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CHARACTERIZATION OF INHALABLE PARTICULATE MATTER EMISSIONS FROM AN IRON FOUNDRY LYNCHBURG FOUNDRY, ARCHER CREEK PLANT

Final Report

June 1984

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DISCLAIMER

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We would like to thank Lynchburg Foundry for allowing us to conduct these IP tests at their facility. Mr. Stephen Paine, Environmental Engineer at Lynchburg, was instrumental in the successful completion of this program. The friendly cooperation received from many other personnel at the Archer Creek Plant is also greatly appreciated.

SECTION 1

INTRODUCTION

The purpose of this program was to develop total and size specific particulate emission factors for pouring and cooling operations at an iron foundry. The Archer Creek plant of Lynchburg Foundry, Lynchburg, Virginia contains two pouring and cooling lines which were built in 1973. Lynchburg Foundry volunteered to host the IP field testing program and the north line was tested during the week of 16 December 1981.

Pouring and cooling fumes from the north line are vented directly to the atmosphere via six stacks containing axial fans. Three stacks vent pouring and three stacks vent cooling emissions. Modified EPA Method 5 (total particulate) and cascade impactor (particle size distribution) tests were conducted simultaneously on a set of three stacks. Dual cyclone sampling was conducted on two of the remaining three stacks simultaneously. Each run was operated over the complete shift and actual run times were typically four hours. This report describes the methods used and the results obtained during the one week test program.

Funding for this program was provided by the Environmental Protection Agency, Industrial Environmental Research Laboratory at Research Triangle Park, North Carolina. EPA contract numbers and the key personnel involved in the program are identified in Appendix A.

SECTION 2

TEST PROGRAM SUMMARY

The field testing program was conducted according to the approved Test Plan during the week of 14 December 1981 and involved eight GCA personnel. Three IP tests, each consisting of three total particulate and three impactor runs, were completed during the one week test program. Two dual cyclone tests, each consisting of two simultaneous runs, were also completed. A summary of the results of all three test methods is presented in Tables 1 through 3 and Figures 1 through 3. The IP size specific emission factors, presented in Tables 1 and 3, are calculated by multiplying the total particulate emission rates measured using a modified EPA Method 1-5 procedure by the impactor derived particle size fraction. The dual cyclone emission factors shown in Table 2 are not considered as accurate as the IP emission factors.

The total particulate results presented are based on one set of three simultaneous modified Method 5 runs on each operation. A third IP test, consisting of two runs on cooling stacks and one run on a pouring stack, was completed on the last field sampling day. The mix was chosen in the field to provide a more balanced total number of runs on both operations. When calculating emission factors, however, the total particulate emission rate from each of the three stacks venting each process is needed. The results show large differences in emission rates from each stack and the potential for variability in emission generation rates. The average of all five cooling and four pouring impactor runs was used to determine the particle size fractions. These results are multiplied by the average of three simultaneous Method 5 runs to calculate emission factors. The use of the third IP test data set is discussed in more detail in Section 5.

The total particulate results appear to correlate well with the amount of activity associated with the area evacuated. Pouring operations were mainly performed under the hood connected to stack P-3. These results are six times greater than the results of tests on stack P-2 which is over the area usually vacant for safety purposes among other reasons. Sometimes a second operator pours hot metal under the hoods connected to stack P-1. The stack P-1 results are in between the stack P-2 and P-3 results. Cooling room emission rates also appear to correlate with the location being vented. The highest emission rates were measured where the hot flasks first enter the room and the lowest rates were measured at the cooling room exit area. All of the results were very low and the maximum particulate catch was 67 mg after sampling 220 dscf.

TABLE 1. SUMMARY OF TOTAL PARTICULATE AND PARTICLE SIZE DISTRIBUTION TEST RESULTS, LYNCHBURG FOUNDRY, LYNCHBURG, VIRGINIA

	Units	Pouring emissions	Cooling emissions
Production Rate	tons/hr	17.37	20.64
Total Particulate Emission Factors			
Mass Concentration[a]	mg/dscm	6.64	4.65
	gr/dscf	0.003	0.002
Mass Emission Rate[b]	g/hr	1,005	809
	lb/hr	2.21	1.78
Process Weight Rate[b,c]	kg/Mg	0.064	0.043
	lb/ton	0.127	0.086
Particle Size Distribution			
Cumulative mass[a]	% <15 μm d_{50}	71	72
	% <2.5 μm d_{50}	26	23
Mass Emission Rate[b]	lb <15 μm d_{50}/hr	1.57	1.28
	lb <2.5 μm d_{50}/hr	0.57	0.41
Size Specific Emission Factors[c]			
kg particulate <15 μm d_{50}/Mg		0.045	0.031
lb particulate <15 μm d_{50}/ton		0.090	0.062
kg particulate <2.5 μm d_{50}/Mg		0.016	0.010
lb particulate <2.5 μm d_{50}/ton		0.033	0.020

[a]Average of four pouring and five cooling runs.

[b]Sum of three simultaneous runs.

[c]Based on the total weight of hot metal poured.

TABLE 2. SUMMARY OF DUAL CYCLONE SAMPLER RESULTS, LYNCHBURG FOUNDRY, LYNCHBURG, VIRGINIA

	Units	Average pouring emissions	Average cooling emissions
Production Rate	tons/hr	18.5	19.6
Particles Smaller Than 3 μm d_{50}			
Fraction of total	percent	19	13
Concentration	gr/dscf	0.0010	0.0007
Emission rate[a]	lb/hr	0.765	0.660
Emission factor[b]	lb/ton	0.041	0.034
Particles Between 3 μm and 17 μm d_{50}			
Fraction of total	percent	62	67
Concentration	gr/dscf	0.0033	0.0036
Emission rate[a]	lb/hr	2.526	3.394
Emission factor[b]	lb/ton	0.137	0.173
Particles Larger Than 17 μm d_{50}			
Fraction of total	percent	19	20
Concentration	gr/dscf	0.0010	0.0011
Emission rate[a]	lb/hr	0.765	1.037
Emission factor[b]	lb/ton	0.041	0.053
Totals			
Concentration	gr/dscf	0.0053	0.0054
Emission rate[a]	lb/hr	4.06	5.09
Emission factor[b]	lb/ton	0.223	0.260

[a]Calculated using stack gas flow rate determined during total particulate tests.

[b]Based on the weight of hot metal processed during the test.

TABLE 3. SIZE SPECIFIC EMISSION FACTORS, LYNCHBURG FOUNDRY, LYNCHBURG, VIRGINIA

Process	Production rate (tons/hr)[b]	Cumulative	Particle aerodynamic 50% cut diameter (d_{50})						
			Total[a]	15 μm	10 μm	6.0 μm	2.5 μm	1.0 μm	0.63 μm
Pouring	17.37	% mass $<d_{50}$	100	71	48	34	26	21	16
		lb $<d_{50}$/hr	2.21	1.57	1.06	0.75	0.57	0.46	0.35
Cooling	20.64	% mass $<d_{50}$	100	72	49	34	23	19	15
		lb $<d_{50}$/hr	1.78	1.28	0.87	0.61	0.41	0.34	0.27
Average	19.00	% mass $<d_{50}$	100	72	49	34	24	20	15
		lb $<d_{50}$/hr	2.00	1.44	0.98	0.68	0.48	0.40	0.30

[a]Modified Method 5 results.

[b]Based on total weight of hot metal.

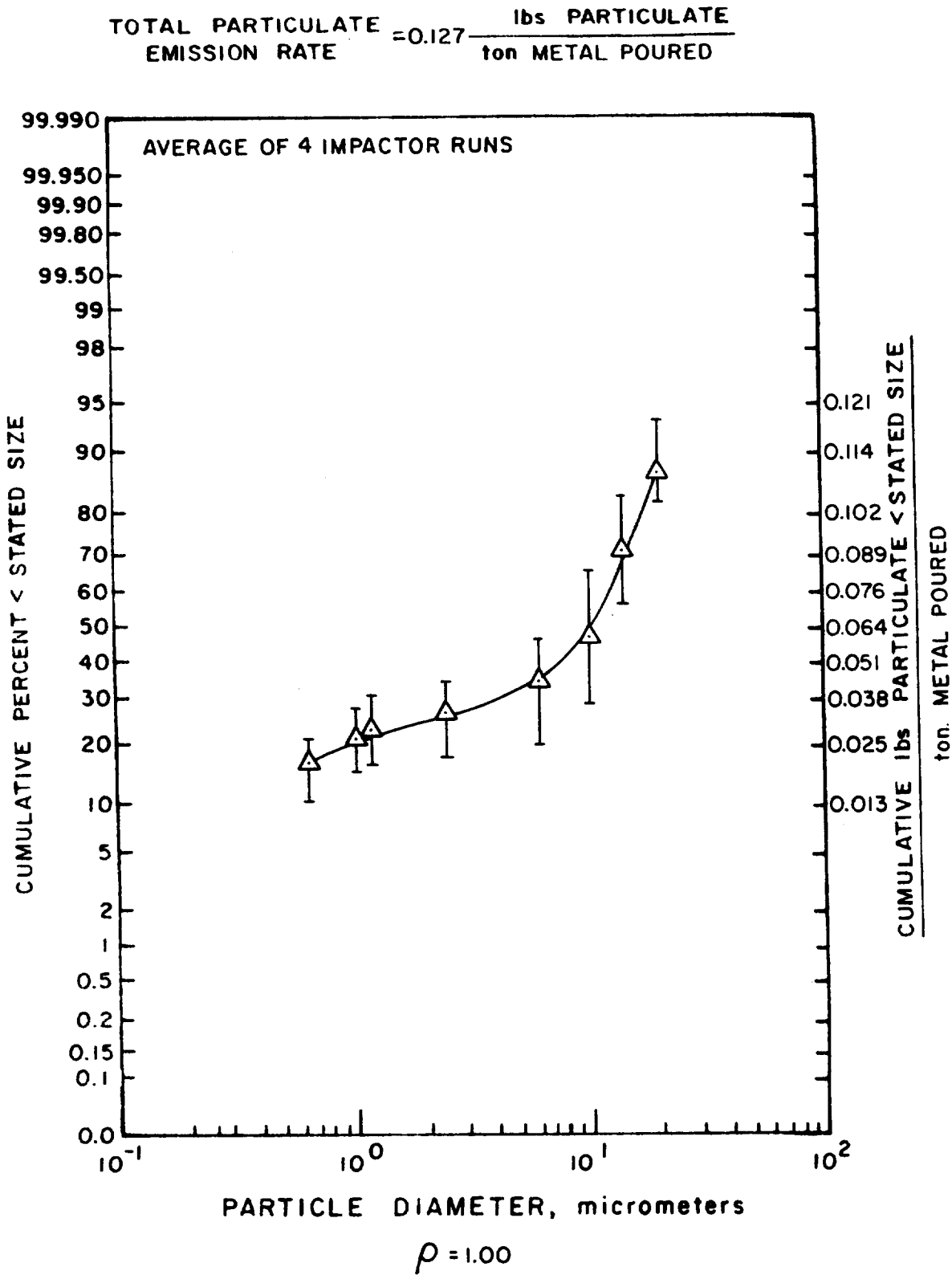


Figure 1. Average particle size distribution of uncontrolled pouring emissions, Lynchburg, Foundry, Lynchburg, Virginia.

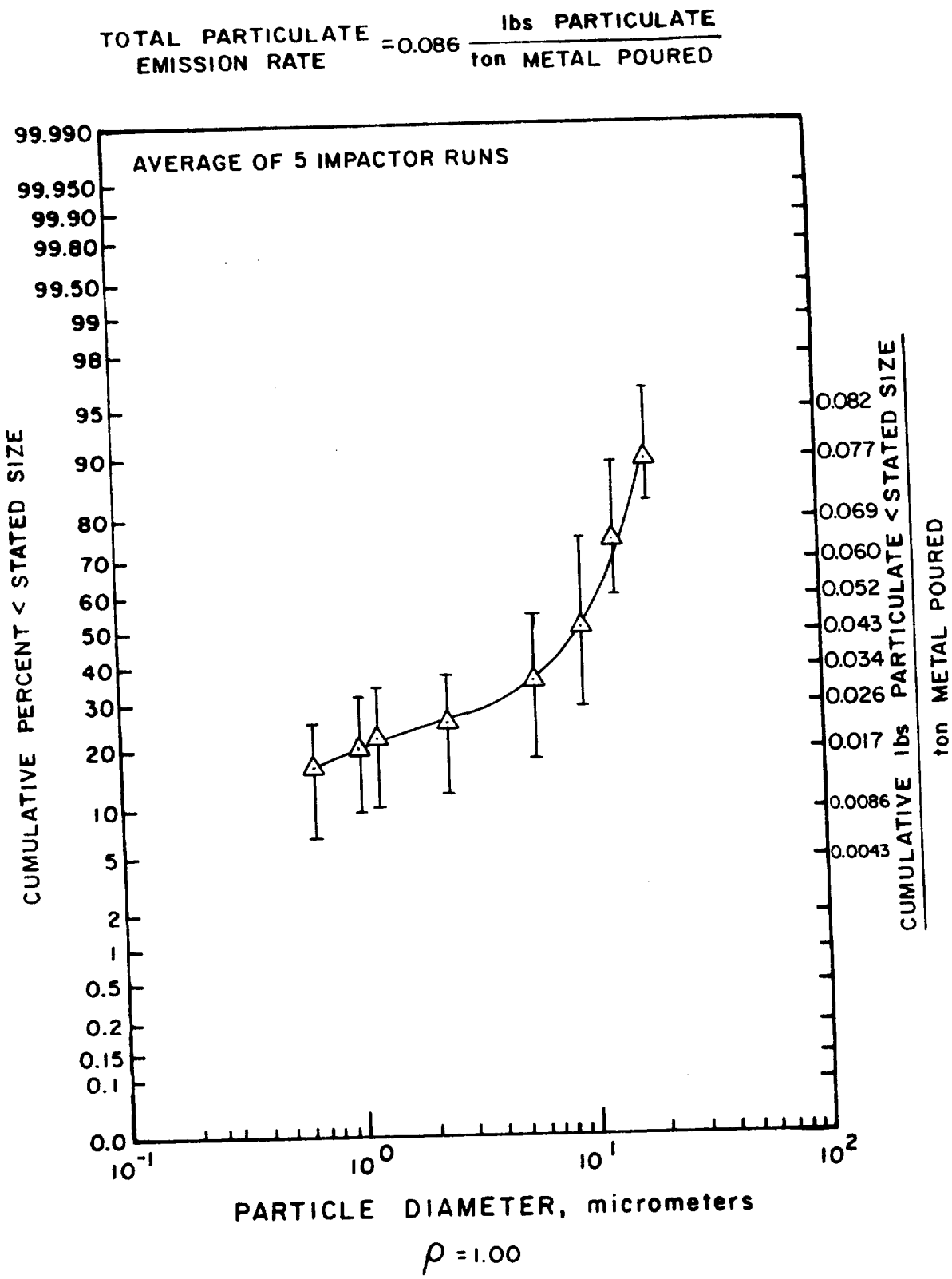


Figure 2. Average particle size distribution of uncontrolled cooling emissons, Lynchburg Foundry, Lynchburg, Virginia.

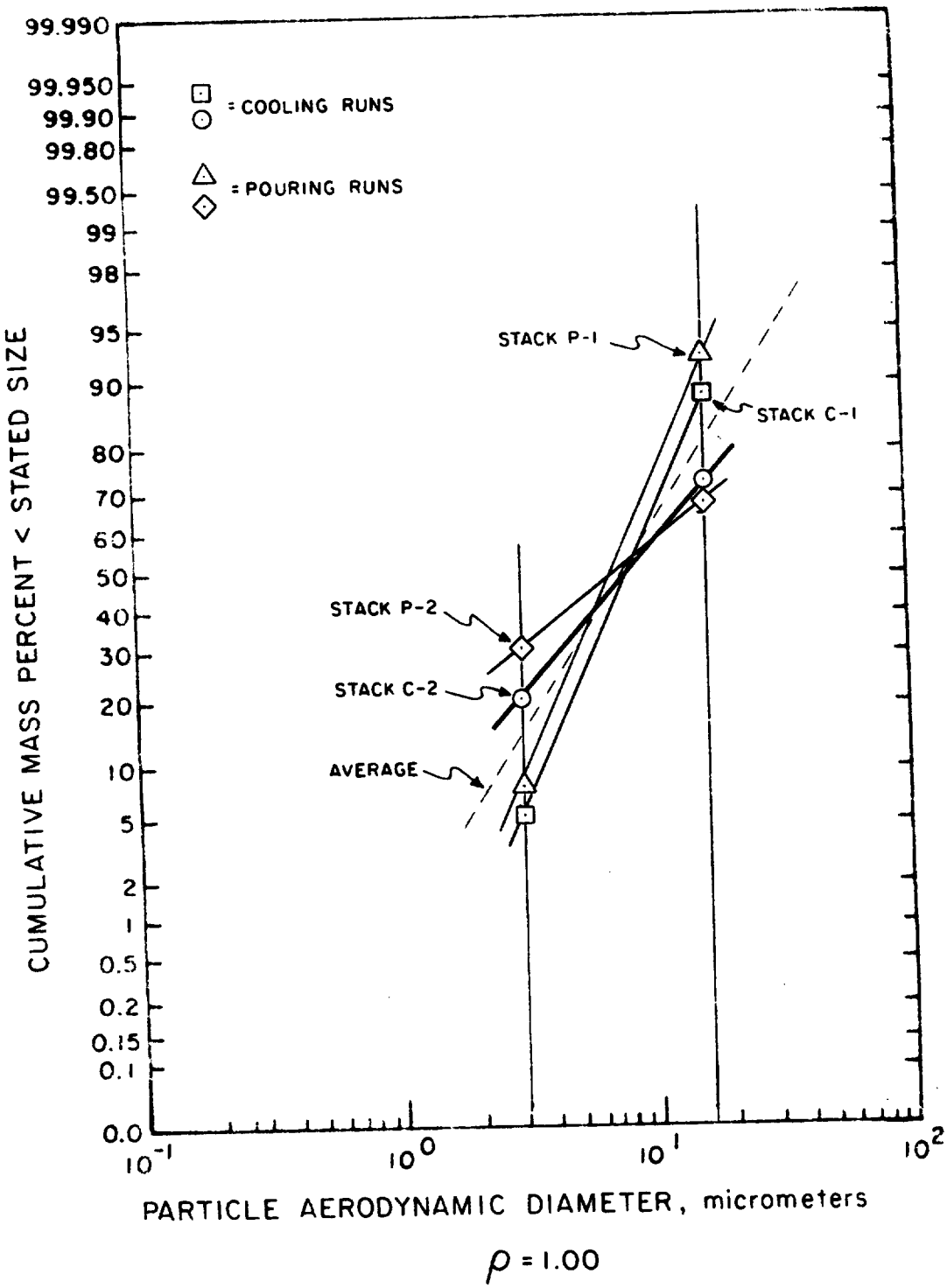


Figure 3. Dual cyclone results, Lynchburg Foundry, Lynchburg, Virginia.

The North pouring and cooling line was operating at an average of 92 percent of the rated 125 tons per hour capacity. This production rate is based on the total weight of all three components in the flask; i.e., the sum of the weight of the cores, sand, and hot metal. The emissions resulting from pouring and cooling operations are generated when the molten metal contacts the sand and cores in the flasks. According to Lynchburg Foundry personnel, the majority of the emissions are from the cores, the second largest source is the sand and the least contribution to the emission rate is from the hot metal. The emission factors are based on the weight of the hot metal only.

The process observer estimated that the capture efficiency of the pouring line hoods was 100 percent. The greatest source of fumes within the shop was observed to be the furnace tapping operation, however none of these fumes appeared to be captured by the pouring and cooling line exhaust system. Fumes were also generated during ladle additions and transfers, however these were captured by a separate baghouse control system. The observer rated these emissions light, that is 0-25 percent opacity as seen within the plant, as were the emissions generated during pouring and cooling.

Visible emission observations were conducted on the stacks tested according to EPA Reference Method 9 procedures. There were no readings above zero for two hours or a total of 480 readings.

SECTION 3

PROCESS DESCRIPTION

The Lynchburg Foundry Archer Creek plant was built in 1973. This relatively modern foundry uses two pouring and cooling lines to produce approximately 75,000 tons per year of good castings for the automotive industry. The average pouring rate is on the order of 150,000 tons per year of hot metal. Seventy-five percent of the castings are ductile iron, the other twenty five percent are mostly grey iron. The pouring and cooling lines each typically operate 250 days per year at 300 molds per hour. Lagging demand for castings had reduced operating levels at the plant prior to the field test program, however, operations were normal during the test program.

Hot metal is produced by melting scrap in a cupola followed by a temperature and chemistry adjustment in an induction furnace and an intermediate ladle, respectively. The hot metal is then transferred into smaller pouring ladles which travel by electric hoist. Up to three operators pour hot metal at an average rate of 5 castings per minute at each pouring line. Molds, contained in flasks mounted on a conveyor, pass through the pouring area where louvered and slot hoods capture any pouring emissions generated. Air flow in the area is increased by the cross flow of make up air which is ducted to the opposite side of the pouring aisle by three fans and eighteen two-foot square ventilators. Pouring emissions are vented to the atmosphere via three stacks, each containing an axial fan rated at 30,000 cfm. The flasks travel around a corner and enter the cooling room which is sized to provide about one hour of residence time. The cooling room air is evacuated once per minute by three axial fans located in the three cooling stacks (also rated at 30,000 cfm) and make up air is provided by two larger fans. At a given time, 21 flasks are in the pouring aisle and 215 flasks are in the cooling room. After cooling, the flasks travel to the shake-out area where the sand and castings are separated for further processing. Figure 4 is a layout of the pouring and cooling lines showing the relative locations of the stacks tested, the make-up air inlets and the relative size of the cooling room.

A process observer documented operations at the North line during the field tests and notified the test crew of any upset conditions. This observer assessed the capture efficiency of the pouring hoods, documented other apparent sources of emissions in the shop and was also responsible for performing EPA Method 9 visible emission observations of the stacks tested. These observations are discussed further in Section 5 along with the production data obtained for the test periods. Also presented in Section 5 are the results of the visible emission observations.

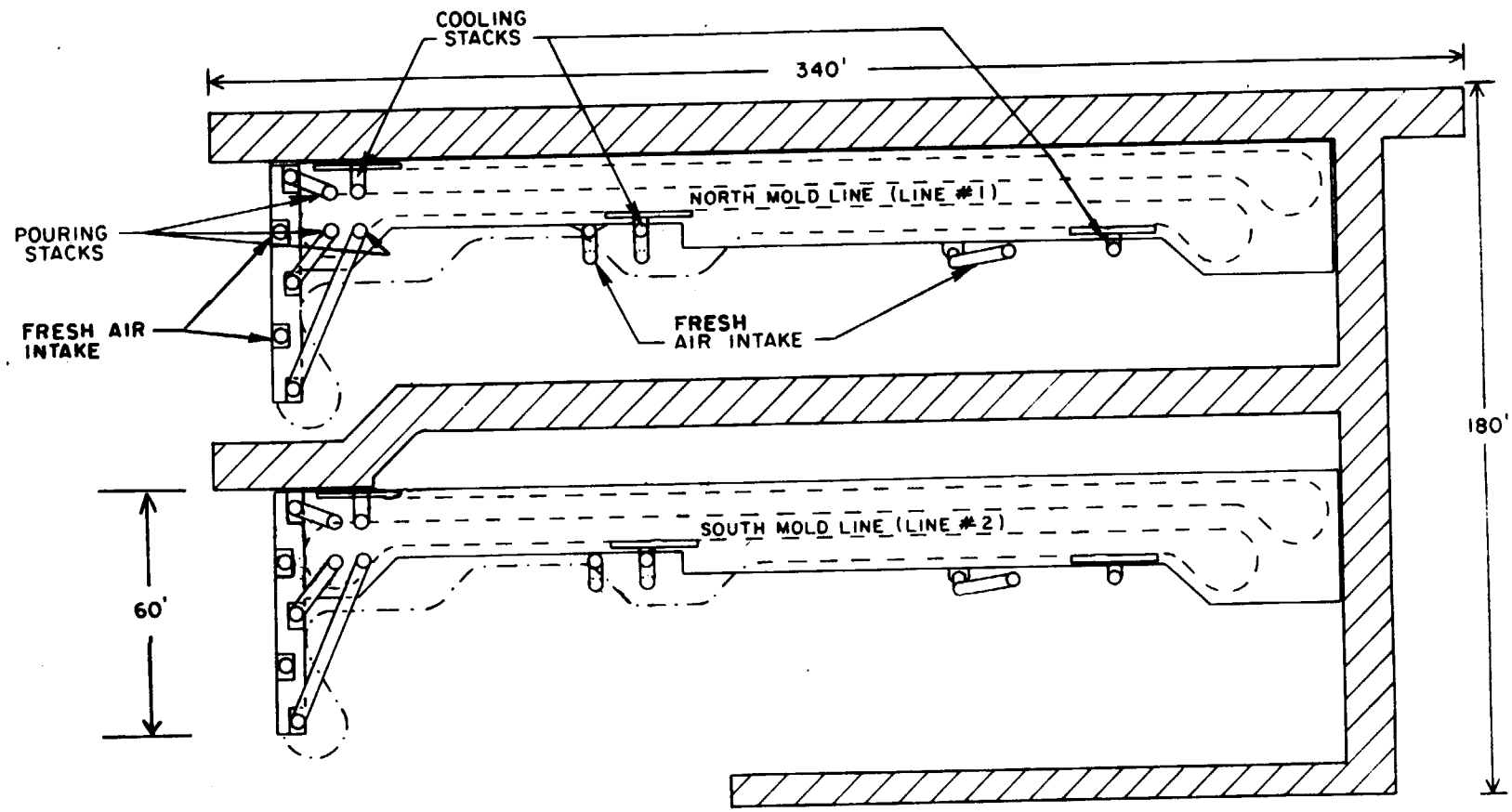


Figure 4. Plant layout, Lynchburg Foundry, Lynchburg, Virginia.

SECTION 4

SAMPLING AND ANALYSIS METHODS

GENERAL

Lynchburg Foundry volunteered to host this Inhalable Particulate Matter Emission Factor Development test program. A pretest site visit was performed on 19 October 1981 in order to gather data necessary to conduct the program. Good sampling locations were found in the six stacks venting pouring and cooling emissions. Lynchburg Foundry personnel were contracted to install sampling ports and electricity on 29 October 1981. Installations were completed by December and the field testing program was conducted during the week of 16 December 1981.

The sampling ports were located three diameters downstream of the axial fans and one diameter upstream of the top of the stack as shown in Figure 5. Two ports were located ninety degrees from each other and two points were sampled on each diameter. All four points, each at 0.7 R (R = stack radius) were sampled during each Method 5 and impactor run, however, the dual cyclone runs were only operated at the center point of the stacks.

SAMPLING METHODS

Presampling Preparations

All glassware and Nalgene sample bottles utilized in this test program were cleaned with an Alconox solution, rinsed with tap water, distilled-deionized (DDI) water and finally rinsed with reagent grade acetone. The glassware was air-dried and capped with Parafilm.

Pitot tube-thermocouple-probe assemblies were calibrated by the measurement procedure as specified in 40 CFR 60, Appendix A, Method 2. Meter control boxes were calibrated according to procedures in APTD 0576 and the sampling nozzles were calibrated with a dial vernier micrometer. Thermocouples were calibrated against a mercury in glass ASTM thermometer in an ice bath, at ambient temperature and in a boiling water bath. All calibrations are given in Appendix B-1.

Impactors and cyclones were prepared for sampling by cleaning with soap and water, then rinsing with DDI water and finally with acetone. All particle sizing dry gas meters and orifices were calibrated by the same procedures prior to sampling.

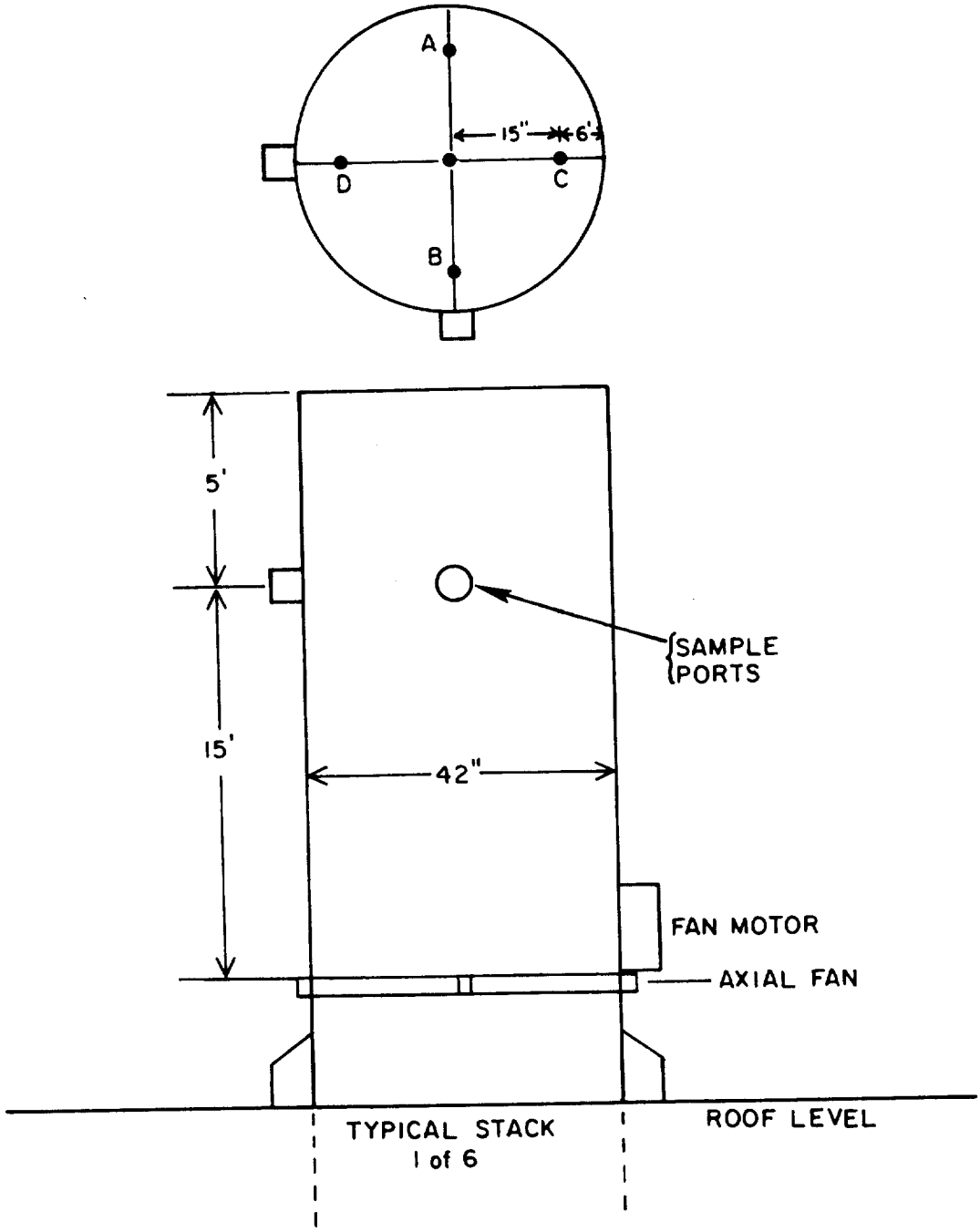


Figure 5. Sample point locations, Lynchburg Foundry, Lynchburg, Virginia.

After the scaffolding was erected and the equipment was set up, a preliminary velocity traverse was performed in order to:

1. Determine if cyclonic flow conditions existed, and if present, determine the gas flow angles.

2. Determine the stack gas velocity pressure and temperature at the sample points representing 0.7R.

3. Properly size the nozzles and obtain the data necessary to perform isokinetic sampling.

Total Particulate Sampling

The RAC Stacksampler™ sampling trains used conform to EPA Method 5 specifications. A schematic of the sampling train is provided in Figure 6. The train consisted of a stainless steel, heat-traced probe with a stainless steel button hook nozzle, thermocouple and pitot tubes attached as per EPA Method 2. Following the probe a glass filter assembly was installed in the the hot box. A Reeve Angel type 900AF 4-inch diameter glass fiber filter was used. The filter compartment was maintained at 248°F ± 24°F. The sampled gas exited the hot box into the impingers where condensable materials are removed. The impingers are the Greenburg-Smith design. The first two impingers each initially contained 200 ml of distilled deionized water (DDI), the third was empty, and the fourth contained preweighed silica gel. Following the impingers, the sample gas flow rate and volume were measured at the control box containing the pump, valves, calibrated orifice and dry gas meter.

Sample train leak checks (sample gas vacuum system and pitot lines) were conducted prior to and after each sampling run and before and after changing or disconnecting any component of the train. A sampling run was started upon notification by the GCA process observer and terminated after approximately 4 hours of operating time. Isokinetic sampling rates were maintained by varying the sampling train flow rate as necessary to match the stack gas flow rate. Upon completion of each sample run, the nozzle was removed, rinsed, and brushed with acetone along with the probe and front half of the filter holder. These rinses were combined into one sample. The tared filter was removed from its holder and replaced into its petri dish. The contents of the first three impingers were first measured for water volume increase and then transferred to a sample container with DDI water rinsing. This procedure generated two liquid samples plus a filter for each run. The pretared silica gel was weighed for moisture gain and eventually regenerated.

Sample train preparation and recovery took place in a clean environment either inside the truck used to transport equipment or inside the foundry building proper. No orsat samples were obtained or analyzed since the stack gas is essentially ambient air.

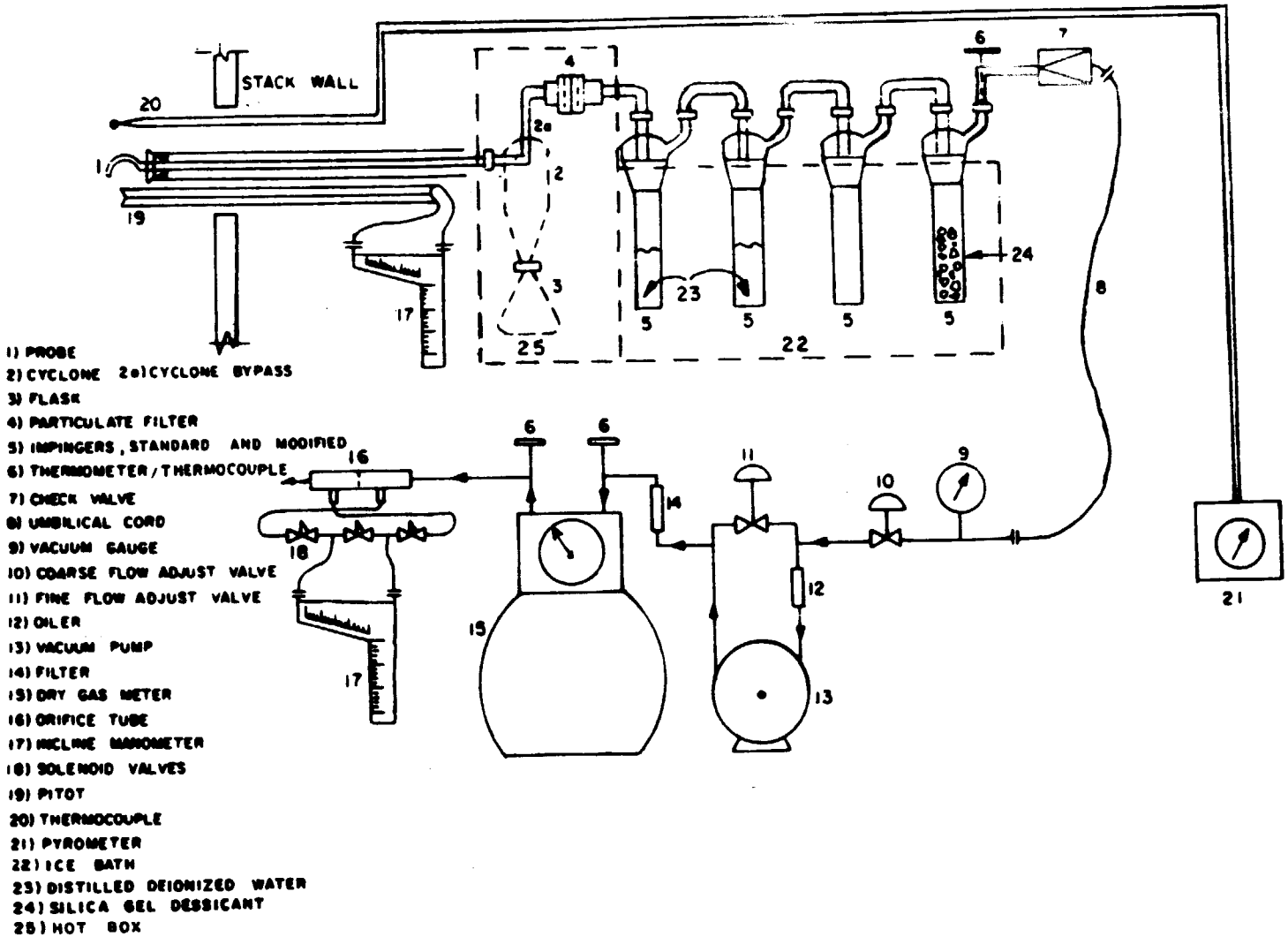


Figure 6. Schematic of total particulate sampling train.

Cascade Impactor Sampling

Reeve Angel type 934 AH-glass fiber substrates were used in the cascade impactors. Each substrate was labeled and placed in a folded aluminum foil liner. Both foil and filter were placed in labeled petri dishes and initially desiccated for 24 hours. The top half of each foil liner was folded back during desiccation. Initial tare weights and all subsequent weights are a combination of foil and filter weights. A minimum of 6 hours was allowed between weighings. After reaching constant weight (± 0.5 mg), substrates were sealed in their petri dishes for transport into the field.

Four sample points of average velocity near 0.7R (R = duct radius) were determined through use of the preliminary traverse data. The proper nozzle size and sample train flow rate was selected and sampling was performed during each EPA Method 5 test run. Four sample points were sampled per run. Total sampling time was designed to collect approximately 30 mg per impactor run through estimated grain loading values, and by visual inspection of the first run filters. All impactor runs were performed with a cyclone precutter installed in front of the impactor to remove particles >15 μm diameter. The remainder of the sample train consisted of an unheated probe, vacuum hose, silica gel moisture trap and dry gas meter/orifice/pump assembly as shown in Figure 7.

Prior to each sampling run the impactors were carefully loaded with tared substrates. The sample train was assembled and leak checked. The impactor was then inserted into the gas stream at the appropriate sample point with the nozzle pointed away from the gas flow and allowed to reach temperature equilibrium for 10 minutes. The sampling nozzle was then turned into the flow and the sample flow was quickly adjusted to the desired rate. The flow was monitored and recorded by observing the pressure drop across a calibrated orifice and the total dry gas volume sampled was determined by a calibrated dry gas meter. The flow rate through the impactor was held constant (± 0.05 cfm) for the duration of each run.

Upon completion of each sample run the sample train was turned off and the probe/impactor assembly was removed from the stack. The nozzle was immediately capped, the probe was disconnected and the impactor transported to the sample recovery area. No leak checks were performed at the end of a run so as not to disturb the particle distribution.

Dual Cyclone Sampling

Preparations for sampling with the dual cyclones consisted of the same washing steps and weighing procedures as used for the impactors. The series cyclones, designed by Southern Research Institute, Birmingham, Alabama and built by Sierra Instrumenta, Carmel Valley, California, were operated in two of the three available stacks. Two cyclone trains were operated simultaneously in either two pouring or two cooling stacks and only the center point in each stack was sampled. The two cyclones in series have particle size cut points of 15 and 2.5 micrometers (microns) when operated at 0.8 cfm

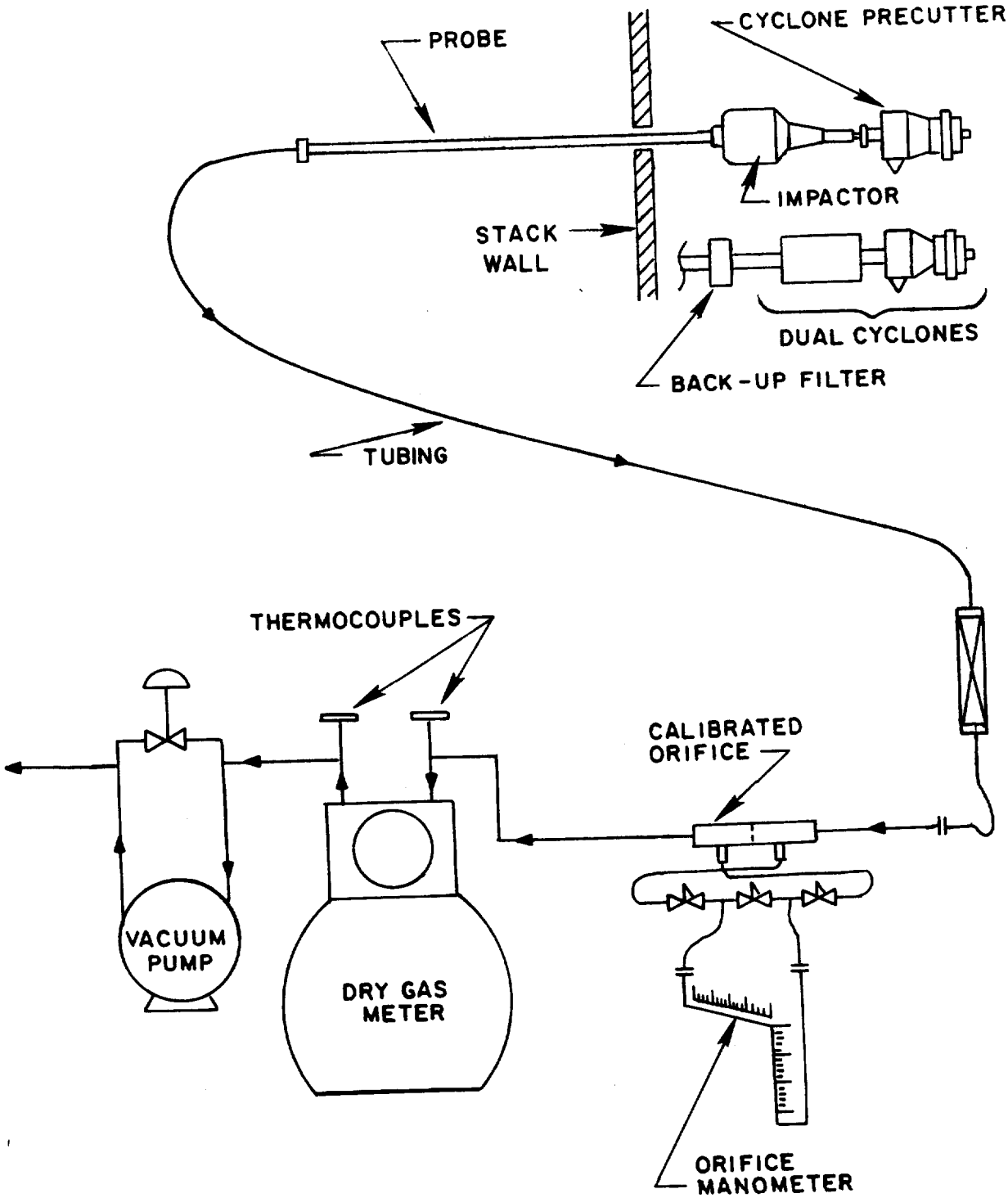


Figure 7. Impactor and dual cyclone sampling trains.

at 300°F. A schematic of the cyclones is shown in Figure 8 and the sampling train, which is equivalent to the impactor train, is shown in Figure 7.

The dual cyclone sampler is primarily used to collect bulk samples of size fractionated particulate. The stack gas is sampled at a constant isokinetic rate for the maximum allowable time in order to maximize the bulk catch. By using a back-up filter, three aerodynamic particle size fractions are obtained. The three fractions are gravimetrically analyzed for this program and under a separate IP task, the elemental composition of the sized particulate is determined using X-ray Fluorescence and Neutron Activation techniques as well as a determination of total and volatile carbon content. The three size fractions are typically 15 microns and greater, between 15 and 2.5 microns and smaller than 2.5 microns. The 2.5 micron fraction is collected on at least two different backup filters--glass fiber and teflon.

Prior to each sample run, the train is assembled and leak checked to less than 0.02 cfm at 5 inches Hg vacuum. The cyclones are then inserted into the stack with the nozzle pointing away from the flow. The sampler was allowed to reach temperature equilibrium for about 10 minutes before turning the nozzle into the flow and starting the train. Constant isokinetic flow was maintained and the sampler was oriented horizontally during the run. Data was recorded at convenient intervals and any required adjustments were made to keep the flow rate constant.

After operating the train for the length of time needed to get adequate loading on the back-up filter, the train was shut down and the cyclones were withdrawn from the stack. The back-up filter holder was replaced. No leak checks were conducted so as not to disturb the particles in the cyclones. With a fresh filter installed, the cyclones were reinserted and allowed to equilibrate before restarting the train. Upon completion of a run, the sampler was withdrawn from the stack, kept in a horizontal position and capped off for careful transport to the sample recovery area.

Process and Visible Emission Observations

In order to ensure that sampling was conducted only during normal pouring and cooling operations, a process engineer was positioned at the North line in order to:

- Notify the test crew when to start and stop tests.
- Document the origin and approximate magnitude of emissions or fumes generated.
- Observe the capture efficiency of the control system hoods.
- Observe and document any other sources of emissions in the shop that could affect the test results.
- Obtain the production data needed for calculation of pouring and cooling rates.

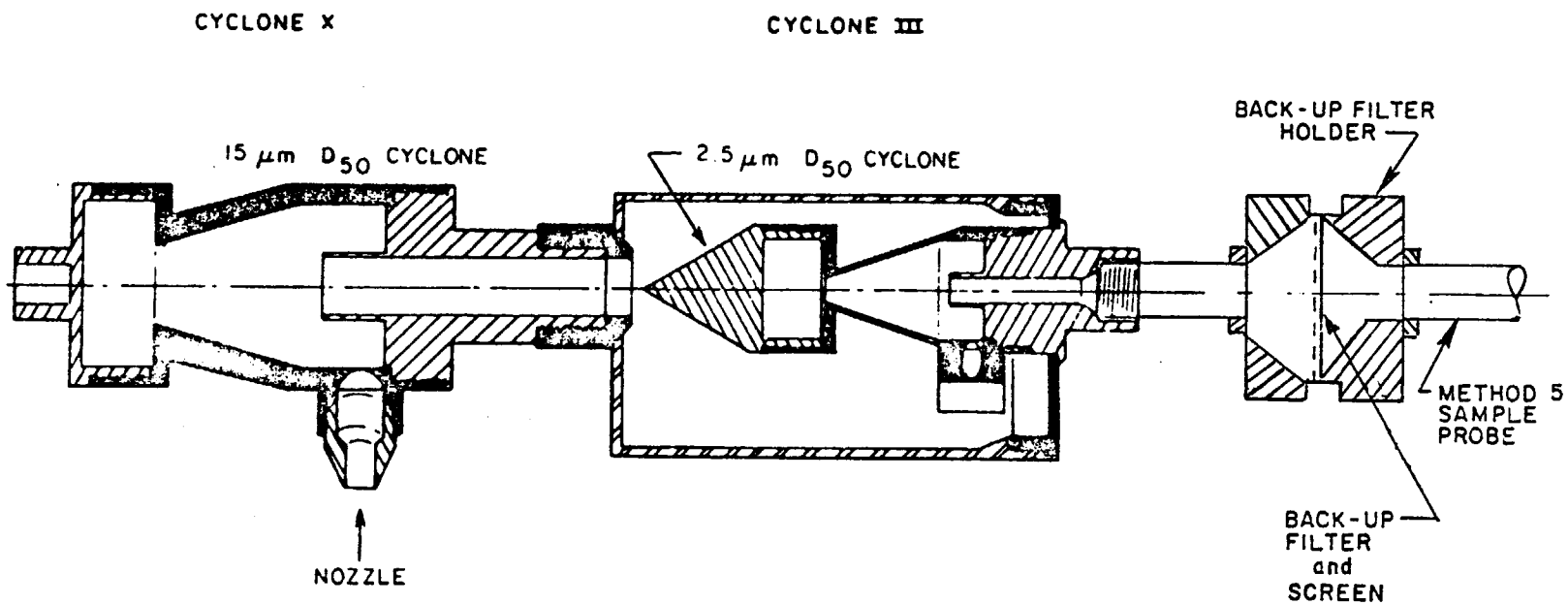


Figure 8. Schematic drawing of the dual cyclone sampler.

The process observer was also required to perform EPA Method 9 visible emission observations of the stacks being tested for one hour per day. During these times, a Lynchburg Foundry environmental engineer (Mr. Stephen Paine) performed the process observations.

EPA Method 9 procedures were used to document the opacity of visible emissions from the stacks being tested. The visible emission observer met the 6 month recertification requirement in Method 9 by passing a recertification test on October 27, 1981. The observer is required to keep the sun within a 140° arc behind him while reading the opacity of emissions at the stack/atmosphere interface. Opacity readings were recorded at 15 second intervals for 1 continuous hour. The results are usually averaged over ten 6-minute intervals and the minimum and maximum opacities are also reported.

The magnitude of emissions observed inside the building were defined on a light, moderate and heavy scale which can be roughly equated to the following apparent opacity scale:

- light emissions = 0 to 25 percent opacity
- moderate emissions = 30 to 60 percent opacity
- heavy emissions = 65 to 100 percent opacity.

SAMPLE ANALYSIS

General

All samples and data obtained in the field were kept in the GCA van and chain of custody documentation was maintained. The samples were driven to the GCA/Technology Division laboratory (Bedford) for analysis. All samples were logged into the sample bank before analysis.

Total Particulate Train

The analysis of the total particulate emissions samples conformed to procedures in EPA Method 5 and the Quality Assurance Handbook, Volume III. Only front half samples were analyzed. The 4-inch filters were desiccated to constant final weight. The front half rinses were transferred to preweighed beakers and dried at ambient temperatures in a hood. The residue was desiccated to constant final weight. The weight gain of the filter was added to the rinse residue weight to determine the total front half particulate weight.

Calculation of isokinetics, volumetric flow rate, grain loading, and pounds of particular per hour were performed on an IBM 370 Computer utilizing the example calculations given in Appendix C-1. The emission rates and concentrations for each Method 5 test run were computed from the total front half particulate weight. Back half analysis was not performed however the back half samples were retained in the GCA sample bank.

Cascade Impactor Train

At the conclusion of each test run, each impactor was carefully disassembled. The cyclone precutter was held 45° from horizontal and disassembled. The dry particulate in the collection cup, if any, was transferred to a separate sample container. The cyclone nozzle, body, collection cup and cap were rinsed into a rinse sample container. The impactor cone was rinsed into a third container. Each impactor substrate was placed into its respective foil package and any particulate adhering to the bottom of the previous jet plate or the top of jet plate upon which the substrate was mounted, and the crossbar/gasket, was brushed into the preweighed aluminum foil package. Each substrate and weighing packet was sealed in a petri dish and, upon return to the GCA laboratory, was opened and immediately placed in a desiccator and dried for at least 24 hours before being weighed. After achieving constant weight, all samples were carefully stored in closed containers in the unrefrigerated sample bank.

Impactor sampling data reduction was performed by computer. Once the appropriate input parameters were quality checked they were entered into the Particulate Data Reduction (PADRE) interactive computer data reduction system developed by Research Triangle Institute (RTI). PADRE is essentially the same as the Southern Research Institute "Computer Based Cascade Impactor Data Reduction System" (CIDRS) (EPA-600/7-78-042). There are, however, some significant differences between the two systems, the most obvious being the interactive nature of PADRE. Another difference is the treatment of potential outliers. The PADRE program uses all inputted values for a specific run and does not have provisions for dropping outlying values whereas CIDRS automatically excluded outliers. Additional differences between CIDRS and PADRE are discussed in Section 5 and Appendix C-2.

Dual Cyclone Train

Recovery of the dual cyclones was initiated by wiping off the outside of the sampler and dismantling the cyclone stages. The sampler was kept at an angle of 45° from horizontal during dismantling. No dry samples were recovered from the collection cups of Cyclone X or Cyclone III. The cyclones and connecting parts were rinsed three times with acetone into one of two sample containers. The nozzle, body, collection cup and top half of Cyclone X was rinsed into one container; the connecting tube, cannister, outside and inside of the body and collection cup of Cyclone III was rinsed into a second container. Several filters were recovered as part of each run and if any filter material adhered to the holder, the material was rinsed and scraped into a separate container.

The samples were labeled and sealed for transfer to the GCA/Technology Division laboratory for analysis. Upon receipt at the weighing laboratory, the samples were logged in and aliquotted appropriately. The filters were

desiccated for 24 hours before weighing and the liquid samples were dried in preweighed beakers at ambient temperatures before desiccation to constant weight. The results were calculated using a programmable calculator and the example calculations provided in Appendix C-3.

Sampling and Analysis Quality Assurance

GCA/Technology Division management is fully committed to an effective Quality Assurance/Quality Control program directed by the Quality Assurance Manager who reports directly to the General Manager. This assures the QA Manager the necessary authority and independence to find and correct any existing quality problems. Department QC Coordinators are responsible for the QC program within each technical department; they report to both their Department Manager and the QA Manager. GCA's program includes a Division QA/QC Committee, Department QC Committees, QA/QC Manuals, specific QA Project Plans and Inspection Plans, personnel training, and audit and corrective action procedures.

No QA Project Plan was prepared for this Technical Directive but the detailed Test Plan incorporated QC procedures and was reviewed and approved by GCA and EPA before field testing began. In addition, the QC procedures provided in GCA's Division QA Manual, Sampling and Field Measurements QC Manual and Analytical QC Manual were followed, as appropriate.

Section 2 of this report summarizes the field test results noting conditions found in the field. Earlier parts of this section briefly describe the QC procedures incorporated in the sampling and analysis activities. The Appendices to this report provide detailed documentation of QC procedures such as the Sample Train Calibration Worksheets, Filter Weighing Procedures, example calculations and field data sheets for each type of measurement. Particulate Analysis data sheets and computer printouts are included.

The QA Manager conducted a system audit of this project on February 25 and 26, 1982. This qualitative review of the quality system for the program checked on adherence to the approved Test Plan and on the use of appropriate QC procedures as defined in that Plan and in GCA's QA/QC Manuals. It was found that the Test Plan had been closely followed and QC measures conscientiously followed. The QA Manager's summary Audit Report is presented in Appendix H.

GCA's QA Program includes review of reports for QA requirements; the Environmental Measurements Department QC Coordinator and the QA Manager have reviewed and approved this report.

SECTION 5

TEST RESULTS

INTRODUCTION

The objective of this program was to develop total and size specific particulate emission factors for pouring and cooling operations at an iron foundry. Uncontrolled emissions from both operations at Lynchburg Foundry were sampled using IP and Source Signature sampling procedures during the week of 16 December 1981. Each IP test was conducted in three stacks simultaneously. Three total particulate and particle size distribution measurements were conducted simultaneously as one IP test. Two tests of pouring and two tests of cooling emissions were planned, however, freezing rain on the second field day allowed completion of only three IP tests. Two dual cyclone runs were operated simultaneously as one source signature test. One source signature test was completed on each operation, however, the pouring emissions test was operated over two complete shifts (days). Process operations were documented and visible emission observations were conducted.

Total Particulate Measurements

Total particulate emission rates from pouring and cooling operations were determined using modified EPA Methods 1 through 5 procedures. These procedures were modified to include only a four point traverse of the sampling plane. Isokinetic rates were maintained while sampling at each point. The low concentration of particulate in the stack gas required operating the train for four hours. Sample time per sample point was one hour and readings and adjustments were performed at five minute intervals or more frequently as necessary.

The total particulate results of the third IP test have not been included in the results presented so far in this report. This is because sample analysis indicated that the emissions from each of the three stacks tested simultaneously varied considerably. The third test did not represent all emissions from either pouring or cooling. Thus, the results could not be averaged with the results of run Nos. 1 or 2 to obtain a more representative average. The results of the third set of impactor runs have been used when averaging size fractions. The total particulate results of all three IP tests are presented in Table 4 where the average results of all three sets of simultaneous runs are presented. The third set of runs are averaged together even though both pouring and cooling stacks were sampled. These results are then included in the overall program average in Table 4.

TABLE 4. TOTAL PARTICULATE RESULTS, LYNCHBURG FOUNDRY, LYNCHBURG, VIRGINIA

Parameter	Units	Pouring runs					Cooling runs					Mixed pouring and cooling runs					Average of all 9 runs
		1P1	1P2	1P3	Total	Average	2C1	2C2	2C3	Total	Average	3C1	3C3	3P3	Total	Average	
Date	m/d/y		12/16/81					12/17/81									
Time interval		0747-1425	0748-1429	0750-1427			0726-1417	0726-1335	0746-1417			0709-1119	0709-1116	0655-1105			
Flue Gas Characteristics																	
Velocity	afpm	3,122.2	2,940.3	3,259.6		3,107.4	3,669.6	3,639.6	3,990.3		3,954.4	3,601.7	3,907.0	3,204.6		357.1	3,544.2
Flow rate	dscfm	29,741	28,342	31,252	89,335	29,778	33,928	34,726	36,254	110,071	36,690	33,150	36,030	31,060	100,340	33,447	33,305
Average temperature	°F	65.8	60.8	63.1		63.2	80.7	631.	82.1		73.6	80.4	80.0	56.9		72.4	69.7
Calculate moisture	percent	1.288	1.071	1.169		1.176	1.387	1.558	2.853		2.274	1.762	1.640	0.730		1.377	1.609
Measured Particulate Emissions[a]																	
Concentration	gr/dscf	0.0029	0.0009	0.0047	0.0085	0.0028	0.0026	0.0027	0.0007	0.006	0.0020	0.0025	0.0016	0.0032	0.0073	0.0024	0.0024
	g/dscm	0.007	0.002	0.011	0.020	0.007	0.006	0.006	0.002	0.014	0.005	0.006	0.004	0.007	0.017	0.006	0.006
Emission rate	lb/hr	0.76	0.21	1.24	2.21	0.74	0.73	0.83	0.22	1.78	0.84	0.72	0.47	0.88	2.07	0.69	0.67
	kg/hr	0.345	0.095	0.574	1.004	0.335	0.332	0.376	0.101	0.807	0.381	0.325	0.215	0.398	0.938	0.313	0.336
Total Particulate Emission Factors[b]																	
lb particulate/ton		0.044	0.012	0.071	0.127	0.043	0.035	0.040	0.011	0.086	0.004	0.042	0.027	0.051	0.120	0.040	0.111
kg particulate/ton (metric)		0.022	0.006	0.036	0.064	0.021	0.018	0.020	0.005	0.044	0.002	0.021	0.014	0.025	0.060	0.020	0.056
Isokinetic rate	percent	106.10	99.15	97.89		101.04	92.36	104.06	98.36		97.91	99.68	97.55	108.53		101.92	100.29

[a]Front half analysis only, average of area method and concentration method of calculating.

[b]Based on total weight of hot metal.

Ambient temperatures during the field tests were 30 to 60°F and the stack gasses that were sampled were essentially heated ambient air. A problem surfaced when measuring the impinger water volume at the end of a run. Typically, less water was measured in the impinger after a test than before. The silica gel weight gain was not sufficient to offset the impinger moisture losses. In calculating results, the relative humidity of the ambient air, as recorded at Lynchburg Airport, was used to back-calculate the amount of moisture that theoretically should have been caught in the impingers. The theoretical value was used in the calculation of results. The reason for the volume losses appears to be due to insufficient ice around the impingers. The cold ambient temperatures provided enough cooling of the gasses to easily maintain the correct impinger outlet temperature. The temperature measurements were checked and found to be correct, however, the gasses were possibly not cooled sufficiently until just before the last impinger outlet. The sampled gas, heated to 250°F in the hot box, absorbed moisture from the impingers due to its lowered moisture content at the elevated temperatures. For this reason, the results of the field moisture determinations were considered unreliable and the relative humidity was used to calculate the theoretical moisture. Table 5 presents the theoretical water volumes as well as the data used to determine the theoretical values. Example calculations are provided in Appendix C-4.

At the end of Test 2-C-1 the operator noticed the U-joint between the first and second impinger was broken. The two ends of the tube were completely separated so no flow was occurring through the probe and filter. The break was determined to have occurred after the conclusion of testing so it did not affect the testing results.

The total particulate results are used in the calculation of IP emission factors. The average of two methods of calculating emission rates--the concentration method and the area method--is used as the total particulate emission rate. Appendix C-1 presents examples of the total particulate calculation methods and the end of Appendix C-2 provides example emission factor equations.

The total particulate results were calculated by an IBM 370 computer using Version 4.0 of the GCA Data Reduction System. The printouts in Appendix E-1 provide all results in both English and Metric units and all data inputted is also presented. The field data sheets are provided in Appendix D-1 and the laboratory analysis data sheets are provided in Appendix F-1. Only front half results are used in all calculations since no back-half analysis was performed. Front half particulate is that caught by the heated glass fiber filter, the heated probe, nozzle and any connecting glassware. The back half samples, namely the impinger waters, are stored in the unrefrigerated sample bank at GCA/Technology Division.

A total of four tests, each consisting of three runs, were planned, however, inclement weather prevented testing on one day. The plant was due to be shut down for three weeks after the third test. Since only three tests were possible, it was decided in the field that on the third day, a mix of pouring and cooling stacks would be sampled in order to provide a more balanced total number of runs. In all, five runs (1.7 tests) were completed

TABLE 5. THEORETICAL WATER VOLUME INCREASES, TOTAL PARTICULATE TESTS, LYNCHBURG FOUNDRY, LYNCHBURG, VIRGINIA

Run No.	Ambient pressure (in. Hg absolute)	Ambient relative humidity (percent of saturation)	Ambient moisture content (percent of total volume)	Stack gas volume sampled (dscf)	Theoretical volume water vapor (dscf)	Theoretical impinger and silica gel weight increase (grams)
1P1	29.89	59.5	1.27	187.658	2.41	51.1
2P2	29.89	59.5	1.07	195.818	2.12	45.0
1P3	29.89	59.5	1.16	220.673	2.59	54.9
2C1	29.86	80.0	2.41	128.722	3.18	67.4
2C2	29.86	80.0	1.56	240.698	3.81	80.8
2C3	29.86	80.0	2.96	271.037	8.27	175.4
3C1	29.82	47.5	1.76	158.901	2.85	60.4
3C3	29.82	47.5	1.64	176.275	2.94	62.4
3P3	29.82	47.5	0.73	160.898	1.18	25.0

on pouring stacks and four runs (1.3 tests) were completed on cooling stacks. The results presented in Section 2 and the results used in all emission factor calculations are only the results of the one simultaneous test (3 runs) on each process. The results of the three simultaneous runs show a wide range of emission rates. Since separate hoods and fans are used to capture emissions, the emission rates will vary depending on the activities near each hood. Figure 9 shows the emission rates relative to the stack locations.

The cooling test results show that as the flasks cool, lesser amounts of particulate are emitted. Cooling stacks C-1 and 2 emit more particulate than stack C-3 which vents emissions at the cool end of the line. The trend is not as clear for the measured pouring emissions. Stacks P-1 and P-3 vent the areas where most of the actual pouring is done. These two stacks indeed emit more particulate than the stack which vents the middle part of the line. When two operators are pouring they maintain a distance between them to allow for safe movement along the line since the conveyor does not stop during pouring operations. For this reason, the low emission rate measured near the middle of the pouring line appears to be justifiable. The stack gas temperatures also confirm this trend since the lowest gas temperature is in the middle stack where little pouring activity occurs.

The results also indicate that pouring emissions are about 50 percent greater than cooling emissions. Emission factors presented thus far have been based only on the weight of the hot metal poured in the flasks as they leave the pouring line and enter the cooling room. Foundry personnel indicated that the cores are the major source of emissions. The cores are essentially sand which has been mixed with either a heat set or chemically set resin. Cores breakdown as the hot metal cools and the core material is recycled as molding sand after screening out any remaining lumps. Some flasks have no cores, some have up to 15 percent of the total weight as cores. The total particulate emission factors associated with the weights of sand/cores and hot metal are shown in Table 6. The daily average of the sand to hot metal ratio is similar enough to prevent any significant correlations or trends to be determined. The average total emission rate from all six stacks is 6 pounds of particulate per hour. This translates to a total of 18 tons per year.

Particle Size Distribution

Andersen cascade impactors equipped with cyclone precollectors and glass fiber substrates were used to determine particle size distribution. The impactors were operated at constant flow rates simultaneous with the total particulate runs. Run times on the order of four hours were required to get adequate particulate loading on the substrates. Each impactor run was conducted over four sample points, the same four points sampled during total particulate runs. Five runs were completed on the cooling stacks and four on pouring stacks.

The average total particulate emission rate determined using the impactor results compares very closely to the average determined using the modified Method 5 data. A summary of impactor data is provided in Table 7. Field data sheets are provided in Appendix D-2 and gravimetric analysis data sheets are provided in Appendix F-2

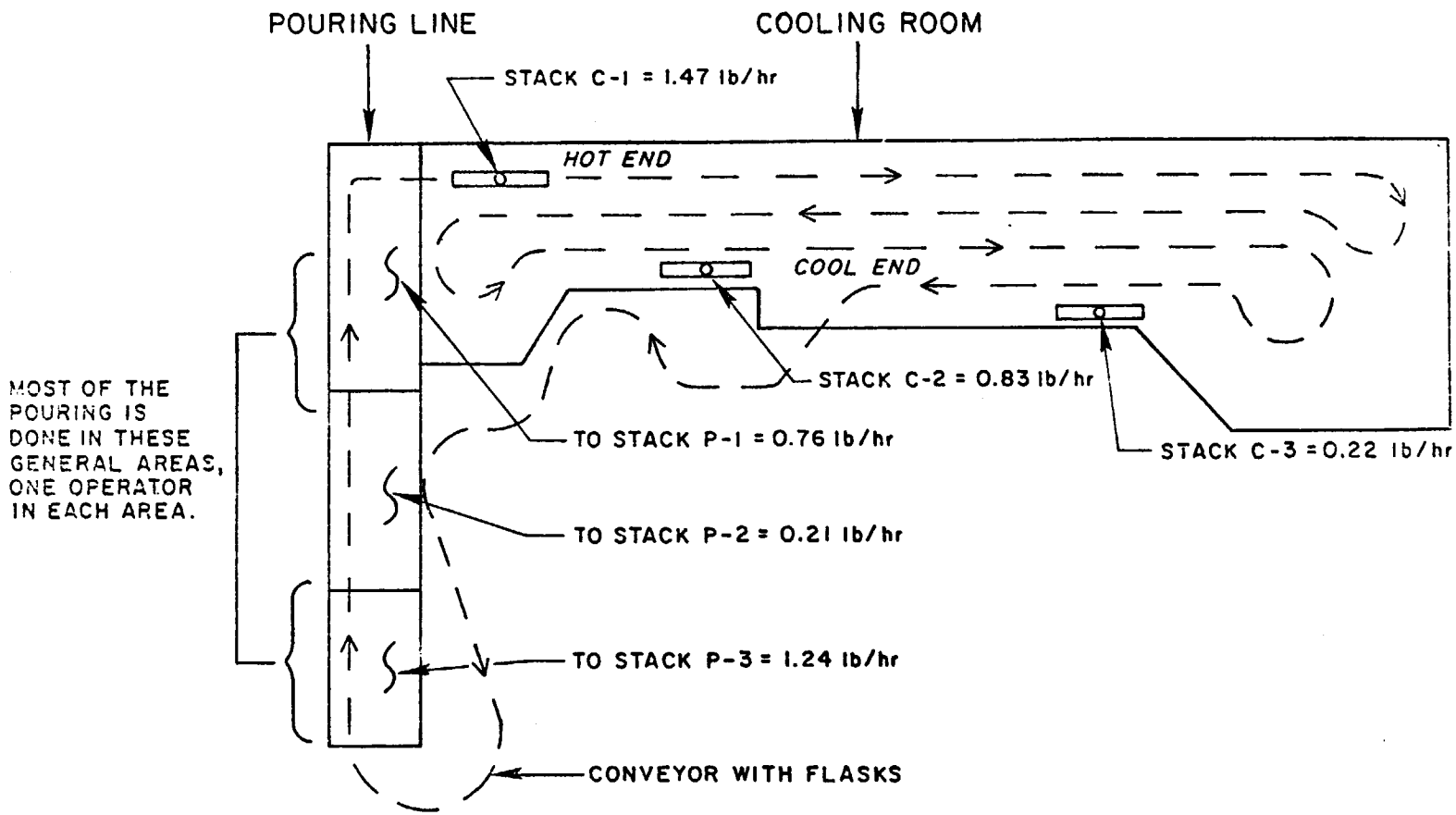


Figure 9. Comparison of stack location and emission rate, Lynchburg Foundry, Lynchburg, Virginia.

TABLE 6. PRODUCTION DATA SUMMARY AND PROCESS SPECIFIC TOTAL PARTICULATE EMISSION FACTORS, LYNCHBURG FOUNDRY, LYNCHBURG, VIRGINIA

Parameter	Units	12/16/81	12/17/81	12/18/81	Average
Production Data					
Sand & cores	ton/hr	86	93	108	96
Hot metal	ton/hr	17.4	20.6	17.8	18.6
Total	ton/hr	103	114	126	115
Particulate Emission Factors					
Sand & cores	lb/ton	0.026	0.019	0.020	0.021
Hot metal	lb/ton	0.127	0.086	0.120	0.111
Total	lb/ton	0.021	0.016	0.017	0.018

TABLE 7. SUMMARY OF IMPACTOR RESULTS, LYNCHBURG FOUNDRY, LYNCHBURG, VIRGINIA

Parameter	Units	Run No.								
		1P1	2P2	1P3	2C1	2C2	2C3	3C1	3C3	3P3
Run date		12/16/81	12/16/81	12/16/81	12/17/81	12/17/81	12/17/81	12/18/81	12/18/81	12/18/81
Run duration	min	240	170	240	240	240	240	240	240	240
Impactor flow rate	acfm	0.402	0.380	0.403	0.416	0.402	0.413	0.411	0.400	0.389
Cyclone cut point	microns	8.51	8.53	8.48	8.57	8.40	8.66	8.82	8.94	8.46
Particulate mass										
In cyclone	mg	13.5	4.68	7.84	11.91	31.35	4.28	5.10	1.98	3.86
Total of 8 stages	mg	3.62	1.80	2.96	2.73	5.85	4.58	2.18	4.40	5.97
Backup filter	mg	1.17	1.05	2.07	1.27	1.44	2.81	1.25	0.83	1.55
Total	mg	18.29	7.53	12.87	15.91	38.64	11.67	8.53	7.21	11.38
Particulate concentration	mg/dscm	6.72	4.05	4.70	6.02	14.25	4.39	3.18	2.76	4.24
	gr/dscf	0.0029	0.0018	0.0021	0.0026	0.0062	0.0019	0.0014	0.0012	0.0018
Isokinetic rate	percent	96.1	148.6	171.2[a]	135.3	90.0	77.0	136.1	76.1	98.9

[a]Wrong nozzle accidentally installed on cyclone precutter.

The particle size results were calculated by the interactive computer program developed by RTI for EPA. This Particulate Data Reduction and Entry System (PADRE) requires that data be entered in response to specific prompts. PADRE checks each response before storing the data and warns the user if an error is detected. The user enters field data and the gravimetric analysis results and PADRE calculates the results.

PADRE also requires a user to make an assumption regarding the validity of the backup filter weight gain. For this report, it was assumed that 100 percent of the backup filter weight gain was actually caused by particles smaller than the last impaction stage cut diameter. It is possible that this assumption is inaccurate and a significant percentage is caused by particle bounce and other factors. The effect of this assumption on the results is limited to particles smaller than about 2 microns.

The results provided in Appendix E-2 were calculated by PADRE using the Task Group on Lung Dynamics definition of aerodynamic diameter. This definition assumes that the particles are of unit density. The particle diameters that result are strictly aerodynamic sizes and do not represent the physical (classical) or impaction (stokes) diameters. PADRE also requires the user to input the maximum particle diameter. This value was determined through microscopic examination of the prefilters used during the blank impactor run. A calibrated image shearing microscope is used and the microscopist report is provided in Appendix G. The largest particle observed was 30 microns and this value was entered into PADRE to be used in the interpolation routines. PADRE uses a finite difference function to curve fit results and calculate results at standard particle diameters. The results of the blank run were insignificant, below 0.5 mg weight gain on each stage.

The average results, wherein all pouring and cooling runs are combined, show that 90 percent of the particles are less than 20 microns as shown in Figure 10. The microscopist estimated that 95 percent (by number) are submicron. A possible explanation for the disparity would be the treatment of cyclone precutter data. When recovering cyclone precutter samples in the field there was no dry catch in the cyclone cups to recover and the cyclone samples consisted of an acetone rinse of all inside surfaces. A second sample, consisting of an acetone rinse of the impactor cone is routinely obtained and the weight results are added to the first impaction stage weight gain. The cyclone precutter rinse residue weight is assigned a lower cut diameter based on calculations provided by SoRI. In the case where the bulk of the cyclone sample is obtained from the cyclone cup, the assignment of a cut size is justified, however, the samples collected here may have consisted of submicron particles that adhered to the inside walls of the cyclone through electrostatic and/or other unquantified forces. The samples obtained by rinsing the impactor cone may also have been submicron particles, however, two data points representing about 15 and 12 micron particle sizes were entered into PADRE. Lumping these inputs together with the first two stages of the impactor and using the second stage d_{50} would probably result in a much higher fraction of particles smaller than 15 microns. This treatment of the data would be justified for several reasons. The cut point of the cyclone precollector is typically between the cut points of the first two impactor

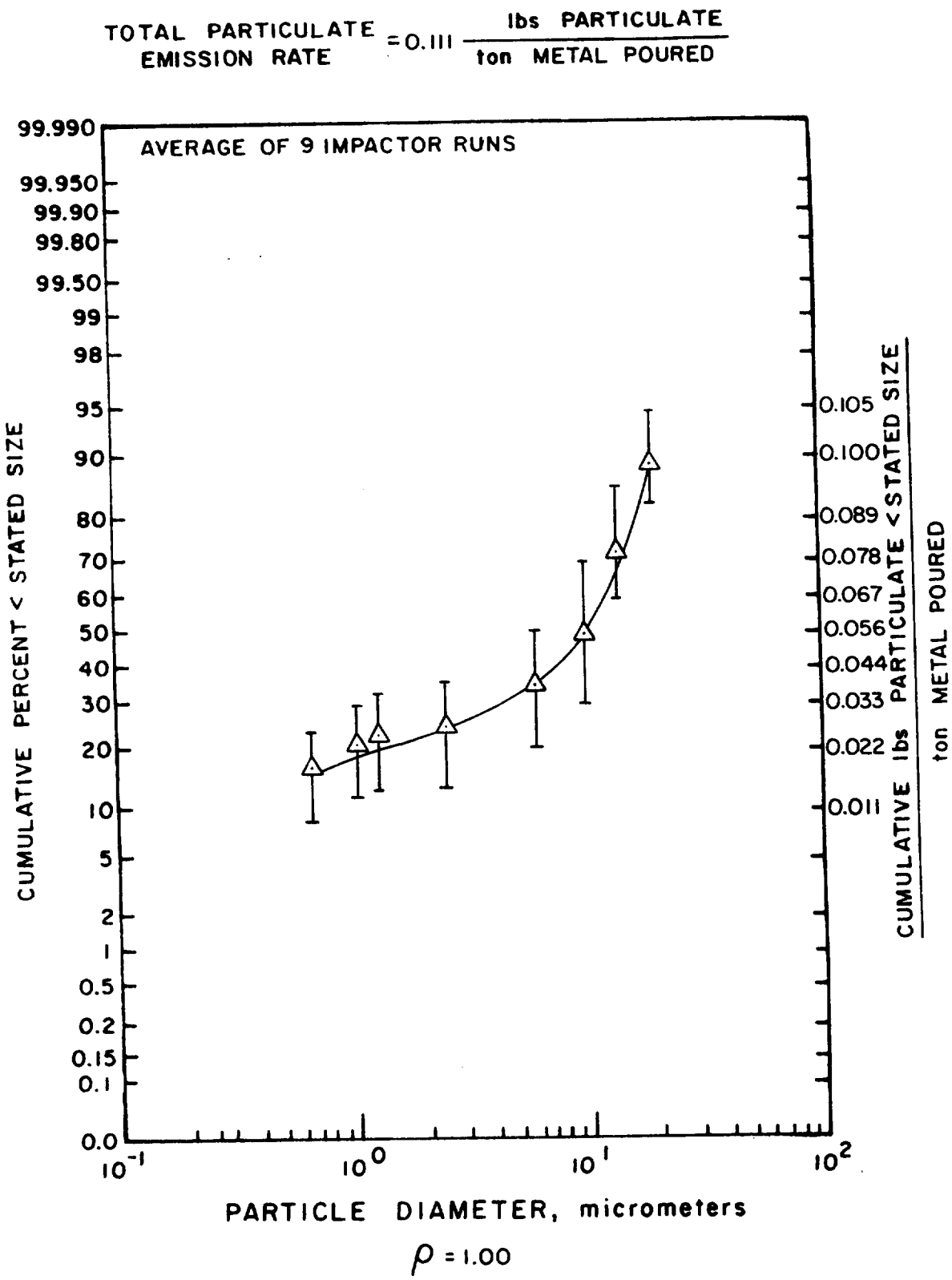


Figure 10. Average particle size distribution of uncontrolled pouring and cooling emissions, Lynchburg Foundry, Lynchburg, Virginia.

stages. The weight results of the first two impaction stages are therefore infuenced by the premature collection of these particles in the cyclone. Adding the precollector, cone and first stage weights to the second stage weight will allow a smoother curve fit through the maximum particle diameter and prevent any artificial steps in the size distribution curve. The current version of PADRE disqualifies from particle size calculations any stages with cutpoints less than 40 percent smaller than the preceding stage. This also applies to the first couple impactor stages if their cutpoints are greater than or almost equal to the cyclone cut size.

In summary, the low particulate mass concentration in the stack gas required long impactor run times and allowed for traversing all four sample points. The results appear to be biased low due to the calculation methods used and the bias is probably less than 10 percent.

Dual Cyclone Results

The IP dual cyclones, developed by SoRI and built by Sierra Instruments, were operated in two of the three stacks not being sampled by total particulate and impactor trains. The cyclone nozzles were positioned at the center of the stack and operated at constant flow rate. On the first sampling day, the cyclones were operated for 5.5 hours and upon recovery there was no dry catch visible in the cyclone cups. The glass fiber and teflon filters used during each run were well loaded. Since the primary goal of cyclone sampling was to obtain bulk size fractionated particulate samples, it was decided in the field to operate the next runs as long as possible over the two remaining days. A total of 9 hours of sampling time still produced very little visible catch in the cyclone cups, however, several backup filters were appropriately loaded. The results for each run are detailed in Table 8 and a summary of results was shown earlier in Table 2. Detailed particulate analysis results are provided in Appendix F-3. The particulate emission factors presented are based solely on the dual cyclone total particulate catch, however, the stack gas volumetric flow rate was determined as part of the Method 5 measurements.

The size fractions agree well with the impactor derived size distribution as shown in Figure 11. The total particulate emission rates vary by as much as 3 times the Method 5 total particulate results. Small sample sizes and single point versus four point sampling may account for the majority of the difference. The potential for wall losses in the sampler is similar in magnitude to the impactor cyclone precutter. For these reasons the dual-cyclone fractional results appear to be biased slightly low. Example cyclone cut point calculations are provided in Appendix C-3 and example emission factor calculations are provided at the end of Appendix C-2. The field data sheets are presented in Appendix D-3.

In summary, only backup filter samples were obtained for future chemical analysis since the cyclone samples consisted of rinse residues. Glass fiber and teflon filters will be retained in the unrefrigerated sample bank until needed. The extremely low particulate loading in the stack combined with the small particle sizes encountered makes the dual cyclone size results questionnable. The cyclones were designed to operate in process streams containing a higher concentration of particulate matter.

TABLE 8. DUAL CYCLONE SAMPLER RESULTS, LYNCHBURG FOUNDRY, LYNCHBURG, VIRGINIA

	Units	Cooling emissions		Pouring emissions	
		1C1	1C2	2P1	2P2
Stack Gas Characteristics					
Temperature	°F	75	63	65	63
Pressure	in. Hg abs.	29.89	29.89	29.84	29.84
Viscosity	micropoise	184.1	181.4	181.8	181.4
Flow rate	dscfm	39,100	34,700	29,700	28,300
Volume Sampled	acfm	0.349	0.313	0.351	0.333
Nozzle Diameter	in.	0.138	0.138	0.138	0.138
Isokinetic Sampling Rate	percent	88.1	85.4	111.6	113.2
Particulate Total Weight Caught					
Cyclone III rinse	mg	14.92	5.95	90.14	2.15
Cyclone X rinse	mg	6.08	7.14	9.21	4.31
Cannister rinse	mg	28.14	6.96	8.96	3.44
Backup filter(s) weight gain	mg	3.41	5.19	9.82	4.05
Total	mg	52.55	25.24	118.13	13.95
Particulate Emission Rates					
Cyclone III d_{50}	microns	3.1	3.2	2.9	3.0
Emissions < Cyclone III d_{50}	percent	6.5	20.6	8.2	29.0
	gr/dscf	0.00048	0.00075	0.00080	0.00034
Cyclone X d_{50}	microns	17.1	17.6	16.6	17.0
Emissions between Cyclone III d_{50} and Cyclone X d_{50} [b]	percent	81.9	51.1	83.9	40.1
	gr/dscf	0.00602	0.00186	0.00814	0.00047
Emissions > Cyclone X d_{50}	percent	11.6	28.3	7.8	30.9
	gr/dscf	0.00085	0.00103	0.00076	0.00036
Total	gr/dscf	0.00735	0.00364	0.00971	0.00118

[a]Determined during modified EPA Method 5 tests.

[b]Cyclone III catch plus cannister rinse equals total particulate between the two cyclone cutpoints.

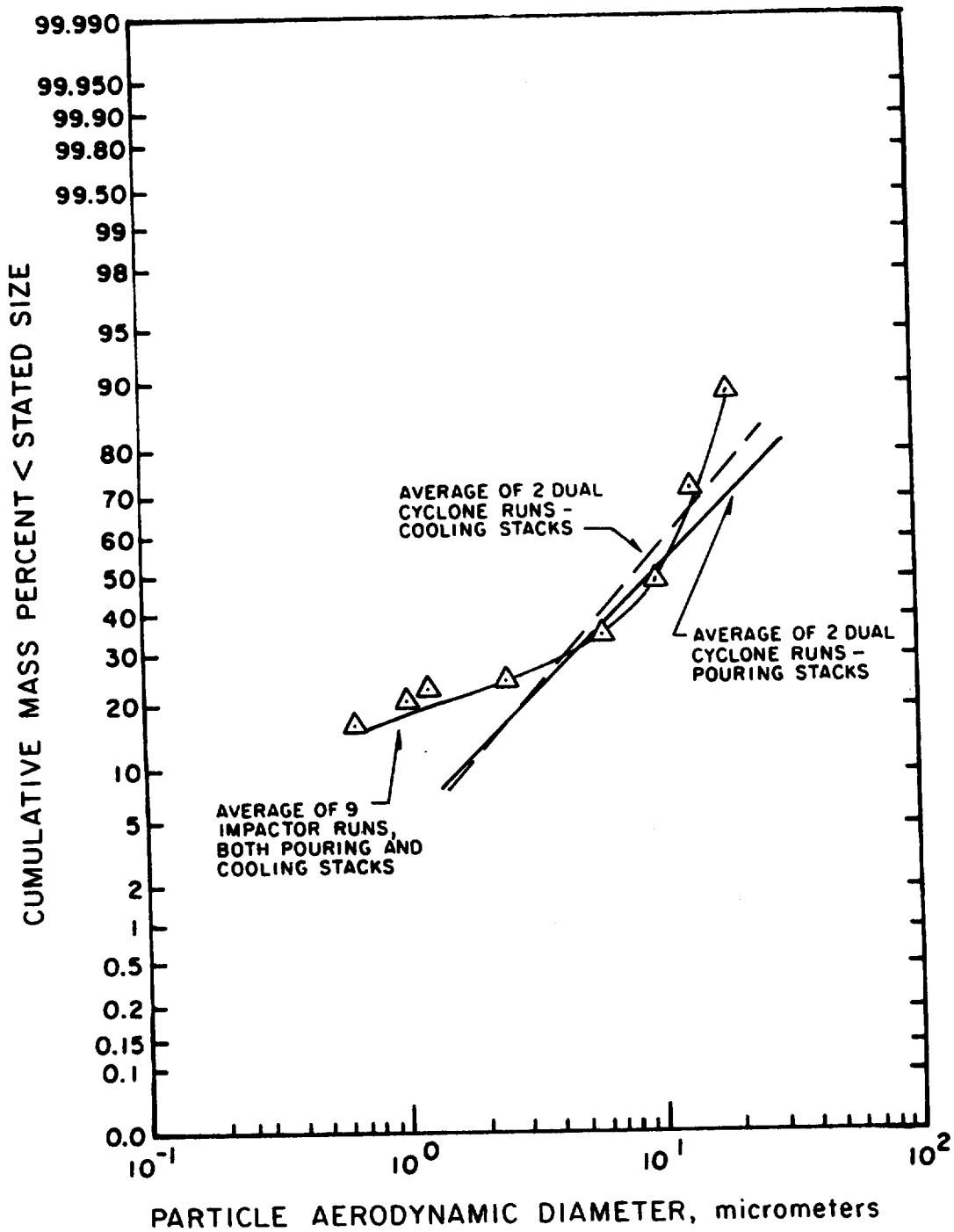


Figure 11. Comparison of dual cyclone and cascade impactor results, Lynchburg Foundary, Lynchburg, Virginia.

Comparison of Results

The total particulate catch from each of the three sample trains are compared in Table 9. IP emission factors are typically calculated using the Method 5 total particulate emission rates. The total particulate emission rate resulting from adding up the catches in the impactors is generally felt to be unreliable, however, these results do agree with the Method 5 results more closely than the dual cyclone results. The differences in emission rates and emission factors between Table 9 and previously shown results is that the Table 9 results were calculated using only the concentration method. In all previous results, the average of the area method and the concentration method were used.

The particle size results from the impactor runs is compared to the dual cyclone size results earlier in Figure 11. The dual cyclones do show good agreement with the impactors at the cyclone cut points. Although the size fractions agree, as shown in Table 9, the total emission rates are a factor of two different.

Process Observations

The process observer was in radio contact with the test team during all tests. A process upset on December 17, 1982 required stopping the tests at 1115 for about 15 minutes. Other routine delays occurred but none lasted more than 10 minutes and tests were not interrupted. The pouring and cooling line was probably operating in "well maintained" condition since recent production cut-backs and shut-downs allowed more down time to be devoted to maintenance. The types of automotive castings produced during this test program include transmission parts, brake system parts, and various housings and bores. Production at the pouring and cooling line was limited by the melting capacity of the cupola. The cupola produces a maximum of 50 tons per hour of hot metal which is divided between both north and south lines. This results in a maximum hot metal pouring rate of 25 tons per hour per line. The line is rated at 125 tons per hour total which means that approximately 100 tons per hour of sand and cores are processed.

The ratio of hot metal to sand to cores varied on a per job basis. Some flasks contained no cores and some contained as much as 1 pound of cores for every 11 pounds of sand. The number of jobs per day varied from one to six during this program. The number of molds per job varied from less than 25 for a test set to 2000 molds for the largest job tested. The weight of each flask also varied, depending on the ratio of its components. The total weight of the flask contents ranged from 850 to 950 pounds. The hourly hot metal pouring rates are presented in Table 10. The total quantities of sand, cores and hot metal passing through the pouring area is presented for each hour in Table 11. The sand used is a blend of various round grain sands and most of it is recycled. Cores are made from the same sand and are mixed with either a chemically set or a heat set resin. The cores break down, are screened for lumps and recycled into the molding sand.

TABLE 9. COMPARISON OF TOTAL PARTICULATE RESULTS

Parameters	Units	Average of simultaneous pouring runs 12/16/81	Average of simultaneous cooling runs 12/17/81	Average of 2 cooling and 1 pouring run 12/18/81	Overall average
Process weight rate	tons processed per hour	17.4	20.6	17.8	18.6
Total exhaust flow rate	dscfm	89,335	110,071	100,340	99,915
Particulate Concentration					
Method 5	gr/dscf	0.0028	0.0020	0.0024	0.0024
Impactor	gr/dscf	0.0023	0.0036	0.0015	0.0025
Dual cyclones	gr/dscf	0.0054	0.0055	--	0.0054
Particulate Emission Rate[a,b]					
Method 5	lb/hr	2.14	1.78	2.06	2.25
Impactor	lb/hr	1.76	3.40	1.29	2.15
Dual cyclones	lb/hr	4.14	5.19	--	4.66
Emission Factors[a,c]					
Method 5	lb/ton	0.123	0.086	0.119	0.110
Impactor	lb/ton	0.101	0.165	0.075	0.117
Dual cyclones	lb/ton	0.236	0.252	--	0.245

[a]Total of two or three runs not average of three runs.

[b]Concentration method only, results in Table 4 were based on average lb/hr, area method and concentration method.

[c]Based on total weight of hot metal.

TABLE 10. HOURLY HOT METAL POURING RATES, LYNCHBURG FOUNDRY, LYNCHBURG, VIRGINIA

Time intervale	Hot metal pouring rate		
	12/16/82 (tons)	12/17/82 (tons)	12/18/82 (tons)
0600-0700	-	29.13	20.34
0700-0800	21.67	28.95	18.37
0800-0900	23.46	14.00	19.20
0900-1000	22.55	20.25	14.32
1000-1100	18.70	22.40	17.22
1100-1200	23.45	13.10	19.14
1200-1300	13.66	26.02	17.92
1300-1400	9.20	15.31	15.49
1400-1500	6.30	16.59	-
Total	138.99	185.75	142.00
Average	17.37	20.64	17.75

TABLE 11. HOURLY TOTAL PROCESS WEIGHT RATES, LYNCHBURG FOUNDRY, LYNCHBURG, VIRGINIA

Time interval	Total weight passing by the pouring area			
	12/16/82 (lbs)	12/17/82 (lbs)	12/18/82 (lbs)	Average (2 or 3 days) (lbs)
0600-0700	-	-	22,496[a]	-
0700-0800	41,053[b]	168,150[c]	259,104	248,438[d]
0800-0900	264,779	248,350	270,840	261,323
0900-1000	254,595	198,198	203,008	218,600
1000-1100	211,082	214,571	243,654	223,102
1100-1200	264,779	125,577	22,560[e]	220,359[d]
1200-1300	207,646	256,609	-	232,127
1300-1400	175,215	235,778	-	205,496
1400-1430	119,848	72,301[f]	-	187,514[d]
Total	1,538,997	1,519,534	1,021,662	1,796,959
Average[d]	210,927	228,875	252,880	224,620

[a]Actual time was 0655-0700

[b]Actual time was 0748-0800

[c]Actual time was 0726-0800

[d]Time weighted average, per hour.

[e]Actual time was 1100-1105

[f]Actual time was 1400-1417

The hot metal is poured through a 5 inch diameter round hole in the top of the flask as it travels by conveyor past the pouring area. An average of 115 tons per hour of filled flasks entered the cooling room. The average pouring rate was 19 tons per hour. Emission rates presented thus far are based only on the metal pouring rate. According to plant personnel, most of the emissions result from the cores, the second most from the sand and the hot metal has the least contribution to the particulate emission rate. Earlier, Table 6 presented the total particulate emission factors based on each of the flask components separately. Daily averages are used since a test was conducted over most of the production day. The production rate values were determined by counting the flasks on the line passing a point beneath the cooling hood.

The flasks enter the cooling room where ambient air is used for cooling. The conveyor travels back and forth providing the residence time needed to sufficiently cool the flasks contents. The cooling time required for each flask is dependent on the ratio of hot metal to sand. This ratio varied from 0.16 to 0.23 during the tests and averaged 0.17 tons hot metal to tons sand.

Visible Emission Observations

Visible emission observations of the stacks being tested were conducted for two 1-hour periods with no above zero readings resulting therefore no 6-minute averages were calculable. The only emissions with observeable opacities were inside the shop, and technically they were not emissions. Fumes generated by pouring were rated light, 0-25 percent opacity. Fumes resulting from hot metal ladle transfers were also light. Moderate emissions (25-50 percent opacity) resulted from the cupola tapping operations.

APPENDIX A-1

EPA PERSONNEL AND CONTRACT NUMBERS

Program Title--Characterization of Inhalable Particulate Matter Emissions - Iron Foundry

Contract Number--68-02-3157, Technical Directive No. 12

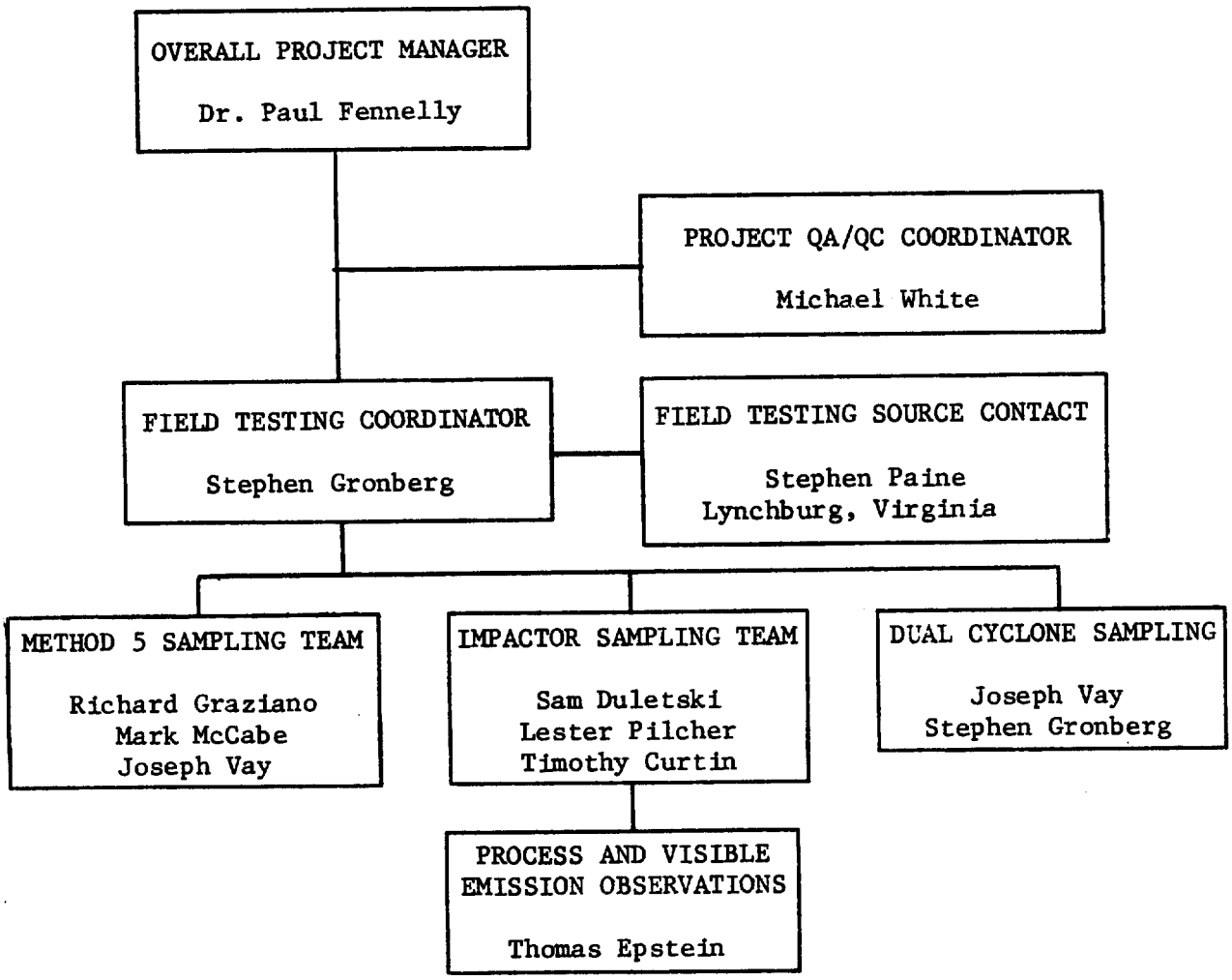
Funded By--EPA Industrial Environmental Research Laboratory
Research Triangle Park, North Carolina

EPA Project Officer--Dale Harmon

EPA Task Manager--Robert C. McCrillis

APPENDIX A-2

PROJECT ORGANIZATION CHART



APPENDIX B-1

SAMPLE TRAIN CALIBRATIONS

PRETEST NOZZLE CALIBRATION

Date 11/16/81 Set No. IP-1 Calibrated by GRONBERG

Nozzle identification (mm) number	D_1 ~~mm~~ (in.)	D_2 ~~mm~~ (in.)	D_3 ~~mm~~ (in.)	ΔD, ~~mm~~ (in.)	D_{avg}
3.5	0.135	0.135	0.134		
4.0	0.156	0.154	0.155		
4.5	0.173	0.172	0.174		
5.0	0.196	0.196	0.194		
6.0	0.234	0.234	0.234		
7.0	0.275	0.276	0.277		
8.5	0.332	0.332	0.333		
10.0	0.393	0.393	0.392		
12.0	0.472	0.469	0.471		
14.5	0.569	0.570	0.566		

POST-TEST NOZZLE CALIBRATION

Date _____ Set No. _____ Calibrated by _____

where:

$D_{1,2,3}$ = nozzle diameter measured on a diff[illegible]
Tolerance = measure within 0.25 mm ([illegible] in.).

ΔD = maximum difference in any two measurements [illegible]
Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

PRETEST NOZZLE CALIBRATION

Date 11/20/81 Set No. straight Calibrated by [illegible]

Nozzle identification number	D_1 mm, (in.)	D_2 mm, (in.)	D_3 mm, (in.)	ΔD, mm,)in.)	D_{avg}
1G	0.125	0.127	0.128	0.003	0.127
1H					
1L	0.499	0.500	0.501	0.003	0.500
2G	0.124	0.124	0.125	0.001	0.124
2H	0.187	0.188	0.188	0.001	0.188
2I	0.250	0.251	0.252	0.002	0.251
2J	0.310	0.310	0.311	0.001	0.310
2L	0.501	0.501	0.502	0.001	0.501
3I	0.306	0.306	0.307	0.001	0.306
3J	0.373	0.374	0.375	0.002	0.374
3K	0.501	0.502	0.502	0.001	0.502

POST-TEST NOZZLE CALIBRATION

Date _____ Set No. _____ Calibrated by _____

where:

$D_{1,2,3}$, = nozzle diameter measured on a different diameter, mm (in.). Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.). Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

PRETEST NOZZLE CALIBRATION

Date 11/16/91 Set No. B Calibrated by TEpsten

Nozzle identification number	D_1 mm, (in.)	D_2 mm, (in.)	D_3 mm, (in.)	ΔD, mm,)in.)	D_{avg}
3.0	0.115	0.115	0.115	0	0.115
3.5	0.135	0.135	0.134	0.001	0.135
→ 4.0	0.157	0.157	0.157	0	0.157
4.5	0.176	0.176	0.176	0	0.175
5.0	0.195	0.195	0.196	0.001	0.195
6.0	0.236	0.236	0.236	0	0.236
7.0	0.275	0.275	0.275	0	0.275
8.5	0.335	0.335	0.336	0.001	0.335
10.0	0.393	0.394	0.394	0.001	0.394
12.5	0.470	0.471	0.471	0.001	0.471
14.5	0.564	0.564	0.565	0.001	0.564

POST-TEST NOZZLE CALIBRATION

Date _____ Set No. _____ Calibrated by _____

where:

$D_{1,2,3}$ = nozzle diameter measured on a different diameter, mm (in.). Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.). Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

PRETEST NOZZLE CALIBRATION
Andersen Cyclone

Date 11/16/81 Set No. A Calibrated by T Epstein

Nozzle identification number	D_1 mm, (in.)	D_2 mm, (in.)	D_3 mm, (in.)	ΔD, mm,)in.)	D_{avg}
3.0	0.115	0.115	0.115	0	0.115
3.5	0.134	0.134	0.134	0	0.134
→ 4.0	0.150	0.150	0.149	0.001	0.150
4.5	0.175	0.175	0.175	0	0.175
5.0	0.195	0.195	0.195	0	0.195
6.0	0.235	0.235	0.235	0	0.235
7.0	0.276	0.276	0.275	0.001	0.275
8.5	0.335	0.335	0.335	0	0.335
10.0	0.394	0.394	0.395	0.001	0.394
12.5	0.470	0.470	0.470	0	0.470
14.5	0.564	0.564	0.565	0.001	0.564

POST-TEST NOZZLE CALIBRATION

Date _____ Set No. _____ Calibrated by _____

where:

$D_{1,2,3}$ = nozzle diameter measured on a different diameter, mm (in.). Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.). Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

M3

PRETEST NOZZLE CALIBRATION

Date 11/17/81 Set No. 6 Calibrated by T Epskn

Nozzle identification number	D_1 mm, (in.)	D_2 mm, (in.)	D_3 mm, (in.)	ΔD, mm, (in.)	D_{avg}
6-1	0.123	0.123	0.123	0	0.123
6-2	0.152	0.152	0.152	0	0.152
6-3	0.188	0.188	0.189	0.001	0.188
6-4	0.249	0.249	0.249	0	0.249
6-5	0.302	0.302	0.302	0	0.302
6-6	0.373	0.373	0.373	0	0.373
6-7	[illegible]	[illegible]	0.502	0.001	0.500

POST-TEST NOZZLE CALIBRATION

Date _____ Set No. _____ Calibrated by _____

where:

$D_{1,2,3}$ = nozzle diameter measured on a different diameter, mm (in.). Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.). Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

M5

PRETEST NOZZLE CALIBRATION

Date 11/17/81 Set No. 1 Calibrated by TEgkin

Nozzle identification number	D_1 mm, (in.)	D_2 mm, (in.)	D_3 mm, (in.)	ΔD, mm,)in.)	D_{avg}
1-1	0.123	0.123	0.122	0.001	0.123
1-2	0.152	0.152	0.152	0	0.152
1-3	0.196	0.196	0.197	0.001	0.196
1-4	0.250	0.250	0.250	0	0.250
1-5	0.300	0.300	0.300	0	0.300
1-6	0.373	0.373	0.372	0.001	0.373
1-7	0.500	0.500	0.500	0	0.500

POST-TEST NOZZLE CALIBRATION

Date _____ Set No. _____ Calibrated by _____

where:

$D_{1,2,3}$ = nozzle diameter measured on a different diameter, mm (in.)
Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.).
Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

Method 5

PRETEST NOZZLE CALIBRATION

Date 11/17/81 Set No. 5 Calibrated by T Epsrin

Nozzle identification number	D_1 mm, (in.)	D_2 mm, (in.)	D_3 mm, (in.)	ΔD, mm, (in.)	D_{avg}
5-1	0.120	0.120	0.121	0.001	0.120
5-2	0.130	0.130	0.131	0.001	0.130
5-3	0.186	0.187	0.187	0.001	0.187
5-4	0.250	0.250	0.250	0	0.250
5-5	0.311	0.310	0.311	0.001	0.311
5-6	0.372	0.372	0.372	0	0.372
5-7	0.490	0.490	0.490	0	0.490

POST-TEST NOZZLE CALIBRATION

Date _____ Set No. _____ Calibrated by _____

where:

$D_{1,2,3}$ = nozzle diameter measured on 3 different diameters, mm (in.).
Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.).
Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

PRETEST NOZZLE CALIBRATION

Date 11/16/81 Set No. 4 Calibrated by T Eplin

Nozzle identification number	D_1 mm, (in.)	D_2 mm, (in.)	D_3 mm, (in.)	ΔD, mm,)in.)	D_{avg}
4-1	0.123	0.123	0.124	0.001	0.123
4-2	0.154	0.154	0.154	0	0.154
4-3	0.192	0.192	0.192	0	0.192
4-4	0.250	0.250	0.250	0	0.250
4-5	0.312	0.312	0.312	0	0.312
4-6	0.376	0.376	0.376	0	0.376
4-7	0.499	0.499	0.499	0	0.499

POST-TEST NOZZLE CALIBRATION

Date _____ Set No. _____ Calibrated by _____

where:

$D_{1,2,3}$ = nozzle diameter measured on a different diameter, mm (in.). Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.). Tolerance = 0.1 mm (0.004 in.).

D_{avg} = average of D_1, D_2, D_3.

LEAK TEST @ 15 psi

0.007 cf/m at 5.5" Hg

BAR. 30.13 "Hg

BALLAST Temp 92 °F

DGM CALIBRATION VI

Time	ΔH MAN	D.G. INITIAL	D.G. FINAL	D.G. NET	W.T. INITIAL	W.T. FINAL	W.T. NET	DRY BULB IN	DRY BULB OUT	WTM °F	WTM PS
0	0.5	565.990		5.010	7	7	5.000	63	69	69.5	30.13
2		567.140						63	69		
4		568.295						63	69		
6		569.450			8.69			63	69		
8		570.595						63	69		
10		571.000						63	69		
	1.0	573.011		10.026	4	4	10.000	63	69	69.5	30.11
		574.655						63	69		
		576.310						63	69		
		577.946						63	69		
		579.580						63	69		
		581.210			12.23			63	69		
		583.037						63	69		
	2.0	587.048		10.022	8	8	10.000	63	69	69.5	30.09
		589.285						63	69		
		591.525			8.92			63	69		
		593.795						63	69		
		596.025						63	69		
		597.070						63	69		

Cont. 1051 @ 13 psi

0

Ambient { BAR. 29.85 in
Temp 72 °

DGM CALIBRATION 2258

Time	Δ # MAN	D.G. INITIAL	D.G. FINAL	D.G. NET	W.T. INITIAL	W.T. FINAL	W.T. NET	D.G. T°F IN	D.G. T°F OUT	W.T.M. T°F	W.T. Ps
0	0.5	942.188		5.223	4.000	9.000	5.000	92	85	69.5	
2		943.030						93	85		
4		943.870						95	85		
6		944.725						96	85		
8		945.560						97	85		
10		946.390						98	85		
		947.411						99	85		
	1.0	949.505		10.540	1.000	1.000	10.000	103	86	69.5	
		950.110						103	86		
		951.288						104	86		
		952.480						104	87		
11/2		953.625						105	87	104.5 °F	
		954.800						105	87		
		955.980						105	87		
		957.155						105	87		
		958.325						105	88		
		959.505						106	88		
		960.045									
	1.0	961.102		10.533	8.000	2.000	10.000	106	88	69.5	
		962.270						106	88		
		963.440						106	88		
		964.605						106	89		
		965.400						106	89		
		966.975						106	89		
		968.140						106	89		
		969.325						107	89		
		970.495						107	89		
		971.635									
	2.0	974.715		10.250	5.000	5.000	10.000	77	71	69.0	
		976.290						80	71		
		977.865						83	72		
		979.460						86	72		
		981.050						89	73		
11/3		982.625						91	73		30.1
		984.230						93	74		
		984.965						93	74		

12.34 m.h

16.91 m.h

17.94 m.h

12.91 m.h

LEAK TEST @ 15 PSI

0

Ambient { BAR. 30.02 "Hg
Temp 72 °F

D.G.M. CALIBRATION 2547

Time	ΔH MAN	D.G. INITIAL	D.G. FINAL	D.G. NET	W.T. INITIAL	W.T. FINAL	W.T. NET	D.G. T°F IN	D.G. T°F OUT	W.T.M. T°F	W.T.M. Ps
0	0.5	546.972		5.258	4.000	9.010	~~[illegible]~~	91	83	68.5	
2		547.810						93	83		
4		548.645					5.010	94	83		
6		549.495						95	83		
8		550.320						96	83		
10		551.160						97	83		
		552.230						97	83		
				12.56		30.01 "Hg					
	1.0	556.265		16.377	3.000	3.000	10.000	103	84	68.5	
		557.420						104	84		
		558.570						104	84		
		559.720						105	84		
		560.875						106	85		
		562.040						106	85		
		563.195						106	85		
		564.345						106	85		
		565.532						106	85		
		566.642						106	85		
				17.98 min		30.00 "Hg					
	2.0	574.975		10.657	1.000	1.000	~~[illegible]~~ 10.000	111	86	68.5	
		576.625						112	87		
		578.270						113	87		
		579.930						114	87		
		581.575						114	88		
		583.240						115	88		
		584.990						115	88		
		585.635						115	88		
				12.89		29.98 "Hg					

LEAK TEST @ 15 psi

0.001 at 15" Hg

AMBIENT { BAR. 29.80" ; TEMP 73 °

D.G.M. CALIBRATION

TIME	ΔH MAN	D.G. INITIAL	D.G. FINAL	D.G. NET	W.T. INITIAL	W.T. FINAL	W.T. NET	DGT °F IN	DGT °F OUT	W.T.M. °F	W.T. PS
0	0.5	847.470		5.085	9	9	5.000	88	71	68.25	
2		848.265						90	72		
4		849.065						91	73		
6		849.865		12.70				92	73		
8		850.660						94	74		
10		851.465						95	75		
		852.265						96	75		
		852.555						96	76		
	1.0	857.700		10.380	9	9	10.000	103	80	68.25	
		858.615						103	80		
		859.045						104	81		
		861.075						104	81		
		862.200						104	82		
		863.525						105	82		
		864.445		18.40				105	83		
		865.590						105	83		
		866.720						105	83		
		867.460						105	84		
		868.080						105	84		
	2.0	872.262		10.474	3	3	10.000	109	85	68.25	
		873.840						109	85		
		875.435						109	85		
		877.035		13.13				109	85		
		878.635						109	86		
		880.230						109	86		
		881.830						109	86		
		882.736						109	86		
									97.25		

LEAK TEST @ 15 PSI

0

Ambient { BAR. 30.10 "Hg
Temp ~~70~~ 70°F

11/11/81 DGM CALIBRATION 2257

Time	Δ# MAN	D.G. INITIAL	D.G FINAL	D.G. NET	W.T. INITIAL	W.T. FINAL	W.T. NET	D.G T°F IN	D.G T°F OUT	W.T.M. T°F	W.T.M Ps
0	0.5	21.094		5.120	8	3	5.000	71	66	68.0	
2		~~21.880~~						74	66		
4		22.686						78	67		
6		23.486						80	69		
8		24.286			12.76 min			83	68		
10		25.086						85	69		
		25.900						87	70		
		26.204						85	70		
	1.0	32.410		10.425	9	9	10.000	101	74	68.0	30.09
		33.450						102	75		
		34.560						103	76		
		35.765						104	77		
		36.880						105	78		
		38.050			16.60			105	79		
		39.135						106	79		
		40.250						106	80		
		41.380						106	80		
		42.505						106	81		
		42.835						107	81		
	2.0	48.085		10.535	4	4	10.000	113	83	67.5	30.08
		49.655						114	84		
		51.230						115	84		
		52.815						116	85		
		54.385			13.35			116	85		
		55.965						117	86		
		57.550						117	86		
		58.620						117	86		
	0.5	61.781		5.264	7	2	5.000	109	86	67.5	30.06
		62.595						107	87		
		63.410						106	87		
		64.225						105	87		
		65.045			12.88			104	87		
		65.885						104	87		
		66.685						103	87		
		67.045						103	87		
		67.045									
		61.781									
		5.264									

LEAK TEST @ 13 psi

0

Ambient { BAR. 30.60 ", Temp 66 °

D.G.M CALIBRATION 2550

Time	ΔH MAN	D.G. INITIAL	D.G FINAL	D.G. NET	W.T. INITIAL	W.T. FINAL	W.T NET	D.G T°F IN	D.G T°F OUT	W.T.M. T°F	W.T P
0	0.1	592.174	597.2~~95~~	~~6.000~~	6.000	1.000	5.000	84	74	69.5	
2		592.555						85	74		
4		592.942						~~85~~	75		
6		593.330						86	75		
8		593.720						86	76		
10		594.106		5.101				87	77		
		594.490						88	77		
		594.885						89	78		
		595.270				26.15 min		89	79		
		595.670						90	79		
		596.055						91	80		
		596.448						91	80		
		596.848						92	81		
		597.275			1.000			92	82		
	0.5	600.422		5.278	4.000	9.000	5.000	102	84	69.5	
		601.242						103	85		
		602.073						104	85		
		602.910						104	86		
	baron = 30.59	603.738				12.715 min		105	86		
		604.565						105	87		
		605.405						106	87		
		605.700						106	87		
	1.5	607.830		10.706	1.000	1.000	10.000	110	88	69.5	
		609.250						112	89		
		610.680						113	90		
		612.110						115	90		
	30.59" Hg	613.540				14.95 min		116	91		
		614.975						117	91		
		616.410						117	92		
		617.840						118	92		
		618.536						118	93		

0.00 at 5" Hg

Ambient { BAR. 30.02 "Hg
TEMP 72 °F

D.G.M. CALIBRATION V2 (spare)

Time	ΔH MAN	D.G. INITIAL	D.G. FINAL	D.G. NET	W.T. INITIAL	W.T. FINAL	W.T. NET	DGT °F IN	DGT °F OUT	W.T.M. T °F	W.T.M. Ps
0	0.5	945.550		4.978	8	3.0	5.00	73	71	69.5	
2	0.49	946.255						73	71		
4		946.965						73	71		
6		947.675			14.16			73	72		
8		948.380						73	72		
10		949.080						73	72		
		949.770						73	73		
		950.528									
	1.0	951.529		10.050	4	4	10.000	73	74	69.5	
		952.540						73	74		
		953.545						73	74		
		954.560						73	75		
		955.575						73	75		
		956.585						74	75		
		957.600			19.85			74	76		
		958.615						74	76		
		959.625						74	76		
		960.635						74	76		
		961.578						74	76		
	2.0	963.602			6	6	10.000	74	77		
		965.055						74	77		
		966.505						74	77		
		967.945						74	78		
		969.400			14.01			74	78		
		970.845						74	78		
		972.300						74	78		
		973.758						74	78		

LEAK TEST @ 15 psi

0

Ambient { BAR. 30.57 "
Temp 69 °

D.G.M CALIBRATION 2438

Time	Δ # MAN	D.G. INITIAL	D.G FINAL	D.G NET	W.T. INITIAL	W.T. FINAL	W.T. NET	D.G T°F IN	D.G T°F OUT	W.T.M. T°F	W.T. Ps
0	0.5	442.475			8.000	1.000	5.000	89	70	69.5	
2		443.280					5.020	89	70		
4		444.098						92	71		
6		444.920						95	71		
8		445.772									
10											
										~~69.5~~	
	0.5	447.642		5.223	3.000	8.000	5.000	99	74	69.5	
		448.452						101	74		
		449.270						102	75		
		450.080						103	76		
		450.898			12.80 min			104	76		
		451.715						104	77		
		452.530						105	77		
		452.865						105	78		
	1.0	454.950		10.501	0.000	0.000	10.000	109	79	69.5	
		456.090						110	79		
		457.238						110	80		
		458.370						111	81		
		459.510						111	81		
		460.655			18.37 min			111	81		
		461.805						112	82		
		462.965						112	82		
		464.110						112	83		
		465.246						112	83		
		465.451						112	83		
	2.0	467.555		10.549	2.000	2.000	10.000	115	84	69.5	
		469.168						116	84		
	(30.58 "Hg)	470.775						117	85		
		472.390			13.08 min			117	85		
		474.060						118	85		
		475.610						118	86		
		477.250						118	86		
		478.104						116	86		

0

BAR 30.57 "Hg
TEMP 69 °F

DGM CALIBRATION 2282

TIME	ΔH MAN	D.G. INITIAL	D.G. FINAL	D.G. NET	WT. INITIAL	WT. FINAL	WT. NET	[illegible] IN	[illegible] OUT	WTM. [illegible]	WTM. P[illegible]
0	0.5	676.975		5.035	5.000	0.000	5.000	80	70	69.5	
2		677.760						82	70		
4		678.584						85	71		
6		679.397						87	71		
8		680.205						89	71		
10		681.015						89	72		
		682.010						91	72		
					12.44 min						
	1.0	683.025		10.350	1.000	1.000	10.000	94	73	69.5	
		684.140						96	74		
		685.260						98	74		
		686.380						99	75		
		687.500						101	75		
		688.615						102	76		
		689.745			18.44 min			103	77		
		690.870						104	77		
		692.000						104	78		
		693.375						105	78		
	2.0	695.460		10.618	3.000	3.000	[illegible]	109	79	69.5	
		697.015						111	80		
		696.580					10.010	112	81		
		700.140						114	83		
		701.705			13.58 min			116	84		
		703.265						116	84		
		704.825						117	85		
		706.078						117	86		

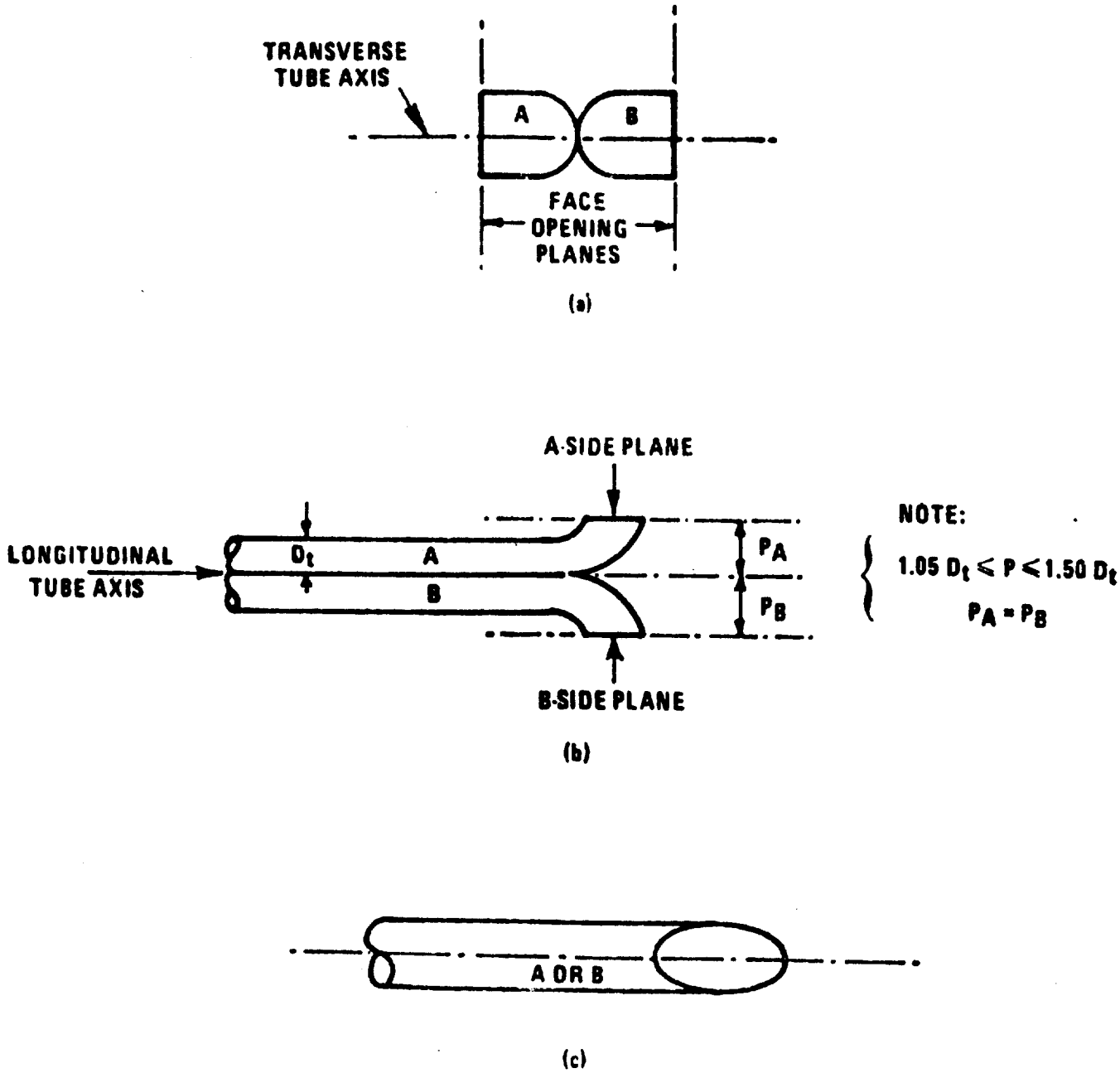


Figure 2-2. Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

$D = 3/8$

pitot #1

$\alpha_1 + \alpha_2 = 0°$

$\beta_1 = +3.5°$

$\beta_2 = 0°$

$z = 1/16''$

$\omega = 0$

$P_A = P_B = 0.5''$

pitot #2

$\alpha_1 + \alpha_2 = 0°$

$\beta_1 = 1°$

$\beta_2 = 0°$

$z = 1/16''$

$\omega = 0$

$P_A = P_B = 0.5''$

pitot #3

$\alpha_1 + \alpha_2 = 0$

$\beta_1 + \beta_2 = 0$

$z = 0$

$\omega = 0$

$P_A = P_B = 0.5''$

Pitot #4

$\alpha_1 + \alpha_2 = 0°$

$\beta_1 + \beta_2 = 0°$

$z = 1/16''$

$\omega = 0''$

$P_A = P_B = 0.5''$

GCA Technology Division

213 Burlington Road
Bedford, Mass 01730
(617) 275-5444

Date: 9 December 1981

To: Steven Gronberg

From: Marilyn Hoyt

Subject: Analysis of Teflon Filter; GCA Contract 1-618-022

Results of analysis conducted on a sample filter (GCA Control No. 15991) indicate that the sample contains Teflon. No evidence for other components was found.

Infrared analysis proved unsuccessful for the submitted sample. The filter material did not transmit light to a degree that a meaningful spectrum could be obtained. No suitable solvent for infrared analysis of Teflon was found.

The sample was therefore analyzed by temperature-programmed low-resolution mass spectrometry. The major fragment seen from the sample degradation up to 300°C was that for the monomer of Teflon, C_2F_4.

Marilyn Hoyt

Marilyn Hoyt

MH/dt

cc: G. T. Hunt
K. T. McGregor

METER BOX CALIBRATION INFORMATION

V2

ΔH	0.5	1.0	2.0
γ	1.009	1.002	0.992
ΔH_a	2.196	2.183	2.169
Q_a	0.352	0.506	0.725
C_c	0.300	0.615	1.233

E, 10/81

2257

ΔH	0.5	1.0	2.0
γ	1.000	0.999	1.003
ΔH_a	1.751	1.843	1.866
Q_a	0.409	0.560	0.789
C_c	0.319	0.633	1.267

E, 11/81

2180 (P-3)

ΔH	0.5	1.0	2.0
γ	1.010	1.006	1.003
ΔH_a	1.763	1.817	1.837
Q_a	0.450	0.591	0.798
C_c	0.315	0.611	1.292

E, 10/81

2438

ΔH	0.5	1.0	2.0
γ	0.992	0.998	1.000
ΔH_a	1.734	1.764	1.773
Q_a	0.408	0.572	0.806
C_c	0.310	0.620	1.268

E, 10/81

2282

ΔH	0.5	1.0	2.0
γ	1.009	0.998	0.989
ΔH_a	1.671	1.804	1.917
Q_a	0.405	0.561	0.732
C_c	0.304	0.619	1.212

E 10/81

V1

ΔH	0.5	1.0	2.0
γ	0.990	0.988	0.986
ΔH_a	0.847	0.939	0.984
Q_a	0.577	0.820	1.124
C_c	0.302	0.603	1.209

E, 10/81

2550 (P-2)

ΔH	0.1	0.5	1.5
γ	1.005	0.992	0.991
ΔH_a	1.463	1.692	1.730
Q_a	0.195	0.415	0.716
C_c	0.061	0.313	0.953

E, 10/81

2258 (P-1)

ΔH	0.5	1.0	2.0
γ	0.994	0.997	0.996
ΔH_a	1.648	1.719	1.816
Q_a	0.423	0.587	0.799
C_c	0.318	0.645	1.236

E, 10/81

2547

ΔH	0.5	1.0	2.0
γ	0.998	1.009	0.992
ΔH_a	1.691	1.719	1.744
Q_a	0.419	0.577	0.827
C_c	0.316	0.639	1.292

E, 10/81

0.75 cfm

APPENDIX B-2

FILTER WEIGHING PROCEDURES

A balance log book is kept at each balance and contains operating instructions and tolerances for the standard weights as well as a daily log listing use of balance, standard weights, calibrations, problems, etc. The operator must sign each time the balance is used.

The filter weight log book remains in the weighing room and all filter weights are recorded as weighed using the following quidelines:

1. Before weighing a group of filters, be sure they have been equilibrated properly by desiccation.

2. Rule and label columns on enough pages in the appropriate filter weight log book.

3. Zero the balance by releasing the pan without dialed in or standard weights on it.

4. Place the 100 mg Class S weight on the pan and dial in 0.1g weight. Release pan and observe readout, recording any variation from zero balancing. If necessary, adjust zero knob. While pan is released and weighing, dial off the 0.1g weight and observe that the optical scale rests at 100 mg.

5. Weigh a Class S weight in the expected filter weight range and enter the observed weight in the balance log book with the date, time and project identification.

6. Weigh filters--If an unexposed filter differs from other in its group by 0.1 gram or more, reweigh it. See table below for acceptable differences between repeat weighings of the same filter; if that difference is exceeded, reweigh all filters weighed since the standard weight. See step 8.

7. At the end of the weighing session, weigh one Class S weight or the aluminum rod and record observed weight in the balance log book.

8. Weighing audit--Plan to reweigh 7 percent of a group of filters (but not less than 4) 1 to 2 days or more after the original weighing. The filters should be equilibrated again. If these reweighings check the original weights within constant weight limits ($\pm$0.5 mg) accept all original weighings in that group as valid. If a reweighing does not check, reweigh all filters in that group. The first weight that can be checked is used as the correct weight.

APPENDIX C-1

SAMPLE CALCULATIONS FOR TOTAL PARTICULATES

Facility_____ Job No._____
Source_____ Date_____
Run_____ Calc/Review_____

SAMPLE CALCULATIONS

Particulate Isokinetic Sampling

I. Calculations for stack volume and Isokinetic Ratio

Time	Dry Gas Meter ft^3	Pitot ΔP, in. H_2O	Orifice ΔH, in. H_2O	Dry Gas Temp ^oF In	Dry Gas Temp ^oF Out	Stack Static Pressure in. H_2O	Stack Temp ^oF
T	VM	ΔP	PM	TMI	TMO	PST	TS

1. DN - Nozzle Diameter, inches _____ in.
2. PB = Barometric Pressure, inches Hg _____ in. Hg
3. TT = Net Sampling Time, minutes _____ min.
4. VM = VM final - VM initial = Sample Gas Volume, ft^3 _____ ft^3

4A. VML = Use only if any final or intermediate leak check rate is over 0.02 cfm

LI = Leak rate after any given sampling period, cfm

TLI = Total time of sampling period in which leak occurred, min.

VML = VM - [(L1 - 0.02) TL1 + (L2 - 0.02) TL2 + (L3 - 0.02) TL3 + L4 + 0.02) TL4]

= ( ) - [(- 0.02)( )+(- 0.02)( )+(- 0.02)( )+(- 0.02)( )]

= ( ) - [( )+( )+( )+( )]

= ( ) - ( ) = _____ ft^3

5. TM = Average Dry Gas Temperature at Meter, ^oF

$$TM = \frac{\text{Avg. TMI + Avg. TMO}}{2} = \_\_\_\_\_\ ^oF$$

6. PM = Average Orifice Pressure Drop, inches H_2O

PM = Avg. Δ H = ____ ÷ 13.6 = ____ in.Hg

7. Volume of dry gas sampled at standard conditions,[a] dscf

$$VMSTD = \frac{528\ (Y)(VM)\left(PB + \frac{PM}{13.6}\right)}{29.92\ (TM + 460)}$$

Y = dry gas meter calibration factor _____

$$= \frac{528\ (\quad)(\quad)(\quad)}{29.92\ (\quad)} = \_\_\_\_\_\ ft^3$$

Job No._____

Run No._____

8. VW = Total Water Collected = gm H_2O Silica gel + ml Imp. H_2O = ml

( ) + ( ) = _____

9. Volume of water vapor at standard conditions, scf

VW gas = 0.04715 × VW = scf = 0.04715 ( ) = _____ ft^3

10. Percent moisture in stack gas

$$\% M = \frac{100 \times VW\ gas}{VMSTD + VW\ gas} = \frac{100\ (\quad)}{(\quad) + (\quad)} = \frac{(\quad)}{(\quad)} =$$

= _____%

11. Mole fraction of dry gas

$$MD = \frac{100 - \%M}{100} = \frac{100 - (\quad)}{100} = \_\_\_\_\_$$

12. Molecular weight of dry stack gas

$$MWD = (\%CO_2 \times \frac{44}{100}) + (\%O_2 \times \frac{32}{100} + \left[(\%CO + \%N_2) \times \frac{28}{100}\right]$$

$$= (\quad \times 0.44) + (\quad \times 0.32) + (\quad \times 0.28)$$

$$= (\quad) + (\quad) + (\quad) = \_\_\_\_\_ \text{lb/lb mole dry}$$

12A. $$\%EA = \%\ Excess\ Air = \frac{[(\%\ O_2 - 0.5\ (\%CO)] \times 100}{[(0.264(\%N_2)] - (\%\ O_2) + 0.5\%\ (CO)}$$

$$= \frac{(\quad - \quad) \times 100}{[(0.264\ (\quad)] - (\quad) + 0.5\ (\quad)}$$

$$= \frac{(\quad) \times 100}{(\quad) - (\quad) + (\quad)} = \_\_\_\_\_\%$$

13. Molecular weight of wet stack gas

$$MW = MWD \times MD + 18\ (1 - MD)$$

$$= (\quad)\ (\quad) + 18(1 - \quad)$$

$$= (\quad) + (\quad) = \_\_\_\_\_ \text{lb/lb mole wet}$$

14. AS = Stack Area, square inches

Circular, $= \left(\frac{\text{Stack diameter}}{2}\right)^2 \pi = \left(\frac{\quad}{2}\right)^2 \pi =$ _____ sq. in.

Rectangular, = Length × width=( )( ) = _____ sq. in.

15. PS = Stack Pressure, absolute, inches Hg = PB ± AV PST

PST = Stack static pressure

Job No._____

Run No._____

$$PST\ in.\ Hg = \frac{PST\ in.\ H_2O}{13.6} = \frac{\quad}{13.6} = \_\_\_\_\_ in.\ Hg$$

$$PS = PB \pm Avg.\ PST = (\qquad)(\qquad) = \_\_\_\_\_ in.\ Hg$$

16. TS = Average Stack Temperature, _____ $^{o}F + 460 =$ _____ ^{o}R

$$TS = Average\ TS \quad \sqrt{TS_{AV} + 460} = \_\_\_\_\_$$

17. $SDE_{AV} = (\sqrt{\Delta P})_{AV} \times \sqrt{TS_{AV} + 460)} = (\qquad)(\qquad) = \_\_\_\_\_$

18. Stack gas velocity at stack conditions, afpm

$$VS = 5130^{(e)} \times Cp \times Avg.\ (SDE) \times \left[\frac{1}{PS \times MW}\right]^{\frac{1}{2}} = afpm$$

Cp = pitot tube coefficient

$$= 5130 \times (\qquad) \times (\qquad) \times \left[\frac{1}{(\qquad)(\qquad)}\right]^{\frac{1}{2}} = \_\_\_\_\_ afpm$$

19. Stack gas volumetric flow rate at standard conditions,[c] dscfm

$$Q_s = \frac{528 \times VS \times AS \times MD \times PS}{(29.92)(144)(TS + 460)} = dscfm$$

$$= \frac{528\ (\qquad) \times (\qquad) \times (\qquad) \times (\qquad)}{29.92 \times 144\ (\qquad)} = \_\_\_\_\_ dscfm$$

20. Stack gas volumetric flow rate at stack conditions, acfm[d]

$$Q_a = \frac{29.92 \times QS\ (TS + 460)}{(528)\ (PS)\ (MD)} = acfm$$

$$= \frac{29.92\ (\qquad)(\qquad)}{528\ (\qquad)(\qquad)} = \_\_\_\_\_ acfm$$

21. Percent isokinetics

$$\%\ I = \frac{1{,}039^{(f)} \times (TS + 460) \times VMSTD}{VS \times TT \times PS \times MD \times (DN)^2}$$

---

[a]Dry standard cubic feet at 68°F (528R) and 29.92 in. Hg.

[b]Standard conditions at 68°F (528R) and 29.92 in. Hg.

[c]Dry standard cubic feet per minute at 68°F (528) and 29.92 in. Hg.

[d]Actual cubic feet per minute

$$^{e}5130 = 85.5\ \frac{ft}{sec}\left[\frac{(lb/lb\ mole)(in.\ Hg)}{(^{o}R)(in.\ H_2O)}\right]^{\frac{1}{2}} \times 60\ sec/min$$

$$^{f}1039 = \frac{29.92\ in.\ Hg}{528\ DegR} \times \frac{144\ in.^2}{ft^2} \times \frac{4}{\pi} \times 100$$

Job No._____
Run No._____

$$= \frac{1{,}039 \times (\quad) \times (\quad)}{(\quad) \times (\quad) \times (\quad) \times (\quad) \times (\quad)^2}$$

$= \_\_\_\_\_\%$

II. Calculations for grain loading and emission rates

22. Particulate, gr/dscf

$$\text{gr/dscf} = 0.0154 \times \frac{\text{mg}}{\text{VMSTD}} = \frac{0.0154\ (\quad)}{(\quad)} = \_\_\_\_\_\ \text{gr/dscf}$$

23. Particulate at stack conditions, gr/acf

$$\text{gr/acf} = \frac{528 \times \text{gr/dscf} \times \text{PS} \times \text{MD}}{29.92\ (\text{TS} + 460)}$$

$$= \frac{528\ (\quad) \times (\quad) \times (\quad)}{29.92\ (\quad)} = \_\_\_\_\_\ \text{gr/acf}$$

24. Particulate, lb/hr conc. method

$$\text{lb/hr} = \frac{60\ \text{min/hr} \times \text{gr/dscf} \times \text{QS}}{7000\ \text{gr/lb}} = \frac{60\ \text{min/hr}}{7000\ \text{gr/lb}} \times (\quad) \times (\quad)$$

$= \_\_\_\_\_\ \text{lb/hr}$

25. Particulate lb/hr area method $= 0.132 \times \dfrac{\text{gms particulate} \times \text{AS}}{\pi\left(\frac{\text{DN}}{2}\right)^2 \times \text{TT}}$

$$= \frac{0.132 \times (\quad) \times (\quad)}{\pi(\frac{\quad}{2})^2 \times (\quad)} = \_\_\_\_\_ = \_\_\_\_\_\ \text{lb/hr}$$

26. $\dfrac{\text{lb/hr area} \times 100}{\text{lb/hr conc.}} = \dfrac{(\quad)}{(\quad)} \times 100 = \_\_\_\_\_\%\ \text{I}$

27. Particulate combustion lb/10^6 Btu heat input method

lb/hr = avg. of area and conc. method = _____

10^6 Btu from fuel flow, steam generation or heat rate = _____

$$\frac{\text{lb/hr}}{10^6\ \text{Btu hr}} = \frac{(\quad)}{(\quad)} = \_\_\_\_\_\ \text{lb}/10^6\ \text{Btu}$$

28. lb/10^6 Btu F Factor method =

$$\frac{\text{gr/dscf}}{7000} \times \text{F} \times \frac{20.9}{(20.9 - \%\ O_2)} = \frac{\quad}{7000} \times (\quad) \times \frac{20.9}{[20.9 - (\quad)]}$$

$$= \frac{\quad}{7000} \times (\quad) \times \frac{(20.9)}{(\quad)} =$$

$= \_\_\_\_\_\ \text{lb}/10^6\ \text{Btu}$

Job No._____
Run No._____

29. Density of stack gas

$$R = 21.85 \frac{ft^3 \text{ in Hg}}{15 \text{ mol } °R}$$

29. Density of stack gas

a. Wet at stack condition = MW lb/lb mol $\Big/ \left[21.85 \times \left(\frac{TS + 460}{PS}\right)\right]$

= ( ) $\Big/ \left[21.85 \times \frac{(\quad)}{(\quad)}\right]$ = ( ) $\Big/$ ( ) = _____ lb/ft^3 wet

b. Dry at 68°F (528R) and 29.92 in. Hg = MWD/385.6

= ( )/385.6 = _____ lb/ft^3 dry

30. Exhaust gas flow rate

a. lb/hr dry = QS × 60 × density dry

FRS = ( ) × 60 × ( ) = _____ lb/hr

b. lb/hr wet = QA × 60 × density wet

FRA = ( ) × 60 × ( ) = _____ lb/hr

31. gr/dscf at 12% CO_2 = gr/dscf × $\frac{12}{\% \ CO_2}$

= ( ) × $\frac{12}{(\quad)}$ = _____ gr/dscf

32. gr/dscf at 50% excess air = $\frac{100 + EA}{150}$ × gr/dscf

= $\frac{(\quad) + 100}{150}$ × ( ) = _____ gr/dscf

33. lb pollutant/1000 lb flue gas at 12% CO_2

wet or dry = $\frac{\text{lb pollutant/hr}}{\text{FRA or FRS}} \times \frac{12}{\% \ CO_2} \times 1000$

= $\frac{(\quad)}{(\quad)} \frac{12}{(\quad)} \times 1000$

= _____ lb/1000 lb

APPENDIX C-2

CASCADE IMPACTOR DATA REDUCTION EXAMPLE CALCULATIONS

The field sampling and laboratory analysis data are reduced by an interactive computer program recently developed by RTI. The Particulate Data Reduction and Entry System (PADRE) prompts the user for input of the following parameters:

TEST ID	RUN TYPE
TEST DATE	GAS COMPOSITION (percent CO_2, etc.)
TEST COMMENTS	PERCENT WATER VAPOR
PARTICLE DENSITY	AMBIENT PRESSURE
RUN COMMENTS	STACK PRESSURE
RUN DATE	STACK TEMPERATURE
STACK TIME	IMPACTOR TEMPERATURE
RUN DURATION	MAXIMUM PARTICLE DIAMETER
CYCLONE CUT POINT	IMPACTOR MAKE/MODEL NO.

PRE AND POST WEIGHTS OF EACH SUBSTRATE

The program calculates results using equations that are fully documented in the Southern Research publication EPA 600/7-78-042, March 1978 describing the "Computer Based Cascade Impactor Data Reduction System (CIDRS). PADRE is identical to CIDRS with the following exceptions:

1. Gas Composition--PADRE prints the dry gas composition, which is what users enter. With CIDRS, users enter the dry gas composition, but the wet gas composition is printed.

2. Treatment of Stage Masses--PADRE deletes from analysis the mass collected on any stage with a cutpoint less than 40 percent smaller than the preceding stage. It also deletes the first stages if their cutpoint is greater than or nearly equal to the cyclone cutpoint. This feature prevents the production of artificial steps in the size distribution curve.

3. Treatment of Backup Filter--PADRE allows for the treatments of the backup filter gain. If the filter has collected large particles due to bounce or reentrainment, the mass is dropped from the analysis and replaced with half the mass collected on the last impaction stage. Otherwise 100 percent of the filter gain is used in calculations.

4. Interpolated Values at Standard Diameters--This is an addition, available only with PADRE, to facilitate comparison of different runs. The differential and cumulative mass distribution values are interpolated and printed for a set of standard diameters. The new version of PADRE uses a finite difference interpolation algorithm instead of the SPLINE routine used in CIDRS.

Once PADRE has determined the standard particle size distribution, the resulting percentages are multipled by the respective total particulate emission rate.

Example:

E = Pouring total emission rate = grains dscf

R_{d50} = Pouring size results = cumulative % mass < d50

$$P_x = \frac{E \times R_{d50}}{100}$$

for pouring emissions,

$$P_{15} = \frac{0.019 \text{ grains}}{\text{dscf}} \times \frac{65\% \ <15 \text{ microns}}{100} = 0.012 \frac{\text{grains} \ <15 \text{ microns}}{\text{dscf}}$$

APPENDIX C-3

DUAL CYCLONE EXAMPLE CALCULATIONS

1. Data Sources

a. The following data is obtained as part of each dual cyclone run:

V_M = Volume of gas sampled, dry gas meter conditions, acf

TT = Total sampling time, minutes

T_M = Average dry gas meter temperature, °F

y = Dry gas meter accuracy factor

O_{SP} = Dry gas meter static pressure, inches Hg

b. The following data is obtained from the corresponding total particulate run.

T_S = Average stack gas temperature, °F

%M = Stack gas moisture content, percent

P_S = Stack gas absolute pressure, inches Hg

P_{ST} = Static stack gas pressure, inches Hg

P_B = Barometric pressure.

2. Preliminary Calculations

a. Cyclone flow rate, acfm

$$Q_{DC} = Q_M \left(\frac{TS + 460}{TM + 460}\right)\left(\frac{P_M}{P_S}\right)$$

where Q_M = dry gas flow rate = VM_{std}/TT;

P_M = absolute meter pressure = $P_B - O_{SP}$

P_S = absolute stack pressure = $P_B + P_{ST}$

b. Stack gas viscosity, micropoise

$$= 174.4 + 0.406\ T_S\ (°c)$$

3. Cyclone Cut Points

a. Cyclone III cut size, $d_{50} = [0.024 - 3.09]\ Q_{DC}^{-0.8}$

b. Cyclone X cut size, d_{50} in microns

$$X\ d_{50} = 15\sqrt{\frac{Q_{cal}}{Q_{act}}}$$

where $Q_{cal} = 105 \log \mu - 225$ (in lpm)

Q_{act} (lpm) = Q_{act} (acfm) x 28.32 (l/cf)

4. Emission Rates

a. Concentration

$$C = \text{total catch (grains)} \times \frac{1}{VM_{std}}$$

where C = emission rate in grains/dscf

VM_{std} = total volume sampled in dscf.

$$C_{III} = \frac{\text{backup filter net weights (grains)}}{\text{total catch (grains)}} \times C$$

$$C_{III-X} = \frac{\text{cyclone III catch + cannister rinse residue (grains)}}{\text{total catch (grains)}} \times C$$

$$C_X = \frac{\text{cyclone X catch (grains)}}{\text{total catch (grains)}} \times C$$

b. Weight rate

$$E_x = C_x \times Q_s \times 0.00857$$

where E = emission rate in lb/hr.

X = one of three size fractions

Q_s = stack gas volumetric flow rate determined by EPA method 5 tests, dscfm

0.00857 = conversion factor,

$$\frac{1\ \text{gram}}{15.43\ \text{grains}} \times \frac{1\ \text{lb}}{453.6\ \text{grams}} \times \frac{60\ \text{min}}{\text{hr}}$$

c. Emission factor

$$P_x = E_x \times \frac{1}{PWR}$$

where p_x = one of three size specific emission factors, lb/ton poured

PWR = process weight rate - tons of sand, cores and hot metal poured/hour.

APPENDIX C-4

THEORETICAL MOISTURE CALCULATION

1. Given:

   RH = Relative humidity, percent
   T_A = Ambient temperature, °F
   P_A = Ambient pressure, in. Hg
   E = Vapor pressure of water at a specific T_A, from a vapor pressure table, in. Hg
   VM_{std} = Volume of stack gas samples
   K = constant, ratio of volume of water vapor to volume of condensed water vapor.

2. Weight or volume of water that should have been caught in the impingers, grams,

$$W = \frac{RH}{100} \times \frac{E' \times 100}{P_A} \times \frac{VM_{std}}{100} \times \frac{1}{K}$$

example, Day 1

RH = 59.9 percent
T_A = 66°F
VM_{std} = 187,658 dscf
K = 0.04715

P_A = 29.89 in. Hg
E' = 0.6442 in. Hg

$$W = \frac{59.9}{100} \times \frac{0.6442 \times 100}{29.89}) \times \frac{187.658}{100} \times \frac{1}{0.04715} = 51 \text{ grams}$$

TABLE C-4.1. VAPOR PRESSURES OF WATER AT SATURATION*
(Inches of Mercury)

Temp. Deg. F.	0	1	2	3	4	5	6	7	8	9
—20	.0126	.0119	.0112	.0106	.0100	.0095	.0089	.0084	.0080	.0075
—10	.0222	.0209	.0199	.0187	.0176	.0168	.0158	.0150	.0142	.0134
—	.0376	.0359	.0339	.0324	.0306	.0289	.0275	.0259	.0247	.0233
0	.0376	.0398	.0417	.0463	.0441	.0489	.0517	.0541	.0571	.0598
10	.0631	.0660	.0696	.0728	.0768	.0810	.0846	.0892	.0932	.0982
20	.1025	.1080	.1127	.1186	.1248	.1302	.1370	.1429	.1502	.1567
30	.1647	.1716	.1803	.1878	.1955	.2035	.2118	.2203	.2292	.2383
40	.2478	.2576	.2677	.2782	.2891	.3004	.3120	.3240	.3364	.3493
50	.3626	.3764	.3906	.4052	.4203	.4359	.4520	.4586	.4858	.5035
60	.5218	.5407	.5601	.5802	.6009	.6222	.6442	.6669	.6903	.7144
70	.7392	.7648	.7912	.8183	.8462	.8750	.9046	.9352	.9666	.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.21	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.50	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67
250	60.72	61.79	62.88	63.98	65.10	66.23	67.38	68.54	69.72	70.92
260	72.13	74.36	74.61	75.88	77.17	78.46	79.78	81.11	82.46	83.83
270	85.22	86.63	88.06	89.51	90.97	92.45	93.96	95.49	97.03	98.61
280	100.2	101.8	103.4	105.0	106.7	108.4	110.1	111.8	113.6	115.4
290	117.2	119.0	120.8	122.7	124.6	126.5	128.4	130.4	132.4	134.4
300	136.4	138.5	140.6	142.7	144.8	147.0	149.2	151.4	153.6	155.9
310	158.2	160.5	162.8	165.2	167.6	170.0	172.5	175.0	177.5	180.0
320	182.6	185.2	187.8	190.4	193.1	195.8	198.5	201.3	204.1	206.9
330	209.8	212.7	215.6	218.6	221.6	224.6	227.7	230.8	233.9	237.1
340	240.3	243.5	246.8	250.1	253.4	256.7	260.1	263.6	267.1	270.6
350	274.1	277.7	281.3	284.9	288.6	292.3	296.1	299.9	303.8	307.7
360	311.6	315.5	319.5	323.5	327.6	331.7	335.9	340.1	344.4	348.7
370	353.0	357.4	361.8	366.2	370.7	375.2	379.8	384.4	389.1	393.8
380	398.6	403.4	408.2	413.1	418.1	423.1	428.1	433.1	438.2	443.4
390	448.6	453.9	459.2	464.6	470.0	475.5	481.0	486.6	492.2	497.9
400	503.6	509.3	515.1	521.0	526.9	532.9	538.9	545.0	551.1	557.3

*Methods for Determination of Velocity, Volume, Dust, and Mist Content of Gases, Bulletin WP-50, Western Precipitation Corp., Los Angeles, Calif.

APPENDIX D-1

TOTAL PARTICULATE (MODIFIED EPA METHOD 5) FIELD DATA SHEETS

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG 1 of 2

VERY IMPORTANT – FILL IN ALL BLANKS

READ AND RECORD AT THE START OF EACH TEST POINT

SKETCH

SHEET 1 OF 3

PREPARED BY GRAZIANO

PITOT NUMBER and SIDE —

PITOT TUBE CP 0.84

FILTER No. / THIMBLE No M-8 1

AMBIENT TEMP °F 31

BAR. PRESS., in. Hg 29.87

ASSUMED MOISTURE, % 1%

HEATER BOX SETTING, °F 250°

NOZZLE #/DIA., in. 5-3 1 0.187

PROBE LENGTH

PROBE HEATER SETTING 250°F

CLIENT EPA

PROJECT No 1-418-022

PLANT Lynchburg Foundry

RUN No. 1

LOCATION STACK P-1

DATE 12/16/81

OPERATOR Graziano

SAMPLE BOX NO. 2180

METER BOX NO. 2058

METER ΔH@ 1.794

Y FACTOR 1.007

* FIELDS FOR NONPARTICULATE RUN

1* POINT	5* DISTANCE IN INCHES	11* 21 CLOCK TIME ACTUAL	RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ACTUAL	51 56 DRY GAS TEMP. °F INLET	OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP °F °C	71* 75 NULL ANGLE (DEGREES)
B-1		0747	00	2.807	1.1	1.5	1.5	49	48	0	274	38		62	
		0757	10	9.500	1.1	1.5	1.5	77	52	0	274	43		57	
		0807	20	16.710	1.1	1.5	1.5	76	55	0	256	46		57	
B-2		0817	30	24.415	.55	1.2	1.2	95	51	0	270	48		58	
		0827	40	30.410	.70	1.25	1.25	73	54	0	275	45		64	
		0837	50	37.0	.70	1.25	1.25	72	56		254	49		67	
	1.00	0847	60	43.533											
A-2		0938	00	46.426	.56	.72	.72	57	54	0	220	~~45~~ 44		65	
		0948	10	51.220	.57	.75	.75	75	57	0	220	49		70	
		0958	20	56.57	.57	.75	.75	77	59	0	258	53		66	
A-1		1008	30	62.7	.59	1.25	1.20	78	60	0				59	
				TOTAL											

COMMENT * Leak after changing parts. Problem was a chipped Ball joint in the SIGG Imp.

METER LEAK CHECK:

BEFORE TEST: .000 CF 60 SEC 16 in. Hg

AFTER TEST: ____ CF ____ SEC ____ in. Hg

PITOT LEAK CHECK ____

ORSAT LEAK CHECK ____

STATIC PRESSURE

PORT ____ ____ ____

in. H_2O ____ ____ ____

in. Hg

DRS-4

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GCA/TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM
PG. 2 of 2

SHEET 2 OF 3

PREPARED BY

CLIENT EPA / LYNCHBURG

PROJECT NO. 1-618-022

PLANT Lynchburg, Va.

LOCATION STACK P-1

RUN NO. 1

DATE 12-16-84

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
		1018	40	68.130	.56	1.25	1.25	51	61	0	265	59		57	
A-1		1028	50	73.37	.92	1.30	1.30	84	63	0	251	62		57	
		1038	60	80.490	.92	1.30	1.30	87	64	0	267	64		57	
	2HR	1035	70	87.86	.92	1.30	1.30	87	65	0	274	67		56	
		1048	80	94.3	.92	1.30	1.30	88	66	0	271	69		56	
		1055	90	101.4	.80	1.15	1.15	89	68	0	265	70		66	
		1103	100	106.5	.81	1.15	1.15	87	69	0	272	70		67	
		1118	110	114.126	.55	.77	.77	87	69	0	275	70		69	
A-2		1128	120	119.105				86							
A-2	3 HR	1138	130	119.285	.50	1.05	1.05	69	64	0	275	68		67	
B-2		1150	140	125.0	.85	1.15	1.15	85	67	0	252	70		69	
		1200	150	131.160	.92	1.20	1.20	88	67	0	263	70		73	
		1210	160	137.60	.95	1.25	1.25	88	68	0	267	68		72	
B-1		1220	170	144.4	.95	1.35	1.35	94	72	0	290	68		74	
		1230	180	151.1	.95	1.35	1.35	102	80	0	260	69		80	
		1240	190	157.936	.96	1.35	1.35	98	75	0	270	70		66	
B-1		1250	200	159.035	1.1	1.45	1.45	95	71	0	225	54		72	
A-1	Start #	1325	00	165.5	1.1	1.55	1.55	99	78	0	275	66		72	
		1335	10	173.17	1.1	1.55	1.55	102	82	0	275	68		71	
		1345	20	180.250	.6	.84	.84	100	81	0	275	68		74	
A-2		1355	30	185.7	.6	.84	.84	96	82	0	270	68		69	
		1405	40	191.280	.6	.84	.84	89	76	0	274	67			
		1415	50												
				TOTAL											

METER LEAK CHECK DURING TEST:

			METER READING STOP	METER READING START
.000 CF	60 SEC	15 in. Hg		
CF	SEC	in. Hg		

STATIC PRESSURE

PORT			
in. H_2O			
in. Hg			

COMMENTS: # Hot Box fell from Mono Rail -- Broke Cyclone Bypass, filter Holder & probe Holder. Replaced Hot Box and changed filter to M-9
Leak Ck. @ 15" Hg 60 SEC. 0.010 cfm

DRS-5

(REVISED 8/31/79)

83

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM
PG. 2 of 2

SHEET 3 OF 3

PREPARED BY

CLIENT EPA / LYNCHBURG

PROJECT NO. 1-415-022

PLANT Lynchburg Foundry VA

LOCATION STACK - P-1

RUN NO. 1

DATE 12-16-87

1* POINT	5* DISTANCE IN INCHES	11* 21 CLOCK TIME ACTUAL	CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH ACTUAL	51 56 DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
A2	STOP	1425	60	196.495											
B-1	START		00												
				TOTAL											

COMMENTS:

METER LEAK CHECK DURING TEST:

				METER READING STOP	METER READING START
____ CF	____ SEC	____ in. Hg		____	____
____ CF	____ SEC	____ in. Hg		____	____

STATIC PRESSURE PORT ____ ____ ____

in. H_2O ____ ____ ____

DRS-5

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG 1 of 2

SHEET 1 OF 2

PREPARED BY MCCABE

PITOT NUMBER and SIDE

PITOT TUBE CP 0.84 Mean

FILTER No./THIMBLE No M-271

AMBIENT TEMP °F 35

BAR. PRESS., in. Hg 29.85

ASSUMED MOISTURE, % 1%

HEATER BOX SETTING, °F 250

NOZZLE #/DIA., in. 0.193

PROBE LENGTH

PROBE HEATER SETTING 100%

CLIENT LYNCHBURG FOUNDRY

PROJECT No 1-618-022

PLANT ARCHER CREEK

RUN No. 1

LOCATION POURING #2 P-2

DATE 12/16/81

OPERATOR MCCABE

SAMPLE BOX NO. 2282

METER BOX NO. 2550

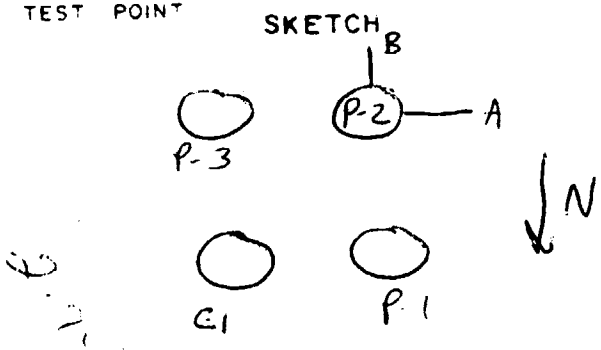
METER ΔH@ 1.71

Y FACTOR 0.99

VERY IMPORTANT – FILL IN ALL BLANKS

READ AND RECORD AT THE START OF EACH TEST POINT

SKETCH



* FIELDS FOR NONPARTICULATE RUN

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP °F	61* STACK PRESS in H_2O in. Hg	66* STACK TEMP °F °C	71* 75 NULL ANGLE (DEGREES)
B1	START	7:48	0	645.025	0.58	0.82	0.82	54.	53.	5	232.			63	
B1	Change		10	650.5	0.61	0.76	0.76	58	57.	5	256.			50	
B-1			20	655.2	0.8	1.0	1.0	75.	61.	5	273.	68.		49	
B-2			30	661.2	1.1	1.4	1.4	81.	62	5	225.			49.	
B-2			40	667.9	1.1	1.4	1.4	83.	64.	6.	262.	67.		61.	
B-2			50	674.8	1.1	1.4	1.4	84	64	6	274			60.	
	STOP	8:48	60	681.708		LK CHECK .005 at 2" Hg									
A1	START	7:14	0	681.717	1.3	1.7	1.7	65	62.	10	260.	56.		62.	
A-1			10	688.3	1.3	1.7	1.7	83	60	10	259.			69.	
A-1			20	694.8	1.3	1.7	1.7	87.	65.	10	255.	67.		62.	
A2			30	704.7	0.6	0.75	0.75	87.	69	6	253.			69	
			TOTAL												

COMMENT

METER LEAK CHECK:

BEFORE TEST: .005 CF 60 SEC 1.5 in. Hg

AFTER TEST: ____ CF ____ SEC ____ in. Hg

PITOT LEAK CHECK ____

INSAT LEAK CHECK ____

STATIC PRESSURE

PORT			
in. H_2O			
in. Hg			

DRS-4

(REVISED 8/31/79)

GCA TECHNOLOGY DIVISION

CLIENT _____

PROJECT NO. _____

PLANT _____

RUN NO. _____

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG. 2 of 2

SHEET 2 OF 2

PREPARED BY _____

LOCATION STACK P-2 Run 1

DATE _____

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
A-2			40	710.1	0.53	0.67	0.67	84.	68.	5.	~~66~~ 250	63.		~~255~~ 66	
A-2			50	714.3	0.54	0.69	0.69	81.	68	6.	255			63	
A-2			60	719.5	0.57	0.73	0.73	80.	67.	6.	257.			51.	
A-2			70	724.6	0.51	0.65	0.65	81.	67.	6	253.	59.		49.	
A-2			80	729.8	0.51	0.65	0.65	82.	68.	6	254.			51.	
A-1	A1		90	735.8	1.1	1.4	1.4	82.	68.	8	258.			53.	
A-1			100	740.4	1.1	1.4	1.4	86.	68.	8	257.	59.		50.	
A-1			110	748.5	1.1	1.4	1.4	89.	70.	8	261.	64.		60.	
	1:363	STOP	120	755.089		LK CHECK		OK						~~70~~	
B-2	B-2	START	0	755.182	0.55	0.72	0.72	65.	65.	4.	248	64		73	
B-2			10	760.4	0.55	0.72	0.72	68.	63.	4.	245	64		69	
B-2			20	765.1	0.55	0.72	0.72	68.	63.	4.	248			70.	
B-1	B-1		30	770.230	.78	1.05	1.05	68	60	5.	240	62		70.	
B-1			40	776.3	1.1	1.5	1.5	67	57.	6	228			72.	
B-1			50	783.4	1.1	1.5	1.5	72	58.	6.	251			69.	
	STOP	1236	60	790.597		LK CHECK 0.002@ 9" Hg									
A-2	START	1251	0	790.660	1.2	1.7	1.7	63.	59.	8	262	60.		52.	
A-2			10	798.3	1.2	1.7	1.7	80.	63.	8	250	62.		52	
A-2			20	805.4	1.1	1.4	1.4	82.	65.	8	255	64		64.	
A-1			30	812.4	0.7	0.9	0.9	79.	66.	6	257	66		68.	
A-1			40	817.9	0.7	0.9	0.9	75.	65.	6	254.	66		67	
A-1			50.	823.2	0.7	0.9	0.9	75	65.	6	254			65	
				TOTAL	7[illegible]		1.06				790.597				

METER LEAK CHECK DURING TEST:

	CF	SEC	in. Hg	METER READING STOP	METER READING START
.001	60	8			

STATIC PRESSURE

PORT	STOP	START
in. H_2O B-1	0.25	

COMMENTS:

B, 30 681.708 755.089 755.182 828.827 844.368

B, 30 645.025 681.797 790.660 829.092

A, 60 110.064

A, 60 35.415

38.167 15.274

35.415

73.292

36.683

DRS-5

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG. 2 of 2

SHEET 3 OF 3

PREPARED BY ______

CLIENT ______

PROJECT NO ______

PLANT LYNCHBURG

RUN NO. ______

LOCATION F 2 Run 1

DATE 12/16/81

POINT (1*)	DISTANCE IN INCHES (5*)	CLOCK TIME ACTUAL (11*)	CLOCK TIME RUN (21)	DRY GAS METER, CF (31)	PITOT in. H_2O ΔP (41*)	ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL (46)	DRY GAS TEMP. °F INLET (51)	DRY GAS TEMP. °F OUTLET (56)	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	STACK PRESS in. H_2O in. Hg (61*)	STACK TEMP. °F °C (66*)	NULL ANGLE (DEGREES) (71* 75)
A-1		1350	60	828.827	LK CHECK		0.002	at 12" Hg							
B-2	B2	1359	0	829.092	0.5	0.65	0.65	64	62	5	231	62		.64	
B-2			10	833.6	0.65	0.84	0.84	69	68	5	240			65	
B-2			20	838.5	0.65	0.84	0.84	72	62	5	240			66	
	570		30	844.368	LK CHECK		0.01	at 12" Hg							

TOTAL

COMMENTS:

METER LEAK CHECK DURING TEST:

				METER READING STOP	METER READING START
____ CF	____ SEC	____	in. Hg	____	____
____ CF	____ SEC	____	in. Hg	____	____

STATIC PRESSURE

PORT	____	____	____
in. H_2O	____	____	____
in. Hg	____	____	____

DRS-5 (REVISED 8/31/79)

* FIELDS FOR NONPARTICULATE RUN

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG 1 of 2

SHEET 1 OF 3

PREPARED BY Joe Vay

CLIENT Lynchburg

PROJECT No 1-618-822

PLANT ARCHER CREEK

RUN No. 1

LOCATION P-3

DATE 12/16/81

OPERATOR Joe Vay

SAMPLE BOX NO. 2258

METER BOX NO. 2180

METER ΔH@ 1.81

Y FACTOR 1.01

PITOT NUMBER and SIDE Pipe #2

PITOT TUBE CP 0.84

FILTER No. / THIMBLE No. M-7

AMBIENT TEMP. °F 38

BAR. PRESS., in. Hg 29.87

ASSUMED MOISTURE, % 1.0

HEATER BOX SETTING, °F 250

NOZZLE #/DIA., in. 6-3 / D.188

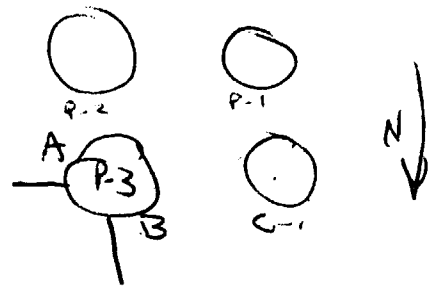
PROBE LENGTH 72"

PROBE HEATER SETTING 85%

VERY IMPORTANT – FILL IN ALL BLANKS

READ AND RECORD AT THE START OF EACH TEST POINT

SKETCH



* FIELDS FOR NONPARTICULATE RUN

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP °F °C	71* 75 NULL ANGLE (DEGREES)
A-1		0750	0	911.184	.90	1.05	1.05	43	49	4	232	41	.52	66	
		0800	10	918.0	.94	1.2	1.2	45	50	4	225	45	.52	52	
		0811	21	922.7	.95	1.1	1.1	63	47	4	275	52	.52	51	
A-2		0820	30	930.1	.89	.89	1.05	63	48	4	255	52	.51	60	
		0830	40	935	.69	.89	.87	63	48	3	225	52	.59	63	
		0840	50	940.7	.84	1.05	1.05	62	48	3.5	231	52	.60	63	
Stop		0850	60	946.482		leak	check	0.014	cfm	@ 15	"Hg				
B-2		0907	60	946.985	.88	1.1	1.1	50	47	3.5	253	50	.70	63	
		0917	70	953	.89	1.1	1.1	65	50	3.5	240	56	.66	64	
		0927	80	958	1.1	1.4	1.4	69	51	3.5	266	61	.71	67	
B-1		0937	90	964	1.0	1.3	1.3	67	52	4	252	67	.54	65	
				TOTAL											

COMMENT

METER LEAK CHECK:

BEFORE TEST: 0.005 CF 60 SEC 15 in. Hg

AFTER TEST: ____ CF ____ SEC ____ in. Hg

PITOT LEAK CHECK ____

ORSAT LEAK CHECK ____

STATIC PRESSURE

PORT ____ ____ ____

in. H_2O ____ ____ ____

DRS-4

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM
PG. 2 of 2

SHEET 2 OF 2

CLIENT Lynchburg

PREPARED BY Joe Vay

PROJECT NO.

PLANT

LOCATION P-3

RUN NO. 1

DATE 12/16/81

1* POINT	5* DISTANCE IN INCHES	11* 21 CLOCK TIME ACTUAL	RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ACTUAL	51 DRY GAS TEMP. °F INLET	56 OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
B-1		0947	100	971	.77	.98	.98	70	53	3	227	69	.54	67	
		0957	110	977	.73	.91	.91	69	53	3	228	68	.51	65	
		1007	120	983	.88	1.05	1.05	67	53	1	275	67	.50	55	
		1017	130	987	.83	1.05	1.05	66	53	2	256	66	.45	54	
		1027	140	993	.80	1.0	1.0	68	53	3	264	66	.42	55	
B-2		1037	150	999	1.2	1.5	1.5	68	53	3	244	67	.54	55	
B-2		1047	160	005	1.2	1.5	1.5	74	55	4	274	69	.69	56	
		1057	170	012	1.1	1.4	1.4	73	55	4	275	69	.70	54	
		1107	180	018.618	.98	1.2	1.2	59	53	3	229	62	.58	68	✓✓
Stop A-2		1115	180	018.618	.98	1.2	1.2	59	53	3	229	67	.58	68	
		1125	190	024	.98	1.2	1.2	73	55	3	245	65	.55	68	
		1135	200	030	.99	1.3	1.3	78	57	3	276	63	.55	68	
		1145	210	37.047	.85	1.1	1.1	64	55	3	272	57	.43	71	✓✓
Stop A-1		1149	210	037.047	.85	1.1	1.1	69	55	3	272	57	.43	71	
		1159	220	043	.87	1.1	1.1	75	55	3	255	60	.48	69	
		1209	230	048	.85	1.1	1.1	77	55	3	221	68	.47	69	
		1219	240	054	.88	1.1	1.1	73	54	3	232	58	.48	69	
		1229	250	060	.86	1.1	1.1	78	56	3	267	64	.47	69	
		1239	260	066	.90	1.1	1.1	79	58	3	245	62	.49	67	
A-2		1249	270	073	.44	1.2	1.2	82	61	3	275	69	.57	56	
		1259	280	078	.96	1.3	1.3	83	62	3.5	256	66	.54	58	
		1309	290	084	.97	1.3	1.3	85	64	3.5	225	66	.54	64	
				TOTAL											

METER LEAK CHECK DURING TEST:

				METER READING STOP	START
____ CF	____ SEC	____ in. Hg		____	____
____ CF	____ SEC	____ in. Hg		____	____

STATIC PRESSURE PORT ____ ____ ____
in. H_2O ____ ____ ____
in. Hg ____ ____ ____

COMMENTS:
at ~~43~~ 1007 pitot line plugged with H_2O gave low reading
Stack pressure up to 290 min. was actually velocity pitot pressure taken by disconnecting negative

DRS-5
(REVISED 8/31/79)

* FIELDS FOR NONPARTICULATE RUN

GCA/TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM
PG. 2 of 2

SHEET 3 OF 3

CLIENT

PREPARED BY Joe Vay

PROJECT NO.

PLANT lynchburg

LOCATION P-3

RUN NO. 1

DATE 12/16/81

1* POINT	5* DISTANCE IN INCHES	11* 21 CLOCK TIME ACTUAL	RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ACTUAL	51 DRY GAS TEMP. °F INLET	56 OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
														~~64~~	Stop ✓
A-2	Stop	1319	300	091.637	~~1.1~~	~~1.5~~	~~1.5~~	~~64~~	~~61~~					70	
B-2		1327	300	091.637	1.1	1.5	1.5	69	66	4	271	60		70	
		1337	310	098	1.1	1.4	1.4	85	63	4	272	63		70	
		1347	320	105	1.2	1.5	1.5	85	63	4	207	61		65	
B-1		1357	330	117	.90	1.1	1.1	81	62	3	241	58		64	
B-1		1407	340	117	.89	1.1	1.1	81	62	3	220	58		65	
		1417	350	122	.89	1.1	1.1	81	61	3	272	59		68	
end test		1425	360	128.304	end test										
				TOTAL											

90

COMMENTS:

METER LEAK CHECK DURING TEST:

	CF	SEC	in. Hg	METER READING STOP	START
0.003	60	15			

STATIC PRESSURE PORT B-center

in. H_2O 0.56

DRS-5

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG 1 of 2

VERY IMPORTANT – FILL IN ALL BLANKS

READ AND RECORD AT THE START OF EACH TEST POINT

SKETCH

SHEET 1 OF 3

PREPARED BY Joe Vay

PITOT NUMBER and SIDE probe #1

PITOT TUBE CP 0.84

FILTER No. / THIMBLE No M-231

AMBIENT TEMP °F 30

BAR. PRESS., in. Hg

ASSUMED MOISTURE, % 1.2

HEATER BOX SETTING, °F 250

NOZZLE #/DIA., in. 6-3 / 0.118

PROBE LENGTH 77

PROBE HEATER SETTING 250

CLIENT

PROJECT No

PLANT Lynchburg

RUN No. 2

LOCATION C-1

DATE 12/17/81

OPERATOR Joe Vay

SAMPLE BOX NO. 2258

METER BOX NO. 2180 - serial #

METER ΔH@ 1.81

Y FACTOR

* FIELDS FOR NONPARTICULATE RUN

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP °F °C	71* 75 NULL ANGLE (DEGREES)
B-2		0726	0	128.704	1.3	1.4	1.4	37	34	5	250	31		71	
		0736	10	134	1.3	1.5	1.5	56	37	6	224	38		72	
		0746	20	140	1.3	1.5	1.5	59	38	6	262	46		75	
		0756	30	147	1.3	1.5	1.5	61	40	6	275	52		75	
		0806	40	153	1.3	1.5	1.5	61	41	6	266	55		73	
		0816	50	159	1.3	1.5	1.5	61	41	6	266	56		72	
		0826	60	166	1.2	1.4	1.4	61	42	6	268	57		73	
		0836	70	172	1.2	1.4	1.4	61	41	6	274	55		75	
		0846	80	178	1.3	1.5	1.5	63	42	6	253	53		73	
		0856	90	185	1.7	2.0	2.0	64	43	8	272	56		76	
B-1		0906	100	192	1.8	2.1	2.1	66	44	8.5	249	55		76	
				TOTAL											

COMMENT

METER LEAK CHECK:

BEFORE TEST: 0.003 CF 60 SEC 15 in. Hg

AFTER TEST: ____ CF ____ SEC ____ in Hg

PITOT LEAK CHECK ✓

ORSAT LEAK CHECK ____

STATIC PRESSURE

PORT			
in. H_2O			
in. Hg			

DRS-4

(REVISED 8/31/79)

GCA/TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG. 2 of 2

SHEET 2 OF 3

PREPARED BY Joe Vay

CLIENT

PROJECT NO.

PLANT Lynchburg

RUN NO. #2 C-1

LOCATION C-1

DATE 12-17-81

1* POINT	5* DISTANCE IN INCHES	11* 21 CLOCK TIME ACTUAL	RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ACTUAL	51 DRY GAS TEMP. °F INLET	56 OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
B-1		0916	110	199	1.8	2.1	2.1	69	45	8.5	241	57		76	
		0926	120	207	1.8	2.1	2.1	73	47	8.5	228	63		73	
		0936	130	214	1.8	2.1	2.1	76	49	8.5	23	63		75	
		0946	140	222	1.8	2.2	2.2	78	52	9.5	244	62		82	
		0956	150	230	1.8	2.2	2.2	81	55	9	227	62		83	
		1006	160	238	1.8	2.2	2.2	83	56	9	280	61		82	
		1016	170	246	1.8	2.2	2.2	84	58	9	246	62		84	
															port cha
stop		1026	180	253	1.8	2.2				3	238	44		83	
A-2		1046	180	253	.45	.52	.52	63	55	2.5	225	48		84	
		1055	190	257	.43	.50	.50	72	58	2.5	226	47		84	
		1105	200	261	.44	.51	.51	73	57	2.5	247	47		77	
		1115	210	265	.46	.53	.58	58 ↔	71	2.5	256	47		74	
		1125	220	269	.46	.58	.58	58 ↔	76						plant do.
stop		1129	224	270.887						2.5	272	44		80	
A-2	120	[redacted]	224	270.887	.43	.54	.54	62	57	2.5	273	42		85	
		1211	234	275	.44	.56	.56	76	60	2.5	253	48		82	
		1217	240	277	.44	.56	.56	78	61	2.5	268	48		87	
		1227	250	281	.44	.56	.56	80	63	2.5	226	48		91	
		1237	260	285	.46	.53	.58	81	64	2.5	259	49		90	change p
A-1		1247	270	289	1.4	1.7	1.7	81	65	6	240	54		89	
A-1		1257	280	295	1.4	1.7	1.7	88	68	6	250	57		89	
		1307	[redacted] 290	302	1.4	1.7	1.7	89	68	6					
				TOTAL											

METER LEAK CHECK DURING TEST:

			METER READING STOP	START
____ CF	____ SEC	____ in. Hg	____	____
____ CF	____ SEC	____ in. Hg	____	____

STATIC PRESSURE PORT ____ ____ ____
in. H_2O ____ ____ ____

COMMENTS:

at 11:15 on T.C's watch i have 11:32
(17 min fast)

DRS-5

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG. 2 of 2

SHEET 3 OF 3

PREPARED BY Joe Vay

CLIENT

PROJECT NO.

PLANT Lynchburg

LOCATION C-1

RUN NO. #2 - C-1

DATE 12/17/81

1* POINT	5* DISTANCE IN INCHES	11* 21 CLOCK TIME ACTUAL	CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
A1		1317	300	310	1.4	1.7	1.7	86	68	6	262	49		91	
		1327	310	316	1.4	1.7	1.7	86	67	6	232	49		84	
		1337	320	324	1.4	1.7	1.7	84	66	6	240	49		84	
		1347	330	330	1.3	1.6	1.6	86	67	6	271	50		93	
		1357	340	337	1.4	1.7	1.7	85	67	6	266	49		88	
		1407	350	343	1.4	1.7	1.7	81	64	6	222	47		88	
Stop		1417	360	350.432											
				End	of	test									
TOTAL															

METER LEAK CHECK DURING TEST:

				METER READING STOP	METER READING START
____ CF	____ SEC	____ in. Hg		____	____
____ CF	____ SEC	____ in. Hg		____	____

STATIC PRESSURE

PORT		A	(at center of stack)
in. H_2O		4.0	
in. Hg			

COMMENTS:

End of test noticed that ~~of~~ U between 1st & 2nd impinger was broken

* FIELDS FOR NONPARTICULATE DATA

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG 1 of 2

SHEET 1 OF 3

CLIENT EPA

PROJECT No

PLANT Lynchburg Foundry

RUN No. ET 2-C-2

LOCATION Stack

DATE 12/17/81

OPERATOR Gardiner

SAMPLE BOX NO.

METER BOX NO. 2258

METER ΔH@

Y FACTOR

PREPARED BY

PITOT NUMBER and SIDE 4

PITOT TUBE CP

FILTER No. /THIMBLE No. 1

AMBIENT TEMP. °F

BAR. PRESS., in. Hg

ASSUMED MOISTURE, %

HEATER BOX SETTING, °F

NOZZLE #/DIA., in. 5-3 1

PROBE LENGTH

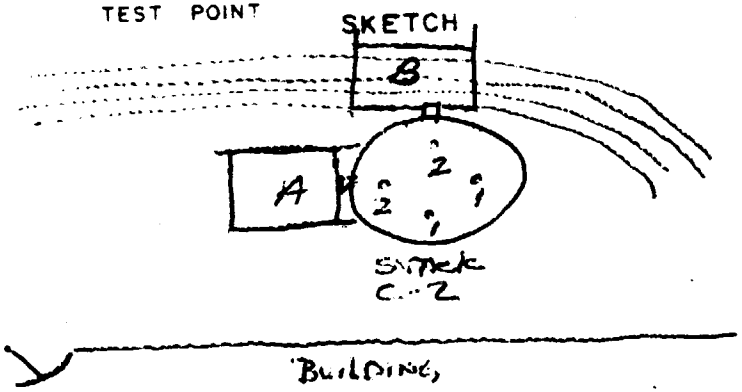
PROBE HEATER SETTING

* FIELDS FOR NONPARTICULATE RUN

VERY IMPORTANT – FILL IN ALL BLANKS

READ AND RECORD AT THE START OF EACH TEST POINT

SKETCH



1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP °F °C	71* 75 NULL ANGLE (DEGREES)
A-1		0936	00	197.56	.9	1.1	1.1	25	25	0	225	32		55	
		36	10	204.5	.7	1.2	1.2	43	28	0	228	35		55	
		46	20	209.3	.88	1.2	1.2	54	32	0	257	36		58	
		56	30	215.7	.8	1.2	1.2	58	35	0	270	43		59	
		1006	40	222.2	.9	1.2	1.2	60	38	0	255	45		57	
		16	50	229.9	.88	1.2	1.2	65	44	0	270	47		58	
		26	60	234.8	.98	1.2	1.2	67	44	0	254	47		55	
		36	70	241.3	.88	1.2	1.2	67	47	0	250	47		55	
		46	80	245.1	.86	1.15	1.15	70	48	0	275	47		58	
A-1		1056	90	253.6	.9	1.2	1.2	70	49	0	260	47		57	
A-2		1106	100	260.7	1.2	1.65	1.65	71	51		266	48		60	
				TOTAL											

COMMENT

METER LEAK CHECK:

BEFORE TEST: ____ CF ____ SEC ____ in. Hg

AFTER TEST: ____ CF ____ SEC ____ in. Hg

PITOT LEAK CHECK ____

ORSAT LEAK CHECK ____

STATIC PRESSURE

PORT ____ ____ ____

in. H_2O ____ ____ ____

in. Hg

DRS-4

(REVISED 8/31/79)

ENVIROSPEC DIVISION

CLIENT _____

PROJECT NO. _____

PLANT Lyndbury Company

RUN NO. CT 2-C2

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG. 2 of 2

SHEET 2 OF 3

PREPARED BY _____

LOCATION STACK

DATE _____

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
A-2		0916	110	267.9	1.3	1.8	1.8	72	51	0	275	49		59	
		26	120	273.3	1.3	1.8	1.8	71	52	0	270	49		58	
		36	130	278.0	1.3	1.75	1.75	68	50	0	255	50		61	
		46	140	284.1	1.3	1.8	1.8	71	51	0	244	50		60	
		0956	150	290.5	1.3	1.8	1.8	70	51	0	250	51		62	
		1006	160	304.1	1.3	1.8	1.8	72	51	0	235	55		64	
		16	170	313.	1.3	1.8	1.8	67	50	0	225	53		63	
A-2	STOP	1026	180	320.550											
B-2	START	1038	00	320.604	1.1	1.35	1.35	53	49	0	230	41		65	
		48	10	327.6	1.1	1.45	1.45	73	53	0	225	49		66	
		1053	20	333.9	1.1	1.45	1.45	70	52	0	246	45		64	
		1103	30	341	1.1	1.35	1.35	69	51	0	246	43		63	
*	STOP	11 14	36	345.305											
	START	35	96	345.300	1.1	1.4	1.4	52	47	0	232	34		62	
		45 35	46	353.5	1.1	1.45	1.45	71	52	0	245	45		66	
		55 45	56	359.0	1.1	1.45	1.45	74	54	0	245	46		67	
		1205 55	1206	364.4	1.1	1.45	1.45	75	56	0	228	52		67	
A-2		1215	96	372.9	1.1	1.45	1.45	74	56	0	262	54		67	
		25	106	379.	1.1	1.45	1.45	73	57	0	270	52		67	
B-2	STOP	35	96	387.5	1.1	1.45	1.45	74	57	0	266	52		69	
B-3		45	106	394.2	1.7	2.2	2.2	75	57	0	275	51		69	
		1255	116	402.7	1.7	2.2	2.2	80	58	0	274	53		69	
				TOTAL											

METER LEAK CHECK DURING TEST:

0.000 CF 60 SEC 15 in. Hg

_____ CF _____ SEC _____ in. Hg

METER READING	STOP	START
	____	____
	____	____

STATIC PRESSURE

PORT			
in. H_2O	____	____	____
in. Hg	____	____	____

COMMENTS: * Shutdown due to process.

* FIELDS FOR NONPARTICULATE RUN

DRS-5

(REVISED 8/31/79)

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM
PG. 2 of 2

SHEET 3 OF 3

CLIENT _____ PREPARED BY _____

PROJECT NO. _____

PLANT _____ LOCATION _____

RUN NO. _____ DATE _____

1* POINT	5* DISTANCE IN INCHES	11* 21 CLOCK TIME ACTUAL	RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ACTUAL	51 DRY GAS TEMP. °F INLET	56 OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
B-1		1305	124	411.0	1.7	~~2.00~~	2.2	82	61	0	235	56		76	
		15	136	419.9	1.7	2.2	2.2	81	62	0	255	56		69	
		25	46	428.6	1.7	2.0	2.0	82	62	0	254	58		72	
A		1330	56	~~433.27~~											
		45	66												
		55	76												
		1405	86												
		5 hr 46 min													
		346 min													
				TOTAL											

COMMENTS: A Short run due to fan loss

METER LEAK CHECK DURING TEST:

_____ CF _____ SEC _____ in. Hg

_____ CF _____ SEC _____ in. Hg

		METER READING STOP	START
STATIC PRESSURE	PORT		
	in. H_2O		

DRS-5

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG 1 of 2

VERY IMPORTANT – FILL IN ALL BLANKS

READ AND RECORD AT THE START OF EACH TEST POINT

SKETCH

SHEET 1 OF 2

PREPARED BY

PITOT NUMBER and SIDE

PITOT TUBE CP

FILTER No. /THIMBLE No. 26 1

AMBIENT TEMP °F

BAR. PRESS., in. Hg

ASSUMED MOISTURE, %

HEATER BOX SETTING, °F

NOZZLE #/DIA., in. 43 0.143 1

PROBE LENGTH ft

PROBE HEATER SETTING

CLIENT

PROJECT No

PLANT LYNCHBURG

RUN No.

LOCATION 2-C3

DATE 12/17/81

OPERATOR M. C. CABE

SAMPLE BOX NO.

METER BOX NO. 2550

METER ΔH@

Y FACTOR

* FIELDS FOR NONPARTICULATE RUN

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
B-1	START	2:46	0	645.163	1.3	1.75	1.75	35	32	6	225			73	
			10	802.0	1.3	1.75	1.75	63	37	6	238	59		76	
			20	859.3	1.3	1.75	1.75	65	40	6	255			78	
			30	862.2	1.3	1.75	1.75	68	42	6	258			76	
			40	874.6	1.3	1.75	1.75	69	45	6	261			74	
			50	882.3	1.3	1.75	1.75	68	43	6	263			75	
			60	890.0	1.3	1.75	1.75	70	45	6	265			74	
			70	897.7	1.3	1.75	1.75	74	45	6	269			75	
			80	904.5	1.3	1.75	1.75	76	51	6	276			76	
B-2			90	912.1	1.7	2.3	2.3	79	54	8	268			77	
	CHECK		100	920.5	1.7	2.5	2.5	86	63	10	268			75	

TOTAL

COMMENT

METER LEAK CHECK:

BEFORE TEST: 0.002 CF 60 SEC 15 in. Hg

AFTER TEST: ____ CF ____ SEC ____ in Hg

PITOT LEAK CHECK ____

ORSAT LEAK CHECK ____

STATIC PRESSURE

PORT			
in. H_2O	0.1	0.05	
in. Hg			

DRS-4

(REVISED 8/31/79)

97

GCA/TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG. 2 of 2

SHEET 2 OF 3

CLIENT

PREPARED BY

PROJECT NO.

PLANT LYNCHBURG

LOCATION C 3

RUN NO. 1-C3

DATE 12/17/81

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* NULL ANGLE (DEGREES) 75
BR (CONT)			110	929.3	1.7	2.5	2.5	85	67	10	266			75	
			120	938.3	1.7	2.5	2.5	82	69	9	262			78	
			130	946.8	1.7	2.5	2.5	86	69	10	268			79	
			140	955.2	1.7	2.5	2.5	83	69	9	270	62		80	
			150	964.9	1.7	2.5	2.5	82	68	9	270			81	
			160	972.3	1.6	2.3	2.3	85	69	8	266			82	
			170	980.4	1.6	2.3	2.3	84	69	8	266			83	
A-1	STOP	1046	180	989.155	LK CHECK		0.01		@ 18" Hg						
	START	1054	0	989.242	0.83	1.2	1.2	76	66	4	220			84	
			10	995.4	0.83	1.2	1.2	72	66	4	225			84	
	STOP	1113		000.662		PROCESS UPSET									
	START	1136		000.662	0.83	1.2	1.2	55	55	4	250			85	
	chg set	1137	20	001.3	0.86	1.1	1.1	55	55	3	250			84	
			30	006.8	0.86	1.1	1.1	64	54	3	260			85	
	chg [illegible]		40	012.6	0.82	1.1	1.1	69	56	3	265			85	
			50	018.3	0.86	1.2	1.2	69	56	3	251	60		85	
			60	023.7	0.80	1.1	1.1	71	57	3	237			86	
			70	029.1	0.80	1.1	1.1	71	57	3	231			88	
			80	034.6	0.80	1.1	1.1	70	57	3	226			82	
A2			90	040.5	1.7	2.4	2.4	75	58	3	231			89	
			100	048.4	1.7	2.4	2.4	82	67	3	233			91	
			110	065.9	1.7	2.4	2.4	84	62	3	239			89	
				TOTAL											

METER LEAK CHECK DURING TEST: METER READING STOP START

_____ CF _____ SEC _____ in. Hg _____ _____

_____ CF _____ SEC _____ in. Hg _____ _____

STATIC PRESSURE PORT _____ _____ _____

in. H_2O _____ _____ _____

COMMENTS:

.9
.9
8.1

DRS-3

GCA/TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG. 2 of 2

SHEET 3 OF 3

CLIENT _____

PREPARED BY _____

PROJECT NO. _____

PLANT LYNCHBURG

LOCATION C-3

RUN NO. 1 C3

DATE 12/17/81

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* NULL ANGLE (DEGREES) 75
A-2	CONT		120	065.4	1.7	2.4	2.4	85	63	3	244	60		88	
			130	073.4	1.7	2.4	2.4	86	63	3	245			88	
			140	084.8	1.7	2.4	2.4	86	63	3	250			89	
			150	090.9	1.7	2.4	2.4	87	63	3	242			89	
			160	099.8	1.7	2.4	2.4	87	63	3	240			89	
			170	107.5	1.7	2.4	2.4	87	63	3	244			87	
								0.005 @ 10 in Hg							
				TOTAL											

COMMENTS:

METER LEAK CHECK DURING TEST:

_____ CF _____ SEC _____ in. Hg

_____ CF _____ SEC _____ in. Hg

METER READING	STOP	START

STATIC PRESSURE

PORT		
in. H_2O		
in. Hg		

DRS-5

(REVISED 8/31/79)

* FIELDS FOR NONPARTICULATE RUN

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG 1 of 2

VERY IMPORTANT – FILL IN ALL BLANKS

READ AND RECORD AT THE START OF EACH TEST POINT

SKETCH

SHEET 1 OF 2
PREPARED BY Joe Vay
PITOT NUMBER and SIDE pope #1
PITOT TUBE CP .84
FILTER No. / THIMBLE No 1M-3
AMBIENT TEMP. °F 35°
BAR. PRESS., in. Hg
ASSUMED MOISTURE, % 1%
HEATER BOX SETTING, °F 250
NOZZLE #/DIA., in. G-3 / .188
PROBE LENGTH 77"
PROBE HEATER SETTING 250°F

CLIENT EPA/RTP
PROJECT No 1-618-022
PLANT lynchburg
RUN No. 3-C-1
LOCATION C-1
DATE 12-18-81
OPERATOR Joe Vay
SAMPLE BOX NO. 2180
METER BOX NO. ~~2180~~ 2258
METER ΔH@ 1.81
Y FACTOR

* FIELDS FOR NONPARTICULATE RUN

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP °F °C	71* 75 NULL ANGLE (DEGREES)
B-2		0709	0	355.002	.47	.54	.54	68	50	2	268	45		74	
		0719	10	359	.45	.52	.52	76	53	2	274	46		78	
		0729	20	363	.46	.58	.58	77	57	2	225	48		77	
		0739	30	367	.46	.58	.58	77	58	2	225	49		77	
		0749	40	372	.47	.54	.54	77	61	2	231	50		82	
		0754	50	376	.46	.58	.58	78	62	2	229	51		82	
		0809	60	381	.46	.58	.58	78	62	2.5	255	51		80	
B-1		0814	65	383	1.25	1.6	1.6	84	63	6	272	64		81	point cha
		0819	70	386	1.25	1.6	1.6	85	64	6	246	55		80	
		0829	80	394	1.25	1.6	1.6	86	64	5	268	55		81	
		0839	90	401	1.25	1.6	1.6	85	63	5	240	55		81	
				TOTAL											

COMMENT
5 min late on point change

METER LEAK CHECK:
BEFORE TEST: 0.010 CF 60 SEC 27 in. Hg
AFTER TEST: ____ CF ____ SEC ____ in. Hg

PITOT LEAK CHECK ____
ORSAT LEAK CHECK ____

STATIC PRESSURE
PORT ____ ____ ____
in. H_2O ____ ____ ____

DRS-4

GCA/TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG. 2 of 2

SHEET 2 OF

PREPARED BY Jeremy

CLIENT

PROJECT NO.

PLANT Lynchburg

LOCATION C-1

RUN NO. 3, C-1

DATE 12-18-81

1* POINT	5* DISTANCE IN INCHES	11* 21 CLOCK TIME ACTUAL	RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ACTUAL	51 DRY GAS TEMP. °F INLET	56 OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
														80	
B-1		0849	100	403	1.2	1.5	1.5	84	62	5	258	57		78	
		0859	110	415	1.25	1.6	1.6	82	61	5	232	59			port cha
stop		0909	120	422.519											
A-2						leak	check	0.006	ft3/min	@	15" Hg			80	
		0919	120	422.722	1.25	1.6	1.6	67	55	5	237	54		76	
		0929	130	429	1.25	1.6	1.6	82	59	5	263	62		85	
		0939	140	437	1.3	1.6	1.6	83	60	5	277	64		85	
		0949	150	444	1.25	1.6	1.6	84	61	5	240	67		83	
		0959	160	451	1.25	1.6	1.6	84	62	5	267	68		85	
		1009	170	457	1.25	1.6	1.6	84	62	5	250	66		83	point cha
A-1		1019	180	464	1.8	2.2	2.2	82	61	7.5	227	63		80	
		1029	190	472	1.7	2.1	2.1	84	61	7.5	262	64		78	
		1039	200	480	1.8	2.2	2.2	84	61	7.5	257	62		80	
		1049	210	489	1.8	2.2	2.2	84	62	7.5	264	63		79	
		1059	220	497	1.7	2.1	2.1	86	67	7	226	63		85	
		1109	230	505	1.8	2.2	2.2	92	69	7	232	71			
		1119	240	513.582											
						end	of	test							
				TOTAL											

METER LEAK CHECK DURING TEST: 0.001 CF 60 SEC 15 in. Hg

_____ CF _____ SEC _____ in. Hg

METER READING	STOP	START
in. Hg		

STATIC PRESSURE PORT A center of stack

in. H_2O 0.35

in. Hg

COMMENTS:

DRS-5

(REVISED 8/31/79)

101

* FIELDS FOR PARTICULATE RUN

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG 1 of 2

VERY IMPORTANT – FILL IN ALL BLANKS

READ AND RECORD AT THE START OF EACH TEST POINT

SKETCH

SHEET 1 OF 2

PREPARED BY McCABE

CLIENT

PROJECT No

PLANT LYNCHBURG

RUN No. ~~2-C3~~ 3-C3

LOCATION C3

DATE 12/18/81

OPERATOR McCABE

SAMPLE BOX NO.

METER BOX NO. 255d

METER ΔH@

Y FACTOR

PITOT NUMBER and SIDE

PITOT TUBE CP

FILTER No. / THIMBLE No 1

AMBIENT TEMP °F

BAR. PRESS., in. Hg

ASSUMED MOISTURE, %

HEATER BOX SETTING, °F

NOZZLE #/DIA., in. #3 .1921

PROBE LENGTH #3

PROBE HEATER SETTING

* FIELDS FOR NONPARTICULATE RUN

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP °F °C	71* 75 NULL ANGLE (DEGREES)
B-2	START	7:07	0	118.852	1.5	2.0	2.0	46.	45	7	225.			75	
			10	126.7	1.5	2.0	2.0	76.	51.	7	222			74	
	Dessel		20	134.4	1.5	2.1	2.1	79	54.	7.	226			75	
			30	142.2	1.5	2.1	2.1	80	55.	7	238			77.	
			40	149.9	1.5	2.1	2.1	81	56	7	249.			77.	
			50	158.0	1.5	2.1	2.1	83	58	8.	253			78.	
			60	166.2	1.3	1.8	1.8	85	61	7	264			80	
B-1			70	173.7	1.3	1.8	1.8	82	65.	7.	270			80	
			80	182.4	1.3	1.8	1.8	82.	68	7.	278			79	
			90	188.5	1.3	1.8	1.8	82	67.	6.	274.			79	
			100	196.0	1.3	1.8	1.8	83	68.	6.	272			80	
				TOTAL											

COMMENT

METER LEAK CHECK:

BEFORE TEST: 5.00 CF 6.0 SEC 12 in. Hg

AFTER TEST: ____ CF ____ SEC ____ in. Hg

PITOT LEAK CHECK ____

ORSAT LEAK CHECK ____

STATIC PRESSURE

PORT B-2

in. H_2O .95

DRS-4

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM
PG. 2 of 2

SHEET 2 OF 2

PREPARED BY McCARE

CLIENT

PROJECT NO.

PLANT LYNCHBURG

LOCATION 0-3

RUN NO. 2-03

DATE 12/18/81

1* 5* 11* 21 31 41* 46 51 56 61* 66* 71* 75

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT in. H_2O ΔP	ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	STACK PRESS in. H_2O in. Hg	STACK TEMP. °F °C	NULL ANGLE (DEGREES)
			10	203.5	1.3	1.8	1.8	85	69	7	259			81	
	STOP	9:09	120	210.812	LK CHECK			100 @ 7"				62			
		11:16	0	210.[illegible]	0.8	1.1	1.1	73	66	3	220			81	
			10	216.4	0.9	1.2	1.2	77	66	4	254			81	
			20	221.6	0.9	1.2	1.2	77	63	4	258			80	
			30	228.0	0.9	1.2	1.2	77	62	4	263			82	
			40	234.9	0.9	1.2	1.2	78	63	4	263			82	
			50	239.9	0.9	1.2	1.2	78	63	4	260			82	
[illegible]			60	244.1	0.9	1.2	1.2	79	63	4	260			82	
B-1			70	251.2	1.8	2.5	2.5	80	63	9	257			84	
			80	261.0	1.8	2.5	2.5	81	66	8	256	64		84	
			90	269.8	1.8	2.5	2.5	81	65	8	254			83	
			100	277.8	1.5	2.1	2.1	82	66	7	261			82	
			110	286.[illegible]	1.5	2.1	2.1	79	61	7	262			82	
	11:16	STOP	120	294.300		LK CHECK		0.008 @ 13" Hg							
				TOTAL											

103

METER LEAK CHECK DURING TEST:

				METER READING STOP	METER READING START
____ CF	____ SEC	____	in. Hg	____	____
____ CF	____ SEC	____	in. Hg	____	____

STATIC PRESSURE

PORT	____	____	____
in. H_2O	____	____	____
in. Hg	____	____	____

COMMENTS:

DRS-5

(REVISED 8/31/79)

* FIELDS FOR NONPARTICULATE RUN

GCA TECHNOLOGY DIVISION

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG 1 of 2

VERY IMPORTANT – FILL IN ALL BLANKS

READ AND RECORD AT THE START OF EACH TEST POINT

SKETCH

CLIENT EPA
PROJECT No
PLANT Lynchburg Foundry
RUN No. P-3
LOCATION STACK
DATE 12/18/81
OPERATOR GRAZIANO
SAMPLE BOX NO.
METER BOX NO. 225-3
METER ΔH@ 1.796
Y FACTOR 1.007

SHEET 1 OF 2
PREPARED BY GRAZIANO
PITOT NUMBER and SIDE 4
PITOT TUBE CP
FILTER No. / THIMBLE No. M-321
AMBIENT TEMP. °F 34
BAR. PRESS., in. Hg
ASSUMED MOISTURE, %
HEATER BOX SETTING, °F 250
NOZZLE #/DIA., in. 5-3 / .187
PROBE LENGTH 5'
PROBE HEATER SETTING 250

* FIELDS FOR NONPARTICULATE RUN.

1* POINT	5* DISTANCE IN INCHES	11* CLOCK TIME ACTUAL	21 CLOCK TIME RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ORIFICE ΔH in. H_2O ACTUAL	51 DRY GAS TEMP. °F INLET	56 DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP °F °C	71* 75 NULL ANGLE (DEGREES)
A-2	START	0655	00	435.712	.89	1.15	1.15	47	45	0	275	39	.56	56	
		0710	15	445.1	.91	1.3	1.3	74	53	0	275	55		55	
		0725	30	455.1	.88	1.25	1.25	80	58	0	267	56		53	
		0740	45	464.9	.88	1.25	1.25	81	62	0	268	56		57	
A-1		0755	60	475.2	.88	1.15	1.15	81	63	0	275	57		58	
A-1		0810	75	483.	.83	1.15	1.15	80	63	0	248	57		58	
		0825	90	492.	.87	1.15	1.15	78	63	0	250	58		58	
		0840	105	503.5	.90	1.15	1.16	76	62	0	261	58		58	
A-1	STOP	0855	120	513.113											
B-1	START	0905	00	513.395	.95	1.35	1.35	65	57	0	271	56		52	
		0920	15	523.3	.92	1.3	1.3	78	61					58	
				TOTAL											

COMMENT

METER LEAK CHECK:

BEFORE TEST: 0.000 CF 60 SEC 18 in. Hg
AFTER TEST: ____ CF ____ SEC ____ in. Hg

PITOT LEAK CHECK ____
ORSAT LEAK CHECK ____

STATIC PRESSURE

PORT ____ ____ ____
in. H_2O ____ ____ ____
in. Hg

DRS-4

GCA TECHNOLOGY DIVISION

CLIENT EPA

PROJECT NO.

PLANT Lynchburg Foundry

RUN NO. 3

PARTICULATE/NONPARTICULATE FIELD DATA CODING FORM

PG. 2 of 2

SHEET 2 OF 2

PREPARED BY GRAZINO

LOCATION Stack - P.3

DATE 12/18/87

1* POINT	5* DISTANCE IN INCHES	11* 21 CLOCK TIME ACTUAL	RUN	31 DRY GAS METER, CF	41* PITOT in. H_2O ΔP	46 ORIFICE ΔH in. H_2O DESIRED	ACTUAL	51 DRY GAS TEMP. °F INLET	56 OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	61* STACK PRESS in. H_2O in. Hg	66* STACK TEMP. °F °C	71* 75 NULL ANGLE (DEGREES)
B-1		0935	30	533.2	.70	1.3	1.3	80	62	0	265	56	.52	60	
		09.50	45	543.4	.70	1.3	1.3	81	63	0	335	57		63	
B 1		1005	60	553.9	.88	1.15	1.15	82	64	0	278	57		64	
B-2		1020	75	563.	1.0	1.3	1.3	81	64	0	275	57		61	
		1035	90	573.3	1.1	1.55	1.55	87	65	0	274	58		50	
		1050	105	583.5	1.1	1.55	1.55	85	67	0	275	59		49	
B-2	STOP	1105	120	585.507											
				TOTAL											

METER LEAK CHECK DURING TEST:

0.010 CF 60 SEC 10 in. Hg

CF SEC in. Hg

	METER READING STOP	START

STATIC PRESSURE PORT

in. H_2O

in. Hg

COMMENTS:

DRS-5

(REVISED 8/31/79)

* FIELDS FOR NONPARTICULATE RUN

APPENDIX D-2

ANDERSEN IMPACTOR FIELD DATA SHEETS

ANDERSEN IMPACTOR FIELD DATA

Plant LYNCHBURG FOUNDRY Time 0752 Nozzle Dia. #B

Location ARCHER CREEK Run No. 1-P Avg. ΔP

Operator ~~SAM DUCZYSKI~~ LES PILCHER Impactor Location STACK P-1 Traverse Pt. P1 A & B

Date 12/16/81 D.G.M. No. 2547 Pb 29.87

Andersen Imp No. E 873 D.G.M. Y 0.99 Stack Dia. 6 ft

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	1321	1314	1315	1316	1317	1318	1319	1320	B-266	

ΔH 0.45

Dry Gas Meter Reading	Elapsed Time (clock)	S.W.	Orifice Δh "H_2O	°F Meter Temperature Outlet	Inlet	Vacuum ~~Orifice~~ ~~S.P.~~ "Hg	Impactor Temp °F	Traverse Point
588.35								
589.00	7:52	0	0.45	65	51	0	62 °F	1 A
592.35	8:02	10	0.45	70	53	0	57 °F	1 A
596.34	8:12	20	0.45	73	55	0	57 °F	1 A
600.33	8:22	30	0.45	73	57	0	58 °F	1 A
604.33	8:32	10	0.45	72	60	0	64 °F	2 A
608.34	8:42	20	0.45	73	61	0	67 °F	2 A
612.36	8:52	30	0.45	77	61	0	67 °F	2 A
616.44	9:36	10	0.45	72	63	0	65 °F	1 B
620.56	9:56	20	0.45	80	66	0	70 °F	1 B
624.68	10:06	30	0.45	83	67	0	66 °F	1 B
628.80	10:16	10	0.45	83	67	0	59 °F	2 B
632.90	10:26	20	0.45	86	67	0	57 °F	2 B
637.01	10:36	30	0.45	86	68	0	57 °F	2 B

Initial leak check .011 - 60 sec 15 "Hg Stack Initial

Final leak check Stack Final

Total H_2O Collected in Flask

Total H_2O Collected

4 hr Run

Start 10:39.51 Dec 16, 1981

	Dry Gas Meter Reading	Elapsed Time		Orifice Δh "H_2O	Meter Temperature ~~Inlet~~ Outlet	~~Outlet~~ Inlet	Vacuum ~~Orifice~~ ~~S.P.~~ - "Hg	Impactor Temp °F	Traverse Point
10:39.51 / 10:49.51	637.01 / 641.10	0	10	0.45	84	69	0	57°F	1 A
10:59	645.19	10:59	20	0.45	83	69	0	56°F	1 A
11:09	649.20	11:09	30	0.45	84	69	0	56	1 A
11:19	653.25	11:19	40	0.45	84	69	0	60	1 B
11:29	657.34	11:29	50	0.45	85	69	0	67	1 B
11:39	661.42		60	0.45	78	70	0	67	1 B
Dec 11:50.50	665.73	Dec 30	10	0.45	84	70	0	67	1 B
D 12:10:30	669.93		20	0.45	88	71	0	73	1 B
D 12:20:30	673.95		30	0.45	88	72	0	73	1 B
12:30:30	678.16		40	0.45	89	74	0	73	1 A
12:40:30	682.25		50	0.45	89	74	0	74	1 A
12:50:30	686.25		60	0.45	90	75	0	80	1 A

Initial leak check _____

Final leak check _____

Total H_2O Collected in Flask _____

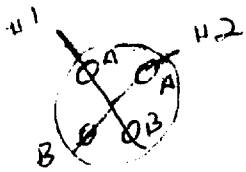
Total H_2O Collected _____

Si-Gel initial _____

Si-Gel final _____

Net _____

4 hr run



meter box - 2547

ANDERSEN IMPACTOR FIELD DATA

Plant LYNCHBURG FOUNDRY Time 1141 Nozzle Dia 4mm / #

Location ARCHER CREEK Run No. 1-P-2 Avg. Δi

Operator Dulctsky Impactor Location P-2 Traverse Pt.

Date 12/16/81 D.G.M. No. 2438 Pb 29.87

Andersen Imp No. A D.G.M. Y 0.99 Static Pb AVE -

Stage No.	0	1	2	3	4	5	6	7	8	9
Substrate No.	[redacted]	1346	1347	1348	1349	1350	1351	1352	B-270	

999 BLANK RUN - DUAL PREFILTRO

Dry Gas Meter Reading	Elapsed Time Clock	Elapsed Time S.W.	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	VACUUM ~~Orifice S.P. = "Hg~~	Impactor Temp	Traverse Point
549.938	11:41	0	0.13	80	68	26	68	A-1
551.9	11:51	10	0.13	80	67	26	69	A-1
554.0	12:01	20	0.13	77	66	26	71	A-1
556.1	12:11	30	0.13	78	66	26	73	A-1
558.3	12:21	40	0.13	76	65	26	72	A-1
560.4	12:31	50	0.10	81	67	26	69	A-1
562.472	12:41	60	0.10	75	66	26	64	A-1
562.472	12:52	0	0.13	84	69	26	53	B-1
564.8	1:02	10	0.13	85	70	26	52	B-1
566.9	1:12	20	0.13	85	71	26	65	B-1
569.1	1:22	30	0.13	85	71	26	66	B-1
571.2	1:32	40	0.13	84	71	26	66	B-1
573.3	1:42	50	0.13	85	71	26	64	B-1
575.491	1:52	60	0.13	80	70	26	62	B-1
575.503	2:05	0	0.13	80	68	26	65	A-1
577.7	2:15	10	0.13	82	69	26	63	A-1

Initial leak check Pitot NOT USED

Final leak check

Total H_2O Collected in Flask N.A., SEE

Total H_2O Collected TOTAL P TRAIN

Dry Gas Meter Reading	Elapsed Time Clock	Elapsed Time S.W.	Orifice Δh "H_2O	Meter Temperature Inlet 5	Meter Temperature Outlet 6	VACUUM ~~Orifice S.P. "Hg~~	Impactor Temp 3	Traverse Point
579.848	2:25	20	0.13	77	68	26	65	A-1

Initial leak check _____

Final leak check _____

Total H_2O Collected in Flask _____

Total H_2O Collected _____

Si-Gel initial _____

Si-Gel final _____

Net _____

Stack P-2
12/16/81
Imp. # A

ANDERSEN IMPACTOR FIELD DATA

Plant LYNCHBURG FOUNDRY Time Nozzle 40 mm

Location ARCHER CREEK Run No. 2-P-2 (PORT) -A&B Nozzle

Operator [illegible] Impactor Location P-2 Traverse Pt.

Date 12/16/81 D.G.M. No. 2438 Pb 29.87

Andersen Imp No. 0 D.G.M. Y 0.99 Start Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	989	982	983	984	985	986	987	988	B237	

Dry Gas Meter Reading	Elapsed Time Clock	Sw	Orifice Δh "H_2O	5 Meter Temperature Inlet	6 Outlet	Orifice S.P. - "Hg	3 Impactor Temp	Traverse Point
482.000	7:59	0	0.45	69	55		52	A-1
486.2	8:09	10	0.45	85	59		49	A-1
490.2	8:19	20	0.45	87	62		48	A-1
494.2	8:29	30	0.45	88	63		58	A-1
498.2	8:39	40	0.45	88	64		63	A-1
502.169	8:49	50	0.45	Stop, change ports				A-1
502.170	9:18	0	0.45	77	64		60	B-1
506.2	9:28	10	0.45	87	65		64	B-1
510.5	9:38	20	0.45	88	66		63	B-1
514.1	9:48	30	0.45	89	66		68	B-1
518.1	9:58	40	0.45	92	67		67	B-1
522.4	10:08	50	0.45	91	68		50	B-1
526.1	10:16	60	0.45	91	68		49	B-1
530.0	10:28	70	0.45	90	68		49	B-2
534.0	10:38	80	0.45	92	69		50	B-2
537.9	10:48	90	0.45	91	69		51	B-2

Initial leak check .008 cfm @ 5" Hg TLL Initial

Final leak check Final

Total H_2O Collected in Check

Total H_2O Collected

P-2

Dry Gas Meter Reading	Elapsed Time Clock Sw	Orifice Δh "H_2O	5 Meter Temperature Inlet	6 Meter Temperature Outlet	Orifice S.P. - "Hg	3 Impactor Temp	Traverse Point
541.9	10:58 100	0.45	91	69		49	B-2
545.9	11:08 110	0.45	92	69		62	B-2
Stop 548.985	11:18 120	0.45	83	69	Cud	53	B-2

Initial leak check _____

Final leak check _____

Total H_2O Collected in Flask _____

Total H_2O Collected _____

Si-Gel initial _____

Si-Gel final _____

Net _____

ANDERSEN IMPACTOR FIELD DATA

Plant Lynchburg Foundry Time 0750 /II 3.0 H

Location Archer Creek Run No. 1-P-3

Operator C Impactor Location Stack P-3

Date 12/16/81 Wed. D.G.M. No RAC 2257 29.87

Andersen Imp No. I D.G.M. 1.00

Stage No.	0	1	2	3	4	5	6	7	8	9
Substrate No.	1077	1070	1071	1072	1073	1074	1075	1076	B-248	
TARE wt. (mg)		.50392	.47658	.52198	.51468	.51627	.51227	.52415	.47425	.57049

Dry Gas Meter Reading	Elapsed Time Clock	Elapsed Time SW	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	VACUUM ~~Orifice S.P. "Hg~~	Impactor Temp	Traverse Point
068.714	0750	0	0.45	50	50	0	52	B-2
72.200	0800	10	0.45	59	51	0	52	B-2
76.420	0810	20	0.45	64	52	0		B-2
80.415	0820	30	0.45	66	53	0		B-2
		POINT CHANGE						
80.415	0827	30	0.45	57	51	0		B-1
84.21	0837	40	0.45	62	52	0		B-1
88.100	0847	50	0.45	67	53	0		B-1
92.020	0857	60	0.45	67	55	0		B-1
		PORT CHANGE						
92.020	0909	60	0.45	44 52	49	0		A-1
95.900	0919	70	0.45	63	54	0		A-1
99.820	0929	80	0.45	67	56	0		A-1
103.737	0939	90	0.45	68	57	0		A-1
103.737	0942	90	0.45	61	53	0		A1

Initial leak check 0 at 13 min @ 7" Hg Final Initial

Final leak check Final

Total H_2O Collected in Flask

Total H_2O Collected

LYNCHBURG FOUNDRY ARCHER CREEK

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	VACUUM ~~Orifice S.P.~~ - "Hg	Impactor Temp	Traverse Point
107.600	0953/100	0.45	68	57	0		A-1
112.8	1003/110	0.45	68	58	0		A-1
117	1014/121	0.45	68	58	0		
120	1023/130	0.45	68	58	0		
124	1033/140	0.45	68	59	0		[illegible]
128	1043/150	0.45	70	60	0		A2
132	1053/160	0.45	70	59	0		
136.523	1103/170	0.45	71	61	0		
	Port change						
136.523	1116/170	0.45	61	58	0		B-1
141	1126/180	0.45	68	61	0		B-1
144	1136/190	0.45	72	61	0		B-1
148.3	1146/200	0.45	70	61	0		B-1
	switched to point B-2 @ 1051						
	1156/210	0.45			0		B-2
154.525	1202/216		66	60	0		B-2

Initial leak check _____

Final leak check _____

Total H_2O Collected in Flask _____

Total H_2O Collected _____

Si-Gel initial _____

Si-Gel final _____

Net _____

LYNCHBURG FOUNDRY ARCHER CREEK

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	~~Orifice~~ S.P. - "Hg	Impactor Temp	Traverse Point
~~1206~~ 156.0	1206/220	0.45	67	60	0		B-2
160.0	1216/230	0.45	65	59	0		B-2
163.889	1226/240	0.45	68	59	0		B-2
			STOP		TEST		

Initial leak check _____

Final leak check _____

Total H_2O Collected in Flask _____

Total H_2O Collected _____

Si-Gel initial _____

Si-Gel final _____

Net _____

ANDERSEN IMPACTOR FIELD DATA

Plant Lynchburg Foundry Time _____ Nozzle _____

Location Lynchburg VA Run No. 2-C/Andersen Avg ΔP 0.45

Operator TC Impactor Location C-1 Traverse Pt.

Date 12/17/81 D.G.M. No. BAC 2257 Pb 29.62

Andersen Imp No. I D.G.M. Y Static Pb

Stage No.	0	1	2	3	4	5	6	7	8	F
Substrate No.	1297	1298	1295	1294	1293	1292	1291	1290	B-263	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	VACUUM ~~Orifice~~ S.P. - "Hg	Impactor Temp	Traverse Point
164.238	0729/0	0.45	31	29	0		A-1
167.97	0739/10	0.45	~~35~~ 44	31	0		A-1
171.75	0749/20	0.45	50	33	0		A-1
175	0759/30	0.45	56	38	0		A-1
176.292	0801/32	0.45	56	38	0		A-1
	CHANGED NOZZLE to #26 from A 3.0						
176.292	0809/32	0.45	45	38	0		A-1
179.350	0817/40	0.45	50	39	0		A-1
183.190	0827/50	0.45	53	39	0		A-1
187.03	0837/60	0.45	55	40	0		A-1
	CHANGED POINT A-2 @ 0837						
191.0	0847/70	0.45	56	42	0		A-2
194.9	0857/80	0.45	55	44	0		A-2
198.8	0907/90	0.45	57	45	0		A-2
202.47	0917/100	0.45	63	47	0		A-2
206.35	0927/110	0.45	62	48	0		A-2

Initial leak check 0.004 cfm @ 7"Hg Sheet Initial _____

Final leak check _____ Sheet Final _____

Total H_2O Collected in Flask _____

Total H_2O Collected _____

J-C1 <085

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
210.26	0937/120	0.45	60	48	0		A-2
214.16	0947/130	0.45	66	49	0		A-2
218.11	0957/140	0.45	70	52	0		A-2
222.0	1007/150	0.45	75	54	0		A-2
225.945	1017/160	0.45	74	57	0		A-2
		Port Change					
225.945	1024/160	0.45	63	53	0		B-1
229.90	1034/170	0.45	70	58	0		B-1
233.84	1044/180	0.45	71	57	0		B-1
237.77	1054/190	0.45	69	55	0		B-1
241.7	1104/200	0.45	73	56	0		B-1
	~~1114/210~~	SWITCH TO POINT B-2 @ 1104					
245.720	1114/210	0.45	75	57	0		B-2
245.720	1136/210	0.45	57	52	0		B-2
249.600	1146/220	0.45	67	54	0		B-2
253.45	1156/230	0.45	73	55	0		B-2

Initial leak check _____

Final leak check _____

Total H_2O Collected in Flask _____

Total H_2O Collected _____

Si-Gel initial _____

Si-Gel final _____

Net _____

Shut down train at 1114, plant shut down
" start up 1136

2-C1 3g-1

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
257,328	1206/240		75	56	0		B-2

Initial leak check _____

Final leak check _____

Total H_2O Collected in Flask _____

Total H_2O Collected _____

Si-Gel initial _____

Si-Gel final _____

Net _____

ANDERSEN IMPACTOR FIELD DATA

Plant Lynchburg Time 7:34 A.m Nozzle Dia. A

Location Stack C-2 Run No. 2-C-2 Cyc. Sl

Operator L & P. Picher Impactor Location Traverse Pt.

Date Dec 17, 1981 D.G.M. No. 2547 Pb 29.62

Andersen Imp No. F (873) D.G.M. Y Static "Hg

Nozzle A

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	718	719	720	721	722	723	724	725	B-204	

Note: Filters put in Andersen w.t. Numbers up

Dry Gas Meter Reading	Elapsed Time		Orifice Δh "H_2O	Meter °F Temperature Inlet	Outlet	Vacuum ~~Orifice S.P.~~ - "Hg	Impactor Temp °F	Traverse Point
686.99	7:34	0						
690.86	7:44	10	0.45	28	35	0	58	B-1
694.69	7:54	20	0.45	34	54	0	58	B-1
698.58	8:04	30	0.45	37	58	0	59	B-1
702.42	8:14	40	0.45	42	64	0	59	B-1
706.30	8:24	50	0.45	45	66	0	57	B-1
710.32	8:34	60	0.45	48	68	0	59	B-1
714.30	8:44	10	0.45	50	70	0	58	B-2
718.30	8:54	20	0.45	52	70	0	57	B-2
722.31	9:04	30	0.45	53	71	0	59	B-2
726.34	9:14	40	0.45	53	71	0	59	B-2
730.40	9:24	50	0.45	54	71	0	61	B-2
734.44	9:34	60	0.45	55	71	0	61	B-2

Initial leak check Final leak check

Total H_2O Collected in Flask

Total H_2O Collected

Dec 17, 1981

Dry Gas Meter Reading	Elapsed Time		Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Vacuum ~~Orifice S.P. – "Hg~~	Impactor Temp	Traverse Point
738.44	9:54	10	0.45	55	72	0	62	A-2
742.46	10:04	20	0.45	56	73	0	63	A-2
746.48	10:14	30	0.45	56	73	0	64	A-2
750.50	10:24	40	0.45	56	73	0	64	A-2
754.52	10:34	50	0.45	57	72	0	64	A-2
758.56	10:44	60	0.45	56	70	0	65	A-2
762.52	10:54	10	0.45	57	70	0	65	A-1
766.59	11:04	20	0.45	56	70	0	63	A-1
770.59	11:14*	30	0.45	55	70	0	63	A-1
Start 11:41 774.45	11:51*	40	0.45	51	57	0	66	A-1
778.48	12:01	50	0.45	53	69	0	66	A-1
782.47	12:11	60	0.45	55	70	0	67	A-1
		240						

Initial leak check ✓

Final leak check

Total H_2O Collected in Flask

Total H_2O Collected

Si-Gel initial

Si-Gel final

Net

* Note: at 11:14 ~~train~~ Anderson was shut down due to plant not operating; 11:41 A.M. Anderson started up again

Nozzle: A

10:36

ANDERSEN IMPACTOR FIELD DATA Nozzle No: B-40

Plant Lynchburg Foundry Time 0738 - 1226 Nozzle Dia. 4.0 mm

Location Archer Creek Run No. 2-C3 Avg. ΔH M-5

Operator Dulletsky Impactor Location C-3 Traverse Pt. 4

Date 12/17/81 D.G.M. No. 2438 Pb 29.62

Andersen Imp No. 0 D.G.M. Y 0.99 Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	1029	1028	1027	1026	1025	1024	1023	1022	B-242	

Dry Gas Meter Reading	Elapsed Time Clock	Elapsed Time SW	Orifice Δh "H_2O	Meter Temperature 1 Inlet	Meter Temperature 2 Outlet	Orifice S.P. - "Hg	6 Impactor Temp	Traverse Point
581.018	7:38	0	0.45	48	31	0	74	A-1
584.9	7:48	10	0.45	63	35	↓	76	A-1
588.7	7:58	20	0.45	69	39		77	A-1
592.6	8:08	30	0.45	71	43		78	A-1
596.5	8:18	40	0.45	72	45		75	A-1
600.4	8:28	50	0.45	73	48		74	A-1
604.3	8:38	60	0.45	73	49		75	A-1
608.2	8:48	70	0.45	75	50		74	A-2
612.1	8:58	80	0.45	77	51		74	A-2
616.0	9:08	90	0.45	77	52		76	A-2
620.0	9:18	100	0.45	78	53		75	A-2
623.9	9:28	110	0.45	80	54		75	A-2
627.8	9:38	120	0.45	80	55		76	A-2
631.7	9:48	130	0.45	80	56		78	A-2
635.6	9:58	140	0.45	81	56		79	A-2
639.6	10:08	150	0.45	81	57		81	A-2

Initial leak check 0.03 cfm @ 15"Hg ; 1 min. Operator Initial

Final leak check

Total H_2O Collected in Black

Total H_2O Collected

Temp. — [illegible]

Dry Gas Meter Reading	Elapsed Time Clock	Elapsed Time S.W	Orifice Δh "H_2O	Meter Temperature Inlet (1)	Meter Temperature Outlet (2)	Orifice S.P. - "Hg	Impactor Temp (6)	Traverse Point
643.5	10:18	160	0.45	81	57	0	81	A-2
647.8	10:28	170	0.45	81	58	↓	82	A-2
651.730	10:38	180	0.45	81	58		84	A-2
651.730	11:02	0	0.45	71	57		82	B-2
655.388	11:12	9[illegible]	0.45	71	57	Plant shut down	82	B-2
~~[illegible]~~	~~11:22~~	~~20~~	~~0.45~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~B2~~
~~[illegible]~~	~~11:32~~	~~30~~	~~0.48~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~B2~~
655.388	11:35	0	0.45	54	53		82	B-2
659.2	11:45	10	0.45	70	53		82	B-2
663.1	11:55	20	0.45	78	54		84	B-2
667.1	12:05	30	0.45	78	56		85	B-1
671.0	12:15	40	0.45	77	56		86	B-1
674.9	12:25	50	0.45	77	57		88	B-1
675.392	12:26	51	0.45	77	57		88	B-1

Initial leak check _____

Final leak check _____

Total H_2O Collected in Flask _____

Total H_2O Collected _____

Si-Gel initial _____

Si-Gel final _____

Net _____

ANDERSEN IMPACTOR FIELD DATA

Plant Lunkbburg Foundry | Time | Nozzle Dia.

Location C-1 | Run No. B-C-1 | Amp [illegible]

Operator TC | Impactor Location | Traverse Pt. 1

Date 12/18/81 | D.G.M. No. 2257 | Pb

Andersen Imp No. I | D.G.M. Y | Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	F
Substrate No.	1005	743	744	745	746	747	748	749	B-207	

0 742 is wrong type anderson substrate, replaced with 1005 from miscellaneous filters

Sizi Cyclone

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	VACUUM ~~Orifice S.P.~~ - "Hg	Impactor Temp	Traverse Point
258.877	0708/0	0.45	43	43	0		B-1
262.67	0718/10	0.45	52	45	0		B-1
266.50	0728/20	0.45	58	48	0		B-1
270.40	0738/30	0.45	60	49	0		B-1
274.3	0748/40	0.45	62	51	0		B-1
278.05	0758/50	0.45	62	52	0		B-1
281.92	0808/60	0.45	62	53	0		B-1
		switch to Point			B-2		
281.92	0808/60	0.45	62	53	0		B-2
285.8	0818/70	0.45	64	54	0		B-2
289.7	0818/80	0.45	63	55	0		B-2
293.4	0828/90	0.45	64	55	0		B-2
297.4	0838/100	0.45	63	55	0		B-2
301.3	0848/110	0.45	63	55	0		B-2
305.144	0858/20	0.45	62	55	0		B2
	0857	SWITCH		to Port	A		

Initial leak check 0.015 fm @ 6"Hg | Stack Initial

Final leak check | Stack Final

Total H_2O Collected in Stack

Total H_2O Collected

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	~~Orifice~~ S.P. - "Hg	Impactor Temp	Traverse Point
305.144	0922/120	0.45	51	50	0		A-1
309.0	0932/130	0.45	58	52	0		A-1
312.8	0942/140	0.45	62	52	0		A-1
316.7	0952/150	0.45	65	54	0		A-1
320.6	1002/160	0.45	66	55	0		A-1
324.6	1012/170	0.45	65	55	0		A-1
328.45	1022/180	0.45	61	54	0		A-1
	1022	switch	to	point	A-2		
328.45	1022/180	0.45	61	54	0		A-2
338.0	1047/205	0.45	60	52	0		A-2
339.9	1052/210	0.45	61	52	0		A-2
343.75	1102/220	0.45	59	52	0		A-2
347.6	1102/230	0.45	63	59	0		A-2
351.487	1122/240	0.45	62	58	0		A-2

Initial leak check _____

Final leak check _____

Total H_2O Collected in Flask _____

Total H_2O Collected _____

Si-Gel initial _____

Si-Gel final _____

Net _____

ANDERSEN IMPACTOR FIELD DATA (Thr. run)

Plant Lynchburg Foundry Time 6 56 Am Nozzle Dia. A

Location F-3 Run No. 3-F-3 Avg. Δ

Operator L Y Fitcher Impactor Location Traverse Pt.

Date Dec 18, 1981 D.G.M. No. 2547 Pb

Andersen Imp No. E D.G.M. Y Stack Dia

Nozzle A

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	1093	1092	1091	1090	1089	1088	1087	1086	B-250	

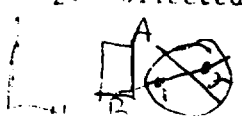
Dry Gas Meter Reading	Elapsed Time		Orifice Δh "H_2O	Meter °F Temperature Inlet	Outlet	Vacuum ~~Orifice S.P.~~ "Hg	°F Impactor Temp	Traverse Point
782.55	6:56	0						
786.52	7:06	10	0.45	49	56	0	56	B-2
790.50	7:16	20	0.45	52	70	0	55	B-2
794.50	7:26	30	0.45	57	78	0	55	B-2
798.53	7:36	40	0.45	59	80	0	56	B-2
802.60	7:46	50	0.45	62	82	0	57	B-2
806.62	7:56	60	0.45	64	83	0	54	B-2
810.71	8:06	10	0.45	64	83	0	57	B-1
814.80	8:16	20	0.45	65	83	0	57	B-1
818.89	8:26	30	0.45	66	84	0	58	B-1
822.92	8:36	40	0.45	66	84	0	58	B-1
826.99	8:46	50	0.45	66	84	0	57	B-1
831.11	8:56	60	0.45	66	83	0	58	B-1

Initial leak check ✓ Silica Gel Initial

Final leak check Silica Gel Final

Total H_2O Collected in Flask

Total H_2O Collected



Stack F-3

Total -82.55

Start 9:13 30

3 P 3

Dry Gas Meter Reading	Elapsed Time		Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
835.22	9:23	10	0.45	62	64	0	60	A-1
839.22	9:33	20	0.45	62	74	0	60	A-1
843.23	9:43	30	0.45	63	83	0	58	A-1
847.33	9:53	40	0.45	65	85	0	59	A-1
851.25	10:03	50	0.45	65	86	0	64	A-1
855.28	10:13	60	0.45	66	86	0	63	A-1
859.30	10:23	10	0.45	66	86	0	62	A-2
863.32	10:33	20	0.45	67	86	0	50	A-2
867.35	10:43	30	0.45	68	87	0	49	A-2
871.41	10:53	40	0.45	70	89	0	48	A-2
875.51	11:03	50	0.45	70	88	0	49	A-2
879.62	11:13	60	0.45	71	90	0	49	A-2
	240							

Initial leak check _____

Final leak check _____

Total H_2O Collected in Flask _____

Total H_2O Collected _____

Si-Gel initial _____

Si-Gel final _____

Net _____

N
W E
S

ANDERSEN IMPACTOR FIELD DATA

Plant Lynchburg Foundry Time 7:01 - Nozzle Dia. 4.0 mm

Location Archer Creek Run No. 3-C3 Ave. ΔP

Operator Duletsky Impactor Location C-3 Traverse Pt.

Date 12/18/81 D.G.M. No. 2438 Pb 29.76

Andersen Imp No. 0 D.G.M. Y Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	1305	1304	1303	1302	1301	1300	1299	1298	B-24	

Nozzle No. B-40

Dry Gas Meter Reading	Elapsed Time Clock	SW	Orifice Δh "H_2O	1 Meter Temperature Inlet	2 Meter Temperature Outlet	Orifice S.P. - "Hg	6 Impactor Temp	Traverse Point
675.542	7:01	0	0.45	67	45	0	75	A-2
679.2	7:11	10	0.45	76	47		75	A-2
683.1	7:21	20	0.45	84	51		75	A-2
687.0	7:31	30	0.45	84	54		75	A-2
690.9	7:41	40	0.45	85	55		77	A-2
694.9	7:51	50	0.45	86	57		78	A-2
698.8	8:01	60	0.45	86	58		80	A-2
702.7	8:11	70	0.45	85	59		80	A-1
706.6	8:21	80	0.45	86	60		79	A-1
710.5	8:31	90	0.45	86	60		79	A-1
714.4	8:41	100	0.45	87	60		80	A-1
718.3	8:51	110	0.45	87	60		80	A-1
722.200	9:01	120	0.45	87	61		80	A-1
722.200	9:20	0	0.45	73	57		81	B-2
726.2	9:30	10	0.45	82	57		80	B-2
730.1	9:40	20	0.45	84	58		80	B-2

Initial leak check 0.005 cfm @ 10"

Final leak check

Total H_2O Collected in Flask

Total H_2O Collected

Silicel Initial

Silicel Final

Anderson AU U.G.M 2435 Stack C-3 2/2

Dry Gas Meter Reading	Elapsed Time		Orifice Δh "H_2O	1 Meter Temperature Inlet	2 Meter Temperature Outlet	Orifice S.P. - "Hg	6 Impactor Temp	Traverse Point
734.0	0950	30	0.45	86	58	0	83	B-2
737.9	1000	40	0.45	87	59	—	82	B-2
741.8	1010	50	0.45	85	58		83	B-2
745.7	1020	60	0.45	81	57		83	B-2
749.6	1030	70	0.45	79	56		83	B-1
753.5	1040	80	0.45	76	54		84	B-1
757.4	1050	90	0.45	77	54		84	B-1
761.3	1100	100	0.45	77	54		84	B-1
765.1	1110	110	0.45	81	56		82	B-1
769.025	1120	120	0.45				82	B-1

Initial leak check _____ Si-Gel initial _____

Final leak check _____ Si-Gel final _____

Total H_2O Collected in Flask _____ Net _____

Total H_2O Collected _____

APPENDIX D-3

DUAL CYCLONE FIELD DATA SHEETS

VG / 'D'

IP DUAL CYCLONE SAMPLER FIELD DATA

Plant Name Lynchburg | Nozzle # 3.5 | Diameter 3.5 mm

Location C-1 | Av. ΔP 1.3 | Stack T ~50

Date 12/16 | Barom P 29.87 | Static P ~0.5

Operator GRONSERG | Start Time 0506 | Meter # V-1 Y =

IP Sampler # GCA | Impactor Location CENTER - C-1 STACK.

Run No. 1 - ~~FOURTH~~ COLLECT % Moisture 1% | Leak Check <0.01

Filter # T-118, C-5, M-2 X Part. Bottle# NONE | III Part. Bottle: NONE

DGM Reading	Elapsed Time	TOT.	Orifice Δh("H2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice Sp."Hg	Comments
635.641	5:06	0	0.21	26	32	0.8	TIME WT
641.34	0523	17	0.21	26	32	0.8	ALL AVG'S.
646.	0538	32	0.21	26	32	0.8	
JV. ~~735~~ 661	0922	~~76~~ 76	0.21	28	33	0.8	[redacted]
667.7	0943	97	0.21	28	33	0.8	
684.05	1033	147	0.21	34	39	0.8	
708.813	1148	222	STOP - Remove GF filter #C-5				Impact b-up & dust 2 plates medium loaded - prompt shut down of IP.
	Removed GF - Thimble only.						
708.813	1200	222	0.21	40	47	0.3	
721.796	1239	261	STOP	40	46	0.3	Final DGMT - 43
	INSERT TFE filter M-2						
721.796	1247	261	~~0.50~~ ~~0.27~~ .08	40	46	6"	Cleaned down vac & get 0.21 [illegible] 0-6" [illegible] = 7" on
730.60	1327	301	0.21 *	40	46	7"	
	1342	316	STOP - VAC CHECK.			7"	
	1345	316	~~Restart~~ 0.21	40	46	7"	box 2257 [illegible] when DH = 0.45
747.779	1402	323	STOP - END TEST			7"	
	TT =	323					

IP IMPACTOR FIELD DATA

Plant Name: Lynchburg Nozzle #: 3.5 Diameter: 3.5mm

Location: C-2 Stack P: 13 Stack T: ~50

Date: 12/16 Barom P: 29.87 Static P: +0.5"

Operator: GRONBERG Start Time: 0815 Meter #: 2282 Y =

IP Sampler #: SRI Impactor Location: CENTER

Run No. T-103, C-4, M-3 % Moisture: 1% Leak Check: 6.00 cfm @ 5"

Filter #: 1-C-2 X Part. Bottle#: III Part. Bottle#:

DGM Reading	Elapsed Time		Orifice Δh("H2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice ~~SP-"Hg~~ VAC.	Comments
	Port B						
[illegible]056	0815	0	0.44	20	20	~1"	
723.0	0839	24	0.44	26	36	~1"	
735	0912	57	0.44	25	33	~1"	
748.	0945	90	0.44	33	42	~1"	
767.3	1035	140	0.44	34	46	<1"	
800.286	1201	286	0.44	- Stopped & Removed GF-TM 34,40			
	Port A - Thimble only. Probe/Gas initially disturbed						
800.286	1211	226	0.44	32	35		
815.231	1250	STOP-265		Add TFE filter M-3			
	START - TFE M-3						
815.231	1259	265	0.44	34	46	5"	
844	1465		0.44 ~~STOP - VAC CHECK~~			7"	
844.232	1416	342	STOP	36	50	—	END TEST

PG 1A of 2A

IP DUAL CYCLONE SAMPLER FIELD DATA

Plant Name LYNCHBURG Nozzle # 3.5 Diameter 3.5mm

Location ARCHER CREEK Av. ΔP 1.3 Stack T See M-5

Date 12/17/81 Barom P 29.82 Static P 0.55 to 0.2

Operator GROUSERC Start Time 0738 Meter # V-1 Y = 0.9

IP Sampler # SRI Impactor Location P-3 B

Run No. [illegible] % Moisture ~1 Leak Check <0.01

Filter # C-7, T-51, M-#5 Part. Bottle# III Part. Bottle#

DGM Reading	Elapsed Time		Orifice Δh("H2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
745.069	0738	0	0.21	20	26	0.8	
752.8	0750	12	0.21	20	27	0.9	
762	0822	44	0.21	20	27	0.9	
772	0852	74	0.21	22	28	1.0	
782	0920	102	0.21	22	29	1.0	
794	0954	136	0.21	22	29	1.0	
816	1059	201	0.21	26	32	1.2	
826.33	1112	214	0.21	26	32	1.2	Stop Line
	Changed GF Filter & a TFE #M-#5						
826.33	1209	214	~~0.21~~	~~28~~	~~36~~	6"-7"	tk j
839	1302	267	0.21	30	37	>6"	
866.005	1409	367	0.21	30	39	>6"	

PG 2A of 2A

IP DUAL CYCLONE SAMPLER FIELD DATA

Plant Name LYNCHBURG Nozzle # 3-5 Diameter 3.5mm

Location ARCHER CREEK Av. ΔP Ø Stack T 260

Date 12/18 Barom P 29.78 Static P ~0

Operator Gronberg Start Time 0723 Meter # V-1 Y =

IP Sampler # SR1 Impactor Location Stack P-2 (formerly P-3)

Run No. 3-P2 % Moisture ~1 Leak Check NO

Filter # C-9 X Part. Bottle# III Part. Bottle#

DGM Reading	Elapsed Time	Orifice Δh("H_2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
846.002	0723 0	0.21	30	38	0.9	
This run is a combination of 2-P3 w/ new 6F filter. Cyclone catch is same, not recov yesterday. Total of 3 filters this Run.						
889	0826 63	0.21	30	38	0.9	
914	0932 129	0.21	34	38	0.9	
	1023 180	0.21	32	41	0.9	STOP
939.003	1023 STOP and Run 2/3					
					PG 2 of 2	
	TT = 547					

Pg 1B of 2B

IP DUAL CYCLONE SAMPLER FIELD DATA

Plant Name LYNCHBURG Nozzle # 3.5 Diameter 3.5 mm

Location ARCHER CREEK Av. ΔP 1.3 Stack T See M-5

Date 12/16/81 Barom P 29.82 Static P 0.55 & 0.25

Operator GRONBERG Start Time ~~0847~~ 0747 Meter # 1252 Y

IP Sampler # GCA Impactor Location P1 port B

Run No. 2-P1B % Moisture ~1 Leak Check <0.01

Filter # C-6, T-59, M-4 X Part. Bottle# III Part. Bottle#

DGM Reading	Elapsed Time	Orifice Δh("H2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
844.853	0747 ~~0847~~ / 0	0.44	30	20	4"	
	0824 / 37	0.44	45	35	~1"	
867	0853 / 66	0.44	45	35	~1"	
877	0923 96	0.44	53	37	~1"	
888 ?	0953 126	0.44	51	35	~1"	
914	1003 ~~156~~	0.44	51	42	~1"	
~~923.666~~ ~~1112~~	1112 205	0.44	46	35	1"	Stop, line dw
	Changed GF filter & TFE #M-4					
923.666	1207	0.44	44	50	5"	
933	1300 258	0.44	57	50	10"	
955.454	1400 358	0.44	61	47	13"	

pg 28 of 45

IP IMPACTOR FIELD DATA

Plant Name [illegible] Nozzle # 3.5 mm Diameter 3.5 mm

Location [illegible] Av. ΔP 1.3" Stack T ~50

Date 12/18 Barom P 29.78 Static P +0.5

Operator GRONBERG Start Time 0722-1022 Meter # 2287 Y =

IP Sampler # 6CA Impactor Location P-1 Stack

Run No. 3-81 % Moisture 1.0 Leak Check N. DONE

Filter # C-6, T-59, C-8, M- X Part. Bottle# III Part. Bottle#

DGM Reading	Elapsed Time	Orifice Δh("H2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
IP Sampler not recovered yesterday, this run is a continuation, new GF filter #C-8, Same thimble & cyclone catches (if any)						
955.461	0722-0	0.44	26	38	~1"	
981	0827-65	0.44	51	66	~1"	
006	0933-131	0.44	54	69	~1"	
023.	1018-	0.44	57	70	~1	
024.914	1022-180	STOP - End run.			2/3, 12/17 & 12/18/81	
	3 hrs Run time today,					
	TT=538					

APPENDIX D-4

VISIBLE EMISSION OBSERVATION FIELD DATA SHEETS

1/2 3

ynchburg Foundry
rcher Creek Plant
ynchburg, VA

Date - 12/16/81

Source - joining stacks, [illegible] #1
Source height - ~20' from roof level
Ht. of observation pt. - ~60-70' (roof level)

A Epstein
ertified - 10/81

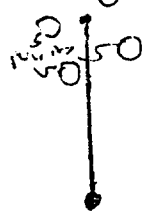
Time	1045	1144			
stance from source	60'	→			
ection from source	SSE	→	S		
ind speed	5-10 mph	→	A		
ackground	blue sky	→	M		
ind direction (from)	NE	→	E		

N

Observation

Wind

Y/O clock's



1144 1045

Lynchburg Foundry
Archer Creek Plant
Lynchburg, VA
12/18/81

111 Epstein

	0	15	30	45	Source	Color	Background
0	-	-	-				
1							
2	-						
3							
4	-						
5							
6	-						
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	0	0	0	0			
46	0	0	0	0			
47	0	0	0	0			
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			
54	0	0	0	0			
55	0	0	0	0			
56	0	0	0	0			
57	0	0	0	0			
58	0	0	0	0			
59	0	0	0	0			

Archer Creek Plant
Lynchburg, VA
12/16/81

3.53

1	0	15	30	45	Source	Color	Background
0	0	0	0	0			
1	0	0	0	0			
2	0	0	0	0			
3	0	0	0	0			
4	0	0	0	0			
5	0	0	0	0			
6	0	0	0	0			
7	0	0	0	0			
8	0	0	0	0			
9	0	0	0	0			
10	0	0	0	0			
11	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			
18	0	0	0	0			
19	0	0	0	0			
20	0	0	0	0			
21	0	0	0	0			
22	0	0	0	0			
23	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			
30	0	0	0	0			
31	0	0	0	0			
32	0	0	0	0			
33	0	0	0	0			
34	0	0	0	0			
35	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			
42	0	0	0	0			
43	0	0	0	0			
44	0	0	0	0			
45							
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49							
50							
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53							
54							
55							
56							
57							
58							
59							

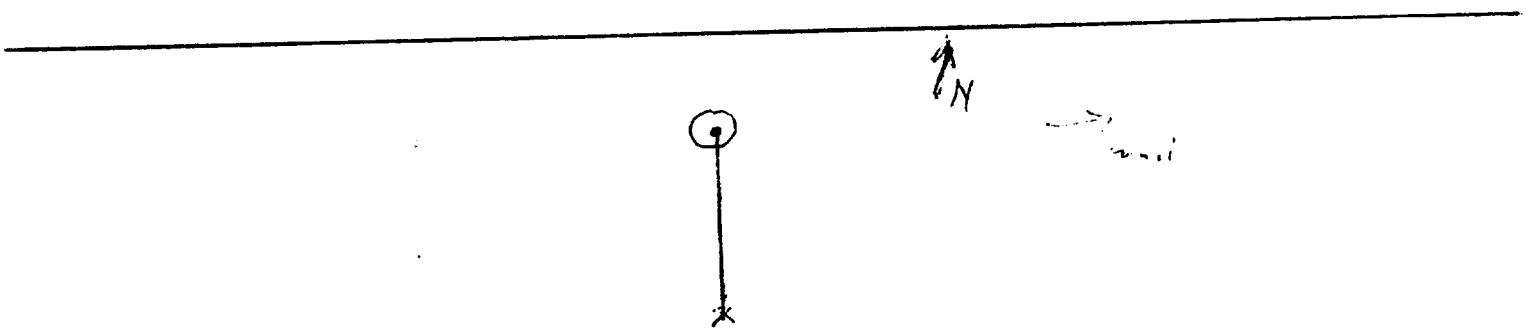
Lynchburg Foundry
Archer Creek Plant
Lynchburg, VA

Date - 12/18/81

Source - [illegible]3
Source height - ~25' from roof level
Ht. of observation pt. - ~60-70' (roof level)

TA Epstein
certified - 10/81

Time	854	913				
Distance from source	50'	5				
Direction from source	S	2				
wind speed	5-10 mph	1M				
direction	E W	E				



1 of 4

854 (approximate position, sun obs (vind [illegible]))

~/50% clouds

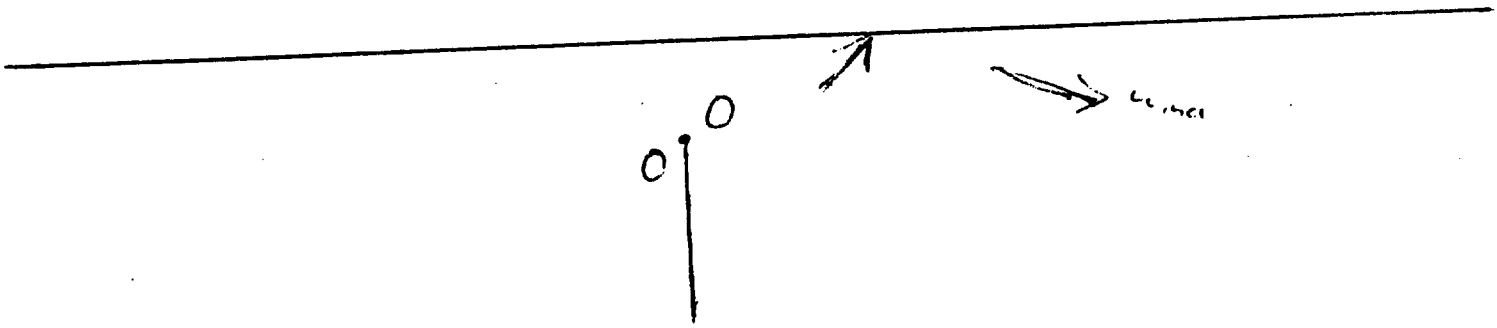
-ynchburg Foundry
-rcher Creek Plant
-ynchburg VA

Date - 12/18/81

Source - C-1, P1
Source height - ~25' from roof level
Ht. of observation pt. - ~60-70' (roof level)

TA Epstein
Certified - 10/81

Time	915	928				
Distance from source	80'					
Direction from source	SE	A				
Wind speed	5-10 mph	M				
Direction	WSW	C				



75% clouds

4 of 4

141 915
sun partially obscured

Archer Creek Plant
Lynchburg, VA
12/19/81

3	0	15	30	45	Source	Color	Background
0	-	-	-				
1							
2	-						
3							
4	-						
5							
6	-						
7							
8	-						
9							
10	-						
11	-						
12							
13	-						
14							
15							
16							
17							
18							
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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	C	C	C	C	C-3		Jim St.
55	C	C	C	C			
56	C	C	C	C			
57	C	C	C	C			
58	C	C	C	C			
59	C	C	C	C			

Archer Creek Plant
Lynchburg, VA
12/18/81

	0	15	30	45	Source	Color	Background	
	0	0	0	0	C-3			
	0	0	0	0				
	0	0	0	0				
	0	0	0	0				
	0	0	0	0				
	0	0	0	0				
	0	0	0	0				
	0	0	0	0				
2	0	0	0	0				
3	0	0	0	0				
0	0	0	0	0				
1	0	0	0	0				
2	0	0	0	0				
3	0	0	0	0				moved
4								
5	0	0	0	0	C-1,2,3		blue sky	
6	0	0	0	0				
7	0	0	0	0				
18	0	0	0	0				
19	0	0	0	0				
20	0	0	0	0				
21	0	0	0	0				
22	0	0	0	0				
23	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	line down			
29								
30								
31								
32								
33	0	0	0	0	restart			
34	0	0	0	0				
35	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				
42	0	0	0	0				
43	0	0	0	0				
44	0	0	0	0				
45	0	0	0	0				
46	0	0	0	0				
47	0	0	0	0				
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				
54	0	0	0	0				
55	0	0	0	0				
56	0	0	0	0				
57	0	0	0	0				
58	0	0	0	0				
59	0	0	0	0				

3 of 4

APPENDIX E-1

TOTAL PARTICULATE DATA REDUCTION SYSTEM COMPUTER PRINTOUTS

GCA SOURCE SAMPLING DATA REDUCTION SYSTEM
VERSION 4.0

CLIENT NAME - EPA IERL RMB / LYNCHBURG FOUNDRY

PLANT LOCATION - LYNCHBURG, VIRGINIA

PROCESS - IRON FOUNDRY POURING AND COOLING

CONTROL EQUIPMENT - NO CONTROLS

SAMPLING POINT - THREE STACKS EACH, POURING AND COOLING

POLLUTANTS - TOTAL PARTICULATE

GCA/TECHNOLOGY DIVISION
BURLINGTON RD
BEDFORD MA 01730
(617)-275-9000

PROJECT NO.: 1618022
DATE PRINTED: 14JUL82
TIME PRINTED: 115956

RESULTS OF FLOW AND ISOKINETIC CALCULATIONS (ENGLISH UNITS):

	RUN NUMBER		1-P1	1-P2	1-P3	2-C1	2-C2	2-C3
	DATE OF RUN		16 DEC 81	16 DEC 81	16 DEC 81	17 DEC 81	17 DEC 81	17 DEC 81
	TIME AT START OF RUN		747.0	748.0	750.0	726.0	726.0	746.0
	TIME AT END OF RUN		1425.0	1429.0	1427.0	1417.0	1335.0	1417.0
DN	SAMPLING NOZZLE DIAMETER	INCHES	0.187	0.193	0.188	0.188	0.187	0.193
PB	BAROMETRIC PRESSURE	INCHES HG ABS	29.85	29.85	29.85	29.82	29.82	29.82
TT	TOT TIME OF TEST	MINUTES	300.0	330.0	360.0	360.0	336.0	360.0
VM	SAMPLED GAS VOLUME	CUBIC FEET	189.699	198.899	216.167	221.778	236.253	272.449
TM	AVG GAS METER TEMPERATURE	DEGREES F	74.0	71.1	62.7	63.3	58.5	66.1
PM	AVG ORIFICE PRESSURE DROP	INCHES H2O	1.187	1.099	1.178	1.435	1.546	1.909
Y	DRY GAS METER CALIB. FACTOR		1.000	0.990	1.010	1.010	1.000	0.990
VMSTD	VOLUME OF DRY GAS SAMPLED	DRY STD CUFT	187.658	195.818	220.673	226.033	240.698	271.097
VW	H2O (IMPINGER+SILICA GEL)	MILLILITERS	51.7	45.0	54.9	67.4	80.8	174.4
VWGAS	H2O COLLECTED AT STD COND	STD CUFT	2.438	2.120	2.589	3.180	3.810	8.223
W	STACK GAS MOIST BY VOL MEAS.	PERCENT	1.282*	1.071*	1.159*	1.387*	1.558*	2.944*
MS	SATURATION MOISTURE AT TS	PERCENT	2.140	1.800	1.950	3.010	1.950	3.700
	CO2 IN DRY STACK GASES	PERCENT	0.0	0.0	0.0	0.0	0.0	0.0
	O2 IN DRY STACK GASES	PERCENT	20.9	20.9	20.9	20.9	20.9	20.9
	CO IN DRY STACK GASES	PERCENT	0.0	0.0	0.0	0.0	0.0	0.0
	N2 IN DRY STACK GASES	PERCENT	78.1	78.1	78.1	78.1	78.1	78.1
MD	MOLE FRACTION OF DRY GAS		0.9872	0.9893	0.9884	0.9861	0.9844	0.9706
MWD	MOL WT OF STACK GAS, DRY	LB/LB MOL DRY	28.57	28.57	28.57	28.57	28.57	28.57
MW	MOL WT OF STACK GAS, WET	LB/LB MOL WET	28.43	28.46	28.45	28.42	28.40	28.26
AS	STACK AREA	SQUARE INCHES	1385.4	1385.4	1385.4	1385.4	1385.4	1385.4
PST	STATIC PRESSURE OF STACK GAS	INCHES HG	0.04	0.04	0.04	0.04	0.04	0.04
PS	STACK GAS PRESSURE	INCHES HG ABS	29.89	29.89	29.89	29.86	29.85	29.86
TS	AVG STACK TEMPERATURE	DEGREES F	65.8	60.8	63.1	80.7	63.1	80.1
CP	PITOT TUBE COEFFICIENT		0.840	0.840	0.840	0.840	0.840	0.840
VS	STACK GAS VELOC, STACK COND	ACTUAL FT/MIN	3122.1	3049.2	3259.5	3669.6	3639.6	3991.0
QS	STACK GAS VOL, DRY STD COND	DSCFM	29745.	29391.	31255.	33928.	34726.	36226.
QA	STACK GAS VOL, STACK COND	ACFM	30037.	29336.	31359.	35305.	35016.	38357.
I	ISOKINETIC RATIO	PERCENT	106.09	95.61	97.89	92.36	104.06	90.44

* - NOTE: THIS % MOISTURE VALUE USED IN CALCULATIONS

RESULTS OF FLOW AND ISOKINETIC CALCULATIONS (METRIC UNITS):

			1-P1	1-P2	1-P3	2-C1	2-C2	2-C3
	RUN NUMBER		[illegible] DEC 81	16 DEC 81	16 DEC 81	17 DEC 81	17 DEC 81	17 DEC 81
	DATE - START		747.0	[illegible]	1427.0	726.0	726.0	746.0
	TIME AT START OF RUN		1425.0	[illegible]	4.7752	1417.0	1335.0	1417.0
	TIME AT END OF RUN		4.7498	4.9022	758.19	4.7752	4.7498	[illegible]
DN	SAMPLING NOZZLE DIAMETER	MILLIMETERS	758.19	758.19	360.0	757.43	757.43	757.43
PB	BAROMETRIC PRESSURE	MM HG ABS.	300.0	330.0	6.122	360.0	336.0	360.0
TT	NET TIME OF TEST	MINUTES	5.372	5.633	17.0	6.281	6.691	7.716
VM	SAMPLED GAS VOLUME	CUBIC METERS	23.4	21.7	29.92	17.4	14.7	18.9
TM	AVG GAS METER TEMPERATURE	DEGREES C	30.15	27.91	1.010	36.45	39.26	48.50
DP	AVG ORIFICE PRESSURE DROP	MM H2O	1.000	0.990	6.249	1.010	1.000	0.990
Y	DRY GAS METER CALIB. FACTOR		5.314	5.546	54.9	6.401	6.817	7.677
VMSTD	VOLUME OF DRY GAS SAMPLED	DSCM	51.7	45.0	0.073	67.4	80.8	174.4
VW	H2O (IMPINGER+SILICA GEL)	MILLILITERS	0.069	0.060	1.159*	0.090	0.108	0.233
VWGAS	H2O COLLECTED AT STD COND	STD CU METERS	1.282*	1.071*	1.950	1.367*	1.558*	2.944*
M	STACK GAS MOIST BY VOL MEAS.	PERCENT	2.140	1.800	0.0	3.010	1.950	3.700
MS	SATURATION MOISTURE AT TS	PERCENT	0.0	0.0	20.9	0.0	0.0	0.0
	CO2 IN DRY STACK GASES	PERCENT	20.9	20.9	0.0	20.9	20.9	20.9
	O2 IN DRY STACK GASES	PERCENT	0.0	0.0	78.1	0.0	0.0	0.0
	CO IN DRY STACK GASES	PERCENT	78.1	78.1	0.9884	78.1	78.1	78.1
	N2 IN DRY STACK GASES	PERCENT	0.9872	0.9893	28.57	0.9861	0.9844	0.9706
MD	MOLE FRACTION OF DRY GAS		28.57	28.57	28.45	28.57	28.57	28.57
MWD	MOL WT OF STACK GAS, DRY	GM/GM MOL DRY	28.43	28.46	0.89	28.42	28.40	28.26
MW	MOL WT OF STACK GAS, WET	GM/GM MOL WET	0.89	0.89	1.03	0.89	0.89	0.89
AS	STACK AREA	SQUARE METERS	1.03	1.03	759.22	1.03	1.03	1.03
PST	STATIC PRESSURE OF STACK GAS	MM HG	759.22	759.22	17.3	758.45	758.45	758.45
PS	STACK GAS PRESSURE	MM HG ABS.	18.8	16.0	0.840	27.1	17.3	27.8
TS	AVG STACK TEMPERATURE	DEGREES C	0.840	0.840	16.6	0.840	0.840	0.840
CP	PITOT TUBE COEFFICIENT		15.9	15.5	885.	18.6	18.5	20.3
VS	STACK GAS VELOC, STACK COND	ACTUAL M/SEC	842.	832.	888.	961.	983.	1026.
QS	STACK GAS VOL, DRY STD COND	DSCMM	851.	831.	97.89	1000.	992.	1087.
QA	STACK GAS VOL, STACK COND	ACMM	106.09	95.61		92.36	104.06	98.44
I	ISOKINETIC RATIO	PERCENT						

* - NOTE: THIS % MOISTURE VALUE USED IN CALCULATIONS

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES (ENGLISH UNITS): PARTICULATE

RUN NUMBER:	1-P1	1-P2	1-P3	2-C1	2-C2	2-C3
DATE OF RUN:	16 DEC 81	16 DEC 81	16 DEC 81	17 DEC 81	17 DEC 81	17 DEC 81
PROBE:						
MILLIGRAMS	27.64	4.55	55.19	35.77	32.03	10.79
GRAINS/DSCF	0.002268	0.000356	0.003852	0.002437	0.002049	0.000715
GRAINS/ACF	0.002246	0.000359	0.003839	0.002342	0.002032	0.000664
LB/HR (CONC. METHOD)	0.5783	0.0901	1.0318	0.7007	0.6100	0.2251
LB/HR (AREA METHOD)	0.6135	0.0862	1.0100	0.6546	0.6347	0.2216
LB/HR (AVERAGE)	0.5959	0.0882	1.0203	0.6817	0.6224	0.2233
PERCENT ISOKINETICS (AREA/CONC)	106.09	95.61	97.88	92.36	104.06	98.44
FILTER:						
MILLIGRAMS	7.60	6.44	12.00	2.60	10.59	0.0
GRAINS/DSCF	0.000624	0.000506	0.000837	0.000177	0.000670	0.0
GRAINS/ACF	0.000618	0.000507	0.000835	0.000170	0.000672	0.0
LB/HR (CONC. METHOD)	0.1590	0.1276	0.2243	0.0515	0.2017	0.0
LB/HR (AREA METHOD)	0.1667	0.1220	0.2196	0.0476	0.2099	0.0
LB/HR (AVERAGE)	0.1638	0.1248	0.2220	0.0495	0.2058	0.0
PERCENT ISOKINETICS (AREA/CONC)	106.08	95.61	97.58	92.36	104.06	**********

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES (ENGLISH UNITS): PARTICULATE

RUN NUMBER:	1-P1	1-P2	1-P3	2-C1	2-C2	2-C3
DATE OF RUN:	16 DEC 81	16 DEC 81	16 DEC 81	17 DEC 81	17 DEC 81	17 DEC 81
FRONT HALF TOTAL:						
MILLIGRAMS	35.24	10.99	67.19	38.37	42.62	12.76
GRAINS/DSCF	0.002892	0.000864	0.004689	0.002614	0.002727	0.000725
GRAINS/ACF	0.002864	0.000866	0.004673	0.002512	0.002704	0.000684
LB/HR (CONC. METHOD)	0.7373	0.2177	1.2562	0.7602	0.8117	0.2251
LB/HR (AREA METHOD)	0.7822	0.2082	1.2295	0.7022	0.8446	0.2216
LB/HR (AVERAGE)	0.7597	0.2130	1.2429	0.7312	0.8281	0.2233
BACK HALF TOTAL:						
MILLIGRAMS	0.0	0.0	0.0	0.0	0.0	0.0
GRAINS/DSCF	0.0	0.0	0.0	0.0	0.0	0.0
GRAINS/ACF	0.0	0.0	0.0	0.0	0.0	0.0
LB/HR (CONC. METHOD)	0.0	0.0	0.0	0.0	0.0	0.0
LB/HR (AREA METHOD)	0.0	0.0	0.0	0.0	0.0	0.0
LB/HR (AVERAGE)	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL:						
MILLIGRAMS	35.24	10.99	67.19	38.37	42.62	12.76
GRAINS/DSCF	0.002892	0.000864	0.004689	0.002614	0.002727	0.000725
GRAINS/ACF	0.002864	0.000866	0.004673	0.002512	0.002704	0.000684
LB/HR (CONC. METHOD)	0.7373	0.2177	1.2562	0.7602	0.8117	0.2251
LB/HR (AREA METHOD)	0.7822	0.2082	1.2295	0.7022	0.8446	0.2216
LB/HR (AVERAGE)	0.7597	0.2130	1.2429	0.7312	0.8281	0.2233

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES (METRIC UNITS): PARTICULATE

RUN NUMBER:	1-P1	1-P2	1-P3	2-C1	2-C2	2-C3
DATE OF RUN:	16 DEC 81	16 DEC 81	16 DEC 81	17 DEC 81	17 DEC 81	17 DEC 81
PROBE:						
MILLIGRAMS	27.64	4.55	55.19	35.77	32.03	12.76
GRAMS/DRY STANDARD CUBIC METER	0.005191	0.000819	0.008815	0.005578	0.004690	0.001659
GRAMS/ACTUAL CUBIC METER	0.005141	0.000821	0.008786	0.005360	0.004652	0.001565
GRAMS/HR (CONC. METHOD)	262.3123	40.8898	468.0188	321.4729	276.6841	102.0045
GRAMS/HR (AREA METHOD)	278.2651	39.0938	458.1074	296.9106	287.9119	100.4983
GRAMS/HR (AVERAGE)	270.2886	39.9918	463.0630	309.1917	282.2979	101.2954
PERCENT ISOKINETICS (AREA/CONC)	106.08	95.61	97.88	92.36	104.06	98.44
FILTER:						
MILLIGRAMS	7.60	6.44	12.00	2.60	10.59	0.0
GRAMS/DRY STANDARD CUBIC METER	0.001427	0.001159	0.001917	0.000405	0.001551	0.0
GRAMS/ACTUAL CUBIC METER	0.001414	0.001161	0.001910	0.000390	0.001538	0.0
GRAMS/HR (CONC. METHOD)	72.1253	57.8749	101.7617	23.3668	91.4794	0.0
GRAMS/HR (AREA METHOD)	76.5128	55.3327	99.6066	21.5814	95.1916	0.0
GRAMS/HR (AVERAGE)	74.3196	56.6038	100.6842	22.4741	93.3355	0.0
PERCENT ISOKINETICS (AREA/CONC)	106.08	95.61	97.86	92.36	104.06	**********

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES (METRIC UNITS): PARTICULATE

RUN NUMBER:	1-P1	1-P2	1-P3	2-C1	2-C2	2-C3
DATE OF RUN:	16 DEC 81	16 DEC 81	16 DEC 81	17 DEC 81	17 DEC 81	17 DEC 81
FRONT HALF TOTAL:						
MILLIGRAMS	35.24	10.99	67.19	38.37	42.62	12.76
GRAMS/DRY STANDARD CUBIC METER	0.006619	0.001978	0.010732	0.005983	0.006241	0.001659
GRAMS/ACTUAL CUBIC METER	0.006554	0.001982	0.010696	0.005750	0.006189	0.001565
GRAMS/HR (CONC. METHOD)	334.4385	98.7648	569.7803	344.8398	368.1636	102.0945
GRAMS/HR (AREA METHOD)	354.7781	94.4266	557.7141	318.4919	383.1035	100.4963
GRAMS/HR (AVERAGE)	344.6082	96.5957	563.7471	331.6658	375.6333	101.2964
BACK HALF TOTAL:						
MILLIGRAMS	0.0	0.0	0.0	0.0	0.0	0.0
GRAMS/DRY STANDARD CUBIC METER	0.0	0.0	0.0	0.0	0.0	0.0
GRAMS/ACTUAL CUBIC METER	0.0	0.0	0.0	0.0	0.0	0.0
GRAMS/HR (CONC. METHOD)	0.0	0.0	0.0	0.0	0.0	0.0
GRAMS/HR (AREA METHOD)	0.0	0.0	0.0	0.0	0.0	0.0
GRAMS/HR (AVERAGE)	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL:						
MILLIGRAMS	35.24	10.99	67.19	38.37	42.62	12.76
GRAMS/DRY STANDARD CUBIC METER	0.006619	0.001978	0.010732	0.005983	0.006241	0.001659
GRAMS/ACTUAL CUBIC METER	0.006554	0.001982	0.010696	0.005750	0.006189	0.001565
GRAMS/HR (CONC. METHOD)	334.4385	98.7648	569.7803	344.8398	368.1636	102.0945
GRAMS/HR (AREA METHOD)	354.7781	94.4266	557.7141	318.4919	383.1035	100.4963
GRAMS/HR (AVERAGE)	344.6082	96.5957	563.7471	331.6658	375.6333	101.2964

POINT NO.	POINT DISTANCE (IN.)	CLOCK TIME	RUN TIME (MIN)	DRY GAS METER (CUFT)	PITOT DELTA P (IN. H2O)	ORIFICE DELTA H (IN. H2O)	DRY GAS METER TEMPERATURES IN (DEGREES F)	DRY GAS METER TEMPERATURES OUT (DEGREES F)	STACK PRESSURE (IN. H2O)	STACK TEMP. (DEG. F)	(PITOT)* (STACK TEMP) (IN H2O*DEG R)	SQUARE ROOT OF PREVIOUS RESULT	STACK GAS VELOC (AFPM)
RUN NUMBER: 1-P1													
B01		747.0	0.0	2.807	1.100	1.50	49.0	48.0	0.55	62.0	574.20	23.9625	3542.0
B01		757.0	10.0	9.500	1.100	1.50	77.0	52.0	0.55	57.0	568.70	23.8474	3525.0
B01		807.0	20.0	16.710	1.100	1.50	76.0	55.0	0.55	57.0	568.70	23.8474	3525.0
B02		817.0	30.0	24.415	0.850	1.20	75.0	51.0	0.55	58.0	440.30	20.9833	3101.6
B02		827.0	40.0	30.410	0.900	1.25	73.0	56.0	0.55	64.0	471.60	21.7164	3210.0
B02		837.0	50.0	37.000	0.900	1.25	72.0	56.0	0.55	67.0	474.30	21.7784	3219.1
STOP		847.0	60.0	43.533									
A02		938.0	60.0	46.426	0.560	0.72	57.0	54.0	0.55	65.0	294.00	17.1464	2534.5
A02		948.0	70.0	51.220	0.570	0.75	75.0	57.0	0.55	70.0	302.10	17.3610	2569.1
A02		958.0	80.0	56.510	0.570	0.75	77.0	59.0	0.55	66.0	299.82	17.3153	2559.4
A02		1008.0	90.0	62.700	0.690	1.25	78.0	60.0	0.55	59.0	461.91	21.4921	3176.8
A01		1018.0	100.0	68.130	0.860	1.25	81.0	61.0	0.55	57.0	444.62	21.0860	3116.8
A01		1028.0	110.0	73.820	0.920	1.30	84.0	62.0	0.55	57.0	475.64	21.8092	3223.7
A01		1038.0	120.0	80.480	0.920	1.30	87.0	64.0	0.55	57.0	475.64	21.8092	3223.7
A01		1048.0	130.0	87.860	0.920	1.30	87.0	65.0	0.55	56.0	474.72	21.7881	3220.6
A01		1058.0	140.0	94.300	0.920	1.30	85.0	66.0	0.55	55.0	474.72	21.7881	3220.6
A01		1108.0	150.0	101.400	0.800	1.15	89.0	68.0	0.55	66.0	420.80	20.5134	3032.2
A01		1118.0	160.0	106.500	0.810	1.15	87.0	69.0	0.55	67.0	426.87	20.6608	3053.9
A02		1128.0	170.0	114.176	0.550	0.77	87.0	69.0	0.55	69.0	290.95	17.0573	2521.3
STOP		1138.0	180.0	119.100									
B02		1140.0	180.0	119.100	0.800	1.05	69.0	64.0	0.55	67.0	421.60	20.5329	3035.0
B02		1150.0	190.0	125.000	0.850	1.15	85.0	67.0	0.55	69.0	449.65	21.2050	3134.4
B02		1200.0	200.0	131.160	0.920	1.20	88.0	67.0	0.55	73.0	490.36	22.1441	3273.2
B01		1210.0	210.0	137.600	0.950	1.25	88.0	68.0	0.55	72.0	505.40	22.4811	3323.0
B01		1220.0	220.0	144.400	0.950	1.35	94.0	72.0	0.55	74.0	507.30	22.5233	3329.3
B01		1230.0	230.0	151.100	0.950	1.35	103.0	80.0	0.55	80.0	513.00	22.6495	3347.9
STOP		1240.0	240.0	157.936									
A01		1325.0	240.0	159.035	1.100	1.45	75.0	71.0	0.55	72.0	585.20	24.1909	3575.7
A01		1335.0	250.0	165.500	1.100	1.55	99.0	78.0	0.55	72.0	585.20	24.1909	3575.7
A01		1345.0	260.0	173.170	1.100	1.55	102.0	82.0	0.55	72.0	585.20	24.1909	3575.7
A02		1355.0	270.0	180.280	0.600	0.84	100.0	81.0	0.55	71.0	318.60	17.8494	2638.4
A02		1405.0	280.0	185.700	0.600	0.84	95.0	82.0	0.55	74.0	320.40	17.8997	2645.5
A02		1415.0	290.0	191.280	0.600	0.84	89.0	76.0	0.55	69.0	317.40	17.8157	2633.4
STOP		1425.0	300.0	196.498									
END													
OVERALL RESULTS:			TT 300.0 (NET)	VM 189.699 (NET)	PIT 0.859 (AVG)	PM 1.19 (AVG)		TM 74.0 (AVG)	PST 0.55 (AVG)	TS 65.8 (AVG)		21.1218 (AVG)	VS 3122.1 (AVG)

POINT NO.	POINT DISTANCE (IN.)	CLOCK TIME	RUN TIME (MIN)	DRY GAS METER (CUFT)	PITOT DELTA P (IN. H2O)	ORIFICE DELTA H (IN. H2O)	DRY GAS METER TEMPERATURES IN (DEGREES F)	DRY GAS METER TEMPERATURES OUT (DEGREES F)	STACK PRESSURE (IN. H2O)	STACK TEMP. (DEG. F)	(PITOT)* (STACK TEMP) (IN H2O*DEG R)	SQUARE ROOT OF PREVIOUS RESULT	STACK GAS VELOC (AFPM)
RUN NUMBER: 1-P2													
B01		748.0	0.0	645.025	0.580	0.82	54.0	53.0	0.55	63.0	303.34	17.4167	2573.4
B01		758.0	10.0	650.500	0.610	0.76	78.0	57.0	0.55	50.0	311.10	17.6380	2606.1
B01		808.0	20.0	655.200	0.800	1.00	75.0	61.0	0.55	49.0	407.20	20.1792	2961.6
B02		818.0	30.0	661.200	1.100	1.40	86.0	63.0	0.55	49.0	559.90	23.6622	3496.2
B02		828.0	40.0	667.900	1.100	1.40	83.0	64.0	0.55	61.0	573.10	23.9395	3537.2
B02		838.0	50.0	674.800	1.100	1.40	84.0	84.0	0.55	60.0	572.00	23.9165	3533.8
STOP		848.0	60.0	681.798									
A01		914.0	60.0	681.717	1.300	1.70	65.0	62.0	0.55	62.0	678.60	26.0500	3849.0
A01		924.0	70.0	689.300	1.300	1.70	83.0	69.0	0.55	64.0	681.20	26.0998	3856.4
A01		934.0	80.0	696.800	1.300	1.70	87.0	65.0	0.55	62.0	678.60	26.0500	3849.0
A02		944.0	90.0	704.700	0.600	0.75	87.0	68.0	0.55	69.0	317.40	17.8157	2632.4
A02		954.0	100.0	710.100	0.530	0.67	84.0	68.0	0.55	66.0	278.78	16.6967	2467.0
A02		1004.0	110.0	714.500	0.540	0.69	91.0	68.0	0.55	53.0	277.02	16.6439	2459.2
A02		1014.0	120.0	719.500	0.570	0.73	90.0	67.0	0.55	51.0	291.27	17.0666	2521.7
A02		1024.0	130.0	724.600	0.510	0.65	91.0	67.0	0.55	49.0	259.59	16.1116	2380.6
A02		1034.0	140.0	729.800	0.510	0.65	92.0	68.0	0.55	51.0	260.61	16.1434	2385.3
A01		1044.0	150.0	735.800	1.100	1.40	82.0	68.0	0.55	53.0	564.30	23.7550	3509.9
A01		1054.0	160.0	740.400	1.100	1.40	86.0	68.0	0.55	50.0	561.00	23.6854	3499.7
A01		1104.0	170.0	746.500	1.100	1.40	89.0	70.0	0.55	60.0	572.00	23.9165	3533.8
STOP		1114.0	180.0	755.081									
B02		1136.0	180.0	755.182	0.550	0.72	65.0	65.0	0.55	73.0	293.15	17.1216	2529.8
B02		1146.0	190.0	760.400	0.550	0.72	68.0	63.0	0.55	69.0	290.95	17.0573	2520.3
B02		1156.0	200.0	765.100	0.550	0.72	65.0	63.0	0.55	70.0	291.50	17.0734	2522.7
B01		1206.0	210.0	770.230	0.780	1.05	68.0	60.0	0.55	70.0	413.40	20.3322	3004.2
B01		1216.0	220.0	776.300	1.100	1.50	67.0	57.0	0.55	72.0	585.20	24.1929	3574.3
B01		1226.0	230.0	783.400	1.100	1.50	73.0	58.0	0.55	69.0	581.90	24.1226	3564.2
STOP		1236.0	240.0	790.597									
A02		1251.0	240.0	790.667	1.200	1.70	65.0	59.0	0.55	52.0	614.40	24.7671	3652.4
A02		1301.0	250.0	798.300	1.200	1.70	60.0	63.0	0.55	52.0	614.40	24.7671	3652.4
A02		1311.0	260.0	805.400	1.100	1.40	82.0	65.0	0.55	64.0	576.40	24.0083	3547.4
A01		1321.0	270.0	812.400	0.700	0.90	79.0	66.0	0.55	68.0	369.60	19.2250	2840.6
A01		1331.0	280.0	817.900	0.700	0.90	75.0	65.0	0.55	67.0	368.90	19.2068	2837.9
A01		1341.0	290.0	823.200	0.700	0.90	75.0	65.0	0.55	65.0	367.50	19.1703	2832.5
STOP		1351.0	300.0	828.827									
B02		1359.0	300.0	829.092	0.500	0.65	64.0	62.0	0.55	64.0	262.00	16.1864	2391.6
B02		1409.0	310.0	833.800	0.650	0.84	69.0	66.0	0.55	65.0	341.25	18.4729	2729.5
B02		1419.0	320.0	838.900	0.650	0.84	72.0	62.0	0.55	66.0	341.90	18.4905	2732.1
STOP		1429.0	330.0	844.369									
END													
OVERALL RESULTS:			TT 330.0 (NET)	VM 198.899 (NET)	PIT 0.842 (AVG)	PM 1.10 (AVG)		TM 71.1 (AVG)	PST 0.55 (AVG)	TS 60.8 (AVG)		20.6369 (AVG)	VS 3049.2 (AVG)

POINT NO.	POINT DISTANCE (IN.)	CLOCK TIME	RUN TIME (MIN)	DRY GAS METER (CUFT)	PITOT DELTA P (IN. H2O)	ORIFICE DELTA H (IN. H2O)	DRY GAS METER TEMPERATURES IN (DEGREES F)	DRY GAS METER TEMPERATURES OUT (DEGREES F)	STACK PRESSURE (IN. H2O)	STACK TEMP. (DEG. F)	(PITOT)* (STACK TEMP) (IN H2O*DEG R)	SQUARE ROOT OF PREVIOUS RESULT	STACK GAS VELOC (AFPM)
RUN NUMBER: 1-P3													
A01		750.0	0.0	911.184	0.900	1.05	43.0	49.0	0.55	66.0	473.40	21.7578	3215.4
A01		800.0	10.0	918.000	0.940	1.20	45.0	50.0	0.55	52.0	481.28	21.9381	3242.0
A01		811.0	21.0	922.700	0.950	1.10	63.0	47.0	0.55	51.0	485.45	22.0329	3255.0
A02		820.0	30.0	930.100	0.890	1.05	63.0	48.0	0.55	60.0	462.80	21.5128	3179.2
A02		830.0	40.0	935.000	0.690	0.87	63.0	48.0	0.55	62.0	360.18	18.9784	2804.6
A02		840.0	50.0	940.700	0.840	1.05	62.0	48.0	0.55	63.0	439.32	20.9600	3097.5
STOP		850.0	60.0	946.482									
B02		907.0	60.0	946.935	0.880	1.10	50.0	47.0	0.55	63.0	460.24	21.4532	3170.3
B02		917.0	70.0	953.000	0.690	1.10	65.0	50.0	0.55	64.0	466.36	21.5954	3191.4
B02		927.0	80.0	958.000	1.100	1.40	69.0	51.0	0.55	67.0	579.70	24.0770	3559.1
B02		937.0	90.0	964.000	1.000	1.30	67.0	52.0	0.55	65.0	525.00	22.9129	3386.1
B01		947.0	100.0	971.000	0.770	0.98	70.0	53.0	0.55	67.0	405.79	20.1442	2976.9
B01		957.0	110.0	977.000	0.720	0.91	69.0	53.0	0.55	65.0	378.00	19.4422	2873.2
B01		1007.0	120.0	982.000	0.820	1.05	67.0	53.0	0.55	55.0	422.30	20.5499	3036.9
B01		1017.0	130.0	987.000	0.830	1.05	66.0	53.0	0.55	54.0	426.62	20.6548	3052.4
B01		1027.0	140.0	993.000	0.800	1.00	68.0	53.0	0.55	55.0	412.00	20.2978	2999.6
B02		1037.0	150.0	999.000	1.200	1.50	68.0	53.0	0.55	55.0	618.00	24.8596	3673.7
B02		1047.0	160.0	1005.001	1.200	1.50	74.0	55.0	0.55	56.0	619.20	24.8837	3677.3
B02		1057.0	170.0	1012.000	1.100	1.40	73.0	55.0	0.55	54.0	565.40	23.7781	3513.9
STOP		1107.0	180.0	1018.618									
A02		1115.0	180.0	1018.618	0.980	1.20	59.0	53.0	0.55	68.0	517.44	22.7473	3361.6
A02		1125.0	190.0	1024.000	0.980	1.20	73.0	55.0	0.55	68.0	517.44	22.7473	3361.6
A02		1135.0	200.0	1030.000	0.990	1.30	78.0	57.0	0.55	68.0	522.72	22.8631	3378.7
STOP		1145.0	210.0	1037.047									
A01		1149.0	210.0	1037.047	0.850	1.10	69.0	55.0	0.55	71.0	451.35	21.2450	3139.6
A01		1159.0	220.0	1043.000	0.870	1.10	75.0	55.0	0.55	69.0	460.23	21.4530	3170.3
A01		1209.0	230.0	1048.000	0.850	1.10	77.0	55.0	0.55	69.0	449.65	21.2050	3133.7
A01		1219.0	240.0	1054.000	0.880	1.10	73.0	54.0	0.55	69.0	465.52	21.5759	3188.5
A01		1229.0	250.0	1060.000	0.860	1.10	78.0	56.0	0.55	69.0	454.94	21.3293	3152.0
A01		1239.0	260.0	1066.000	0.900	1.10	79.0	58.0	0.55	67.0	474.30	21.7784	3216.4
A02		1249.0	270.0	1073.000	0.940	1.20	82.0	61.0	0.55	56.0	485.04	22.0236	3254.6
A02		1259.0	280.0	1078.000	0.960	1.30	83.0	62.0	0.55	58.0	497.28	22.2998	3295.5
A02		1309.0	290.0	1084.000	0.970	1.30	85.0	64.0	0.55	64.0	508.28	22.5451	3331.7
STOP		1319.0	300.0	1091.137									
B02		1327.0	300.0	1091.637	1.100	1.50	69.0	61.0	0.55	70.0	583.00	24.1454	3566.2
B02		1337.0	310.0	1098.000	1.100	1.40	85.0	63.0	0.55	70.0	583.00	24.1454	3566.2
B02		1347.0	320.0	1105.000	1.200	1.50	85.0	63.0	0.55	65.0	630.00	25.0998	3709.2
B01		1357.0	330.0	1111.000	0.900	1.10	81.0	62.0	0.55	64.0	471.60	21.7164	3209.2
B01		1407.0	340.0	1117.000	0.890	1.10	81.0	62.0	0.55	65.0	467.25	21.6160	3194.4
B01		1417.0	350.0	1122.000	0.890	1.10	81.0	61.0	0.55	68.0	469.92	21.6776	3203.5
STOP		1427.0	360.0	1128.304									
END													
OVERALL RESULTS:			TT 360.0 (NET)	VM 216.167 (NET)	PIT 0.934 (AVG)	PM 1.18 (AVG)		TM 62.7 (AVG)	PST 0.55 (AVG)	TS 63.1 (AVG)		22.0566 (AVG)	VS 3259.5 (AVG)

POINT NO.	POINT DISTANCE (IN.)	CLOCK TIME	RUN TIME (MIN)	DRY GAS METER (CUFT)	PITOT DELTA P (IN. H2O)	ORIFICE DELTA H (IN. H2O)	DRY GAS METER TEMPERATURES IN (DEGREES F)	OUT	STACK PRESSURE (IN. H2O)	STACK TEMP. (DEG. F)	(PITOT)* (STACK TEMP) (IN H2O*DEG R)	SQUARE ROOT OF PREVIOUS RESULT	STACK GAS VELOC (AFPM)
RUN NUMBER: 2-C1													
B02		726.0	0.0	128.704	1.300	1.40	37.0	34.0	0.55	71.0	690.30	26.2736	3896.3
B02		736.0	10.0	134.000	1.300	1.50	56.0	37.0	0.55	72.0	691.60	26.2983	3893.0
B02		746.0	20.0	140.000	1.300	1.50	59.0	38.0	0.55	75.0	695.50	26.3723	3900.9
B02		756.0	30.0	147.000	1.300	1.50	61.0	40.0	0.55	75.0	695.50	26.3723	3900.9
B02		806.0	40.0	153.000	1.300	1.50	61.0	41.0	0.55	73.0	692.90	26.3230	3893.6
B02		816.0	50.0	159.000	1.300	1.50	61.0	41.0	0.55	72.0	691.60	26.2983	3890.0
B02		826.0	60.0	166.000	1.200	1.40	61.0	42.0	0.55	73.0	639.60	25.2903	3740.9
B02		836.0	70.0	172.000	1.200	1.40	61.0	41.0	0.55	75.0	642.00	25.3377	3747.9
B02		846.0	80.0	178.000	1.300	1.50	62.0	42.0	0.55	73.0	692.90	26.3230	3893.6
B01		856.0	90.0	185.000	1.700	2.00	64.0	43.0	0.55	76.0	911.20	30.1861	4465.0
B01		906.0	100.0	192.000	1.800	2.10	66.0	44.0	0.55	76.0	964.80	31.0612	4594.5
B01		916.0	110.0	199.000	1.800	2.10	69.0	45.0	0.55	76.0	964.80	31.0612	4594.5
B01		926.0	120.0	207.000	1.800	2.10	73.0	47.0	0.55	73.0	959.40	30.9742	4581.6
B01		936.0	130.0	214.000	1.800	2.10	76.0	49.0	0.55	73.0	959.40	30.9742	4581.6
B01		946.0	140.0	222.000	1.800	2.20	78.0	52.0	0.55	82.0	975.60	31.2346	4620.1
B01		956.0	150.0	230.000	1.800	2.20	81.0	55.0	0.55	83.0	977.40	31.2634	4624.4
B01		1006.0	160.0	238.000	1.800	2.20	83.0	56.0	0.55	82.0	975.60	31.2346	4620.1
B01		1016.0	170.0	246.000	1.800	2.20	84.0	58.0	0.55	84.0	979.20	31.2922	4628.6
STOP		1026.0	180.0	253.000									
A 2		1045.0	190.0	253.000	0.450	0.52	63.0	55.0	0.55	83.0	244.35	15.6317	2312.2
A 2		1055.0	200.0	257.000	0.430	0.50	72.0	58.0	0.55	84.0	233.92	15.2944	2262.3
A 2		1105.0	210.0	261.000	0.440	0.51	73.0	57.0	0.55	84.0	235.36	15.4713	2288.5
A 2		1115.0	220.0	265.000	0.460	0.58	71.0	58.0	0.55	77.0	247.02	15.7169	2324.8
A 2		1125.0	224.0	269.000	0.460	0.58	76.0	58.0	0.55	74.0	245.64	15.6729	2318.3
STOP		1129.0	224.0	270.887									
A 2		1201.0	234.0	270.887	0.430	0.54	62.0	57.0	0.55	80.0	232.20	15.2381	2254.0
A 2		1211.0	240.0	275.000	0.440	0.56	76.0	60.0	0.55	85.0	239.80	15.4855	2290.6
A 2		1217.0	250.0	277.000	0.440	0.56	78.0	61.0	0.55	82.0	238.48	15.4428	2284.2
A 2		1227.0	260.0	281.000	0.440	0.56	80.0	63.0	0.55	87.0	240.68	15.5139	2294.8
A 2		1237.0	270.0	285.000	0.460	0.58	81.0	64.0	0.55	91.0	253.46	15.9204	2354.9
A 1		1247.0	280.0	289.000	1.400	1.70	81.0	65.0	0.55	90.0	770.00	27.7489	4104.5
A 1		1257.0	290.0	295.000	1.400	1.70	88.0	68.0	0.55	89.0	768.60	27.7236	4100.8
A 1		1307.0	300.0	302.000	1.400	1.70	89.0	68.0	0.55	89.0	768.60	27.7236	4100.8
A 1		1317.0	310.0	310.000	1.400	1.70	86.0	68.0	0.55	91.0	771.40	27.7741	4108.2
A 1		1327.0	320.0	316.000	1.400	1.70	86.0	67.0	0.55	84.0	761.60	27.5971	4082.1
A 1		1337.0	330.0	324.000	1.400	1.70	84.0	66.0	0.55	84.0	761.60	27.5971	4082.1
A 1		1347.0	340.0	330.000	1.300	1.60	86.0	67.0	0.55	93.0	718.90	26.8123	3966.0
A 1		1357.0	350.0	337.000	1.400	1.70	85.0	67.0	0.55	88.0	767.20	27.6964	4097.0
A 1		1407.0	360.0	343.000	1.400	1.70	81.0	64.0	0.55	88.0	767.20	27.6984	4097.0
STOP		1417.0	360.0	350.482									
END													
OVERALL RESULTS:			TT 360.0 (NET)	VM 221.778 (NET)	PIT 1.204 (AVG)	PM 1.43 (AVG)		TM 63.3 (AVG)	PST 0.55 (AVG)	TS 80.7 (AVG)		24.8089 (AVG)	VS 3669.6 (AVG)

POINT NO.	POINT DISTANCE (IN.)	CLOCK TIME	RUN TIME (MIN)	DRY GAS METER (CUFT)	PITOT DELTA P (IN. H2O)	ORIFICE DELTA H (IN. H2O)	DRY GAS METER TEMPERATURES IN (DEGREES F)	DRY GAS METER TEMPERATURES OUT (DEGREES F)	STACK PRESSURE (IN. H2O)	STACK TEMP. (DEG. F)	(PITOT)* (STACK TEMP) (IN H2O*DEG R)	SQUARE ROOT OF PREVIOUS RESULT	STACK GAS VELOC (AFPM)
RUN NUMBER: 2-C2													
A01		726.0	0.0	197.300	0.900	1.10	25.0	25.0	0.55	55.0	463.50	21.5290	3185.5
A01		736.0	10.0	204.500	0.900	1.20	43.0	28.0	0.55	55.0	463.50	21.5290	3185.5
A01		746.0	20.0	209.800	0.880	1.20	54.0	32.0	0.55	58.0	455.84	21.3504	3159.1
A01		756.0	30.0	215.700	0.900	1.20	58.0	35.0	0.55	59.0	467.10	21.6125	3197.9
A01		806.0	40.0	222.200	0.900	1.20	60.0	38.0	0.55	59.0	467.10	21.6125	3197.9
A01		816.0	50.0	228.700	0.880	1.20	65.0	41.0	0.55	58.0	455.84	21.3504	3159.1
A01		826.0	60.0	234.800	0.880	1.20	67.0	44.0	0.55	58.0	455.84	21.3504	3159.1
A01		836.0	70.0	241.300	0.880	1.20	69.0	47.0	0.55	58.0	455.84	21.3504	3159.1
A01		846.0	80.0	248.100	0.860	1.15	70.0	48.0	0.55	58.0	445.48	21.1064	3123.0
A01		856.0	90.0	253.600	0.900	1.20	70.0	49.0	0.55	57.0	465.30	21.5708	3191.7
A01		906.0	100.0	260.700	1.200	1.65	71.0	51.0	0.55	60.0	624.00	24.9800	3656.1
A02		916.0	110.0	267.900	1.300	1.80	72.0	51.0	0.55	58.0	673.40	25.9500	3839.7
A02		926.0	120.0	275.300	1.300	1.80	71.0	52.0	0.55	58.0	673.40	25.9500	3839.7
A02		936.0	130.0	282.000	1.300	1.75	68.0	50.0	0.55	61.0	677.30	26.0250	3850.8
A02		946.0	140.0	289.100	1.300	1.80	71.0	51.0	0.55	61.0	677.30	26.0250	3850.8
A02		956.0	150.0	296.500	1.300	1.80	70.0	51.0	0.55	62.0	678.60	26.0500	3854.4
A02		1006.0	160.0	304.900	1.300	1.80	72.0	51.0	0.55	64.0	681.20	26.0998	3861.8
A02		1016.0	170.0	313.000	1.300	1.80	67.0	50.0	0.55	63.0	679.90	26.0749	3858.1
STOP		1026.0	180.0	320.350									
B02		1038.0	190.0	320.604	1.100	1.35	53.0	49.0	0.55	65.0	577.50	24.0312	3555.8
B02		1048.0	190.0	327.600	1.100	1.45	73.0	53.0	0.55	66.0	578.60	24.0541	3559.1
B02		1058.0	200.0	333.900	1.100	1.45	70.0	52.0	0.55	64.0	576.40	24.0083	3552.4
B02		1108.0	210.0	341.100	1.100	1.35	67.0	51.0	0.55	63.0	575.30	23.9854	3549.0
STOP		1114.0	216.0	345.300									
A02		1135.0	216.0	345.300	1.100	1.40	52.0	47.0	0.55	66.0	578.60	24.0541	3559.1
A02		1145.0	226.0	352.500	1.100	1.45	71.0	52.0	0.55	66.0	578.60	24.0541	3559.1
A02		1155.0	236.0	359.200	1.100	1.45	74.0	54.0	0.55	67.0	579.70	24.0770	3562.5
A02		1205.0	246.0	364.400	1.100	1.45	75.0	56.0	0.55	69.0	581.90	24.1226	3569.3
A02		1215.0	256.0	372.900	1.100	1.45	74.0	56.0	0.55	69.0	581.90	24.1226	3569.3
B02		1225.0	266.0	379.300	1.100	1.45	73.0	57.0	0.55	69.0	581.90	24.1226	3569.3
B02		1235.0	276.0	387.500	1.100	1.45	74.0	57.0	0.55	69.0	581.90	24.1226	3569.3
B02		1245.0	286.0	394.000	1.700	2.20	75.0	57.0	0.55	69.0	899.30	29.9883	4437.2
B01		1255.0	296.0	402.700	1.700	2.20	80.0	58.0	0.55	69.0	899.30	29.9883	4437.2
B01		1305.0	306.0	411.000	1.700	2.20	82.0	61.0	0.55	70.0	901.00	30.0187	4441.4
B01		1315.0	316.0	419.900	1.700	2.20	81.0	62.0	0.55	69.0	899.30	29.9883	4437.2
B01		1325.0	326.0	428.600	1.700	2.00	80.0	62.0	0.55	72.0	904.40	30.0732	4449.7
B01		1335.0	336.0	433.807									
STOP													
END													
OVERALL RESULTS:			TT 336.0 (NET)	VM 236.253 (NET)	PIT 1.170 (AVG)	PM 1.55 (AVG)		TM 58.5 (AVG)	PST 0.55 (AVG)	TS 63.1 (AVG)		24.5978 (AVG)	VS 3639.6 (AVG)

POINT NO.	POINT DISTANCE (IN.)	CLOCK TIME	RUN TIME (MIN)	DRY GAS METER (CUFT)	PITOT DELTA P (IN. H2O)	ORIFICE DELTA H (IN. H2O)	DRY GAS METER TEMPERATURES IN (DEGREES F)	DRY GAS METER TEMPERATURES OUT (DEGREES F)	STACK PRESSURE (IN. H2O)	STACK TEMP. (DEG. F)	(PITOT)* (STACK TEMP) (IN H2O*DEG R)	SQUARE ROOT OF PREVIOUS RESULT	STACK GAS VELOC (AFPM)
RUN NUMBER: 2-C3													
B01		746.0	0.0	845.163	1.300	1.75	35.0	32.0	0.55	73.0	692.90	26.3230	3904.9
B01		756.0	10.0	852.000	1.300	1.75	63.0	37.0	0.55	76.0	696.80	26.3970	3915.9
B01		806.0	20.0	859.300	1.300	1.75	65.0	40.0	0.55	78.0	699.40	26.4462	3923.2
B01		816.0	30.0	867.200	1.300	1.75	68.0	47.0	0.55	76.0	696.80	26.3970	3915.9
B01		826.0	40.0	874.600	1.300	1.75	69.0	45.0	0.55	74.0	694.20	26.3477	3908.6
B01		836.0	50.0	882.300	1.300	1.75	68.0	43.0	0.55	75.0	695.50	26.3723	3912.2
B01		846.0	60.0	890.000	1.300	1.75	70.0	45.0	0.55	74.0	694.20	26.3477	3908.6
B01		856.0	70.0	897.200	1.300	1.75	54.0	49.0	0.55	75.0	695.50	26.3723	3912.2
B01		906.0	80.0	904.500	1.300	1.75	76.0	51.0	0.55	76.0	696.80	26.3970	3915.9
B02		916.0	90.0	912.100	1.700	2.30	79.0	54.0	0.55	77.0	912.90	30.2142	4482.2
B02		926.0	100.0	920.500	1.700	2.50	86.0	63.0	0.55	75.0	909.50	30.1579	4473.8
B02		936.0	110.0	929.300	1.700	2.50	85.0	67.0	0.55	75.0	909.50	30.1579	4473.8
B02		946.0	120.0	938.300	1.700	2.50	87.0	69.0	0.55	78.0	914.60	30.2424	4486.4
B02		956.0	130.0	946.800	1.700	2.50	86.0	69.0	0.55	79.0	916.30	30.2704	4490.5
B02		1006.0	140.0	955.200	1.700	2.50	83.0	69.0	0.55	80.0	918.00	30.2985	4494.7
B02		1016.0	150.0	964.900	1.700	2.50	83.0	68.0	0.55	81.0	919.70	30.3266	4498.8
B02		1026.0	160.0	972.300	1.600	2.30	85.0	69.0	0.55	82.0	867.20	29.4463	4358.5
B02		1036.0	170.0	980.400	1.600	2.30	84.0	68.0	0.55	83.0	868.80	29.4754	4372.6
STOP		1046.0	180.0	989.155									
A01		1054.0	180.0	989.242	0.830	1.20	76.0	66.0	0.55	84.0	451.52	21.2490	3152.2
A01		1104.0	190.0	995.400	0.830	1.20	77.0	66.0	0.55	84.0	451.52	21.2490	3152.2
STOP		1113.0	199.0	1000.662									
A01		1136.0	199.0	1000.662	0.830	1.20	55.0	55.0	0.55	85.0	452.35	21.2685	3155.1
A01		1137.0	200.0	1001.300	0.860	1.10	55.0	55.0	0.55	85.0	468.70	21.6495	3211.6
A01		1147.0	210.0	1006.800	0.860	1.10	54.0	54.0	0.55	84.0	467.84	21.6296	3208.7
A01		1157.0	220.0	1012.600	0.820	1.10	69.0	56.0	0.55	85.0	446.90	21.1400	3136.0
A01		1207.0	230.0	1018.300	0.860	1.20	69.0	56.0	0.55	85.0	468.70	21.6495	3211.6
A01		1217.0	240.0	1023.700	0.800	1.10	71.0	57.0	0.55	86.0	436.80	20.8997	3100.4
A01		1227.0	250.0	1029.100	0.800	1.10	71.0	57.0	0.55	88.0	438.40	20.9380	3106.1
A01		1237.0	260.0	1034.600	0.800	1.10	70.0	57.0	0.55	87.0	437.60	20.9189	3103.2
A02		1247.0	270.0	1040.500	1.700	2.40	75.0	58.0	0.55	89.0	933.30	30.5500	4532.0
A02		1257.0	280.0	1048.400	1.700	2.40	87.0	69.0	0.55	87.0	929.90	30.4943	4523.7
A02		1307.0	290.0	1055.500	1.700	2.40	84.0	62.0	0.55	89.0	933.30	30.5500	4532.0
A02		1317.0	300.0	1065.400	1.700	2.40	85.0	63.0	0.55	88.0	931.60	30.5221	4527.9
A02		1327.0	310.0	1073.400	1.700	2.40	86.0	63.0	0.55	88.0	931.60	30.5221	4527.9
A02		1337.0	320.0	1084.300	1.700	2.40	86.0	63.0	0.55	89.0	933.30	30.5500	4532.0
A02		1347.0	330.0	1090.900	1.700	2.40	87.0	63.0	0.55	89.0	933.30	30.5500	4532.0
A02		1357.0	340.0	1099.400	1.700	2.40	87.0	63.0	0.55	89.0	933.30	30.5500	4532.0
A02		1407.0	350.0	1107.500	1.700	2.40	87.0	63.0	0.55	89.0	933.30	30.5500	4532.0
STOP		1417.0	360.0	1117.698									
END													
OVERALL RESULTS:			TT 360.0 (NET)	VM 272.448 (NET)	PIT 1.362 (AVG)	PM 1.91 (AVG)		TM 66.1 (AVG)	PST 0.55 (AVG)	TS 82.1 (AVG)		26.9032 (AVG)	VS 3991.0 (AVG)

RESULTS OF FLOW AND ISOKINETIC CALCULATIONS (ENGLISH UNITS):

			3-C1	3-C3	3-P3
	RUN NUMBER		18 DEC 81	18 DEC 81	18 DEC 81
	DATE OF RUN		709.0	709.0	655.0
	TIME AT START OF RUN		1119.0	1116.0	1105.0
	TIME AT END OF RUN				
DN	SAMPLING NOZZLE DIAMETER	INCHES	0.188	0.192	0.187
PB	BAROMETRIC PRESSURE	INCHES HG ABS	29.76	29.78	29.76
TT	NET TIME OF TEST	MINUTES	240.0	240.0	240.0
VM	SAMPLED GAS VOLUME	CUBIC FEET	158.377	175.325	159.808
TM	AVG GAS METER TEMPERATURE	DEGREES F	70.9	70.3	68.8
PM	AVG ORIFICE PRESSURE DROP	INCHES H2O	1.443	1.800	1.272
Y	DRY GAS METER CALIB. FACTOR		1.010	1.010	1.010
VMSTD	VOLUME OF DRY GAS SAMPLED	DRY STD CUFT	158.901	176.275	160.898
VW	H2O (IMPINGER+SILICA GEL)	MILLILITERS	60.4	62.4	25.0
VWGAS	H2O COLLECTED AT STD COND	STD CUFT	2.850	2.940	1.179
M	STACK GAS MOIST BY VOL MEAS.	PERCENT	1.762*	1.640*	0.727*
MS	SATURATION MOISTURE AT TS	PERCENT	3.710	3.460	1.545
	CO2 IN DRY STACK GASES	PERCENT	0.0	0.0	0.0
	O2 IN DRY STACK GASES	PERCENT	20.9	20.9	20.9
	CO IN DRY STACK GASES	PERCENT	0.0	0.0	0.0
	N2 IN DRY STACK GASES	PERCENT	78.1	78.1	78.1
MD	MOLE FRACTION OF DRY GAS		0.9824	0.9836	0.9927
MWD	MOL WT OF STACK GAS, DRY	LB/LB MOL DRY	26.57	28.57	28.57
MW	MOL WT OF STACK GAS, WET	LB/LB MOL WET	28.38	28.40	28.49
AS	STACK AREA	SQUARE INCHES	1385.4	1385.4	1385.4
PST	STATIC PRESSURE OF STACK GAS	INCHES HG	0.04	0.04	0.04
PS	STACK GAS PRESSURE	INCHES HG ABS	29.82	29.82	29.82
TS	AVG STACK TEMPERATURE	DEGREES F	60.4	80.0	56.9
CP	PITOT TUBE COEFFICIENT		0.840	0.840	0.840
VS	STACK GAS VELOC, STACK COND	ACTUAL FT/MIN	3601.7	3907.0	3204.6
QS	STACK GAS VOL, DRY STD COND	DSCFM	33150.	36030.	31161.
QA	STACK GAS VOL, STACK COND	ACFM	34652.	37589.	30831.
I	ISOKINETIC RATIO	PERCENT	99.68	97.55	108.53

* - NOTE: THIS % MOISTURE VALUE USED IN CALCULATIONS

RESULTS OF FLOW AND ISOKINETIC CALCULATIONS (METRIC UNITS):

	RUN NUMBER		3-C1	3-C3	3-P3
	DATE OF RUN		18 DEC 81	18 DEC 81	18 DEC 81
	TIME AT START OF RUN		709.0	709.0	655.0
	TIME AT END OF RUN		1119.0	1116.0	1105.0
DN	SAMPLING NOZZLE DIAMETER	MILLIMETERS	4.7752	4.8768	4.7498
PB	BAROMETRIC PRESSURE	MM HG ABS.	756.41	756.41	756.41
TT	NET TIME OF TEST	MINUTES	240.0	240.0	240.0
VM	SAMPLED GAS VOLUME	CUBIC METERS	4.485	4.965	4.526
TM	AVG GAS METER TEMPERATURE	DEGREES C	21.6	21.3	20.5
PM	AVG ORIFICE PRESSURE DROP	MM H2O	36.65	45.72	32.31
Y	DRY GAS METER CALIB. FACTOR		1.010	1.010	1.010
VMSTD	VOLUME OF DRY GAS SAMPLED	DSCM	4.500	4.992	4.557
VW	H2O (IMPINGER+SILICA GEL)	MILLILITERS	60.4	62.4	25.0
VWGAS	H2O COLLECTED AT STD COND	STD CU METERS	0.081	0.083	0.033
M	STACK GAS MOIST BY VOL MEAS.	PERCENT	1.762*	1.640*	3.727*
MS	SATURATION MOISTURE AT TS	PERCENT	3.710	3.460	1.540
	CO2 IN DRY STACK GASES	PERCENT	0.0	0.0	0.0
	O2 IN DRY STACK GASES	PERCENT	20.9	20.9	20.9
	CO IN DRY STACK GASES	PERCENT	0.0	0.0	0.0
	N2 IN DRY STACK GASES	PERCENT	78.1	78.1	78.1
MD	MOLE FRACTION OF DRY GAS		0.9824	0.9836	0.9927
MWD	MOL WT OF STACK GAS, DRY	GM/GM MOL DRY	28.57	28.57	28.57
MW	MOL WT OF STACK GAS, WET	GM/GM MOL WET	28.38	28.40	28.49
AS	STACK AREA	SQUARE METERS	0.89	0.89	0.89
PST	STATIC PRESSURE OF STACK GAS	MM HG	1.03	1.03	1.03
PS	STACK GAS PRESSURE	MM HG ABS.	757.44	757.44	757.44
TS	AVG STACK TEMPERATURE	DEGREES C	26.9	26.7	13.8
CP	PITOT TUBE COEFFICIENT		0.840	0.840	0.840
VS	STACK GAS VELOC, STACK COND	ACTUAL M/SEC	18.3	19.8	16.3
QS	STACK GAS VOL, DRY STD COND	DSCMM	939.	1020.	882.
QA	STACK GAS VOL, STACK COND	ACMM	981.	1065.	873.
I	ISOKINETIC RATIO	PERCENT	99.66	97.55	108.53

* - NOTE: THIS % MOISTURE VALUE USED IN CALCULATIONS

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES (ENGLISH UNITS): PARTICULATE

RUN NUMBER:	3-C1	3-C3	3-P3
DATE OF RUN:	18 DEC 81	18 DEC 81	18 DEC 81
PROBE:			
MILLIGRAMS	24.33	17.79	27.41
GRAINS/DSCF	0.002356	0.001554	0.002623
GRAINS/ACF	0.002256	0.001490	0.002652
LB/HR (CONC. METHOD)	0.6700	0.4800	0.7007
LB/HR (AREA METHOD)	0.6678	0.4682	0.7605
LB/HR (AVERAGE)	0.6689	0.4741	0.7306
PERCENT ISOKINETICS (AREA/CONC)	99.68	97.54	108.53
FILTER:			
MILLIGRAMS	1.80	0.0	5.57
GRAINS/DSCF	0.000174	0.0	0.000533
GRAINS/ACF	0.000167	0.0	0.000539
LB/HR (CONC. METHOD)	0.0496	0.0	0.1424
LB/HR (AREA METHOD)	0.0494	0.0	0.1545
LB/HR (AVERAGE)	0.0495	0.0	0.1485
PERCENT ISOKINETICS (AREA/CONC)	99.68	**********	108.53

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES (ENGLISH UNITS): PARTICULATE

RUN NUMBER:	3-C1	3-C3	3-P3
DATE OF RUN:	18 DEC 81	18 DEC 81	18 DEC 81
FRONT HALF TOTAL:			
MILLIGRAMS	26.13	17.79	32.98
GRAINS/DSCF	0.002532	0.001554	0.003157
GRAINS/ACF	0.002423	0.001490	0.003190
LB/HR (CONC. METHOD)	0.7196	0.4800	0.8431
LB/HR (AREA METHOD)	0.7173	0.4682	0.9150
LB/HR (AVERAGE)	0.7184	0.4741	0.8790
BACK HALF TOTAL:			
MILLIGRAMS	0.0	0.0	0.0
GRAINS/DSCF	0.0	0.0	0.0
GRAINS/ACF	0.0	0.0	0.0
LB/HR (CONC. METHOD)	0.0	0.0	0.0
LB/HR (AREA METHOD)	0.0	0.0	0.0
LB/HR (AVERAGE)	0.0	0.0	0.0
TOTAL:			
MILLIGRAMS	26.13	17.79	32.98
GRAINS/DSCF	0.002532	0.001554	0.003157
GRAINS/ACF	0.002423	0.001490	0.003190
LB/HR (CONC. METHOD)	0.7196	0.4800	0.8431
LB/HR (AREA METHOD)	0.7173	0.4682	0.9150
LB/HR (AVERAGE)	0.7184	0.4741	0.8790

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES (METRIC UNITS): PARTICULATE

	3-C1	3-C3	3-P3
RUN NUMBER:	3-C1	3-C3	3-P3
DATE OF RUN:	18 DEC 81	18 DEC 81	18 DEC 81
PROBE:			
MILLIGRAMS	24.33	17.79	27.41
GRAMS/DRY STANDARD CUBIC METER	0.005397	0.003557	0.006004
GRAMS/ACTUAL CUBIC METER	0.005163	0.003410	0.006069
GRAMS/HR (CONC. METHOD)	303.9011	217.7181	317.8401
GRAMS/HR (AREA METHOD)	302.9287	212.3673	344.9373
GRAMS/HR (AVERAGE)	303.4148	215.0427	331.3884
PERCENT ISOKINETICS (AREA/CONC)	99.68	97.54	108.53
FILTER:			
MILLIGRAMS	1.80	0.0	5.57
GRAMS/DRY STANDARD CUBIC METER	0.000399	0.0	0.001220
GRAMS/ACTUAL CUBIC METER	0.000382	0.0	0.001233
GRAMS/HR (CONC. METHOD)	22.4834	0.0	64.5884
GRAMS/HR (AREA METHOD)	22.4115	0.0	70.0948
GRAMS/HR (AVERAGE)	22.4475	0.0	67.3416
PERCENT ISOKINETICS (AREA/CONC)	99.68	**********	108.53

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES (METRIC UNITS): PARTICULATE

RUN NUMBER:	3-C1	3-C3	3-P3
DATE OF RUN:	18 DEC 8:	18 DEC 81	18 DEC 81
FRONT HALF TOTAL:			
MILLIGRAMS	26.13	17.79	32.98
GRAMS/DRY STANDARD CUBIC METER	0.005796	0.003557	0.007225
GRAMS/ACTUAL CUBIC METER	0.005545	0.003410	0.007302
GRAMS/HR (CONC. METHOD)	326.3845	217.7181	382.4285
GRAMS/HR (AREA METHOD)	325.3403	212.3673	415.0320
GRAMS/HR (AVERAGE)	325.8623	215.0427	398.7300
BACK HALF TOTAL:			
MILLIGRAMS	0.0	0.0	0.0
GRAMS/DRY STANDARD CUBIC METER	0.0	0.0	0.0
GRAMS/ACTUAL CUBIC METER	0.0	0.0	0.0
GRAMS/HR (CONC. METHOD)	0.0	0.0	0.0
GRAMS/HR (AREA METHOD)	0.0	0.0	0.0
GRAMS/HR (AVERAGE)	0.0	0.0	0.0
TOTAL:			
MILLIGRAMS	26.13	17.79	32.98
GRAMS/DRY STANDARD CUBIC METER	0.005796	0.003557	0.007225
GRAMS/ACTUAL CUBIC METER	0.005545	0.003410	0.007302
GRAMS/HR (CONC. METHOD)	326.3845	217.7181	382.4285
GRAMS/HR (AREA METHOD)	325.3403	212.3673	415.0320
GRAMS/HR (AVERAGE)	325.8623	215.0427	398.7300

POINT NO.	POINT DISTANCE (IN.)	CLOCK TIME	RUN TIME (MIN)	DRY GAS METER (CUFT)	PITOT DELTA P (IN. H2O)	ORIFICE DELTA H (IN. H2O)	DRY GAS METER TEMPERATURES IN (DEGREES F)	DRY GAS METER TEMPERATURES OUT (DEGREES F)	STACK PRESSURE (IN. H2O)	STACK TEMP. (DEG. F)	(PITOT)* (STACK TEMP) (IN H2O*DEG R)	SQUARE ROOT OF PREVIOUS RESULT	STACK GAS VELOC (AFPM)
RUN NUMBER: 3-C1													
B02		709.0	0.0	355.002	0.470	0.54	68.0	50.0	0.55	74.0	250.98	15.8423	2346.6
B02		719.0	10.0	359.000	0.450	0.52	76.0	53.0	0.55	78.0	242.10	15.5596	2304.7
B02		729.0	20.0	363.000	0.460	0.58	77.0	57.0	0.55	77.0	247.02	15.7169	2328.0
B02		739.0	30.0	367.000	0.460	0.58	77.0	58.0	0.55	77.0	247.02	15.7169	2328.0
B02		749.0	40.0	372.000	0.470	0.59	77.0	61.0	0.55	82.0	254.74	15.9606	2364.1
B02		759.0	50.0	376.000	0.460	0.58	78.0	62.0	0.55	82.0	249.32	15.7899	2338.8
B02		809.0	60.0	381.000	0.460	0.58	78.0	62.0	0.55	80.0	248.40	15.7607	2334.5
B01		814.0	65.0	383.000	1.250	1.60	84.0	63.0	0.55	81.0	676.25	26.0048	3851.8
B01		819.0	70.0	386.000	1.250	1.60	85.0	64.0	0.55	80.0	675.00	25.9808	3846.2
B01		829.0	80.0	394.000	1.250	1.60	86.0	64.0	0.55	81.0	676.25	26.0048	3851.6
B01		839.0	90.0	401.000	1.250	1.60	85.0	63.0	0.55	81.0	676.25	26.0048	3851.6
B01		849.0	100.0	408.000	1.200	1.50	84.0	62.0	0.55	80.0	648.00	25.4558	3770.5
B01		859.0	110.0	415.000	1.250	1.60	82.0	61.0	0.55	78.0	672.50	25.9326	3841.1
STOP		909.0	120.0	422.519									
A02		919.0	120.0	422.722	1.250	1.60	67.0	55.0	0.55	80.0	675.00	25.9808	3846.2
A02		929.0	130.0	429.000	1.250	1.60	82.0	57.0	0.55	76.0	670.00	25.8844	3834.0
A02		939.0	140.0	437.000	1.300	1.60	83.0	60.0	0.55	85.0	708.50	26.6177	3942.6
A02		949.0	150.0	444.000	1.250	1.60	84.0	61.0	0.55	85.0	681.25	26.1008	3866.0
A02		959.0	160.0	451.000	1.250	1.60	84.0	62.0	0.55	83.0	678.75	26.0528	3858.9
A02		1009.0	170.0	457.000	1.250	1.60	84.0	62.0	0.55	85.0	681.25	26.1008	3866.0
A01		1019.0	180.0	464.000	1.800	2.20	82.0	61.0	0.55	83.0	977.40	31.2634	4633.7
A01		1029.0	190.0	472.000	1.700	2.10	84.0	61.0	0.55	80.0	918.00	30.2985	4487.8
A01		1039.0	200.0	480.000	1.800	2.20	84.0	61.0	0.55	78.0	968.40	31.1191	4609.3
A01		1049.0	210.0	489.000	1.800	2.20	84.0	62.0	0.55	80.0	972.00	31.1769	4617.9
A01		1059.0	220.0	497.000	1.700	2.10	86.0	62.0	0.55	79.0	916.30	30.2704	4483.6
A01		1109.0	230.0	505.000	1.800	2.20	92.0	69.0	0.55	85.0	981.00	31.3209	4639.2
STOP		1119.0	240.0	513.582									
END													
OVERALL RESULTS:			TT 240.0 (NET)	VM 158.377 (NET)	PIT 1.153 (AVG)	PM 1.44 (AVG)		TM 70.9 (AVG)	PST 0.55 (AVG)	TS 80.4 (AVG)		24.3166 (AVG)	VS 3601.7 (AVG)

POINT NO.	POINT DISTANCE (IN.)	CLOCK TIME	RUN TIME (MIN)	DRY GAS METER (CUFT)	PITOT DELTA P (IN. H2O)	ORIFICE DELTA H (IN. H2O)	DRY GAS METER TEMPERATURES IN (DEGREES F)	DRY GAS METER TEMPERATURES OUT (DEGREES F)	STACK PRESSURE (IN. H2O)	STACK TEMP. (DEG. F)	(PITOT)* (STACK TEMP) (IN H2O*DEG R)	SQUARE ROOT OF PREVIOUS RESULT	STACK GAS VELOC (AFPM)
RUN NUMBER: 3-C3													
B02		709.0	0.0	118.852	1.500	2.00	46.0	45.0	0.55	75.0	802.50	28.3284	4195.0
B02		719.0	10.0	126.700	1.500	2.00	76.0	51.0	0.55	74.0	801.00	28.3019	4191.1
B02		729.0	20.0	134.400	1.500	2.10	79.0	54.0	0.55	75.0	802.50	28.3284	4195.0
B02		739.0	30.0	142.200	1.500	2.10	80.0	55.0	0.55	77.0	805.50	28.3813	4202.9
B02		749.0	40.0	149.900	1.500	2.10	81.0	56.0	0.55	77.0	805.50	28.3813	4202.9
B02		759.0	50.0	158.000	1.500	2.10	83.0	58.0	0.55	78.0	807.00	28.4077	4206.8
B01		809.0	60.0	166.200	1.300	1.80	85.0	61.0	0.55	80.0	702.00	26.4953	3923.6
B01		819.0	70.0	173.700	1.300	1.80	82.0	65.0	0.55	80.0	702.00	26.4953	3923.6
B01		829.0	80.0	182.400	1.300	1.80	82.0	68.0	0.55	79.0	700.70	26.4707	3919.9
B01		839.0	90.0	188.700	1.300	1.80	82.0	69.0	0.55	79.0	700.70	26.4707	3919.9
B01		849.0	100.0	196.000	1.300	1.80	83.0	68.0	0.55	80.0	702.00	26.4953	3923.6
B01		859.0	110.0	203.500	1.300	1.80	86.0	69.0	0.55	81.0	703.30	26.5198	3927.2
STOP		909.0	120.0	210.812									
B01		916.0	120.0	210.935	0.800	1.10	73.0	66.0	0.55	81.0	432.80	20.8038	3060.7
B01		926.0	130.0	216.400	0.900	1.20	77.0	66.0	0.55	81.0	486.90	22.0658	3267.6
B01		936.0	140.0	221.600	0.900	1.20	77.0	63.0	0.55	80.0	486.00	22.0454	3264.6
B01		946.0	150.0	228.000	0.900	1.20	77.0	62.0	0.55	82.0	487.80	22.0862	3270.6
B01		956.0	160.0	234.900	0.900	1.20	78.0	63.0	0.55	82.0	487.80	22.0862	3270.6
B01		1006.0	170.0	239.900	0.900	1.20	78.0	63.0	0.55	82.0	487.80	22.0862	3270.6
B01		1016.0	180.0	244.100	0.900	1.20	79.0	63.0	0.55	82.0	487.80	22.0862	3270.6
B01		1026.0	190.0	251.200	1.800	2.50	80.0	63.0	0.55	84.0	979.20	31.2922	4633.9
B01		1036.0	200.0	261.000	1.800	2.50	81.0	66.0	0.55	84.0	979.20	31.2922	4633.9
B01		1046.0	210.0	269.600	1.800	2.50	81.0	65.0	0.55	83.0	977.40	31.2634	4629.7
B01		1056.0	220.0	277.800	1.500	2.10	82.0	66.0	0.55	82.0	813.00	28.5132	4222.4
B01		1106.0	230.0	286.200	1.500	2.10	79.0	61.0	0.55	82.0	813.00	28.5132	4222.4
STOP		1116.0	240.0	294.300									
END													
OVERALL RESULTS:			TT 240.0 (NET)	VM 175.325 (NET)	PIT 1.308 (AVG)	PM 1.80 (AVG)	TM 70.3 (AVG)		PST 0.55 (AVG)	TS 80.0 (AVG)		26.3837 (AVG)	VS 3907.0 (AVG)

POINT NO.	POINT DISTANCE (IN.)	CLOCK TIME	RUN TIME (MIN)	DRY GAS METER (CUFT)	PITOT DELTA P (IN. H2O)	ORIFICE DELTA H (IN. H2O)	DRY GAS METER TEMPERATURES IN (DEGREES F)	DRY GAS METER TEMPERATURES OUT (DEGREES F)	STACK PRESSURE (IN. H2O)	STACK TEMP. (DEG. F)	(PITOT)* (STACK TEMP) (IN H2O*DEG R)	SQUARE ROOT OF PREVIOUS RESULT	STACK GAS VELOC (AFPM)
RUN NUMBER: 3-P3													
A02		655.0	0.0	435.712	0.890	1.15	47.0	45.0	0.55	56.0	459.24	21.4295	3158.1
A02		710.0	15.0	445.100	0.910	1.30	74.0	53.0	0.55	55.0	468.65	21.6483	3200.4
A02		725.0	30.0	455.100	0.880	1.25	80.0	58.0	0.55	53.0	451.44	21.2471	3141.1
A02		740.0	45.0	464.900	0.880	1.25	81.0	62.0	0.55	57.0	454.96	21.3292	3153.3
A02		755.0	60.0	475.200	0.820	1.15	81.0	63.0	0.55	58.0	424.76	20.6097	3046.8
A02		810.0	75.0	483.000	0.830	1.15	80.0	63.0	0.55	58.0	429.94	20.7350	3065.3
A02		825.0	90.0	492.000	0.820	1.15	78.0	63.0	0.55	58.0	424.76	20.6097	3046.8
A02		840.0	105.0	503.500	0.900	1.15	76.0	62.0	0.55	58.0	414.40	20.3568	3009.4
STOP		855.0	120.0	513.113									
B01		905.0	120.0	513.395	0.950	1.35	65.0	57.0	0.55	52.0	486.40	22.0545	3260.4
B01		920.0	135.0	523.300	0.920	1.30	78.0	61.0	0.55	53.0	476.56	21.8312	3227.3
B01		935.0	150.0	533.200	0.900	1.30	80.0	62.0	0.55	60.0	468.00	21.6333	3198.1
B01		950.0	165.0	543.400	0.900	1.30	81.0	63.0	0.55	63.0	470.70	21.6956	3207.4
B01		1005.0	180.0	553.900	0.880	1.15	82.0	64.0	0.55	64.0	461.12	21.4737	3174.6
B01		1020.0	195.0	563.000	1.000	1.30	81.0	64.0	0.55	61.0	521.00	22.8254	3374.4
B01		1035.0	210.0	573.300	1.100	1.55	82.0	65.0	0.55	50.0	561.00	23.6854	3501.5
B01		1050.0	225.0	585.500	1.100	1.55	85.0	67.0	0.55	49.0	559.90	23.6622	3498.1
STOP		1105.0	240.0	595.902									
END													
OVERALL RESULTS:			TT 240.0 (NET)	VM 159.808 (NET)	PIT 0.911 (AVG)	PM 1.27 (AVG)		TM 63.8 (AVG)	PST 0.55 (AVG)	TS 56.9 (AVG)		21.6786 (AVG)	VS 3204.6 (AVG)

APPENDIX E-2

CASCADE IMPACTOR DATA REDUCTION SYSTEM COMPUTER PRINTOUTS

"COMPARE" OUTPUT FOR ALL POURING RUNS

TEST SITE	LYNF	LYNF	LYNF	LYNF
TEST DATE	121681	121681	121681	121681
RUN NUMBER	2	5	7	13
RUN DATE	121681	121681	121681	121881
START TIME	752	759	750	656
TOTAL MASS	6.717E+00	4.054E+00	4.695E+00	4.236E+00

STD.	DIAM.	CUM. % MASS < D50			
4	.63	7.77	17.68	20.15	17.25
5	1.00	10.61	23.98	24.38	25.78
6	1.25	11.90	26.62	25.83	29.69
7	2.50	13.76	29.18	27.15	34.24
8	6.00	18.57	34.59	31.87	50.62
9	10.00	31.43	41.72	44.02	73.68
10	15.00	60.28	65.77	67.99	88.79
11	20.00	83.39	85.61	86.69	95.99

DATA COMPARISON FOR 4 OUTLET RUNS BY GCA

STD. DIAM. (MICRONS)		NO. RUNS	DM/DLOGD (MG/DNCM)	CUMULATIVE MASS < D50	CUM. % MASS < D50 AVG.	STD. DEV.	MIN.	MAX.
4	.63	4	1.02E+00	7.29E-01	15.72	5.45	7.77	20.15
5	1.00	4	1.26E+00	9.81E-01	21.19	7.09	10.61	25.78
6	1.25	4	7.66E-01	1.09E+00	23.51	7.92	11.90	29.69
7	2.50	4	4.74E-01	1.21E+00	26.08	8.74	13.76	34.24
8	6.00	4	2.34E+00	1.57E+00	33.91	13.15	18.57	50.62
9	10.00	4	4.87E+00	2.25E+00	47.71	18.15	31.43	73.68
10	15.00	4	7.46E+00	3.42E+00	70.71	12.48	60.28	88.79
11	20.00	4	6.17E+00	4.30E+00	87.92	5.55	83.39	95.99

"COMPARE" OUTPUT FOR ALL COOLING RUNS

TEST SITE	LYNF	LYNF	LYNF	LYNF	LYNF
TEST DATE	121681	121681	121681	121681	121681
RUN NUMBER	8	9	10	11	12
RUN DATE	121781	121781	121781	121881	121881
START TIME	729	734	738	708	701
TOTAL MASS	6.019E+00	1.425E+01	4.390E+00	3.178E+00	2.757E+00

STD.	DIAM.	CUM. % MASS < D50				
4	.63	10.17	5.05	28.71	16.67	14.36
5	1.00	12.90	6.50	34.67	18.54	20.65
6	1.25	14.06	7.05	37.14	19.28	23.60
7	2.50	16.92	7.98	41.74	21.33	28.12
8	6.00	22.60	11.56	53.09	30.65	50.21
9	10.00	31.47	25.02	67.80	44.09	78.79
10	15.00	59.76	56.68	83.22	67.79	93.60
11	20.00	83.09	81.91	93.30	86.56	98.31

DATA COMPARISON FOR 5 OUTLET RUNS BY GCA

STD. DIAM. (MICRONS)		NO. RUNS	DM/DLOGD (MG/DNCM)	CUMULATIVE MASS < D50	CUM. % MASS < D50 AVG.	STD. DEV.	MIN.	MAX.
4	.63	5	8.16E-01	7.04E-01	14.99	8.85	5.05	28.71
5	1.00	5	8.12E-01	8.76E-01	18.65	10.51	6.50	34.67
6	1.25	5	5.78E-01	9.49E-01	20.23	11.29	7.05	37.14
7	2.50	5	5.32E-01	1.09E+00	23.22	12.67	7.98	41.74
8	6.00	5	2.84E+00	1.54E+00	33.62	17.83	11.56	53.09
9	10.00	5	6.57E+00	2.40E+00	49.43	23.16	25.02	78.79
10	15.00	5	1.04E+01	4.01E+00	72.21	13.77	56.68	93.60
11	20.00	5	8.63E+00	5.25E+00	88.63	6.99	81.91	98.31

"COMPARE" OUTPUT FOR ALL POURING AND COOLING RUNS COMBINED

TEST SITE	LYNF	LYNF	LYNF	LYNF	LYNF	LYNF	LYNF
TEST DATE	121681	121681	121681	121681	121681	121681	121681
RUN NUMBER	2	5	7	8	9	10	11
RUN DATE	121681	121681	121681	121781	121781	121781	121881
START TIME	752	759	750	729	734	738	708
TOTAL MASS	6.717E+00	4.054E+00	4.695E+00	6.019E+00	1.425E+01	4.390E+00	3.178E+00

STD.	DIAM.	CUM. % MASS < D50						
4	.63	7.77	17.68	20.15	10.17	5.05	28.71	16.67
5	1.00	10.61	23.98	24.38	12.90	6.50	34.67	18.54
6	1.25	11.90	26.62	25.83	14.06	7.05	37.14	19.28
7	2.50	13.76	29.18	27.15	16.92	7.98	41.74	21.33
8	6.00	18.57	34.59	31.87	22.60	11.56	53.09	30.65
9	10.00	31.43	41.72	44.02	31.47	25.02	67.80	44.09
10	15.00	60.28	65.77	67.99	59.76	56.68	83.22	67.79
11	20.00	83.39	85.61	86.69	83.09	81.91	93.30	86.56

TEST SITE	LYNF	LYNF
TEST DATE	121681	121681
RUN NUMBER	12	13
RUN DATE	121881	121881
START TIME	701	656
TOTAL MASS	2.757E+00	4.236E+00

STD.	DIAM.	CUM. % MASS < D50	
4	.63	14.36	17.25
5	1.00	20.65	25.78
6	1.25	23.60	29.69
7	2.50	28.12	34.24
8	6.00	50.21	50.62
9	10.00	78.79	73.68
10	15.00	93.60	88.79
11	20.00	98.31	95.99

DATA COMPARISON FOR 9 OUTLET RUNS BY GCA

STD. DIAM. (MICRONS)		NO. RUNS	DM/DLOGD (MG/DNCM)	CUMULATIVE MASS < D50	CUM. % MASS < D50 AVG.	STD. DEV.	MIN.	MAX.
4	.63	9	9.07E-01	7.15E-01	15.31	7.10	5.05	28.71
5	1.00	9	1.01E+00	9.23E-01	19.78	8.71	6.50	34.67
6	1.25	9	6.61E-01	1.01E+00	21.68	9.50	7.05	37.14
7	2.50	9	5.06E-01	1.14E+00	24.49	10.55	7.98	41.74
8	6.00	9	2.62E+00	1.55E+00	33.75	14.96	11.56	53.09
9	10.00	9	5.81E+00	2.33E+00	48.67	19.82	25.02	78.79
10	15.00	9	9.08E+00	3.75E+00	71.54	13.54	56.68	93.60
11	20.00	9	7.54E+00	4.83E+00	88.31	6.01	81.91	98.31

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 10/25/83 09:05:27
DATA FOR TEST BY CONTRACTOR GCA , AT SITE LYNF, ON DATE 121681, RUN NO. 2
TEST COMMENTS: IP TEST IRON FOUNDRY POURING AND COOLING
RUN COMMENTS: 1-P-1
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.0

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	[illegible]	.0759	.0000	.3850
5	264	[illegible]	[illegible]	.3690
6	264	.0343	.1760	[illegible]
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .402 ACFM IMPACTOR TEMPERATURE = 64.6 F (18.1 C) SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = .341 IN. OF HG STACK TEMPERATURE = 64.6 F (18.1 C) STACK PRESSURE = 29.95 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = .00 CO = .00 N2 = 78.10 O2 = 20.90 H2O = 1.30

CALC. MASS LOADING = 2.9287-003 GR/ACF 2.9352-003 GR/DNCF 6.7020+000 MG/ACM 6.7167+000 MG/DNCM
SAMPLING AT 96.1 % OF ISOKINETIC RATE

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

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 30.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	8.51	11.91	10.52	7.02	4.70	2.62	1.28	.79	.43	.43/2.0
MASS (MG)	13.52	1.06	.15	.26	.28	.49	.35	.56	.47	1.17
MG/DNCM/STAGE	4.96+000	3.89-001	5.50-002	9.54-002	1.03-001	1.80-001	1.28-001	2.05-001	1.72-001	4.29-001
CUM. % OF MASS < D50	26.16	20.37	19.55	18.13	16.60	13.93	12.02	8.96	6.39	
CUM. MASS (MG/ACM) < D50	1.75+000	1.37+000	1.31+000	1.22+000	1.11+000	9.33-001	8.05-001	6.00-001	4.28-001	
CUM. MASS (MG/DNCM) < D50	1.76+000	1.37+000	1.31+000	1.22+000	1.12+000	9.35-001	8.07-001	6.02-001	4.29-001	
CUM. MASS (GR/ACF) < D50	7.66-004	5.97-004	5.73-004	5.31-004	4.86-004	4.08-004	3.52-004	2.62-004	1.87-004	
CUM. MASS (GR/DNCF) < D50	7.68-004	5.98-004	5.74-004	5.32-004	4.87-004	4.09-004	3.53-004	2.63-004	1.88-004	
GEO. MEAN DIA.(MICRONS)	1.60+001	1.01+001	1.12+001	8.60+000	5.74+000	3.51+000	1.83+000	1.01+000	5.85-001	3.05-001
DM/DLOGD (MG/DNCM)	9.07+000	-2.66+000	1.02+000	5.42-001	5.89-001	7.07-001	4.14-001	9.90-001	6.51-001	1.43+000
DN/DLOGD (NUMBER/DNCM)	4.24+006	-4.98+006	1.39+006	1.63+006	5.94+006	3.14+007	1.29+008	1.85+009	6.21+009	9.61+010

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 11.91 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 10.52 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 2 3 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 3 WITH D50= 7.02 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 2.6155844 4.6969585

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000*	15.000*	20.000*
CUM. MASS (MG/DNCM)	.522	.713	.799	.924	1.247	2.111	4.049	5.601
DM/DLOGD (MG/DNCM)	6.92-001	9.97-001	6.10-001	5.86-001	2.11+000	7.31+000	1.29+001	1.10+001

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 10/25/83 09:05:27
DATA FOR TEST BY CONTRACTOR GCA , AT SITE LYNF, ON DATE 121681, RUN NO. 5
TEST COMMENTS: IP TEST IRON FOUNDRY POURING AND COOLING
RUN COMMENTS: 2-P-2

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .380 ACFM IMPACTOR TEMPERATURE = 56.7 F (13.7 C) SAMPLING DURATION = 170.00 MIN

IMPACTOR PRESSURE DROP = .310 IN. OF HG STACK TEMPERATURE = 56.7 F (13.7 C) STACK PRESSURE = 29.95 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = .00 CO = .00 N2 = 78.81 O2 = 20.90 H2O = 1.07

CALC. MASS LOADING = 1.7991-003 GR/ACF 1.7718-003 GR/DNCF 4.1169+000 MG/ACM 4.0544+000 MG/DNCM
SAMPLING AT 148.6 % OF ISOKINETIC RATE

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

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 30.0 MICRONS

IMPACTOR STAGE STAGE INDEX NO.	CYCLONE 1	S1 2	S2 3	S3 4	S4 5	S5 6	S6 7	S7 8	S8 9	FILTER 10
D50 (MICRONS)	8.53	12.20	10.77	7.19	4.81	2.68	1.31	.82	.44	.44/2.0
MASS (MG)	4.68	.02	.09	.00	.29	.23	.18	.47	.52	1.05
MG/DNCM/STAGE	2.52+000	1.08-002	4.85-002	5.38-004	1.56-001	1.24-001	9.69-002	2.53-001	2.80-001	5.65-001
CUM. % OF MASS < D50	37.86	37.59	36.40	36.38	32.53	29.48	27.09	20.85	13.94	
CUM. MASS (MG/ACM) < D50	1.56+000	1.55+000	1.50+000	1.50+000	1.34+000	1.21+000	1.12+000	8.58-001	5.74-001	
CUM. MASS (MG/DNCM) < D50	1.53+000	1.52+000	1.48+000	1.48+000	1.32+000	1.20+000	1.10+000	8.45-001	5.65-001	
CUM. MASS (GR/ACF) < D50	6.81-004	6.76-004	6.55-004	6.55-004	5.85-004	5.30-004	4.87-004	3.75-004	2.51-004	
CUM. MASS (GR/DNCF) < D50	6.71-004	6.66-004	6.45-004	6.45-004	5.76-004	5.22-004	4.80-004	3.69-004	2.47-004	
GEO. MEAN DIA.(MICRONS)	1.60+001	1.02+001	1.15+001	8.80+000	5.88+000	3.59+000	1.88+000	1.03+000	6.02-001	3.14-001
DM/DLOGD (MG/DNCM)	4.61+000	-6.93-002	8.99-001	3.06-003	8.95-001	4.87-001	3.13-001	1.22+000	1.06+000	1.88+000
DN/DLOGD (NUMBER/DNCM)	2.15+006	-1.25+005	1.14+006	8.58+003	8.41+006	2.01+007	9.05+007	2.11+009	9.31+009	1.16+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 12.20 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 10.77 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 2 3 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 3 WITH D50= 7.19 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 4.8103513 8.5294243

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000*	15.000*	20.000*
CUM. MASS (MG/DNCM)	.717	.972	1.079	1.183	1.402	1.691	2.667	3.471
DM/DLOGD (MG/DNCM)	1.07+000	1.27+000	7.88-001	3.75-001	8.68-001	3.48+000	6.63+000	5.71+000

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 10/25/83 09:05:27
DATA FOR TEST BY CONTRACTOR GCA , AT SITE LYNF, ON DATE 121681, RUN NO. 7
TEST COMMENTS: IP TEST IRON FOUNDRY POURING AND COOLING
RUN COMMENTS: 1-P-3
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.0

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .403 ACFM IMPACTOR TEMPERATURE = 63.1 F (17.3 C) SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = .343 IN. OF HG STACK TEMPERATURE = 63.1 F (17.3 C) STACK PRESSURE = 29.95 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = .00 CO = .00 N2 = 78.10 O2 = 20.90 H2O = 1.17

CALC. MASS LOADING = 2.0559-003 GR/ACF 2.0518-003 GR/DNCF 4.7045+000 MG/ACM 4.6952+000 MG/DNCM
SAMPLING AT 171.2 % OF ISOKINETIC RATE

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

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 30.0 MICRONS

IMPACTOR STAGE STAGE INDEX NO.	CYCLONE 1	S1 2	S2 3	S3 4	S4 5	S5 6	S6 7	S7 8	S8 9	FILTER 10
D50 (MICRONS)	8.48	11.90	10.51	7.01	4.69	2.61	1.28	.79	.43	.43/2.0
MASS (MG)	7.84	1.22	.00	.00	.05	.25	.17	.46	.81	2.07
MG/DNCM/STAGE	2.86+000	4.45-001	3.66-004	3.65-004	1.82-002	9.12-002	6.20-002	1.68-001	2.95-001	7.55-001
CUM. % OF MASS < D50	39.09	29.61	29.61	29.60	29.21	27.27	25.95	22.37	16.08	
CUM. MASS (MG/ACM) < D50	1.84+000	1.39+000	1.39+000	1.39+000	1.37+000	1.28+000	1.22+000	1.05+000	7.57-001	
CUM. MASS (MG/DNCM) < D50	1.84+000	1.39+000	1.39+000	1.39+000	1.37+000	1.28+000	1.22+000	1.05+000	7.55-001	
CUM. MASS (GR/ACF) < D50	8.04-004	6.09-004	6.09-004	6.09-004	6.01-004	5.61-004	5.33-004	4.60-004	3.31-004	
CUM. MASS (GR/DNCF) < D50	8.02-004	6.08-004	6.07-004	6.07-004	5.99-004	5.59-004	5.32-004	4.59-004	3.30-004	
GEO. MEAN DIA.(MICRONS)	1.59+001	1.00+001	1.12+001	8.58+000	5.73+000	3.50+000	1.83+000	1.01+000	5.84-001	3.05-001
DM/DLOGD (MG/DNCM)	5.21+000	-3.02+000	6.79-003	2.07-003	1.05-001	3.59-001	2.00-001	8.08-001	1.12+000	2.51+000
DN/DLOGD (NUMBER/DNCM)	2.45+006	-5.70+006	9.27+003	6.26+003	1.06+006	1.60+007	6.26+007	1.51+009	1.07+010	1.70+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 11.90 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 10.51 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 2 3 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 3 WITH D50= 7.01 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 2.6119463 4.6903290

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000*	15.000*	20.000*
CUM. MASS (MG/DNCM)	.946	1.145	1.213	1.275	1.497	2.067	3.192	4.070
DM/DLOGD (MG/DNCM)	1.08+000	8.15-001	4.32-001	2.94-001	1.62+000	4.45+000	7.34+000	6.16+000

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 10/25/83 09:05:27
DATA FOR TEST BY CONTRACTOR GCA , AT SITE LYNF, ON DATE 121681, RUN NO. 8
TEST COMMENTS: IP TEST IRON FOUNDRY POURING AND COOLING
RUN COMMENTS: 2-C-1
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.0

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .416 ACFM IMPACTOR TEMPERATURE = 75.8 F (24.3 C) SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = .354 IN. OF HG STACK TEMPERATURE = 75.8 F (24.3 C) STACK PRESSURE = 29.70 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = .00 CO = .00 N2 = 78.10 O2 = 20.90 H2O = 2.41

CALC. MASS LOADING = 2.5192-003 GR/ACF 2.6301-003 GR/DNCF 5.7649+000 MG/ACM 6.0186+000 MG/DNCM
SAMPLING AT 135.3 % OF ISOKINETIC RATE

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

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 30.0 MICRONS

IMPACTOR STAGE STAGE INDEX NO.	CYCLONE 1	S1 2	S2 3	S3 4	S4 5	S5 6	S6 7	S7 8	S8 9	FILTER 10
D50 (MICRONS)	8.57	11.76	10.39	6.93	4.63	2.58	1.26	.78	.42	.42/2.0
MASS (MG)	11.91	.40	.28	.23	.32	.39	.48	.43	.60	1.27
MG/DNCM/STAGE	4.39+000	1.48-001	1.03-001	8.49-002	1.18-001	1.44-001	1.77-001	1.59-001	2.21-001	4.69-001
CUM. % OF MASS < D50	26.98	24.52	22.81	21.40	19.44	17.04	14.10	11.47	7.79	
CUM. MASS (MG/ACM) < D50	1.56+000	1.41+000	1.31+000	1.23+000	1.12+000	9.83-001	8.13-001	6.61-001	4.49-001	
CUM. MASS (MG/DNCM) < D50	1.62+000	1.48+000	1.37+000	1.29+000	1.17+000	1.03+000	8.49-001	6.90-001	4.69-001	
CUM. MASS (GR/ACF) < D50	6.80-004	6.18-004	5.75-004	5.39-004	4.90-004	4.29-004	3.55-004	2.89-004	1.96-004	
CUM. MASS (GR/DNCF) < D50	7.10-004	6.45-004	6.00-004	5.63-004	5.11-004	4.48-004	3.71-004	3.02-004	2.05-004	
GEO. MEAN DIA.(MICRONS)	1.60+001	1.00+001	1.11+001	8.48+000	5.67+000	3.46+000	1.80+000	9.92-001	5.74-001	2.99-001
DM/DLOGD (MG/DNCM)	8.08+000	-1.08+000	1.92+000	4.83-001	6.76-001	5.66-001	5.70-001	7.62-001	8.31-001	1.56+000
DN/DLOGD (NUMBER/DNCM)	3.74+006	-2.03+006	2.71+006	1.51+006	7.10+006	2.61+007	1.86+008	1.49+009	8.38+009	1.11+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 11.76 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 10.39 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 2 3 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 3 WITH D50= 6.93 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 4.6341833 8.5731734

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000*	15.000*	20.000*
CUM. MASS (MG/DNCM)	.612	.776	.846	1.018	1.360	1.894	3.597	5 001
DM/DLOGD (MG/DNCM)	8.20-001	7.59-001	6.42-001	4.01-001	1.70+000	6.08+000	1.16+001	9.96+000

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 10/25/83 09:05:27
DATA FOR TEST BY CONTRACTOR GCA , AT SITE LYNF, ON DATE 121681, RUN NO. 9
TEST COMMENTS: IP TEST IRON FOUNDRY POURING AND COOLING
RUN COMMENTS: 2-C-2
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.0

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .402 ACFM IMPACTOR TEMPERATURE = 61.5 F (16.4 C) SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = .340 IN. OF HG STACK TEMPERATURE = 61.5 F (16.4 C) STACK PRESSURE = 29.70 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = .00 CO = .00 N2 = 78.10 O2 = 20.90 H2O = 1.56

CALC. MASS LOADING = 6.1806-003 GR/ACF 6.2258-003 GR/DNCF 1.4143+001 MG/ACM 1.4247+001 MG/DNCM
SAMPLING AT 90.0 % OF ISOKINETIC RATE

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

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 30.0 MICRONS

IMPACTOR STAGE STAGE INDEX NO.	CYCLONE 1	S1 2	S2 3	S3 4	S4 5	S5 6	S6 7	S7 8	S8 9	FILTER 10
D50 (MICRONS)	8.40	11.88	10.49	7.00	4.68	2.61	1.28	.79	.43	.43/2.0
MASS (MG)	31.35	2.32	.45	.32	.36	.72	.38	.50	.80	1.44
MG/DNCM/STAGE	1.16+001	8.55-001	1.66-001	1.18-001	1.33-001	2.65-001	1.40-001	1.84-001	2.95-001	5.31-001
CUM. % OF MASS < D50	18.87	12.86	11.70	10.87	9.94	8.07	7.09	5.80	3.73	
CUM. MASS (MG/ACM) < D50	2.67+000	1.82+000	1.65+000	1.54+000	1.41+000	1.14+000	1.00+000	8.20-001	5.27-001	
CUM. MASS (MG/DNCM) < D50	2.69+000	1.83+000	1.67+000	1.55+000	1.42+000	1.15+000	1.01+000	8.26-001	5.31-001	
CUM. MASS (GR/ACF) < D50	1.17-003	7.95-004	7.23-004	6.72-004	6.14-004	4.99-004	4.38-004	3.58-004	2.30-004	
CUM. MASS (GR/DNCF) < D50	1.17-003	8.01-004	7.28-004	6.77-004	6.19-004	5.03-004	4.41-004	3.61-004	2.32-004	
GEO. MEAN DIA.(MICRONS)	1.59+001	9.99+000	1.12+001	8.57+000	5.73+000	3.50+000	1.82+000	1.00+000	5.83-001	3.04-001
DM/DLOGD (MG/DNCM)	2.09+001	-5.67+000	3.08+000	6.71-001	7.61-001	1.04+000	4.51-001	8.88-001	1.11+000	1.76+000
DN/DLOGD (NUMBER/DNCM)	9.98+006	-1.09+007	4.22+006	2.04+006	7.74+006	4.67+007	1.42+008	1.67+009	1.07+010	1.20+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 11.88 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 10.49 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 2 3 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 3 WITH D50= 7.00 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 2.6080471 4.6836091

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000*	15.000*	20.000*
CUM. MASS (MG/DNCM)	.720	.925	1.004	1.136	1.646	3.565	8.075	11.669
DM/DLOGD (MG/DNCM)	1.08+000	8.91-001	5.22-001	8.06-001	4.26+000	1.72+001	2.99+001	2.53+001

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 10/25/83 09:05:27
DATA FOR TEST BY CONTRACTOR GCA , AT SITE LYNF, ON DATE 121681, RUN NO. 10
TEST COMMENTS: IP TEST IRON FOUNDRY POURING AND COOLING
RUN COMMENTS: 2-C-3
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.0

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .413 ACFM IMPACTOR TEMPERATURE = 79.4 F (26.3 C) SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = .345 IN. OF HG STACK TEMPERATURE = 79.4 F (26.3 C) STACK PRESSURE = 29.70 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = .00 CO = .00 N2 = 78.10 O2 = 20.90 H2O = 2.85

CALC. MASS LOADING = 1.8169-003 GR/ACF 1.9183-003 GR/DNCF 4.1578+000 MG/ACM 4.3899+000 MG/DNCM
SAMPLING AT 77.0 % OF ISOKINETIC RATE

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

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 30.0 MICRONS

IMPACTOR STAGE STAGE INDEX NO.	CYCLONE 1	S1 2	S2 3	S3 4	S4 5	S5 6	S6 7	S7 8	S8 9	FILTER 10
D50 (MICRONS)	8.66	11.82	10.44	6.96	4.66	2.59	1.27	.78	.42	.42/2.0
MASS (MG)	4.28	1.55	.23	.09	.13	.49	.55	.68	.86	2.81
MG/DNCM/STAGE	1.61+000	5.83-001	8.65-002	3.39-002	4.89-002	1.84-001	2.07-001	2.56-001	3.24-001	1.06+000
CUM. % OF MASS < D50	63.32	50.04	48.07	47.30	46.19	41.99	37.28	31.45	24.08	
CUM. MASS (MG/ACM) < D50	2.63+000	2.08+000	2.00+000	1.97+000	1.92+000	1.75+000	1.55+000	1.31+000	1.00+000	
CUM. MASS (MG/DNCM) < D50	2.78+000	2.20+000	2.11+000	2.08+000	2.03+000	1.84+000	1.64+000	1.38+000	1.06+000	
CUM. MASS (GR/ACF) < D50	1.15-003	9.09-004	8.73-004	8.59-004	8.39-004	7.63-004	6.77-004	5.71-004	4.37-004	
CUM. MASS (GR/DNCF) < D50	1.21-003	9.60-004	9.22-004	9.07-004	8.86-004	8.05-004	7.15-004	6.03-004	4.62-004	
GEO. MEAN DIA.(MICRONS)	1.61+001	1.01+001	1.11+001	8.53+000	5.70+000	3.48+000	1.81+000	9.97-001	5.77-001	3.00-001
DM/DLOGD (MG/DNCM)	2.98+000	-4.31+000	1.60+000	1.92-001	2.80-001	7.24-001	6.65-001	1.23+000	1.21+000	3.51+000
DN/DLOGD (NUMBER/DNCM)	1.36+006	-7.95+006	2.23+006	5.93+005	2.89+006	3.30+007	2.13+008	2.37+009	1.21+010	2.48+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 11.82 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 10.44 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 2 3 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 3 WITH D50= 6.96 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 2.5927085 4.6585911
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000*	15.000*	20.000*
CUM. MASS (MG/DNCM)	1.260	1.522	1.630	1.832	2.330	2.976	3.653	4.096
DM/DLOGD (MG/DNCM)	1.22+000	1.23+000	8.75-001	7.02-001	2.78+000	3.43+000	3.89+000	2.99+000

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 10/25/83 09:05:27
DATA FOR TEST BY CONTRACTOR GCA , AT SITE LYNF, ON DATE 121681, RUN NO. 11
TEST COMMENTS: IP TEST IRON FOUNDRY POURING AND COOLING
RUN COMMENTS: 3-C-1
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.0

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .411 ACFM IMPACTOR TEMPERATURE = 80.4 F (26.9 C) SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = .344 IN. OF HG STACK TEMPERATURE = 80.4 F (26.9 C) STACK PRESSURE = 29.84 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = .00 CO = .00 N2 = 78.10 O2 = 20.90 H2O = 1.76

CALC. MASS LOADING = 1.3339-003 GR/ACF 1.3887-003 GR/DNCF 3.0524+000 MG/ACM 3.1779+000 MG/DNCM
SAMPLING AT 136.1 % OF ISOKINETIC RATE

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

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 30.0 MICRONS

IMPACTOR STAGE STAGE INDEX NO.	CYCLONE 1	S1 2	S2 3	S3 4	S4 5	S5 6	S6 7	S7 8	S8 9	FILTER 10
D50 (MICRONS)	8.82	11.89	10.50	7.00	4.69	2.61	1.27	.79	.43	.43/2.0
MASS (MG)	5.10	.55	.03	.34	.22	.46	.18	.14	.26	1.25
MG/DNCM/STAGE	1.90+000	2.05-001	1.12-002	1.27-001	8.20-002	1.71-001	6.71-002	5.22-002	9.69-002	4.66-001
CUM. % OF MASS < D50	40.21	33.76	33.41	29.43	26.85	21.45	19.34	17.70	14.65	
CUM. MASS (MG/ACM) < D50	1.23+000	1.03+000	1.02+000	8.98-001	8.19-001	6.55-001	5.90-001	5.40-001	4.47-001	
CUM. MASS (MG/DNCM) < D50	1.28+000	1.07+000	1.06+000	9.35-001	8.53-001	6.82-001	6.15-001	5.63-001	4.66-001	
CUM. MASS (GR/ACF) < D50	5.36-004	4.50-004	4.46-004	3.93-004	3.58-004	2.86-004	2.58-004	2.36-004	1.95-004	
CUM. MASS (GR/DNCF) < D50	5.58-004	4.69-004	4.64-004	4.09-004	3.73-004	2.98-004	2.69-004	2.46-004	2.04-004	
GEO. MEAN DIA.(MICRONS)	1.63+001	1.02+001	1.12+001	8.58+000	5.73+000	3.50+000	1.82+000	1.00+000	5.81-001	3.02-001
DM/DLOGD (MG/DNCM)	3.57+000	-1.58+000	2.07-001	7.20-001	4.69-001	6.73-001	2.16-001	2.51-001	3.64-001	1.55+000
DN/DLOGD (NUMBER/DNCM)	1.59+006	-2.81+006	2.84+005	2.18+006	4.77+006	3.01+007	6.80+007	4.75+008	3.55+009	1.07+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 11.89 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 10.50 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 2 3 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 3 WITH D50= 7.00 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 1.2744022 2.6076433
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000*	15.000*	20.000*
CUM. MASS (MG/DNCM)	.530	.589	.613	.678	.974	1.401	2.154	2.751
DM/DLOGD (MG/DNCM)	3.49-001	2.51-001	2.30-001	2.37-001	1.39+000	2.90+000	4.97+000	4.20+000

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 10/25/83 09:05:27
DATA FOR TEST BY CONTRACTOR GCA , AT SITE LYNF, ON DATE 121681, RUN NO. 12
TEST COMMENTS: IP TEST IRON FOUNDRY POURING AND COOLING
RUN COMMENTS: 3-C-3
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.0

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .400 ACFM IMPACTOR TEMPERATURE = 80.1 F (26.7 C) SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = .326 IN. OF HG STACK TEMPERATURE = 80.1 F (26.7 C) STACK PRESSURE = 29.84 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = .00 CO = .00 N2 = 78.10 O2 = 20.90 H2O = 1.64

CALC. MASS LOADING = 1.1590-003 GR/ACF 1.2046-003 GR/DNCF 2.6523+000 MG/ACM 2.7566+000 MG/DNCM
SAMPLING AT 76.1 % OF ISOKINETIC RATE

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

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 30.0 MICRONS

IMPACTOR STAGE STAGE INDEX NO.	CYCLONE 1	S1 2	S2 3	S3 4	S4 5	S5 6	S6 7	S7 8	S8 9	FILTER 10
D50 (MICRONS)	8.94	12.06	10.65	7.10	4.75	2.65	1.29	.80	.43	.43/2.0
MASS (MG)	1.98	1.54	.32	.45	.46	.40	.33	.50	.40	.83
MG/DNCM/STAGE	7.57-001	5.89-001	1.22-001	1.72-001	1.76-001	1.53-001	1.26-001	1.91-001	1.53-001	3.17-001
CUM. % OF MASS < D50	72.54	51.18	46.74	40.50	34.12	28.57	23.99	17.06	11.51	
CUM. MASS (MG/ACM) < D50	1.92+000	1.36+000	1.24+000	1.07+000	9.05-001	7.58-001	6.36-001	4.52-001	3.05-001	
CUM. MASS (MG/DNCM) < D50	2.00+000	1.41+000	1.29+000	1.12+000	9.41-001	7.88-001	6.61-001	4.70-001	3.17-001	
CUM. MASS (GR/ACF) < D50	8.41-004	5.93-004	5.42-004	4.69-004	3.95-004	3.31-004	2.78-004	1.98-004	1.33-004	
CUM. MASS (GR/DNCF) < D50	8.74-004	6.17-004	5.63-004	4.88-004	4.11-004	3.44-004	2.89-004	2.06-004	1.39-004	
GEO. MEAN DIA.(MICRONS)	1.64+001	1.04+001	1.13+001	8.70+000	5.81+000	3.55+000	1.85+000	1.02+000	5.90-001	3.07-001
DM/DLOGD (MG/DNCM)	1.44+000	-4.54+000	2.27+000	9.78-001	1.01+000	6.01-001	4.06-001	9.19-001	5.75-001	1.05+000
DN/DLOGD (NUMBER/DNCM)	6.26+005	-7.74+006	2.98+006	2.84+006	9.81+006	2.58+007	1.23+008	1 66+009	5.35+009	6.94+010

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 12.06 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 10.65 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 2 3 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 3 WITH D50= 7.10 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 2.6454004 4.7520931

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000*	15.000*	20.000*
CUM. MASS (MG/DNCM)	.396	.569	.651	.775	1.384	2.172	2.580	2.710
DM/DLOGD (MG/DNCM)	6.12-001	9.35-001	6.21-001	5.13-001	4.07+000	3.26+000	1.50+000	6.46-001

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 10/25/83 09:05:27
DATA FOR TEST BY CONTRACTOR GCA , AT SITE LYNF, ON DATE 121681, RUN NO. 13
TEST COMMENTS: IP TEST IRON FOUNDRY POURING AND COOLING
RUN COMMENTS: 3-P-3
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.0

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .389 ACFM IMPACTOR TEMPERATURE = 56.2 F (13.4 C) SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = .324 IN. OF HG STACK TEMPERATURE = 56.2 F (13.4 C) STACK PRESSURE = 29.84 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = .00 CO = .00 N2 = 78.10 O2 = 20.90 H2O = .73

CALC. MASS LOADING = 1.8811-003 GR/ACF 1.8512-003 GR/DNCF 4.3046+000 MG/ACM 4.2362+000 MG/DNCM
SAMPLING AT 98.9 % OF ISOKINETIC RATE

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

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 30.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	8.46	12.06	10.65	7.11	4.76	2.65	1.30	.81	.44	.44/2.0
MASS (MG)	3.86	2.10	.35	.22	.45	.46	.50	1.06	.83	1.55
MG/DNCM/STAGE	1.44+000	7.82-001	1.30-001	8.19-002	1.68-001	1.71-001	1.86-001	3.95-001	3.09-001	5.77-001
CUM. % OF MASS < D50	66.08	47.63	44.55	42.62	38.66	34.62	30.23	20.91	13.62	
CUM. MASS (MG/ACM) < D50	2.84+000	2.05+000	1.92+000	1.83+000	1.66+000	1.49+000	1.30+000	9.00-001	5.86-001	
CUM. MASS (MG/DNCM) < D50	2.80+000	2.02+000	1.89+000	1.81+000	1.64+000	1.47+000	1.28+000	8.86-001	5.77-001	
CUM. MASS (GR/ACF) < D50	1.24-003	8.96-004	8.38-004	8.02-004	7.27-004	6.51-004	5.69-004	3.93-004	2.56-004	
CUM. MASS (GR/DNCF) < D50	1.22-003	8.82-004	8.25-004	7.89-004	7.16-004	6.41-004	5.60-004	3.87-004	2.52-004	
GEO. MEAN DIA.(MICRONS)	1.59+001	1.01+001	1.13+001	8.70+000	5.81+000	3.55+000	1.85+000	1.02+000	5.94-001	3.10-001
DM/DLOGD (MG/DNCM)	2.61+000	-5.08+000	2.42+000	4.66-001	9.60-001	6.74-001	6.00-001	1.90+000	1.17+000	1.92+000
DN/DLOGD (NUMBER/DNCM)	1.23+006	-9.41+006	3.17+006	1.35+006	9.33+006	2.88+007	1.80+008	3.41+009	1.07+010	1.23+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 12.06 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 10.65 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 2 3 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 3 WITH D50= 7.11 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 2.6495168 4.7563265

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000*	15.000*	20.000*
CUM. MASS (MG/DNCM)	.731	1.092	1.258	1.451	2.144	3.121	3.761	4.066
DM/DLOGD (MG/DNCM)	1.24+000	1.95+000	1.23+000	6.40-001	4.76+000	4.23+000	2.98+000	1.87+000

APPENDIX F-1

TOTAL PARTICULATE ANALYSES REPORT SHEETS

GCA/TECHNOLOGY DIVISION

SOURCE PARTICULATE SAMPLING
TRAIN ASSEMBLY, RECOVERY AND ANALYTICAL REPORT SHEET

Run Date: 12/16/87
Run No.: 1-P1
Sample Box No.: 2180
Operator: GRAZIANO

Client: EPA/LYNCHBURG
W. O. No.: 1-618-022
Plant: ARCHER CREEK
Sampling Location: P-1

FRONT HALF

Nozzle and Probe (Cyclone Bypass)-Acetone Wash,

Cyclone and Flask-Acetone Wash

Thimble No.	Lab No.	Weight Results
		mg
		mg
		mg
		mg

Filter No.	Lab No.	Weight Results
M-8		6.31 mg
M-9		1.29 mg
		mg
		mg

Laboratory Results

Lab No.: B-216 Residue 27.64 mg
Lab No.: — Residue — mg

Thimble particulate weight — mg

Filter particulate weight 7.60 mg

FRONT HALF Sub Total 35.24 mg

BACK HALF

Impinger WATER and Water Wash of Impingers Connectors and Back Half of Filter Holder

Lab No.:

ACETONE WASH of Impinger, Connectors and Back Half of Filter Holder

Lab No.:

Collected on 0.22μ Filter — mg
Chloroform-ether Extract — mg
Aqueous Residue — mg

Residue — mg
BACK HALF Sub Total — mg

TOTAL WEIGHT (Front & Back) 35.24 mg

TOTAL TRAIN

MOISTURE

Impingers: ~~150~~
~~150~~
#1 100
#2 150
#3 10

Final Volume Total
Initial Volume Total 300
Net Volume

Silica Gel

Weight after test: 306.5
Weight before test: 265.9

Net Weight: 40.6

Container No.: 1. 1-P1 2. 3. 4.

TOTAL NET WEIGHT-Silica Gel 40.6 gm
NET VOLUME-Impingers −40 ml
TOTAL MOISTURE +0.6 gm

Comments:

LAB: DATE RECEIVED
DATE REPORTED

Train Assembled by: S. Grady
Sample Recovered by: GRAZIANO
Sample Analyzed by: L. SORENSON

GCA/TECHNOLOGY DIVISION

SOURCE PARTICULATE SAMPLING
TRAIN ASSEMBLY, RECOVERY AND ANALYTICAL REPORT SHEET

Run Date: 12/16/81
Run No.: 1-P2 RUN 1
Sample Box No.: 2550
Operator: MC CABE

Client: EPA LYNCHBURG
W. O. No.: 1-618-022
Plant: ARCHER CREEK
Sampling Location: P2

FRONT HALF

Nozzle and Probe (Cyclone Bypass)-Acetone Wash,

Cyclone and Flask-Acetone Wash

Thimble No.	Lab No.	Weight Results
		mg
		mg
		mg
		mg

Laboratory Results

Lab No.: B 258 Residue 4.55 mg

Lab No.: Residue mg

Thimble particulate weight — mg

Filter No.	Lab No.	Weight Results
M27 (FROM FIELD DATA SHEET)		
		6.445 mg
		mg
		mg

Filter particulate weight 6.445 mg

FRONT HALF Sub Total 10.995 mg

BACK HALF

Impinger WATER and Water Wash of Impingers Connectors and Back Half of Filter Holder

Lab No.:

Collected on 0.22 Filter — mg

Chloroform-ether Extract — mg

Aqueous Residue — mg

ACETONE WASH of Impinger, Connectors and Back Half of Filter Holder

Lab No.:

Residue — mg

BACK HALF Sub Total — mg

TOTAL TRAIN

TOTAL WEIGHT (Front & Back) 10.995 mg

MOISTURE

Impingers: 150, 150

Final Volume Total 234

Initial Volume Total 300

Net Volume −66

Silica Gel

Weight after test: 311.6

Weight before test: 266.7

Net Weight: 44.9

Container No.: 1. 1-P2 2. 3. 4.

TOTAL NET WEIGHT-Silica Gel 44.9 gm

NET VOLUME-Impingers −66.0 ml

TOTAL MOISTURE −21.1 gm

Comments:

LAB: DATE RECEIVED

DATE REPORTED

Train Assembled by: GROUBERT

Sample Recovered by: MCCABE

Sample Analyzed by: SORENSON

GCA/TECHNOLOGY DIVISION

SOURCE PARTICULATE SAMPLING
TRAIN ASSEMBLY, RECOVERY AND ANALYTICAL REPORT SHEET

Run Date: 2/14
Run No.: 1 - P-3
Sample Box No: 2258
Operator: VAY

Client: EPA/LYNCHBURG
W. O. No.: 1-618-022
Plant: ARCHER CREEK
Sampling Location: POURING - #3 P-3

FRONT HALF

Nozzle and Probe (Cyclone Bypass)-Acetone Wash,

Cyclone and Flask-Acetone Wash

Thimble No.	Lab No.	Weight Results
		mg
		mg
		mg
		mg

Filter No.	Lab No.	Weight Results
~~[illegible]~~		mg
N-7		12.0 mg
		mg
		mg

Laboratory Results

Lab No.: B-263 Residue 55.19 mg
Lab No.: Residue — mg

Thimble particulate weight — mg

Filter particulate weight 12.0 mg

FRONT HALF Sub Total 67.19 mg

BACK HALF

Impinger WATER and Water Wash of Impingers Connectors and Back Half of Filter Holder

Lab No.:

ACETONE WASH of Impinger, Connectors and Back Half of Filter Holder

Lab No.:

Collected on 0.22μ Filter — mg
Chloroform-ether Extract — mg
Aqueous Residue — mg
Residue — mg
BACK HALF Sub Total — mg

TOTAL WEIGHT (Front & Back) 67.19 mg

TOTAL TRAIN

MOISTURE

Impingers: 150
150

Final Volume Total
Initial Volume Total 300
Net Volume

Silica Gel

Weight after test: 321.6
Weight before test: 267.3

Net Weight: 54.3

Container No.: 1. 1-P-3 2. 3. 4.

TOTAL NET WEIGHT-Silica Gel 54.3 gm
NET VOLUME-Impingers -208 ml
TOTAL MOISTURE -153.7 gm

Comments:

LAB: DATE RECEIVED
DATE REPORTED

Train Assembled by: VAY
Sample Recovered by: VAY
Sample Analyzed by: Sorenson

GCA/TECHNOLOGY DIVISION

SOURCE PARTICULATE SAMPLING
TRAIN ASSEMBLY, RECOVERY AND ANALYTICAL REPORT SHEET

Run Date: 12-17-81
Run No.: #2, C-1
Sample Box No.: 2180
Operator: Joe Vay

Client: EPA/RTP
W. O. No.: 1-618-022
Plant: Lynchburg
Sampling Location: C-1

FRONT HALF

Nozzle and Probe (Cyclone Bypass)-Acetone Wash,

Cyclone and Flask-Acetone Wash

Thimble No.	Lab No.	Weight Results
		mg
		mg
		mg
		mg

Filter No.	Lab No.	Weight Results
M-28		2.6 mg
		mg
		mg
		mg

Laboratory Results

Lab No.: B267 Residue 35.27 mg

Lab No.: — Residue — mg

Thimble particulate weight — mg

Filter particulate weight 2.6 mg

FRONT HALF Sub Total 38.37 mg

BACK HALF

Impinger WATER and Water Wash of Impingers Connectors and Back Half of Filter Holder

Lab No.:

ACETONE WASH of Impinger, Connectors and Back Half of Filter Holder

Lab No.:

Collected on 0.22μ Filter — mg

Chloroform-ether Extract — mg

Aqueous Residue — mg

Residue — mg

BACK HALF Sub Total — mg

TOTAL TRAIN

TOTAL WEIGHT (Front & Back) 38.37 mg

MOISTURE

Impingers: 79, 100

Final Volume Total 179

Initial Volume Total 200 ml

Net Volume -21

Silica Gel

Weight after test: 307.8

Weight before test: 264.8 g

Net Weight:

Container No.: 1. 2. 3. 4.

TOTAL NET WEIGHT-Silica Gel 43 gm

NET VOLUME-Impingers -21 ml

TOTAL MOISTURE 22 gm

Comments:

LAB: DATE RECEIVED

DATE REPORTED

Train Assembled by: VAY

Sample Recovered by: VAY

Sample Analyzed by: JORENSON

GCA/TECHNOLOGY DIVISION

SOURCE PARTICULATE SAMPLING
TRAIN ASSEMBLY, RECOVERY AND ANALYTICAL REPORT SHEET

Run Date: 12/17/81
Run No.: 2-C2
Sample Box No.: 2180
Operator: GRAZIANO

Client: EPA/LYNCHBURG.
W. O. No.: 1-618-022
Plant: ARCHER CREEK
Sampling Location: C-2

FRONT HALF

Nozzle and Probe (Cyclone Bypass)-Acetone Wash,

Cyclone and Flask-Acetone Wash

Thimble No.	Lab No.	Weight Results
		mg
		mg
		mg
		mg

Filter No.	Lab No.	Weight Results
M-31		10.59 mg
		mg
		mg
		mg

Laboratory Results

Lab No.: B-301 Residue 32.03 mg

Lab No.: Residue — mg

Thimble particulate weight — mg

Filter particulate weight 10.59 mg

FRONT HALF Sub Total 42.62 mg

BACK HALF

Impinger WATER and Water Wash of Impingers Connectors and Back Half of Filter Holder

Lab No.:

ACETONE WASH of Impinger, Connectors and Back Half of Filter Holder

Lab No.:

Collected on 0.22μ Filter — mg

Chloroform-ether Extract — mg

Aqueous Residue — mg

Residue mg

BACK HALF Sub Total — mg

TOTAL WEIGHT (Front & Back) 42.62 mg

TOTAL TRAIN

MOISTURE

Impingers: 0, 150, 75, 180, 10

Final Volume Total 265

Initial Volume Total 300

Net Volume -35

Silica Gel

Weight after test: 311.5

Weight before test: 266.5

Net Weight: 45.0

Container No.: 1. #2C 2. 3. 4.

TOTAL NET WEIGHT-Silica Gel 45.0 gm

NET VOLUME-Impingers -35.0 ml

TOTAL MOISTURE 10.0 gm

Comments:

LAB: DATE RECEIVED

DATE REPORTED

Train Assembled by: GRAZIANO

Sample Recovered by: GRAZIANO

Sample Analysed by: SORENSON

GCA/TECHNOLOGY DIVISION

SOURCE PARTICULATE SAMPLING
TRAIN ASSEMBLY, RECOVERY AND ANALYTICAL REPORT SHEET

Run Date: 12/17/81
Run No.: 2-C3
Sample Box No.: 2550
Operator: McABE

Client: EPA/RTP
W. O. No.: 1-618-022
Plant: LYNCHBURG
Sampling Location: COOLING 3

FRONT HALF

Nozzle and Probe (Cyclone Bypass)-Acetone Wash,

Cyclone and Flask-Acetone Wash

Thimble No.	Lab No.	Weight Results
		mg
		mg
		mg
		mg

Filter No.	Lab No.	Weight Results
M-26		-3.0 mg
		mg
		mg
		mg

Laboratory Results

Lab No.: B266 Residue 15.76 mg

Lab No.: Residue — mg

Thimble particulate weight — mg

Filter particulate weight -3.0 mg

FRONT HALF Sub Total 12.76 mg

BACK HALF

Impinger WATER and Water Wash of Impingers Connectors and Back Half of Filter Holder

Lab No.:

ACETONE WASH of Impinger, Connectors and Back Half of Filter Holder

Lab No.:

Collected on 0.22μ Filter — mg

Chloroform-ether Extract — mg

Aqueous Residue — mg

Residue — mg

BACK HALF Sub Total — mg

TOTAL WEIGHT (Front & Back) 12.76 mg

TOTAL TRAIN

MOISTURE

Impingers: 63 ml

Final Volume Total 63 ml

Initial Volume Total 200

Net Volume -137

Silica Gel

Weight after test: 324.5

Weight before test: 279.8

Net Weight: 45.7

Container No.: 1. 2. 3. 4.

TOTAL NET WEIGHT-Silica Gel 45.7 gm

NET VOLUME-Impingers -137 ml

TOTAL MOISTURE -91.3 gm

Comments:

LAB: DATE RECEIVED

DATE REPORTED

Train Assembled by:

Sample Recovered by:

Sample Analyzed by:

GCA/TECHNOLOGY DIVISION

SOURCE PARTICULATE SAMPLING
TRAIN ASSEMBLY, RECOVERY AND ANALYTICAL REPORT SHEET

Run Date: 12-18-81
Run No.: 3, C-1
Sample Box No.: 2258
Operator: Joe Vay

Client: Lynchburg
W. O. No.:
Plant: Lynchburg
Sampling Location: C-1

FRONT HALF

Nozzle and Probe (Cyclone Bypass)-Acetone Wash,

Cyclone and Flask-Acetone Wash

Thimble No.	Lab No.	Weight Results
		mg
		mg
		mg
		mg

Filter No.	Lab No.	Weight Results
M-33		1.8 mg
		mg
		mg
		mg

Laboratory Results

Lab No.: B-75 Residue 24.33 mg

Lab No.: Residue mg

Thimble particulate weight — mg

Filter particulate weight 1.8 mg

FRONT HALF Sub Total 26.13 mg

BACK HALF

Impinger WATER and Water Wash of Impingers Connectors and Back Half of Filter Holder

Lab No.:

ACETONE WASH of Impinger, Connectors and Back Half of Filter Holder

Lab No.:

Collected on 0.22μ Filter — mg

Chloroform-ether Extract — mg

Aqueous Residue — mg

Residue — mg

BACK HALF Sub Total — mg

TOTAL WEIGHT (Front & Back) 26.13 mg

TOTAL TRAIN

MOISTURE

Impingers:

100
65

Final Volume Total 165
Initial Volume Total 200 ml
Net Volume -35

Silica Gel

Weight after test:
Weight before test:

Net Weight: 267.2 g

Container No.: 1. 2. 3. 4.

TOTAL NET WEIGHT-Silica Gel 36.9 gm

NET VOLUME-Impingers -35 ml

TOTAL MOISTURE 1.9 gm

Comments:

LAB: DATE RECEIVED

DATE REPORTED

Train Assembled by: VAY

Sample Recovered by: VAY

Sample Analyzed by: SORENSON

GCA/TECHNOLOGY DIVISION

SOURCE PARTICULATE SAMPLING
TRAIN ASSEMBLY, RECOVERY AND ANALYTICAL REPORT SHEET

Run Date: 12/18/81
Run No.: 3-C3
Sample Box No.: 2550
Operator: MC CABE

Client: EPA/RTP
W. O. No.: 1-618-022
Plant: LYNCHBURG
Sampling Location: C3

FRONT HALF

Nozzle and Probe (Cyclone Bypass)-Acetone Wash,

Cyclone and Flask-Acetone Wash

Thimble No.	Lab No.	Weight Results
		mg
		mg
		mg
		mg

Filter No.	Lab No.	Weight Results
M-29		-2.67 mg
		mg
		mg
		mg

Laboratory Results

Lab No.: B-73 Residue 20.4 mg
Lab No.: Residue — mg

Thimble particulate weight — mg

Filter particulate weight -2.67 mg

FRONT HALF Sub Total 17.79 mg

BACK HALF

Impinger WATER and Water Wash of Impingers Connectors and Back Half of Filter Holder

Lab No.:

ACETONE WASH of Impinger, Connectors and Back Half of Filter Holder

Lab No.:

Collected on 0.22μ Filter — mg
Chloroform-ether Extract — mg
Aqueous Residue — mg
Residue — mg
BACK HALF Sub Total — mg

TOTAL TRAIN

TOTAL WEIGHT (Front & Back) 17.79 mg

MOISTURE

Impingers: 70ml

Final Volume Total 70 ml
Initial Volume Total 200
Net Volume -130

Silica Gel

Weight after test:
Weight before test: 2666.7

Net Weight:

Container No.: 1. 2. 3. 4.

TOTAL NET WEIGHT-Silica Gel 41.1 gm
NET VOLUME-Impingers -130 ml
TOTAL MOISTURE -88.9 gm

Comments:

LAB: DATE RECEIVED
DATE REPORTED

Train Assembled by: McCABE
Sample Recovered by: McCABE
Sample Analyzed by: SORENSON

GCA/TECHNOLOGY DIVISION

SOURCE PARTICULATE SAMPLING
TRAIN ASSEMBLY, RECOVERY AND ANALYTICAL REPORT SHEET

Run Date: 12/18/81
Run No.: 3 P3
Sample Box No.: 2180
Operator: GRAZIANO

Client: EPA
W. O. No.:
Plant: Lynchburg Foundry VA.
Sampling Location: STACK P-3

FRONT HALF

Nozzle and Probe (Cyclone Bypass)-Acetone Wash,

Cyclone and Flask-Acetone Wash

Thimble No.	Lab No.	Weight Results
		mg
		mg
		mg
		mg

Filter No.	Lab No.	Weight Results
M-32		5.57 mg
		mg
		mg
		mg

Laboratory Results

Lab No.: B-77 Residue 27.41 mg

Lab No.: Residue — mg

Thimble particulate weight — mg

Filter particulate weight 5.57 mg

FRONT HALF Sub Total 32.98 mg

BACK HALF

Impinger WATER and Water Wash of Impingers Connectors and Back Half of Filter Holder

Lab No.:

ACETONE WASH of Impinger, Connectors and Back Half of Filter Holder

Lab No.:

Collected on 0.22μ Filter — mg

Chloroform-ether Extract — mg

Aqueous Residue — mg

Residue — mg

BACK HALF Sub Total — mg

TOTAL TRAIN

TOTAL WEIGHT (Front & Back) 32.98 mg

MOISTURE

Impingers: ~~150~~, 150, 90, 170, 110

Final Volume Total 270

Initial Volume Total 300

Net Volume -30

Silica Gel

Weight after test:

Weight before test: 2661

Net Weight: 36.1

Container No.: 1. 2. 3. 4.

TOTAL NET WEIGHT-Silica Gel 36.1 gm

NET VOLUME-Impingers -30 ml

TOTAL MOISTURE 6.1 gm

Comments:

LAB: DATE RECEIVED

DATE REPORTED

Train Assembled by: GRAZIANO

Sample Recovered by: GRAZIANO

Sample Analyzed by: SORENSON

APPENDIX F-2

IMPACTOR PARTICULATE ANALYSIS REPORT SHEETS

ANDERSEN IMPACTOR DATA SUMMARY

DATE: 12-16-81 RUN # 1-P-1

Um

$d_{50} = (0.0767\mu - 8.17)\ Q^{-0.47}$

PADRE now calculates the cyclone cut-point utilizing this new equation provided by SoRI.

Run 1-P1

$\mu = 174.4 + 0.406\ (T_s\ ^\circ C.)$

$T_s\ ^\circ C = 5/9\ (64.6 - 32) = 18.1$

$\mu = 181.75$

$d_{50} = (.091\mu - 10.136)\ F^{-0.579}$

$F = 0.4068$

$[(.091 \times 181.75) - 10.136]\ 0.4068^{-0.579}$

6.40325

$\boxed{d_{50} = 10.779}$

STAGE	Net Weight (gm)	% On Stage	Final Weight (gm)	Tare Weight (gm)
Front Half Rinse	0.01352		104.12229	104.10877
0 1321	0.00110 / −0.00004	0.000106	106.45093 / 0.53486 / 106.98579	106.44983 / 0.53440 / 106.98423
1 1314	0.00015		0.47636	0.47621
2 1315	0.00026		0.48282	0.48256
3 1316	0.00028		0.48100	0.48072
4 1317	0.00049		0.49400	0.49351
5 1318	0.00035		0.44620	0.44585
6 1319	0.00056		0.46622	0.46566
7 1320	0.00047		0.46413	0.46366
F B-266	0.00117		0.57481	0.57364
TOTAL				

DATE: 12-16-81 RUN # 1-P-2

Vm_{std} (dscf) Pb Blank

Moisture (%) MW

Run 1-P-2

$\mu = 174.4 + 0.406\ (T_s\ °C)$

$T_s\ °C = 5/9\ (65-32) = 18.3$

$\mu = 181.83$

$d_{50} = (.091\mu - 10.136)\ 0.2121^{-0.579}$

$= [(.091 \times 181.83) - 10.136]$

6.41053×2.45433

$d_{50} = 15.7335$

STAGE	Net Weight (gm)	% On Stage	Final Weight (gm)	Tare Weight (gm)
Front Half Rinse	Blank run - no rinses			
0 999	0.00044		0.50010	0.49966
1 1346	0.00031		0.47648	0.47617
2 1347	0.0002		0.48582	0.48562
3 1348	0.00017		0.48676	0.48659
4 1349	0.00018	?	0.49813	0.49795
5 1350	0.01192	?	0.47672	0.47648
6 1353	0.00014		0.46869	0.46855
7 1352	0.00008		0.46142	0.46134
F B-270	0.00017	192	0.57876	0.57859
TOTAL	[illegible]			

ANDERSEN IMPACTOR DATA SUMMARY

DATE: 12-16-81 RUN # 1-P-3

$V_{m_{std}}$ (dscf) Pb

Run 1-P3

$\mu = 174.4 + 0.406\left[5/9\,(63.1-32)\right]$

17.28

$\mu = 181.41$

$d_{50} = \left[(.091 \times 181.41) - 10.136\right] 0.40261^{-0.579}$

16.58231

$d_{50} = 10.791$

Blank Corr. Factor-Acetone(mg/ml) Avg. T_S (°F)

STAGE	Net Weight (gm)	% On Stage	Final Weight (gm)	Tare Weight (gm)
Front Half Rinse	0.00764		101.88737	101.82953
0 1077	0.00106 } 0.00016 }	0.00122	106.94320 0.47674	106.94214 0.47658
1 1070	-0.00019		107.41994 0.50373	107.41873 0.50392
2 1071	-0.00014		0.52184	0.52198
3 1072	0.00005		0.51473	0.51468
4 1073	0.00025		0.51652	0.51627
5 1074	0.00017		0.51244	0.51227
6 1075	0.00046		0.52461	0.52415
7 1076	0.00081		0.47506	0.47425
F B-248	0.00207		0.57256	0.57049
TOTAL				

DATE: 12-16-81 RUN # 2-P-2

Vm_{std} (dscf) Pb

Run 2-P-2

μ = 174.4 + 0.906 [5/9 (56 - 32)]
13.72

μ = 179.972

d_{50} = [(.091 × 179.972) - 1.[illegible]] 0.3841
6.[illegible]

d_{50} = 10.861

Blank Corr. Factor-Acetone(mg/ml) Avg. T_S (°F)

STAGE	Net Weight (gm)	% On Stage	Final Weight (gm)	Tare Weight (gm)
Front Half Rinse	0.00468		100.62568	100.62100
0 989	-0.00017 / 0.00019	0.00019	106.73543 / 0.47454 / 107.21297	106.73560 / 0.47435 / 107.21295
1 982	0.01882		0.49317	0.49308
2 983	-0.00001		0.50330	0.50331
3 984	0.00029		0.49276	0.49247
4 985	0.00023		0.51030	0.51007
5 986	0.00018		0.50900	0.50882
6 987	0.00047		0.53220	0.53173
7 988	0.00052		0.48322	0.48270
F B-237	0.00105		0.56098	0.55993
TOTAL				

ANDERSEN IMPACTOR DATA SUMMARY

DATE: 12-18-81 RUN # 3-P3

Vm_{std} (dscf)

[illegible] 3-P3

$U = 174.4 + 0.406\,[5/9\,(56.2-32)]$

$U = 179.858$

$d_{50} = [(0.011 \times 179.858) - 10.136] \cdot [illegible]$

6.25018

$d_{50} = 10.690$

Blank Corr.

Blank Corr. Factor-Acetone(mg/ml) Avg. T_S (°F)

STAGE	Net Weight (gm)	% On Stage	Final Weight (gm)	Tare Weight (gm)
Front Half Rinse	0.00386		102.57242	102.56856
0 1093	0.00204 / 0.00006	0.00210	163.31145 / 0.48345	163.30941 / 0.48339
1 1092	0.00035		0.49633	0.49598
2 1091	0.00022		0.51496	0.51474
3 1090	0.00045		0.49980	0.49935
4 1089	0.00046		0.49953	0.49907
5 1088	0.0005		0.47686	0.47636
6 1087	0.00106		0.50062	0.49956
7 1086	0.00083		0.47648	0.47565
F B-250	0.00155		0.53834	0.53679
TOTAL				

ANDERSEN IMPACTOR DATA SUMMARY

DATE: 12-18-81 RUN # 3-C3

Vm (dscf) Pb

Run 3-C3

μ 174.4 + 0.406 [5/9 (85.15 - 32)]

μ = 185.2605

d_{50} = [(.091 × 185.2605) - 10.136] 0.40459 - 0.579

d_{50} = 11.353

Blank Corr. Factor-Filters(mg/ml) Avg. Ps (+"H_2O)

Blank Corr. Factor-Acetone(mg/ml) Avg. T_S (°F)

STAGE	Net Weight (gm)	% On Stage	Final Weight (gm)	Tare Weight (gm)
Front Half Rinse	0.00198		111.94857	111.93859
0 1305	0.00142 0.00012 }	0.00154	102.05459 0.48875	102.05317 0.48863
1 1304	0.00632		0.47422	0.47390
2 1303	0.00045		0.48760	0.48715
3 1302	0.00046		0.47145	0.47099
4 1301	0.0004		0.44810	0.44770
5 1300	0.00033		0.47500	0.47467
6 1299	0.0005		0.47742	0.47692
7 1298	0.0004		0.44410	0.44370
F B-264	0.00083		0.56591	0.56508
TOTAL				

ANDERSEN IMPACTOR DATA SUMMARY

DATE: 12-18-81 RUN # 3-C-1

Pb

Run 3-C1

$\mu = 1.144 + 0.406[\%(80.4-32)]$

$\mu = 185.317$

$d_{50} = [(0.41 \times 185.317) - 10.136]\, 0.[illegible]^{-0.74}$

$[illegible]$

$\boxed{d_{50} = 11.255}$

Blank Corr. Factor-Acetone(mg/ml) Avg. ^{1}S ( )

STAGE	Net Weight (gm)	% On Stage	Final Weight (gm)	Tare Weight (gm)
Front Half Rinse	0.00510		103.64010	103.63500
0 1005	0.00057 / 0.00002	0.00055	104.60182 / 0.52788	104.60125 / 0.52790
1 743	0.00003		0.46900	0.46897
2 744	0.00034		0.46743	0.46709
3 745	0.00022		0.44875	0.44853
4 746	0.00046		0.47350	0.47304
5 747	0.00018		0.44461	0.44443
6 748	0.00014		0.48530	0.48516
7 749	0.00026		0.48575	0.48549
F B-207	0.00125		0.58295	0.58170
TOTAL				

ANDERSEN IMPACTOR DATA SUMMARY

DATE: 12-17-81 RUN # 2-C3

Vm_{std} (dscf) Pb

Run 2-C3

μ: 174.4 + 0.4106 [59 (74.4 - 32)]

185.091

d_{50} = [(.091 x 185.091) - 10.136] 0.41813 - 0.279

6.70281

d_{50} = 11.102

Blank Corr. Factor-Filters(mg/ml) Avg. Ps (+"H_2O)

Blank Corr. Factor-Acetone(mg/ml) Avg. T_S (°F)

STAGE	Net Weight (gm)	% On Stage	Final Weight (gm)	Tare Weight (gm)
Front Half Rinse	0.00428		102.22868	102.22446
0 1024	0.00103 0.60052	0.00155	105.99303 0.49546	105.99200 0.49494
1 1028	0.60023		0.49123	0.49100
2 1027	0.00009		0.49609	0.49600
3 1026	0.00013		0.48976	0.48963
4 1025	0.00049		0.48560	0.48511
5 1024	0.00055		0.49718	0.49663
6 1023	0.00068		0.52183	0.52115
7 1022	0.00086		0.51854	0.51768
F B-242	0.00281		0.59142	0.58861
TOTAL				

ANDERSEN IMPACTOR DATA SUMMARY

DATE: 12-17-81 RUN # 2-C-1

Vm_{std} (dscf) Pb

Moisture (%) MW

Run 2-C1

$\mu = 174.4 + 0.406 \left[5/9 (75.8 - 32) \right] = 184.279$

$d_{50} = \left[(1.091 \times 184.279) - 10.136 \right] \cdot .41631^{-0.579}$

6.633387

$d_{50} = 11.018$

Blank Corr. Factor-Acetone(mg/ml) Avg. T_S (°F)

STAGE	Net Weight (gm)	% On Stage	Final Weight (gm)	Tare Weight (gm)
Front Half Rinse	0.01191		104.16274	104.15083
0 1297	0.00026 } 0.00014 }	0.00040	105.16555 0.48947	105.16529 0.48933
1 1296	0.00028		0.48178	0.48150
2 1295	0.00023		0.50307	0.50284
3 1294	0.00032		0.44392	0.44360
4 1293	0.00039		0.46074	0.46035
5 1292	0.00048		0.48928	0.48880
6 1291	0.00043		0.46684	0.46641
7 1290	0.0006		0.45374	0.45314
F B-263	0.00127		0.53624	0.53502
TOTAL			✓	

ANDERSEN IMPACTOR DATA SUMMARY

DATE: 12-17-81 RUN # 2-C-2

Vm_{std} (dscf) Pb

Moisture (%) MW

Run 2-C-2

U 124.4 + 0.906 [5/9 (61.5 - 32)]

U: 181.051

d50 = [(.091 × 181.051) - 10.136] 0.4065596 - 0.579

6 : 3944

d50 = 10.675

Blank Corr. Factor-Acetone(mg/ml) Avg. T_S (°F)

STAGE	Net Weight (gm)	% On Stage	Final Weight (gm)	Tare Weight (gm)
Front Half Rinse	0.03135		101.75494	101.72359
0 718	0.00206 / 0.00024	0.06232	103.11808 / 0.47660	103.11600 / 0.47636
1 719	0.00045		0.47280	0.47235
2 720	0.00032		0.45282	0.45250
3 721	0.00036		0.44491	0.44455
4 722	0.00072		0.45958	0.45886
5 723	0.00038		0.44243	0.44205
6 724	0.0005		0.46050	0.46000
7 725	0.0008		0.44412	0.44332
F B204	0.00144		0.56470	0.56326
TOTAL				

Andersen Dry Downs:

Cups:		final (g)	tare (g)	net (mg)
B-261	1-P1	104.12229	104.10877	13.52 mg
B-245	2-P2	100.62568	100.62100	4.68
B-63	1-P3	101.88737	101.87953	7.84
B-251	2-C1	104.16274	104.15083	11.91
B-67	2-C2	101.75494	101.72359	31.35
B238	2-C3	102.22868	102.22440	4.28
B-269	3-C1	103.64010	103.63500	5.10
B-298	3-C3	111.94057	111.93859	1.98
B-62	3P3	102.57242	102.56856	3.86

Vortex:		final	tare	net
B-250	1-P1	106.45093	106.44983	1.10
B-264	2-P2	106.73843	106.73860	-0.17
B-243	1-P3	106.94320	106.94214	1.06
B-268	2-C1	105.16555	105.16529	0.26
B-76	2-C2	103.11808	103.11600	2.08
B-209	2-C3	105.99303	105.99200	1.03
B-257	3-C1	104.60182	104.60125	0.57
B-61	3-C3	102.05459	102.05317	1.42
B-66	3-P3	103.31145	103.30941	2.04

Blanks:				
	B-247	104.54950	104.54900	0.5
	B-247	105.03673	105.03716	-0.43
	B-259	103.71162	103.70986	1.76
[illegible]	B-262	105.28173	105.28164	0.09

APPENDIX F-3

DUAL CYCLONE PARTICULATE ANALYSIS RESULTS

DUAL CYCLONE SAMPLING TRAINS - ACETONE RINSE DRY DOWNS

RUN 1-C1		NET	TARE	FINAL
1-C1-15	B-299	0.00608	109.86300	169.86908
1-C1-2.5	B-71	0.01492	101.76215	101.77707
1-C1-2.5-15	B-65	0.02814	105.41540	105.44354

RUN 1-C2		NET	TARE	FINAL
1-C2-15	B-302	0.00714	109.79240	109.79954
1-C2-2.5	B-64	0.00595	103.04656	103.05251
1-C2-2.5-15	B-79	0.00696	102.03347	102.04043

RUN 2-P1		NET	TARE	FINAL
2-P1-15	B-304	0.09014	111.39495	111.48509
2-P1-GF	B-300	0.00453	108.49930	108.50383
2-P1-GF	B-226	0.00114	110.02770	110.02884
2-P1-2.5-15	B-305	0.00896	111.27455	111.28351
2-P1-2.5	B-80	0.00921	100.26560	100.27481

RUN 2-P2		NET	TARE	FINAL
2-P2-15	B-229	0.00431	84.55169	84.55600
2-P2-GF	B-233	0.00334	110.55436	110.55770
2-P2-2.5	B-211	0.00215	108.96383	108.96598
2-P2-2.5-15	B-214	0.00344	108.57756	108.58100
Blanks:	B-78	0.00042	102.11052	102.11094

DUAL CYCLONE TRAINS - FILTER WEIGHTS

RUN 1-C1	NET	TARE	FINAL
T-118	-0.02433	4.31702	4.29269
C-5	0.00282	0.07162	0.07444
M-2	0.00059	0.09008	0.09067

RUN 1-C2	NET	TARE	FINAL
T-103	-0.01521	3.82101	3.80580
C-4	-0.01272	0.07150	0.05878
M-3	0.00056	0.08888	0.08944

RUN 2-P1, 3-P1	NET	TARE	FINAL
T-59	-0.023	4.11412	4.09112
C-6	0.00194	0.07082	0.07276
C-8	0.00105	0.07000	0.07105
M-4	0.00116	0.08565	0.08681

RUN 2-P2, 3-P2	NET	TARE	FINAL
T-51	-0.02718	3.65569	3.62851
C-7	-0.00173	0.07063	0.06890
C-9	0.00466	0.07113	0.06647
M-5	0.00071	0.08678	0.08749
Blanks:			
C-4	-0.01272	0.07150	0.05878
C-10	0.00013	0.07212	0.07225
M-6	0.00018	0.08720	0.08738
M-7	0.00008	0.09007	0.09019

T = thimble
C = glass fiber filter
M = teflon filter

1-C-1

Y =
0.99

TT =
323.

PB =
29.87

%M =
1.

VOL =
112.138

AND T =
75. — assumed

DGM T =
36.6

D/S.P. =
1.93

STATIC = " Hg
0.04

Q ACFM =
0.349352542

VM STD =
110.2433488

1-C-1

TS=
75.

DN=
0.135

PB=
29.87

TT=
323.

VM=
112.138

TM=
36.6

Y =
0.99

ΔH=
0.21

VW=
0.

%CO2=
0.

%O2 =
20.9

%CO =
0.

%N2 =
78.1

AS=
1385.4

PST= " H_2O
0.5

ΓΔP=
1.238143772

=
0.84

1MSTD
117.900

0.00	%M
-7421.88	%EA
4222.90	VS
40078.54	QS
88.15	=%I

1-C-1

T=? (°F)
75.

QACFM =?
0.349

CYC X D50=

17.09037353

CYC 3 D50=

3.083612568

Qacfm
9-2

Y =
1.009

TT =
342.

PB =
29.87

%M =
1.

VOL =
100.176

AND T =
63.1 assumed

DGM T =
38.9

D/S.P. =
-0.032

STATIC =
0.04 ng

Q ACFM =
0.31289971

VM STD =
106.9267325

C-2

TS=
63.1

DN=
0.135

PB=
29.87

TT=
342.

VM=
100.176

TM=
38.9

Y =
1.009

ΔH=
0.44

VW=
0.

%CO2=
0.

%O2 =
20.9

%CO =
0.

%N2 =
78.1

AS=
1385.4

PST=
0.5

ΔP=
1.081665383

=
0.84

1MSTD
106.910

0.00 %M
-7421.88 %EA
3647.95 VS
-35409.38 QS
85.45 =%I

C-2

T=? (°F)
63.1

QACFM =?
0.313

CYC % D50=

17.56913957

CYC 3 D50=

3.201076312

Coefficient 2-P-1

Y =
1.009

TT =
538.

PB =
29.82

%M =
1.

VOL =
180.061

AND T = assumed
65.

DGM T =
50.13

D/S.P. =
-0.032

STATIC =
0.03

Q ACFM =
.3510406891

VM STD =
187.6497984

2-P-1

TS=
65.

DN=
0.135

PB=
29.82

TT=
538.

VM=
180.061

TM=
50.13

Y =
1.009

ΔH=
0.44

VW=
0.

%CO2=
0.

%O2 =
20.9

%CO =
0.

%N2 =
78.1

AS=
1385.4

PST=
0.4

ΓΔP=
.9268225289

=
0.84

1MSTD
187.621

0.00	%M
-7421.88	%EA
3134.41	VS
30256.44	QS
111.56	=%I

2-P-1

T=? (°F)
65.

QACFM =?
0.351

CYC X D50=

16.66410325

CYC 3 D50=

2.9444592

Y =
0.99

TT =
547.

PB =
29.82 "Hg

%M =
1.

VOL =
190.96

AMB T =
63. assumed

DGM T =
36.35

Δ/S.P. =
2.64 "Hg

STATIC =
0.03 "Hg

Q ACFM =
.3335677006

VM STD =
181.9857153

TS=
63.

DN=
0.135

PB=
29.82 "Hg

TT=
547.

VM=
190.96

TM=
38.35

Y =
0.99

ΔH=
0.21 "H_2O

VM=
0.

%CO2=
0.

%O2 =
20.9

%CO =
0.

%N2 =
78.1

AS=
1285.4

PST=
0.4 "H_2O

ΓΔP=
.9544631999

=
0.84

1NSTD
199.732

0.00	%M
-7421.88	%EA
3221.74	VS
31218.30	QS
113.21	=%I

63.

QACFM =?
0.3336

CYC X D50=

17.01407608

CYC 3 D50=

3.040637325

APPENDIX G

MICROSCOPY REPORT

TO: 1-618-022 File

FROM: Pablo Huidobro

SUBJECT: LYNCHBURG FOUNDRY MILLIPORE FILTER USED AS PREFILTER #1 FOR BLANK RUN

Sample #18622

Because this filter was covered with a fine and uniform veneer of particulates, it was not possible to scrape any dust onto a glass slide for observation under the optical microscope. Therefore, two pie-shaped wedges of the filter were cut for observation under PLM and under phase contract (PC). The wedge for PC analysis was mounted in a 50/50 mixture of Dimethyl Phthalate and diethly oxalate. This mounting media dissolves the membrane filter leaving the particulates with a "clear" background.

1) PLM Analysis

About 95% of the particulates are submicron in size and composed chiefly of iron oxide and other (unknown) crystalline material - possibly carbonates.

Feldspars and quartz constitute another phase which ranges in size from 5 to about 20 microns. The largest particle measures 30 microns in diameter. In the same size range as these minerals, a number of starch grains are also present; these constitute about 50% of the organic phase. The rest of the organic material is fibrous and individual fibers measure in general in excess of 150 microns.

Larger size "particles" were observed but examination at higher magnifications showed that these are agglomerates of the submicron size particles, possibly caused by moisture effects during sampling.

2) PC Analysis

This procedure showed the same results as observation under PLM with one exception. The organic fibers were not present. It is possible that these fibers are soluble in the mounting media and therefore were dissolved together with the filter.

Pablo Huidobro

APPENDIX H

QA AUDIT REPORT

GCA Technology Division

To: 1-618-022 File

1 March 1982

From: R. M. Ellersick

Subject: QA Audit - Characterization of Inhalable Particulate Emissions at the Lynchburg, Virginia Iron Foundry

This audit on 25 and 26 February 1982 reviewed the data gathered during the December 1981 field testing and the data reduction performed to date. The detailed test plan prepared after the 19 October 1981 pretest survey was reviewed and approved by both GCA and EPA; the plan was followed closely in the actual testing.

The standardized field data sheets shown in the test plan were used during the testing and the originals were readily available to the auditor. Other raw and reduced data checked included:

- task leader's field log
- calibration data sheets for dry gas meters, pilot tubes, thermocouples, thermometers, pretest nozzles
- balance logs of weighings of Andersen substrates, Method 5 and other filters, thimbles, and various beakers and containers
- process information recording
- visible emissions data sheets
- summary and work sheets for impactor and particulate data
- printouts of input data to, and particle sizing calculations by, the PADRE data system.
- coding forms for, and total particulate calculation printouts from, GCA's Source Sampling Data Reduction System

It was easy to verify that the testing equipment used had been calibrated and that constant weight had been achieved on weighings. Spot checks of data transcription showed it to be accurate; one calculation error on a summary work sheet had been corrected so that the PADRE entry was correct.

The blank Andersen impactor run used to quantify substrate weight changes caused by gaseous absorption or substrate handling resulted in weight changes of less than 0.5 mg for all stages. This indicates no weight change and no blank correction was made to other runs. The blank (run 1-P-2) was originally processed through the PADRE system without identification as a blank; a comment was entered on 26 February to so identify it.

GCA

In summary, this task appears to have been well planned and executed with appropriate QC measures used and documented.

RoseMary Ellersick
QA Manager

RME/cf

cc: A. Engelman
P. Fennelly
S. Gronberg
L. Seale