROL NO.
MELTER	TRW	FIRST HELPER Santoro	OBSERVER	QUALITY CONTROL NO.

ANALYSIS – METAL / SLAG

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	Co	Cu	Co	Ti
SPEC.			.97	.30	.025	.066	.20	1.35	.15	.06				.10		
AIM			1.05	.41			.35	1.55								
FINAL																
01 PREL.	1.33															
02 PREL.																
03 PREL.																<.005
04 PREL.																
05 PREL.																

TAP. PREV. HEAT	TAPPED	START END. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
930 A.M.	12 P.M.	HR.	2.5 HR.	PRIOR FCE.	38368	38202	166

TIME	VOLT BANK	RESISTOR SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
935 A.M.				LEFT IN FCE.	
				START CHARGE	
1st Bucket			4101-01	Ferrum (1)	47640
			43-350	Ferro Si	
1-10-7			43-561	Lime	1800
			43-950	Fluor	
1023	100		43-115	Burnlon	
			43-703		
2nd Bucket			4101-01	Ferrum (2)	18600
1150	5	100		Burnlon	
1235				1st Sample	
				11C3080	
100				Tap	
125				Finish Patch	
OUT-TRANS				Sec 66240	
66000				7021 2800	
				73315 69040	
				Sec 67813	
				7021 3350	
				74988 71403	

DELAYS	TIME FROM	TO	TOTAL	APP.	REASON
	1115	1126	11		adjusted on Blowoff
	1120	1140	20		repair water pipe
					Red Lite
					Yellow lite
					Meltdown

OXYGEN	MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O_2

TEST FINAL

FCE. TEMP. AT TAP	
FCE. TAPPING CONDITION	
FCE. COND. FINAL SLAG	
FCE. COND. OF FCE. AFTER TAP	Good
LADLE STOPPER SET BY	Lewis
LADLE NOZZLE SIZE	2 SET BY Lewis
LADLE TEMP. AT TAP	
LADLE TIME HELD IN LADLE	
LADLE TEEMING CONDITION	ok
LADLE TEMP. OF LADLE AT TAP	Hot
LADLE #	2 TEEMED BY Lewis

ACC. CODE — TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
14	14C	
1-14C	Stuck in mold in MC S# S1028	6440C

220PM TOTAL WEIGHT GOOD INGOTS

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	14C	BUTTS	2400
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	500
		LDL. SKULL	
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: Donut used on 14 mold

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS ABO

74069 7075 81144 66060 7075 73135

N 980.39 170-2

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

ELECTRIC FURNACE RECORD

HEAT NO. 9P110
GRADE 40
MELTING PRACTICE
SERIAL NO.

START DATE 4/8 FIN. DATE 4-8-81

MELTER RW. FIRST HELPER LBURDI OBSERVER QUALITY CONTROL NO.
MELTER RW. FIRST HELPER Santoro OBSERVER QUALITY CONTROL NO. D

ANALYSIS — METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	Co	Cu	Co	Ti
SPEC.			.38/.43	.24/.40	.015	.010	.80/1.00	4.75/5.25	.35	1.24/1.40	.35	.40/.55	check	.35		—
AIM																
FINAL																
∘: PREL.	5.11	5.20	.068	.21	.008	.06	.02	.90	.107	.09	<.01	.012				
∘: PREL.																
∘: PREL.																
∘: PREL.																
∘: PREL.																

SLAG

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
100	5:37	HR.	3.5 HR.	ROOF FCE.	38581	38383	198

TIME	VOLT BANK	RHEOSTAT SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
	P.M.			LEFT IN FCE.	
				START CHARGE	
				Low-Phn (1)	25560
			43-350	Fe Mn	1000
1:15	200		43-461	Bond 2700	
			43-410		
			43-115		
335			403-37	L.P.	20,780
312			43-703	P.ON	
375			403-41	L.P.	19,800
350				P.ON	
513				IA	
559				IAP	
640				NEW BOTTOM FIN PATCH	
CUT TEMP				Acc. 66060 2709 9075 73135 68,760	
66000					
				Acc. 74069 2700 81144 76,769	

TIME FROM	TO	TOTAL	APP.	REASON
		4		Blowdown Stack 16316
150				Redlite Yellowlite
655	645	45		NEW BOTTOM IN FCE

OXYGEN	MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O.

TEST FINAL

FCE	
TEMP. AT TAP.	
TAPPING CONDITION	OK
COND. FINAL SLAG	OK
COND. OF FCE. AFTER TAP	

LADLE	
STOPPER SET BY	
NOZZLE SIZE	211 SET BY
TEMP. AT TAP	
TIME HELD IN LADLE	
TEEMING CONDITION	GOOD
TEMP. OF LADLE AT TAP	
LADLE #	2 TEEMED BY Chandler

ACC. CODE

TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
4	23T	59200
3	16S	10350

820PM

TOTAL WEIGHT GOOD INGOTS 69550

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	16S	BUTTS	3000
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL	200
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: 40 Bags Refined Balls, Bud
Left off N.S. down
H.T. [illegible] H.T. OK

AUTHORIZED SIGNATURE — ALSO APPROVE ALLOWED DELATS ABOVE

79328 85903 67400 6375 73975

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

ELECTRIC FURNACE RECORD

START DATE 4-8-81 FIN. DATE 4/8/81

HEAT NO. S 08464
GRADE 316L-4 Ao
MELTING PRACTICE
SERIAL NO. OP357

MELTER LaRkin / FIRST HELPER / OBSERVER / QUALITY CONTROL NO.
MELTER Ev. FIRST HELPER Mill OBSERVER QUALITY CONTROL NO. D

ANALYSIS – METAL	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	N	Co	Cu	Co	Ti		
SPEC.			.028/	1.50/	.030X	.028X	.30/	17.00/	12.00/	2.10/		.05X	.50X	.50X				
AIM				2.00			.60	26.00	13.50	2.80								
FINAL																		
⇒ PREL.																		
⇒ PREL.																		
⇒ PREL.																		
⇒ PREL.																		
⇒ PREL.																		

SLAG: 6000

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
71	10 A	HR.	2.2 HR.	GOOF FEE	84339	41.63	176

TIME	VOLT BANK	RESISTOR SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
				LEFT IN FCE.	
				START CHARGE	
7:00 AM			4154-02	440	21660
				~~444~~ 600	
			4146-02	335	20340
			4121-01	805	15500
			42-141	Ni Cr 53	6800
			42-552	100% Ni	3700
			43-910		
			43-961	Lime 3200 ~~4500~~	
			43-111	500	
			43-350	Coke	500
			43-703	Power On 500	
8:00					
10:00				1A Prel	
10:15				Tap 1	
				Burn Bottom	
10:40				Tap 1	
11:30 AM				Gun Patch	
				B.P.I. Wall (Top)	
				N.W. of Door N.E. of	
				Tap Spout	
WT. TRANSF.				Add 67400 ~~6375~~ ~~73975~~ ~~7700~~	
63000					
				Add 79328 ~~6575~~ ~~85903~~ ~~6680~~	

TIME FROM	TO	TOTAL	APP.	REASON
8:30	9:35			Block Wall Add #1

DELAYS

OXYGEN	MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O₂

TEST FINAL

FCE	TEMP. AT TAP.
	TAPPING CONDITION
	COND. FINAL SLAG
	COND. OF FCE. AFTER TAP
LADLE	STOPPER SET BY Parker
	NOZZLE SIZE 2 SET BY Parker
	TEMP. AT TAP
	TIME HELD IN LADLE
	TEEMING CONDITION OK
	TEMP. OF LADLE AT TAP 1st
	LADLE Parker TEEMED BY 45

ACC. CODE

TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
33	14	

12:30 PM

TOTAL WEIGHT GOOD INGOTS 6649

MISCELLANEOUS CREDITS

NO.	SIZE	WEIGHT
	None	BUTTS
		SCRAP INGOTS
		PIT SKULL
		FCE. SKULL
		LDL. SKULL
		PANCAKES
		PILOTS
		SLAG POT

REMARKS:

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS AB.

72020 78095 64800 70875

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. 508446
GRADE 310-S
MELTING PRACTICE AP
SERIAL NO. 0/358

ELECTRIC FURNACE RECORD

START DATE 4/8 FIN. DATE 4/8/81

MELTER | FIRST HELPER | OBSERVER | QUALITY CONTROL NO.
MELTER Larkin | FIRST HELPER Millett | OBSERVER | QUALITY CONTROL NO. D

ANALYSIS – METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	Co	Cu	Cb	Ti
SPEC.			.10	1.50	.0251	.0251	.30	24.00	21.00	.50				.50	.50	
AIM			.15	2.30			.60	28.00	22.50							
FINAL																
PREL.																
PREL.																
PREL.																
PREL.																
PREL.																

SLAG: 6 000

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
6:15 A M.	2:00 P M.	HR.	2.4 HR.	FOOD FCE.	84558	84339	219

TIME	VOLT BANK	RHEOSTAT SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
				LEFT IN FCE.	
				START CHARGE	
7:30 AM.			4142-01	309	14780
			42-552	100% Coal	12140 500
			4101-01	Mattay	10720
			4103-01	L.R.	3160
			42-178	Hy Carb (65)	21300
			43-961	Lime (77.00) ~~1500~~ ~~2900~~	
			42-552	100% Ni	600
			42-181	Hi Carb (53)	2100
11:38			43-950	Power On	575
			43-115		500
			43-707		500
1:45				IA Peel	
2:00 P.M.				Tap I	
				Good Bottom (2-X)	
2:35				Tap II	
				Bottom about 8" over Floor level	
					640 PM
3:00				In Patch	
11:00 TRANSF				Sta 64800 / 6075 / 70875	3200 / 1800
65000					
				Sta 72020 / 6075 / 78095	2250 / 2470

TIME FROM	TO	TOTAL	APP.	REASON

MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O₂

TEST FINAL
TEMP. AT TAP.
TAPPING CONDITION
COND. FINAL SLAG
COND. OF FCE. AFTER TAP
STOPPER SET BY
NOZZLE SIZE 2 1/1 SET BY
TEMP. AT TAP
TIME HELD IN LADLE
TEEMING CONDITION Good
TEMP. OF LADLE AT TAP
LADLE # 5 TEEMED BY McKinnon

ACC. CODE | TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
21	16S	

TOTAL WEIGHT GOOD INGOTS 72450

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	16S	BUTTS	3000
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL	None
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: HT. 30min 1102

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS AB.

81530 8P795 65980 7275 73255

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. 508447
GRADE 309-7
MELTING PRACTICE
SERIAL NO. OP339

ELECTRIC FURNACE RECORD

START DATE 4/8/81 FIN. DATE 4/8/81

MELTER LEWNTW FIRST HELPER Bakay OBSERVER QUALITY CONTROL NO.
MELTER LAPRIN FIRST HELPER MILLER OBSERVER TA QUALITY CONTROL NO.

ANALYSIS – METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	Co	Cu	Cb	Ti	N2
SPEC.			.06	1.50	.0381	.0381	.30	23.50	14.50	.50	Check	Check	Check	.50	Check	Check	.05
AIM			.07	2.30			.60	25.00	13.80								
FINAL																	
#1 PREL.																	
#2 PREL.																	
#3 PREL.																	
#4 PREL.																	
#5 PREL.																	

SLAG

TAP PREV. HEAT	TAPPED	START ENG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
2:30 P.M.	7:00 P.M.	HRS.	3:1 HRS.	ROOF FCE.	84774	84558	216

TIME	VOLT BANK	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
			LEFT IN FCE.	
			START CHARGE	
3:30		4102-01	309	21020
		4101-01	MURRAY FE	17460
		42-481	HIS. CR53	27300
			COAL	600
		42-552	100% NICKEL	6200
		43-350	FE ORE	1200
		43-961	LIME 3500	
		43-950		
3:30		43-115	POWER ON 500	
		43-703	500	
5:30			1st PRELIM	
7:00			TAP	
7:25			FINISH PATCH	
			Sub 65980 (5300)	
			7275	
			73255 (11180)	
6:35:00				
			Sub 81530	
			F 7275 (1121)	
			8P795	

DELAYS

TIME FROM	TO	TOTAL	APP.	REASON
3:45				BLOW OFF AND ADJUST ELECTRODES
5:45	7:05	80	(UL)	WAIT FOR ADD

OXYGEN

MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O_2

FCE.

TEST FINAL
TEMP. AT TAP
TAPPING CONDITION OK
COND. FINAL SLAG OK
COND. OF FCE. AFTER TAP OK Br. S.L.

LADLE

STOPPER SET BY
NOZZLE SIZE .27 SET BY
TEMP. AT TAP
TIME HELD IN LADLE
TEEMING CONDITION OK *
TEMP. OF LADLE AT TAP
LADLE - 5 TEEMED BY McKinnch

ACC. CODE

TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
33	12H	

1105 PM

TOTAL WEIGHT GOOD INGOTS 6,49

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	12H	SUTTS	100
		SCRAP INGOTS	
		PIT SKULL	1000
		FCE. SKULL	
		LDL. SKULL	300
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: HT. ~~Stone~~ 1102

* OPR. leaker M.A's 2-79

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS AB

Melter: LaRkin

Operator: ARcolano

Helper: McAllister

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

AT 8900

2.5 11928 V

Heat No: S 08464 Grade: 316L-4 AOD No: 12,302

Vessel No.	6	Prev. Tap AOD:	0935	4/8/81	Reladle No.	D	Reladle Full: 47200
Heats on Vessel	13	Charge AOD:	10:55	" " "	Heats on Reladle:		Reladle Empty: 21200
Dome No.	4	Tap AOD:	13:25	" " "	Tap Ladle No.	5	Gross 65400
Heats on Dome	13	Time in AOD:	2:30	2.5	Ladleman:	Parker	Net Metal 63000

L # 376

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	44403	54587	70621
START	40096	54397	68121
USED	4307	190	2500
CF/T	11.9	0.52	6.92

ADDITIONS

Acct. Code	Material	Weight	Time
42-457	Li C. Mn	1080	
42-178	Li C. Cr	1300	~~44:28~~
42-552	Ni	1000	
42-701	Lump Si	1850	
4141-01	18-8	3000	
	~~Lime~~ 133	2950	
	~~Spar~~ 100	10	~~1:18~~
42-701	Lump Si	300	
	~~Lime~~ 200	202	
42-504	Mo ox	~~22~~	1147#
42-74	Lump Si	600	~~[illegible]~~
	~~Lime~~ 825	825	
	~~Lime~~ 100	100	
42-450	Met Mn	260	
42-701	Lump Si	380	
42-164	05 CR	800	~~12:15~~
42-552	Ni	90	
42-504	Mo ox	~~32~~ 104	#
42-051	Fe B	17	~~[illegible]~~

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge		10:55	Stir	2750		190	
BG	10:57	11:06	2-1		319		500
BG Add	11:21	11:38	2-1	3055	997		1660
BG	11:39	12:00	1-3		2781		2233 ①
BG	12:08	12:17	1-3		3625		2500
Reduction	12:18	12:24	Stir	2940	3933		
Do Slag	12:24	12:27					
AlN	12:28	12:30	Stir	2935	4093		
Do Slag	12:34	12:36					
Al	13:15	13:17	Stir	2780	4239		
Tap	1325		Stir	2780	4307		
Tap Range	2750	2775	ITC →	2745 ←	Ladle	Temp	

ANALYSIS

Sent	Received		C	Mn	P	S	Si	Cr	Ni	Mo	Cu	Co		B.	N
	FeE	1A					.14								
11:00	11:04	11:04	.947	.68	.024	.005	.08	18.10	12.67	1.35	.18	.07			
12:03	12:07		.038												
12:34	12:42	12:44	.015	1.47		.011	.18	17.76	13.16	2.11					.018
Aims			LAP	1.80		<.015	40	18.15	13.00	2.15				.004	LAP
Specification				1.50			30	18.00	12.00	2.10					
			.028	2.30	.03	.025	60	20.00	13.50	2.80	.50	.50			.05
Final															
Delays															

Blow Calculation

764	lb. C X 16.1	1230
76	lb. Si X 13.75	105
2 1/2	% Mets X 4.75	898
	TEO	2233
	% TEO-Switch	change Bal AR.
	Reduction Slag	
Slag No. 2.5	Spar No.	
Condition: Fluid	Sluggish	
Color: Sh. Bk. Lt. Gr. Dk. Gr. Dk. Br.		
Other:		
Patch Vessel		
Tap Wt. 72230 lb.	36.1	T.
Yield (Office Use):		

Sa 11928

F ~~[illegible]~~ 3175

~~[illegible]~~ 15703

HJW - 66495

Remarks:

Bull - None

414010

LARKIN	7220 ✓
39

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

AT 8800

...r: LARKIN

Operator: ARCOLANO

...er: McALLISTER — Heat No: 508446 — Grade: 310-S — AOD No: 12,303

...el No.	6	Prev. Tap AOD:	1325 4/8/81	Reladle No.	D	Reladle Full:	23020
Heats on Vessel	14	Charge AOD:	14:50 4-8-81	Heats on Reladle:		Reladle Empty:	
...me No.	4	Tap AOD:	18:40 4-8-81	Tap Ladle No.	5	Gross	78600 ~~73000~~ ?
...s on Dome	14	Time in AOD:	3:50	Ladleman:		Net Metal	EST 65000

L.F. 376

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
...ISH	46890	55919	73746
...ART	44403	54587	70621
...USED	2487	1332	3125
...T	70.	32.5	88.

ADDITIONS

Acct. Code	Material	Weight	Time
42-178	HC Cr	1920	~~1455~~
42-458	Mn Si	1220	
42-183	Ca Si	820	~~1244~~
42-552	Ni	1450	
	~~Lime~~ 1350	~~1350~~	
4141-81	18-8	2000	
	~~Lime~~ 200	~~200~~	
42-552	Ni	215	
42-178	HC Cr	130	~~1527~~
42-457	HC Mn	90	
4181-0	Mn N	325	
	~~Lime~~	~~600~~	
	~~Spar~~	~~100~~	
42-993	Ni Mg	240	~~1832~~

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge	1450	1452		2860		170	
...low	15:00	15:14	2-1			647	706
...low	15:30	15:35	2-1			875	1057
...add	1636	1538	S			967	
...w	1538	1547	2-1			1332	1700
...ow	1547	1553	2-1		207		2061
3 Blow	1615	1621	2-1	3040	526		2540
Blow	1622	1626	1-2		232		2700 C
...low	16:28	16:40	1-2		1731		3125
[illegible]	[illegible]	1715	S	2820	2012		
...slag	1808	18:10	S	2815	2110		
Adds	18:27	18:29	S				
Stir	1830	18:32	S				
Add	18:36	1839	S	2730	2380		
Tap		1840			2487		
	Ladle Temp			2710			
Range	2690	2715	ITC →				

ANALYSIS

Sent	Received		C	Mn	P	S	Si	Cr	Ni	Mo	Cu	Cb		MG.	N
1525	1570	1530	194	56	018	007	501	2549	2208	15	14	001			
1628	1631		302												
1753	1756	1801	106	1.63		011	50	2668	2121						054
...Aim			13	1.70		K015	45	26.40	21.50					05	035
Specification			10	1.50			30	26.00	21.00						
			15	2.30	035	035	60	27.00	22.50	50	50	50			

Delays: 15:53 To 16:16 (22 min.) 16:40 To 17:42 (62 min.)

Remarks: Patch east seam. Charging crane down

Blow Calculation

1343	lb. C X 16.1	2162
39	lb. Si X 13.75	54
~~[illegible]~~	% Mets X 4.75	618
	TEO	2834
60	% TEO-Switch	1700

Reduction Slag

Slag No. 1.5 — Spar No.

Condition: Fluid — Sluggish

Color: Sh. Bk. Lt. Gr. Dk. Gr. Dk. Br

Other:

Patch Vessel

Tap Wt. 71,000 lb. 35.5 T.

Yield (Office Use):

AQ	7220
F	~~600~~ 2250
	~~7220~~ 9470

Y&W - 72450

Butt - 2000

J 1 | 1-81

Melter: Reiser, Irw
Operator: Mons, Thomas Collins
Helper: Parker

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

3.8 3889 V

AT 8900

Heat No: N98090 ~~N98043~~ AOD Record 403-8 Grade: ~~403-4~~ AOD No: 5041

Vessel No.	4	Prev. Tap AOD:	0645	4-9	Reladle No.	A	Reladle Full: 116 900
Heats on Vessel	46	Charge AOD:	0720	4-9	Heats on Reladle:	15	Reladle Empty: 047 100
Dome No.	5	Tap AOD:	1105	4-9	Tap Ladle No.	8	Gross 63 800
Heats on Dome	46	Time in AOD:	3:45	3.8	Ladleman:	Parker	Net Metal 62000

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	51851	46726	78887
START	49695	45493	76147
USED	2156	1233	2740
CF/T	473	266	579

ADDITIONS

Acct. Code	Material	Weight	Time
42-178	HCCR	2230	~~0725~~
		~~800~~ 800	
	~~Lime~~	~~500~~	
	~~Fine Si~~	~~720~~ 720	
	~~Fine Al~~	~~90~~ 90	~~0745~~
	~~Lime~~	~~200~~ 200	
		~~200~~	
		~~400~~	
42-003	Al Bar	200	~~0776~~
	~~Lime~~	~~300~~ 300	
	~~Lime~~	~~750~~ 750	
42-003	Al Bar	300	~~1012~~
	~~[illegible]~~	~~[illegible]~~	
42-100	Graph	80	
42-450	Met Mn	~~140~~ 139#	139 # mtl.
42504	Mn ox	~~[illegible]~~	
	~~Fine Si~~	~~25~~ 65	~~1056~~
4101-01	Mn Fe	650	
42-003	Al	200	
	~~Lime~~	~~500~~ 600	

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge	0720	0725		2750			
Blow	0758	0826	3-1	3050		1061	1949
" "	0832	0840	1-1			1196	2040
Reduce	0840	0846	S	3010	436		
Reslag	0851	0854					
Re HT	0936	0940	3-1		1386		2240
Re HT	1007	1030	3-1	2925	1919		2540
Add Re HT	1056	1105	3-1	2930	2081		2740
Tap	1105				2152		
Tap Range	2900	2925	ITC →	2930			

Ladle Temp → 2890

ANALYSIS

Sent	Received		C	Mn	P	S	Si	Cr	Ni	Mo	Cu	Co	Al		N
0717	0722	0727	137	41	017	015	01	1092	09	02	08	026			
8-24	0928		180												
850	0855	0900	102	35		016	25	1205	12	03	08				040
1930	0937	0939	095	40		003	24	1212	14	03	08				023
Aims			14	45			40	1175							
Specification			12	30			20	1150							
			15	60	025	025	50	1200	50	50	50	50	05		08
Final															

Blow Calculation

931	lb. C X 16.1	1499
6	lb. Si X 13.75	8
11/2	% Mets X 4.75	442
	TEO	1949
	% TEO Switch	N2 To Reduce

Reduction Slag

Slag No. Spar No.

Condition: (Fluid) Sluggish

Color: Sp. Bk. Lt. Gr. Dk. Gr. Dk. Br

Other:

Patch Vessel

NA. 64280

Tap Wt. ~~[illegible]~~ ~~[illegible]~~ T.

Yield (Office Use):

3889

~~[illegible]~~

~~[illegible]~~ V 7414

JSW-62100

Delays 0900 No ladle ready

Remarks: Went Through 3 have to Re ladle and patch. Crane down use Pit Crane. Change Heat to 403-8 OK J Dillon

Built - 1 ...

4151-01

Foreman: Jew-Dispice
Operator: Collins, SMI
Helper: Parker, McEwen

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

13070
3.8 V

Heat No: ~~N85046~~ 98091 Grade: ~~176-0~~ 176-2 AOD No: 5042

Ladle No.	4	Prev. Tap AOD:	1105	4/9/81	Reladle No.	A	Reladle Full:	~~10:8:10:0~~	
Heats on Vessel	47	Charge AOD:	1305	4/9/81	Heats on Reladle:	16	Reladle Empty:	~~0:4:5:4:0:0~~	
Line No.	5	Tap AOD:	1650	4/9	Tap Ladle No.	2	Gross	~~62700~~	
Heats on Dome	47	Time in AOD:	3:45	3.75	Ladleman:	McKINNON	Net Metal	~~62000~~ 56000	

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	53150	47108	80137
START	51851	46726	78887
USED	1299	382	1250
LOST	355	104	342

ADDITIONS

Acct. Code	Material	Weight	Time
42-003	Bar AL	100	
42-100	Graph	60	~~1445~~
	~~Fine Si~~	~~160~~	
42-100	GRAPHITE	6	~~LADLE~~
42-504	MG O X	~~1425#~~	1425# M11
	~~SICA~~	~~100~~	~~Line~~
	~~LIME~~	~~1100~~	
42-183	CR.SI	1000	
42-003	BAR AL	300	~~1607~~
42-174	NICR	2400	
42-853-2	L	385	
42-164	CRX CR	330	~~1432~~
~~42-003~~	~~AL CR~~		
	~~LIME~~	~~1100~~	
42-504	MG O X	~~LEAN~~	235#
42-100	GRAPHITE	13	
	~~FINE SI~~	~~465~~	~~1531~~
4101-01	MURRYFE	3000	
42-003	BAR AL	~~400~~	
	~~LIME~~	~~1100~~	
4101-01	MURRYFE	3000	~~2477~~
42-504	MG OX	~~3 LEAN 1607~~	→ 104#
42-100	GRAPHITE	12	
	~~LIME~~	~~400~~	
	~~FINE SI~~	~~1100~~	

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge		1310	S	3125		3887	
~~TAP~~	1402	1417	~~2~~	2840	155		
D.SLAG	1418	1421	—				
ADD	1432	1440	3-1	2930	700	—	1500
DSLAG	1441	1443	—	2850	536		
DBLOW	1531	1535	3:1		702		900
STIR	1535	1536	90A	2900	817		
~~Lance~~	1542	1546		~~2860~~			
DBLOW	1607	1611	3:1		956		1200
STIR	1611	1612	STIR	2860	1041		
Blow	1616	1617	3:1		1092		1250
STIR	1617	1618	STIR	2875	1172		
TAP	1650			2850	1299		
	2825	2850					
Range	~~2825~~		ITC →	2770	LADLE	Temp	

ANALYSIS

Heat	Received		C	Mn	P	S	Si	Cr	Ni	Mo	AL	CU	CO	W	V	N
		A	109	18	008	.019	<.01	1.41	.13	08		.03	.07	03	<.01	
316	1313	1322	132	23	013	021	<01	183	21	08		04	01	07	01	
449	1454	1500	368	31		002	42	541	.19	132					52	
32	1541	1545	401	33		002	95	536	18	128					78	
018	1623	1630	412	34		001	.99	508	.17	129					46	
			42	30		4005	90	466		130					45	
			38	20			82	475		124					46	
			43	40	015	011	100	525	25	140		35		35	10	
Limits			84	35		LAP	20	410		425	<03				100	6
Specification			80	15			10	400		400					90	4
			85	35	*015	006	25	425	*15	450	(03)	*10	25	25	110	✓

Blow Calculation

lb. C X 16.1

lb. Si X 13.75

% Mets X 4.75

TEO

N— % TEO Switch TEO

Reduction Slag

Slag No. Spar No.

Condition Fluid Sluggish

Color: Sh. Bk Lt. Gr. Dk. Gr. Dk. Br

Other:

Patch Vessel

67000

Tap Wt. ~~73000~~ lb. 36.5T

Yield (Office Use):

AC 13070
1- ~~000~~ 5950
~~13070~~

JSW-66100

Butt - 1000

4156-01

Remarks: CHANGE HEAT 170-2 J.K.
LADLE TEMP 2770°

69110 76185 56040 63115

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. ~~98066~~ 98091 N
GRADE ~~[illegible]~~ 170-2
MELTING PRACTICE AO
SERIAL NO. 94115

ELECTRIC FURNACE RECORD

START DATE _____ FIN. DATE 4/9/81

QUALITY CONTROL NO.
QUALITY CONTROL NO.

MELTER _____ FIRST HELPER _____ OBSERVER _____
MELTER IRW. FIRST HELPER Sam Ford OBSERVER _____

SLAG

ANALYSIS – METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	~~Co~~ N	Cu	Cb	Ti		
SPEC.			.38	.20	.015	.010	.84	4.75	.25	1.20	.35	.40	.06	.35				
AIM			.43	.40			1.00	5.25		1.40		.60						
FINAL																		
#1 PREL.																		
#2 PREL.																		
#3 PREL.																		
#4 PREL.																		
#5 PREL.																		

Good

Deoxidized Lt N

TAP PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USE
710 = H	1250 P H	HR.	2.5 HR.	ROOF FCE.	39393	39201	192

TIME	VOLT/BANK	AMPERAGE SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
810				LEFT IN FCE.	
				START CHARGE	
Lt Bucket			401-01	Murry iron	41140
			43-350	Fe Cr	1000
			43-961	Lime	600
917	6	700		Powder	
Lt Bucket			401-01	Murry iron	14900
			43-950		~~515~~
			43-115		~~500~~
1145			43-703	170 2810	~~500~~
1130				Lt Sample	
1240				170 0314	
1250				Tap	
~~1500~~				New Bottom in 89 FC 46 Bags of Sindfay	

TIME FROM	TO	TOTAL	EPP	REASON
810	915	65	(V)	Wait for Crane Crane out Work
932	941	11		Blackoff Field 3
				Redlite 3
				Sodium Cyanide
				Lt Black Bond
1200	1230	50	(V)	Drill Ladle
				Not Ready To
				Sigmaure

OXYGEN	MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O_2

TEST FINAL
TEMP. AT TAP.

FCE: TEMP. AT TAP.
TAPPING CONDITION
COND. FINAL SLAG
COND. OF FCE. AFTER TAP Bottom low

LADLE: STOPPER SET BY
NOZZLE SIZE 211 SET BY
TEMP. AT TAP
TIME HELD IN LADLE
TEEMING CONDITION Good
TEMP. OF LADLE AT TAP
LADLE # 2 TEEMED BY McKinney

ACC. CODE

TOTAL NO. OF INGOTS

NO. OF INGOTS	SIZE	WEIGHT
4	23 I	592
2	16 S	690

450 PM

TOTAL WEIGHT GOOD INGOTS - 661

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	16S	BUTTS	100
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL 300 [illegible]	
		PANCAKES	
		PILOTS	
		SLAG POT	

Wt. Transf.
62000

Sa 56040
" ~~4075~~ 2400
~~63115~~ 58440

Sa 69110
" ~~2025~~ 8950
~~76185~~ 1142

REMARKS: 46 Bags Sindfay on Bottom. BRI 5L
#1. 15 mg 1102

AUTHORIZED SIGNATURE — ALSO APPROVE ALLOWED DELAYS

330

69929 76461 64360 64775 70835

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

HEAT NO. H98044
GRADE 403-4
MELTING PRACTICE AO
SERIAL NO. 9P116

ELECTRIC FURNACE RECORD

START DATE 4/9 FIN. DATE 4-9-81

MELTER RW FIRST HELPER LIEURDI OBSERVER QUALITY CONTROL NO.
MELTER RW FIRST HELPER Sanpro OBSERVER QUALITY CONTROL NO. D

ANALYSIS – METAL	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	Al	Nb	Co	Cu	Co	Ti	SLAG		
SPEC.			.12/	.30/	.0255	.035	.20/	11.50/	.54	.50	.054	.025	.50	.54					
AIM			.11	.60			.50	12.00											
FINAL																			
#1 PREL.	3:47	3:55	.50				.26		.09	<.01				.10					
#2 PREL.																			
#3 PREL.																	6000		
#4 PREL.																			
#5 PREL.																			

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
1250 P.M.	5 P.M.	HR.	2.0 HRS.	REP. FCE.	39580	39393	187

TIME	VOLT BANK	RESISTANCE SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
1550 P.M.				LEFT IN FCE.	
				START CHARGE	
				COAL	600
1st Buck			4463-01	Pour Pkg	30360
			42-181	1-Lb Flux 53	14200
1-B-1			43-350	Coke	400
			43-961	Lime 3200	
			43-910		575
1569	100		43-115	Briquettes	500
			43-103		500
305			4103-01	L.O	19,800
310				P.ON	
350				IA	
530				TAP	
635				BUILD UP REAR BANK / FIN PATCH	
				Sub 64360 / 64775 / 70835	64360
				Sub 69929 / 64775 / 76461	76929

DELAYS	TIME FROM	TO	TOTAL	APP.	REASON
	3:00	5:30	9.5	KD	WAIT FOR AOD

OXYGEN	MINUTES	PRESSURE	PIPE	CU. FT. OXYGEN

FCE.	
TEST FINAL	
TEMP. AT TAP	
TAPPING CONDITION	OK
COND. FINAL SLAG	OK
COND. OF FCE. AFTER TAP	Poor Coke Dec

LADLE	
STOPPER SET BY	
NOZZLE SIZE 211	SET BY
TEMP. AT TAP	
TIME HELD IN LADLE	
TEEMING CONDITION	Good
TEMP. OF LADLE AT TAP	
LADLE 2	TEEMED BY M. Kirk

ACC. CODE	TOTAL NO. OF INGOTS		
	NO. OF INGOTS	SIZE	WEIGHT
	17	165	

720 PM

TOTAL WEIGHT GOOD INGOTS 59650

MISCELLANEOUS CREDITS	NO.	SIZE	WEIGHT
BUTTS		None	
SCRAP INGOTS			
PIT SKULL			
FCE. SKULL		5000	
LDL. SKULL		None	
PANCAKES			
PILOTS			
SLAG POT			

REMARKS: * Spoiled Hot top Pulls on heats 1-26, 5-8, 1 Heat Heat Emi Built up Bkr Sa We can draw Lee Bkr Straight up / HT 30 min.

AUTHORIZED SIGNATURE ALSO APPROVE ALLOWED DELAYS

78575 85850 65980 7275 7325

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

NEAT NO. S08451
GRADE 309-3
MELTING PRACTICE AO
SERIAL NO. 0P565

ELECTRIC FURNACE RECORD

START DATE 4-9-81 FIN. DATE 4/9/81

MELTER Larry FIRST HELPER Miller OBSERVER QUALITY CONTROL NO.
MELTER Ru FIRST HELPER OBSERVER QUALITY CONTROL NO.

ANALYSIS — METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	V	Co	Cu	Cb	Ti	N
SPEC.			.10	1.50	.03	.03	.30	23.00	12.00	.50	Check	Check	Check	.50	Check	Check	.08
AIM				2.00			.5	25.00	13.00								
FINAL																	
PREL.																	
PREL.																	
PREL.																	
PREL.																	
PREL.																	

SLAG 6 oz

TAP. PREV. HEAT	TAPPED	START ENG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
1	1205 P.M.	HR.	9.3 HR.	ROOF FCE.	85526	85313	213

TIME	VOLT BANK	RESISTOR SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
				LEFT IN FCE.	
				START CHARGE	
730			441-04	312	14720
				Coke	500
			4101-01	Murray	7680
			4101-01	Murray	15560
			42-181	Ni Cr 53	21500
			42-552	Ni	6500
			43-350	Ore	1200
			43-961	Lime	3500
			43-950		57
939			43-115	Power On	500
			43-703		500
1145				IA Prel.	
1150 A.M.				Tap #1 Lost Rod under R. Had To Tap Part of Heat into the Ritter Ladle	
1158				O2 Blow	
1205 P.M.				Tap #2 Burn Bottom Again	
1230 P.M.				Tap 3	
1255				Jim Patch	
LOT TRANSF.				Loc 65980	5200
67660				7275	
				73255	7100
				Loc 78575	3110
				85850	6910

TIME FROM	TO	TOTAL	APP.	REASON
730	915	105		Lower Cr
915				Block
	920	5		

	MINUTES	PRESSURE	PIPE	CU. FT. OR LBS.
OXYGEN	11	50		11

TEST FINAL

FCE.	TEMP. AT TAP.
	TAPPING CONDITION
	COND. FINAL SLAG
	COND. OF FCE. AFTER TAP
LADLE	STOPPER SET BY
	NOZZLE SIZE 211 SET BY
	TEMP. AT TAP
	TIME HELD IN LADLE
	TEEMING CONDITION GOOD
	TEMP. OF LADLE AT TAP
	LADLE - 5 TEEMED BY Charlie

ACC. CODE	TOTAL NO. OF INGOTS	SIZE	WEIGHT
	35	12H	

320 PM

TOTAL WEIGHT GOOD INGOTS 7[illegible]

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
2	165	BUTTS	640
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL	None
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: Only 35 12H2 up.

AUTHORIZED SIGNATURE — ALSO APPROVE ALLOWED DELAYS

82725
88810 64980
71135

ALTECH SPECIALTY STEEL CORP.

DUNKIRK, N.Y. 14048
WATERVLIET, N.Y. 12189

ELECTRIC FURNACE RECORD

START DATE 4/9 FIN. DATE 4/9/81

HEAT NO. 508465 ~~[illegible]~~
GRADE 3F2-1 ~~[illegible]~~
MELTING PRACTICE AO
SERIAL NO. OP364

MELTER
FIRST HELPER
OBSERVER
QUALITY CONTROL NO.

MELTER LaRue
FIRST HELPER Millet
OBSERVER
QUALITY CONTROL NO. D

ANALYSIS – METAL

	SENT	REC'D	C	Mn	P	S	Si	Cr	Ni	Mo	W	N2	Co	Cu	Co	Ti		
SPEC.			.03X	2.00X	.03X	.010X	1.0X	12.00	9.40	.75X		.05X	1.00	3.00				
AIM								12.25	10.00					4.00				
FINAL																		
PREL.																		
PREL.																		
PREL.																		
PREL.																		
PREL.																		

SLAG

TAP. PREV. HEAT	TAPPED	START CHG. TO FIN. PATCH	TIME IN FCE.	NO. HEATS	METER AFTER	METER BEFORE	KWH USED
1905		HR.	2.5 HR.	BROF FCE.		85.526	204

TIME	VOLT BANK	RESISTOR SETTING	ACCOUNT CODE	OPERATIONS	GROSS WEIGHT
				LEFT IN FCE.	
				START CHARGE	
1209			415-01	400	9100
			4142-04	387	19420
			42-996	Cupro Ni	920
			42-558	25% Ni Pip	5660
1255				Power On	
1332			4142-04	257	26250
			42-181	Ni Cr 53	3500
			43-115	Coal	500 ~~[illegible]~~
			42-761	Li Lump	100
			43-961	Lime 2700 ~~[illegible]~~	
			43-950	575	
1405			43-703	Power On 500	
1444				1st Prel	
1550				Tap.	
1725				Finish Patch	
WITHRAWE			Ira	64980	
71500			F	~~[illegible]~~	
				~~[illegible]~~ 6X140	
			Ira	88729	
			F	6075	
				88810	

DELAYS

TIME FROM	TO	TOTAL	APP.	REASON
1332	1350	2.5	WL	WAIT FOR A.O.D

OXYGEN

MINUTES	PRESSURE	PIPE	CU. FT. OR LBS. O.

FCE.

TEST FINAL
TEMP. AT TAP
TAPPING CONDITION
COND. FINAL SLAG OK
COND. OF FCE. AFTER TAP

LADLE

STOPPER SET BY
NOZZLE SIZE 2 1/1 SET BY
TEMP. AT TAP
TIME HELD IN LADLE
TEEMING CONDITION Good
TEMP. OF LADLE AT TAP
LADLE # 5 TEEMED BY Chandler

ACC. CODE	TOTAL NO. OF INGOTS		
	NO. OF INGOTS	SIZE	WEIGHT
	20	165	

9:35 PM

TOTAL WEIGHT GOOD INGOTS 64980

MISCELLANEOUS CREDITS

NO.	SIZE		WEIGHT
1	165	BUTTS	2500
		SCRAP INGOTS	
		PIT SKULL	
		FCE. SKULL	
		LDL. SKULL	
		PANCAKES	
		PILOTS	
		SLAG POT	

REMARKS: Bri [illegible] spots at top of fce
HT. 50 [illegible] SPECIAL H.T.C.
110 [illegible] 336 [illegible]

AUTHORIZED SIGNATURE – ALSO APPROVE ALLOWED DELAYS AS
8 INGOTS.

Melter: ALLEN

Operator: RIEGERT - ARCOLANO

Helper: NOESEN - McAllister

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

8389 3.3 ✓ AT 8900

Heat No: 508452 Grade: 304-14 AOD No: 12,307

Vessel No.	6	Prev. Tap AOD:	0540	4-9-81	Reladle No.	A	Reladle Full: 73300
Heats on Vessel	18	Charge AOD:	0630	4-9-81	Heats on Reladle:		Reladle Empty: 45300
Dome No.	4	Tap AOD:	0945	4-9-81	Tap Ladle No.	2	Gross 63080
Heats on Dome	18	Time in AOD:	3:15	3.25	Ladleman:	LEWIS	Net Metal 61000

L376

North

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	59361	60975	87237
START	57928	60060	85371
USED	1433	915	1866
CF/T	4.19	2.67	5.45

ADDITIONS

Acct. Code	Material	Weight	Time
4101-01	Manganese	3000	~~0632~~
	~~Lime~~	~~1000~~	
42-701	Lump Si	1400	
42-552	Ni	570	
4101-01	Manganese	3000	
	~~Lime~~	~~1100~~	~~0838~~
	~~Fluor Spar~~	~~200~~	
	~~Lime~~	~~400~~ 400	
	~~Fluor Spar~~	~~100~~ 400	~~0845~~
42-100	Graphite	5	~~0838~~
42-353	Shell	9	~~0845~~
42-164	05'	180	
42-183	Low Si	225	~~0833~~
	~~Ni~~	~~264~~	

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge	0630	0636	STIR	2870		210	
BLOW	0638	0645	2-1			456	401
Blo Add	0652	0654	Stir			580	
Blo	0654	0710	3-1	3050	129	915	1550 ①
Blo	0754	0801	1-2	3150	622		1750 ①
Reduction	0838	0844	Stir	2875	977		
Shut	0850	0854	3-1	2915	1114		1866
Pre Slag	0856	0900					
Add	0933	0935	Stir	2825	1371		
Tap	0945		Stir	2825	1433		

Tap Range 2800/2825 ITC → 2790 ← Ladle Temp.

ANALYSIS

Sent	Received	C	Mn	P	S	Si	Cr	Ni	Mo	CU	CO			N
602	0610	1A	FURNACE →			.10								
633	0637	0644	.977	.84	.028	.019	.03	20.63	9.22	.46	.43	.106		
718	0724		.135											
805	0809		.053											
859	0905	0908	.063	.63		.015	.22	17.96	9.35					.052
Aims		.07			.025	.35	18.15	9.10						.07
Specification		.04			.015	.20	18.00	9.00						
		.08	2.00	.040	.030	.60	18.60	9.50	.75	.75	.75			.08
Final														

Delays: Wait for drum 0724 to 0838
Wait for Tap Ladle 0900 to 0945

Remarks:

Blow Calculation

560	lb. C X 16.1	901
18	lb. Si X 13.75	25
2	% Mets X 4.75	580
	TEO	1506
90	% TEO-Switch	1355

Reduction Slag

Slag No. 2.5 Spar No. 0

Condition: Fluid Sluggish

Color: Sh. Bk. Lt. Gr. Dk. Gr. Dk. Br.

Other:

Patch Vessel: North Seam / South

Tap Wt. 68418 lb. 34.2 T.

Yield (Office Use):

~~8389~~ 1.00

~~8389~~ ✓ 10129

DW - 62100

Burt - Stone 4141010

Melter: Larkin

Operator: Nicolano-Lyons

Helper: Mr Allison

ALTECH SPECIALTY STEEL CORP.

WATERVLIET, N.Y. 12189

AOD Record

3.7 V 12595 At 3000

Heat No: S08451 Grade: 309-3 AOD No: 12,708

Vessel No.	6	Prev. Tap AOD:	0945	4/9/81	Reladle No.	A	Reladle Full: 0000
Heats on Vessel	19	Charge AOD:	1240	/ /	Heats on Reladle:		Reladle Empty:
Dome No.	4	Tap AOD:	1520	4.9.81	Tap Ladle No.	5	Gross 10500
Heats on Dome	19	Time in AOD:	2:40	.	Ladleman:	Chandler	Net Metal 34300 ? 67000

L # 371

GAS CONSUMPTION

	Argon	Nitrogen	Oxygen
FINISH	62883	62536	91437
START	59361	60975	87237
USED	3522	1561	4200
CFT	912	40.4	108.8

ADDITIONS

Acct. Code	Material	Weight	Time
42-457	HC MN	1300	~~1500~~
42-178	HC CR	4570	
42-552	NICKEL	1785	
4141-01	18-8	2000	~~1476~~
42-761	LIMESIL	1870	
	~~LIME~~	~~2000~~	
	~~SPAR~~	~~2000~~	
	~~Z~~	~~420~~	
	~~LIME~~	~~400~~	
42-178	HCCL	320	
42-458	MnSi	360	~~1516~~
	~~FMS~~	~~20~~	
42-552	Ni	94	
	~~Al~~	~~2265~~	
42-051	FeB	36	~~1511~~
42-993	NiMg	260	

LOG

Operation	Start	End	Ratio	Temp.	Ar	N2	O2
Charge		1240	Stir	2700		255	
Blo	1244	1325	2-1	3065	25	1535	2365
Blowdown	1327	1329	Stir		190		
Blo	1330	1347	2-1	3058	857		3476
Blow	1349	1405	1.2		2170		4100C
Blow	1407	1410	1-3		2519		4200
Reduce	1418	1424	S	2925	3055		
Deslag	1428	1430					
Add.	1506	1508	S	2806	3391		
Adds	1517		S				
Tap		1520				1561	

Tap Range 2750 / 2775 ITC → 2770 ← Ladle Temp

ANALYSIS

Sent	Received		C	Mn	P	S	Si	Cr	Ni	Mo	Cu	B	Mg		N
245	1249	1250	1.79	59	020	011	12	2246	1093	10	05				
407	1411		103												
															097
430	1437	1438	045	1.52		018	25	2380	1235						
Aims			08	1.80		<.015	.40	23.75	12.50			.008	.05		.05
Specification				1.50			.30	23.50	12.25						
			.10	2.00	.030	.030	.50	24.00	13.50	.50	.50				.08
Final															
Delays															

Remarks:

Blow Calculation

1570	lb. C X 18.1	= 528
171	lb. Si X 13.75	2.35
		2763
2.75	% Mets X 4.75	875
	TEO	3638
65	% TEO-Switch	2365

Reduction Slag

Slag No. 1.5 Spar No.:

Condition: Fluid Sluggish

Color: Sh. Bk. Lt. Gr. Dk. Gr. Dk. Br

Other:

Patch Vessel

Tap Wt. 77231 lb. 38.6 T.

Yield (Office Use):

A&Q 12595

F ~~662~~ 3140

~~12595~~

15735

SIBW - 70525

Butt - 6400

4141-01

APPENDIX E

CALIBRATION PROCEDURES AND RESULTS

CALIBRATION PROCEDURES AND RESULTS

All of the equipment used was calibrated according to the procedures outlined in Maintenance, Calibration, and Operation of Isokinetic Source-Sampling Equipment.*

NOZZLE DIAMETER

The nozzles were calibrated by making 3 separate measurements of different inside diameters and calculating the average. If a deviation of more than 0.004 inches was found, the nozzle was either discarded or reamed out and remeasured. A micrometer was used for measuring. This calibration data is shown in Figure E-1.

PITOT TUBE CALIBRATION

The pitot tubes used in sampling were constructed by PEDCo Environmental and met all requirements of Method 2, Section 4.1 of the Federal Register.** All pitot tubes were calibrated before field use according to the Quality Assurance Handbook for Air Pollution Measurement Systems*** to determine a base line coefficient. See Figures E-2 and E-2a for alignment requirements of Method 2, and Figure E-3 for actual inspection and calibration data of the pitot tubes used during the test program.

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*Office of Air Programs Publication No. APTD-0576.

**40 CFR 60, Appendix A, July 1, 1980.

***Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. III, August 1977.

NOZZLE CALIBRATION

Date 4-6-81 Calibrated by D. FITZGERALD

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
3-111	0.187	0.188	0.188	0.001	0.188

where:

$D_{1,2,3,}$ = nozzle diameter measured on a different diameter, in. Tolerance = measure within 0.001 in.

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

D_{avg} = average of D_1, D_2, and D_3.

Figure E-1. Nozzle calibration data.

NOZZLE CALIBRATION

Date 4-6-81 Calibrated by D. FITZGERALD

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
2-101	0.124	0.121	0.122	~~0.122~~ 0.002	0.122

where:

$D_{1,2,3,}$ = nozzle diameter measured on a different diameter, in.
Tolerance = measure within 0.001 in.

ΔD = maximum difference in any two measurements, in.
Tolerance = 0.004 in.

D_{avg} = average of D_1, D_2, and D_3.

Figure E-1 (continued)

NOZZLE CALIBRATION

Date 4-6-81 Calibrated by MASON

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
A2 PS-P	0.135	0.134	0.135	0.001	0.135
A1 PS-2 ✓P	0.133	0.134	0.134	0.001	0.134
A1 PM-2B ✓P	0.136	0.135	0.133	0.003	0.135

where:

$D_{1,2,3}$ = nozzle diameter measured on a different diameter, in. Tolerance = measure within 0.001 in.

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

D_{avg} = average of D_1, D_2, and D_3.

Figure E-1 (continued)

NOZZLE CALIBRATION

Date 4-7-81 Calibrated by MASON

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
A1PM1B	0.136	0.133	0.134	0.003	0.134
A1PM2A JP	0.134	0.136	0.135	0.002	0.135

where:

$D_{1,2,3,}$ = nozzle diameter measured on a different diameter, in. Tolerance = measure within 0.001 in.

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

D_{avg} = average of D_1, D_2, and D_3.

Figure E-1 (continued)

NOZZLE CALIBRATION

Date 4/6/81 Calibrated by Schwa

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
A3.PS-P	.500	.501	.500	0.001	.500

where:

$D_{1,2,3}$, = nozzle diameter measured on a different diameter, in. Tolerance = measure within 0.001 in.

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

D_{avg} = average of D_1, D_2, and D_3.

Figure E-1 (continued)

NOZZLE CALIBRATION

Date 4/7/81 Calibrated by P. Schwoa

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
A3PS-1B	0.498	.499	.498	0.001	.498

where:

$D_{1,2,3}$ = nozzle diameter measured on a different diameter, in. Tolerance = measure within 0.001 in.

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

D_{avg} = average of D_1, D_2, and D_3.

Figure E-1 (continued)

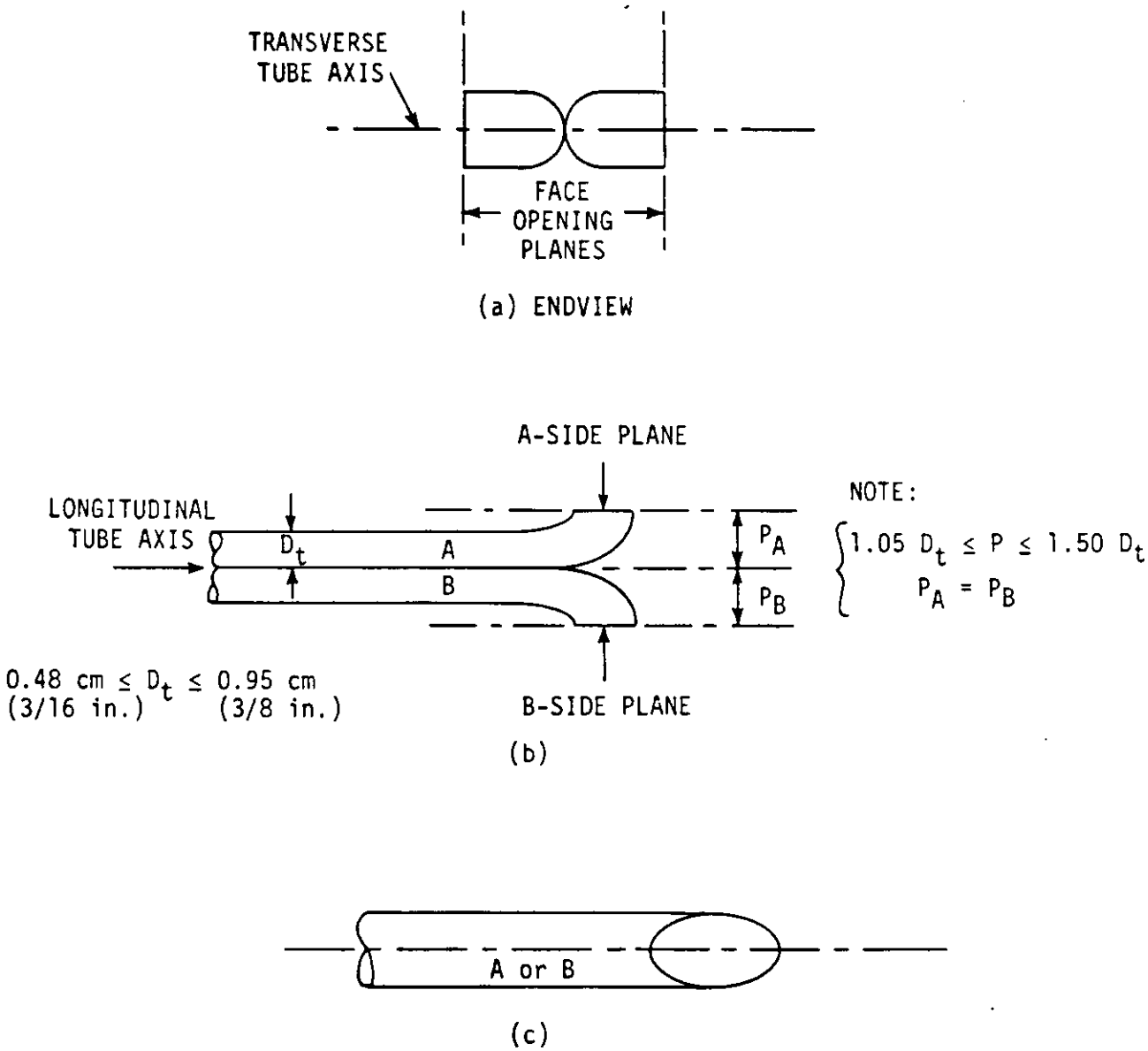

Figure E-2. Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

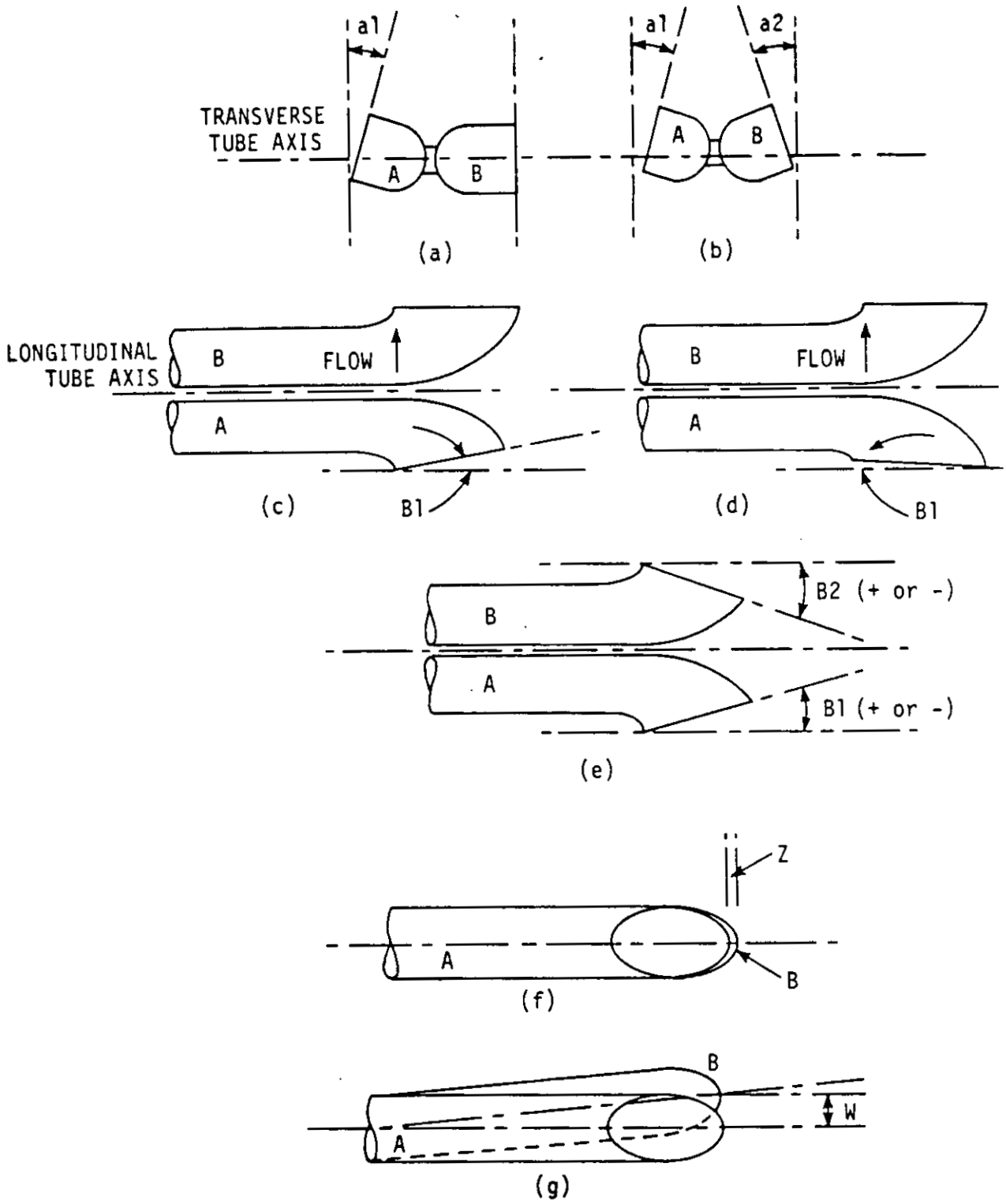

Figure E-2a. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect Cp so long as a_1 and a_2 <10°, B_1 and B_2 <5°, z <0.32 (1/8 in.) and w <0.08 cm (1/32 in.).

PITOT TUBE INSPECTION DATA SHEET

α_1 = 1.0 ° (must be less than 10°)

α_2 = 0.0 ° (must be less than 10°)

β_1 = 1.0 ° (must be less than 5°)

β_2 = 2.0 ° (must be less than 5°)

γ = 0.0 °

θ = 0.0 °

A = 1.056 inches

z = A sin γ = 0.000 inches (must be less than 0.125 inches)

w = A sin θ = 0.000 inches (must be less than 0.03125 inches)

P_A = 0.574 inches

P_B = 0.482 inches

P_t = 0.375 inches

Pitot tube No. 251

Need calibration _____ yes X no

Inspector B. Armstrong

Date 3/11/81

Figure E-3. Pitot tube inspection data sheet.

PITOT TUBE CALIBRATION DATA SHEET

Pitot tube No.: 251 Date: 4/16/81 Calibrator: B Armstrong

Reference pitot tube No.: 502 Type: standard Cp: 0.99

Side	ΔP_{std} in. H_2O	Δp_s in. H_2O	Cp(s) a	Dev. b		$\bar{C}p(s)$	$\lvert\bar{C}p(A)-\bar{C}p(B)\rvert$ c
A	0.81	1.20	0.814	0.004		0.810	0.000
A	0.99	1.48	0.810	0.000	$\bar{C}p(A)$	$\overline{Dev.}(A)$ c	
A	0.35	0.53	0.805	0.005	0.810	0.003	
B	0.81	1.20	0.814	0.004			
B	0.99	1.48	0.810	0.000	$\bar{C}p(B)$	$\overline{Dev.}(B)$ c	
B	0.35	0.53	0.805	0.005	0.810	0.003	

[a] $Cp(s) = (Cp_{std})(\Delta P_{std}/\Delta p_s)^{1/2}$

[b] Deviation = $|Cp(s)-\bar{C}p(A \text{ or } B)|$

[c] Must be less than or equal to 0.01.

Figure E-3 (continued)

PITOT TUBE INSPECTION DATA SHEET

α_1 = 2.0 ° (must be less than 10°)

α_2 = 0.0 ° (must be less than 10°)

β_1 = 1.0 ° (must be less than 5°)

β_2 = 3.0 ° (must be less than 5°)

γ = 1.0 °

θ = 0.0 °

A = 1.175 inches

z = A sin γ = 0.021 inches (must be less than 0.125 inches)

w = A sin θ = 0.000 inches (must be less than 0.03125 inches)

P_A = 0.635 inches

P_B = 0.540 inches

P_t = 0.325 inches

Pitot tube No. 252

Need calibration _____ yes X no

Inspector B. Armstrong

Date 3/11/81

Figure E-3 (continued)

PITOT TUBE CALIBRATION DATA SHEET

Pitot tube No.: 252 Date: 4/16/81 Calibrator: B. Armstrong

Reference pitot tube No.: 502 Type: standard Cp: 0.99

Side	ΔP_{std} in. H_2O	Δ_{ps} in. H_2O	Cp(s) a	Dev. b		$\bar{C}p(s)$	$\lvert\bar{C}p(A)-\bar{C}p(B)\rvert$ c
A	0.81	1.20	0.814	0.003		0.811	0.000
A	0.99	1.49	0.807	0.004	$\bar{C}p(A)$	$\overline{Dev.}(A)$ c	
A	0.35	0.52	0.812	0.001	0.811	0.003	
B	0.81	1.20	0.814	0.003			
B	0.99	1.49	0.807	0.004	$\bar{C}p(B)$	$\overline{Dev.}(B)$ c	
B	0.35	0.52	0.812	0.001	0.811	0.003	

[a] $Cp(s) = (Cp_{std})(\Delta P_{std}/\Delta_{ps})^{1/2}$

[b] Deviation = $\lvert Cp(s)-\bar{C}p(A \text{ or } B)\rvert$

[c] Must be less than or equal to 0.01.

Figure E-3 (continued)

PITOT TUBE INSPECTION DATA SHEET

α_1 = 0.0 ° (must be less than 10°)

α_2 = 0.0 ° (must be less than 10°)

β_1 = 3.0 ° (must be less than 5°)

β_2 = 3.0 ° (must be less than 5°)

γ = 1.0 °

θ = 0.0 °

A = 1.060 inches

z = A sin γ = 0.018 inches (must be less than 0.125 inches)

w = A sin θ = 0.000 inches (must be less than 0.03125 inches)

P_A = 0.446 inches

P_B = 0.614 inches

P_t = 0.375 inches

Pitot tube No. 253

Need calibration _____ yes X no

Inspector B. Armstrong

Date 3/11/81

Figure E-3 (continued)

PITOT TUBE CALIBRATION DATA SHEET

Pitot tube No.: 253 Date: 4/16/81 Calibrator: B Amstutz

Reference pitot tube No.: 532 Type: standard Cp: 0.99

Side	ΔP_{std} in. H_2O	Δ_{ps} in. H_2O	Cp(s) a	Dev. b		$\bar{C}p(s)$	$\lvert\bar{C}p(A)-\bar{C}p(B)\rvert$ c
A	0.81	1.25	0.797	0.001		0.798	0.000
A	0.99	1.52	0.799	0.001	$\bar{C}p(A)$	$\overline{Dev.}(A)$ c	
A	0.35	0.54	0.797	0.001	0.798	0.001	
B	0.81	1.25	0.797	0.001			
B	0.99	1.52	0.799	0.001	$\bar{C}p(B)$	$\overline{Dev.}(B)$ c	
B	0.35	0.54	0.797	0.001	0.798	0.001	

[a] $Cp(s) = (Cp_{std})(\Delta P_{std}/\Delta_{ps})^{1/2}$

[b] Deviation = $\lvert Cp(s)-\bar{C}p(A \text{ or } B)\rvert$

[c] Must be less than or equal to 0.01.

Figure E-3 (continued)

DRY GAS METER AND ORIFICE METER

Figure E-4 was the set-up used for the initial and post-test calibration. A wet test meter with a 2-cubic-feet-per-minute capacity and ±1 percent accuracy was used. The pump was run for approximately 15 minutes at an orifice manometer setting of 0.5 inch of water to heat up the pump and wet the interior surface of the wet test meter. The information on Figure E-5 (example calculation sheet) was gathered for the initial calibration and then, the ratio of accuracy of the wet test meter to the dry test meter, and the ΔH@ were calculated.

POST-TEST METER CALIBRATION CHECK

A post-test meter calibration check was made on the meter box used during the test to check its accuracy against its last calibration check. This post-test calibration must be within ±5 percent of the initial calibration. The initial calibration was performed as described in APTD-0576. The post-test calibration was performed using the same method as the initial calibration. Three calibration runs were made using the average orifice setting obtained during each test run and with the vacuum set at the average value obtained during each test run. After running the post-test calibration check all three runs were within the ±5 percent range allowed by the Federal Register.*

The initial and post-test meter box calibration data are presented in Figure E-6.

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*40 CFR 60, Appendix A, July 1, 1980.

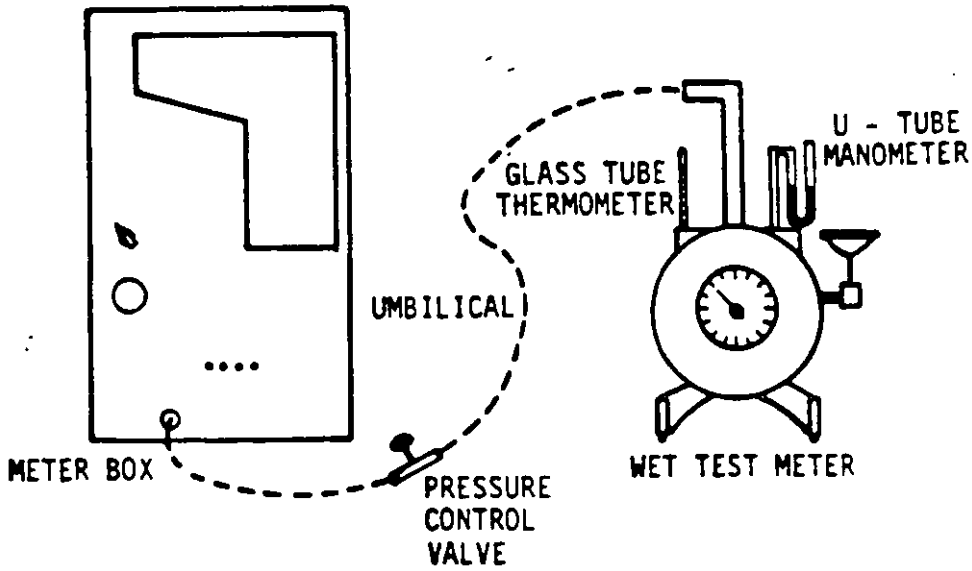

Figure E-4. Calibration setup.

DATE_____ METER BOX NO._____

BAROMETRIC PRESSURE, P_b = _____in. Hg. DRY GAS METER NO._____

Orifice manometer setting ΔH in. H_2O	Gas volume wet test meter V_w, ft_3	Gas volume dry gas meter V_d, ft_3	Wet test meter t_w, °F	Dry gas meter Inlet t_{di}, °F	Dry gas meter outlet t_{dn}, °F	Dry gas meter Average t_d, °F	Time θ, min	γ	$\Delta H@$
0.5	5								
1.0	5								
1.5	10								
2.0	10								
3.0	10								
4.0	10								

Average _____

ΔH	$\frac{\Delta H}{13.6}$	γ $\frac{V_w P_b (t_d + 400)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@$ $\frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w} \right]^2$
0.5	0.0368		
1.0	0.0737		
1.5	0.110		
2.0	0.147		
3.0	0.221		
4.0	0.294		

γ = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01
$\Delta H@$ = Orifice of pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in H_2). Tolerance = +0.15.

Figure E-5. Calibration data sheet.

DRY GAS METER AND ORIFICE CALIBRATION DATA SHEET

LEAK CHECK:

POSITIVE*: ✓

NEGATIVE**: vacuum used 27.5" Hg leakage rate 0.000 cfm***

DATE 2/12/80 METER BOX NO. FB-2

BAROMETRIC PRESSURE, P_b = 30.33 in. Hg. CALIBRATOR B. Armstrong

VACUUM USED DURING CALIBRATION ~10" Hg

Orifice manometer setting ΔH in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Wet test Meter t_w, °F	Dry gas meter Inlet t_{di}, °F	Dry gas meter Outlet t_{do}, °F	Dry gas meter Average t_d, °F	Time θ, min.	Y	ΔH@
0.5	5	675.500	71.0	73	69	72.0	$12\frac{19.3}{60}$	1.000	1.68
		680.507	71.0	76	70				
1.0	5	680.900	71.0	76	70	74.0	$8\frac{45.4}{60}$	1.002	1.69
		685.907	71.0	80	70				
1.5	10	686.400	71.0	80	70	77.0	$14\frac{46.3}{60}$	1.006	1.80
		696.416	71.0	85	73				
2.0	10	696.900	71.0	85	73	80.0	$12\frac{53.6}{60}$	1.010	1.81
		706.932	71.0	88	74				
3.0	10	707.300	71.0	88	74	82.0	$10\frac{26.4}{60}$	1.012	1.78
		717.309	71.0	90	76				
4.0	10	717.703	71.0	90	76	83.0	$9\frac{06.9}{60}$	1.012	1.80
		727.707	71.0	90	76				
							Average	1.007	1.76

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	ΔH@: $\frac{0.0317\,\Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$
0.5	0.0368	$\frac{(5.000)(30.33)(532.0)}{(5.001)(30.3668)(531.0)}$	$\frac{(0.0317)(0.5)}{(30.33)(532.0)}\left[\frac{(531.0)(12.328)}{(5.000)}\right]^2$
1.0	0.0737	$\frac{(5.000)(30.33)(534.0)}{(5.007)(30.4037)(531.0)}$	$\frac{(0.0317)(1.0)}{(30.33)(534.0)}\left[\frac{(531.0)(8.757)}{(5.000)}\right]^2$
1.5	0.110	$\frac{(10.000)(30.33)(537.0)}{(10.016)(30.440)(531.0)}$	$\frac{(0.0317)(1.5)}{(30.33)(537.0)}\left[\frac{(531.0)(14.772)}{(10.000)}\right]^2$
2.0	0.147	$\frac{(10.000)(30.33)(540.0)}{(10.032)(30.477)(531.0)}$	$\frac{(0.0317)(2.0)}{(30.33)(540.0)}\left[\frac{(531.0)(12.893)}{(10.000)}\right]^2$
3.0	0.221	$\frac{(10.000)(30.33)(542.0)}{(10.009)(30.551)(531.0)}$	$\frac{(0.0317)(3.0)}{(30.33)(542.0)}\left[\frac{(531.0)(10.440)}{(10.000)}\right]^2$
4.0	0.294	$\frac{(10.000)(30.33)(543.0)}{(10.004)(30.624)(531.0)}$	$\frac{(0.0317)(4.0)}{(30.33)(543.0)}\left[\frac{(531.0)(9.115)}{(10.000)}\right]^2$

Y = Ratio of accuracy of wet test meter to dry test meter.
Tolerance = ± 0.02Y

ΔH@ = Orifice of pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2O.
Tolerance = 0.15.

* At least five inches water pressure.

** Within three inches mercury of absolute vacuum.

*** Not to exceed 0.005 cfm.

Figure E-6. Pre-test and post-test meter box calibration data.

Date 4/14/81

Barometric pressure, P_b = 29.83 "Hg

Meter Box No. FB-2

Dry Gas Meter No. N/A

Plant AL tech

P/N 3450-2

Project Manager John Prchasky

Pretest Y 1.007

Test No.	Orifice manometer setting, ΔH,* in H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average[a] t_d, °F	Time θ, min.	Vacuum setting in Hg**	Yi	Yi $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1	1.20	10	854.504	74.5	80	72	77.5	16.0	2.5	0.985	(10.000)(29.83)(537.5)
			864.681	74.5	86	72					(10.177)(29.918)(534.5)
2	1.20	10	864.681	74.5	86	72	80.0	16.0	2.5	0.987	(10.000)(29.83)(540.0)
			874.890	74.5	88	74					(10.209)(29.918)(534.5)
3	1.20	10	874.890	74.5	88	74	81.5	16.0	2.5	0.990	(541.5)
			885.095	74.5	88	76					(10.205)

Post-test y = 0.987

Calibrated by Bruce Armstrong
Signature

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

where:

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in H_2O.

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

Y = Average ratio of accuracy of wet test meter to dry test meter for all three runs.
Tolerance = Pretest Y ±0.05 Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, minutes.

* To be the average ΔH used during the test series
** To be the maximum vacuum used during the test series.

Figure E-6 (continued)

DRY GAS METER AND ORIFICE CALIBRATION DATA SHEET

LEAK CHECK:

POSITIVE*: ✓BA

NEGATIVE**: vacuum used 27.0 "Hg leakage rate 0.000 cfm***

DATE 3/4/81 METER BOX NO. FB-3

BAROMETRIC PRESSURE, P_b = 29.26 in. Hg. CALIBRATOR B. Armstrong

VACUUM USED DURING CALIBRATION ~10 "Hg

Orifice manometer setting ΔH in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Wet test Meter t_w, °F	Dry gas meter Inlet t_{di}, °F	Dry gas meter Outlet t_{do}, °F	Dry gas meter Average t_d, °F	Time θ, min.	Y	ΔH@
0.5	5	830.940	72.5	82	74	78.5	12 52.5/60	1.005	1.89
		835.963	72.5	84	74				
1.0	5	836.250	72.5	85	75	80.25	9 16.5/60	1.003	1.96
		841.294	72.5	86	75				
1.5	10	841.550	72.5	86	75	82.5	16 47.8/60	1.008	1.98
		852.625	72.5	91	78				
2.0	10	852.850	72.5	90	78	85.0	13 17.9/60	1.010	1.99
		862.934	72.5	93	79				
3.0	10	863.502	72.5	94	79	87.25	10 54.9/60	1.010	2.01
		873.603	72.5	96	80				
4.0	10	874.850	72.5	96	80	88.5	9 29.5/60	1.011	2.02
		884.740	72.5	98	80				
						Average		1.008	1.98

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	ΔH@: $\frac{0.0317\,\Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$
0.5	0.0368	$\frac{(5.000)(29.26)(538.5)}{(5.023)(29.2968)(532.5)}$	$\frac{(0.0317)(0.5)}{(29.26)(538.5)}\left[\frac{(532.5)(12.8750)}{(5.000)}\right]^2$
1.0	0.0737	$\frac{(5.000)(29.26)(540.25)}{(5.047)(29.3331)(532.5)}$	$\frac{(0.0317)(1.0)}{(29.26)(540.25)}\left[\frac{(532.5)(9.2750)}{(5.000)}\right]^2$
1.5	0.110	$\frac{(11.000)(29.26)(542.5)}{(11.075)(29.370)(532.5)}$	$\frac{(0.0317)(1.5)}{(29.26)(542.5)}\left[\frac{(532.5)(16.7967)}{(11.000)}\right]^2$
2.0	0.147	$\frac{(10.000)(29.26)(545.0)}{(10.084)(29.407)(532.5)}$	$\frac{(0.0317)(2.0)}{(29.26)(545.0)}\left[\frac{(532.5)(13.2983)}{(10.000)}\right]^2$
3.0	0.221	$\frac{(10.000)(29.26)(547.25)}{(10.100)(29.481)(532.5)}$	$\frac{(0.0317)(3.0)}{(29.26)(547.25)}\left[\frac{(532.5)(10.9150)}{(10.000)}\right]^2$
4.0	0.294	$\frac{(10.000)(29.26)(548.5)}{(10.090)(29.554)(532.5)}$	$\frac{(0.0317)(4.0)}{(29.26)(548.5)}\left[\frac{(532.5)(9.4983)}{(10.000)}\right]^2$

Y = Ratio of accuracy of wet test meter to dry test meter.
Tolerance = ± 0.02Y

ΔH@ = Orifice of pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2O.
Tolerance = 0.15.

* At least five inches water pressure.

** Within three inches mercury of absolute vacuum.

*** Not to exceed 0.005 cfm.

Figure E-6 (continued)

Date 4/16/81

Barometric pressure, P_b = 29.91 "Hg

Meter Box No. FB-3

Dry Gas Meter No. N/A

Plant Al Tech

P/N 3530-2

Project Manager J. Prohaska

Pretest Y 1.008

Test No.	Orifice manometer setting, ΔH,* in H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average[a] t_d, °F	Time θ, min.	Vacuum setting in Hg**	Yi	Yi $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1	0.25	10	595.400	73.5	80	74	79.5	37.2	12.5	1.016	(10.000)(29.91)(539.5)
			605.346	73.5	88	76					(9.946)(29.928)(533.5)
2	0.25	11	605.346	73.5	88	76	83.5	41.1	12.5	1.023	(11.000)(29.91)(543.5)
			616.293	73.5	90	80					(10.947)(29.928)(533.5)
3	0.25	11	616.293	73.5	90	80	85.5	41.1	12.5	1.021	(11.000)(29.91)(545.5)
			627.307	73.5	92	80					(11.014)(29.928)(533.5)

Post-test y = 1.020

Calibrated by Brice Armstrong
Signature

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

where:

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in H_2O.

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

Y = Average ratio of accuracy of wet test meter to dry test meter for all three runs.
Tolerance = Pretest Y ±0.05 Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, minutes.

* To be the average ΔH used during the test series
** To be the maximum vacuum used during the test series.

Figure E-6 (continued)

DRY GAS METER AND ORIFICE CALIBRATION DATA SHEET

LEAK CHECK:

POSITIVE*: JBA

NEGATIVE**: vacuum used 26.0 "Hg leakage rate 0.000 cfm***

DATE 3/4/81 METER BOX NO. F13-5

BAROMETRIC PRESSURE, P_b = 29.18 in. Hg. CALIBRATOR B. Armstrong

VACUUM USED DURING CALIBRATION ~10 " Hg

Orifice manometer setting ΔH in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Wet test Meter t_w, °F	Dry gas meter Inlet t_{di}, °F	Dry gas meter Outlet t_{do}, °F	Dry gas meter Average t_d, °F	Time θ, min.	Y	ΔH@
0.5	5	136.350	72.3	78	77	78.5	13 29.6/60	1.048	2.08
		141.169	72.3	81	78				
1.0	5	141.450	72.3	81	78	80.25	9 28.1/60	1.050	2.04
		146.270	72.3	84	78				
1.5	10	146.500	72.3	84	78	82.5	15 15.3/60	1.057	1.98
		156.110	72.3	88	80				
2.0	10	156.600	72.3	88	80	85.0	13 17.9/60	1.060	2.00
		166.215	72.3	91	81				
3.0	10	167.850	72.3	91	81	86.5	10 52.5/60	1.060	2.01
		177.461	72.3	92	82				
4.0	10	177.703	72.3	92	82	88.0	9 32.3/60	1.062	2.04
		187.204	72.3	94	84				
						Average		1.056	2.03

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	ΔH@: $\frac{0.0317\,\Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$
0.5	0.0368	(5.000)(29.19)(538.5) / (4.819)(29.2168)(532.3)	(0.0317)(0.5) / (29.18)(538.5) [(532.3)(13.49333) / (5.000)]²
1.0	0.0737	(5.000)(29.18)(540.25) / (4.820)(29.2537)(532.3)	(0.0317)(1.0) / (29.18)(540.25) [(532.3)(9.46833) / (5.000)]²
1.5	0.110	(10.000)(29.18)(542.5) / (9.610)(29.290)(532.3)	(0.0317)(1.5) / (29.18)(542.5) [(532.3)(15.25500) / (10.000)]²
2.0	0.147	(10.000)(29.18)(545.0) / (9.615)(29.327)(532.3)	(0.0317)(2.0) / (29.18)(545.0) [(532.3)(13.29833) / (10.000)]²
3.0	0.221	(10.000)(29.18)(546.5) / (9.611)(29.401)(532.3)	(0.0317)(3.0) / (29.18)(546.5) [(532.3)(10.91467) / (10.000)]²
4.0	0.294	(10.000)(29.18)(548.0) / (9.601)(29.474)(532.3)	(0.0317)(4.0) / (29.18)(548.0) [(532.3)(9.53833) / (10.000)]²

Y = Ratio of accuracy of wet test meter to dry test meter.
Tolerance = ± 0.02Y

ΔH@ = Orifice of pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2O.
Tolerance = 0.15.

* At least five inches water pressure.

** Within three inches mercury of absolute vacuum.

*** Not to exceed 0.005 cfm.

Figure E-6 (continued)

Date 7/14/81

Barometric pressure, P_b = 29.68 "Hg

Meter Box No. FB-5

Dry Gas Meter No. N/A

Plant Al Tech

P/N 3530-2

Project Manager J. Prokuska

Pretest Y 1.056

Test No.	Orifice manometer setting, ΔH,* in H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average[a] t_d, °F	Time θ, min.	Vacuum setting in Hg**	Yi	Yi $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1	0.4	10	867.235	74.5	80	78	81.0	28.8	2.0	1.074	(10.000)(29.68)(541.0)
			876.653	74.5	86	80					(9.418)(29.709)(534.5)
2	0.4	15	882.800	74.5	80	78	82.0	43.4	2.0	1.080	(15.000)(29.68)(542.0)
			896.870	74.5	88	82					(14.070)(29.709)(534.5)
3	0.4	11	896.870	74.5	88	82	86.5	31.2	2.0	1.071	(11.000)(29.68)(546.5)
			907.366	74.5	92	84					(10.496)(29.709)(534.5)

Post-test y = 1.075

Calibrated by Bruce Armstrong
Signature

* If there is only one thermometer on the dry gas meter record the temperature under t_d.

where:

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in H_2O.

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

Y = Average ratio of accuracy of wet test meter to dry test meter for all three runs.
Tolerance = Pretest Y ±0.05 Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, minutes.

* To be the average ΔH used during the test series
** To be the maximum vacuum used during the test series.

Figure E-6 (continued)

DRY GAS METER AND ORIFICE CALIBRATION DATA SHEET

LEAK CHECK:

POSITIVE*: ✓

NEGATIVE**: vacuum used 27.0" Hg leakage rate 0.000 cfm***

DATE 8/27/80 METER BOX NO. FB-6

BAROMETRIC PRESSURE, P_b = 29.64 in. Hg. CALIBRATOR Bruce Armstrong

VACUUM USED DURING CALIBRATION ~11" Hg

Orifice manometer setting ΔH in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Wet test Meter t_w, °F	Dry gas meter Inlet t_{di}, °F	Dry gas meter Outlet t_{do}, °F	Dry gas meter Average t_d, °F	Time θ, min.	Y	ΔH@
0.5	5	269.300	73.4	78	74	76.5	$11\frac{21.9}{60}$	0.973	1.47
		274.460	73.4	79	75				
1.0	5	280.600	73.4	79	75	77.75	$8\frac{15.2}{60}$	0.973	1.54
		285.768	73.4	82	75				
1.5	10	286.900	73.4	82	75	79.25	$13\frac{25.7}{60}$	0.973	1.53
		297.252	73.4	84	76				
2.0	10	298.900	73.4	84	76	80.75	$11\frac{40.3}{60}$	0.973	1.53
		309.265	73.4	86	77				
3.0	10	310.000	73.4	86	77	82.25	$9\frac{33.2}{60}$	0.974	1.54
		320.365	73.4	88	78				
4.0	10	321.100	73.4	88	78	83.0	$8\frac{17.3}{60}$	0.974	1.54
		331.446	73.4	88	78				

Average 0.973 1.53

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	ΔH@: $\frac{0.0317\,\Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$
0.5	0.0368	$\frac{(5.000)(29.64)(536.5)}{(5.160)(29.6768)(533.4)}$	$\frac{(0.0317)(0.5)}{(29.64)(536.5)}\left[\frac{(533.4)(11.365000)}{(5.000)}\right]^2$
1.0	0.0737	$\frac{(5.000)(29.64)(537.75)}{(5.168)(29.7137)(533.4)}$	$\frac{(0.0317)(1.0)}{(29.64)(537.75)}\left[\frac{(533.4)(8.2533333)}{(5.000)}\right]^2$
1.5	0.110	$\frac{(10.000)(29.64)(539.25)}{(10.352)(29.750)(533.4)}$	$\frac{(0.0317)(1.5)}{(29.64)(539.25)}\left[\frac{(533.4)(13.429333)}{(10.000)}\right]^2$
2.0	0.147	$\frac{(10.000)(29.64)(540.75)}{(10.365)(29.787)(533.4)}$	$\frac{(0.0317)(2.0)}{(29.64)(540.75)}\left[\frac{(533.4)(11.671666)}{(10.000)}\right]^2$
3.0	0.221	$\frac{(10.000)(29.64)(542.25)}{(10.365)(29.861)(533.4)}$	$\frac{(0.0317)(3.0)}{(29.64)(542.25)}\left[\frac{(533.4)(9.5533333)}{(10.000)}\right]^2$
4.0	0.294	$\frac{(10.000)(29.64)(543.0)}{(10.346)(29.934)(533.4)}$	$\frac{(0.0317)(4.0)}{(29.64)(543.0)}\left[\frac{(533.4)(8.2883333)}{(10.000)}\right]^2$

Y = Ratio of accuracy of wet test meter to dry test meter.
Tolerance = ± 0.02.

ΔH@ = Orifice of pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2O.
Tolerance = 0.15.

* At least five inches water pressure.

** Within three inches mercury of absolute vacuum.

*** Not to exceed 0.005 cfm.

Figure E-6 (continued)

Date 4/16/81

Barometric pressure, P_b = 29.93 "Hg

Meter Box No. EB-6

Dry Gas Meter No. N/A

Plant Al Tech

P/N 3530-2

Project Manager J Prohaska

Pretest Y 0.973

Test No.	Orifice manometer setting, ΔH,* in H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average[a] t_d, °F	Time θ, min.	Vacuum setting in Hg**	Yi	Yi: $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1	1.1	10	143.800	74.0	80	74	79.0	15.4	3.5	0.972	(10.000)(29.93)(539.0)
			154.157	74.0	86	76					(10.357)(30.011)(534.0)
2	1.1	10	154.157	74.0	86	76	82.5	15.4	3.5	0.975	(10.000)(29.93)(542.5)
			164.546	74.0	90	78					(10.389)(30.01)(534.0)
3	1.1	10	164.546	74.0	90	78	85.0	15.4	3.5	0.977	(10.000)(29.93)(545.0)
			174.964	74.0	92	80					(10.418)(30.011)(534.0)

Post-test y = 0.975

Calibrated by Bruce Anzfogy
Signature

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

where:

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in H_2O.

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

Y = Average ratio of accuracy of wet test meter to dry test meter for all three runs.
Tolerance = Pretest Y ±0.05 Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, minutes.

* To be the average ΔH used during the test series
** To be the maximum vacuum used during the test series.

Figure E-6 (continued)

DRY GAS METER AND ORIFICE CALIBRATION DATA SHEET

LEAK CHECK:

POSITIVE*: ✓

NEGATIVE**: vacuum used 28.0" Hg leakage rate 0.000 cfm***

DATE 1/27/81 METER BOX NO. FB-7

BAROMETRIC PRESSURE, P_b = 29.30 in. Hg. CALIBRATOR B. Armstrong

VACUUM USED DURING CALIBRATION ~10" Hg

Orifice manometer setting ΔH in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Wet test Meter t_w, °F	Dry gas meter Inlet t_{di}, °F	Dry gas meter Outlet t_{do}, °F	Dry gas meter Average t_d, °F	Time θ, min.	Y	ΔH@
0.5	5	41.300	72.0	92	82	87.0	$12\frac{07.8}{60}$	0.995	1.65
		46.460	72.0	92	82				
1.0	5	49.000	72.0	92	82	88.0	$8\frac{43.4}{60}$	1.009	1.70
		54.090	72.0	94	84				
1.5	10	54.400	72.0	94	84	90.0	$14\frac{20.0}{60}$	1.008	1.72
		64.620	72.0	96	86				
2.0	10	64.900	72.0	96	86	92.5	$12\frac{25.8}{60}$	1.008	1.71
		75.156	72.0	100	88				
3.0	10	75.400	72.0	98	88	93.5	$10\frac{13.1}{60}$	1.004	1.73
		85.686	72.0	100	88				
4.0	10	86.500	72.0	100	88	94.5	$8\frac{55.9}{60}$	1.000	1.76
		96.815	72.0	102	88				
							Average	1.004	1.71

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	ΔH@: $\frac{0.0317\,\Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$
0.5	0.0368	$\frac{(5.000)(29.30)(547.0)}{(5.160)(29.3368)(532.0)}$	$\frac{(0.0317)(0.5)}{(29.30)(547.0)} \left[\frac{(532.0)(12.1300)}{5.000}\right]^2$
1.0	0.0737	$\frac{(5.000)(29.30)(548.0)}{(5.090)(29.3737)(532.0)}$	$\frac{(0.0317)(1.0)}{(29.30)(548.0)} \left[\frac{(532.0)(8.7233)}{5.000}\right]^2$
1.5	0.110	$\frac{(10.000)(29.30)(550.0)}{(10.220)(29.410)(532.0)}$	$\frac{(0.0317)(1.5)}{(29.30)(550.0)} \left[\frac{(532.0)(14.3333)}{10.000}\right]^2$
2.0	0.147	$\frac{(10.000)(29.30)(552.5)}{(10.256)(29.447)(532.0)}$	$\frac{(0.0317)(2.0)}{(29.30)(552.5)} \left[\frac{(532.0)(12.4300)}{10.000}\right]^2$
3.0	0.221	$\frac{(10.000)(29.30)(553.5)}{(10.286)(29.521)(532.0)}$	$\frac{(0.0317)(3.0)}{(29.30)(553.5)} \left[\frac{(532.0)(10.2183)}{10.000}\right]^2$
4.0	0.294	$\frac{(10.000)(29.30)(554.5)}{(10.315)(29.594)(532.0)}$	$\frac{(0.0317)(4.0)}{(29.30)(554.5)} \left[\frac{(532.0)(8.9317)}{10.000}\right]^2$

Y = Ratio of accuracy of wet test meter to dry test meter.
Tolerance = ± 0.02Y

ΔH@ = Orifice of pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2O.
Tolerance = 0.15.

* At least five inches water pressure.

** Within three inches mercury of absolute vacuum.

*** Not to exceed 0.005 cfm.

Figure E-6 (continued)

Date 4/15/81

Barometric pressure, P_b = 30.21 "Hg

Meter Box No. FB-7

Dry Gas Meter No. N/A

Plant Al Tech

P/N 3530-2

Project Manager J. Prohaska

Pretest Y 1.004

Test No.	Orifice manometer setting, ΔH,* in H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter: Inlet t_{di}, °F	Temperature: Dry gas meter: Outlet t_{do}, °F	Temperature: Dry gas meter: Average[a] t_d, °F	Time O, min.	Vacuum setting in Hg**	Yi	Yi: $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1	1.0	10	450.500	74.0	90	80	86.0	16.7	5.0	1.014	(10.000)(30.21)(546.0)
			460.563	74.0	92	82					(10.063)(30.284)(534.0)
2	1.0	12 ~~10~~	460.563	74.0	92	82	87.5	20.1	5.0	1.012	(12.000)(30.21)(547.5)
			472.685	74.0	93	83					(12.122)(30.284)(534.0)
3	1.0	10	472.685	74.0	93	83	88.5	16.7	5.0	1.012	(10.000)(30.21)(548.5)
			482.810	74.0	94	84					(10.125)(30.284)(534.0)

Post-test y = 1.013

Calibrated by Bruce Armstrong
Signature

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

where:

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in H_2O.

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

Y = Average ratio of accuracy of wet test meter to dry test meter for all three runs.
Tolerance = Pretest Y ±0.05 Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, minutes.

* To be the average ΔH used during the test series.
** To be the maximum vacuum used during the test series.

Figure E-6 (continued)

DRY GAS METER AND ORIFICE CALIBRATION DATA SHEET

LEAK CHECK:

POSITIVE*: ✓ BA

NEGATIVE**: vacuum used 26.5" Hg leakage rate 0.000 cfm***

DATE 1/20/81 METER BOX NO. FB-8

BAROMETRIC PRESSURE, P_b = 29.47 in. Hg. CALIBRATOR Bruce Armstrong

VACUUM USED DURING CALIBRATION ~10 in Hg

Orifice manometer setting ΔH in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Wet test Meter t_w, °F	Dry gas meter Inlet t_{di}, °F	Dry gas meter Outlet t_{do}, °F	Dry gas meter Average t_d, °F	Time θ, min.	Y	ΔH@
0.5	5	180.000	71.5	77	72	74.75	12 48.0/60	0.972	1.86
		185.170	71.5	77	73				
1.0	5	185.400	71.5	78	74	76.25	9 9.7/60	0.990	1.90
		190.485	71.5	79	74				
1.5	10	191.400	71.5	80	75	77.75	14 58.9/60	0.981	1.90
		201.617	71.5	81	75				
2.0	10	202.000	71.5	82	76	79.25	12 58.8/60	0.985	1.90
		212.251	71.5	82	77				
3.0	10	212.800	71.5	82	77	79.75	10 12.4/60	0.983	1.94
		223.058	71.5	83	77				
4.0	10	229.100	71.5	81	77	79.5	9 21.7/60	0.980	1.97
		239.360	71.5	82	78				
							Average	0.982	1.91

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	ΔH@: $\frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368	(5.000)(29.47)(534.75) / (5.170)(29.5068)(531.5)	(0.0317)(0.5) / (29.47)(534.75) [(531.5)(12.8000) / 5.000]^2
1.0	0.0737	(5.000)(29.47)(536.25) / (5.085)(29.5437)(531.5)	(0.0317)(1.0) / (29.47)(536.25) [(531.5)(9.1617) / 5.000]^2
1.5	0.110	(10.000)(29.47)(537.75) / (10.217)(29.580)(531.5)	(0.0317)(1.5) / (29.47)(537.75) [(531.5)(14.9817) / 10.000]^2
2.0	0.147	(10.000)(29.47)(539.25) / (10.251)(29.617)(531.5)	(0.0317)(2.0) / (29.47)(539.25) [(531.5)(12.9800) / 10.000]^2
3.0	0.221	(10.000)(29.47)(539.75) / (10.258)(29.691)(531.5)	(0.0317)(3.0) / (29.47)(539.75) [(531.5)(10.7067) / 10.000]^2
4.0	0.294	(10.000)(29.47)(539.5) / (10.260)(29.764)(531.5)	(0.0317)(4.0) / (29.47)(539.5) [(531.5)(9.3617) / 10.000]^2

Y = Ratio of accuracy of wet test meter to dry test meter.
Tolerance = ± 0.02Y

ΔH@ = Orifice of pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2O.
Tolerance = 0.15.

* At least five inches water pressure.

** Within three inches mercury of absolute vacuum.

*** Not to exceed 0.005 cfm.

Figure E-6 (continued)

Date 4/16/81

Barometric pressure, P_b = 29.96 "Hg

Meter Box No. FB-8

Dry Gas Meter No. N/A

Plant Al tech

P/N 3530-2

Project Manager John Prohaska

Pretest Y 0.982

Test No.	Orifice manometer setting, ΔH,* in H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average[a] t_d, °F	Time θ, min.	Vacuum setting in Hg**	Yi	Yi: $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1	1.3	10	307.900	74.5	72	72	72.5	15.9	21.0	1.001	(10.000)(29.96)(532.5)
			317.825	74.5	74	72					(9.925)(30.056)(534.5)
2	1.3	10	317.825	74.5	74	72	73.0	15.9	21.0	0.999	(10.000)(29.96)(533.0)
			327.775	74.5	74	72					(9.950)(30.056)(534.5)
3	1.3	10	327.775	74.5	74	72	73.5	16.1	21.0	0.998	(10.000)(29.96)(533.5)
			337.749	74.5	75	73					(9.974)(30.056)(534.5)

Post-test y = 0.999

Calibrated by Bruce Armstrong
Signature

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

where:

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

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

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

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

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

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

ΔH = Pressure differential across orifice, in H_2O.

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

Y = Average ratio of accuracy of wet test meter to dry test meter for all three runs.
Tolerance = Pretest Y ±0.05 Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, minutes.

* To be the average ΔH used during the test series
** To be the maximum vacuum used during the test series.

Figure E-6 (continued)

THERMOCOUPLE

Thermocouples were calibrated by comparison against an ASTM-2F thermometer at approximately 32°F, ambient temperature, 100°F, and 500°F. The thermocouples read within 1.5 percent of the reference thermometer throughout the entire range when expressed in degrees Rankine. If the thermocouple did not read within 1.5 percent, a correction formula based on a least squares analysis of the data was utilized. The correction formula corrected the data to within 1.5 percent. The thermocouple was checked at ambient temperature at the test site to verify the calibration. Calibration data is presented in Figure E-7.

DIGITAL INDICATOR FOR THERMOCOUPLE READOUT

A digital indicator was calibrated by feeding a series of millivolt signals to the input, and comparing the indicator reading with the reading the signal should have generated. Error did not exceed 0.5 percent when the temperatures were expressed in degrees Rankine. Calibration data are shown in Figure E-8.

DRY GAS THERMOMETERS

The dry gas thermometers were calibrated by comparison against an ASTM-2F thermometer at approximately 32°F, at ambient temperature, and at approximately 110°F. The thermometer agreed within 5°F of the reference thermometer. The thermometers were checked prior to each test series at ambient temperature to verify calibration. Calibration data are included in Figure E-9.

THERMOCOUPLE CALIBRATION DATA SHEET

Date: 5/14/80 Thermocouple No.: 128

Ambient temperature: 75 °F Barometric pressure: 29.50 " Hg

Calibrator: B. Armstrong Reference: ASTM-2F

Reference point No.	Source,* (specify)	Reference thermometer temperature, °F***	Thermocouple temperature, °F	Difference, %**
1	2	75	75	0.00
2	1	37	38	-0.20
3	3	116	118	-0.35
4	3	498	466	3.34

Correction factor****: Slope: 1.0821 Intercept: -7.06

Reference point No.	Reference thermometer temperature, °F	Corrected thermocouple temperature, °F	Difference, %**
1	75	74	0.19
2	37	34	0.60
3	116	121	-0.87
4	498	497	0.10

Critical test points are 32°, 100°, and 500°.

*Source: 1) Ice bath
2) Ambient
3) Furnace

**Percent difference

$$\frac{\text{Reference temp. °F - thermocouple temp. °F}}{\text{(Reference temp. °F + 460°F)}} \times 100\%$$

Each percent difference must be less than or equal to 1.5%.

***Reference thermometer must be ASTM.

****Correction factor must be determined if any percent difference is >1.5%.

Figure E-7. Thermocouple calibration data sheet.

THERMOCOUPLE CALIBRATION DATA SHEET

Date: 5/14/80 Thermocouple No.: 129

Ambient temperature: 75 °F Barometric pressure: 29.50 " Hg

Calibrator: B Armstrong Reference: ASTM-2F

Reference point No.	Source,* (specify)	Reference thermometer temperature, °F***	Thermocouple temperature, °F	Difference, %**
1	2	75	75	0.00
2	1	37	37	0.00
3	3	116	112	0.69
4	3	498	518	-2.09

Correction factor****: Slope: 0.9538 Intercept: 4.57

Reference point No.	Reference thermometer temperature, °F	Corrected thermocouple temperature, °F	Difference, %**
1	75	76	-0.19
2	37	40	-0.60
3	116	111	0.37
4	498	499	-0.10

Critical test points are 32°, 100°, and 500°.

*Source: 1) Ice bath
2) Ambient
3) Furnace

**Percent difference

$$\frac{\text{Reference temp. °F} - \text{thermocouple temp. °F}}{(\text{Reference temp. °F} + 460\text{°F})} \times 100\%$$

Each percent difference must be less than or equal to 1.5%.

***Reference thermometer must be ASTM.

****Correction factor must be determined if any percent difference is >1.5%.

Figure E-7 (continued)

THERMOCOUPLE CALIBRATION DATA SHEET

Date: 5/15/80 Thermocouple No.: 138

Ambient temperature: 77 °F Barometric pressure: 29.59 " Hg

Calibrator: B. Armstrong Reference: ASTM 2F

Reference point No.	Source,* (specify)	Reference thermometer temperature, °F***	Thermocouple temperature, °F	Difference, %**
1	2	77	77	0.00
2	1	34	35	-0.20
3	3	127	129	-0.17
4	3	468	473	-0.54

Correction factor****: Slope: _____ Intercept: _____

Reference point No.	Reference thermometer temperature, °F	Corrected thermocouple temperature, °F	Difference, %**

Critical test points are 32°, 100°, and 500°.

*Source: 1) Ice bath
2) Ambient
3) Furnace

**Percent difference

$$\frac{\text{Reference temp. °F - thermocouple temp. °F}}{\text{(Reference temp. °F + 460°F)}} \times 100\%$$

Each percent difference must be less than or equal to 1.5%.

***Reference thermometer must be ASTM.

****Correction factor must be determined if any percent difference is >1.5%.

Figure E-7 (continued)

THERMOCOUPLE CALIBRATION DATA SHEET

Date: 5/15/80 Thermocouple No.: 149

Ambient temperature: 77 °F Barometric pressure: 29.59 " Hg

Calibrator: B. Armstrong Reference: ASTM-2F

Reference point No.	Source,* (specify)	Reference thermometer temperature, °F***	Thermocouple temperature, °F	Difference, %**
1	2	77	77	0.00
2	1	34	35	-0.20
3	3	127	131	-0.68
4	3	468	470	-0.22

Correction factor****: Slope: _____ Intercept: _____

Reference point No.	Reference thermometer temperature, °F	Corrected thermocouple temperature, °F	Difference, %**

Critical test points are 32°, 100°, and 500°.

*Source: 1) Ice bath
2) Ambient
3) Furnace

**Percent difference

$$\frac{\text{Reference temp. °F} - \text{thermocouple temp. °F}}{(\text{Reference temp. °F} + 460\text{°F})} \times 100\%$$

Each percent difference must be less than or equal to 1.5%.

***Reference thermometer must be ASTM.

****Correction factor must be determined if any percent difference is >1.5%.

Figure E-7 (continued)

THERMOCOUPLE CALIBRATION DATA SHEET

Date: 4/13/81 Thermocouple No.: 254

Ambient temperature: 77 °F Barometric pressure: 29.59 " Hg

Calibrator: B. Armstrong Reference: ASTM-3F

Reference point No.	Source,* (specify)	Reference thermometer temperature, °F***	Thermocouple temperature, °F	Difference, %**
1	2	77	77	0.0
2	1	35	38	-0.61
3	3	144	146	-0.33
4	3	520	525	-0.51

Correction factor****: Slope: _____ Intercept: _____

Reference point No.	Reference thermometer temperature, °F	Corrected thermocouple temperature, °F	Difference, %**

Critical test points are 32°, 100°, and 500°.

*Source: 1) Ice bath
2) Ambient
3) Furnace

**Percent difference

$$\frac{\text{Reference temp. °F - thermocouple temp. °F}}{\text{(Reference temp. °F + 460°F)}} \times 100\%$$

Each percent difference must be less than or equal to 1.5%.

***Reference thermometer must be ASTM.

****Correction factor must be determined if any percent difference is >1.5%.

Figure E-7 (continued)

DIGITAL READOUT CALIBRATION DATA SHEET

Date: 6/18/80 Digital readout No. 219

Ambient Temperature: 71°F Ice bath temp.: 32°F

Calibrator: B. Armstrong Digital readout manuf.: Newport

Reference point No.	Millivolts	Reference temperature, °F	Thermocouple potentiometer temperature, °F	Difference, %**
1	0.[illegible]	32	32	0.00
2	1.52	100	101	-0.18
3	3.82	200	200	0.00
4	6.09	300	300	0.00
5	8.31	400	398	0.23
6	10.57	500	499	0.10
7	15.18	700	699	0.09
8	22.26	1000	1002	-0.14

Percent difference must be less than or equal to 0.5 .

**Percent difference

$$\frac{\text{Reference temp. °F} - \text{thermocouple temp. °F}}{(\text{Reference temp. °F} + 460\text{°F})} \times 100$$

Figure E-8. Digital readout calibration data sheet.

DIGITAL READOUT CALIBRATION DATA SHEET

Date: 6/18/80 Digital readout No. 222

Ambient Temperature: 71°F Ice bath temp.: 32°F

Calibrator: B. Armstrong Digital readout manuf.: Newport

Reference point No.	Millivolts	Reference temperature, °F	Thermocouple potentiometer temperature, °F	Difference, %**
1	0.00	32	32	0.00
2	1.52	100	98	0.36
3	3.82	200	199	0.15
4	6.09	300	299	0.13
5	8.31	400	399	0.12
6	10.57	500	498	0.21
7	15.18	700	698	0.17
8	22.26	1000	998	0.14

Percent difference must be less than or equal to 0.5.

**Percent difference

$$\frac{\text{Reference temp. °F} - \text{thermocouple temp. °F}}{(\text{Reference temp. °F} + 460\text{°F})} \times 100$$

Figure E-8 (continued)

DIGITAL READOUT CALIBRATION DATA SHEET

Date: 5/13/80 Digital readout No. 208

Ambient Temperature: 72°F Ice bath temp.: 32°F

Calibrator: B. Armstrong Digital readout manuf.: Newport

Reference point No.	Millivolts	Reference temperature, °F	Thermocouple potentiometer temperature, °F	Difference, %**
1	0.00	32	32	0.00
2	1.52	100	100	0.00
3	3.82	200	202	-0.30
4	6.09	300	302	-0.26
5	8.31	400	400	0.00
6	10.57	500	499	0.12
7	15.18	700	700	0.00
8	22.26	1000	1001	-0.07

Percent difference must be less than or equal to 0.5.

**Percent difference

$$\frac{\text{Reference temp. °F} - \text{thermocouple temp. °F}}{(\text{Reference temp. °F} + 460\text{°F})} \times 100$$

Figure E-8 (continued)

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: 6/10/80 Thermometer No.: FB-2 Inlet

Ambient temperature: 72 °F Barometric pressure: 29.38 " Hg

Calibrator: B. Armstrong Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	72.0	71	1.0
2	1	32.7	33	0.3
3	3	125.1	122	3.1

Figure E-9. Dry gas thermometer calibration data sheet.

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: 6/10/80 Thermometer No.: FB-2 Outlet

Ambient temperature: 72 °F Barometric pressure: 29.38 " Hg

Calibrator: B. Armstrong Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	72.0	71	1.0
2	1	32.7	30	0.3
3	3	130.0	126	4.0

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: 6/10/80 Thermometer No.: FB-3 Inlet

Ambient temperature: 72 °F Barometric pressure: 29.38 " Hg

Calibrator: B. Armstrong Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	72.0	72	0.0
2	1	32.7	32	0.7
3	3	116.0	113	3.0

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: 6/10/80 Thermometer No.: FB-3 Outlet

Ambient temperature: 72 °F Barometric pressure: 29.38 " Hg

Calibrator: B. Armstrong Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	72.0	71	1.0
2	1	32.7	30	2.7
3	3	114.0	112.0	2.0

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: 6/10/80 Thermometer No.: FB-5 Inlet

Ambient temperature: 72 °F Barometric pressure: 29.38 " Hg

Calibrator: B. Armstrong Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	72.0	76	4.0
2	1	32.7	35	2.3
3	3	108.0	106	2.0

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: 6/10/80 Thermometer No.: FB-5 Outlet

Ambient temperature: 72 °F Barometric pressure: 29.38 " Hg

Calibrator: B. Armstrong Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	72.0	73	1.0
2	1	32.7	34	1.3
3	3	117.5	115	2.5

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: 6/10/80 Thermometer No.: FB-6 Inlet

Ambient temperature: 72 °F Barometric pressure: 29.38 " Hg

Calibrator: B. Armstrong Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	72.0	72	0.0
2	1	32.7	32	0.7
3	3	115.0	114	1.0

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: 6/10/80 Thermometer No.: FB-6 Outlet

Ambient temperature: 72 °F Barometric pressure: 29.38 " Hg

Calibrator: B. Armstrong Reference: ASTM-25

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	72.0	73	1.0
2	1	32.7	32	0.7
3	3	119.0	116.	3.0

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: 6/11/80 Thermometer No.: FB-7 Inlet

Ambient temperature: 72 °F Barometric pressure: 29.38 " Hg

Calibrator: B Armstrong Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	72.0	76	4.0
2	1	33.5	38	4.5
3	3	119.0	117	2.0

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: 6/11/80 Thermometer No.: FB-7 Outlet

Ambient temperature: 72 °F Barometric pressure: 29.38 " Hg

Calibrator: B Armstrong Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	72.0	72	0.0
2	1	37.3	37	0.3
3	3	117.0	113.0	4.0

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: NOVEMBER 4, 1980 Thermometer No.: FB#8 INLET

Ambient temperature: 73 °F Barometric pressure: 29.41 " Hg

Calibrator: DAN FITZGERALD Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	36°F	38°F	2°F
2	1	73°F	74°F	1°F
3	3	108°F	108°F	0°F

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

DRY GAS THERMOMETER CALIBRATION DATA SHEET

Date: NOVEMBER 4, 1980 Thermometer No.: AB#8 OUTLET

Ambient temperature: 29.41 °F Barometric pressure: 29.41 " Hg

Calibrator: DAN FITZGERALD Reference: ASTM-2F

Reference point No.	Source,*	Reference thermometer temperature, °F***	Thermometer temperature, °F	Difference, **
1	2	36°F	33°F	3°F
2	1	73°F	72°F	1°F
3	3	108°F	105°F	3°F

Figure E-9 (continued)

*Source: 1) Ice bath
2) Ambient
3) Furnace set at approximately 110°F

**Difference must be less than or equal to ±5°F.

***Reference thermometer must be ASTM.

TRIP BALANCE

The trip balance was calibrated by comparison with a Class-S standard weight and agreed within 0.5 g. Calibration data are shown in Figure E-10.

BAROMETER

The field barometer was calibrated to within 0.1 in. Hg of an NBS-traceable mercury-in-glass barometer before each test series. The field barometer was checked against the mercury-in-glass barometer after each test series to determine if it read within 0.2 in. Hg. If it did not read within 0.2 in. Hg, a correction factor was determined for the last test series. Calibration data are included in Figure E-11.

ORSAT ANALYZER

The orsat analyzer was calibrated before each test series by determining the percentages of oyxgen, carbon monoxide, and carbon dioxide in a calibration gas containing known percentages of each. The analyzer read within 0.5 percent of the known value for each gas. Calibration data are shown in Figure E-12.

TRIP BALANCE ACCURACY LOG

Trip bal. number	Date	Calibrator	Ref. weight	Weight observed	Difference
194	6/9/80	B. Armstrong	200	200.10	0.10
195	6/9/80	B Armstrong	200	199.95	0.05
196	6/9/80	B. Armstrong	200	199.80	0 20
197	6/9/80	B. Armstrong	200	200.10	0.10
198	6/9/80	B. Armstrong	200	200 00	0.00

Figure E-10. Trip balance accuracy log.

BAROMETER CALIBRATION LOG

	3/9/81		3/27/81	3/30/81	4/1/81	4/1/81	
Barometer Number	[illegible]	237	227	226	237	227	
Project Number	[illegible]	5165	5166-A	5170	3530-2	3530-2	
Pre-test							
Barometer Reading	[illegible]	29.45	29.74	29.16	29.40	29.43	
Reference Barometer Reading	[illegible]	29.50	29.74	29.18	29.43	29.43	
Difference*	[illegible]	0.05	0.00	0.02	0.03	0.00	
Post-test	3/16/81	3/19/81	4/1/81				
Barometer Reading	29.38	28.85	29.43				
Reference Barometer Reading	29.38	29.18	29.43				
Difference**	0.00	0.33	0.00				

* Barometer is adjusted so that difference does not exceed 0.1"Hg.
** Barometer is <u>not</u> adjusted, difference must not exceed 0.2"Hg.

Figure E-11. Barometer calibration log.

ORSAT CALIBRATION DATA SHEET

Orsat No.: 142 Gas (circle one): O_2 CO_2 CO

Calibrator	Date	Value Det.
B Armstrong	6/18/80	4.0
B. Armstrong	7/28/80	3.9
M. Smith	9/2/80	4.0
D. Schuffel	12/1/80	4.0
B. Armstrong	1/15/81	4.0
B. Armstrong	2/19/81	4.0
B. Armstrong	3/5/81	4.0
B. Armstrong	4/1/81	4.0

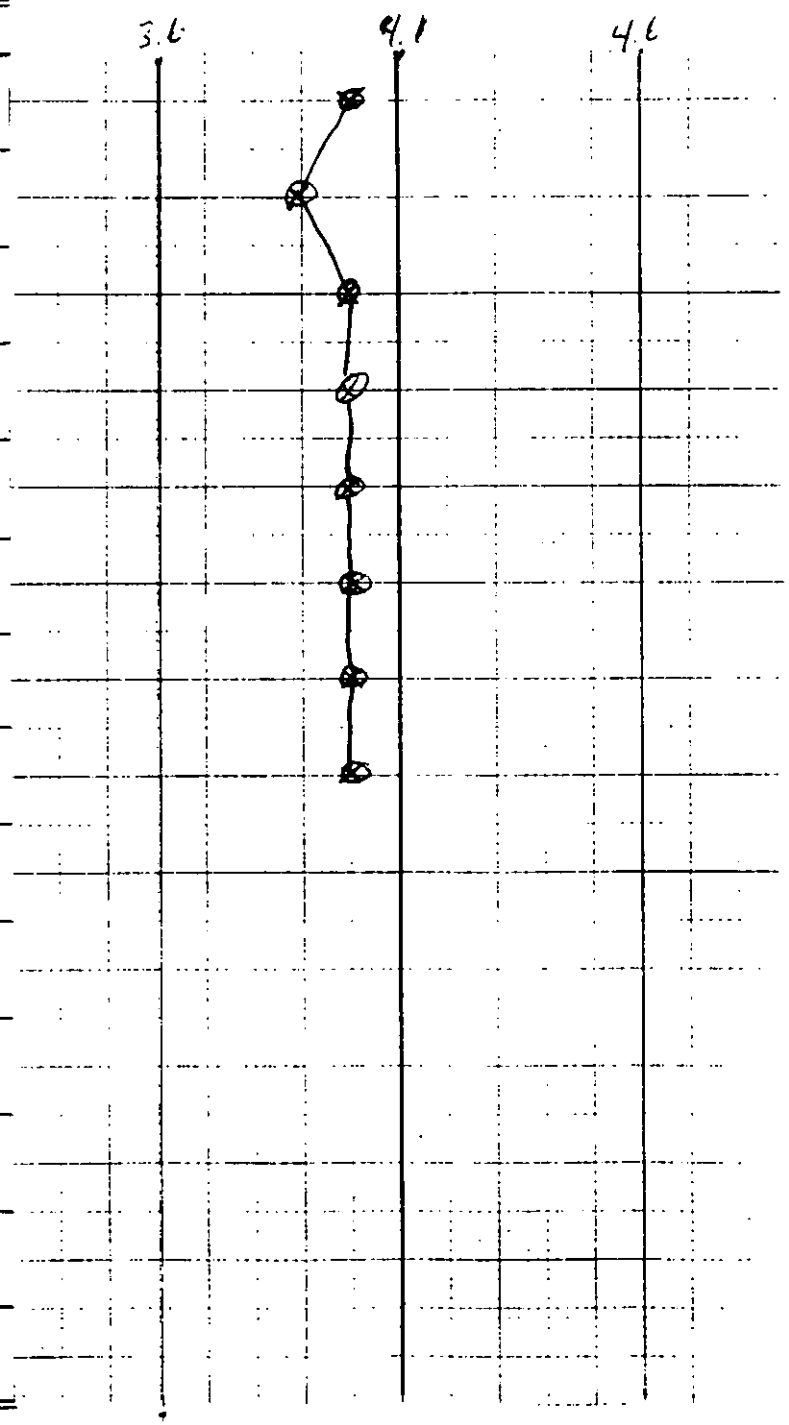

Figure E-12. Orsat calibration data sheet.

ORSAT CALIBRATION DATA SHEET

Orsat No.: 142 Gas (circle one): O_2 CO_2 CO

Calibrator	Date	Value Det.
B Armstrong	6/18/80	15.0
B. Armstrong	7/28/80	14.9
M. Spirtas	9/2/80	14.8
D. Scheffel	12/1/80	15.0
B. Armstrong	1/15/81	15.0
B Armstrong	2/19/81	15.0
B Armstrong	3/5/81	15.0
B. Armstrong	4/1/81	15.2

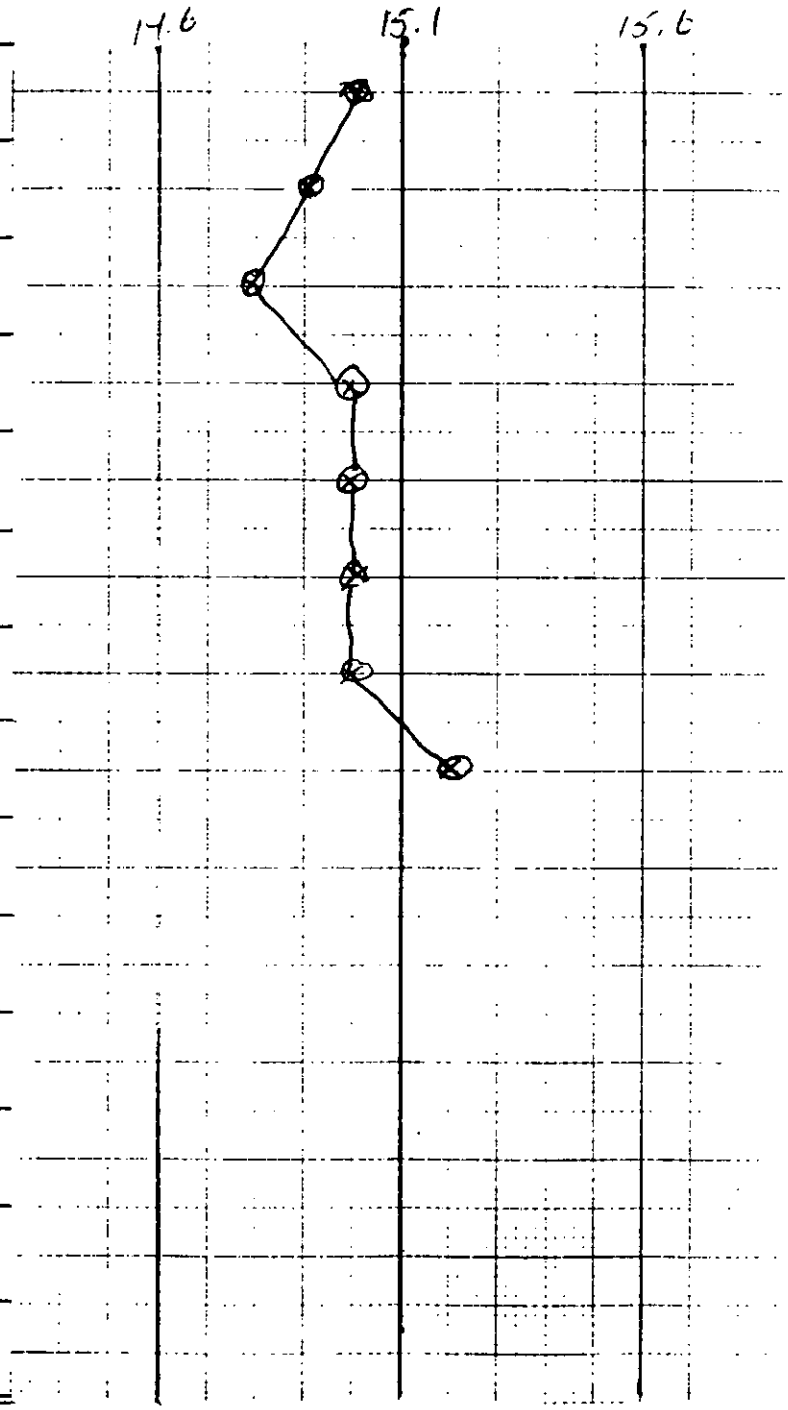

Figure E-12 (continued)

ORSAT CALIBRATION DATA SHEET

Orsat No.: 142 Gas (circle one): O_2 CO_2 CO

Calibrator	Date	Value Det.
B. Armstrong	6/18/80	2.0
B. Armstrong	7/28/80	2.1
M. Spaite	9/2/80	2.2
D. Schiffel	12/1/80	2.0
B. Armstrong	1/15/81	2.0
B. Armstrong	2/19/81	2.0
B. Armstrong	3/5/81	2.0
B. Armstrong	4/1/81	1.8

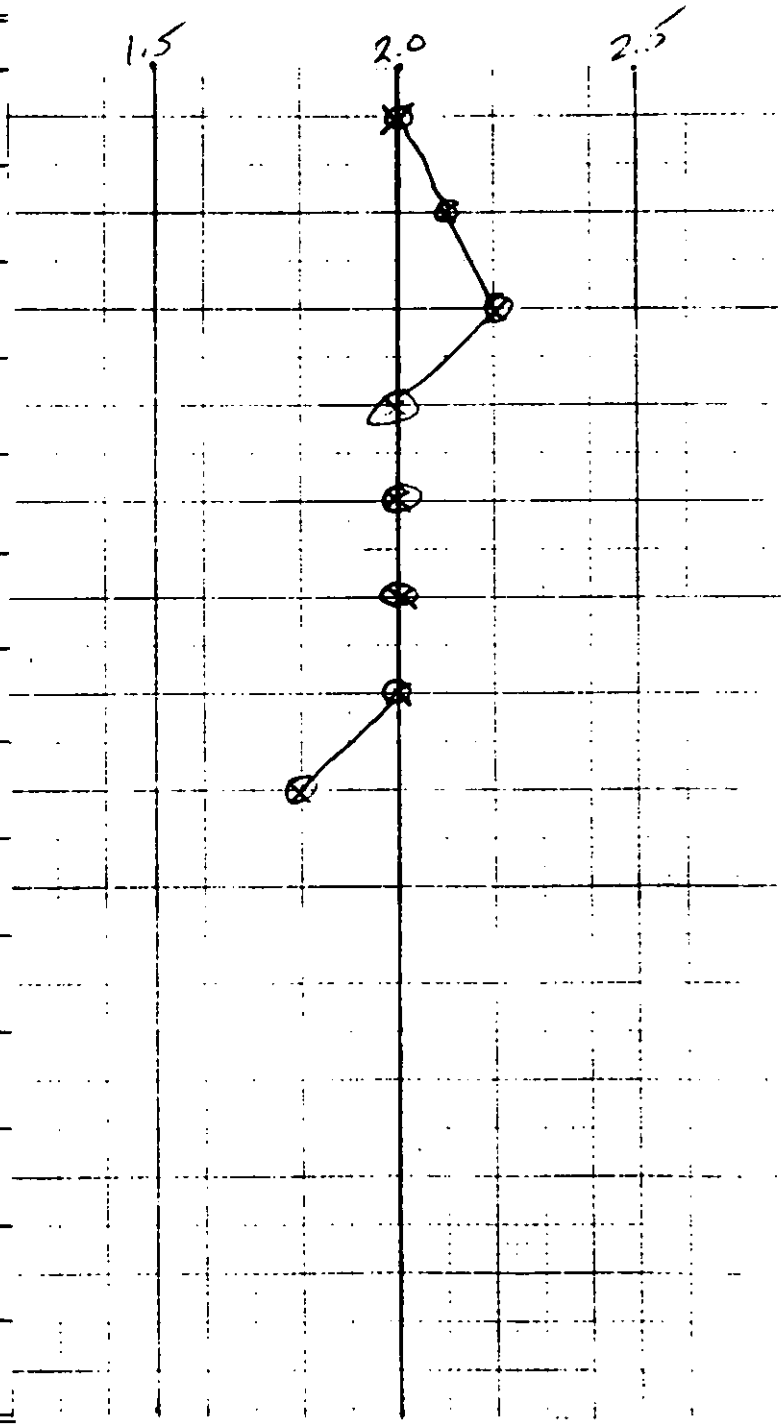

Figure E-12 (continued)

APPENDIX F

QUALITY ASSURANCE SUMMARY

QUALITY ASSURANCE SUMMARY

The following summary addresses factors that ultimately are used to ensure data quality and accuracy for any given emission test project.

PROJECT ORGANIZATION AND RESPONSIBILITES

The project organization and responsibilities are generally defined in the test plan. Specific responsibilities for this field test are shown in the list of project participants in Appendix G.

QA OBJECTIVE

The QA objective of the data collection was for potential NSPS standards setting. Therefore, all procedures used to collect and analyze emissions samples followed EPA reference methods where applicable. No attempt was made to determine precisions, because the precision of these reference methods had previously been determined. Modifications to Method 5 were necessary in order to perform emission tests at the nonideal outlet site. The precision of the modified method was not determined because such determination was not included in the scope of the project. The completeness of the data was the same as required for a performance test as defined in 40 CFR 60, Section

60.8. The emission results were to be representative of normal operations. The data and results were presented in several units to allow for comparability with data from all other organizations wishing to access the data summary.

DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction and reporting have been shown to be great potential sources of system error. Most of PEDCo's test method calculations are performed by a validated computer program to minimize error. The field data sheets are also set up on a standard computer card to allow accurate input of data into the computer by individuals unfamiliar with testing procedures. The data printout is then validated by comparison with the field and analytical data sheets. In addition, hand calculation checks are generally made to validate the computer output. Other data validations are made whenever possible. The particulate emission test results were validated by good agreement with the particle size sample results. The reporting format provides efficient and effective review of all data and results.

PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

When feasible, PEDCo performs both performance and system audits. A performance audit for accuracy was performed in the field on all dry gas meter systems using critical orifices that were supplied and calibrated by the EPA. The EMB task manager was onsite and performed a general system audit. Items checked

were similar to those on the checklist in "Quality Assurance Handbook"; however, no written record was made.

SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

No attempt was made to assess data precision, which had been reported elsewhere or else was not in the scope of the report. Precision results for EPA reference methods are summarized in "The EPA Program for the Standardization of Stationary Source Emission Test Methodology, A Review," EPA-600/4-76-044. PEDCo has been a collaborator in several of the EPA programs to determine method precision. In all cases of final data summary reporting, PEDCo was within two standard deviations of the method precision. Based on the quality and experience of the test team used in this test series, all data summaries are likely to be within one standard deviation of the documented precision, as determined for a single run for each specific reference method. The precision of the modified method used at the non-ducted outlet site is probably lower; however, results seemed consistent. The accuracy audit procedure used for the dry gas meter is the standardized written procedure used by the EPA Quality Assurance Division program. The procedure for determining completeness of data is the same as that specified in 40 CFR 60, Section 60.8.

INTERNAL QUALITY CONTROL CHECKS

Several internal quality control checks are usually made for each test. The majority of these checks usually deal with the

field sample analysis. Filter blanks were returned to the laboratory for gravimetric analysis. This control checked the quality of both the initial and the final weighing. Results of the control sample checks are included in Section 5.

CORRECTIVE ACTION

PEDCo has two methods for corrective action. The first is the use of control limits. Examples of control limits are audit sample results, control sample results, and calibration results. When any of these limits show that data are of questionable integrity, then the procedure is repeated, additional data are collected, or the data are rejected. The second method is the use of red tags. Whenever any piece of equipment is suspected of producing unacceptable data, the entire apparatus or malfunctioning component is replaced and a red tag is placed on the item. That piece of equipment is then rejected until its ability to perform its function properly is verified by the proper individuals. The use of control limits and red tags reduces the amount of unacceptable data and provides a system to track and correct unacceptable items and procedures.

PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

PEDCo has a comprehensive preventive maintenance program. Many major components of test equipment have pretest checklists. These checklists ensure that all functions are checked and that action is taken to repair or replace any part likely to malfunction. These checks are made before every field test series;

however, only the control console (meter box) checks are recorded. Although the preventive maintenance program and schedule are not in writing, PEDCo's commitment of three full-time, experienced personnel for equipment construction, preparation, calibration, and maintenance has resulted in a program based on experience and skill that cannot be matched by a program based on written guidelines.

QUALITY ASSURANCE REPORTS TO MANAGEMENT

The standard quality assurance procedures used in this test program generate sufficient documentation to indicate the quality of data. All evidence of the execution of the quality assurance guidelines is reviewed by management. In addition, all PEDCo's EMB task managers and project managers meet weekly. During these group meetings all aspects of each task, including quality assurance, are discussed. No written reports result from these meetings because all interested parties are verbally apprised of the situation during each meeting.

Two other reports not related to EMB task are made to management. PEDCo's emission test and laboratory groups participate in all EPA QAD's national audits; and PEDCO's quality assurance coordinator, Mr. T.J. Wagner, makes several independent checks for management.

APPENDIX G

PROJECT PARTICIPANTS AND ACTIVITY LOG

TABLE G-1. PROJECT PARTICIPANTS

Name	Affiliation	Activities
J. Prohaska	PEDCo	Coordinate test activities, liaison with MRI, site preparation, collect dust samples, sample recovery
W. Mason	PEDCo	Team leader at Sites No. 1 and 2, particle size (PSD) runs at Site No. 1, recovery of PSD samples, assist in particulate (PM) runs at Sites No. 1 and 2, site preparation
D. Fitzgerald	PEDCo	PM runs at Sites No. 1 and 2, sample recovery
P. Reinermann	PEDCo	Assist in tests at Sites No. 1 and 2, sample recovery, site preparation
R. Antesberger	PEDCo	PM runs at Site No. 3, assist in PSD runs, site preparation, sample recovery
P. Schworer	PEDCo	Team leader at Site No. 3, PSD runs, assist in PM runs, recovery of PSD samples
T. Clark	PEDCo	Visible emissions from the melt shop, sample recovery
S. Howison	PEDCo	Visible and fugitive emissions from the baghouse, sample recovery
Dennis Holzschuh	EPA	EMB task manager, monitor test performance
Art Stienstra, Sr.	Al Tech	Plant contact, general assistance
Baghouse Operator (2)	Al Tech	Assisted in collection of dust samples; general assistance
Lalit Banker	MRI	Monitored process operation
Bill Terry	MRI	Monitored process operation

TABLE G-2. FIELD SAMPLING LOG

Day	Date, April 1981	Activity
Thursday	2	Transported equipment to site (P.R., R.A.)
Friday	3	Transported equipment to site (cont.); traveled to site (J.P., W.M.)
Saturday	4	Set-up equipment (4 men)
Sunday	5	Completed equipment set-up, took Method 1 measurements, prepared sampling train (4 men); traveled to site (D.F., P.S.)
Monday	6	Took Method 2 measurements at all sites; completed preliminary and blank test runs (6 men); traveled to site (S.H., T.C.)
Tuesday	7	Conducted one run at all sites (entire crew)
Wednesday	8	Conducted one run at all sites
Thursday	9	Conducted one run at all sites; packed equipment and left site
Friday	10	Returned to base (6 men); returned with equipment and samples (R.A., P.R.)
Saturday	11	Returned with samples (cont.)

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