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REPORT

CHARACTERIZATION OF INHALABLE PARTICULATE MATTER EMISSIONS FROM A WET PROCESS CEMENT PLANT

DRAFT REPORT

August 1983

Volume II - Appendices A through H

EPA Contract No. 68-02-3158, Technical Directive No. 10
MRI Project No. 4892-L(04)

For

Industrial Environmental Research Laboratory
Environmental Protection Agency
5555 Ridge Avenue
Cincinnati, Ohio 45268

Attn: Charles H. Darvin

MIDWEST RESEARCH INSTITUTE 425 VOLKER BOULEVARD, KANSAS CITY, MISSOURI 64110 • 816 753-7600

MRI WASHINGTON, D.C. 20006—Suite 250, 1750 K Street, N.W. • 202 293-3800

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FROM A WET PROCESS CEMENT PLANT

by

Mark D. Hansen
John S. Kinsey
Fred J. Bergman

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APPENDIX A

REPORT OF BASELINE ASSESSMENT FOR INHALABLE PARTICULATE TESTING OF A WET PROCESS CEMENT KILN

REPORT OF BASELINE ASSESSMENT FOR INHALABLE PARTICULATE TESTING OF A WET PROCESS CEMENT KILN

Prepared by

PEDCo Environmental, Inc.
11499 Chester Road
Cincinnati, Ohio 45246

EPA Contract No. 68-02-3158
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Prepared for

MIDWEST RESEARCH INSTITUTE
425 Volker Boulevard
Kansas City, Missouri 64110

June 1982

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FIGURES

FIGURES (continued)

FIGURES (continued)

TABLES

ACKNOWLEDGMENT

This report was prepared for the U.S. Environmental Protection Agency and Midwest Research Institute by PEDCo Environmental, Inc., Cincinnati, Ohio. Dr. Kenneth Wilcox was the MRI Task Manager; Mr. Dale Harmon was the EPA Task Manager; Mr. Wade Mason was the Project Director, and Mr. Ronald Hawks was the Project Manager. Mssrs. Ronald Hawks and Steven Schliesser were the principal authors.

SECTION 1

INTRODUCTION

The Industrial Environmental Research Laboratory (IERL) is conducting sampling and analysis to determine inhalable particulate (IP) emission factors for the major industrial source categories. In order to conduct this sampling, a standardized source testing protocol was developed that includes quality control and assurance measures, information on particle size sampling equipment, calibration procedures, and data acquisition, reduction, and analysis procedures. The scope of the standardized protocol focuses on the mechanics of the measurement systems and the mathematical treatment of the measured results. The quality and utility of the measured emission results, however, are dependent not only on the adherence to the standardized sampling methodology, but also on the process generating the emissions and the control device collecting these emissions.

PEDCo Environmental, Inc. (PEDCo), as a subcontractor to Midwest Research Institute (MRI), was commissioned to assess and qualify the representativeness of the cement plant process operating conditions and associated particulate control device performance levels for an IP test series. PEDCo directed the acquisition of characteristic data and results from three strategic periods: 1) the initial performance tests of the electrostatic precipitators (ESP's) controlling the cement kiln emissions, 2) the 90-day period preceding the IP test, and 3) the period during the IP testing.

Acquisition and analysis of this historic data base have provided an objective evaluation of the normal and historical operating ranges for both the kiln and the ESP and the emissions associated with the initial performance and IP tests. Design specifications, operating conditions, analyses of feed materials and particulate composition, and other emission data were used in conducting this evaluation.

SECTION 2

SUMMARY OF RESULTS

Table 1 summarizes the ESP operating conditions for the original performance test and the addditional IP tests. A review of the data indicates that the overall collection efficiency of the unit has not changed significantly from 1975 to 1981. It appears, however, that inlet temperature and moisture content have decreased and that the inlet dust loading (gr/acfm) has increased. These changes are the result of a trend to decrease energy consumption (i.e., reduce outlet temperatures) and increase kiln production. The increase in clinker yield is accomplished by increasing the insufflation rate of recycled dust. High insufflation rates, however, result in an increase in recirculated dust loading.

During the test periods, the kiln processes were not stable. There were significant changes in kiln temperature, insufflation dust rates, and coal firing rates that tend to affect both kiln gas volumes and uncontrolled emission rates. The implementation of the sampling protocol that calls for taking impactor and one-point flow determinations in separate quadrants over an extended period of time seemed to cause an unreasonable scatter in both the process and emission rate parameters.

Both temporal and spacial variations in inlet emission rates occurred as a result of kiln operator and duct configuration. The three most significant variables observed were insufflation rate, flue gas temperature, and coal firing rate. Table 2 presents the average value for selected process parameters for a 30-day period prior to the testing and the range and average values for the IP test series.

It should be noted that the kiln was stopped on May 4, 1982, and the slurry feed, coal rate, and insufflation dust rate were interrupted. The insufflation dust rate on May 4, 1982, varied from 0 to 21.81 tons/h. A change in kiln chemistry (product) was made on May 5, 1982, that resulted in a change in kiln alkali equilibrium. The change was accompanied by a significant increase in

TABLE 1. SUMMARY OF ESP CHARACTERISTICS ON CEMENT KILNS - WET PROCESS

Characteristic	Test	
	1975[a]	1981[b]
Collection efficiency, %	99.97	99.987
Specific corona power, W/1000 acfm	478	624
Corona current density, mA/1000 ft^2	20.8	21.0
Inlet dust concentration, gr/dscf	49.8	78.2
Gas flow rate, 1000 acfm	200	167.6
Gas superficial velocity, ft/s	2.71	2.26
Gas temperature, ^oF	587	375
Gas moisture, % by volume	42.5	29.1

[a]Averaged results from guarantee-performance testing May 21-22, 1975.
[b]Averaged results from IP testing May 1-6, 1981.

TABLE 2. TYPICAL KILN OPERATING PARAMETERS

	April 1981	IP test period	
		Range	Avg.
Kiln feeder, rev/h	318	322-337	327
Slurry moisture, %	31.7	30.06-31.96	31.49
Slurry feed, tons/h (dry)	57.80	58.89-61.93	59.64
Dust insufflation feeder, rev/h	1630.8	0-2909	1745.9
Dust insufflation, tons/h	12.23	0-21.81	13.09
Kiln speed, rev/h	86	86-91	87
Carbonate content, % ($MgCO_3$ + $CaCO_3$)	77.14	77.05-77.41	77.2
Coal firing rate, tons/h	6.2	5.2-6.2	5.75
Heat input, 10^6 Btu/h	160	132.6-158.1	146.6
Feed end flue gas oxygen, %	2-4	1.4-4.5	2.8
Feed end flue gas temperature, °F	400-500	390-500	456

measured opacity and rapper reentrainment loses. A significant decrease in ESP corona power was also noted. The tests on May 5 and May 6 were conducted during a period of changing kiln alkali equilibrium and therefore the emitted particle chemistry and emission rate were not constant.

Because of the variation in kiln conditions and the use of a sampling protocol that did not allow for the consideration of process variations with time, the data presented in this report should be carefully reviewed before assumptions are made that the results are typical of most wet process kiln operations. The analysis presented in this report was critically limited by the inability of PEDCo personnel to be on site during the test period.

SECTION 3

CEMENT KILN PROCESS CHARACTERIZATION

3.1 GENERAL PROCESS DESCRIPTION

Cement is an adhesive substance that either on its own or mixed with a liquid is capable of uniting pieces or masses of solid matter into a compact whole. Portland cement is defined as a product obtained by intimately mixing calcareous and argillaceous or other silica, alumina, and iron oxide bearing materials, burning this mixture at a clinkering temperature, and grinding the resulting clinker into a fine powder.[1]

Commercial cement is produced by passing feed materials through a rotating kiln to affect heating, drying, calcining, and fusing of the materials into clinkers. The clinkers are then cooled and ground with gypsum to form a final product that is packaged and shipped. Commercial grades of cement can be produced through either a dry or wet process.

In the wet process, water is added to the raw materials in a grinding mill to form a slurry containing about 30 percent water. The raw materials contain silica, aluminates, ferrous compounds, magnesium, sulfates, carbonates (calcium and magnesium), and alkali materials (sodium, chlorine, and potassium compounds). The concentration of alkali in the raw materials depends on quarry mixture and cement type. In general, the raw materials contain about 75 percent carbonate material (mostly calcium carbonate) and about 1 percent alkali oxides (mostly potassium and sodium).

The kiln is fed with a finely ground homogeneous slurry that is dried and heated as it moves down the kiln toward the burning zone. As the slurry approaches the firing end, the carbonates are calcined to yield calcium oxide and magnesium oxide. The material continues to increase in temperature to about 2700°F at which time the nodules fuse and chemically react to form calcium silicates, calcium silicate aluminates, and calcium silicate ferro aluminates. The fused nodules are then cooled to about 1000° to 1200°F before they are discharged to the clinker cooler. Chains are installed in the back end of the kiln to affect heat exchange and reduce dust emissions in the exhaust gas. Figure 1 provides typical gas and material temperature profiles for a wet process kiln.

The alkali compounds (potassium and sodium) along with sulfur and chloride are considered the volatile components. When the alkali material in the feed slurry is heated to about 1000° to 1500°F, it is vaporized and becomes entrained in the kiln combustion gases. As the gases reach the feed end of the kiln, they are reduced in temperature (because of the heat exchange with the chains and heat loss in evaporating water in the slurry), and the volatile compounds condense on the feed slurry nodules. Through the normal movement of the slurry down the kiln, the volatiles are returned to the hotter area of the kiln and are revaporized. This vaporizing/condensing cycle continues until an equilibrium is reached between the feed alkali and the final loss from the kiln through the clinker product and the particulate in the exhausted combustion gases. Figure 2 demonstrates the concept of circulation of volatile matter in a kiln system.[2]

The condensed alkali compounds appear as submicron size or fine particles composed mainly of potassium hydroxide, potassium chloride, potassium sulfate, sodium hydroxide, sodium sulfate, and sodium chloride. The specific chemistry of the alkali compounds depends on kiln temperature, slurry chemistry, and back-end temperature. Chemical properties of typical volatile components are provided in Table 3 and Figure 3.

The volatile compounds also condense on larger particles that are entrained by the flue gases in the drying slurry feed materials. These larger particles are primarily $CaCO_3$, CaO, SiO_2, and are chemically close to the composition of the feed slurry. The emissions from the kiln typically form a bimodal particle size distribution with a submicron size fraction and a supermicron size fraction.

An ESP is effective in collecting both particle size modes, with the larger particles being collected with a higher degree of probability. The larger nonalkali particles are collected in the front fields of the ESP. The finer alkali particles are not as easily collected and tend to pass through the inlet fields. A typical analysis of the dust found in ESP hoppers shows increasing alkali composition from inlet to outlet fields.

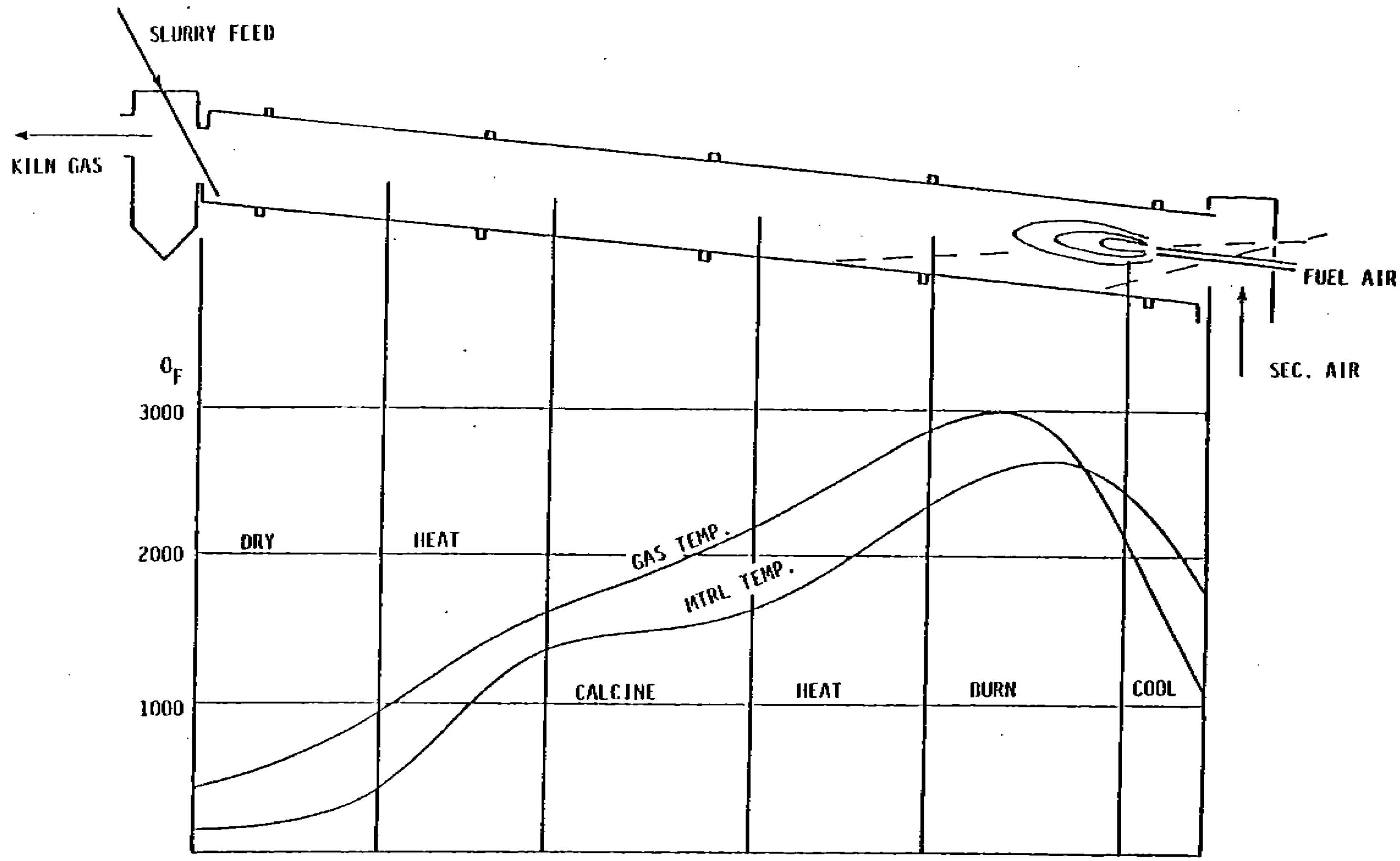

Figure 1. Typical cement kiln material and gas temperature profile.

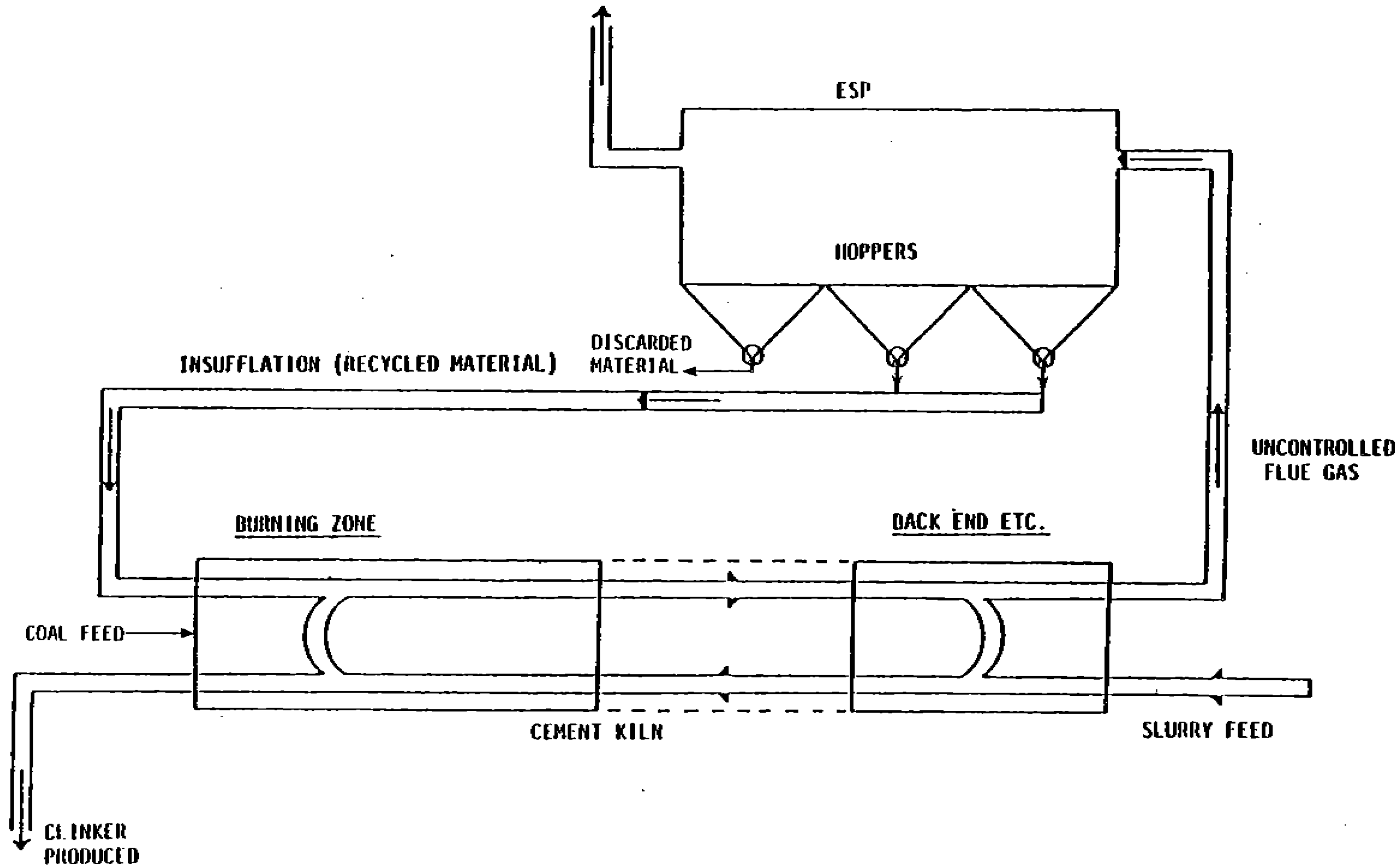

Figure 2. Cement kiln process schematic depicting alkali behavior.

TABLE 3. CHEMICAL PROPERTIES OF VOLATILE COMPONENTS IN CEMENT KILNS

Compound	K Melting point, °C	K Boiling point, °C	Na Melting point, °C	Na Boiling point, °C
Oxide	decomp.	350	sublim.	1275
Carbonate	894	decomp.	850	decomp.
Sulfate	1074	1689	884	-
Chloride	768	1411	801	1440
Hydroxide	360	1320	328	1390

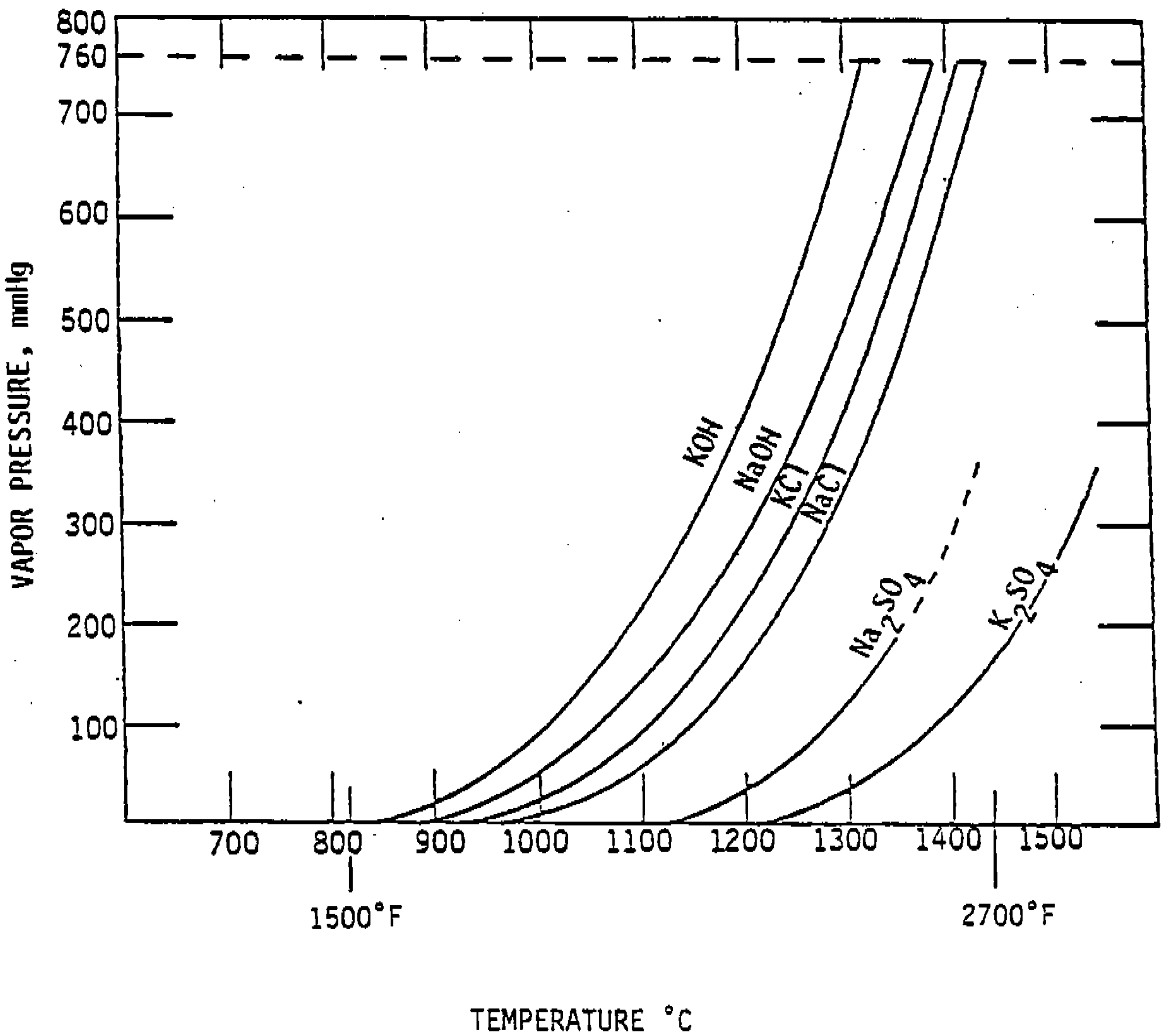

Figure 3. Chemical properties of alkali volatile materials in cement kiln processing.

Typical data from a wet process kiln ESP are provided in Table 4. Figure 4 shows the decrease in nonalkali particulate (CaO and SiO) as a percentage of total dust composition in successive fields of a typical ESP.[3] The enrichment of alkali particulate (Na_2O, K_2O, and SO_3) is primarily the result of the high removal rate of nonalkali materials in the inlet field. The close association of K_2O and SO_4 is expected since a major portion of the alkali particulate is composed of potassium sulfate (Na_2SO_4). It should be noted that the increasing percentage is not always found especially if most of the alkali condenses onto larger nonalkali particles. In this case, the particle size/chemistry is more homogeneous and the ESP does not chemically segregate the dust by fields.

The chemistry of the particulate also has an effect on the resistivity of the material. Soluble alkali components (Na_2SO_4 and NaCl) have been shown to be effective in reducing resistivity.[4] Resistivity is also a function of temperature and moisture of the gas stream. Figures 5 through 9 show the range of cement dust bulk resistivity in successive fields of a typical ESP as the alkali content is increased.[5]

To increase the kiln yield, it is possible to return low-alkali ESP dust to the kiln. The intent is to recover the carbonates, oxides, aluminates, and ferrous compounds. The dust may be returned by several methods: insufflation at the burner end, dry dust at the feed end, and scoops at mid kiln. It is common practice to collect dust from the front ESP fields and return it to the kiln by one of the above methods.

The alkali material in the slurry becomes vaporized and enters the "volatile recirculation system" within the kiln. The net effect of this recirculation system is to increase the fine particle fraction and loading to the ESP. The nonalkali materials are also suspended in the flue gases and are exhausted to the ESP. The equilibrium obtained by the combined recirculation of alkali and nonalkali dust increases the inlet loading to the ESP by a factor of 2 to 3 above nonrecirculation conditions. The amount of insufflated dust that may be used is limited by the allowable alkali content in finished cement. Typical specifications for standard types of cement are provided in Table 5.[6]

TABLE 4. TYPICAL COMPOSITION OF DUST COLLECTED IN SUCCESSIVE FIELDS OF AN ESP SERVING A WET PROCESS CEMENT KILN (ROCK FEED)[3]

Chemical compound	Composition, %				
	Inlet	Field 1	Field 2	Field 3	Field 4
Na_2O	0.47	0.50	0.74	0.98	1.72
K_2O	5.80	7.00	12.05	19.80	35.80
Li_2O	0.34	0.24	1.00	1.64	2.16
MgO	0.41	0.85	1.09	0.20	0.12
CaO	41.98	43.26	39.41	29.09	8.19
Al_2O_3	7.98	6.15	2.14	2.15	1.75
SiO_2	13.48	12.80	11.72	8.76	3.72
Fe_2O_3	1.84	1.90	1.84	1.44	0.63
LOD	19.91	18.96	17.89	14.08	7.85
SO_3	6.84	7.19	11.15	20.31	37.03
TiO_2	0.26	0.25	0.22	0.17	0.06

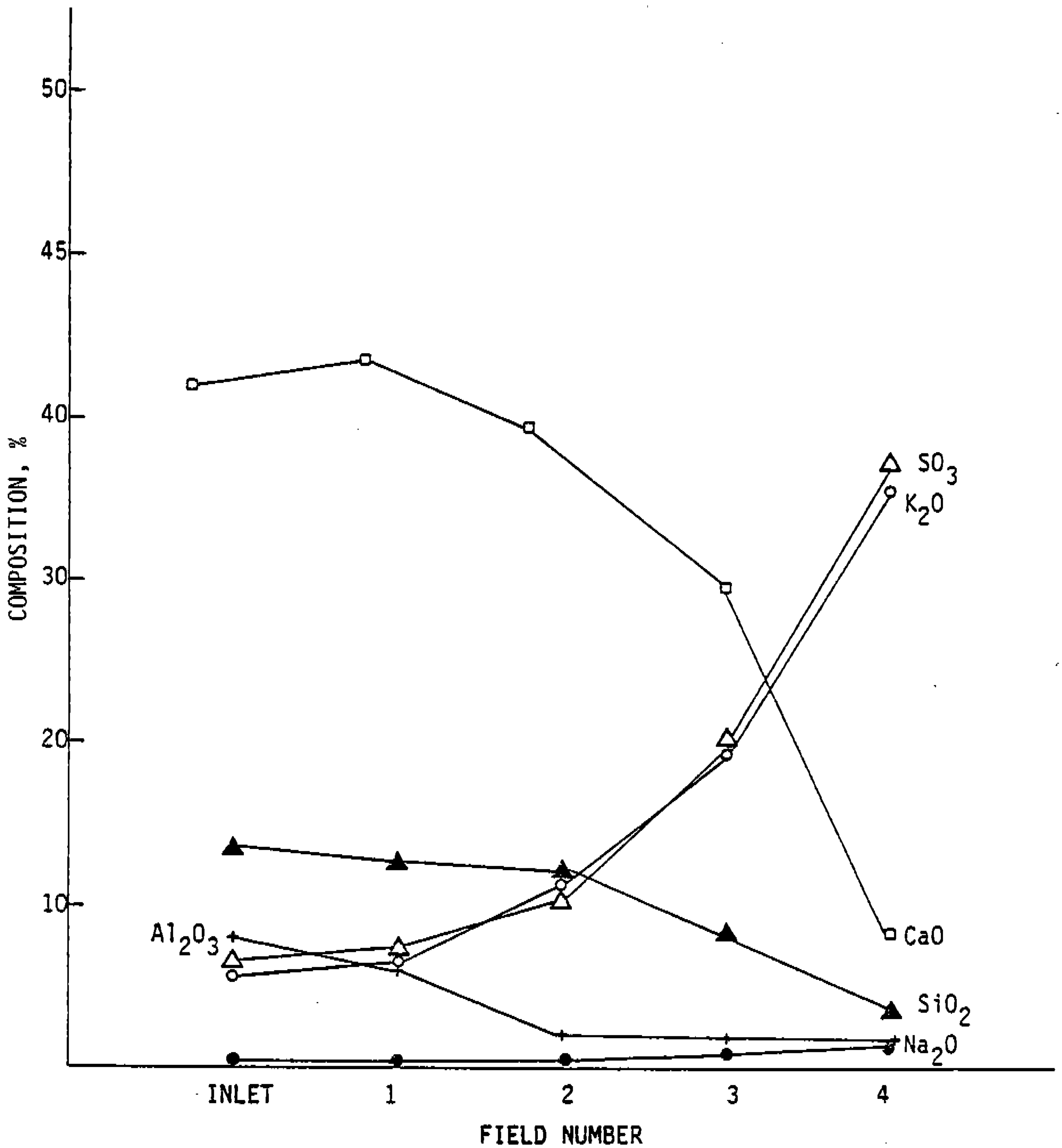

Figure 4. Selective removal of nonalkali particulate in inlet fields of ESP and enrichment of alkali dust in outlet fields.

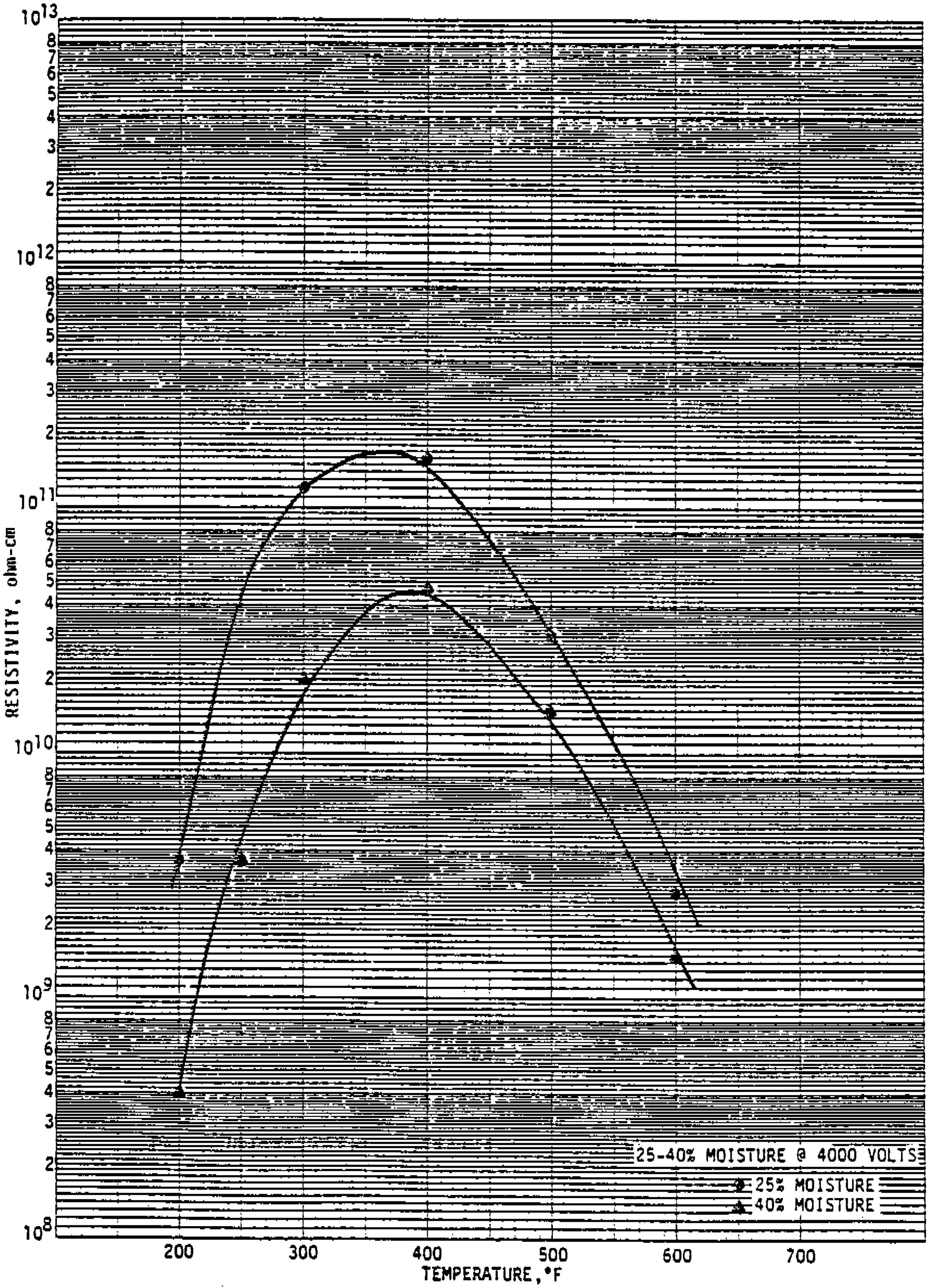

Figure 5. Typical resistivity of cement dust collected at the inlet of an ESP serving a wet process cement kiln (rock feed) as a function of moisture content.

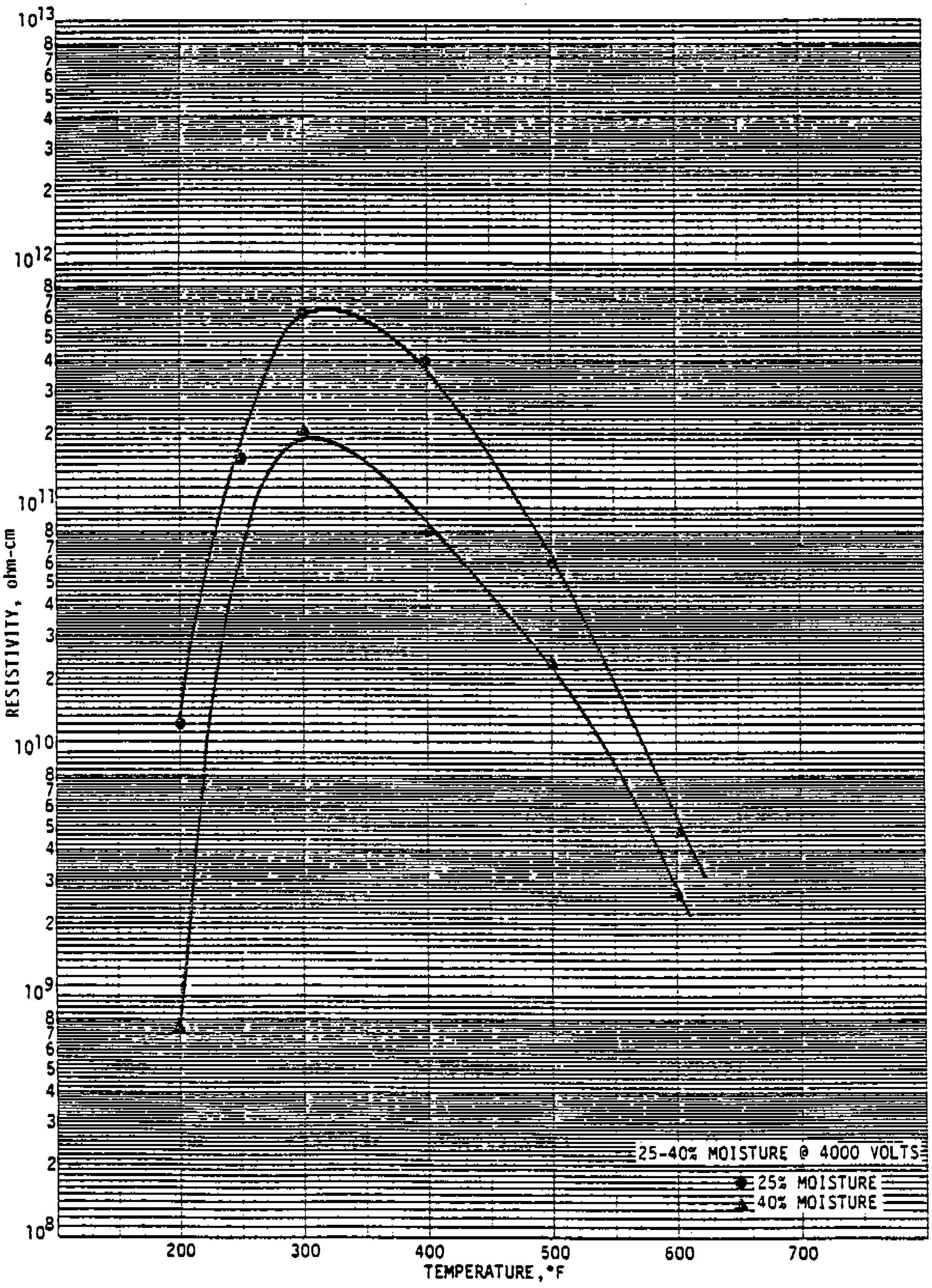

Figure 6. Typical resistivity of cement dust collected in the first field of an ESP serving a wet process cement kiln (rock feed) as a function of moisture content.

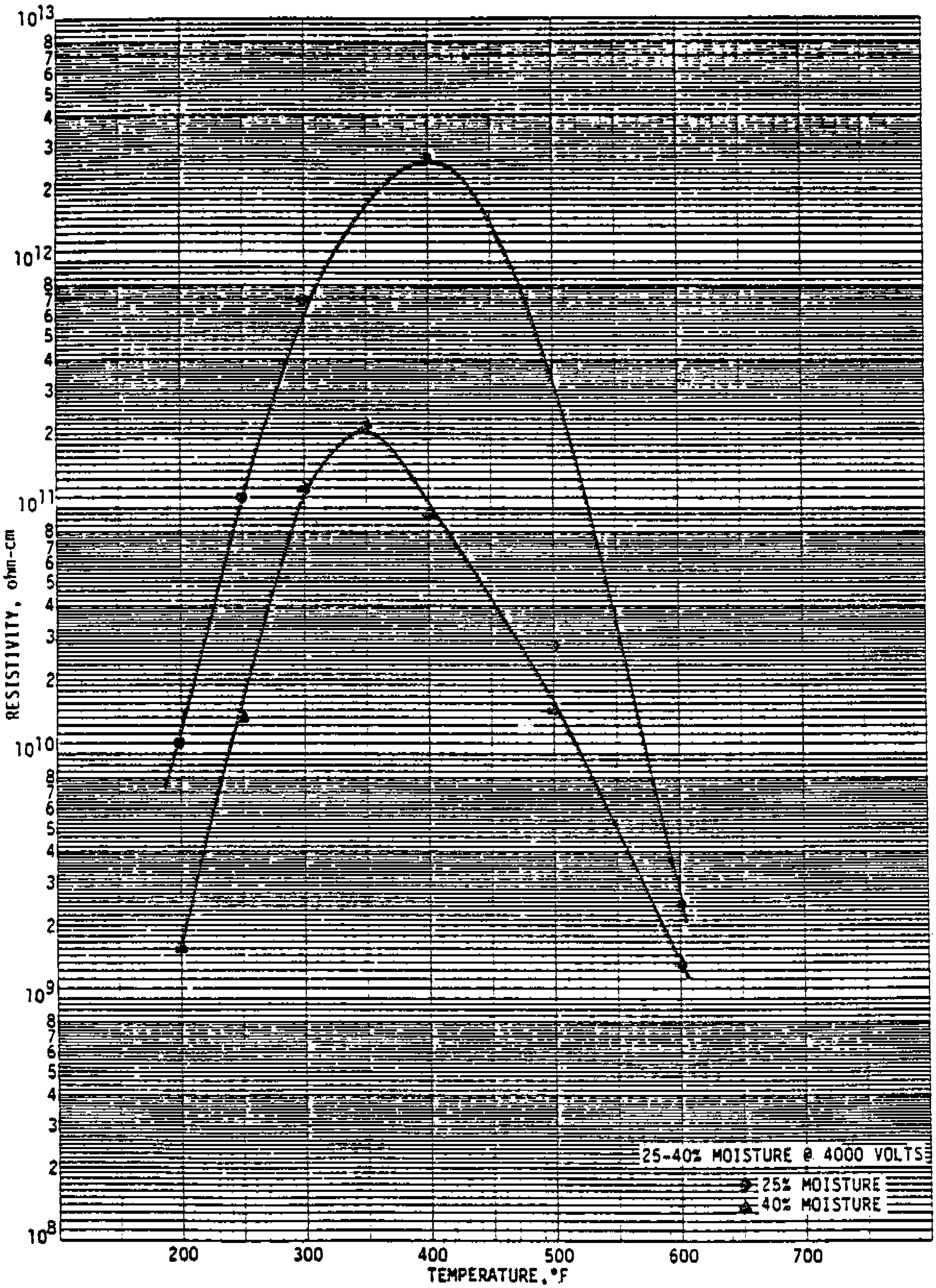

Figure 7. Typical resistivity of cement dust collected in the second field of an ESP serving a wet process cement kiln (rock feed) as a function of moisture content.

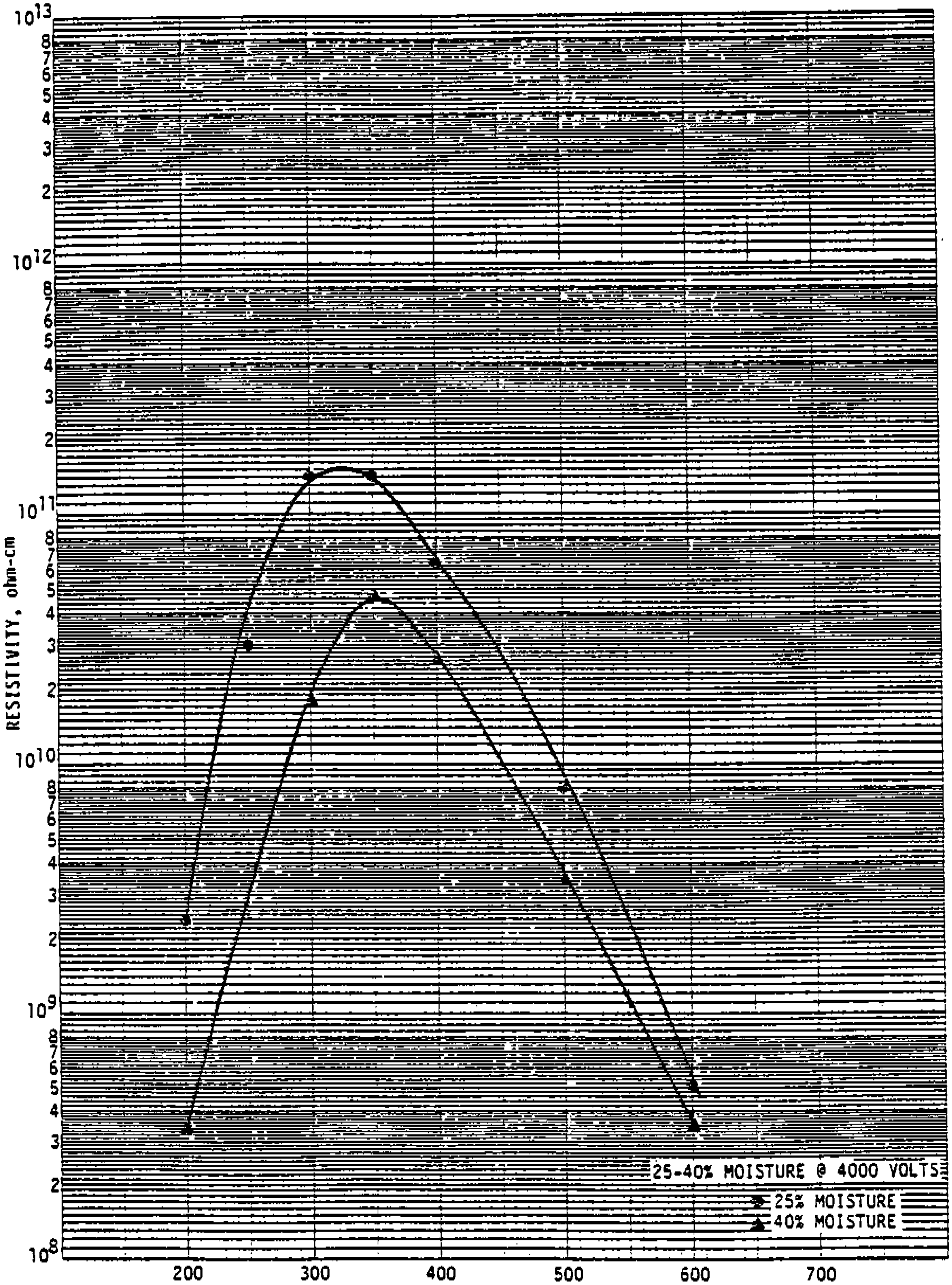

Figure 8. Typical resistivity of cement dust collected in the third field of an ESP serving a wet process cement kiln (rock feed) as a function of moisture content.

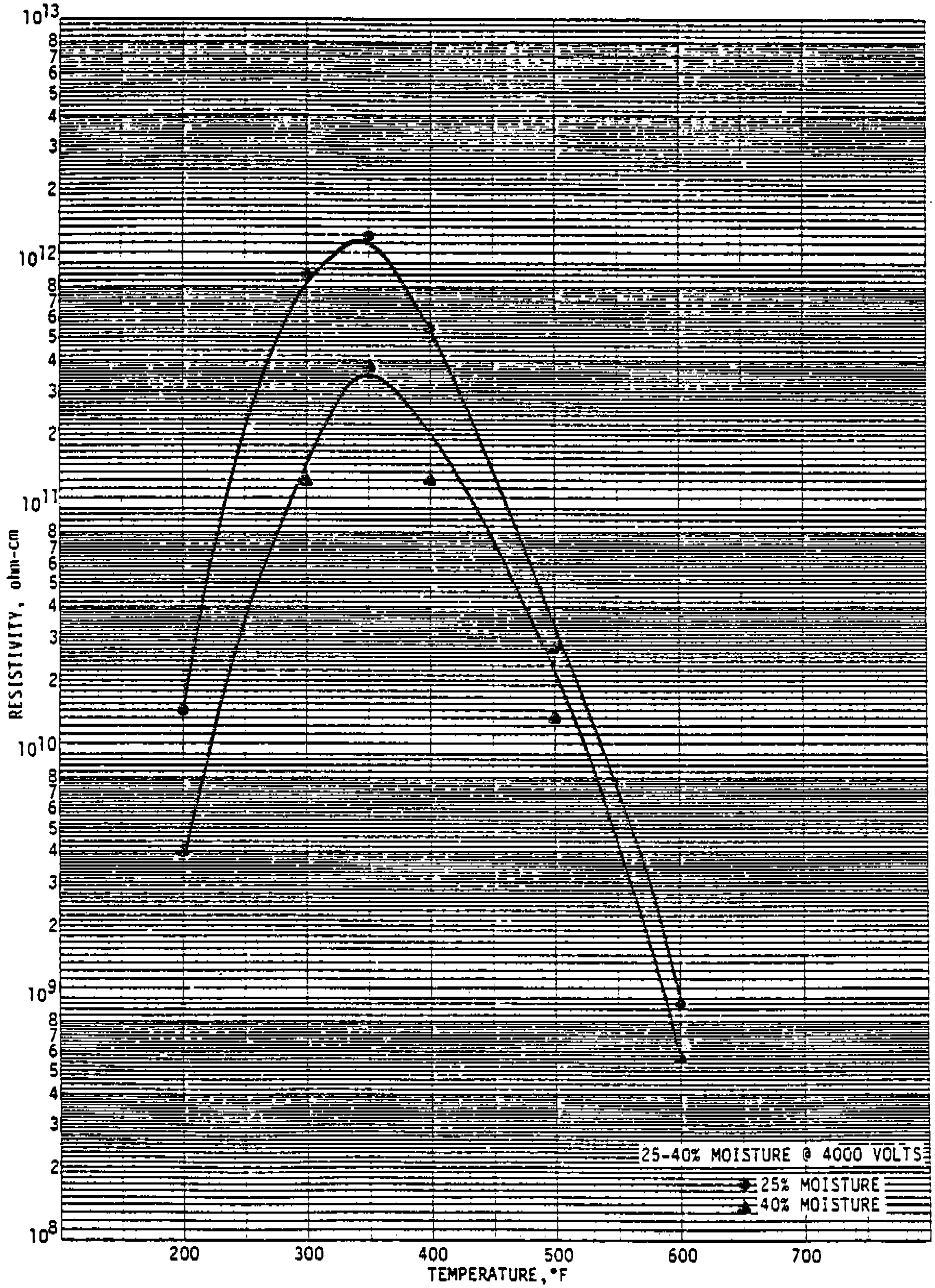

Figure 9. Typical resistivity of cement dust collected in the fourth field of an ESP serving a wet process cement kiln (rock feed) as a function of moisture content.

TABLE 5. TYPICAL SPECIFICATIONS FOR STANDARD TYPES OF CEMENT[6]

Cement type	I and IA	II and IIA	III and IIIA	IV	V
Silicon dioxide (SiO_2) min., %	-	2.1	-	-	-
Aluminum oxide (Al_2O_3) max., %	-	6.0	-	-	-
Ferric oxide (Fe_2O_3) max., %	-	6.0	-	6.5	-
Magnesium oxide (MgO) max., %	6.0	6.0	6.0	6.0	6.0
Sulfur trioxide (SO_3) max., %					
when ($3\ CAO \cdot Al_2O_3$) is $\leq$ 8%	3.0	3.0	3.5	2.3	2.3
when ($3\ CaO \cdot AL_2O_3$) is > 8%	3.5	-	4.5	-	-
Loss on ignition max., %	3.0	3.0	3.0	2.5	3.0
Tricalcium silicate ($3\ CaO \cdot SiO_2$) max., %	-	-	-	35.0	-
Dicalcium silicate ($2\ CaO \cdot SiO_2$) min., %	-	-	-	40.0	-
Tricalcium aluminate ($3\ CaO \cdot Al_2O_3$) max., %	-	8.0	15.0	7.0	5.0
Tetracalcium aluminoferite plus twice the tricalcium aluminate ($4\ CaO \cdot Al_2O_3 \cdot Fe_2O_3 + 2(3\ CaO \cdot Al_2O_3)$) or solid solution ($4\ CaO \cdot Al_2O_3 \cdot Fe_2O_3 + 2\ CaO \cdot Fe_2O_3$) max., %	-	-	-	-	20.0
Alkali ($Na_2O + 0.658\ K_2O$)[a]	0.60	0.60	-	-	-

[a]Optional standard.

3.2 PROCESS SPECIFICATIONS AND NORMAL OPERATION OF TEST SITE

The test facility is a wet process portland cement plant with a total production capacity of 1800 tons of cement per day. The plant operates two identical rotary kilns for the production of clinker. Each kiln is 12 ft in diameter and 450 ft in length with a production capacity of 40 tons of clinker per hour. The No. 2 kiln was selected for testing and was originally installed in 1958. The kiln contains a chain in the feed end from the 306-ft position to the 432-ft position in four sections (A, B, C, and D). The total chain weight is 106.6 tons with a chain density of 15.3 lb/ft^3. The kiln is refractory lined up to the 364-ft position for shell protection and insulation. The internal diameter of the kiln in the refractory section is 11 ft 4 in.

The slurry is fed into the kiln from feed tanks by a rotating bucket feeder resembling a ferris wheel. The slurry typically contains 30 percent moisture, 77 percent carbonate material (mostly calcium), and 2 percent alkali material (mostly potassium).

Insufflation dust is collected from the first two fields of the ESP into pyramidal-shaped hoppers. It is continuously removed from the hoppers through rotary air locks, combined with Unit No. 1's insufflation material, and returned to the burner end of the kiln. Dust from the last hopper is pneumatically conveyed to a storage tank for removal by truck.

The kiln is fired with pulverized coal that is locally mined and washed. Secondary air is obtained from the clinker cooler heat exchanger to provide preheated air for coal drying and combustion through the firing hood. Typical coal firing rates are between 5.0 and 6.5 tons/h at a raw meal dry solids feed rate of 60 tons/h (insufflation not included in weight). The thermal heat requirements are in the range of 2.1 to 2.5 x 10^6 Btu/ton of slurry feed (3.2 to 3.8 x 10^6 Btu/ton of clinker) at a typical coal heat value of 12,750 Btu/lb (dry basis).

Kiln process operating parameters are recorded on a daily operating log sheet once an hour by plant personnel. Key parameters recorded include coal firing rate, slurry feed rate, insufflation rate, kiln rotation rate, exit gas temperature, flue gas oxygen, and other important parameters related to kiln operation. Formulas used to calculate dry slurry feed rate and insufflation rate from operating data are provided in Appendix A.

Copies of the daily operating logs were obtained for the 3-month period prior to testing. Kiln outages were noted on two occasions. Records were examined for the month prior to testing to establish the normal range of operating conditions.

Samples of the feed slurry are collected three times per day and analyses conducted for moisture and carbonate content. Clinker samples are collected every two hours and analyzed for chemical composition. Coal samples are taken each day with certain analyses being performed daily and others determined weekly. Daily, weekly, and monthly averages are recorded by the plant's quality control laboratory.

3.3 PROCESS ANALYSIS DURING IP TESTING

During the test period May 1-6, 1981, process records were monitored and process inputs calculated from operators' logs. Abnormal process conditions were noted and recorded. Analyses of the process conditions were made to determine kiln conditions during each run and to note if any changes in specific variables occurred that would have had an impact on uncontrolled emission rates, or controlled emission rates due to observed changes in gas volume, temperature, moisture, or fine particulate characteristics.

The quantitative impact of these process changes cannot be determined due to the interaction of several parameters, but a qualitative assessment can be made. Appendix B provides the hourly process weight determinations during the test period. The slurry feed rate was calculated from the hourly integrated slurry feeder revolutions and the slurry moisture measured at the end of each shift. The insufflation dust rate is based on the dust feeder screw integrated revolutions. The combined kiln process rate is the total of slurry feed (tons/h dry) and insufflated dust (tons/h dry).

Figures 10 through 15 provide a graphic display of the slurry feed and insufflation dust rate. It is apparent that the insufflation dust rate is highly irregular with a range of 0 to 21.82 tons/h and an average of 12.5 tons/h. The dry slurry feed rate is very stable with minor variations. Slurry feed was interrupted, however, between 9:00 a.m. and 10:00 a.m. on May 4, 1981. This interruption is expected to have an impact on the stack test results obtained during and immediately after this occurrence. Although no explanation of the event was indicated on the operator's log, it is apparent

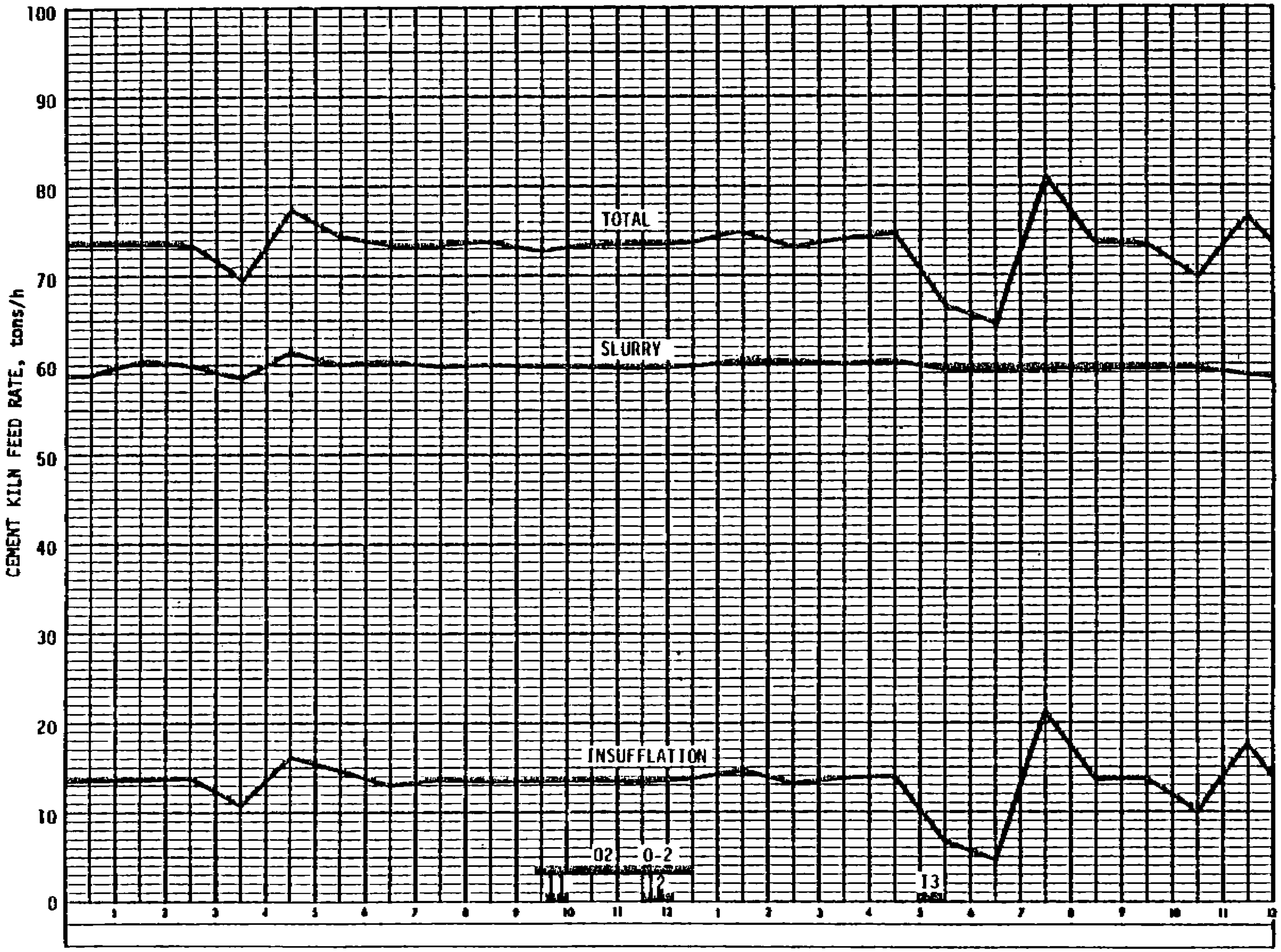

Figure 10. Slurry feed and insufflation dust rate for May 1, 1981.

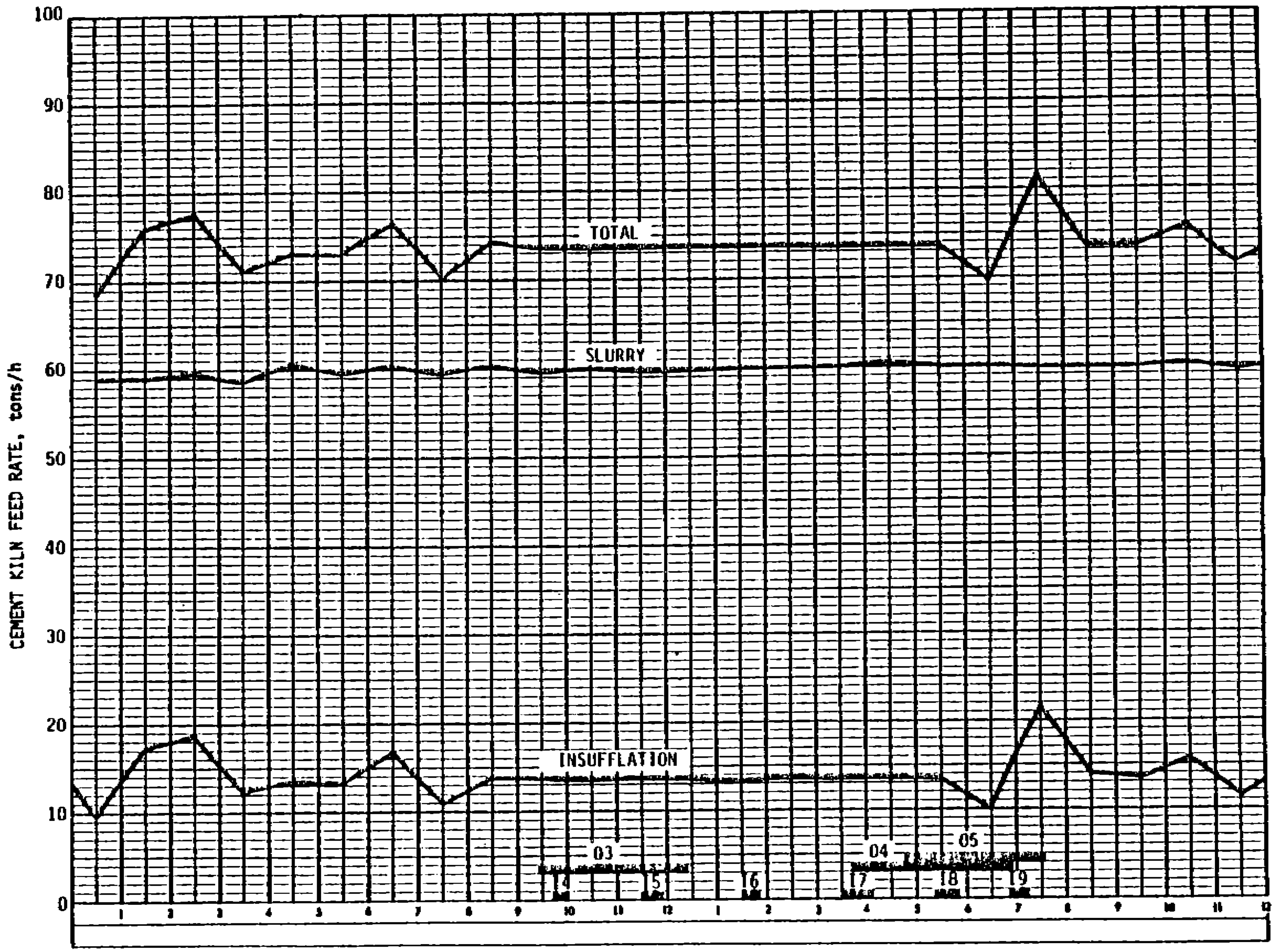

Figure 11. Slurry feed and insufflation dust rate for May 2, 1981.

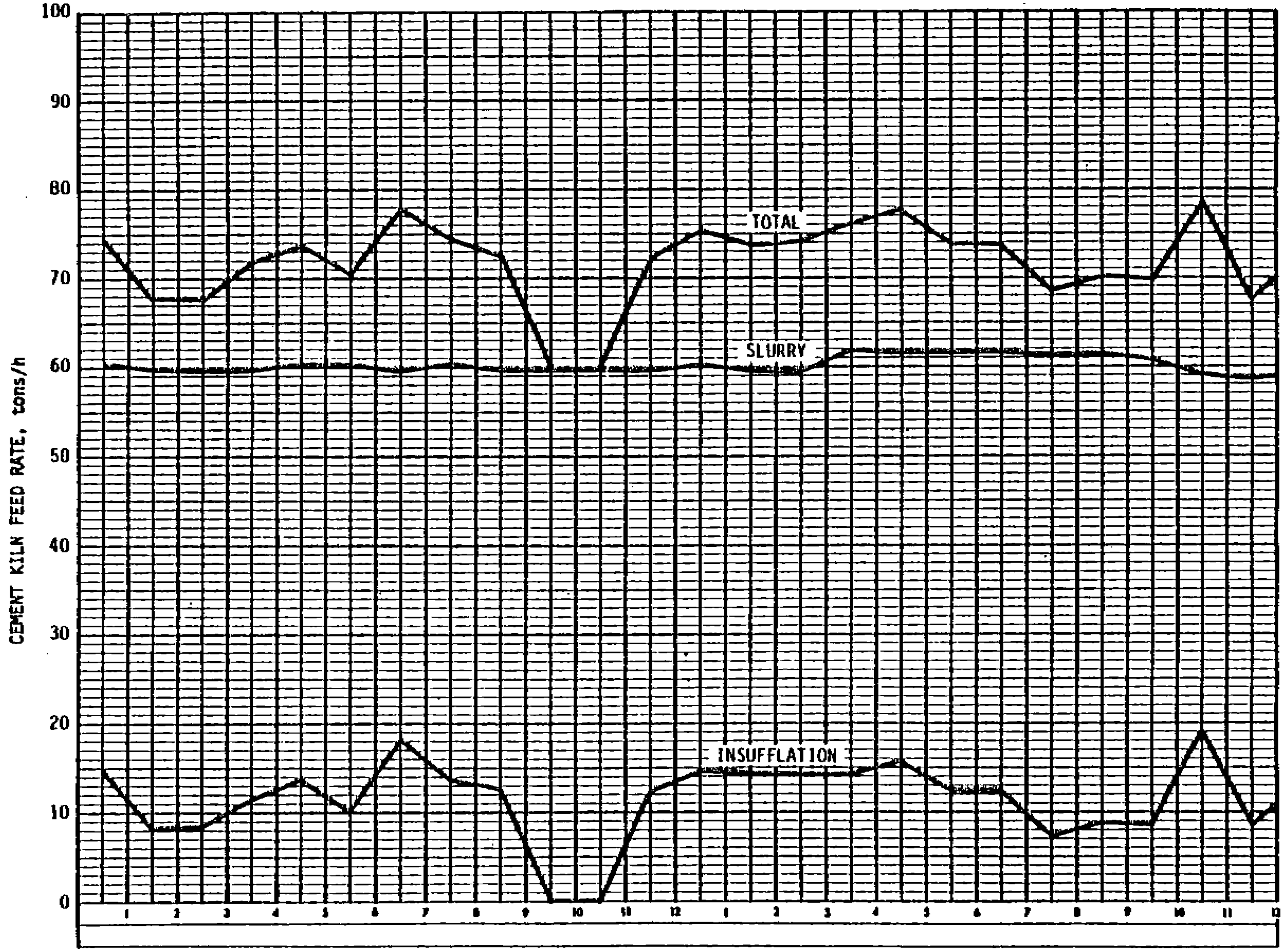

Figure 12. Slurry feed and insufflation dust rate for May 3, 1981.

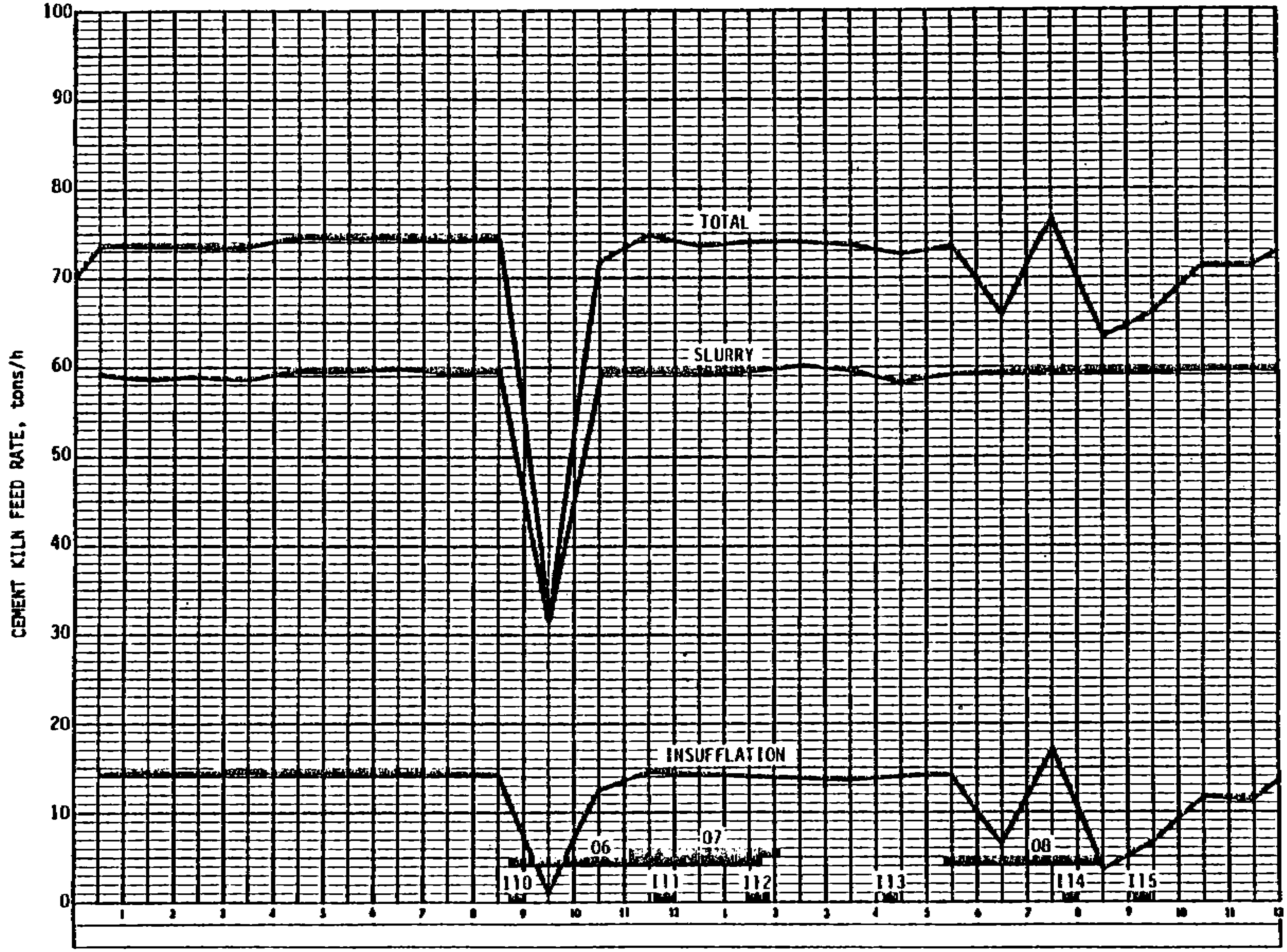

Figure 13. Slurry feed and insufflation dust rate for May 4, 1981.

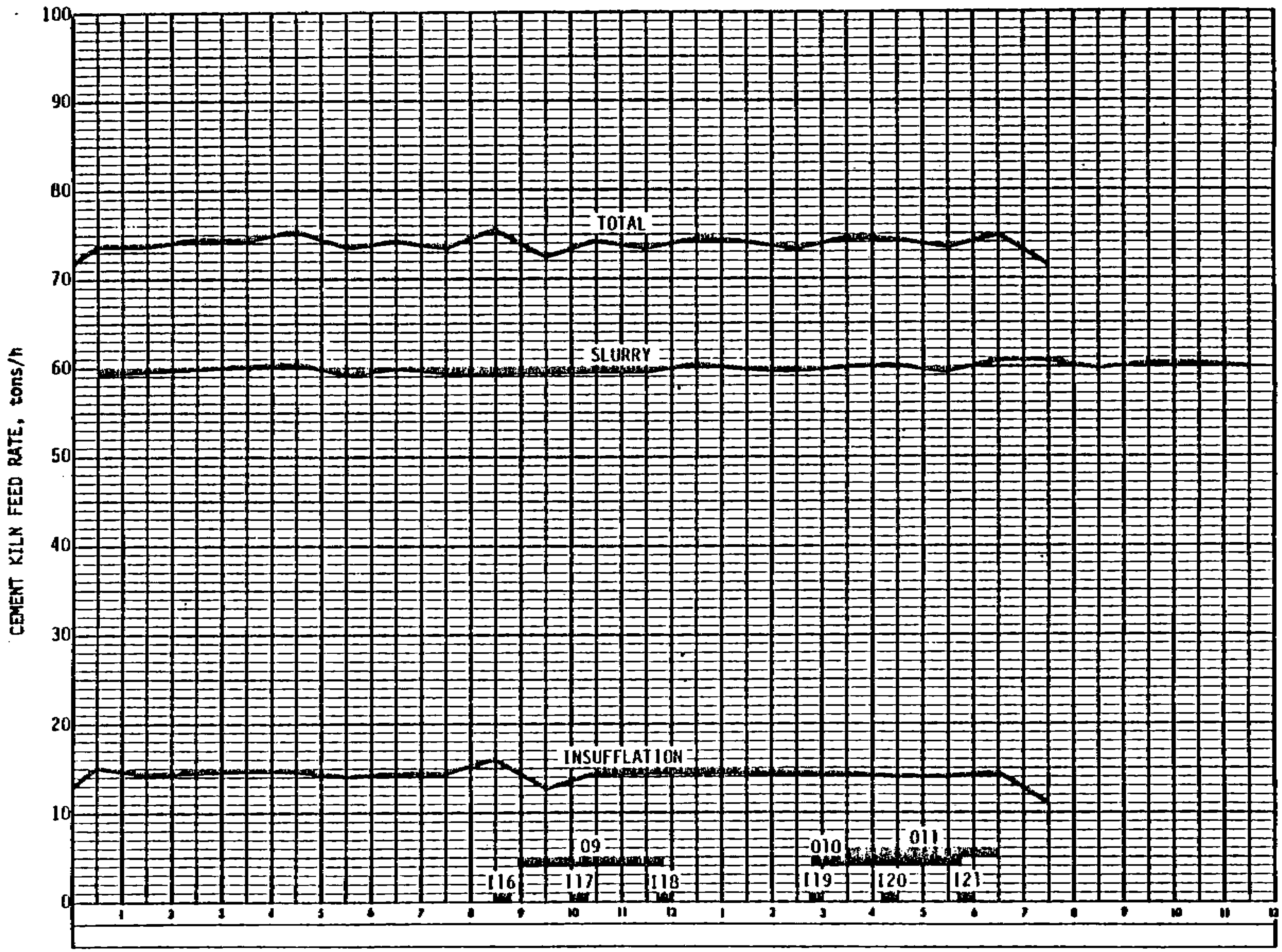

Figure 14. Slurry feed and insufflation dust rate for May 5, 1981.

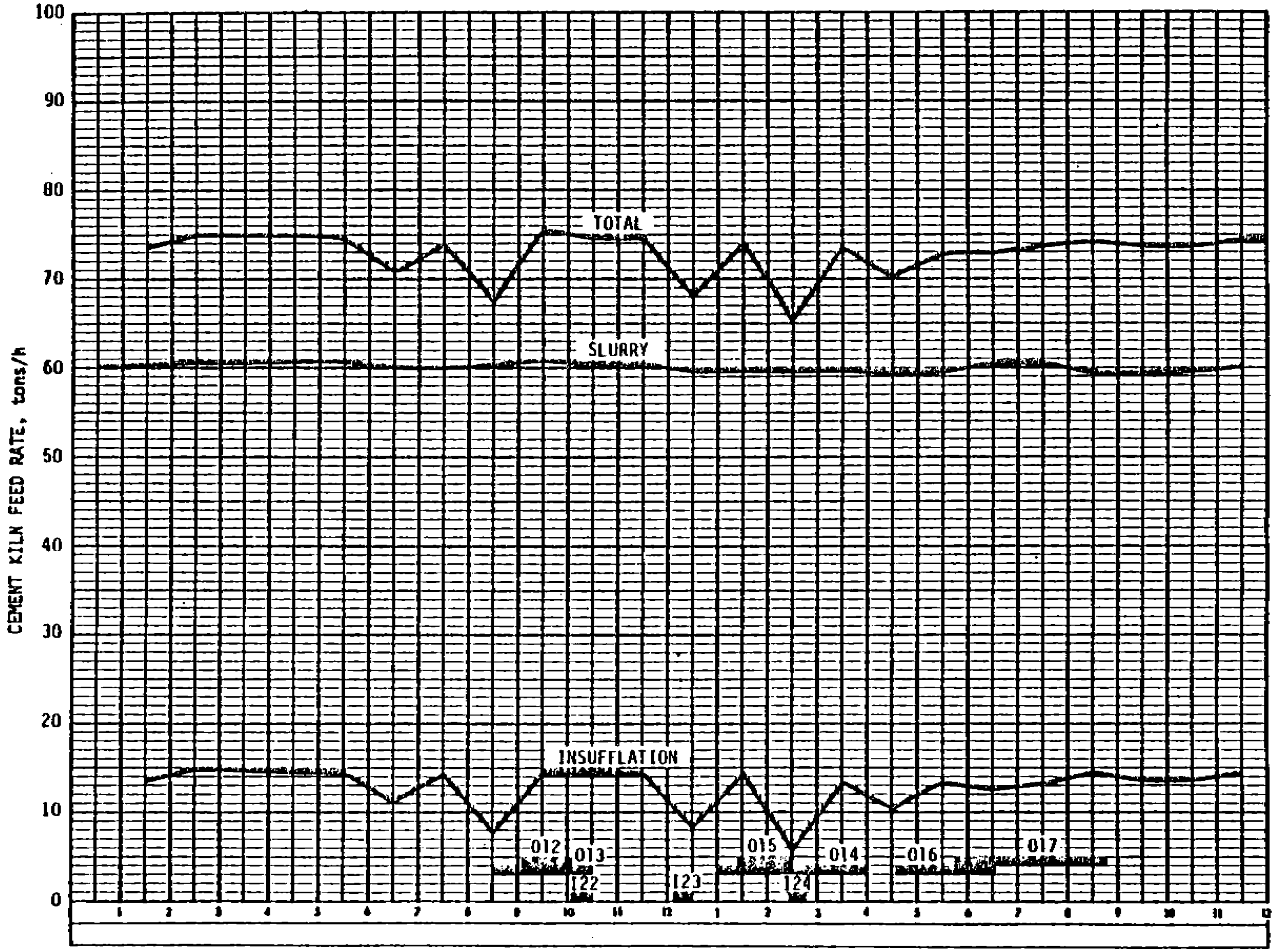

Figure 15. Slurry feed and insufflation dust rate for May 6, 1981.

the kiln's speed and feed were reduced for a 1-hour period. Figures 16 through 21 provide a graphical display of the coal firing rate and kiln exit gas temperature during the period May 1-6, 1981.

Specific process rates were determined for each inlet and outlet test run by use of the hourly integrated readings. The results of the inlet and outlet tests are presented in Tables 6 and 7, respectively. The process weight is the average of integrated hourly readings during each test period. Slurry constants, kiln operator logs, slurry feeder charts, and kiln feed gas temperature and oxygen content charts are provided in Appendices C through F.

Clinker composition was determined every two hours and a daily average recorded. Table 8 provides the clinker analysis for the test period. It should be noted that the cement production changed from Type I to Type II for the last two days of the test. The change from Type I to Type II was observed to result in an increase in kiln opacity (combined Kilns 1 and 2). Appendix G is a summary of the clinker analysis and Appendix H is the kiln coal analysis.

Slurry carbonate content is measured at the end of each shift and recorded on the operator's log. Table 9 provides the calculated carbonate content of the slurry for the testing period. An increase in carbonate content in the slurry typically will reduce the clinker yield and increase the calcium content of the clinker. A very narrow range of carbonate is typically maintained.

Grab samples of raw meal were collected each day during the sampling period to provide an indication of the alkali content of the kiln feed. Table 10 provides an analysis of each sample. Because the samples were not integrated composites, they may not be used for analysis of individual test runs, but may be used to qualify the kiln feed with respect to other wet process kiln feeds.

In order to determine the enrichment of kiln feed meal as a result of insufflated dust, composite samples were obtained from the dust-return pipe (Fields 1 and 2). It should be noted that the insufflated dust was the combined material from Kilns 1 and 2. Table 11 provides an analysis of the insufflated dust.

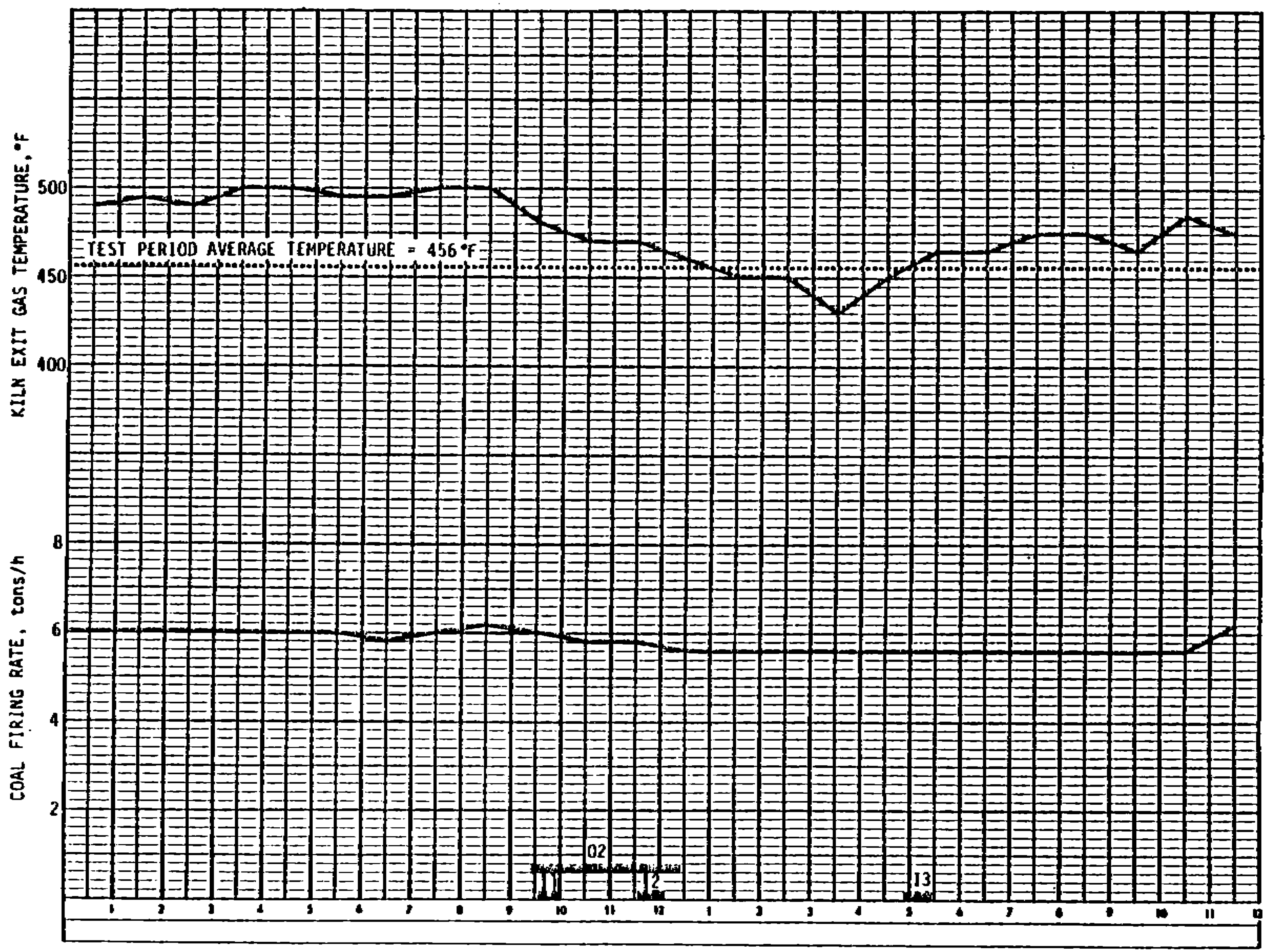

Figure 16. Coal firing rate and kiln exit gas temperature for May 1, 1981.

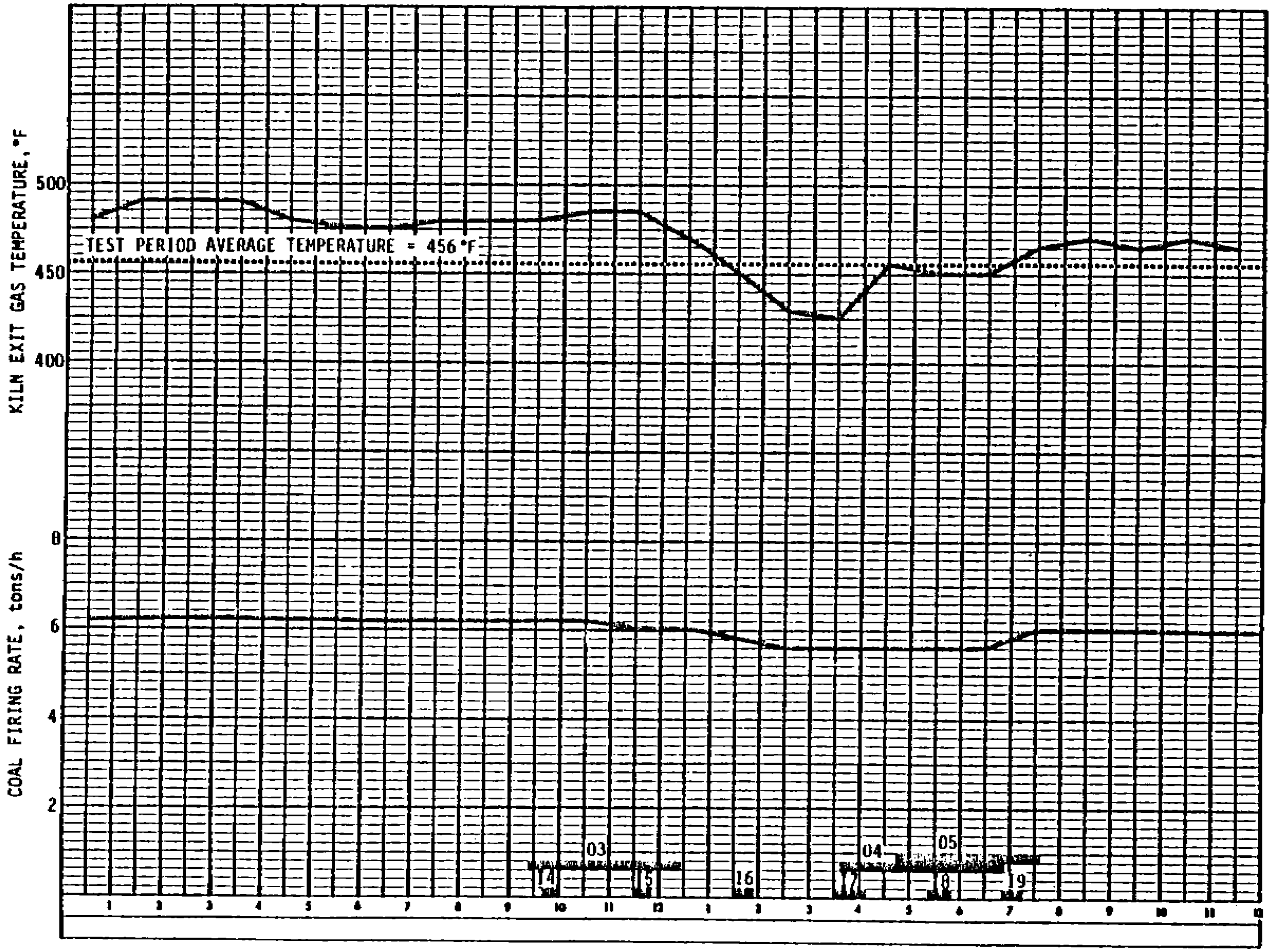

Figure 17. Coal firing rate and kiln exit gas temperature for May 2, 1981.

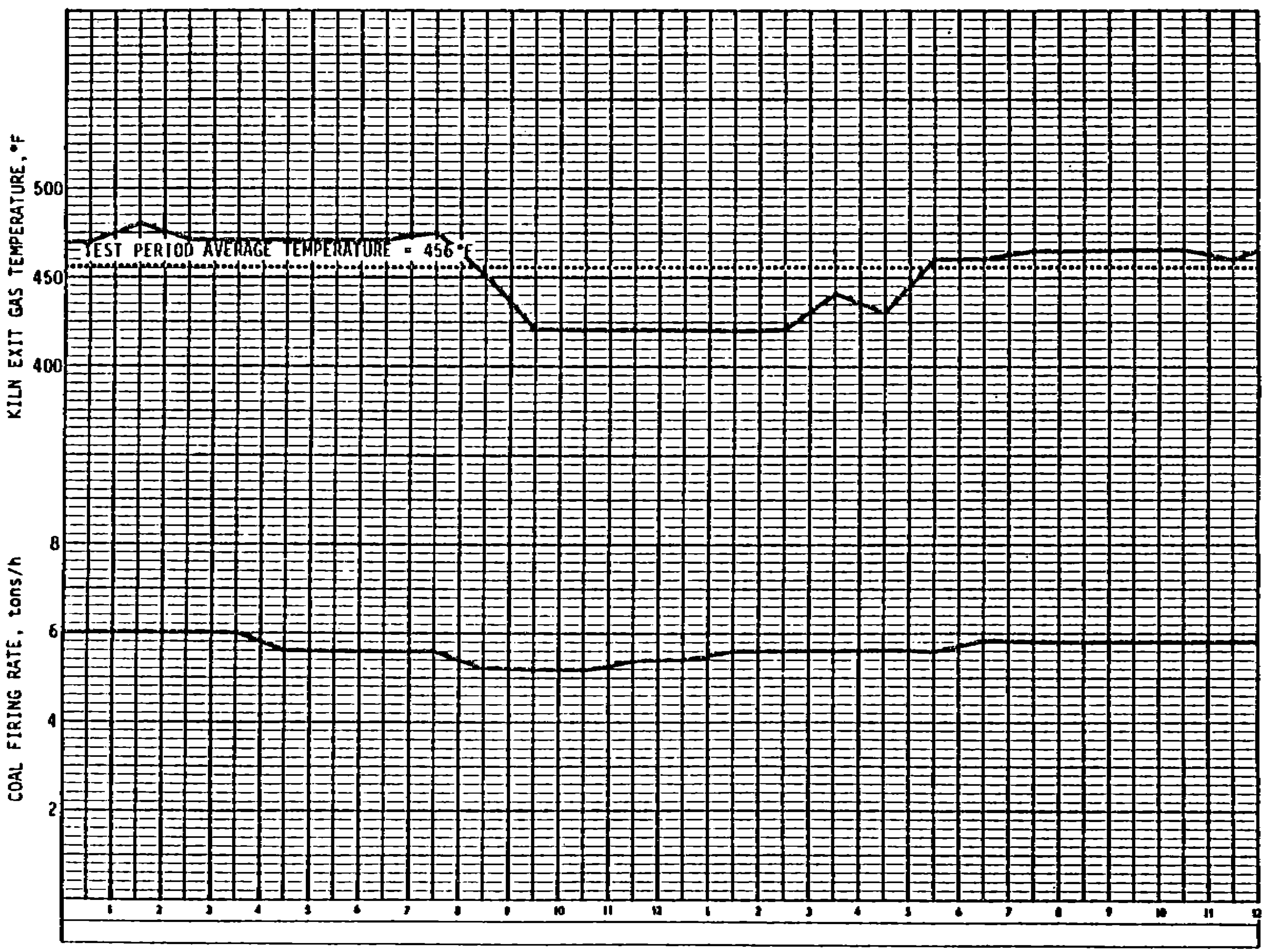

Figure 18. Coal firing rate and kiln exit gas temperature for May 3, 1981.

Figure 19. Coal firing rate and kiln exit gas temperature for May 4, 1981.

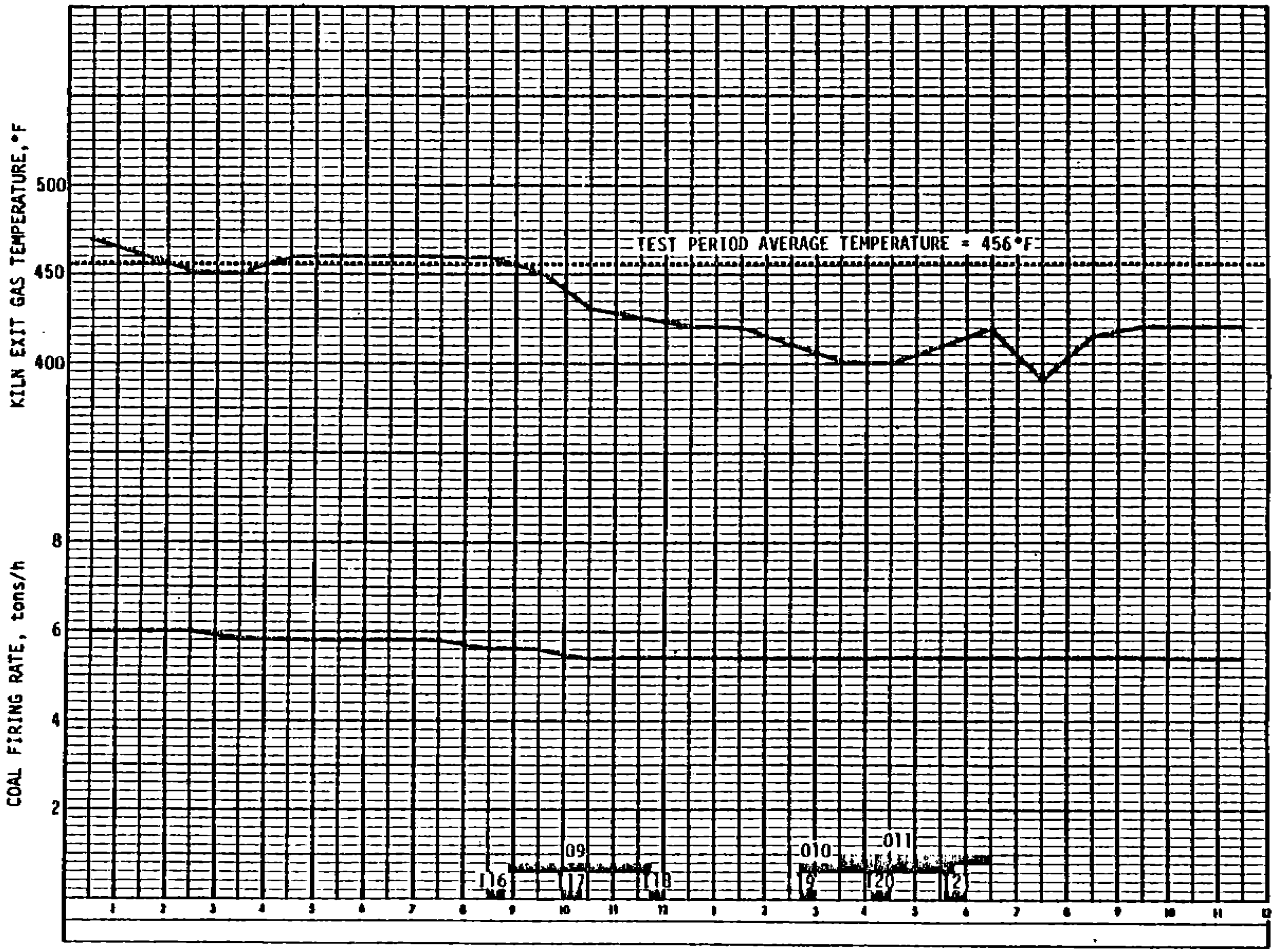

Figure 20. Coal firing rate and kiln exit gas temperature for May 5, 1981.

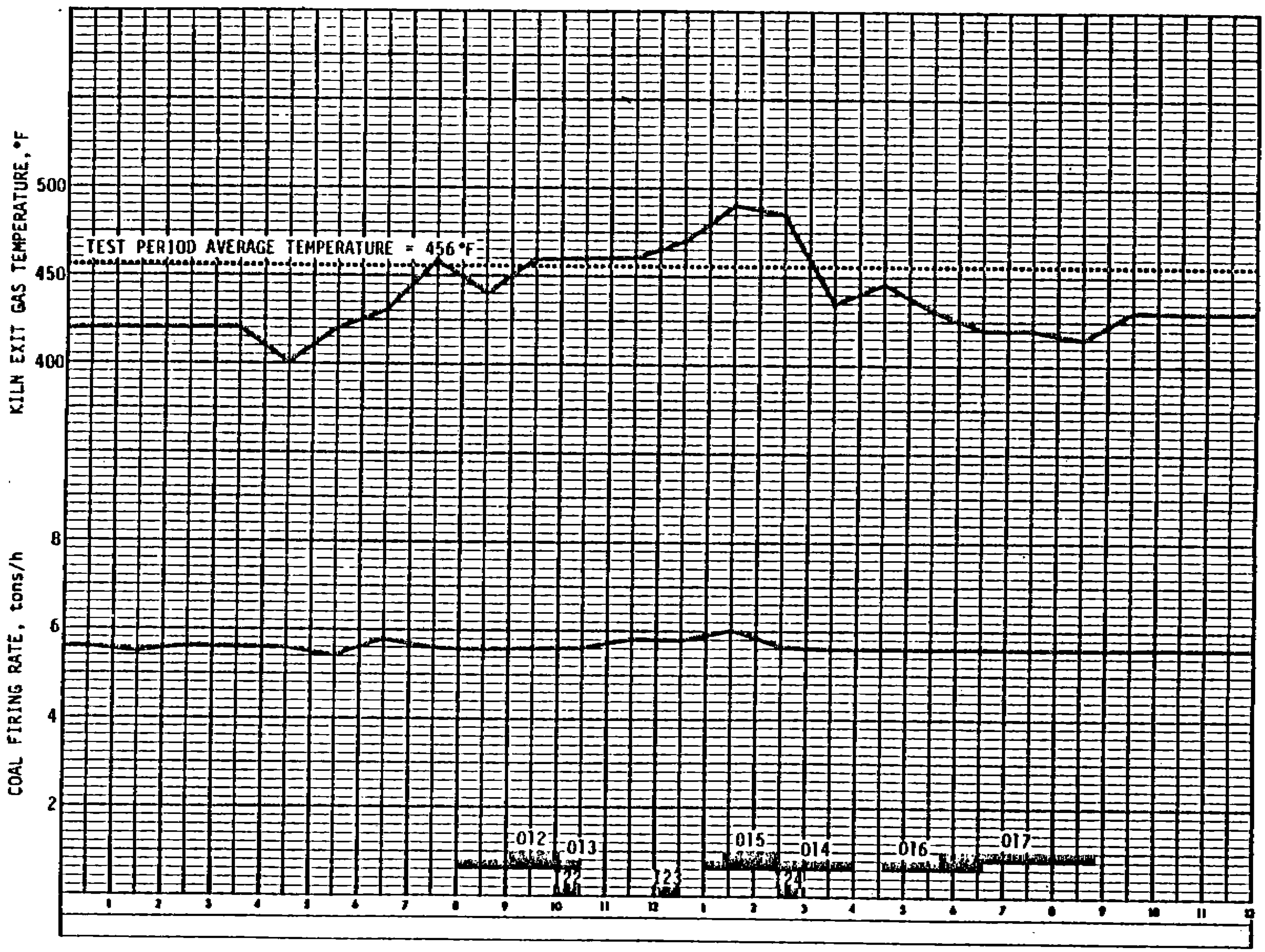

Figure 21. Coal firing rate and kiln exit gas temperature for May 6, 1981.

TABLE 6. PROCESS RATES FOR INLET EMISSION TESTS

Date	Run no.	Time	Slurry, tons/h	Dust, tons/h	Total, tons/h
5/1	I-31	942-957	59.64	13.31	72.95
5/1	I-31	1135-1205	58.82	13.52	72.34
5/1	I-32	1657-1721	59.68	6.77	66.45
5/2	I-11	945-957	59.74	13.54	73.28
5/2	I-11	1130-1154	59.74	13.74	73.48
5/2	I-12	1332-1347	59.92	13.43	73.35
5/2	I-41	1537-1607	59.99	13.52	73.51
5/2	I-41	1718-1741	59.80	13.58	73.38
5/2	I-42	1850-1914	59.62	15.93	75.55
5/4	I-21	844-857	59.68	14.42	74.10
5/4	I-21	1137-1201	59.50	14.58	74.08
5/4	I-22	1325-1349	59.68	14.19	73.87
5/4	I-12	1611-1623	58.41	14.09	72.50
5/4	I-14	1943-1958	59.32	17.18	76.50
5/4	I-13B	2110-2125	59.32	6.67	65.99
5/5	I-32	826-844	59.55	15.93	75.68
5/5	I-33	1000-1021	59.74	14.34	74.08
5/5	I-34	1142-1203	59.55	14.26	73.81
5/5	I-22	1443-1455	59.41	14.15	73.56
5/5	I-23	1610-1631	59.22	14.23	74.15
5/5	I-24	1742-1803	59.38	14.05	73.43
5/6	I-42	1006-1027	60.09	14.55	74.64
5/6	I-43	1200-1231	59.55	8.69	68.24
5/6	I-44	1425-1443	59.55	5.61	65.16

TABLE 7. PROCESS RATES FOR OUTLET EMISSION TESTS

Date	Run no.	Time	Slurry, tons/h	Dust, tons/h	Total, tons/h
5/1	0-21	925-1225	59.88	13.64	73.52
5/2	0-31	930-1230	59.89	13.18	73.08
5/2	0-41	1538-1850	59.92	13.67	73.59
5/2	0-31	1642-1933	60.47	14.93	75.50
5/4	0-12	840-1347	55.47	12.23	67.70
5/4	0-41	1108-1414	59.64	14.22	73.86
5/4	0-12	1723-2036	59.27	10.42	69.69
5/5	0-32	855-1145	59.61	13.83	73.44
5/5	0-32	1447-1747	59.66	14.18	73.84
5/5	0-42	1526-1826	59.78	11.88	71.66
5/6	0-22B	905-1005	60.82	14.55	75.37
5/6	0-42	830-1030	60.28	12.30	72.58
5/6	0-21B	1300-1600	59.58	11.20	70.78
5/6	0-11C	1323-1433	59.55	10.05	69.60
5/6	0-11C	1635-1835	59.74	12.26	71.94
5/6	0-22B	1732-2043	59.82	13.47	73.29

TABLE 8. ANALYSIS OF DAILY CLINKER COMPOSITION

Date	Type	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Loss	Na_2O	K_2O	Total	C_3S	C_2S	C_3A	C_4AF	Free CaO
5/1	I	21.42	5.40	3.10	65.43	1.71	1.23	0.08	0.21	0.93	99.50	60.4	14.0	9.1	9.4	0.43
5/2	I	a	a	a	a	a	a	a	0.21	0.93	a	a	a	a	a	a
5/3	I	20.70	5.69	3.37	65.62	1.66	1.46	0.09	0.24	0.90	99.73	66.8	9.0	9.4	10.3	0.36
5/4	I	20.66	5.67	3.59	65.40	1.76	1.53	0.13	0.24	0.99	99.97	66.0	9.4	9.0	10.9	0.43
5/5	II	21.42	5.93	3.39	64.04	1.76	2.08	0.10	0.26	1.12	100.00	56.3	18.1	10.0	10.3	0.55
5/6	II	23.38	3.97	3.55	65.04	2.24	1.00	0.14	0.18	0.62	100.12	55.3	25.3	4.5	10.8	0.48

[a] No data.

TABLE 9. SLURRY FEED CARBONATE PERCENTAGES

Date	CaO	MgO	$CaCO_3$	$MgCO_3$	Total
5/1	42.2	1.00	75.32	1.09	77.41
5/2	42.0	1.00	74.96	2.09	77.05
5/3	42.1	1.00	75.13	2.09	77.22
5/4	42.2	1.00	75.32	2.09	77.41
5/5	42.0	1.00	74.96	2.09	77.05
5/6	42.1	1.00	75.13	2.09	77.22

TABLE 10. RAW PRODUCT SAMPLE ANALYSIS RESULTS[a]

	Composition, weight %				
	Type I product			Type II product	
Sample No.:	555	666	777	888	999
Date collected:	5-1-81	5-2-81	5-4-81	5-5-81	5-6-81
Plant shift:	First	First	Second	First	First
Shift hours:	0700-1500	0700-1500	1500-2300	0700-1500	0700-1500
Na_2O	0.29	0.29	0.30	0.29	0.24
K_2O	0.90	0.90	1.00	0.80	0.40
Li_2O	0.12	0.12	0.10	0.14	0.12
LOI[b]	34.08	34.34	33.89	34.72	34.51
Total S as SO_3	0.42	0.33	0.31	0.40	0.36
Cl	0.03	0.01	0.01	0.03	0.02
CaO	41.96	42.05	41.94	41.53	40.22
SiO_2	13.40	13.44	13.92	13.91	15.56
MgO	2.06	1.84	1.98	1.56	1.62
Al_2O_3	4.19	4.50	4.37	4.21	4.46
Fe_2O_3	2.09	1.67	1.72	1.97	2.17
TiO_2	0.22	0.19	0.19	0.20	0.21

[a]Analytical results provided by Spectrochemical Laboratories, Inc., 8350 Frankstown Avenue, Pittsburgh, Pennsylvania 15221.

[b]LOI = Loss on ignition.

TABLE 11. INSUFFLATION DUST SAMPLE ANALYSIS RESULTS[a]

	Composition, weight %				
	Type I product		Type II product		
Sample No.: Date collected:	111 5-1-81	222 5-4-81	333 5-5-81	444 5-6-81	10 10[b] 5-6-81
Na_2O	0.60	0.55	0.55	0.55	0.50
K_2O	3.10	3.01	2.60	2.22	2.00
Li_2O	0.01[c]	0.01[c]	0.08	0.06	0.10
LOI[d]	22.15	23.03	21.60	24.00	22.34
Total S as SO_3	2.97	3.11	2.47	3.88	3.67
Cl	0.34	0.36	0.43	0.25	0.24
CaO	46.37	46.92	47.30	45.70	45.54
SiO_2	15.79	14.56	15.32	14.86	15.08
MgO	1.50	1.34	2.18	2.01	2.14
Al_2O_3	4.61	4.73	4.64	3.25	5.36
Fe_2O_3	2.19	1.97	2.29	2.77	2.57
TiO_2	0.24	0.22	0.25	0.21	0.19

[a]Analytical results provided by Spectrochemical Laboratories, Inc., 8350 Frankstown Avenue, Pittsburgh, Pennsylvania 15221.

[b]Sample No. 10 10 is a duplicate of Sample No. 444.

[c]Not detected. The number indicates the minimum limit of detection.

[d]LOI = Loss on ignition.

3.4 EVALUATION OF OPACITY DATA

A continuous opacity monitor is installed in the stack that serves Kilns 1 and 2. Strip charts and a time index were provided for each day during the sampling period.

Figures 22 through 38 are reduced photocopies of the strip charts. The test periods are indicated on each chart, and an estimate of the opacity is provided in Table 12. Exact analysis of the opacity was not possible since scale factors, span, and zero offset values were not provided.

In general, during the early periods of testing the opacity appears to be very stable with minimum evidence of rapper reentrainment or transient occurrences. A nominal increase in opacity was noted on May 1 (2000 h) until May 2 (0520 h) and on May 3 (1720 h) until May 4 (0400 h). A sharp increase in opacity occurred on May 4 between 0520 and 0640 that was accompanied by an increase in rapper reentrainment. The occurrence of reentrainment spikes continued for several hours (opacity and spike pattern returned to normal at about 0920 h). The increase in opacity appears to be associated with a decrease in kiln feed rates and rotation rates prior to a malfunction reported between 0800 and 1100 h on May 4. The nature of the malfunction was not indicated during the testing period for either the inlet or outlet tests (Runs I-10, I-11, I-06, I-07).

The reduction in feed meal is expected to have three effects. The first is that a reduction in the moisture content of the flue gas stream temporarily increases the dust resistivity. This would result in a reduction in ESP corona power and an increase in rapper reentrainment. The second is that a reduction in the alkali material entering the kiln shifts the alkali recirculation equilibrium in the kiln, which causes the recirculation value to be reduced (temporary increase in alkali fine particulate emissions). The third is that a reduction in the feed rate, coal firing rate, and kiln rotation rate reduces the flue gas volume exiting the kiln and reduces the entrainment loss of larger particulate (CaO and SiO_2). All of these changes have the effect of increasing the observed opacity either by increasing the mass loading or by shifting the mass-opacity relationship (change in attenuation coefficient).

At about 0800 on May 5, a significant increase in opacity was noted. The opacity, which continued to remain high on May 5 (40 to 60%) and into

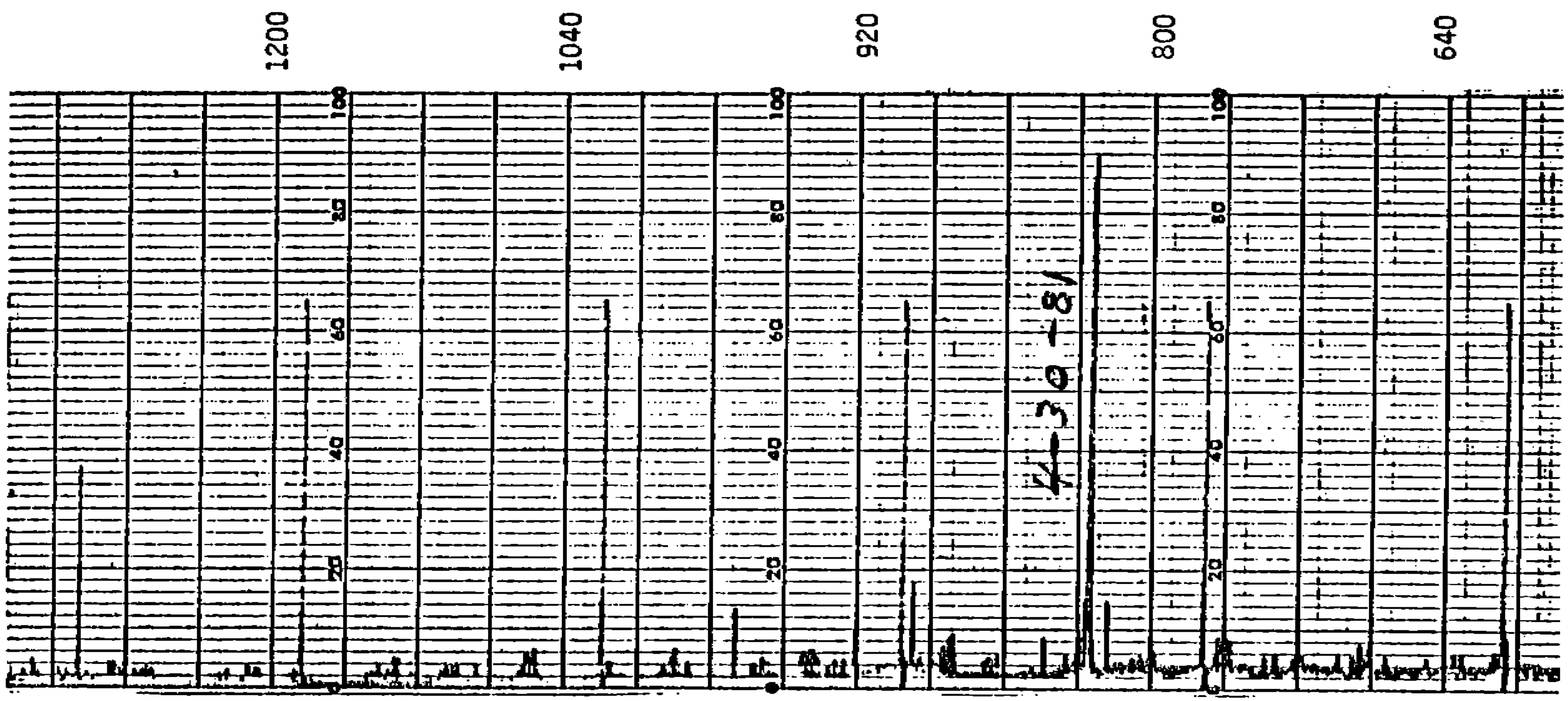

Figure 22. Opacity strip chart for April 30, 1981 (0640 to 1200 h).

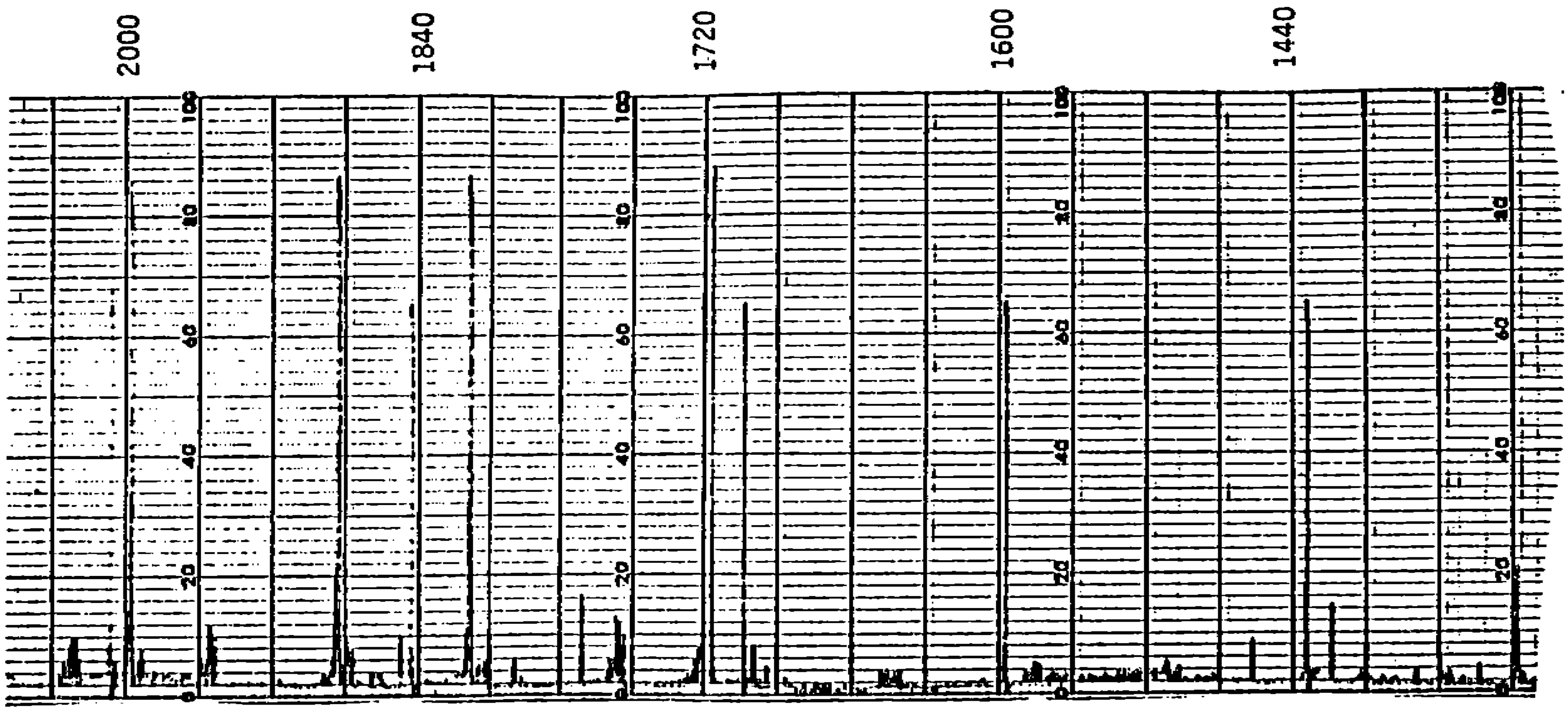

Figure 23. Opacity strip chart for April 30, 1981 (1440 to 2000 h).

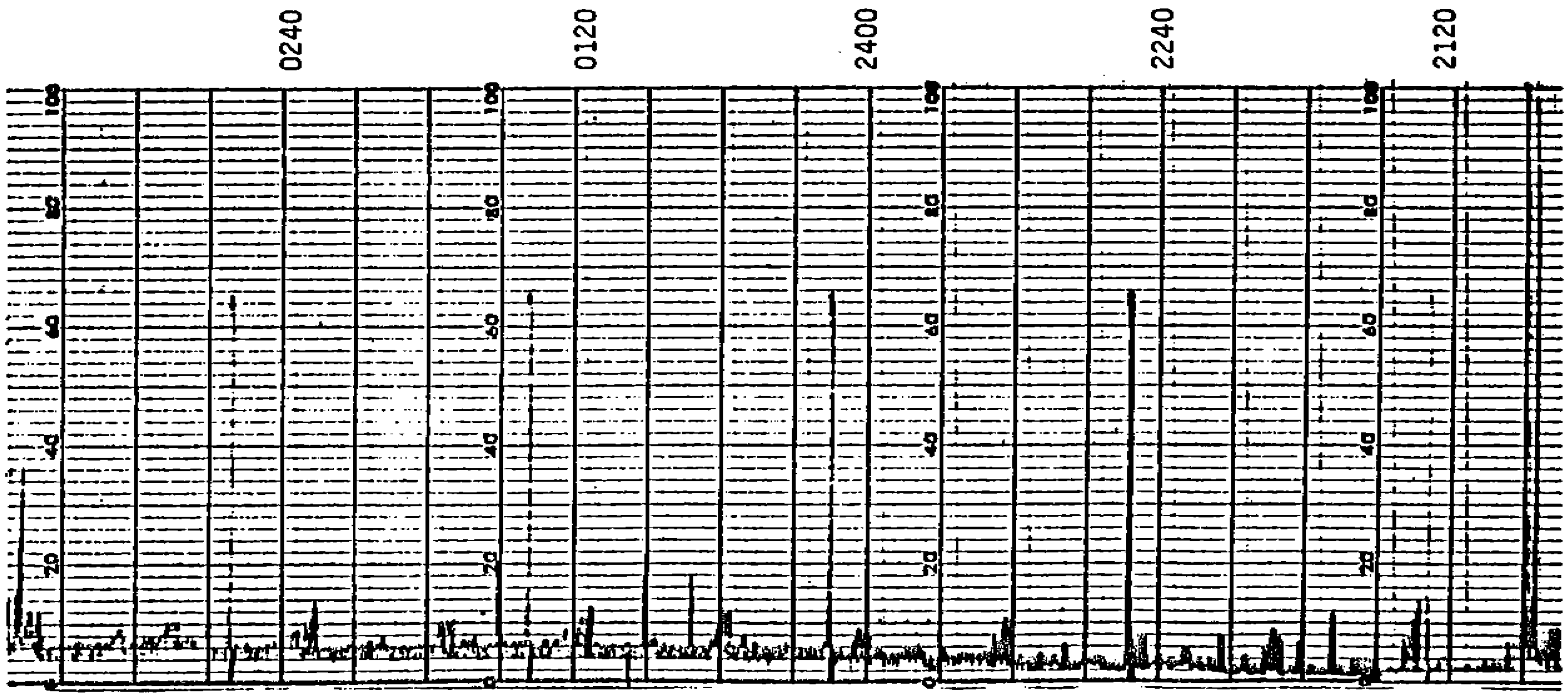

Figure 24. Opacity strip chart for April 30, 1981 (2120 to 2400 h) and May 1, 1981 (0120 to 0240 h).

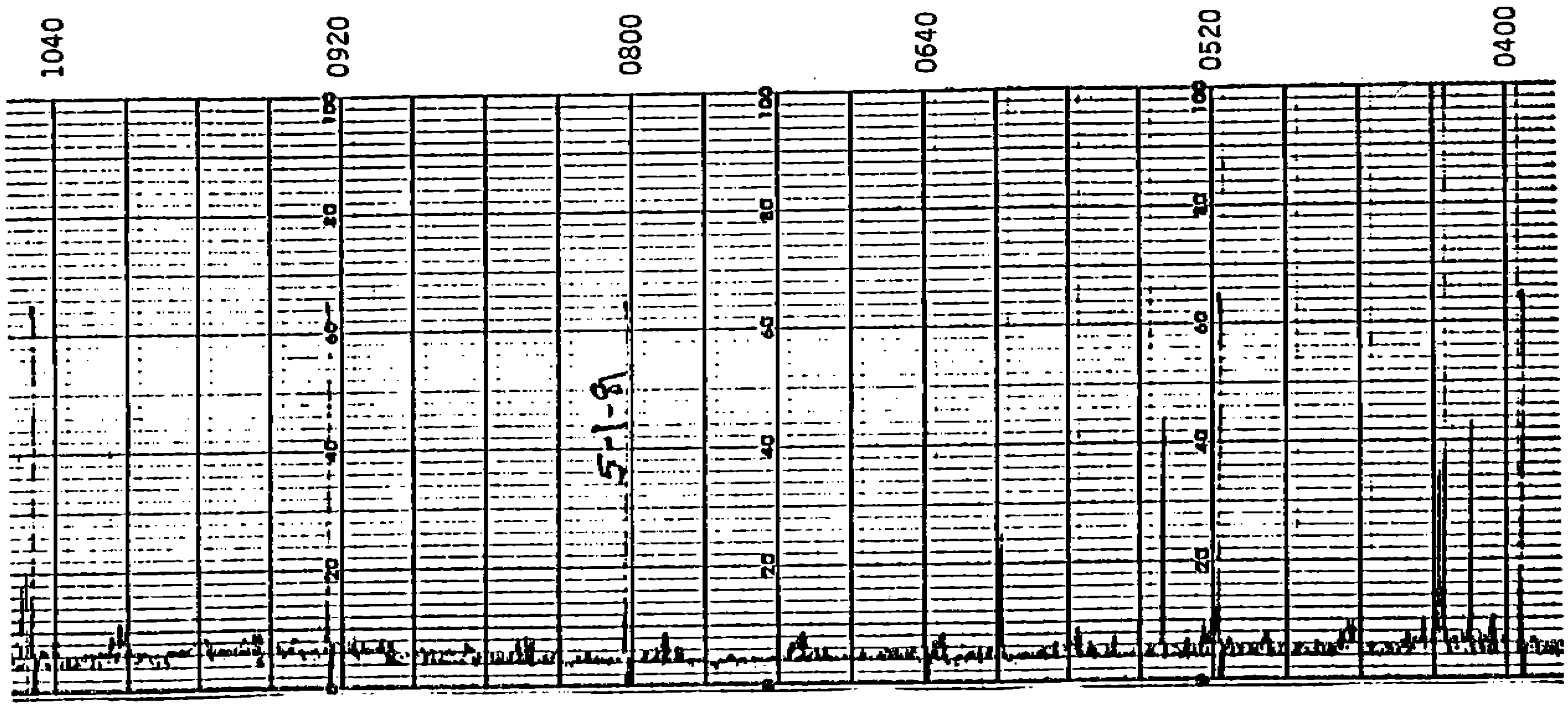

Figure 25. Opacity strip chart for May 1, 1981 (0400 to 1040 h).

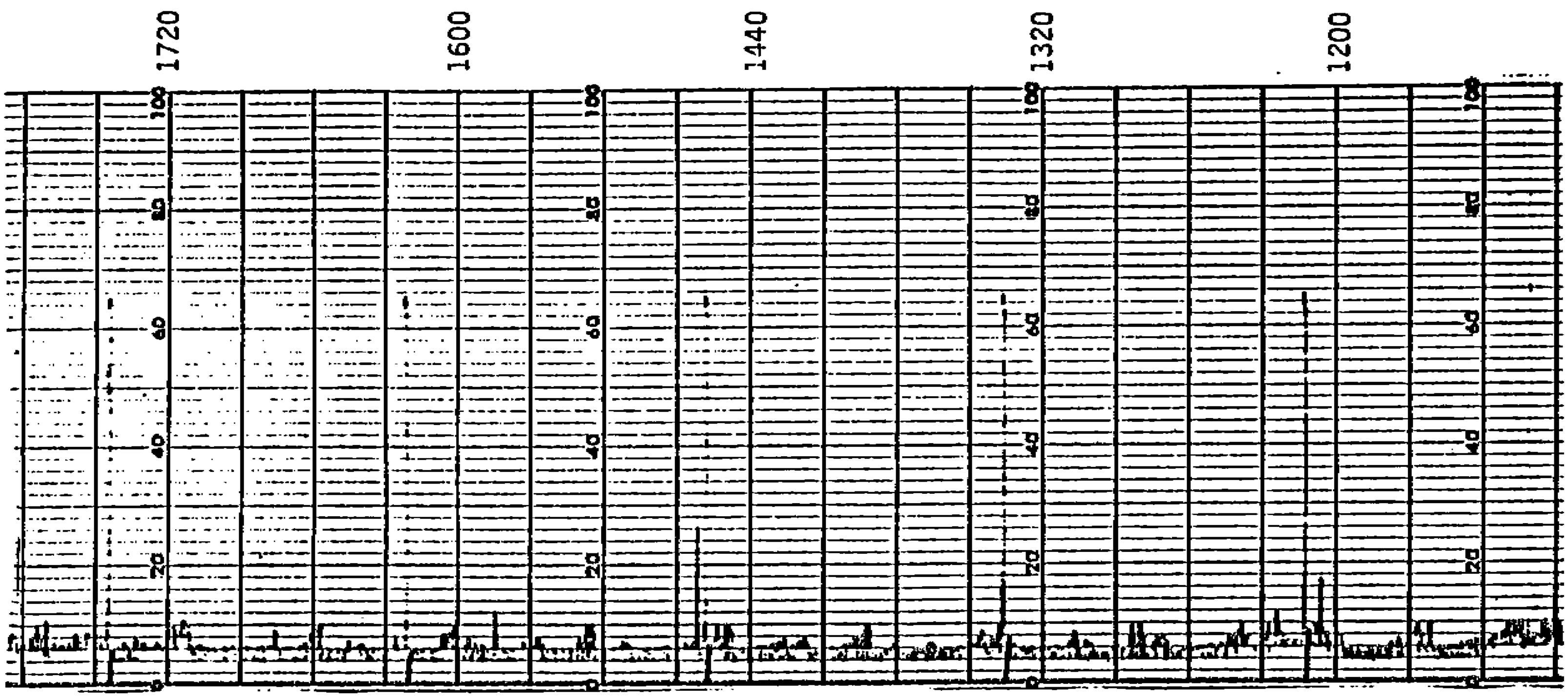

Figure 26. Opacity strip chart for May 1, 1981 (1200 to 1720 h).

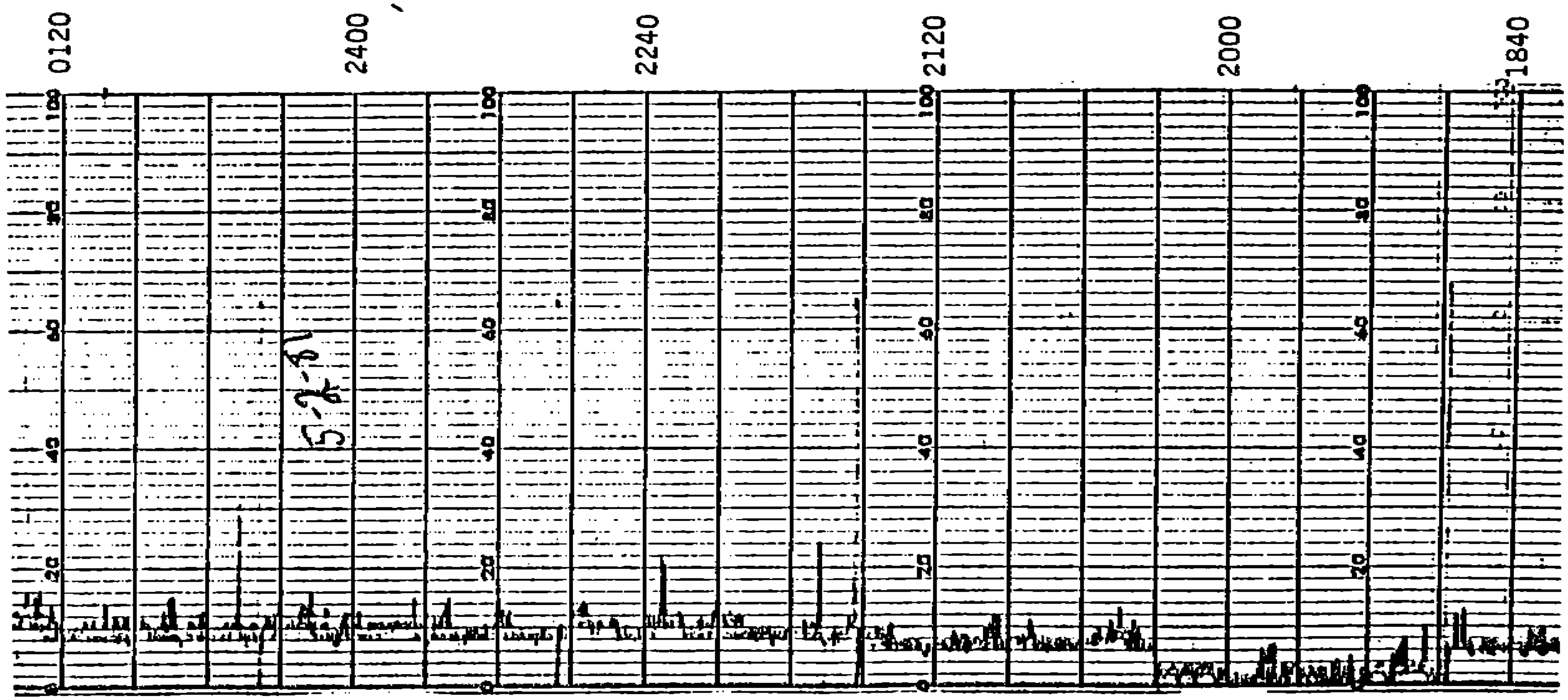

Figure 27. Opacity strip chart for May 1, 1981 (1840 to 2120 h) and May 2, 1981 (2240 to 0120 h).

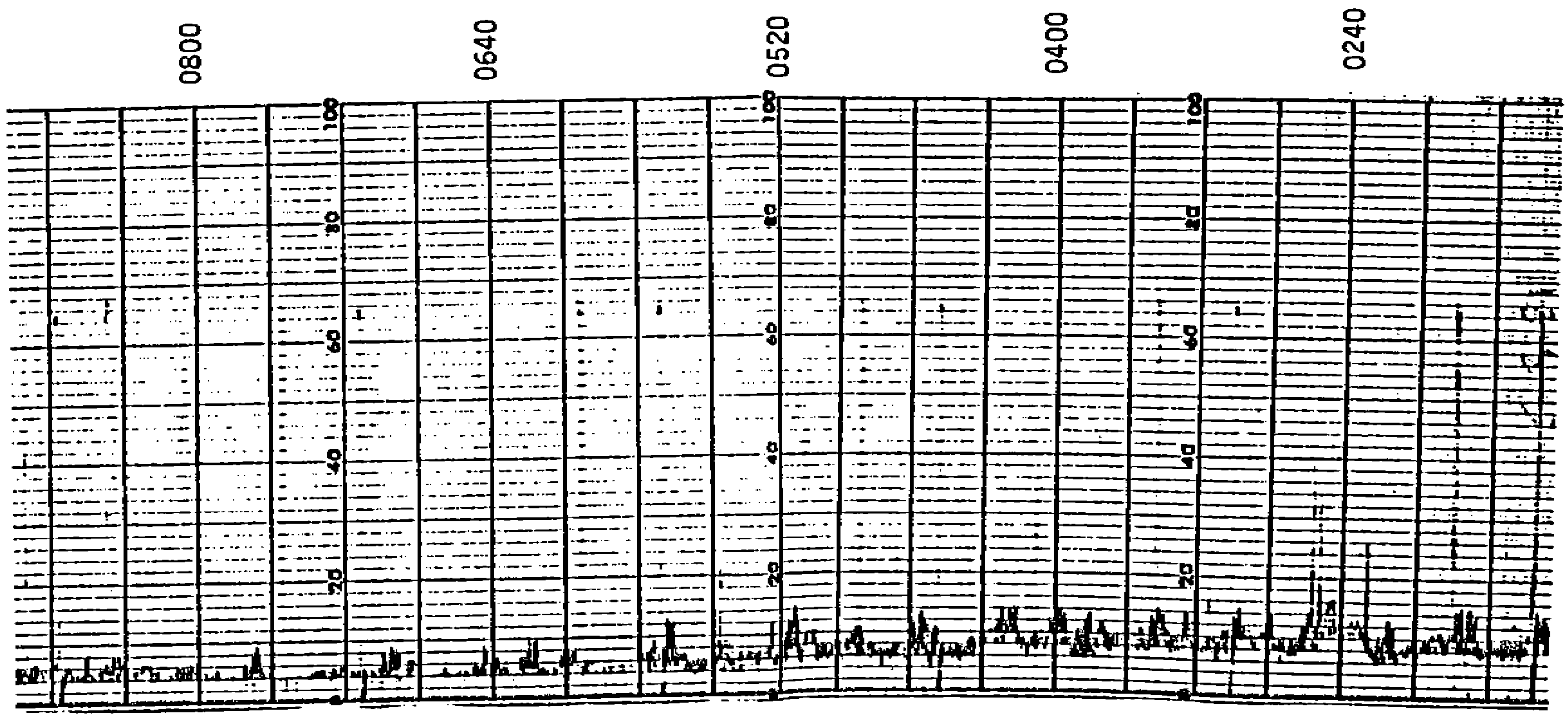

Figure 28. Opacity strip chart for May 2, 1981 (0240 to 0800 h).

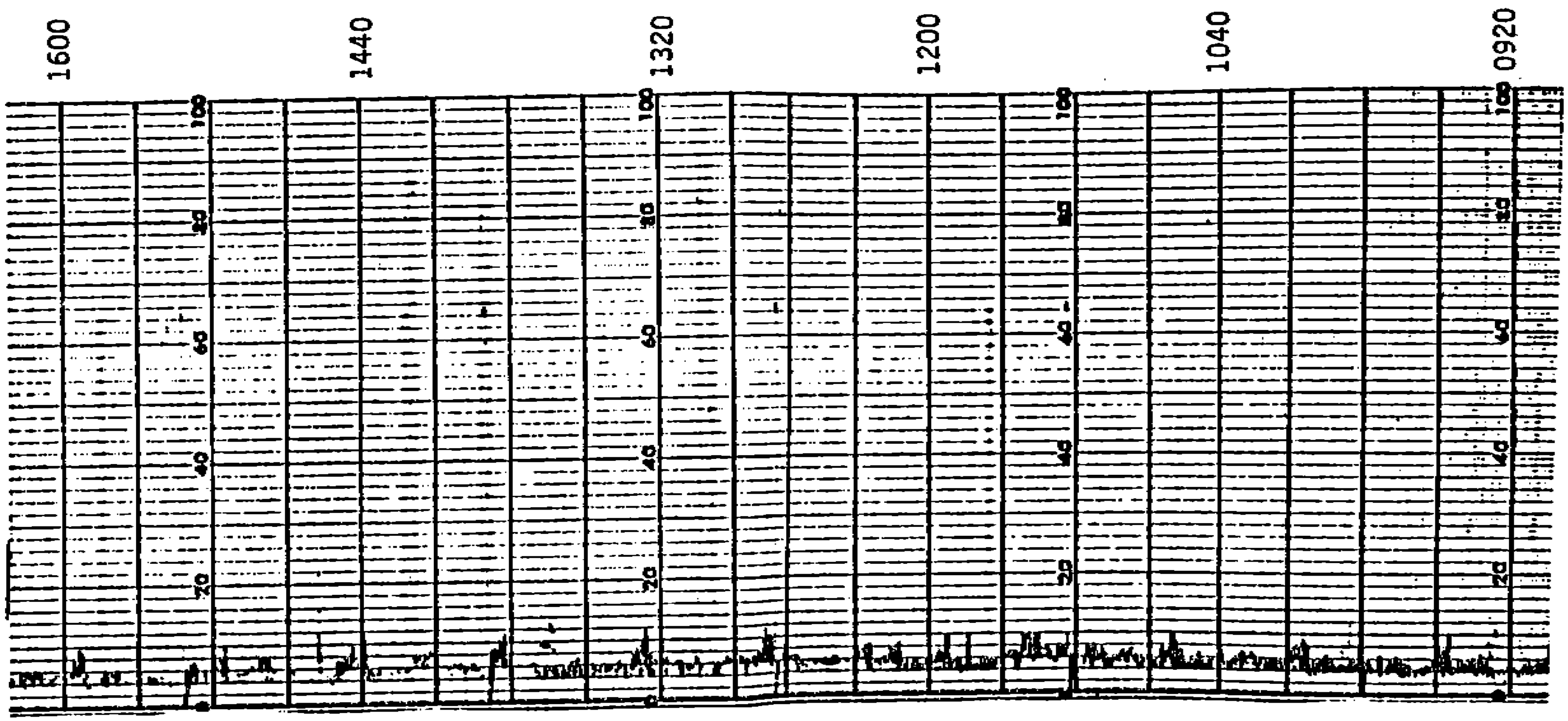

Figure 29. Opacity strip chart for May 2, 1981 (0920 to 1600 h).

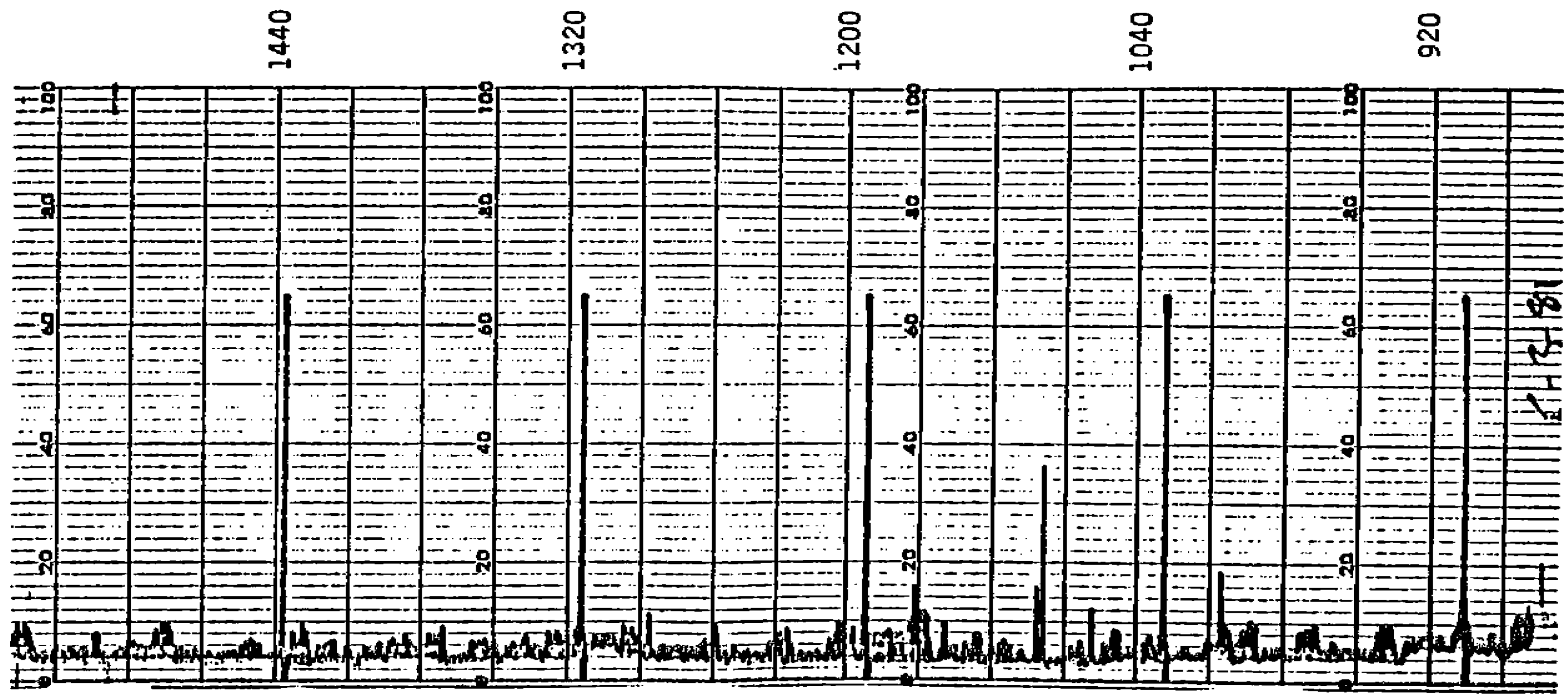

Figure 30. Opacity strip chart for May 3, 1981 (0920 to 1440 h).

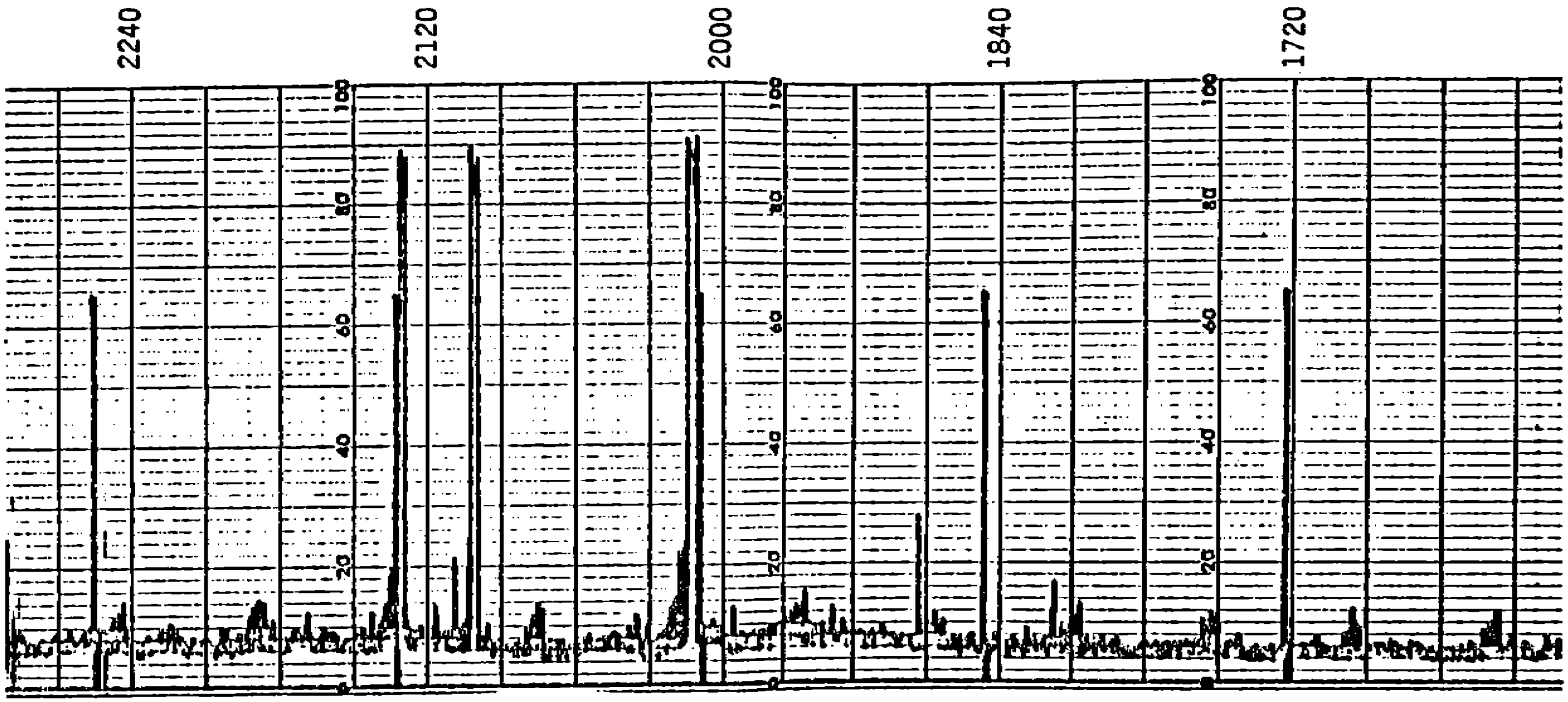

Figure 31. Opacity strip chart for May 3, 1981 (1720 to 2240 h).

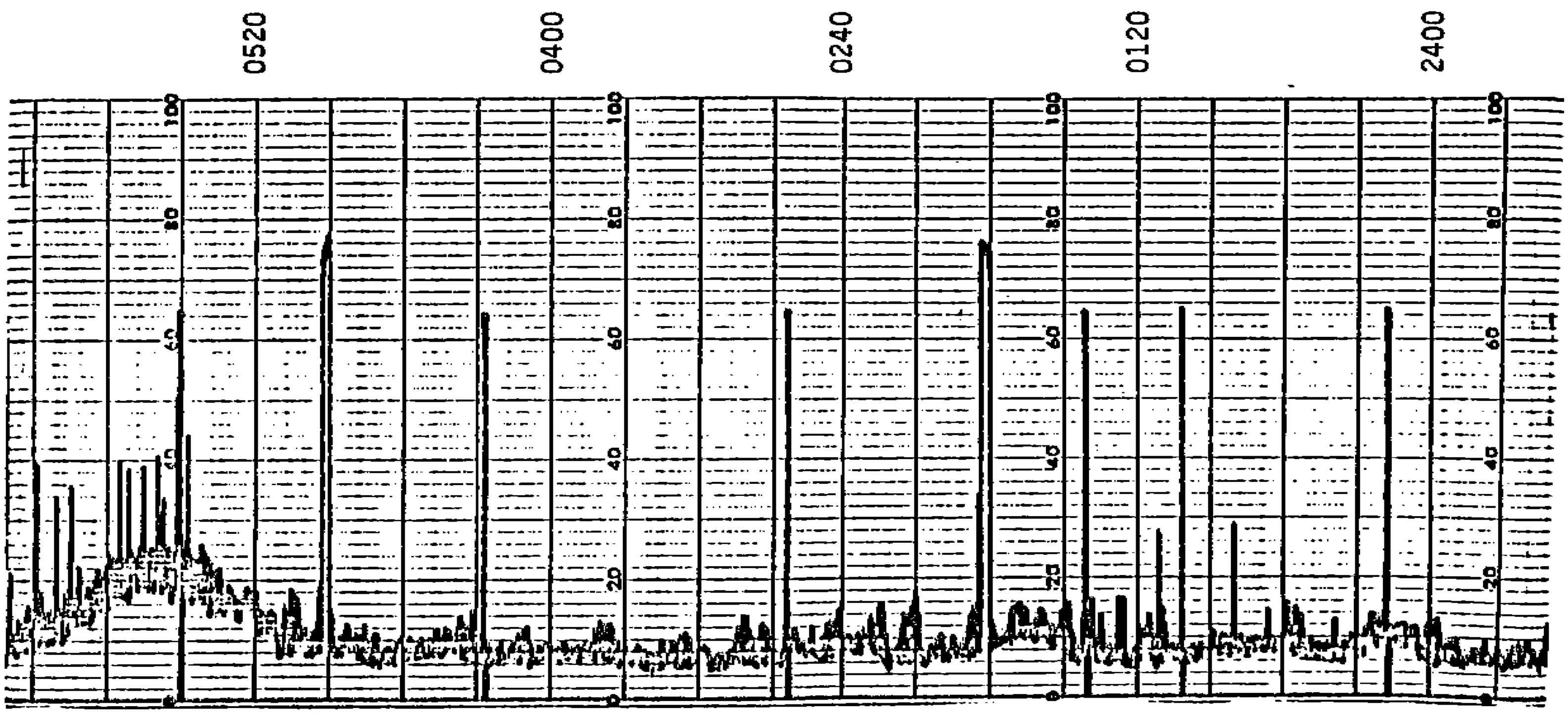

Figure 32. Opacity strip chart for May 4, 1981 (0120 to 0520 h).

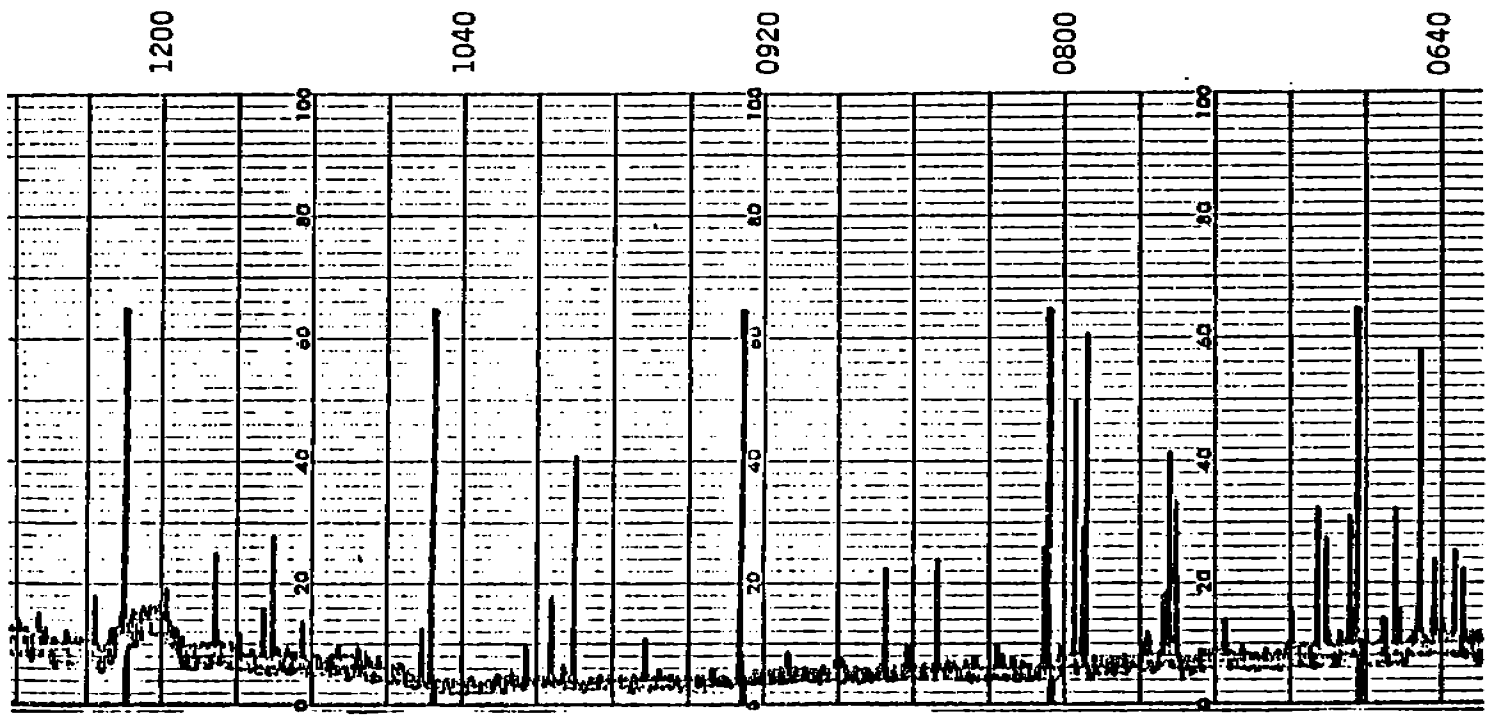

Figure 33. Opacity strip chart for May 4, 1981 (0640 to 1200 h).

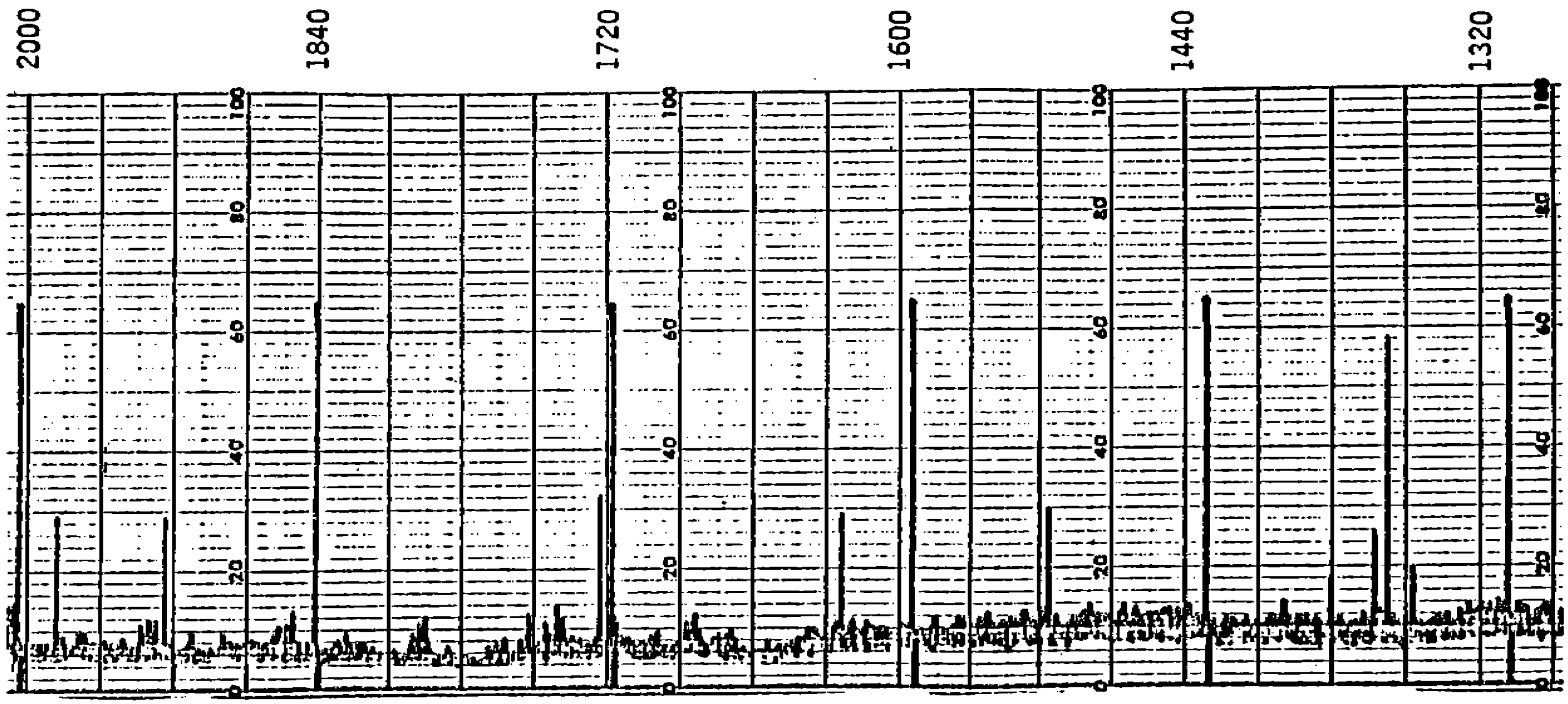

Figure 34. Opacity strip chart for May 4, 1981 (1320 to 2000 h).

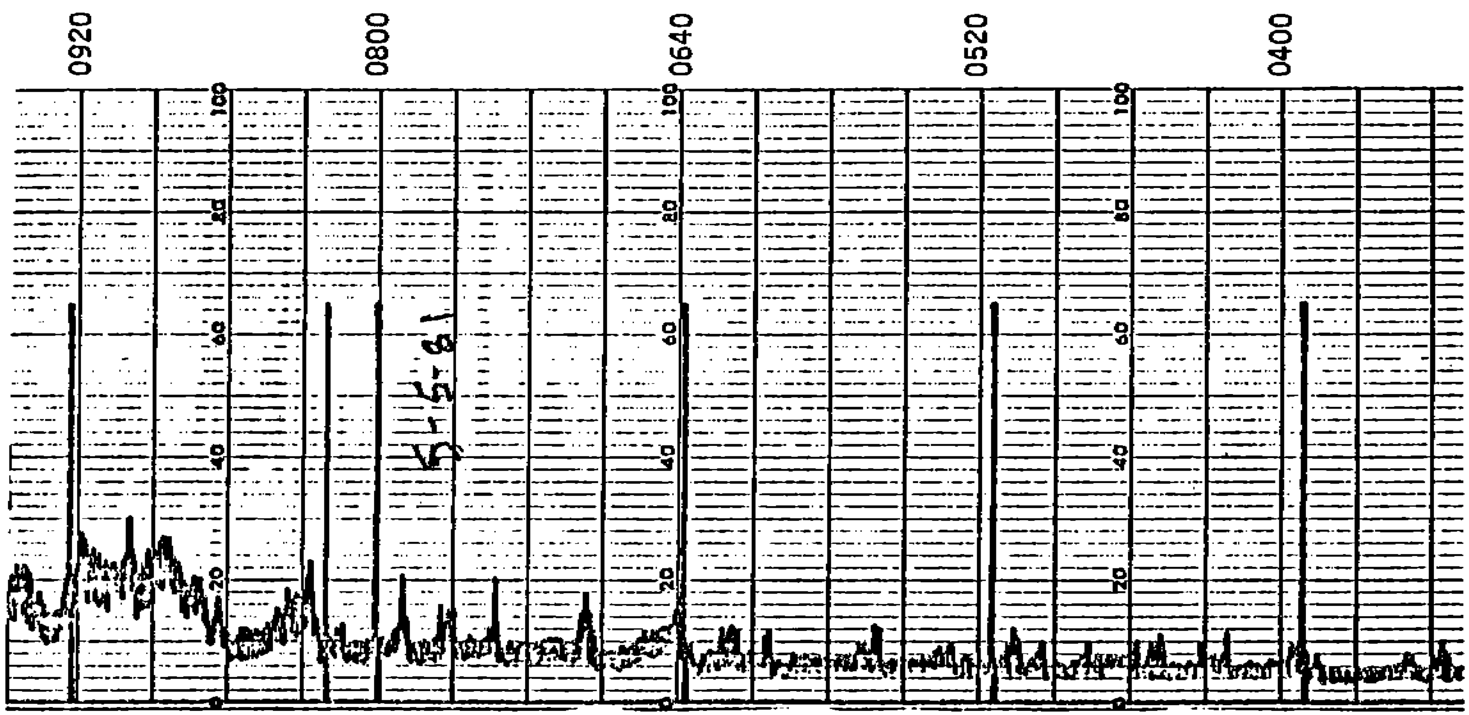

Figure 35. Opacity strip chart for May 5, 1981 (0400 to 0920 h).

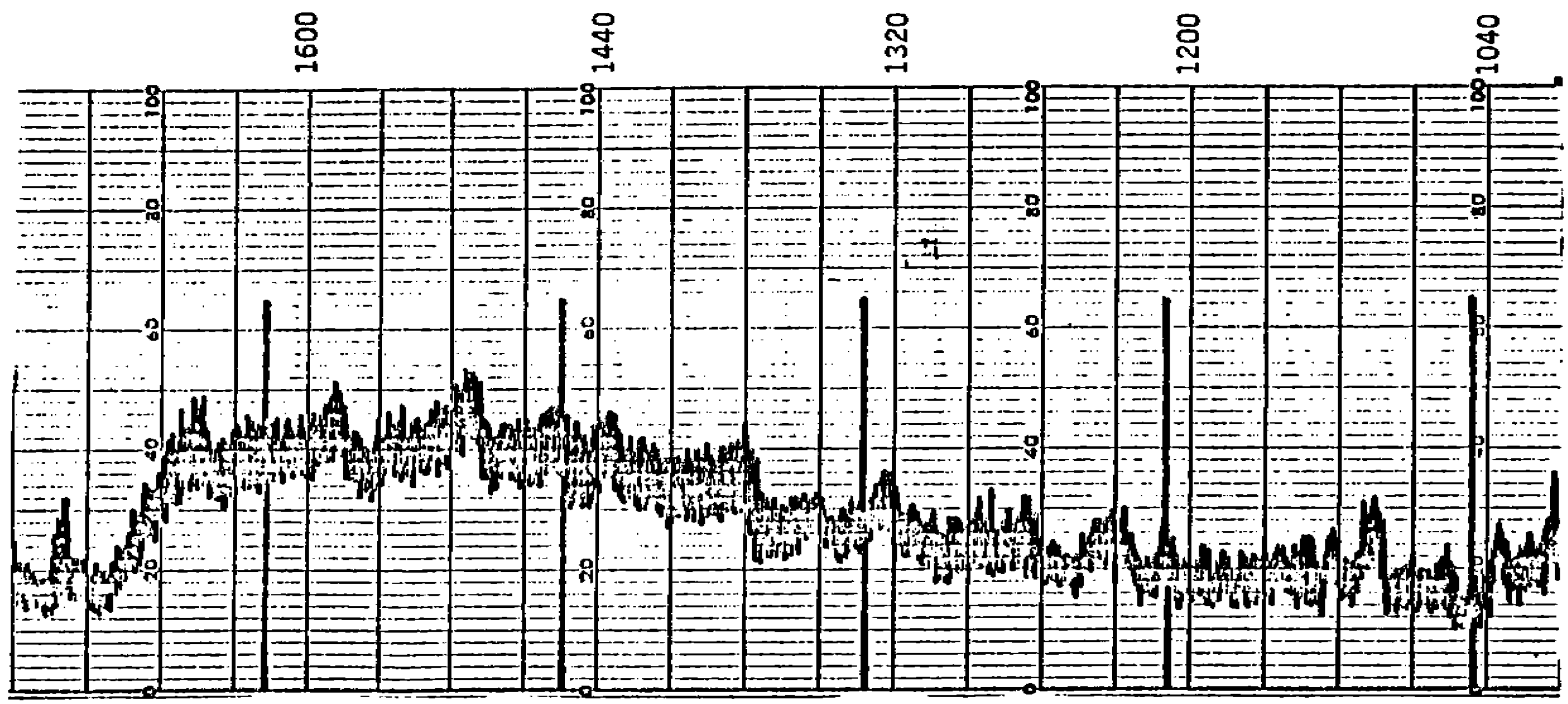

Figure 36. Opacity strip chart for May 5, 1981 (1040 to 1600 h).

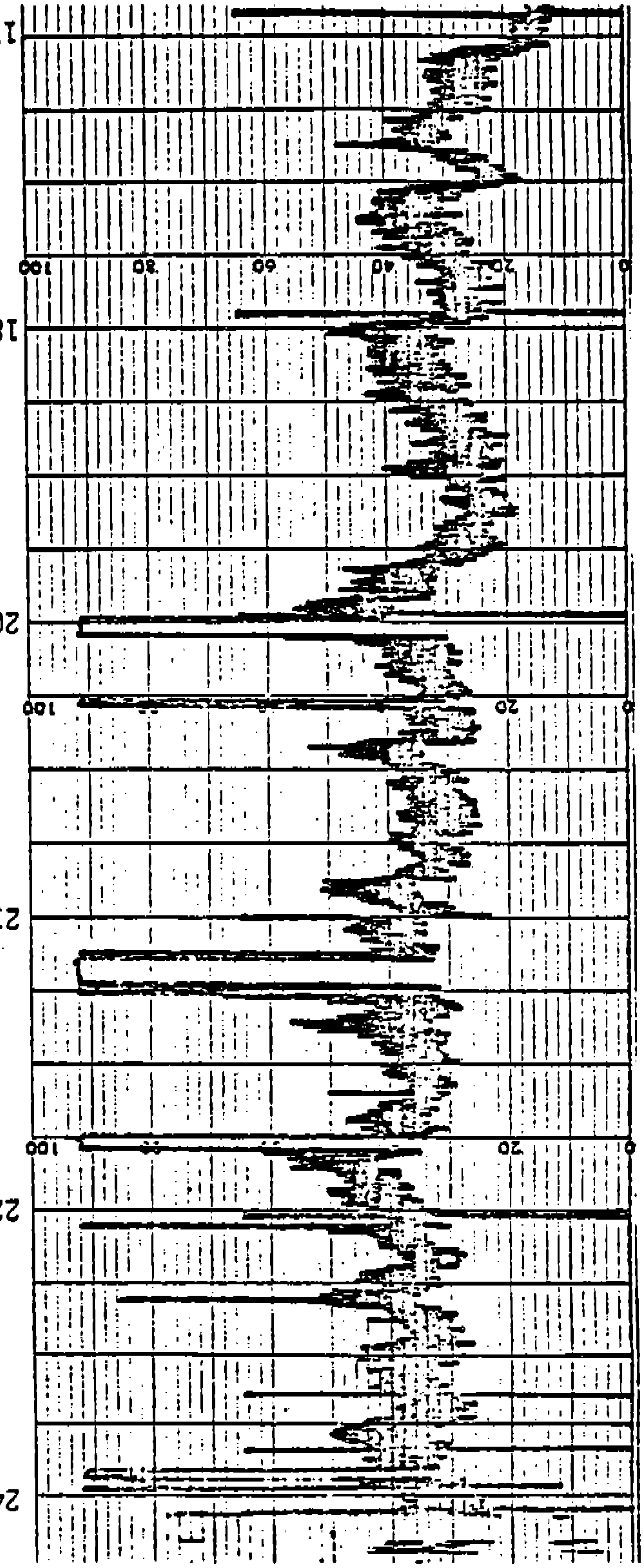

Figure 37. Opacity strip chart for May 5, 1981 (1720 to 2400 h).

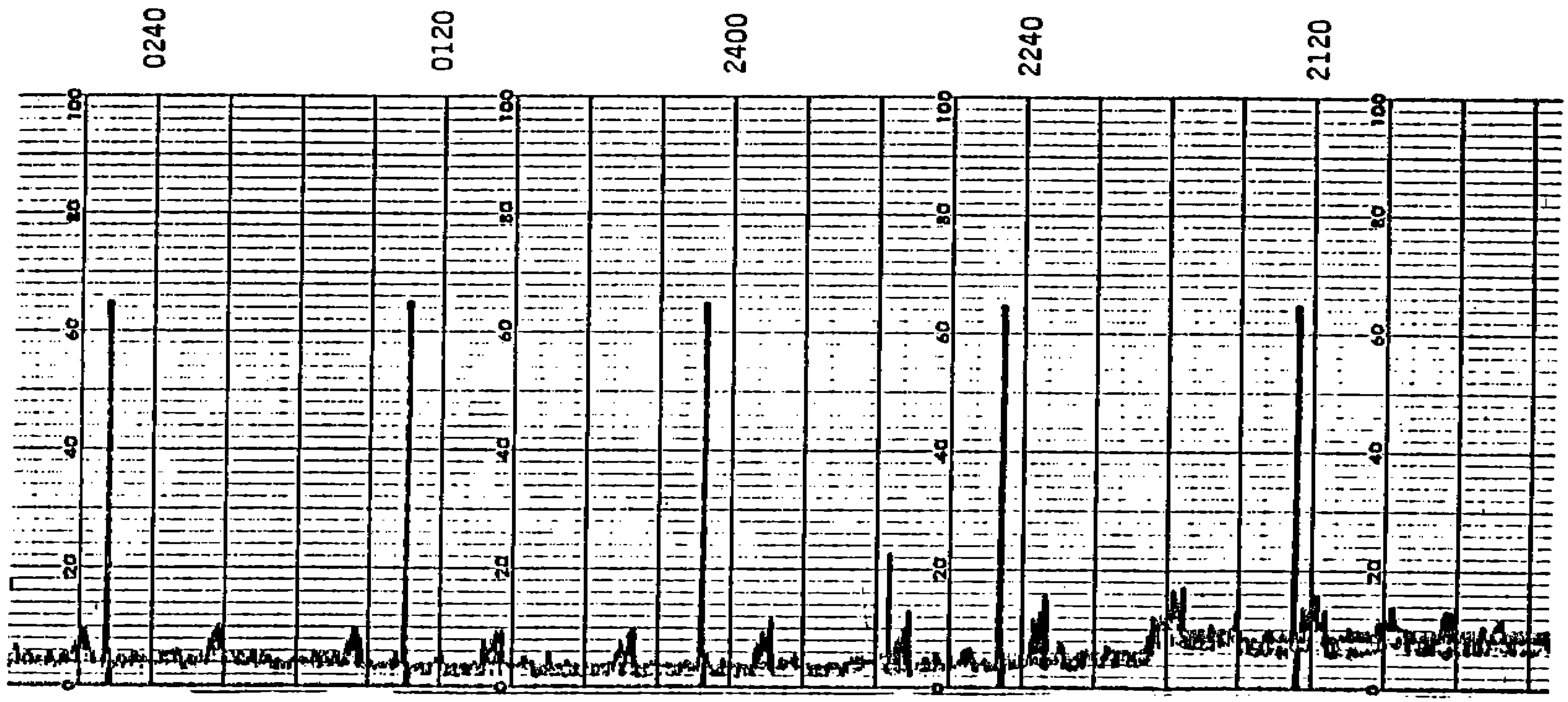

Figure 38. Opacity strip chart for May 5, 1981 (2120 to 2400 h) and May 6, 1981 (0120 to 0240 h).

TABLE 12. SUMMARY OF OPACITY DATA FOR INDIVIDUAL TEST RUNS

Date	Run No.	Time	Average opacity, %	Comment
5/1	I-31	0942 - 0957	8	
	I-31	1135 - 1205	6	
	I-32	1657 - 1721	6	
	0-21	0925 - 1225	7	
5/2	I-11	0945 - 957	5	
	I-11	1130 - 1154	5	
	I-12	1332 - 1347	6	
	I-41	1537 - 1607	6	
	I-41	1718 - 1741	-[a]	
	I-42	1850 - 1914	-	
	0-31	0730 - 1230	5	
	0-41	1538 - 1850	-	
	0-31	1642 - 1933	-	
5/4	I-21	0844 - 0857	6	
	I-21	1132 - 1201	8	
	I-22	1325 - 1349	10	
	I-12	1611 - 1623	7	
	I-14	1943 - 1958	6	
	I-13B	2110 - 2125	10	
	0-12	0840 - 1347	6	
	0-41	1108 - 1414	8	
	0-12	1723 - 2036	7	
5/5	I-32	0826 - 0844	10	Rapper reentrainment spikes all fields
	I-33	1000 - 1021	20	Rapper reentrainment spikes all fields
	I-34	1142 - 1203	20	Rapper reentrainment spikes all fields
	I-22	1443 - 1455	40	Heavy rapper reentrainment spikes all fields
	I-23	1610 - 1631	37	Heavy rapper reentrainment spikes all fields
	I-24	1742 - 1803	38	Heavy rapper reentrainment spikes all fields
	0-32	0855 - 1145	21	Heavy rapper reentrainment spikes all fields
	0-32	1447 - 1747	42	Heavy rapper reentrainment spikes all fields
	0-42	1526 - 1826	29	Heavy rapper reentrainment spikes all fields

(continued)

TABLE 12 (continued)

Date	Run No.	Time	Average opacity, %	Comment
5/6	I-42	1006 - 1027	-	
	I-43	1210 - 1231	-	
	I-44	1425 - 1443	-	
	O-22B	0905 - 1005	-	
	O-42	0830 - 1030	-	
	O-21B	1300 - 1600	-	
	O-11C	1323 - 1433	-	
	O-11C	1635 - 1835	-	
	O-22B	1743 - 2043	-	

[a]No data available.

May 6, was accompanied by a severe increase in rapper reentrainment spikes. The rapper pattern indicated reentrainment from all fields instead of the previously noted rapper spikes from the outlet field. The increased rapper spiking is indicative of overrapping as the dust resistivity is reduced. It should be noted that the raw meal composition was changed from Type I to Type II on May 5. This change generally would be accomplished by an increase in the silica content of the raw meal. The increased silica content would result in an increased burning temperature and cause an increase in the evaporation rate of alkali material in the kiln. The increased evaporation shifts the alkali recirculation equilibrium and results in a temporary increase in the uncontrolled emissions, which are composed of low-resistivity alkali particles. The fine particulate penetrates further into the ESP and results in higher rapper reentrainment losses (rapper intensity was fixed based on normal resistivity dust). As the alkali equilibrium is reestablished at the new feed meal chemistry, the alkali loss is reduced. The shift to normal conditions results in a decrease in opacity levels.

SECTION 4

ESP CHARACTERIZATION

4.1 GENERAL ESP DESCRIPTION

Electrostatic precipitators use electrically induced forces to separate charged particles from a gas stream. Three steps are involved in the precipitation process: particle charging, collection, and removal. Each step is affected by the electrical energization levels of the ESP and by the electrical properties of the particles and gas stream. Consequently, ESP performance is sensitive to corona power levels and electrical properties of the particle/gas stream.

An ESP system consists of mechanical and electrical equipment designed to effect the three process steps. A steel shell houses the internal equipment and provides an airtight enclosure. The shell is typically insulated for thermal stability and corrosion protection. Suspended within the shell are steel plates (collecting electrodes) connected to the grounded steel framework of the supporting structure. Suspended between the plates are metal wires (discharge electrodes), insulated from the ground and energized at voltages generally ranging from 20,000 to 60,000 volts (20 to 60 kV). These high voltage levels are generated by Transformer-Rectifier (T-R) sets. T-R sets transform low a.c. voltage to high a.c. voltage, and then rectify it to d.c. voltage with a negative polarity.

High d.c. voltage levels applied to the wire and plate configuration cause high electric field levels near the wires. High electric field levels ionize electronegative gas molecules (e.g., O_2, SO_2) near the wires; this occurrence is called corona. During ionization, free electrons and ions are produced and these charge carriers migrate toward the collection plate. Suspended particles collide with the charge carriers, and then become charged and influenced by the electric field. Under these conditions, strong electric forces act on the charged particles in the direction of the collection plate.

Rapping of the plates and wires periodically with hammers or vibrator systems is necessary to sustain the charging and collection process. The material that falls from the plates and wires is collected in a hopper.

Resistivity of the particle/gas stream can greatly limit ESP performance when it is outside the preferred range of 10^8 to 10^{10} ohm-cm. Resistivity plays a major role in the electrical conditions of the collection dust layer, influencing the electric field stress in the dust layer, the voltage drop across the dust layer, and the electrical force component holding the dust layer to the collection plate. Resistivity also affects the energization levels due to its impact on particle charging, and the interdependent relationship between dust layer conditions and the operating voltage and current levels.

As resistivity levels digress from the preferred range, collection performance levels will be reduced. For ESP's treating streams with fluctuating resistivity levels (e.g., different temperature, moisture, fuel quality), special or different ESP operation may be necessary to maintain collection performance.

At low temperatures (<175°F), current conduction occurs principally along the surface layer of the particle and is related to the absorption of water vapor and other conditioning agents in the flue gas. At elevated temperatures (<400°F), conduction takes place primarily through the bulk of the material, and resistivity depends on the chemical composition of the material.

As noted in the previous section, the dust emitted from the kiln may be bimodal consisting of a large fraction composed of calcium and silica compounds and a fine fraction composed of alkali materials (Na_2SO_4, KCl, KOH, NaCl, etc.). In general, the alkali materials are lower in resistivity than the calcium-based material. The effects of the elemental composition are more severe in the temperature range between 250° and 450°F. No resistivity data were taken on the collected dust, but based on experience, the resistivity for a wet process kiln is between 5×10^{10} and 1×10^{11} ohm-cm (30 percent moisture and flue gas temperature between 400° and 500°F).

It should be noted that changes in kiln flue gas moisture, temperature, and alkali content result in major changes in dust resistivity. Most of the effects of elemental composition are modified by the presence of moisture (surface conductivity). Unmodified dust has a much higher resistivity (10^{15} - 10^{16} ohm-cm) that limits power input to the ESP (W/ft^2 of plate).[7]

An ESP is composed of sections that are individually energized by separate T-R sets. Individual sections are advantageous because of several performance and reliability factors. The particle-laden stream entering the ESP becomes adequately charged almost immediately, allowing the electric field to move most of the large particles to the plate for collection. These large particles represent 70 to 80 percent of the mass concentration and are the most easily collected particles. The smaller and more difficult to collect particles penetrate the first field and enter the second field. Since the particle concentration and size distribution have decreased, the second field treats a characteristically different gas stream. The charging and collection processes in the second field reflect this difference by operating at a slightly higher power level. The third section treats a stream with a further reduced concentration and size distribution. This stream represents about 10 percent of the mass and the most difficult to collect fine particles. Because the fine particulate in the gas stream is composed of alkali materials, the ESP selectively separates particulate according to size and composition by field.

The kiln's exhaust stream contains large amounts of material similar in composition to the kiln feed. Therefore, the return of this material has a direct economic value. The alkali-bearing constituents account for the majority of fine particle concentration and tend to be collected in the outlet field of the ESP. One common problem with many cement plants is that feed materials contain more alkali than is permitted in the clinker product. The alkali-enriched material collected in the outlet section is therefore usually disposed of, as was the case for the test facility.

4.2 ESP SPECIFICATION AND NORMAL OPERATION

Particulate emissions from Kiln 2 are controlled by an ESP manufactured by Wheelabrator-Frye, Inc. The unit was installed in 1975 as a replacement for the original ESP. The existing ESP has three electrical fields in the direction of flow, each section energized by separate but identical T-R sets. The unit has three pyramidal-shaped hoppers in which dust is continuously removed from the hoppers through rotary air locks and into screw conveyors.

Collected dust from the first two hoppers is insufflated back to the kiln for reprocessing. Dust from the last hopper is pneumatically conveyed to a storage tank for removal by truck.

Design specifications for the tested ESP are presented in Table 13. This listing of the design factors is organized into three categories: hardware, electrical, and application. Hardware specifications identify the significant mechanical and dimensional characteristics of the unit. Electrical specifications describe the rated power, voltage, and current levels of the T-R sets along with other electrical qualifiers used later in this report. The application category includes the important gas and particulate characteristics encountered by the ESP.

A review of the specifications indicates that the ESP has conventional wire-to-plate design features with typical electrical energization and electrode spacing. Notable design features include 1) 1-in. diameter framing to support and locate the discharge wires, 2) hammers for both wire and plate rapping systems, 3) three fields energized with 78.5 kVA T-R's each, and 4) a design-specific collection efficiency area of 384 ft^2/1000 acfm at 600°F. The guaranteed design collection efficiency is 99.93 percent, contingent on the following operating conditions: gas volume of 240,000 acfm at 600°F, inlet dust loading of 15 gr/acfm or more, minimum 30 percent moisture by volume, insufflation of dust from first two hoppers (fields), and catch from outlet hopper (field) being discarded.

Stack testing was conducted to determine the initial performance of the ESP during May 1975 by an independent test crew. Inlet tests were conducted by use of the ASME Power Test Code PTC-27, consisting of a regular sampling train and an in-stack alundum thimble followed by an impinger and standard gas meter. Outlet tests were conducted in accordance with the EPA Methods for Standard of Performance for New Stationary Sources, more commonly known as EPA Method 5.

Results from guarantee-performance tests are presented in Table 14. Average efficiency level was determined to be 99.97 percent for a mean inlet loading of 49.8 gr/dscf. The corresponding specific corona power level for the average of the three tests was 478 W/1000 acfm.

In order to assess and qualify the normal operation of the test facility, PEDCo directed the acquisition of the ESP operating log sheets for the 90-day

TABLE 13. ESP DESIGN SPECIFICATIONS

Hardware specifications	
Manufacturer	Wheelabrator-Frye, Inc.
Manufacturer contract number	06-1326
Year installed	1975
Collection plate area (total)	92,252 ft^2
Number of chambers	1
Number of fields	3
Plate spacing	12 in.
Plate height	30.8 ft
Plate width	12.5 ft
Number of gas passages	40
Cross-sectional area	1232 ft^2
Linear ft of discharge wire	86,400 ft
Rapper type (plate)	Hammers
Rapper type (wires)	Hammers
Electrical specifications	
Number of T-R sets	3
Rating(s) of T-R set	78.5 kVA
Maximum primary voltage	440 V
Maximum primary current	178 A
Maximum secondary voltage	55 kV
Maximum secondary current	1000 mA
Maximum current density/plate area	0.0325 mA/ft^2
Maximum current density/electrode length	0.035 mA/ft
Application specifications	
Gas flow rate, total	240,000 acfm
Gas temperature, inlet	600°F
Gas composition	30% H_2O by volume
Gas velocity, superficial	3.25 ft/s
Specific collection area (SCA)	384 ft^2/acfm
Collection efficiency	99.93%
Particulate concentration, inlet	15.0 gr/acf
Particulate concentration, outlet	0.01 gr/acf

TABLE 14. SUMMARY OF INITIAL ESP PERFORMANCE TESTS

	Tests			
	1	2	3	Avg.
Date	5-21-75	5-21-75	5-22-75	
Gas volume, acfm	198,200	200,500	201,100	199,933
Inlet temperature, °F	588	588	585	587
Outlet temperature, °F	498	488	495	494
Percent moisture	40.7	44.5	42.3	42.5
Inlet dust concentration, gr/dscf	48.4	45.6	55.3	49.8
Inlet dust concentration, gr/acfm	15.0	13.0	16.2	14.7
Outlet dust concentration, gr/dscf	0.0222	0.0096	0.0099	0.0139
Oulet dust concentration, gr/acfm	0.0079	0.0033	0.0036	0.0049
Efficiency	99.94	99.98	99.98	99.97
Total ESP input power (primary) kVA	137.6	136.9	135.2	136.6
Specific corona power @ 70% T-R set transfer efficiency, W/1000 acfm	486	478	471	478

period preceding the scheduled IP tests. Collection and review of the pretest ESP operating data provided 1) assurance that the ESP was operated in a normal fashion prior to and during the IP testing, 2) documentation of normal operating levels and variations, and 3) indicators for evaluating ESP reliability.

Table 15 presents a summary of the ESP electrical data for each of the three months prior to testing. (Appendix I contains all ESP power levels from April 30 to May 6, 1981 for Kiln 2.) The data are organized to show the monthly mean values and the experienced minimum and maximum levels taken from available instrumentation. Each of the three T-R sets is instrumented with primary voltage, primary current, and secondary current meters. The monthly mean values show reasonably steady levels for each of the 10 electrical categories. A review of the minimum and maximum values, however, shows that minor fluctuations do exist and are more pronounced for the primary voltage levels than for the other electrical categories. Power consumption level, which is the principal indicator of ESP collection performance, remained reasonably steady throughout the 3-month period.

The operating log sheets show that the ESP operated continuously during the 3-month period except for two kiln outages. A survey of ESP electrical levels before and after the outage periods reflects conditions that are within the normal range of fluctuations experienced during continuous operating periods. This relative stability of ESP operating levels supports the log entry that the kiln's need for servicing was responsible for the experienced outages.

Reliability of the ESP is reflected by the stability of the electrical operating conditions and the frequency of outages dictated by service requirements. The following evidence obtained from the daily log sheets indicates high ESP reliability performance: 1) the minor level of fluctuations experienced, 2) the repetitive restoration to higher power consumption levels after relatively low levels are encountered, and 3) the absence of outages due to ESP service requirements.

4.3 ESP ANALYSIS DURING IP TESTING

Test personnel were responsible for acquiring ESP operating data during the test period from available instrumentation. Operating data for the ESP consisted of the electrical readings logged from the primary voltage, primary

TABLE 15. SUMMARY OF ESP OPERATING DATA DURING 90-DAY PRETEST PERIOD

Period		1st field			2nd field			3rd field			Power
		ACV[a]	ACA[b]	DCA[c]	ACV	ACA	DCA	ACV	ACA	DCA	kVA[d]
Mean Values											
Feb. 1981		345	148	0.68	355	150	0.65	315	153	0.72	151.4
March 1981		350	150	0.68	360	149	0.65	330	144	0.66	152.3
April 1981		350	145	0.67	360	147	0.63	147	0.63	0.64	148.0
Range of values											
Feb:	min	310	125	0.52	300	140	0.60	280	145	0.64	139.4
	max	390	150	0.70	400	155	0.74	370	160	0.74	162.3
March:	min	320	145	0.66	350	145	0.62	310	140	0.64	148.5
	max	380	150	0.68	380	150	0.66	345	145	0.68	157.4
April:	min	330	125	0.58	350	145	0.62	290	140	0.62	143.6
	max	360	150	0.68	380	150	0.66	350	150	0.64	153.3

[a]ACV = PRIMARY VOLTAGE, volts

[b]ACA = PRIMARY CURRENT, amperes

[c]DCA = SECONDARY CURRENT, amperes

[d]kVA = kilovolt-amps = (ACV) x (ACA)

current, and secondary current meters from each of these T-R sets. Hourly recordkeeping of the electrical data was specified for the initial sampling periods. Since steady electrical levels were experienced during the initial test period (i.e., variations less than 1 percent), hourly logging was considered unnecessary and the frequency was extended to recordkeeping before and after a given test series. Steady electrical data persisted throughout the test program except for the final testing day. As indicated previously, the cement produced changed from Type I to Type II for the final two test days along with a noteworthy reduction in ESP power level for the last day.

To supplement ESP electrical data and to account for significant conditions experienced by the ESP, certain data were extracted from computerized sampling run sheets provided by MRI. Table 16 presents the ESP operating conditions and includes ESP corona power levels and measured inlet and outlet conditions for the gas flow rate, gas temperature, oxygen, and moisture content. This table is organized in chronological order to depict the conditions experienced by the ESP and to relate these conditions to certain process conditions.

Review and comparison of inlet and outlet conditions in Table 16 provide an account of ESP power levels, gas temperatures, moisture, and oxygen contents. Inlet gas temperature levels are consistently 40° to 50°F higher than outlet temperatures as a result of normal heat losses. A comparison of inlet to outlet levels for both oxygen and moisture contents shows equivalent averaged values, indicating no significant amounts of air inleakage through the ESP. A comparison of gas flow rates determined by inlet and outlet pitot measurements, however, shows a substantial discrepancy for most test periods. Chronologically based levels of inlet and outlet gas flow rates are not in agreement, do not show a consistent trend, and cannot be totally supported by review of process conditions. The apparent gas flow rate discrepancy adversely impacts flow-calculated values for emisssion rates and flow-based ESP performance parameters (i.e., specific collection area and specific corona power).

The reason for the apparent discrepancy in gas flow rates is due to the single-point sampling protocol. IP sampling protocol stipulates that sample locations be determined on a geometrical basis instead of a representative basis determined by an average velocity location. Gas velocity levels

TABLE 16. ESP OPERATING CONDITIONS DURING TEST PERIOD

Date	MRI Run no.[a]	ESP corona power level, kW	Gas flow, 1000 acfm		Gas temperature, °F		Moisture content, percent by volume		Oxygen content, percent by volume	
			Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
5/1	I-31 M	106.6	198.1		397.0		29.5		8.30	
	I-31 A	106.6			408.0		28.2		8.30	
	0-21 M	106.6		87.5		349.0		25.2		8.33
	I-32 A	106.6			391.0		29.2		8.30	
	AVG.	106.6	198.1		398.7	349.0	29.0	25.2	8.30	8.33
5/2	I-11 M	105.9	152.9		391.0		31.5		8.30	
	I-11 A	105.9			404.0		25.5		8.30	
	0-31 M	105.9		136.0		345.0		25.2		8.33
	I-12 A	105.9			384.0		25.0		8.30	
	I-41 M	105.9	169.9		353.0		22.0		8.30	
	I-41 A	105.9			379.0		29.2		8.30	
	I-42 A	105.9			386.0		28.6		8.30	
	0-41 M	105.9		222.5		338.0		27.6		8.33
	0-31 A	105.9				341.0		27.7		8.33
	AVG.	105.9	161.4		382.8	341.3	27.0	26.8	8.30	8.33
5/4	I-21 M	105.2	160.2		417.0		31.2		8.25	
	I-21 A	105.2			376.0		30.5		8.25	
	I-22 A	105.2			364.0		31.2		8.25	
	0-12 M	105.2		106.8		345.0		22.3		5.83
	0-41 A	105.2				341.0		29.7		5.83
	I-12 M	105.2	137.9		366.0		31.5		8.25	
	I-14 A	105.2			374.0		27.7		8.25	
	0-12 A	105.2				322.0		34.5		5.83
	I-13B A	105.2			382.0		27.7		8.25	
	AVG.	105.2	149.1		379.8	336.0	30.0	28.8	8.25	5.83

(continued)

TABLE 16 (continued)

Date	MRI Run no.[a]	ESP corona power level, kW	Gas flow, 1000 acfm Inlet	Gas flow, 1000 acfm Outlet	Gas temperature, °F Inlet	Gas temperature, °F Outlet	Moisture content, percent by volume Inlet	Moisture content, percent by volume Outlet	Oxygen content, percent by volume Inlet	Oxygen content, percent by volume Outlet
5/5	I-32 M	105.4	189.4		373.0		31.2		8.25	
	I-32 A	105.4			364.0		32.2		8.25	
	I-34 A	105.4			346.0		32.1		8.25	
	0-32 M	105.4		142.1		318.0		29.2		8.33
	I-22 M	105.4	153.7		348.0		30.8		8.25	
	I-23 A	105.4			344.0		29.9		8.25	
	I-24 A	105.4			359.0		27.6		8.25	
	0-32 A	105.4				308.0		29.2		8.33
	0-42 M	105.4		203.6		313.0		27.5		8.33
	AVG.	105.4	171.6		355.7	313.0	30.6	28.6	8.25	8.33
5/6	I-42	99.7	177.0		351.0		31.6		8.00	
	0-22B M	99.7		101.5		310.0		29.4		8.00
	0-42 A	99.7				316.0		28.4		8.00
	I-43 A	99.7			363.0		31.5		8.00	
	I-44 A	99.7			382.0		24.0		8.00	
	0-21B A	99.7				330.0		28.4		8.00
	0-11C M	99.7		113.8		338.0		29.6		8.00
	0-11C A	99.7				317.0		29.7		8.00
	0-22B A	99.7				301.0		29.0		8.00
	AVG.	99.7	177.9		365.3	318.7	29.0	29.1	8.00	8.00
OVERALL AVG.		104.6	167.5		375.1	327.0	29.1	28.3	8.24	8.24

[a]Run number suffix M designates mass tests; suffix A designates Andersen tests.

corresponding to the geometrically determined sampling location are not representative of the actual flow conditions.

Table 17 presents several ESP performance parameters, including measured inlet and outlet mass concentrations, and calculated values for collection efficiency, penetration, specific corona power, and SCA. Efficiency and penetration were calculated from the averages of inlet and outlet mass concentration tests. Calculated efficiency levels were in a narrow range from 99.978 to 99.993 percent. Penetration results reveal a wider range of values varying from 0.00725 to 0.0220.

Values for specific corona power and SCA are presented for each test day. Two values are included for each gas flow-based performance indicator as determined by traverse and single-point pitot tube measurements. Specific corona power and SCA values were determined for analytical purposes. Specific collection area is used in the Deutsch-Anderson equation to determine the migration velocity term "w," also known as precipitation rate parameter, based on collection plate area. Specific corona power is used in an equation developed by H. J. White to determine an analogous precipitation rate parameter term "k," based on energization level. A review of the precipitation rate parameter values for both flow bases indicates 1) minor variations in ESP performance, 2) close agreement with design values, and 3) reasonable agreement with values contained in the literature.

Deutsch-Anderson performance equation:

$$n = 1 - e^{-(A/V)w}$$

White's corona power equation:

$$n = 1 - e^{-0.06\ (Pc/V)K}$$

where:

n = efficiency, fraction
A = collection plate area, ft^2
V = gas volume rate, acfm
w = migration velocity, ft/min
Pc = corona power, W
K = nontitled precipitation rate parameter

TABLE 17. ESP PERFORMANCE CHARACTERISTICS DURING TEST PERIOD

Date	MRI Run no.	Mass concentration, g/dscf		Collection efficiency, percent	Penetration, percent	Specific corona power, W/1000 acfm		Specific collection area, ft^2/1000 acfm		Migration velocity (W), ft/s	
		Inlet	Outlet			a	b	a	b	a	b
5/1	I-31 0-21	29.9	 0.0060								
	AVG.	29.9	0.0060	99.980	0.0201	585	536	506	466	0.280	0.304
5/2	I-11 0-31 I-41 0-41	98.2 34.8	 0.0099 0.0058								
	AVG.	66.5	0.0079	99.988	0.0118	581	656	506	572	0.298	0.264
5/4	I-21 0-12 I-12	106.7 174.9	 0.0194								
	AVG.	140.8	0.0194	99.986	0.0138	577	706	506	619	0.293	0.275
5/5	I-32 0-32 I-22 0-42	39.3 69.7	 0.0051 0.0028								
	AVG.	54.5	0.00395	99.993	0.00725	578	614	506	538	0.314	0.295

(continued)

TABLE 17 (continued)

Date	MRI Run no.	Mass concentration, g/dscf		Collection efficiency, percent	Penetration, percent	Specific corona power, W/1000 acfm		Specific collection area, ft^2/1000 acfm		Migration velocity (W), ft/s	
		Inlet	Outlet			a	b	a	b	a	b
5/6	I-42 0-22B 0-11C	72.6 	 0.0240 0.0075								
	AVG.	72.6	0.0158	99.978	0.0220	547	560	506	519	0.277	0.270
Type I avg.		79.1	0.0111	99.985	0.0153	581	633	506	552	0.289	0.265
Type II avg.		63.6	0.0099	99.986	0.0140	563	587	506	528	0.292	0.280

[a] Based on gas flow value obtained from pitot tube traverse data.

[b] Based on gas flow value obtained from single-point pitot tube data.

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APPENDIX A

SAMPLE CALCULATIONS

Slurry feed rate, tons/h

- o Integrator reading from kiln log in rev/h
- o Slurry moisture content from kiln log
- o Slurry feed constant (c) from conversion chart - dry solids per slurry tank foot as a function of moisture.

$$\text{Dry slurry feed (tons/h)} = \frac{(\text{rev/h})(4.9\ \text{ft}^3/\text{rev})(c\ \text{tons/tank ft})}{(2{,}376\ \text{ft}^3/\text{tank ft})}$$

Dry insufflation dust feed rate, tons/h

- o Integrator reading from kiln log in rev/h

Insufflation rate (tons/h) = (rev/h)(0.0075)

APPENDIX B

CEMENT KILN FEED RATES AND CONDITIONS
MAY 1-6, 1981

5/1/81

TABLE A-1. CEMENT KILN FEED RATES

TIME	KILN FEED	% M	C FACTOR	SOLIDS TON/HR	CLINKER TON/HR	DUST FEED	DUST RATE TON/HR	TOTAL FEED TON/HR	
7									
8	322	30.96	89.81	59.64		1820	13.65	73.29	
9	324			60.01		1788	13.41	73.42	
10	322			59.64		1775	13.31	72.95	
11	323			59.82		1807	13.55	73.37	
12	323			59.82		1803	13.52	73.34	
1	324			60.01		1837	13.78	73.79	
2	326			60.38		1930	14.48	74.86	
3	326			60.38		1760	13.20	73.58	
4	325	31.04	.89.59	60.05		1862	13.96	74.01	
5	327			60.42		1865	13.99	74.41	
6	323			59.68		903	6.77	66.45	
7	323			59.68		605	4.54	64.22	
8	324			59.86		2806	21.05	80.91	
9	324			59.86		1809	13.57	73.43	
10	323			59.68		1824	13.68	73.36	
11	324			59.86		1306	9.79	69.65	
12	324	31.64	88.23	58.95		2313	17.34	76.29	
1	322			58.59		1308	9.81	68.40	
2	323			58.77		2292	17.19	75.96	
3	325			59.14		2500	18.75	77.88	
4	323			58.77		1640	12.30	71.07	
5	330			60.05		1770	13.28	73.33	
6	328			59.68		1790	13.43	73.11	
7	330			60.05		2220	16.65	76.70	
26									
27									
28									
29									
30									
31									

NOTES

5/2/81

TABLE A-2. CEMENT KILN FEED RATES

TIME	KILN FEED	% M	C FACTOR	SOLIDS TON/HR	CLINKER TON/HR	DUST FEED	DUST RATE TON/HR	TOTAL FEED TON/HR
7								
8	327	31.6	88.32	59.56		1454	10.91	70.47
9	330			60.11		1836	13.92	74.03
10	328			59.74		1805	13.54	73.28
11	329			59.92		1800	13.50	73.42
12	328			59.74		18.32	13.74	73.48
1	329			59.92		1802	13.52	73.44
2	329			59.92		1791	13.43	73.35
3	329			59.92		1818	13.64	73.56
4	329	31.56	88.41	59.99		1803	13.52	73.51
5	330			60.17		1797	13.48	73.65
6	328			59.90		1811	13.58	73.38
7	325			59.26		[illegible]	10.04	69.30
8	[illegible]			59.99		2909	21.82	81.81
9	[illegible]			59.96		[illegible]	13.99	73.79
10	[illegible]			59.86		1841	13.80	73.60
11	328	31.56	88.96	60.11		2115	15.86	75.97
12	[illegible]			59.74		1505	11.27	71.01
1	[illegible]			60.11		1919	14.39	74.50
2	[illegible]			59.74		1179	8.89	67.73
3	[illegible]			59.56		1107	8.30	67.86
4	327			59.92		1560	11.71	71.63
5	328			60.11		1833	13.75	73.86
6	328			60.11		1347	10.10	70.21
7	326			59.72		2425	18.19	77.93
26								
27								
28								
29								
30								
31								

NOTES

5/3/81

TABLE A-3. CEMENT KILN FEED RATES

TIME	KILN FEED	% M	C FACTOR	SOLIDS TON/HR	CLINKER TON/HR	DUST FEED	DUST RATE TON/HR	TOTAL FEED TON/HR	
7									
8	329	31.40	88.77	60.23		1846	13.85	74.08	
9	327			59.86		1659	12.44	72.30	
10	327			59.86		0	0	59.86	
11	326			59.68		0	0	59.68	
12	327			59.86		1651	12.38	72.24	
1	329			60.05		1996	14.97	75.02	
2	325			59.49		1921	14.41	73.90	
3	326			59.68		1911	14.33	74.01	
4	327	30.06	91.84	61.93		1892	14.19	76.12	
5	326			61.74		2100	15.75	77.49	
6	323			61.18		1695	12.71	73.89	
7	323			61.18		1637	12.28	73.46	
8	[illegible]			61.18		986	7.395	68.58	
9	[illegible]			61.18		1186	8.89	70.07	
10	[illegible]			60.99		1175	8.81	69.80	
11	327	31.44	88.65	59.07		2542	19.06	78.13	
12	[illegible]			58.89		1327	9.95	68.72	
1	[illegible]			59.77		1891	14.18	73.25	
2	[illegible]			59.09		1925	14.22	73.31	
3	327			59.07		1921	14.41	73.48	
22	327			58.89		1927	14.45	73.34	
23	327			59.80		1968	14.76	74.56	
24	327			59.80		1931	14.48	74.28	
7	328			59.98		1937	14.53	74.51	
26									
27									
28									
29									
30									
31									

NOTES

TABLE A-4. CEMENT KILN FEED RATES 5/4/81

TIME	KILN FEED	% M	C FACTOR	SOLIDS TON/HR	CLINKER TON/HR	DUST FEED	DUST RATE TON/HR	TOTAL FEED TON/HR	
7									
8	327	31.64	88.23	59.50		1935	14.51	74.01	
9	328			59.68		1923	14.42	74.10	
10	172			31.29		156	1.17	32.46	
11	326			59.32		1670	12.53	71.85	
12	327			59.50		1945	14.58	74.08	
1	326			59.32		1888	14.16	73.48	
2	328			59.68		1892	14.19	73.87	
3	330			60.05		1860	13.95	74.00	
4	329	31.76	87.96	59.68		1850	13.88	73.56	
5	322			58.41		1879	14.09	72.50	
6	326			59.14		1887	14.15	73.29	
7	327			59.32		868	6.51	65.83	
8	[illegible]			59.32		2291	17.18	76.50	
9	327			59.32		510	3.83	63.15	
10	327			59.32		889	6.67	65.99	
11	325			55.50		1550	11.63	71.13	
12	330	31.80	87.87	59.80		1522	11.42	71.22	
1	329			59.62		2010	15.08	74.75	
2	329			59.62		1905	14.29	73.91	
3	330			59.80		19.35	14.51	74.31	
4	331			59.98		1952	14.64	74.62	
5	333			60.34		1967	14.75	75.09	
6	328			59.44		1896	14.22	73.66	
7	330			59.80		1917	14.38	74.18	
~~26~~									
~~27~~									
~~28~~									
~~29~~									
~~30~~									
~~31~~									

NOTES

TABLE A-5. CEMENT KILN FEED RATES

5/5/81

TIME	KILN FEED	% M	C FACTOR	SOLIDS TON/HR	CLINKER TON/HR	DUST FEED	DUST RATE TON/HR	TOTAL FEED TON/HR	
7									
8	328	31.96	87.51	59.19					
9	330			59.53		1916	14.37	73.56	
10	330			59.55		2124	15.93	75.48	
11	331			59.74		1720	12.90	72.45	
12	330			59.55		1912	14.34	74.08	
1	333			60.09		1902	14.27	73.82	
2	332			59.92		1906	14.30	74.39	
3	331			59.41		1884	14.13	74.05	
4	331	31.84	87.78	59.92		1887	14.15	73.56	
5	331			59.92		1908	14.31	74.23	
6	328			59.39		1898	14.24	74.16	
7	333			60.28		1874	14.06	73.44	
8	333			60.26		1939	14.54	74.82	
9	331			59.92		1479	11.09	71.37	
10	332			60.10					
11	332			60.16					
12	330	31.80	87.97	59.70					
1	331			59.98		—			
2	332			60.16					
3	333			60.34		1747	13.10	73.63	
4	332			60.16		1964	14.73	75.07	
5	333			60.34		1988	14.91	75.07	
6	332			60.86		1965	14.74	75.08	
7	331			59.98		1953	14.65	74.81	
-26-						1469	11.02	71.00	
-27-									
-28-									
-29-									
-30-									
-31-									

NOTES

TABLE A-6. CEMENT KILN FEED RATES 5/6/81

TIME	KILN FEED	% M	C FACTOR	SOLIDS TON/HR	CLINKER TON/HR	DUST FEED	DUST RATE TON/HR	TOTAL FEED TON/HR
7								
8	332	31.96	87.51	~~58~~.59.92		1978	14.08	74.00
9	332			59.92		1041	7.91	67.73
10	337			60.42		[illegible]	14.55	75.37
11	333			60.09		1940	[illegible]	74.64
12	335			60.46		1920	14.40	74.86
1	330			59.55		1158	[illegible]	68.24
2	330			59.55		[illegible]	14.50	74.05
3	330			59.55		[illegible]	5.61	65.16
4	327	31.52	88.50	59.68		[illegible]	13.50	73.18
5	327			59.68		1390	10.42	70.10
6	325			59.32		[illegible]	[illegible]	72.78
7	330			60.23		[illegible]	12.73	72.96
[illegible]	[illegible]			60.23		1752	[illegible]	73.37
[illegible]	[illegible]			59.50		[illegible]	[illegible]	74.05
10	[illegible]			59.50		[illegible]	13.89	73.38
11	327			59.68		1949	[illegible]	73.55
12	[illegible]	31.32	[illegible]	60.17		[illegible]	14.42	74.59
1	329			60.35		[illegible]	[illegible]	74.69
2	327			59.98		[illegible]	[illegible]	71.68
3	326			59.80		[illegible]	14.51	74.31
4	329			60.35		[illegible]	14.52	74.87
5	331			60.72		[illegible]	14.95	75.67
6	330			60.54		1913	13.61	74.15
7	330			60.54		[illegible]	16.78	77.32
26								
27								
28								
29								
30								
31								

NOTES

TABLE A-7. CEMENT KILN CONDITIONS

4/30/81

	COAL FEED	BTU/HR 10^6			KILN REV.	KILN EXIT TEMP.	% O_2		
8	5.8	147.9			87	470	3.5		
9	5.8	147.9			86	470	3.5		
10	5.8	147.9			86	470	3.5		
11	5.8	147.9			87	470	4.0		
12	5.8	147.9			86	470	3.8		
1	5.8	147.9			87	480	3.4		
2	5.8	147.9			87	470	3.4		
3	5.8	147.9			87	470	3.6		
4	5.8	147.9			87	445	3.4		
5	5.8	147.9			88	445	3.5		
6	5.8	147.9			88	455	3.6		
7	5.8	147.9			87	450	3.6		
8	5.8	147.9			89	450	4.6		
9	5.8	147.9			87	455	3.8		
10	5.8	147.9			87	460	4.2		
11	6.3	165.70			87	475	3.4		
12	6.3	165.70			86	490	3.5		
1	6.1	153.05			86	490	4.3		
2	[illegible]	153.05			86	495	4.4		
3	[illegible]	153.05			86	490	4.4		
4	[illegible]	153.05			85	500	4.4		
5	[illegible]	153.05			89	500	4.1		
6	6.0	153.05			85	495	4.0		
7	6.0	153.05			87	495	4.1		
25									
26									
27									
28									
29									

NOTES

TABLE A-8. CEMENT KILN CONDITIONS 5/1/81

[illegible]	BTU/hr			KILN REV	KILN EXIT T.	% O_2		
6.0	153.05			87	500	4.1		
6.2	158.15			86	500	3.2		
6.0	153.05			86	480	2.7		
5.8	147.95			86	470	3.9		
5.8	147.95			87	470	4.0		
5.6	142.84			87	460	3.9		
5.6	142.84			87	450	3.7		
5.6	142.84			88	450	2.7		
5.6	142.84			87	430	3.7		
5.6	142.84			89	450	4.2		
5.6	142.84			89	465	3.1		
5.6	142.84			89	[illegible]	2.9		
5.6	142.84			88	[illegible]	2.8		
[illegible]	[illegible]			88	475	2.6		
5.6	142.84			88	[illegible]	3.1		
5.6	142.84			[illegible]	495	2.6		
6.2	159.15			87	475	2.6		
6.2	158.15			85	450	3.2		
6.2	158.15			87	490	2.9		
6.2	158.15			[illegible]	490	2.7		
6.2	158.15			87	490	2.6		
6.2	158.15			86	480	2.9		
6.2	158.15			87	475	2.6		
6.2	158.15			87	475	2.7		

NOTES

TABLE A-9. CEMENT KILN CONDITIONS 5/2/81

	COAL FEED T/hr	BTU/hr			KILN REV	KILN EXIT T.	% O_2		
8	6.2	158.15			86	480	2.4		
9	6.2	158.15			88	490	2.6		
10	6.2	158.15			87	480	2.2		
11	6.2	158.15			88	485	2.4		
12	6.0	153.05			88	485	2.4		
1	6.0	153.05			88	470	2.2		
2	5.8	147.95			87	450	2.0		
3	5.6	142.84			88	430	3.5		
4	5.6	142.84			89	425	2.8		
5	5.6	142.84			89	455	4.3		
6	5.6	142.84			89	450	4.6		
7	5.6	142.84			89	450	3.2		
8	6.0	153.05			89	465	3.2		
9	6.0	153.05			89	470	3.5		
10	6.0	153.05			89	465	3.3		
11	6.0	153.05			88	470	3.0		
12	6.0	153.05			87	465	3.8		
1	6.0	153.05			87	470	3.2		
2	6.0	153.05			87	480	5.0		
3	6.0	153.05			86	470	3.8		
4	6.0	153.05			87	470	3.0		
5	5.6	142.84			88	470	3.4		
6	5.6	142.84			88	470	4.0		
7	5.6	142.84			87	470	4.5		
25									
26									
27									
28									
29									
30									
31									
1									
						455.6			

NOTES

TABLE A-10. CEMENT KILN CONDITIONS 5/3/81

COAL FEED T/hr	BTU/hr			KILN REV	KILN EXIT T.	% O_2		
5.6	142.84			87	475	3.5		
5.2	132.64			87	450	3.7		
5.2	132.64			86	420	3.5		
5.2	132.64			89	420	3.7		
5.4	137.74			88	420	3.0		
5.4	137.74			89	4.20	2.5		
5.6	~~137.74~~	142.84		89	420	2.7		
5.6	~~137.74~~	142.84		88	420	2.0		
5.6	~~137.74~~	142.84		89	440	2.2		
5.6	~~137.74~~	142.84		89	430	3.6		
5.6	~~137.74~~	142.84		89	460	3.4		
5.8	147.95			89	460	2.6		
5.8	147.95			89	465	3.2		
5.8	147.95			88	465	3.5		
5.8	147.95			87	465	3.4		
5.8	147.95			87	465	3.2		
5.8	147.95			86	460	3.0		
6.0	153.05			87	470	3.5		
6.0	153.05			86	480	3.6		
6.0	153.05			86	480	3.5		
6.0	153.05			86	4.90	3.2		
5.8	147.95			87	490	3.6		
5.8	147.95			86	490	4.0		
5.8	147.95			86	490	3.4		
					456.0			

TABLE A-11. CEMENT KILN CONDITIONS 5/4/81

	COAL FEED T/hr	BTU/hr			KILN REV	KILN EXIT T.	% O_2		
8	5.8	147.95			87	490	2.7		
9	5.8	147.95			86	490	2.5		
10	5.8	147.95			48	460	2.0		
11	5.6	142.84			90	450	2.2		
12	5.4	137.74			90	430	2.7		
1	5.6	142.84			88	440	1.8		
2	5.6	142.84			88	440	2.1		
3	5.6	142.84			88	435	2.1		
4	5.6	147.84			88	435	2.1		
5	5.6	142.84			88	460	3.2		
6	5.6	142.84			88	465	2.8		
7	5.6	142.84			89	465	3.6		
8	5.6	142.84			88	465	3.7		
9	6.0	153.05			88	460	3.2		
10	6.0	153.05			89	465	2.8		
11	6.0	153.05			87	470	2.9		
12	6.0	153.05			87	470	2.9		
1	6.0	153.05			87	470	2.6		
2	6.0	153.05			87	460	2.8		
3	6.0	153.05			87	450	2.9		
4	5.8	147.95			89	450	2.0		
5	5.8	147.95			91	460	2.6		
6	5.8	147.95			87	460	2.6		
7	5.8	147.95			88	460	2.6		
25									
26									
27									
28									
29									
30									
31									

NOTES

TABLE A-12. CEMENT KILN CONDITIONS 5/5/81

COAL FEED T/hr	BTU/hr			KILN REV	KILN EXIT T.	% O_2		
5.8	147.95			87	460	2.6		
5.6	142.84			88	466	3.2		
5.6	142.84			87	450	3.3		
5.4	137.74			.86	450	2.7		
5.4	137.74			87	425	3.0		
5.4	137.74			88	450	2.9		
5.4	137.74			87	420	3.7		
5.4	137.74			88	470	1.8		
5.4	137.74			88	400	2.2		
5.4	137.74			88	405	2.8		
5.4	137.74			88	410	2.6		
5.4	137.74			90	420	2.2		
5.4	137.74			88	390	3.3		
5.4	137.74			88	415	2.1		
5.4	137.74			90	420	2.2		
5.4	137.74			86	426	2.2		
5.4	137.74			87	426	2.2		
5.6	142.84			87	420	2.5		
5.5	—			88	420	2.5		
5.6	142.84			87	425	3.2		
5.6	142.84			87	420	2.7		
5.6	142.84			87	400	2.2		
5.4	137.74			88	420	2.5		
5.8	147.95			87	430	2.5		

NOTES

TABLE A-13. CEMENT KILN CONDITIONS 5/6/81

	COAL FEED T/hr	BTU/hr			KILN REV	KILN EXIT T.	% O_2		
8	5.6	142.84			87	460	3.5		
9	5.6	142.84			89	440	2.5		
10	5.6	142.84			83	460	2.7		
11	5.6	142.84			88	460	2.7		
12	5.8	147.95			88	460	2.5		
1	5.8	147.95			88	470	2.4		
2	6.0	153.05			87	490	2.7		
3	5.6	142.84			88	470	3.5		
4	5.6	142.84			88	435	2.7		
5	5.6	142.84			88	445	2.6		
6	5.6	142.84			89	430	2.0		
7	5.6	142.84			91	420	2.1		
8	5.6	142.84			90	420	1.9		
9	5.6	142.84			88	415	2.0		
10	5.6	142.84			89	430	1.8		
11	5.6	142.84			89	430	1.4		
12	5.6	142.84			88	430	1.4		
1	5.6	142.84			88	446	2.5		
2	5.8	147.95			87	448	2.5		
3	5.8	147.95			87	460	1.8		
4	5.8	147.95			87	470	1.8		
5	5.8	147.95			86	470	1.5		
6	6.0	153.05			87	470	2.2		
7	6.0	153.05			88	476	2.0		
25									
26									
27									
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29									
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NOTES

APPENDIX C

SLURRY FEED CONSTANTS
(Courtesy of Ideal Basic Cement
Ada, Oklahoma)

SLURRY FEED CONSTANTS

% H_2O	Lb dry mix per tank ft	Tons/tank ft	% H_2O	Lb dry mix per tank ft	Tons/tank ft
30.0	183950	59.55	34.1	165691	53.64
30.1	185504	59.41	34.2	165268	53.50
30.2	183043	59.26	34.3	164845	53.37
30.3	182565	59.10	34.4	164423	53.23
30.4	182105	58.95	34.5	164001	53.09
30.5	181645	58.80	34.6	163564	52.95
30.6	181186	58.66	34.7	163134	52.81
30.7	180727	58.51	34.8	162723	52.68
30.8	180269	58.36	34.9	162303	52.54
30.9	179812	58.21	35.0	161884	52.41
31.0	179355	58.06	35.1	161465	52.27
31.1	178898	57.91	35.2	161063	52.14
31.2	178442	57.77	35.3	160645	52.01
31.3	177987	57.62	35.4	160228	51.87
31.4	177549	57.48	35.5	159811	51.74
31.5	177095	57.33	35.6	159395	51.60
31.6	176641	57.18	35.7	158980	51.47
31.7	176188	57.04	35.8	158564	51.33
31.8	175736	56.89	35.9	158170	51.20
31.9	175295	56.75			
32.0	174849	56.60	29.9	184429	59.71
32.1	174398	56.46	29.8	184892	59.86
32.2	173964	56.32	29.7	185373	60.01
32.3	173515	56.17	29.6	185837	60.16
32.4	173065	56.03	29.5	186302	60.31
32.5	172633	55.89	29.4	186785	60.47
32.6	172190	55.74	29.3	187251	60.62
32.7	171738	55.60	29.2	187718	60.77
32.8	171307	55.46	29.1	188201	60.93
32.9	170873	55.32	29.0	188670	61.08
33.0	170431	55.17	28.9	189138	61.23
33.1	170002	55.03	28.8	189624	61.39
33.2	169573	54.90	28.7	190111	61.54
33.3	169129	54.75	28.6	190581	61.70
33.4	168698	54.61	28.5	191069	61.85
33.5	168258	54.47	28.4	191557	62.01
33.6	167832	54.33	28.3	192029	62.17
33.7	167405	54.19	28.2	192518	62.32
33.8	166976	54.05	28.1	193009	62.48
33.9	166540	53.91	28.0	193500	62.64
34.0	166115	53.78	27.9	193974	62.80
			27.8	194466	62.95
			27.7	194959	63.11
			27.6	195435	63.27
			27.5	195946	63.43

APPENDIX D

KILN OPERATOR LOGS,
April 30 - May 6, 1981
(Courtesy of Ideal Basic Cement
Ada, Oklahoma)

Date 4-30-81

	Cooler					Dust				
·ke	Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.	Hour	Total	Gas Valve % Open	Clinker Free Lime	Remarks
							704840			
	160	90		3.8	210		706722	2	.42	3
	160	90		3.8	210		708589	2		3
	160	90		3.8	210		710438	2	.48	3
	160	90		3.5	270		712266	2		3
	160	90		3.5	270		714114	2	.30	3
	180	90		3.5	270		715985	2		3
	180	92		3.7	270		717831	2	.40	3
	180	92		3.7	270		719689	2		3
	260	90		38	320		721543	2	.36	3
	245	90		38	335		723397	2		6
	235	90		39	350		725245	2	14	6
	255	95		38	370		727091	2		6
	220	90		39	355		728335	2	.18	6
	200	90		39	325		730780	2		6
	185	90		35	300		732607	2	24	6
	165	90		35	250		734408	2		6
	170	84		40	330		736200	2	.40	6
	150	84		40	315		737985	2		6
	165	84		3.8	280		739770	2	.24	6
	135	84		3.8	270		741530	2		6
	120	84		3.8	255		743355	2	.30	6
	130	84		3.8	260		745200	2		6
	130	84		3.9	275		747150	2	.48	6
	130	84		3.8	265		748880	2		6

Shift	C.R. Attendant	Supervisor
1		
2	[illegible]	
3		

5/1/81

Kiln No. 2

Time	Cyclone Temp	Coal Mill Hour	F-O-W Total Revs.	Feed Rate T.P.H.	Temp In	Temp Out	Suct.	Press	Amps	Kiln Feed Hour	Kiln Feed Total	Kiln Revs. Hour	Kiln Revs. Total	Drive Amps
Brought Forward											150841		40798	
8 am	600		60	60	310	180	22	13	50	322	151163	87	40885	770
9	590		120	62	320	180	22	13	50	324	151487	86	40971	770
10	610		182	60	320	180	22	13	50	322	151809	86	41057	770
11	620		241	58	320	180	22	13	50	323	152132	86	41143	750
12 noon	620		298	58	320	180	22	13	50	323	152455	87	41230	750
1 pm	610		355	56	320	180	22	13	50	324	152779	87	41317	750
2	600		412	56	310	180	22	13	50	326	153105	87	41404	750
3	590		468	56	310	180	22	13	50	326	153431	88	41492	760
4	[illegible]		523	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	580		579	56	320	180	22	13	50	327	154083	89	41669	[illegible]
6	600		642	56	340	180	22	13	50	[illegible]	154406	88	[illegible]	[illegible]
7	600		704	56	340	180	22	13	53	323	154729	89	[illegible]	750
8	620		767	56	340	180	22	13	50	324	155053	88	41933	[illegible]
9	600		830	56	340	180	22	13	53	324	155377	88	42021	750
10	610		[illegible]	56	340	180	22	13	[illegible]	323	[illegible]	88	42105	750
11	620		[illegible]	56	340	180	22	13	50	324	156024	88	42197	750
12 mid	620		101.4	6.2	340	180	2.2	12	54	324	156348	88	42285	750
1 am	600		108.0	6.2	340	180	2.2	12	56	322	156670	85	[illegible]	760
2	560		114.3	6.2	340	180	2.2	12	56	323	156993	87	42457	780
3	560		120.6	6.2	320	180	2.2	12	56	325	157318	88	42545	790
4	520		121.9	6.2	340	180	2.2	12	54	323	157641	87	42632	790
5	520		133.2	6.2	340	180	2.2	12	56	330	157971	86	42718	790
6	520		139.4	6.2	320	180	2.2	12	54	328	158299	87	42805	800
7 am	520		145.0	6.2	320	180	2.2	12	54	330	158629	87	42892	800
Total														

Kiln Feed

+25

Shift	CaO	H_2O	Port Hole % H_2O
1	42.4	30.96	
2	[illegible]	[illegible]	
3	42.1	31.64	~~41.75~~ 7.63

323
32
2?

Clinker To	
Silo No.	Time

A-109

18-206

Daily Kiln Operation
Ada Plant

Kiln										Cooler						
Drive	Draft				Temperatures											
Amps	Hood Draft	Exit Draft	Exit Damper % Open	I. D. Fan Amps.	Front End Temp	Chain Sect. Temp	Exit Temp	Sec Air Temp	% O_2	Drive Amps	Stroke	Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp
770	07	41	42	55			500		41	36	14	130	84		39.	27
770	07	41	40	55			500		32	38	15	140	84		39	29.
770	06	35	36	54			480		27	42	15	150	84		39	32
750	06	38	38	54			470		34	42	15	200	84		39	37.
750	06	38	38	54			470		40	40	15	180	84		39	34
750	06	38	36	54			460		37	42	15	180	84		39	32
[illegible]	06	3[illegible]	3[illegible]	54			450		37	40	15	180	84		39	35
760	09	37	3[illegible]	5[illegible]			450		37	38	15	170	84		39	35
[illegible]	[illegible]	35	3[illegible]	54			43[illegible]		37	3[illegible]	[illegible]	17[illegible]	84		38	[illegible]
[illegible]	07	[illegible]	40	55			42[illegible]		4[illegible]	34	15	15[illegible]	84		37	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	55			42[illegible]		31	40	16	160	90		[illegible]	[illegible]
[illegible]	10	4[illegible]	4[illegible]	55			42[illegible]		25	34	15	155	90		37	[illegible]
[illegible]	05	41	40	55			41[illegible]		25	40	15	205	90		3[illegible]	3[illegible]
[illegible]	08	[illegible]	[illegible]	55			47[illegible]		2.8	[illegible]	15	170	90		35	310
[illegible]	05	41	40	55			42[illegible]		3[illegible]	3[illegible]	15	1[illegible]	90		39	32
[illegible]	07	4[illegible]	4[illegible]	55			4[illegible]		2.2	32	15	14[illegible]	90		39	[illegible]
[illegible]	.09	40	40	55		-	475		2.8	38	15.	160	90		3.7	34
[illegible]	1.0	4.0	40	55			480		3.2	38	15	155	90		3.8	325
[illegible]	.1[illegible]	4[illegible]	40	[illegible]			4[illegible]		2.7	3[illegible]	16	175	90		3.[illegible]	3[illegible]
[illegible]	.0[illegible]	4[illegible]	40	55			4[illegible]		2.7	[illegible]	16	180	90		3.[illegible]	3[illegible]
[illegible]	.05	[illegible]	40	55			420		2.8	40	16	180	90		3.2	320
[illegible]	.0[illegible]	40	40	5[illegible]			460		2.[illegible]	40	16	230	90		3.8	33[illegible]
[illegible]	.05	4[illegible]	[illegible]	5[illegible]			4[illegible]		2.[illegible]	4[illegible]	16	[illegible]70	90		3.9	33[illegible]
[illegible]	.03	40	40	55			495		2.7	40	16	[illegible]	90		3.8	310

KILN SPEED - 86 RPH
DUST RATE - ALL POSSIBLE
O_2 - 1.0% - 2.0%
FEED RATE - CHART +25 RPH
FREE LIME - .6 TO 1.0%

Shift	C.R. Attendant
1	C.B.
2	[illegible]
3	

A-110

R. M[illegible]

Date 5-1-81

	Cooler					Dust				
[illegible]ke	Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.	Hour	Total	Gas Valve % Open	Clinker Free Lime	Remarks
							748880			
	130	84		39.	270		750704	2	.18	6
	140	84		39	290		752462	2		6
	150	84		39	330		754267	2	.12	6
	200	84		39	370		756074	2		6
	180	84		39	340		757877	2	.18	6
	180	84		39	320		759414	2		6
	180	84		39	350		761600	2	.30	6
	170	84		39	350		763404	2		6
	170	84		38	340		765286	2	.20	6 = 1, in @ 430
	165	84		37	[illegible]		767131	[illegible]		6
	150	90		[illegible]	310		768034	2	.18	6
	155	90		37	[illegible]		[illegible]	2		6
	[illegible]	90		39	330		771443	2	.24	6
	170	90		35	310		773250	2		6
	150	90		39	320		775[illegible]	2	.18	6
	150	90		39	[illegible]		7763[illegible]			
	130	90		3.7	345		[illegible]	2	.18	6
	155	90		3.8	305		780[illegible]	2		6
	175	90		3.[illegible]	315		[illegible]	2	.24	6
	180	90		[illegible]	[illegible]		[illegible]	2		6
	180	90		3.8	320		7857[illegible]	2	.36	[illegible]
	[illegible]	90		3.8	[illegible]		787710	2		[illegible]
	[illegible]	90		3.9	335		[illegible]	2	.18	[illegible]
	[illegible]	[illegible]		3.8	310		791720	2		[illegible]

Shift	C.R. Attendant	Supervisor
1	CB.	
2	[illegible]	
3		

5/2/81

Kiln No. 2

Time	Cyclone Temp	Coal Mill Hour	Coal Mill F-O-W Total Revs.	Coal Mill Feed Rate T.P.H.	Coal Mill Temp In	Coal Mill Temp Out	Coal Mill Suct.	Coal Mill Press	Coal Mill Amps	Kiln Feed Hour	Kiln Feed Total	Kiln Revs. Hour	Kiln Revs. Total	Drive Amps
Brought Forward											158620		[illegible]	
8 am	500		62	62	310	180	22	12	54	328	[illegible]	91	[illegible]	750
9	540		125	62	310	180	22	12	54	330	159288	88	43068	770
10	510		187	62	310	180	22	12	54	328	159616	87	43155	770
11	510		250	62	300	180	22	12	54	329	159945	88	43243	770
12 noon	520		312	60	300	180	22	12	54	328	160273	88	43331	770
1 pm	520		372	60	300	180	22	12	54	329	160602	88	43419	770
2	490		431	58	300	180	22	12	54	329	160931	87	43508	770
3	590		486	56	300	180	22	12	54	329	161260	88	43596	770
4	520		544	56	320	180	22	12	53	326	161586	88	43684	750
5	520		600	56	340	180	22	12	53	330	161916	89	43774	750
6	480		655	56	340	180	22	12	53	328	162241	89	43863	750
7	410		713	56	320	180	22	12	53	325	162571	89	43952	750
8	540		773	6.0	340	180	22	12	53	329	162904	89	44041	750
9	520		834	60	340	180	22	12	53	330	163234	88	44129	760
10	520		894	60	340	180	22	12	53	328	163562	88	44217	770
11	520		954	60	340	180	22	12	53	329	163890	88	44305	770
12 mid	520		101.3	6.0	340	180	2.4	12	53	326	164216	87	44392	82
1 am	520		107.2	6.0	340	180	2.4	12	53	329	164545	87	44479	81
2	520		113.8	6.0	340	180	2.4	12	53	326	164871	87	44566	810
3	520		119.5	6.0	320	180	2.4	12	53	325	165196	86	44652	810
4	480		125.3	6.0	340	180	2.4	12	53	327	165523	87	44739	800
5	500		131.4	5.6	320	180	2.4	12	53	328	165851	88	44827	800
6	500		137.1	5.6	320	180	2.4	12	53	328	166179	88	44915	800
7 am	520		142.7	5.6	320	180	2.4	12	53	326	166505	87	45002	790
Total														

Kiln Feed

	Shift	CaO	H_2O	Port Hole % H_2O
328	1	420	3160	
	2	420	3156	
27	3	42.0	3136	

Clinker To	
Silo No.	Time

18-308

Daily Kiln Operation

Ada Plant

Kiln										Cooler						
Drive	Draft				Temperatures											
Amps	Hood Draft	Exit Draft	Exit Damper % Open	I. D. Fan Amps.	Front End Temp	Chain Sect. Temp	Exit Temp.	Sec Air Temp	% O_2	Drive Amps	Stroke	Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]		24	[illegible]	[illegible]	[illegible]	[illegible]		35	26[illegible]
70	07	41	40	56			480		[illegible]	[illegible]	15	170	98		35	28[illegible]
170	06	41	40	56			480		22	36	15	160	98		35	32[illegible]
170	06	41	40	56			485		24	38	15	180	98		37	37
170	05	41	40	56			485		24	38	15	180	98		37	34[illegible]
170	05	38	38	56			470		22	38	15	180	98		37	35[illegible]
170	06	37	36	55			450		30	40	15	180	90		37	45[illegible]
[illegible]	04	37	36	54			430		35	40	16	230	90		37	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	54			[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
[illegible]	0	42	40	55			455		43	[illegible]	15	170	90		32	26[illegible]
[illegible]	0	[illegible]	40	55			450		[illegible]	34	15	135	90		32	2[illegible]
[illegible]	04	42	40	55			[illegible]		32	34	15	135	86		33	25[illegible]
	[illegible]	42	40	55			460		[illegible]	40	15	165	86		35	315
[illegible]	02	41	40	55			470		35	40	15	170	86		38	325
[illegible]	03	41	40	55			460		37	40	15	150	86		38	340
[illegible]	[illegible]	42	40	55			470		[illegible]	40	15	150	86		38	30[illegible]
20	.03	41	40	55			465		3.8	40	15	150	86		3.7	30[illegible]
1[illegible]	[illegible]	[illegible]	[illegible]	55			[illegible]		4.2	[illegible]	[illegible]	140	86		38	[illegible]
10	.05	42	40	55			480		5.0	40	1.4	150	86		3.9	360
10	.02	41	40	55			470		3.8	44	15	205	86		3.8	410
00	.07	41	40	55			470		3.0	40	[illegible]	140	86		39	325
00	.06	[illegible]	[illegible]	55			470		[illegible]	36	14	145	86		37	32[illegible]
00	.05	[illegible]	40	55			470		[illegible]	40	14	140	86		3.6	[illegible]
20	.01	41	40	55			470		4	52	16	150	86		3.8	32[illegible]

Shift	C.R. Attendant	
1	OB	
2	[illegible]	
3		

Date 5-2-81

Coke	Cooler: Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.	Dust: Hour	Total	Gas Valve % Open	Clinker Free Lime	Remarks
							791720			
	180	98		35	280		793174	2	.12	3
	170	98		35	280		795030	2		3
	160	98		38	320		796835	2	.12	3
	180	98		37	370		798635	2		3
	180	98		37	340		800467	2	.06	3
5	180	98		37	350		802269	2		3 1 stage outside @ 1:00
	180	90		37	450		804060	2	.06	3
	230	90		37	530		805878	2		3
	200	90		37	380		807681	2	.12	3
	150	90		32	265		809478	2		3
	135	90		32	240		811280	2	.24	3
	135	86		33	250		813151	2		3
	165	86		35	315		815060	2	.12	3
	170	86		38	325		816926	2		3
	150	86		38	340		818767	2	.24	3
	150	86		38	320		820[illegible]	2		3
	150	86		3.7	300		822325	2	.12	3
	14[illegible]	86		3.8	3[illegible]		[illegible]	2		3
	150	86		3.9	360		[illegible]	2	.12	3
	205	86		3.8	410		826[illegible]	2		3
	140	86		3.9	325		[illegible]	2	.12	3
	145	86		[illegible]	325		[illegible]	2		3
	1[illegible]	[illegible]		[illegible]	300		[illegible]	2	.12	3
	150	86		3.8	325		833655	2		3

Shift	C.R. Attendant	Supervisor
1	CB	
2	[illegible]	
3		

5/3/81

Kiln No. 2

Time	Cyclone Temp	Coal Mill Hour	Coal Mill F.O.W. Total Revs.	Coal Mill Feed Rate T.P.H.	Coal Mill Temp In	Coal Mill Temp Out	Coal Mill Suct.	Coal Mill Press	Coal Mill Amps	Kiln Feed Hour	Kiln Feed Total	Kiln Revs. Hour	Kiln Revs. Total	Drive Amps	Ho Dr[illegible]
Brought Forward											[illegible]		[illegible]		
8 am	[illegible]		144.6	56	300	180	21	12	54	329	166834	87	45089	800	[illegible]
9	520		154.3	52	300	180	21	12	54	327	167161	87	45176	800	[illegible]
10	590		159.4	52	300	180	21	12	54	327	167488	86	45262	800	[illegible]
11	590		164.7	52	300	180	21	12	54	326	167814	89	45351	800	[illegible]
12 noon	590		170.1	54	300	180	21	12	54	327	168141	88	45439	800	[illegible]
1 pm	590		175.5	54	300	180	21	12	54	328	168469	89	45528	800	[illegible]
2	600		181.0	56	300	180	21	12	54	325	168794	88	45616	800	[illegible]
3	650		186.6	56	300	180	21	12	54	326	169120	88	45704	800	[illegible]
4	[illegible]		191.[illegible]	56	320	180	21	12	53	327	169[illegible]	88	45792	750	[illegible]
5	540		1961	56	320	180	21	12	53	[illegible]	169773	89	45881	750	
6	500		2037	56	320	180	21	12	53	323	170096	87	45968	750	[illegible]
7	500		20[illegible]	58	340	180	21	12	53	323	1704[illegible]	89	46057	760	[illegible]
8	560		2151	58	340	180	21	12	53	323	1707[illegible]	84	46141	760	[illegible]
9	560		2210	58	340	180	21	12	53	323	17104[illegible]	88	46233	760	[illegible]
10	500		2268	58	340	180	21	12	53	322	171357	87	46320	760	[illegible]
11	460		2325	58	340	180	21	12	53	323	171710	87	46407	760	2
12 mid	470		2377	5.8	320	[illegible]	21	12	53	322	171632	86	46493	760	[illegible]
1 am	[illegible]		2426	6.0	320	[illegible]	[illegible]	[illegible]	53	[illegible]	172[illegible]	[illegible]	465[illegible]	750	[illegible]
2	440		2497	6.0	320	180	21	12	53	322	17[illegible]	86	46[illegible]	750	[illegible]
3	440		2547	6.0	320	180	21	12	53	323	173001	86	46752	750	[illegible]
4	480		2620	6.0	320	180	21	12	53	322	173322	86	46[illegible]	750	[illegible]
5	540		2664	5.8	320	180	21	12	53	327	173[illegible]	87	46925	750	[illegible]
6	510		2727	5.8	320	180	21	12	53	327	173976	84	47011	740	[illegible]
7 am	580		2792	5.8	320	180	21	12	53	329	174304	86	47097	800	[illegible]
Total															

Kiln Feed

327

Shift	CaO	H_2O	Port Hole % H_2O
1	42.1	31.40	
2	42.0	31.16	
3	42.1	31.44	

Clinker T[illegible]	
Silo No.	Time

LB-206

Daily Kiln Operation

Ada Plant

Kiln: Draft – Hood Draft	Kiln: Draft – Exit Draft	Kiln: Draft – Exit Damper % Open	Kiln: Draft – I. D. Fan Amps.	Kiln: Temperatures – Front End Temp.	Kiln: Temperatures – Chain Sect. Temp	Kiln: Temperatures – Exit Temp	Kiln: Temperatures – Sec. Air Temp	% O_2	Cooler: Drive Amps	Cooler: Stroke	Cooler: Clinker Disch. Temp.	Cooler: Stack Damper % Open	Cooler: Under-Grate Damper % Open	Cooler: Under-Grate Press.	Cooler: Stack Temp.
[illegible]	40	40	52			475		37	36	11	125	92		36	[illegible]
06	40	40	52			450		37	40	14	140	92		38	390
05	37	38	52			420		35	44	14	140	92		38	400
05	37	38	52			420		37	40	14	140	90		38	450
06	37	38	52			420		30	40	14	160	90		38	320
07	37	38	52			420		25	40	14	220	90		38	320
07	37	38	52		-	420		27	38	14	150	90		38	300
07	37	38	52			420		20	38	14	160	90		38	320
[illegible]	[illegible]	40	[illegible]			[illegible]		22	[illegible]	14	170	90		38	320
[illegible]	[illegible]	40	54			[illegible]		30	[illegible]	15	170	90		36	325
06	[illegible]	40	54			460		34	[illegible]	14	125	90		33	270
03	40	40	54			460		27	30	14	170	90		33	225
[illegible]	[illegible]	40	[illegible]			465		32	34	14	[illegible]	90		35	[illegible]
04	[illegible]	40	54			465		35	34	[illegible]	150	70		38	300
[illegible]	[illegible]	[illegible]	[illegible]			465		[illegible]	40	[illegible]	170	90		38	[illegible]
20	40	40	54			465		[illegible]	34	14	145	90		36	315
20	4.0	40	54			460		3.0	38	14	150	70		3.6	330
.12	4.4	42	54			470		3.0	38	14	150	84		3.8	330
.15	4.3	42	53			480		3.0	37	14	[illegible]	84		3.7	[illegible]
.10	4.3	42	53			490		3.5	[illegible]	14	150	[illegible]		3.3	[illegible]
.12	4.3	42	53			[illegible]		3.2	42	15	170	82		3.2	350
.11	4.2	42	53			490		3.4	40	15	190	82		3.0	[illegible]
.120	4.2	42	53			490		4.0	40	14	150	82		35	320
.05	4.3	42	53			490		3.4	36	14	150	90		3.5	[illegible]

Shift	C.R. Attendant
1	CB
2	DJ
3	ORC

FEED RATE - CHART + 25 RPH

R McCabe

Date 5-3-81

Cooler					Dust				
Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.	Hour	Total	Gas Valve % Open	Clinker Free Lime	Remarks
						833655			
125	92		38	330		835601	2	.06	3
140	92		38	390		837160	2		3
160	92		38	400		837160	2	.12	3
170	90		38	450		837160	2		3
160	90		38	320		838811	2	.18	3
220	90		38	320		840807	2		3
150	90		38	300		842728	2	.36	3
160	90		38	320		844639	2		3
170	90		38	320		846531	2	.36	3
175	90		30	325		[illegible]	2		3
125	90		33	270		[illegible]	2	.16	3
170	90		33	225		[illegible]	2		3
[illegible]	90		38	325		[illegible]	2	.60	3
150	70		38	310		[illegible]	2		3
170	90		38	325		[illegible]	2	.30	3 + 1 out @ 1100
125	90		36	315		[illegible]	2		3
150	70		3.6	330		[illegible]	2	.18	3
150	84		3.8	330		[illegible]	2		3
[illegible]	84		3.7	340		[illegible]	2	.36	3
180	[illegible]		3.3	300		[illegible]	2		3
170	82		[illegible]	350		[illegible]	2	.24	3
190	82		3.0	340		[illegible]	2		3
150	82		35	310		871593	2		3
150	90		3.5	320		872527	2		3

Shift	C.R. Attendant	Supervisor
1	CB	
2	DJ	
3	[illegible]	

5/4/81

Kiln No. 2

Time	Cyclone Temp	Coal Mill Hour	F-O-W Total Revs.	Feed Rate T.P.H.	Temp In	Temp Out	Suct.	Press	Amps	Kiln Feed Hour	Kiln Feed Total	Kiln Revs. Hour	Kiln Revs. Total	Drive Amps
Brought Forward											174304		47097	
8 am	590		63	58	300	180	21	12	54	327	174631	87	47184	810
9	690		12.2	5.8	300	180	21	12	54	328	174959	86	47270	810
10	690		152	58	300	180	21	12	54	182	175131	48	47318	800
11	700		208	56	300	180	21	12	54	326	175457	90	47408	770
12 noon	740		264	54	300	180	21	12	54	327	175784	90	47498	750
1 pm	740		322	56	300	180	21	12	54	326	176110	88	47586	750
2	740		379	56	240	180	20	13	54	328	176438	88	47674	760
3	700		436	56	240	180	20	13	54	330	176768	88	47762	760
4	700		492	56	320	180	20	13	53	329	177097	85	47850	730
5	620		547	56	340	180	20	13	53	330	177427	84	47938	730
6	600		603	56	340	180	20	13	53	326	177753	88	48026	730
7	640		657	56	340	180	20	13	53	327	178080	89	48115	730
8	640		714	56	340	180	20	13	53	327	178417	88	48203	730
9	680		774	60	340	180	20	13	53	327	178734	88	48291	730
10	700		834	60	360	180	20	13	53	327	179061	89	48380	730
11	620		894	60	360	180	20	13	53	324	179385	87	48467	730
12 mid	600		944	6.0	360	180	20	13	53	330	179719	87	48557	730
1 am	600		1001	6.0	360	180	20	13	53	329	180048	87	48641	760
2	650		1064	6.0	360	180	20	13	53	329	180377	87	48728	750
3	600		1125	6.0	360	180	20	13	53	330	180707	87	48815	750
4	610		1210	5.8	360	180	20	13	53	331	181038	89	48904	720
5	610		1246	5.8	360	180	20	13	53	333	181371	91	48995	760
6	610		1307	5.8	360	180	20	13	53	328	181699	87	49082	760
7 am	640		1384	5.8	360	180	20	13	53	330	182029	88	49170	730
Total														

425

328

Kiln Feed

Shift	CaO	H_2O	Port Hole % H_2O
1	42.1	3164	
2	42.3	3176	
3	42.1	31.8	

Clinker To	
Silo No.	Time

13-306

Daily ~~Kiln~~ Operation

Ada Plant

Kiln									Cooler						
Draft				Temperatures				% O_2	Drive Amps	Stroke	Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.
Hood Draft	Exit Draft	Exit Damper % Open	I. D. Fan Amps.	Front End Temp	Chain Sect. Temp	Exit Temp	Sec Air Temp								
.05	44	42	53			460		27	50	17	130	90		32	280
.05	44	42	53			460		25	44	16	160	90		35	330
.06	37	42	53			460		20	44	16	160	90		35	350
.04	35	38	52			450		22	38	15	200	90		35	330
.04	37	40	53			430		27	40	16	180	90		35	340
.07	37	42	53			440		18	36	15	160	90		35	240
.09	37	40	53			440		21	34	15	170	90		35	310
.09	37	40	53			435		21	38	16	200	90		35	340
.01	37	40	53			435		21	34	16	165	90		33	335
.02	41	42	55			460		32	30	15	185	90		34	260
.03	41	42	55			465		28	33	14	165	90		34	225
.03	41	42	55			465		32	30	15	145	90		33	250
.02	41	42	55			460		37	30	15	150	90		33	250
.02	41	42	55			460		32	34	16	135	90		34	260
.02	40	42	55			465		28	36	16	180	90		34	280
.02	40	42	55			470		29	30	15	150	90		33	265
.02	4.0	42	55			470		2.9	36	15	140	84		3.3	260
.0	4.1	42	55			470		2.6	32	15	140	84		3.3	260
.0	3.4	42	55			460		2.8	38	14	140	84		3.3	260
.0	4.0	42	55			450		2.4	36	14	140	84		3.3	270
.0	4.0	42	55			450		2.0	38	14	180	84		3.3	280
.0	4.0	42	55			460		2.6	38	16	170	84		3.3	280
.0	4.0	42	55			460		2.6	38	16	170	84		3.3	280
.0	4.0	42	55			460		2.6	42	14	170	84		3.3	280

Shift	C.R. Attendant	Su
1	CB	
2	DZ	
3	JRC	

Date 5-4-81

	Cooler					Dust				
oke	Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.	Hour	Total	Gas Valve % Open	Clinker Free Lime	Remarks
							872527			
7	130	90		32	287		874462	2	.18	3
6	160	90		35	330		876385	2		3 Stopped 9 05
6	160	90		35	350		876541	2	.18	3 Started 9 25
5	200	90		35	330		878211	2		3
	180	90		35	340		880156	2	.24	3
5	160	90		35	290		882044	2		3
5	170	90		35	310		883936	2	.24	3
6	200	90		35	340		885796	2		3
	265	90		33	335		887645	2	.42	3
—	285	90		34	260		889525	2		3
	255	91		34	225		891412	2	.46	3
—	245	90		33	250		892250	2		3
—	180	90		33	250		894371	2	.90	3
	135	90		34	260		895081	2		3
	180	90		34	290		895592	2	.36	3
—	150	90		33	260		897560	2		3
	140	84		33	240		899142	2	.36	3
	140	84		33	260		901352	2		3
	140	84		33	240		902957	2	.18	3
	[illegible]	84		33	270		904892	2		3
	180	84		33	290		906844	2	.24	3
	[illegible]	84		33	290		908811	2		3
	170	84		33	270		910707	2	.32	3
	170	84		33	[illegible]		912624	2		3

Shift	C.R. Attendant	Supervisor
1	CB	
2	DZ	
3	ORC	

5/5/81

Kiln No. 2

Time	Cyclone	Coal Mill								Kiln Feed		Kiln Revs.		Drive	
	Temp	Hour	F.O.W Total Revs.	Feed Rate T.P.H.	Temp In	Temp Out	Suct.	Press	Amps	Hour	Total	Hour	Total	Amps	Ho[illegible] Dra[illegible]
Brought Forward											182029		[illegible]		
8 am	[illegible]		60	58	320	180	20	12	54	328	182357	87	49257	760	[illegible]
9	620		126	56	320	180	20	12	54	330	182687	88	49345	760	0[illegible]
10	620		180	56	320	180	20	12	54	330	183017	87	49432	760	[illegible]
11	610		235	56	310	180	20	12	53	331	183348	86	49518	790	[illegible]
12 noon	630		285	54	310	[illegible]	21	12	53	330	183678	87	49605	760	[illegible]
1 pm	630		341	[illegible]	[illegible]	[illegible]	20	12	53	333	184011	88	49663	780	[illegible]
2	620		395	56	[illegible]	180	20	12	53	332	184342	87	49780	770	[illegible]
3	620		446	54	310	180	20	12	53	331	184673	88	49868	770	0[illegible]
4	[illegible]		[illegible]	5.4	[illegible]	180	2.2	13	55	[illegible]	1850[illegible]	88	479[illegible]	740	[illegible]
5	[illegible]		55.6	5.4	320	180	2.2	13	55	331	185325	88	50[illegible]	[illegible]	[illegible]
6	540		60.7	5.4	[illegible]	[illegible]	2.2	[illegible]	55	[illegible]	185662	88	[illegible]	750	[illegible]
7	[illegible]		[illegible]	5.4	[illegible]	180	2.2	[illegible]	[illegible]	33[illegible]	[illegible]	90	50222	750	[illegible]
8	[illegible]		717	5.4	320	180	2.2	13	55	333	186229	88	50310	[illegible]	[illegible]
9	[illegible]		[illegible]	5.6	[illegible]	180	2.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	540		[illegible]	5.6	[illegible]	180	2.2	[illegible]	[illegible]	332	186992	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]		[illegible]	[illegible]	[illegible]	180	2.2	[illegible]	[illegible]	332	187324	86	[illegible]	[illegible]	[illegible]
12 mid	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	50[illegible]2	[illegible]	[illegible]
1 am	[illegible]		[illegible]	5.6	[illegible]	[illegible]	2.2	13	54	[illegible]	[illegible]	[illegible]	[illegible]	750	[illegible]
2	[illegible]		[illegible]	5.6	320	180	2.2	13	[illegible]	[illegible]	188317	[illegible]	50[illegible]	[illegible]	[illegible]
3	520		[illegible]	5.6	320	[illegible]	2.2	13	54	[illegible]	188[illegible]	97	50[illegible]	[illegible]	[illegible]
4	520		[illegible]	5.6	[illegible]	[illegible]	2.2	13	54	332	[illegible]	97	51011	750	[illegible]
5	520		[illegible]	5.6	[illegible]	[illegible]	2.2	[illegible]	[illegible]	333	[illegible]315	97	51098	[illegible]	[illegible]
6	[illegible]		[illegible]75	5.4	[illegible]	[illegible]	2.2	13	54	[illegible]	189[illegible]47	[illegible]	51186	720	[illegible]
7 am	[illegible]		1337	5.8	[illegible]	[illegible]	2.2	[illegible]	54	331	[illegible]	97	51273	730	[illegible]
Total															

Kiln Feed

331

Shift	CaO	H_2O	Port Hole % H_2O
1	41.95	31.96	
2	41.9	31.84	
3	42.0	31.80	

Clinker To	
Silo No.	Time

Kiln
Dus[illegible]
O_2
Fee[illegible]
Free[illegible]

B-306

Daily Kiln Operation

Ada Plant

Kiln									Cooler							
Draft				Temperatures				% O_2	Drive Amps	Stroke	Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.	Ho[illegible]
Hood Draft	Exit Draft	Exit Damper % Open	I. D. Fan Amps.	Front End Temp	Chain Sect. Temp	Exit Temp	Sec Air Temp									
	35	42	55			410		24	40	10	170	60	[illegible]	34	200	
7	38	42	55			410		22	40	16	160	90		34	270	
5	37	40	55			450		33	36	15	160	90		34	250	
[illegible]	35	38	54			430		27	36	15	170	90		34	270	
[illegible]	35	37	56			425		30	42	16	161	60		34	290	
[illegible]	37	38	54			421		24	40	15	200	47		34	280	
[illegible]	43	42	55			420		34	40	15	180	90		34	290	
[illegible]	37	38	54			410		18	40	15	200	90		34	300	
25	3.2	26	54			400		2.2	40	16	185	90		3.4	285	
[illegible]	[illegible]	36	56			400		1.8	[illegible]	16	135	90		3.2	260	
[illegible]	[illegible]	36	50			410		[illegible]	6	[illegible]	175	90		3.5	285	
[illegible]	[illegible]	34	50			420		[illegible]	[illegible]	16	[illegible]	90		3.5	310	
[illegible]	4.0	35	54			390		3.3	36	16	205	90		3.3	310	
[illegible]	[illegible]	35	52			415		2.1	32	15	145	90		[illegible]	255	
[illegible]	[illegible]	[illegible]	52			440		2.2	34	15	140	90		5.4	250	
[illegible]	4.4	35	53			420		2.2	40	16	170	100		3.5	280	
	[illegible]	[illegible]	53			420		[illegible]	[illegible]	[illegible]	[illegible]	100		3.3	290	
[illegible]	4.0	35	53			420		2.5	42	[illegible]	[illegible]	100		3.3	290	
[illegible]	4.0	[illegible]	53			420		2.5	40	15	160	100		3.3	270	
[illegible]	4.0	35	53			420		3.2	38	5	[illegible]	100		3.3	250	
[illegible]	4.0	34	53			420		2.7	40	15	150	100		3.3	250	
[illegible]	4.0	[illegible]	53			420		2.12	38	[illegible]	[illegible]	100		3.3	230	
[illegible]	[illegible]	[illegible]	53			420		2.5	[illegible]	15	150	100		3.3	240	
[illegible]	[illegible]	[illegible]	53			420		2.5	30	15	[illegible]	100		3.3	200	
.2	[illegible]	38	53			430										

Kiln Speed - 86 RPH.
Dust Rate - All Possible
O_2 - 1.0% - 2.0%
Feed Rate - Chart + 25 RPH
Free Lime - .6 To 1.0%

R. McCabe

Shift	C.R. Attendant	
1	CB	
2		
3	[illegible]	

Date 5-5-81

	Cooler					Dust				
Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.	Hour	Total	Gas Valve % Open	Clinker Free Lime	Remarks
						912[illegible]			
170	91	[illegible]	34	260		914543	2	.18	3
160	90		34	270		916664	2		3
160	90		34	250		918384	2	.18	3 2nd [illegible] @ 10
170	90		34	270		920266	2		3
161	90		34	240		922198	2	.36	3
207	97		34	280		924104	2		3
180	90		34	240		925988	2	.42	3
200	90		34	300		927875	2		3
195	90		3.4	285		929783	2	.40	3
175	90		3.2	280		931660	2		3
175	90		3.3	265		933554	2	.54	3
160	90		3.3	310		935493	2		3
205	90		3.3	310		[illegible]	2	[illegible]	3
145	90		3.4	255		[illegible]	2		3
140	90		3.6	250		[illegible]	2	.56	[illegible]
153	100		3.3	280		[illegible]	2		[illegible]
[illegible]	100		3.3	240		[illegible]	2	.24	[illegible]
[illegible]	100		3.3	[illegible]		94[illegible]44	[illegible]		
160	100		3.3	270		[illegible]	2	.36	6
[illegible]	100		3.3	250		[illegible]555	2		6
[illegible]	100		3.3	250		950543	2	.42	
[illegible]	100		3.3	250		[illegible]	2		6
[illegible]	100		3.3	[illegible]		[illegible]	2		5
150	100		3.3	230		9552[illegible]	2		5

Shift	C.R. Attendant	Supervisor
1	CB	
2		
3	[illegible]	

5/6/81

Kiln No. 2

Time	Cyclone Temp	Coal Mill Hour	Coal Mill F.O.W Total Revs.	Coal Mill Feed Rate T.P.H.	Coal Mill Temp In	Coal Mill Temp Out	Coal Mill Suct.	Coal Mill Press	Coal Mill Amps	Kiln Feed Hour	Kiln Feed Total	Kiln Revs. Hour	Kiln Revs. Total	Drive Amps
Brought Forward											[illegible]		51273	
8 am	500		50	56	350	180	24	13	52	332	190310	87	51360	700
9	560		117	56	350	180	24	13	52	332	190642	88	51448	700
10	570		172	56	350	180	24	13	52	337	190979	88	51536	700
11	560		224	56	350	180	24	13	52	333	191312	88	51624	700
12 noon	550		286	58	350	180	24	13	52	335	191647	88	51712	720
1 pm	520		352	58	350	180	24	13	52	330	191977	88	51800	720
2	520		412	6.0	350	180	24	13	52	330	192307	87	51887	780
3	690		472	56	350	180	24	13	52	330	192637	88	51975	780
4	560		527	5.6	340	180	2.6	12	52	327	192964	88	52063	760
5	580		58.3	5.6	340	180	2.6	12	52	327	193291	88	52151	720
6	600		64.0	5.6	340	180	2.6	12	52	325	193616	89	52240	720
7	600		70.2	5.6	340	180	2.6	12	52	330	193946	91	52331	690
8	580		75.2	5.6	360	180	2.6	12	52	330	194276	90	52421	680
9	580		80.4	5.6	340	180	2.6	12	52	326	194602	88	52509	680
10	600		86.4	5.6	340	180	2.6	12	52	326	194928	89	52598	700
11	580		92.1	5.6	340	180	2.6	12	52	327	195255	89	52687	690
12 mid	550		956	5.6	350	180	2.6	12	53	328	195583	88	52775	700
1 am	560		1022	5.6	350	180	2.6	12	53	329	195912	88	52863	690
2	660		1092	5.8	340	180	2.6	12	53	327	196239	87	52950	700
3	700		1137	5.8	340	180	2.6	12	53	326	196565	87	53037	710
4	620		1203	5.8	340	180	2.6	12	53	329	196894	87	53124	730
5	600		1263	5.8	340	180	2.6	12	53	331	197227	86	53210	730
6	580		1316	6.0	340	180	2.6	12	53	330	197557	87	53297	710
7 am	600		1386	6.0	340	180	2.6	12	53	330	197887	88	53385	710
Total														

#25

Kiln Feed

331

Shift	CaO	H_2O	Port Hole % H_2O
1	423	3166	
2	42.1	3152	
3	42.35	31.32	

Clinker To	
Silo No.	Time

K
Du:
O_2
Fe
Fre

IB-308

Daily Kiln Operation
Ada Plant

Kiln										Cooler						
..ve	Draft				Temperatures											
..ps	Hood Draft	Exit Draft	Exit Damper % Open	I. D. Fan Amps.	Front End Temp	Chain Sect. Temp	Exit Temp	Sec Air Temp	% O_2	Drive Amps	Stroke	Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.
[illegible]	.0	40	38	52			420		35	32	14	100	100		34	1[illegible]
[illegible]	04	42	38	52			440		25	32	14	100	100		34	220
[illegible]	.01	40	38	52			420		27	32	14	100	100		34	240
[illegible]	0	40	38	52			420		27	32	14	100	100		34	220
[illegible]	055	42	40	53			420		25	30	14	100	100		34	250
[illegible]	05	42	40	54			410		24	34	14	120	100		34	24[illegible]
[illegible]	05	42	40	54			440		27	34	14	140	100		34	250
[illegible]	05	35	38	52			470		35	54	18	230	100		34	900
[illegible]	.0	2.1	37	53			435		2.7	46	16.	170	100		3.3	366
[illegible]	.0	2.5	35	53			445		2.6	42	16.	180	100		34	3[illegible]
[illegible]	.0	2.5	35	53			420		2.0	40	16	170	100		34	300
[illegible]	.02	2.5	35	53			420		2.1	32	15	150	100		33	260
[illegible]	.01	3.5	35	53			420		1.9	32	15	145	100		33	255
[illegible]	.0	3.4	35	53			445		2.0	36	16	145	100		33	270
[illegible]	.02	3.6	35	53			430		1.6	30	15	120	100		3.3	330
[illegible]	.02	3.5	35	53			430		1.4	30	15	115	100		3.3	250
[illegible]	.02	3.7	35	53			450		1.4	30	14	130	100		3.3	240
[illegible]	.02	3.9	38	53			440		2.5	30	14	130	100		3.3	240
[illegible]	.02	3.8	38	53			440		2.5	26	14	90	100		3.3	190
[illegible]	.02	3.8	38	53			440		1.8	32	15	130	100		3.3	230
[illegible]	.02	3.8	38	53			470		1.5	40	14	130	100		3.3	290
[illegible]	.02	3.9	38	53			470		1.5	40	16	130	100		3.3	250
[illegible]	.02	3.9	38	53			470		2.2	40	16	140	100		3.3	250
[illegible]	.0	3.9	38	53			470		2.0	42	16	140	100		3.3	2[illegible]

KILN SPEED – 86 RPH
DUST RATE – ALL POSSIBLE
O_2 – 1.0% – 3.0%
FEED RATE – CHART 235 RPH (ADD FEED IF FREE LIME STAYS LOW)
FREE LIME [illegible] 1.00

Shift	C.R. Attendant
1	CB
2	
3	ORC

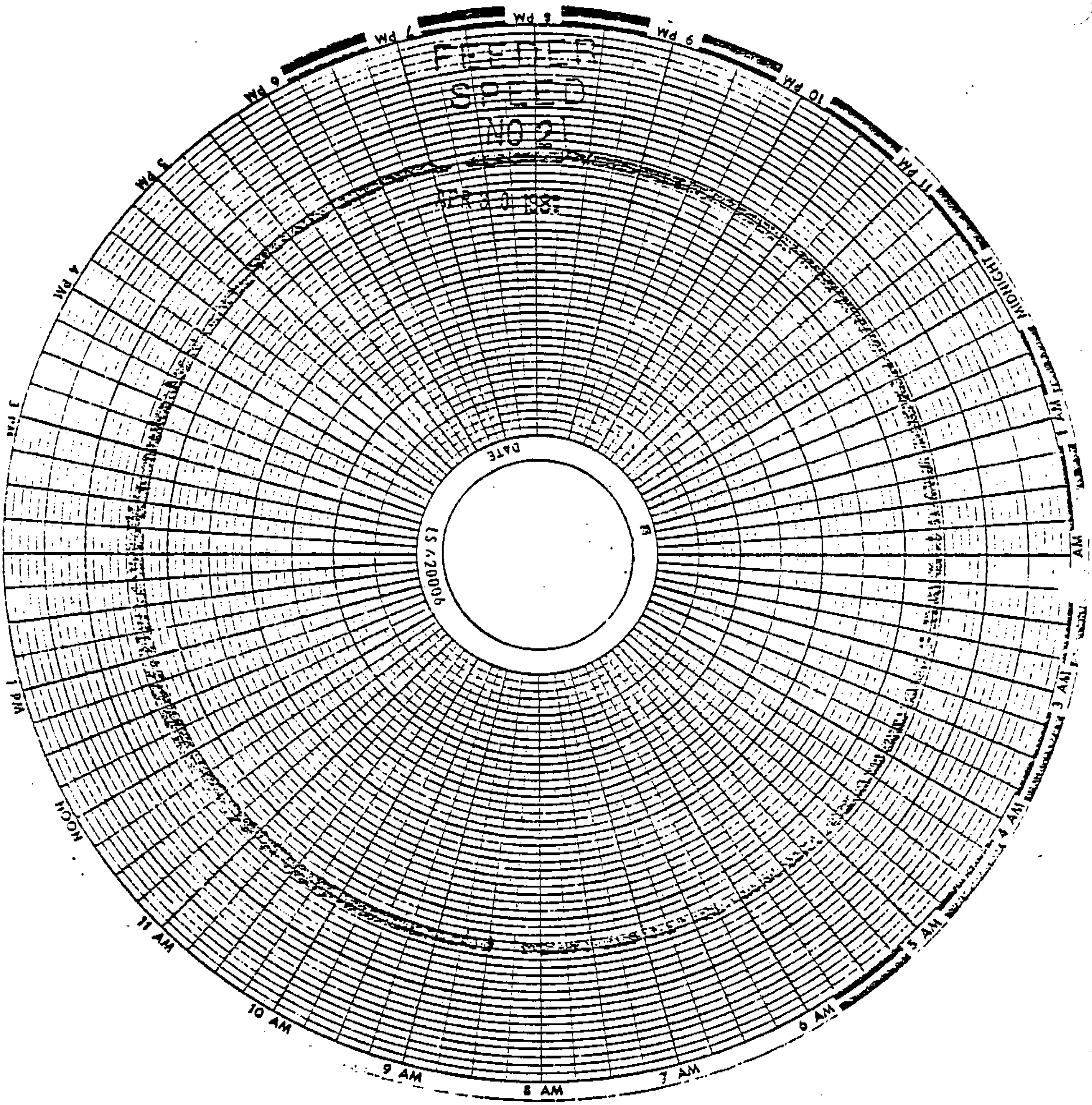
Date 5-6-81

Cooler						Dust				
roke	Clinker Disch. Temp.	Stack Damper % Open	Under-Grate Damper % Open	Under-Grate Press.	Stack Temp.	Hour	Total	Gas Valve % Open	Clinker Free Lime	Remarks
							955940			
3	100	100		34	180		957818	2	.40	5
4	100	100		34	220		958859	2		5 1st Stage outside @ 815
4	100	100		34	240		960799	2	.30	5 1st & 2nd Stages inside @ 9
4	140	100		34	220		962739	2		2
4	160	100		34	250		964659	2	1.74	2
4	150	100		34	245		965817	2		2
14	140	100		34	250		967750	2	.24	2 All DUST TO WASTE @ 345
18	232	100		34	940		968499	2		5
6	170	100		33	360		970300	2	.18	5
6	180	100		34	385		971690	2		5
6	170	100		34	300		973485	2	1.14	5
–	150	100		33	260		[illegible]	2		5
5	145	100		33	255		[illegible]	2	[illegible]	5
[illegible]	145	100		33	280		[illegible]	2		5
5	120	100		33	330		980727	2	.48	5
[illegible]	115	100		3.3	260		98250[illegible]	2		5
1	130	100		3.3	240		[illegible]	2	[illegible]	5
	130	100		3.3	240		[illegible]	2		5
1	90	100		3.3	190		987920	2	1.20	5
–	120	100		3.3	230		[illegible]	2		5
1	150	100		3.3	290		991841	2	.74	5
1	130	100		3.3	250		993834	2		5
	[illegible]	100		3.3	250		[illegible]	2	.34	5
1	140	100		3.3	280		997887	2		5

Shift	C.R. Attendant	Supervisor
1	CB	
2		
3	[illegible]	

APPENDIX E

SLURRY FEEDER CHARTS,
April 30 - May 6, 1981
(Courtesy of Ideal Basic Cement
Ada, Oklahoma)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SPEED
NO 2
DATE
MIDNIGHT
NOON
8 AM
9 AM
10 AM
11 AM
7 AM
6 AM
5 AM
4 AM
3 AM
1 PM
3 PM
4 PM
5 PM
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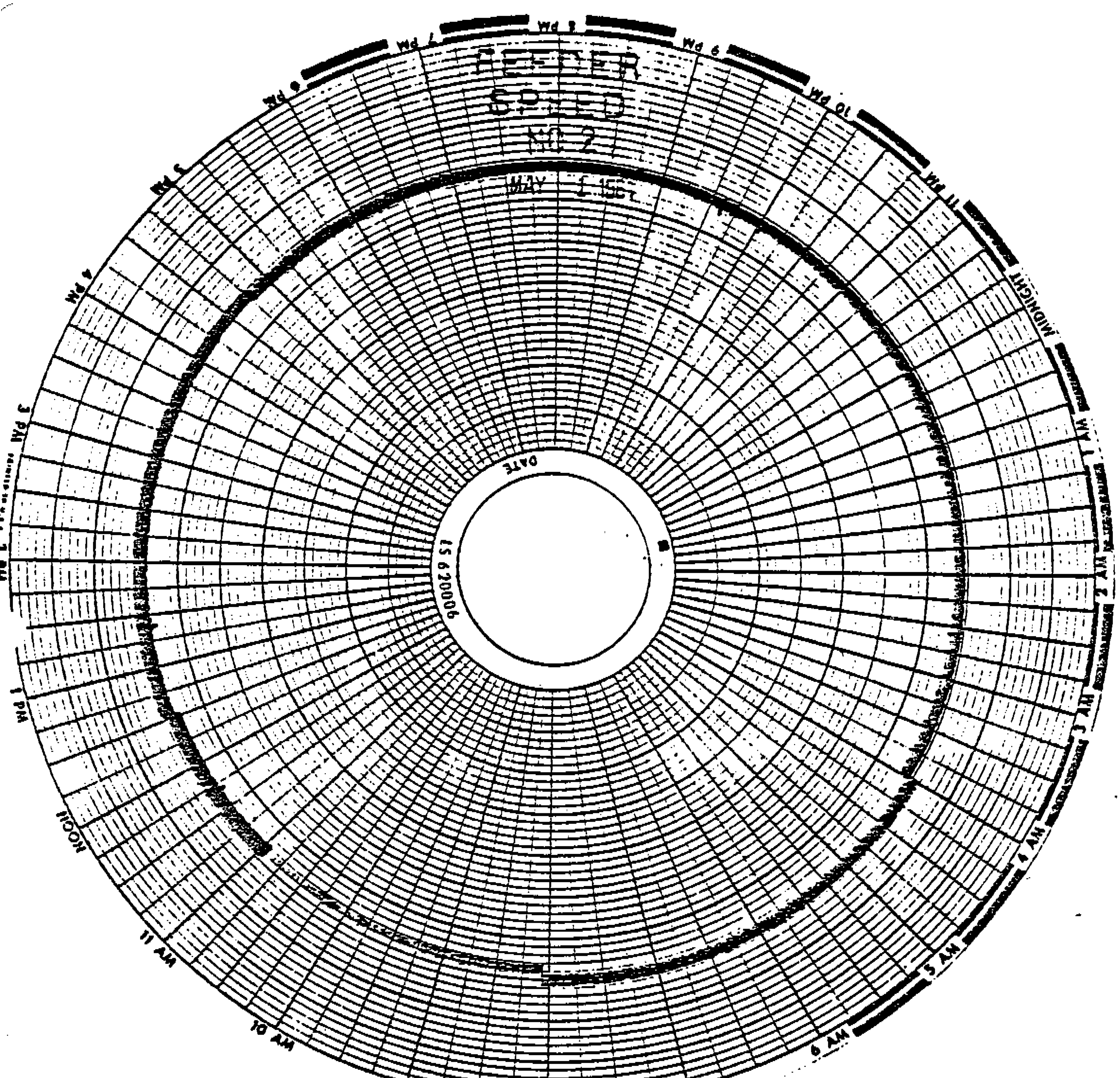
11 PM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DATE
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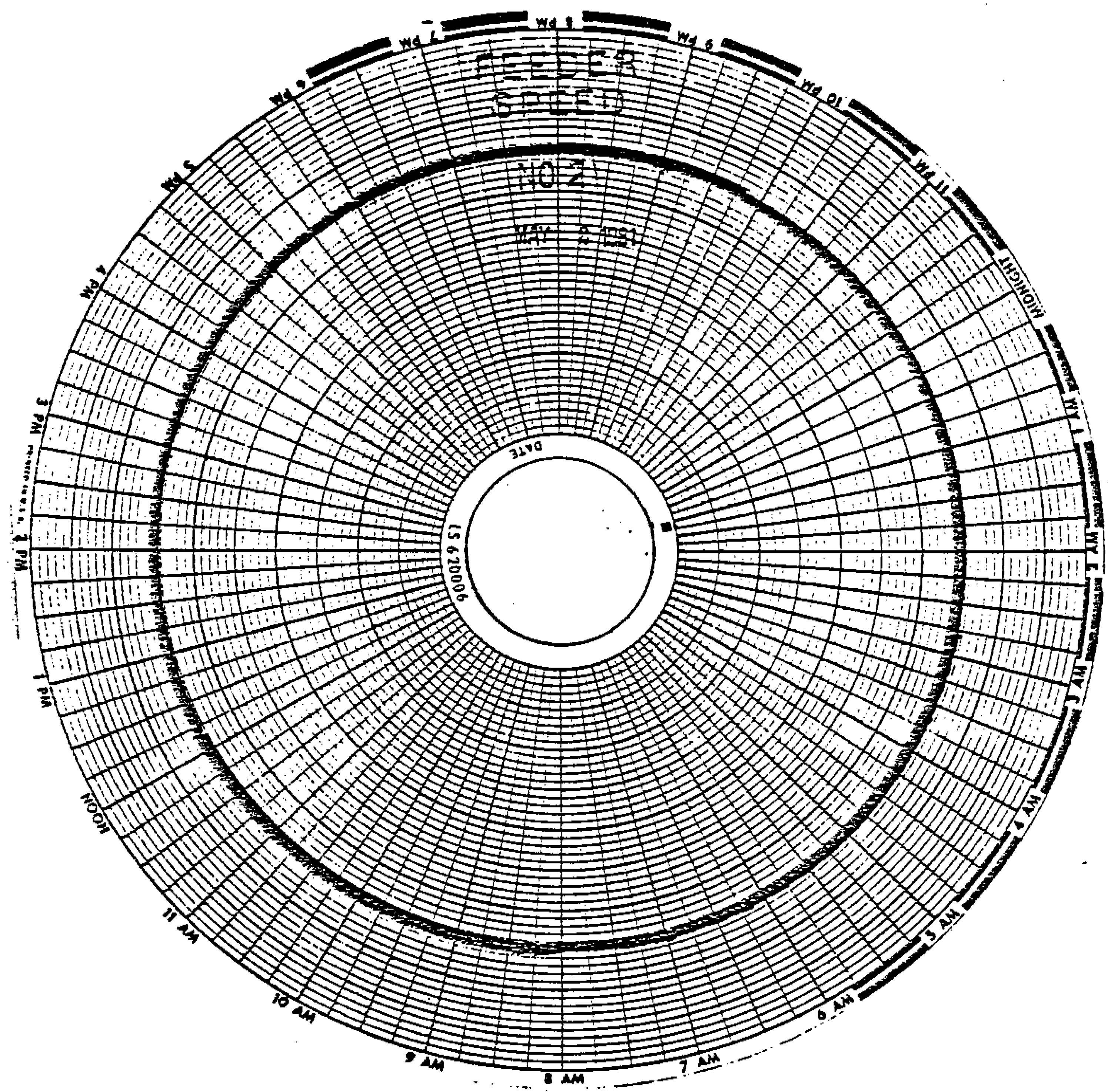
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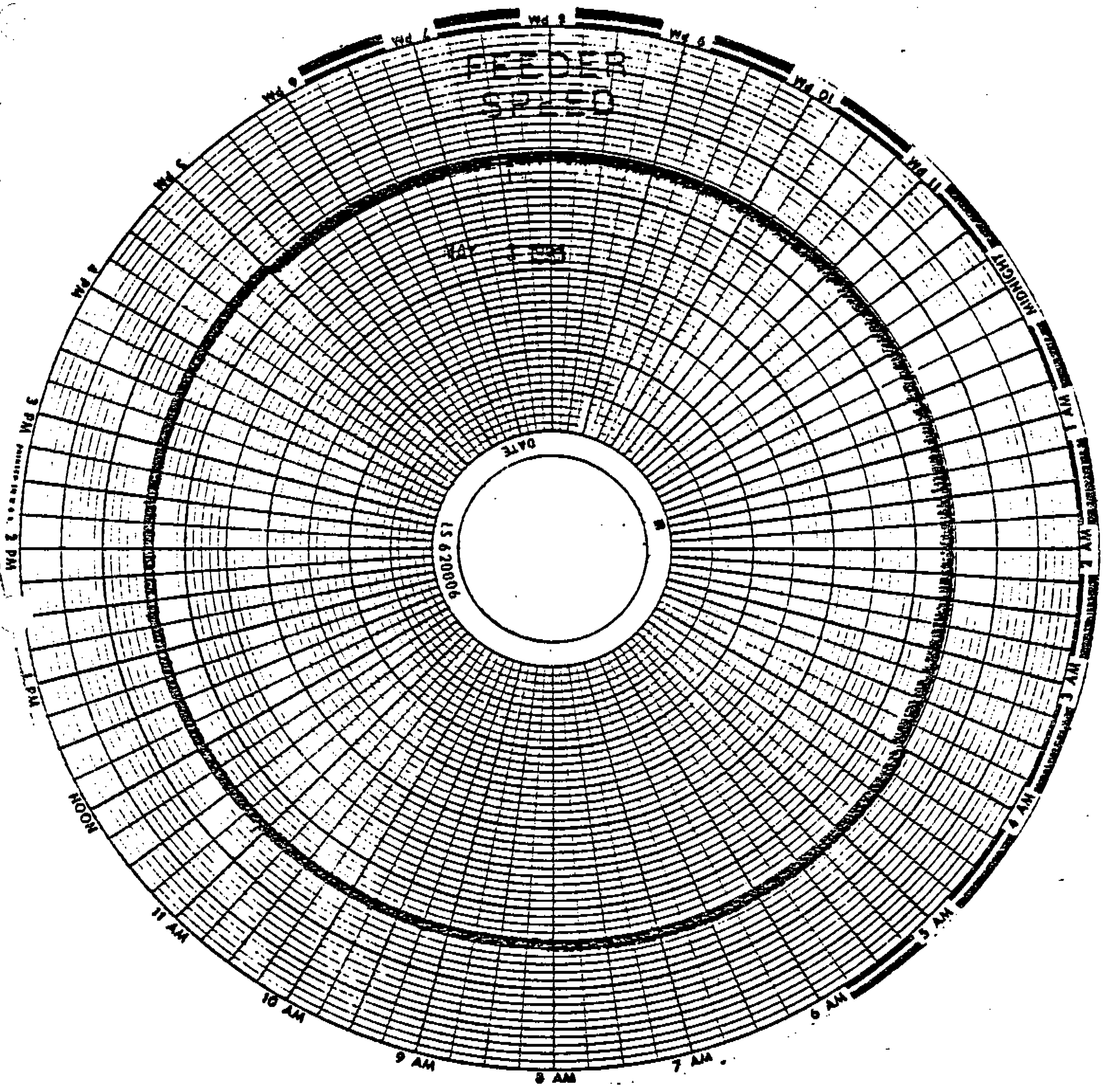
DATE
LS 620006


FEEDER
SPEED
DATE
LS 620006
MIDNIGHT
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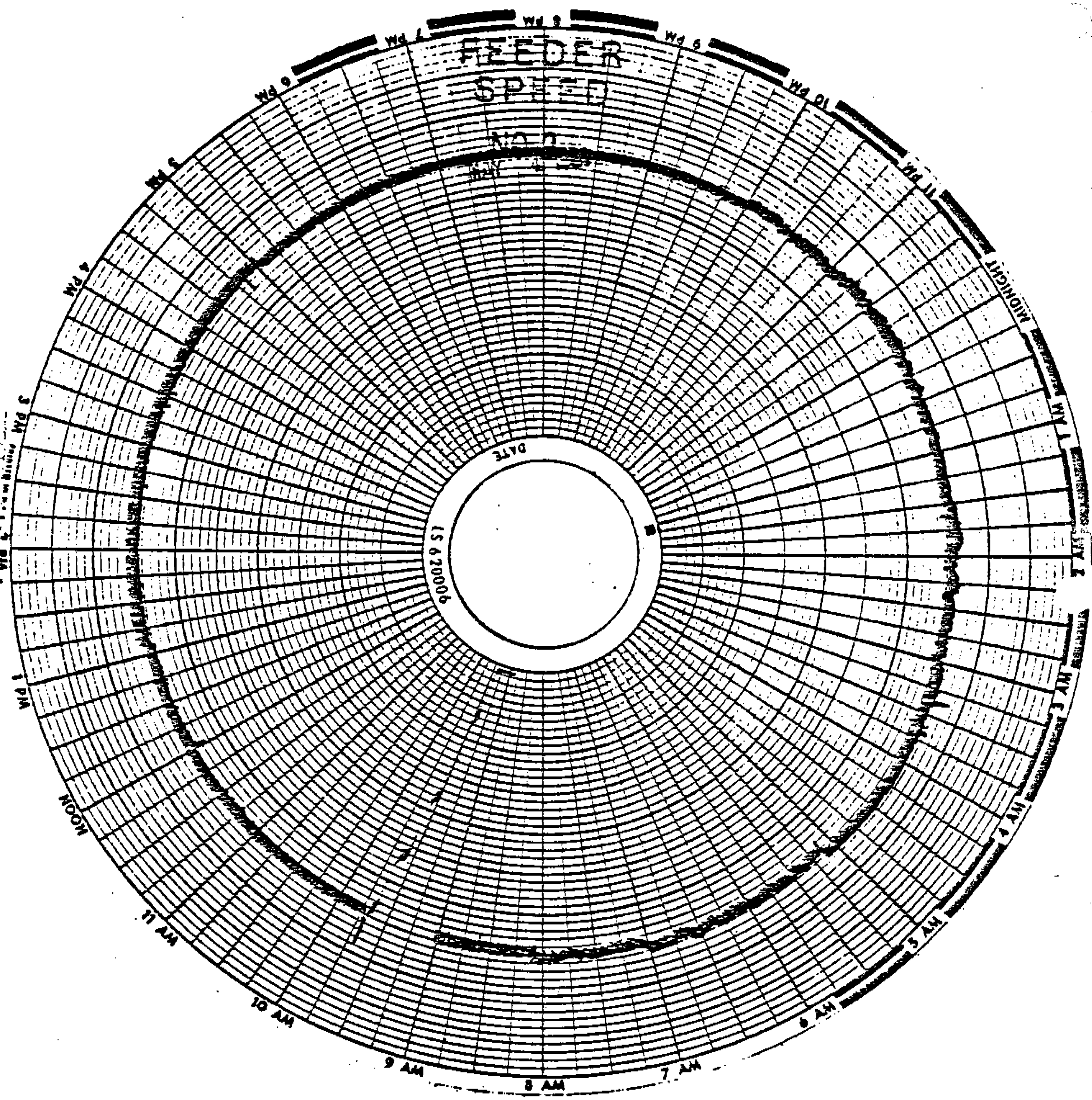
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SPEED
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8 PM
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MIDNIGHT
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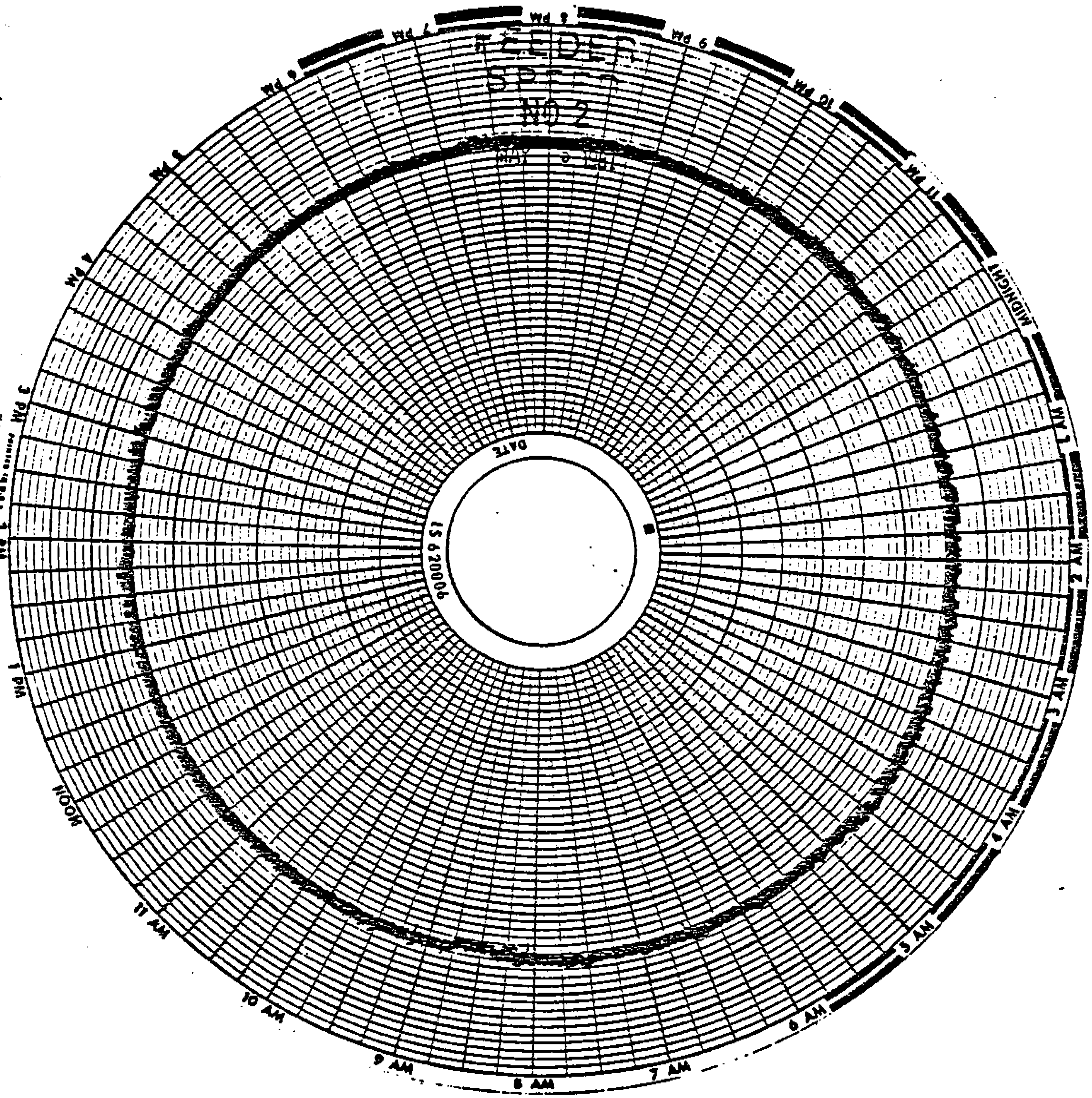
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SPEED
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DATE
MIDNIGHT
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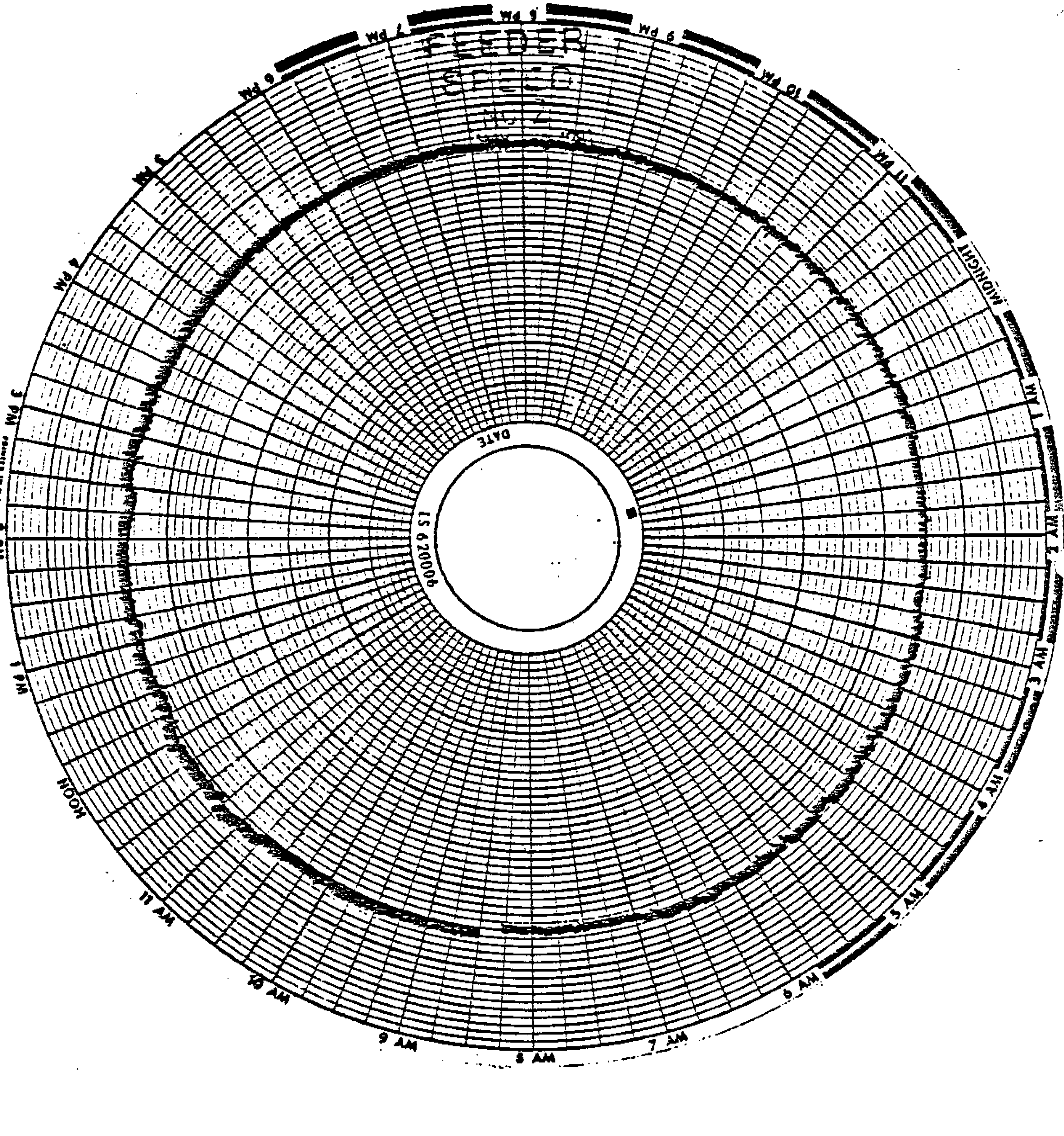
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MIDNIGHT
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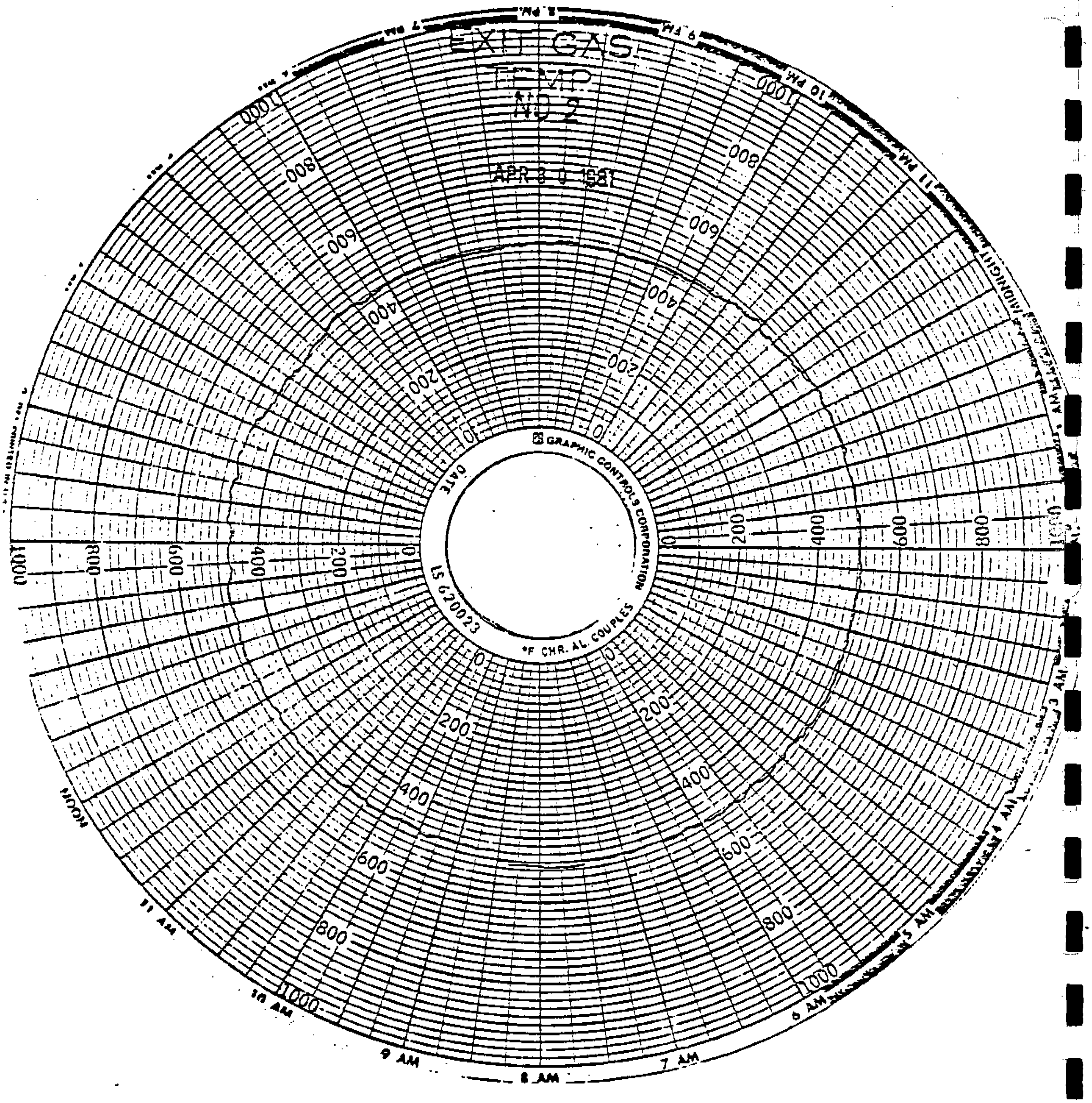
DATE
LS 620006

APPENDIX F

KILN FEED END GAS TEMPERATURE AND KILN FLUE GAS OXYGEN CONTENT CHARTS
April 30 - May 6, 1981
(Courtesy of Ideal Basic Cement
Ada, Oklahoma)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TEMP
NO 2
APR 3 0 1981
GRAPHIC CONTROLS CORPORATION
°F CHR. AL. COUPLES
LS 620023
DATE
NOON
11 AM
10 AM
9 AM
8 AM
7 AM
6 AM
5 AM
4 AM
3 AM
MIDNIGHT
11 PM
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8 PM
7 PM
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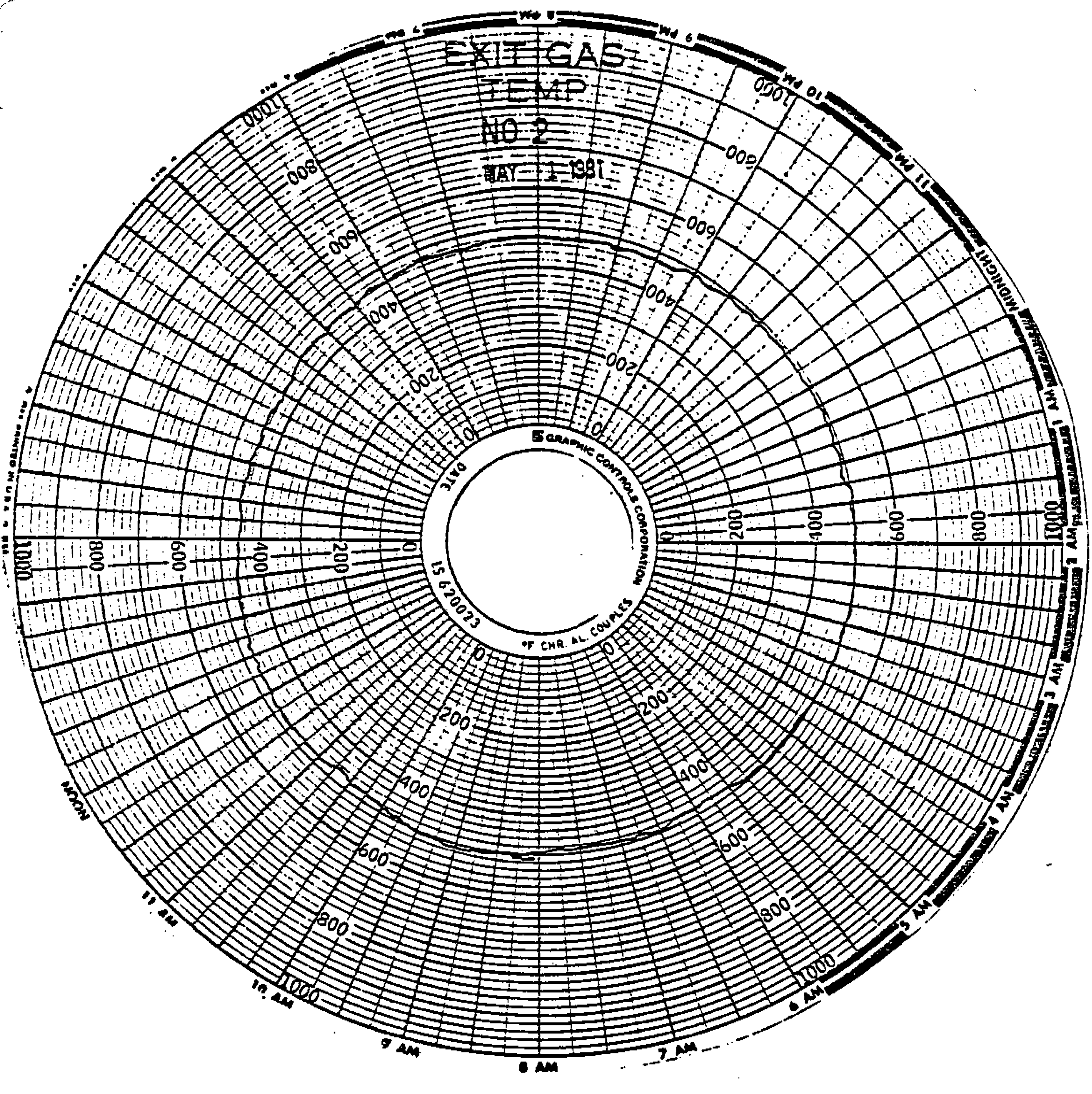
600
800
1000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TEMP
NO 2
MAY 1 1981
GRAPHIC CONTROLS CORPORATION
°F CHR. AL. COUPLES
DATE
NOON
11 AM
10 AM
9 AM
8 AM
7 AM
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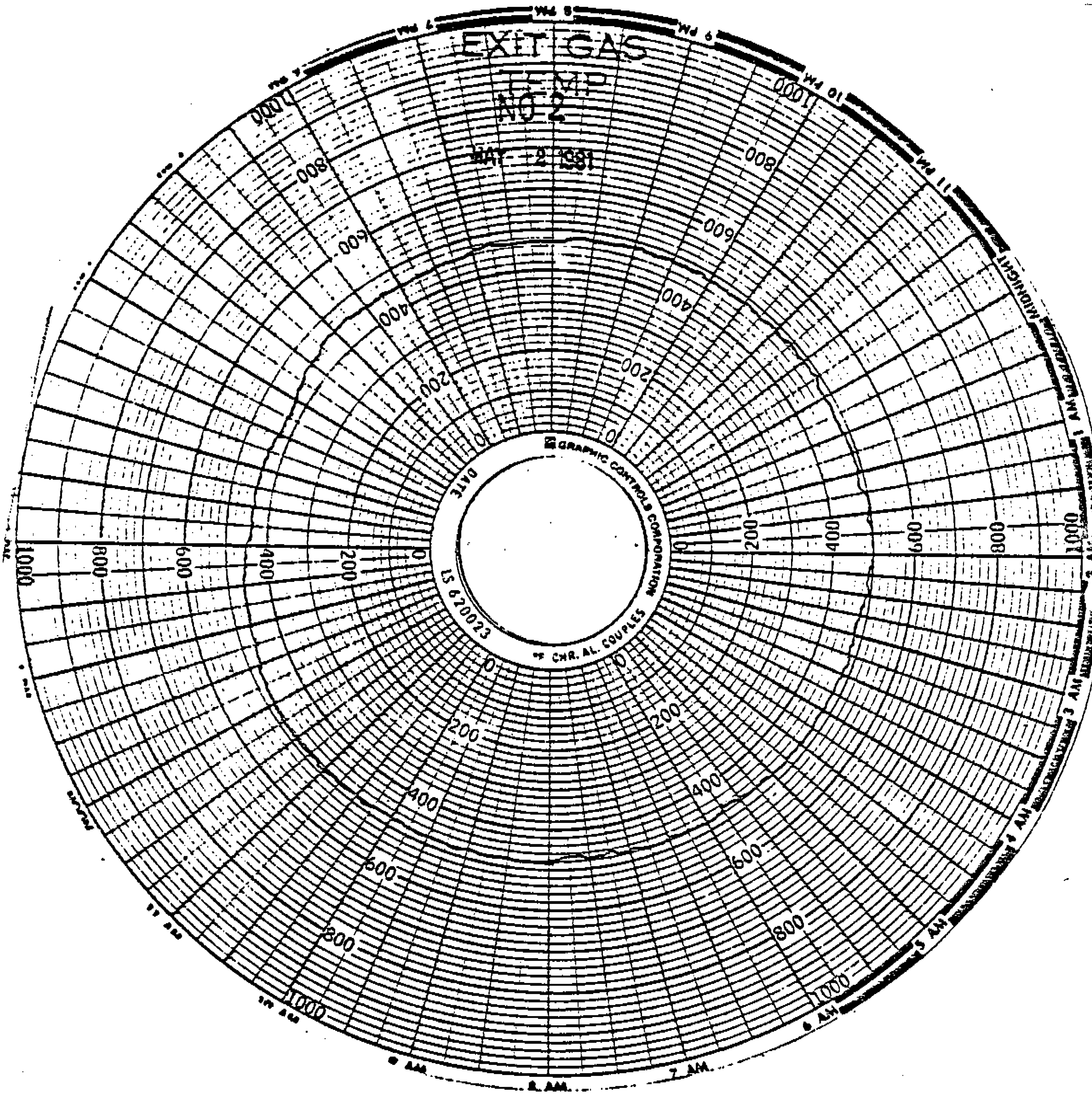
EXIT GAS
TEMP
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MAY 2 1981
GRAPHIC CONTROLS CORPORATION
LS 620023
°F CHR. AL. COUPLES
DATE
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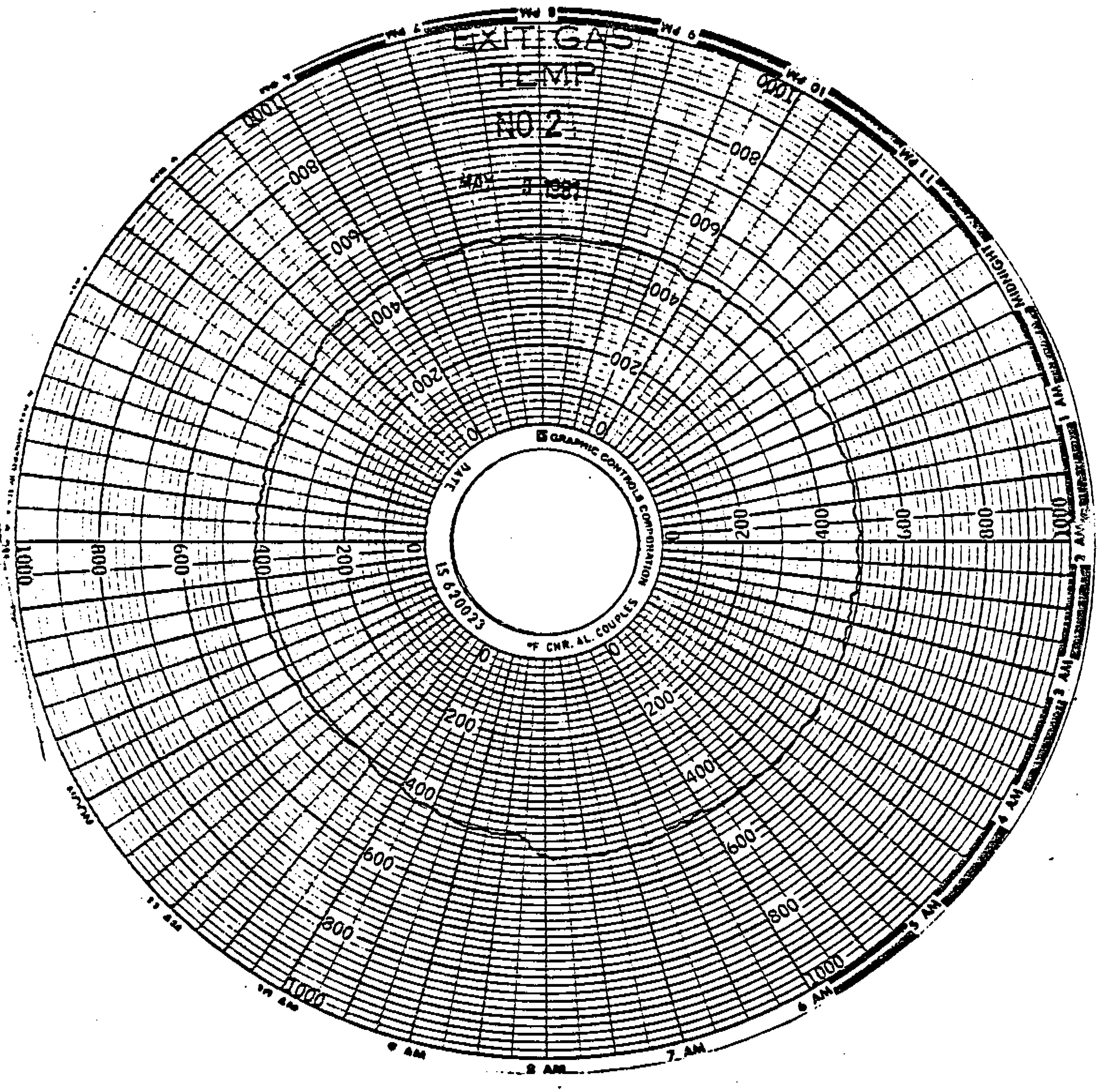
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GRAPHIC CONTROLS CORPORATION
DATE
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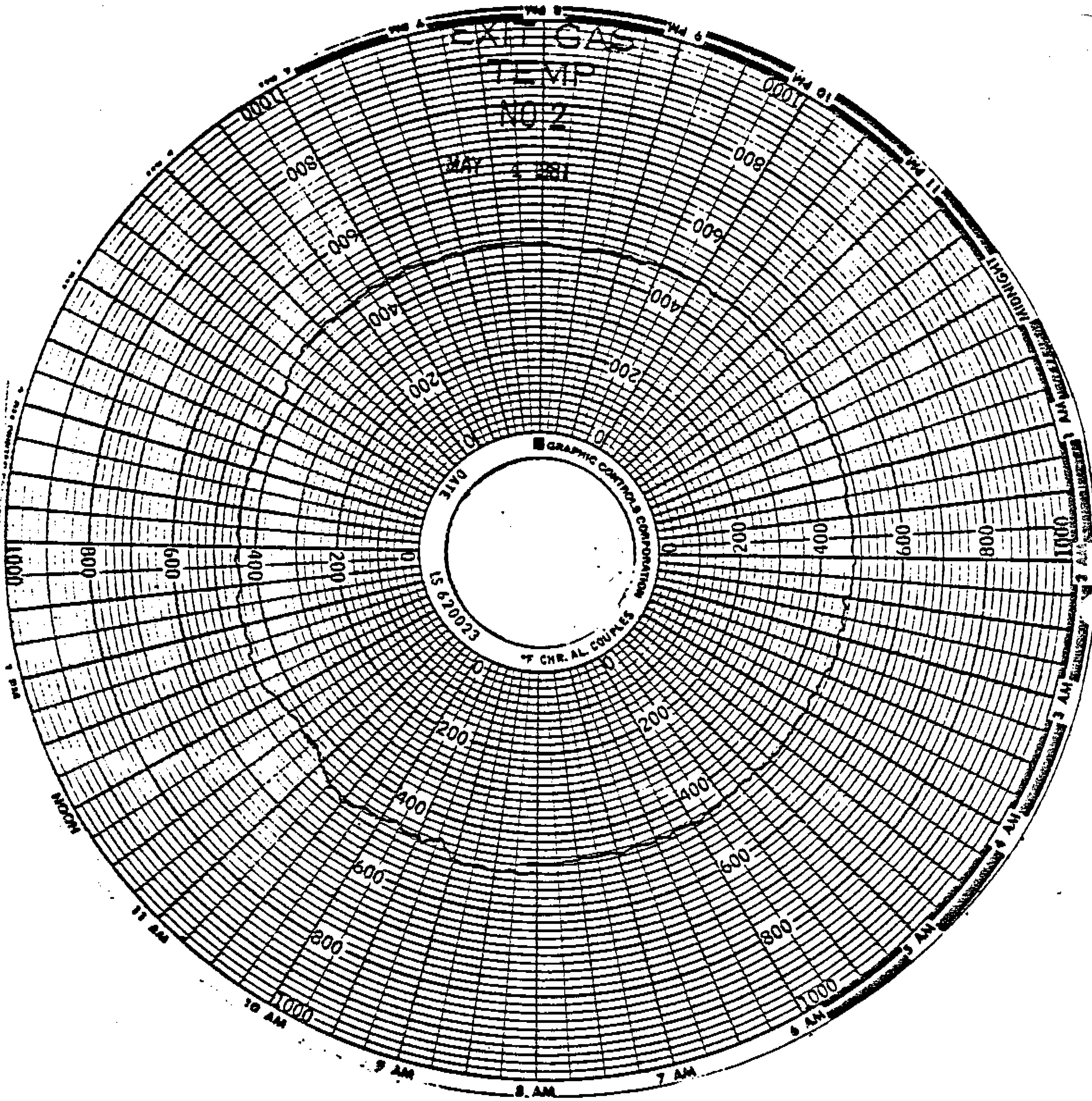
°F CHR. AL. COUPLES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MAY 4 '81
GRAPHIC CONTROLS CORPORATION
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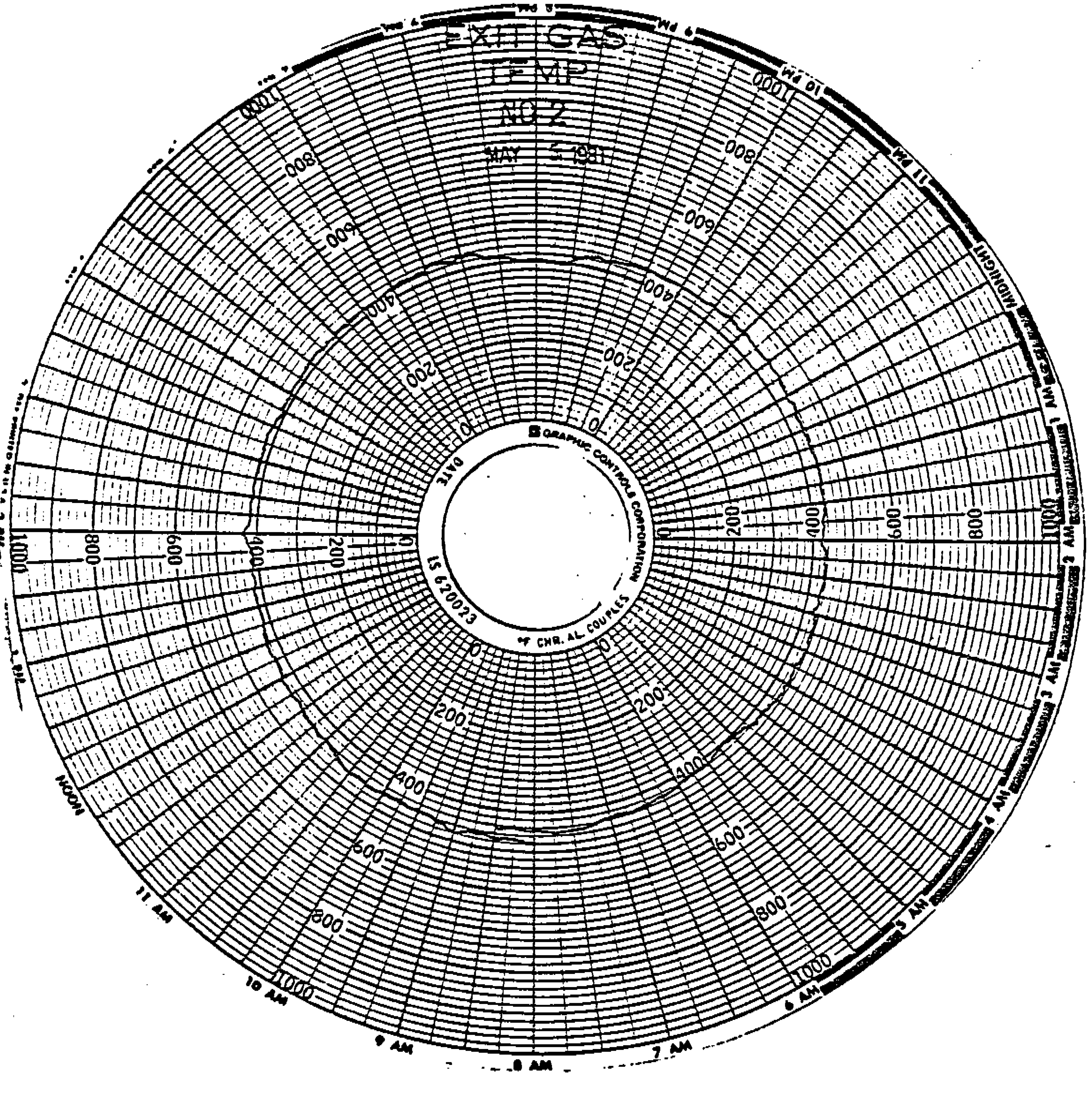
DATE
IS 620023
MIDNIGHT
NOON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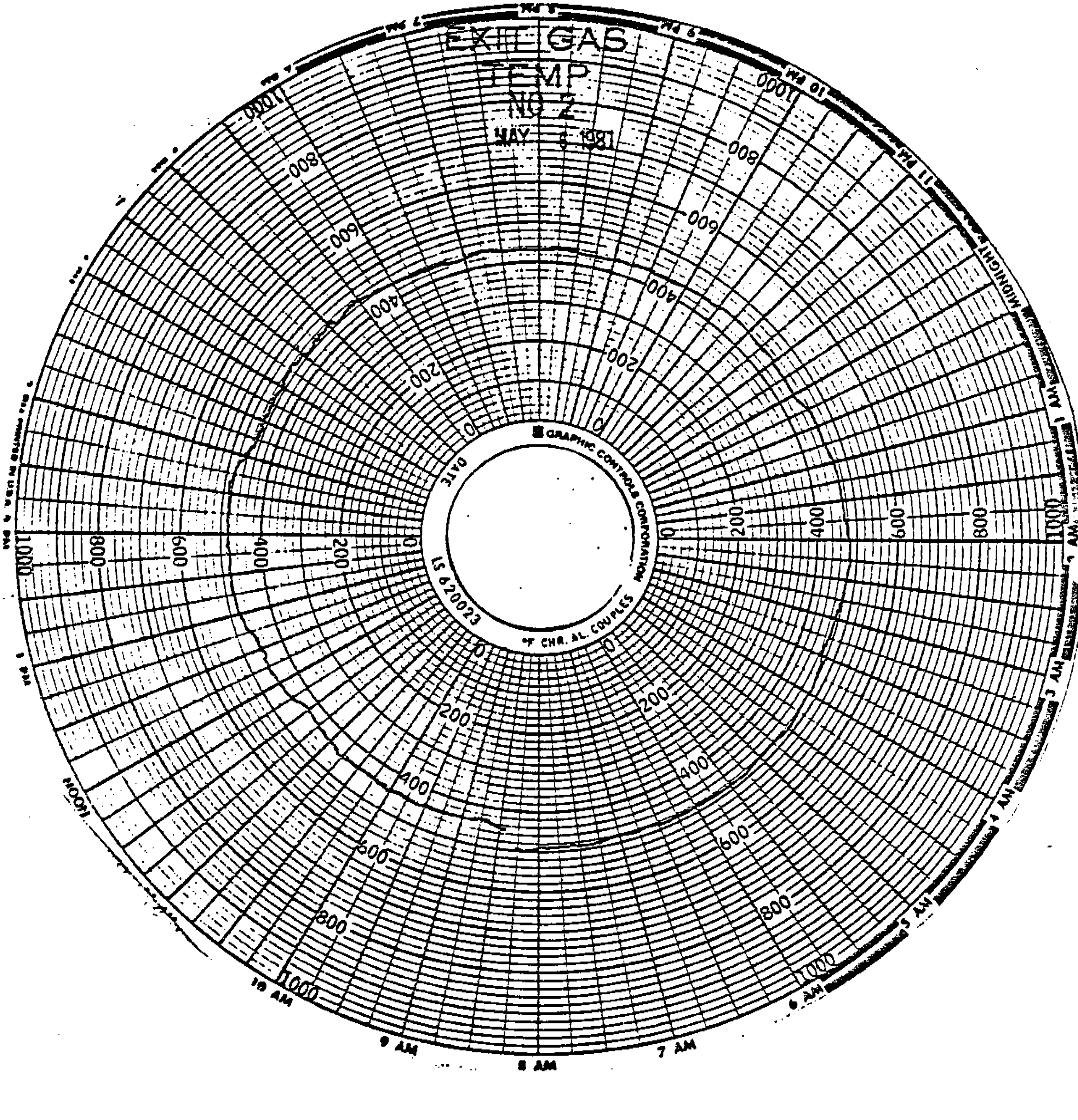
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TEMP
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MAY 6 1981
GRAPHIC CONTROLS CORPORATION
DATE
LS 620023
°F CHR. AL. COUPLES
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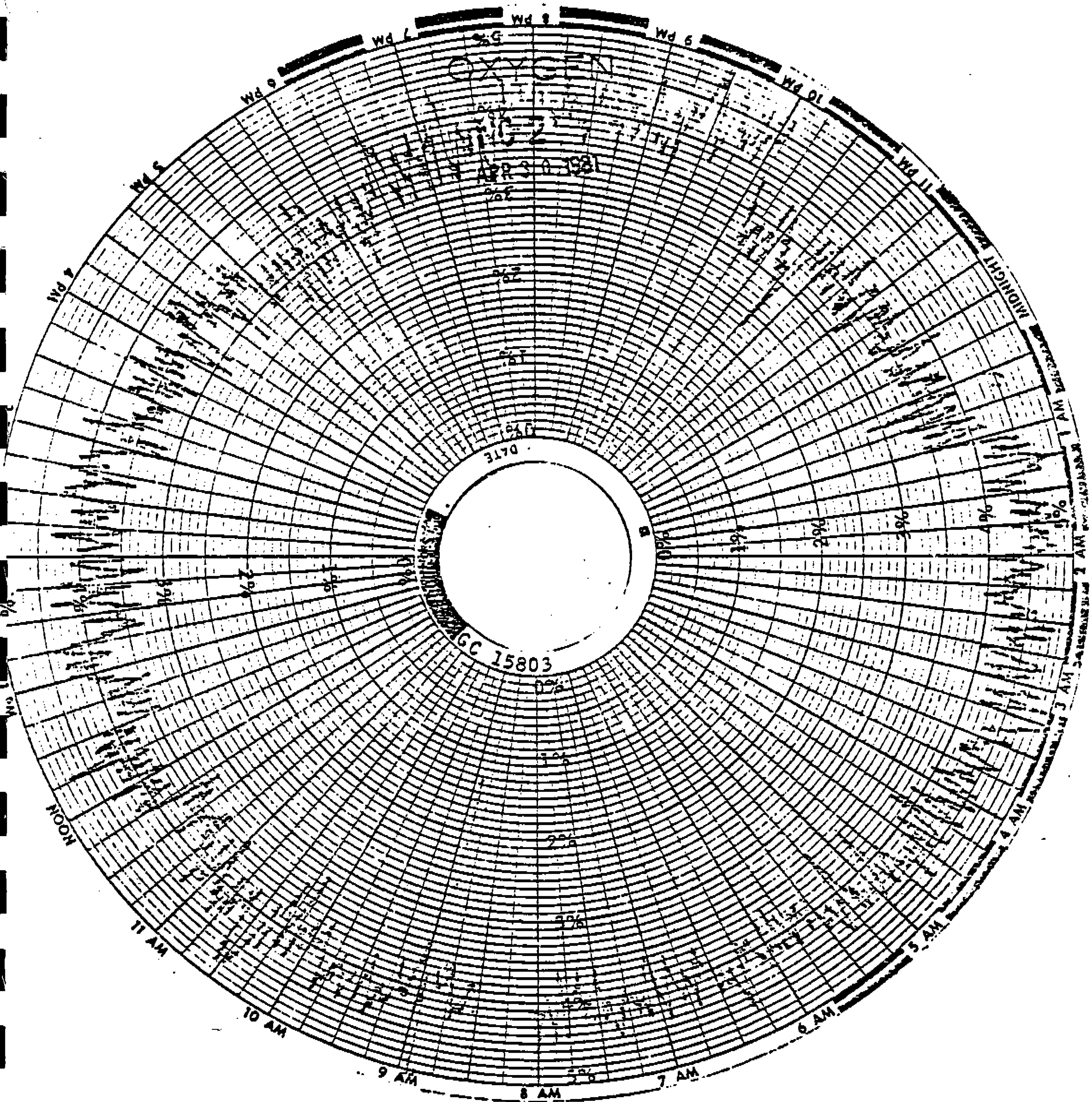
OXYGEN
APR 3 0 1981
GC 15803
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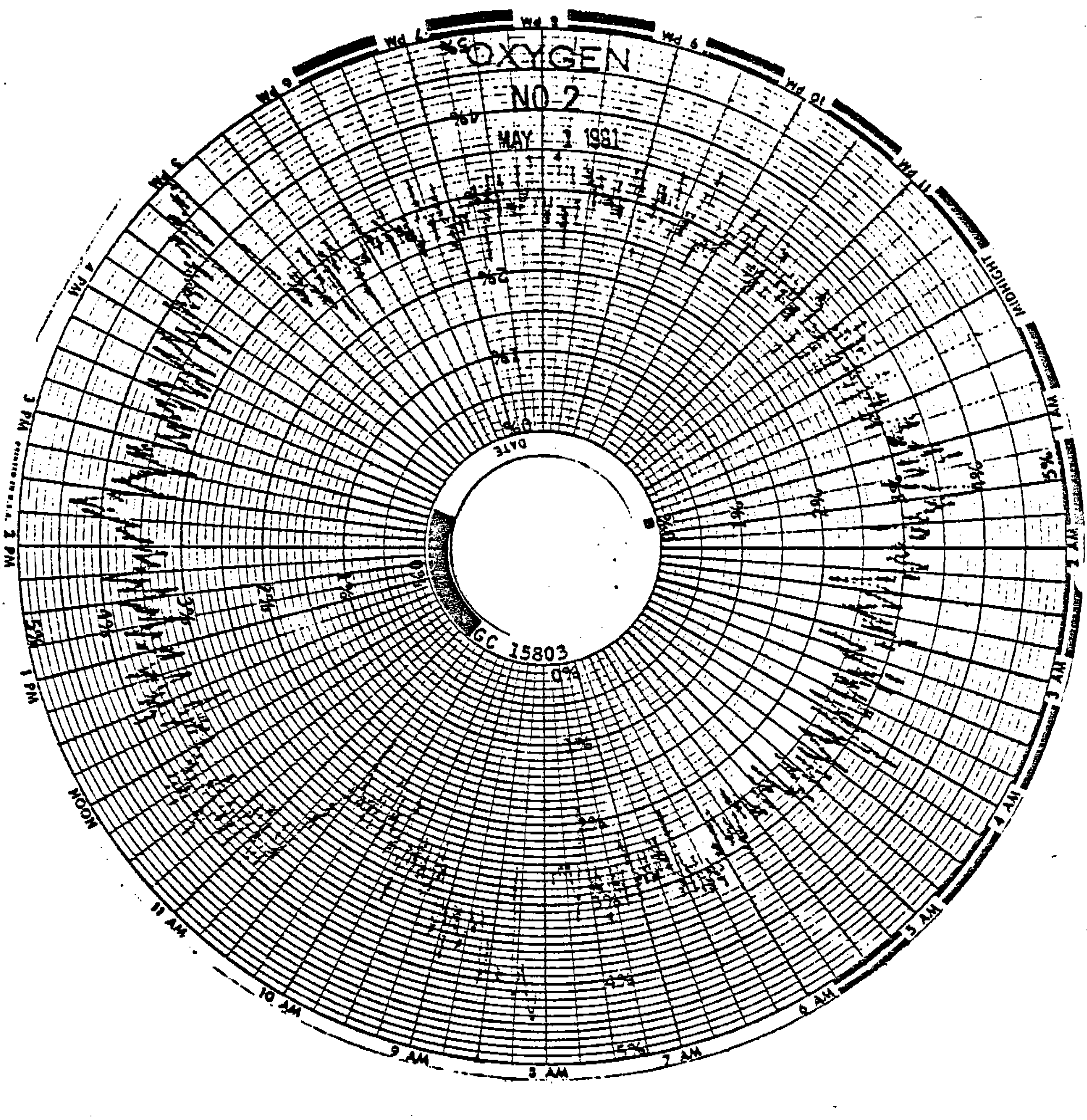

OXYGEN
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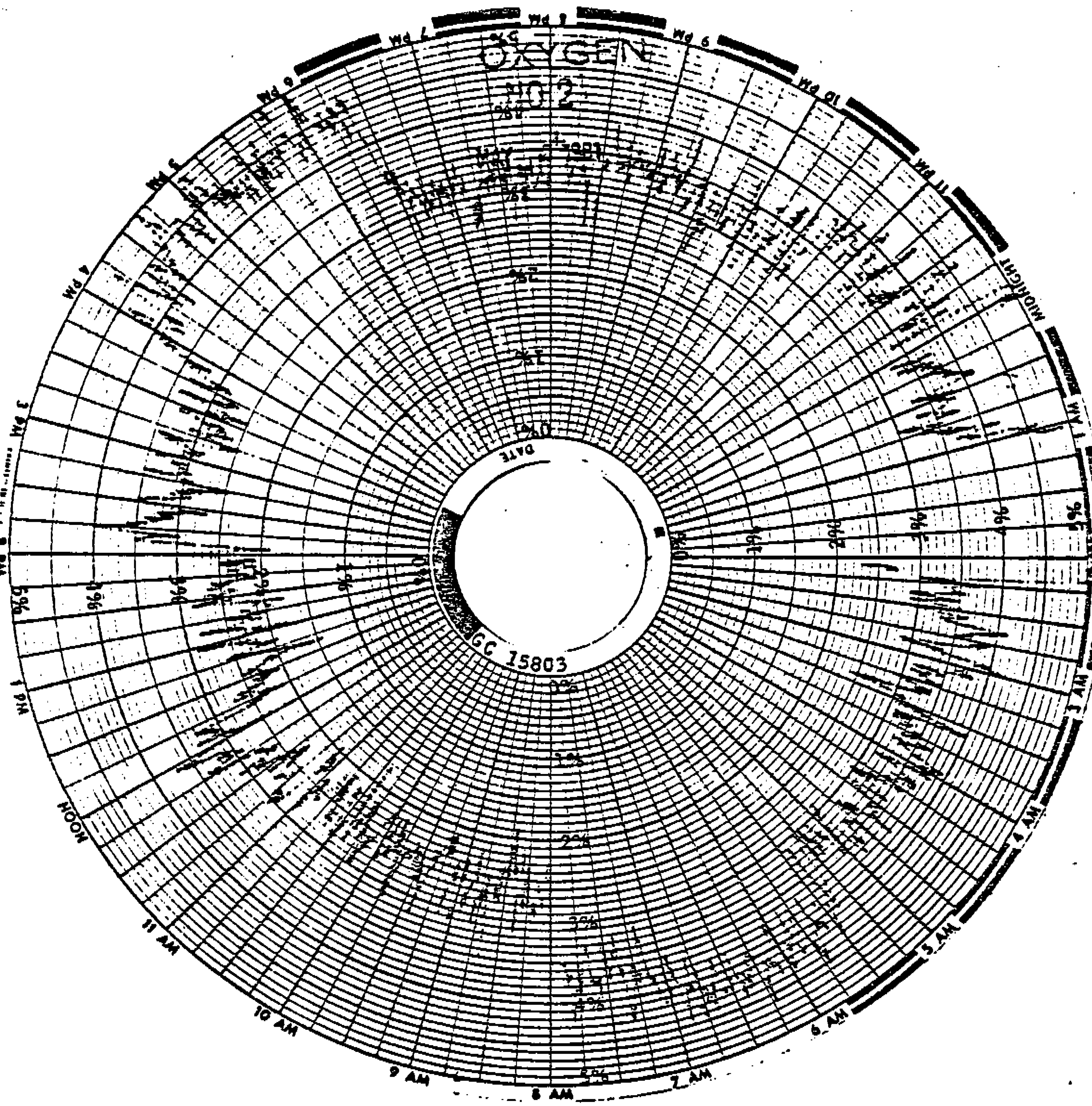
OXYGEN
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GC 15803
MIDNIGHT
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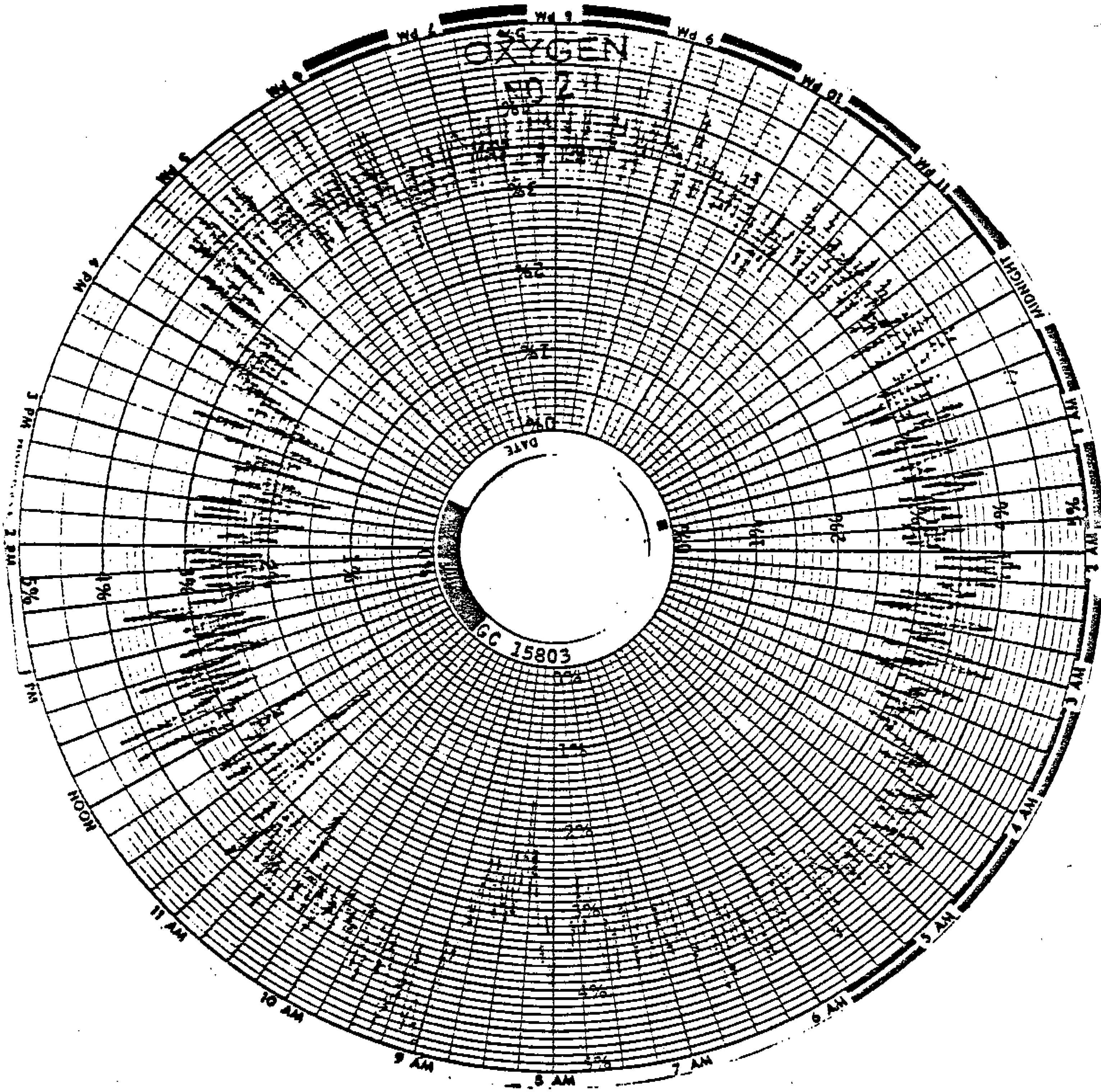
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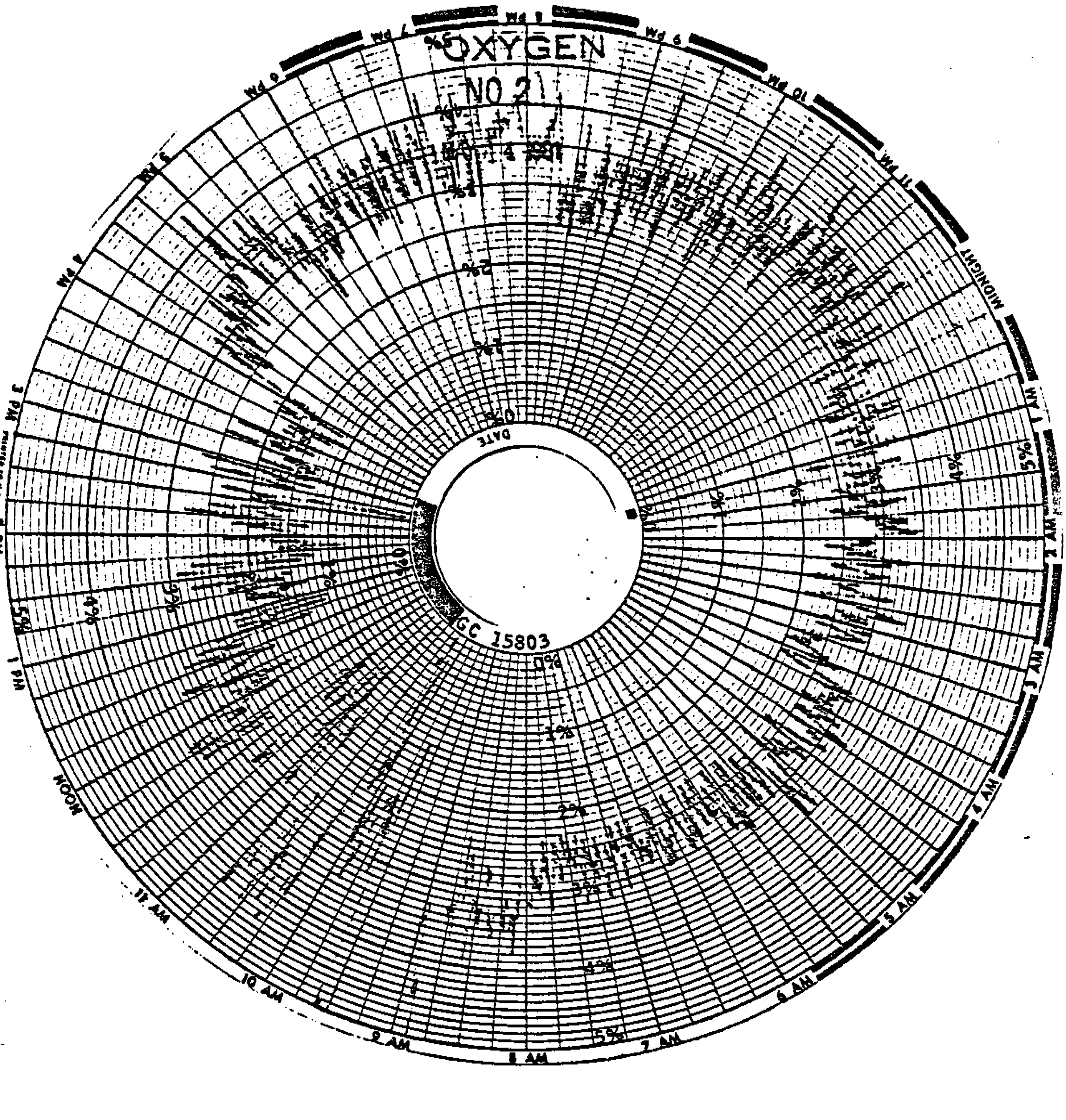

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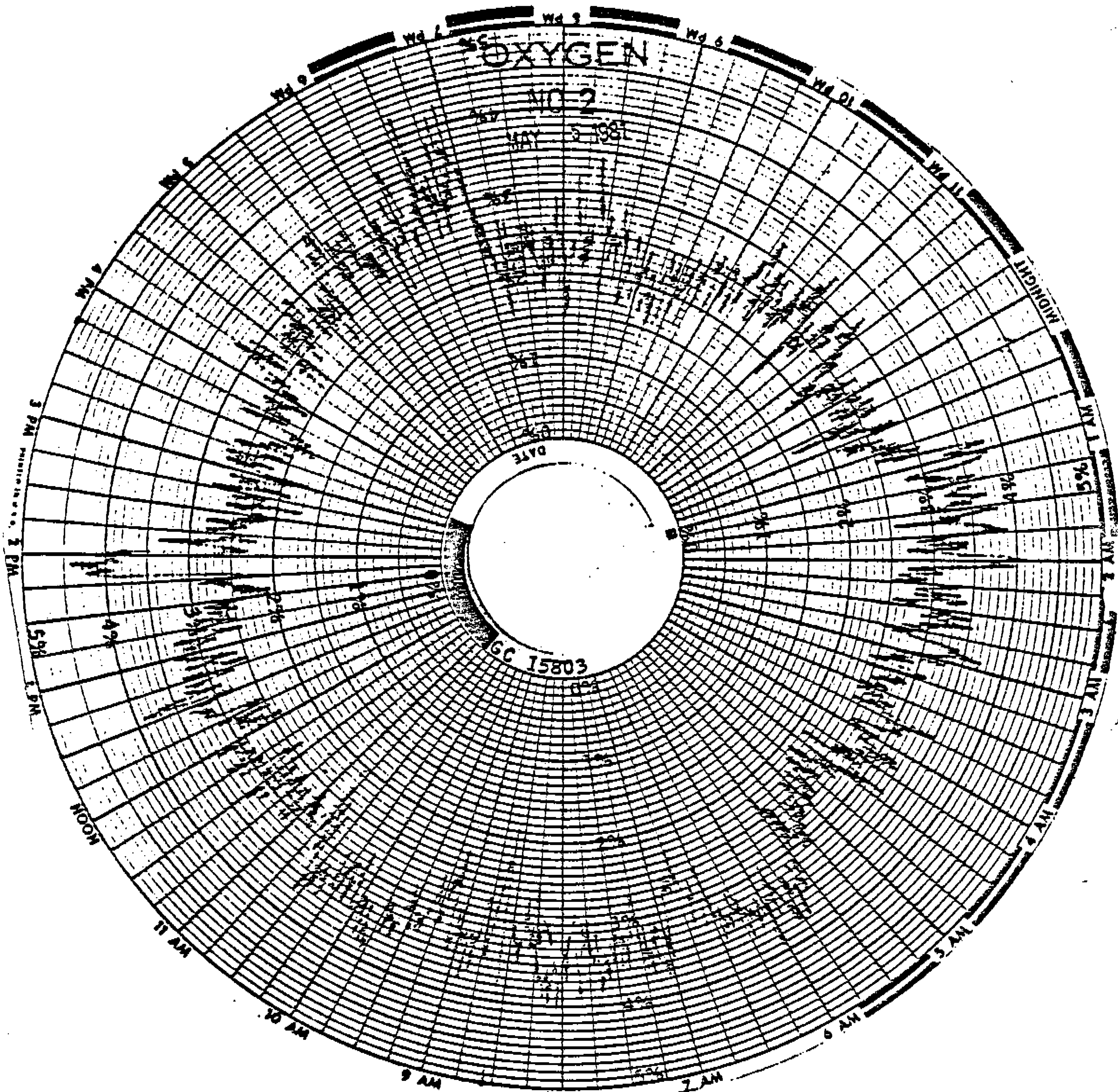
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MAY 5 1981
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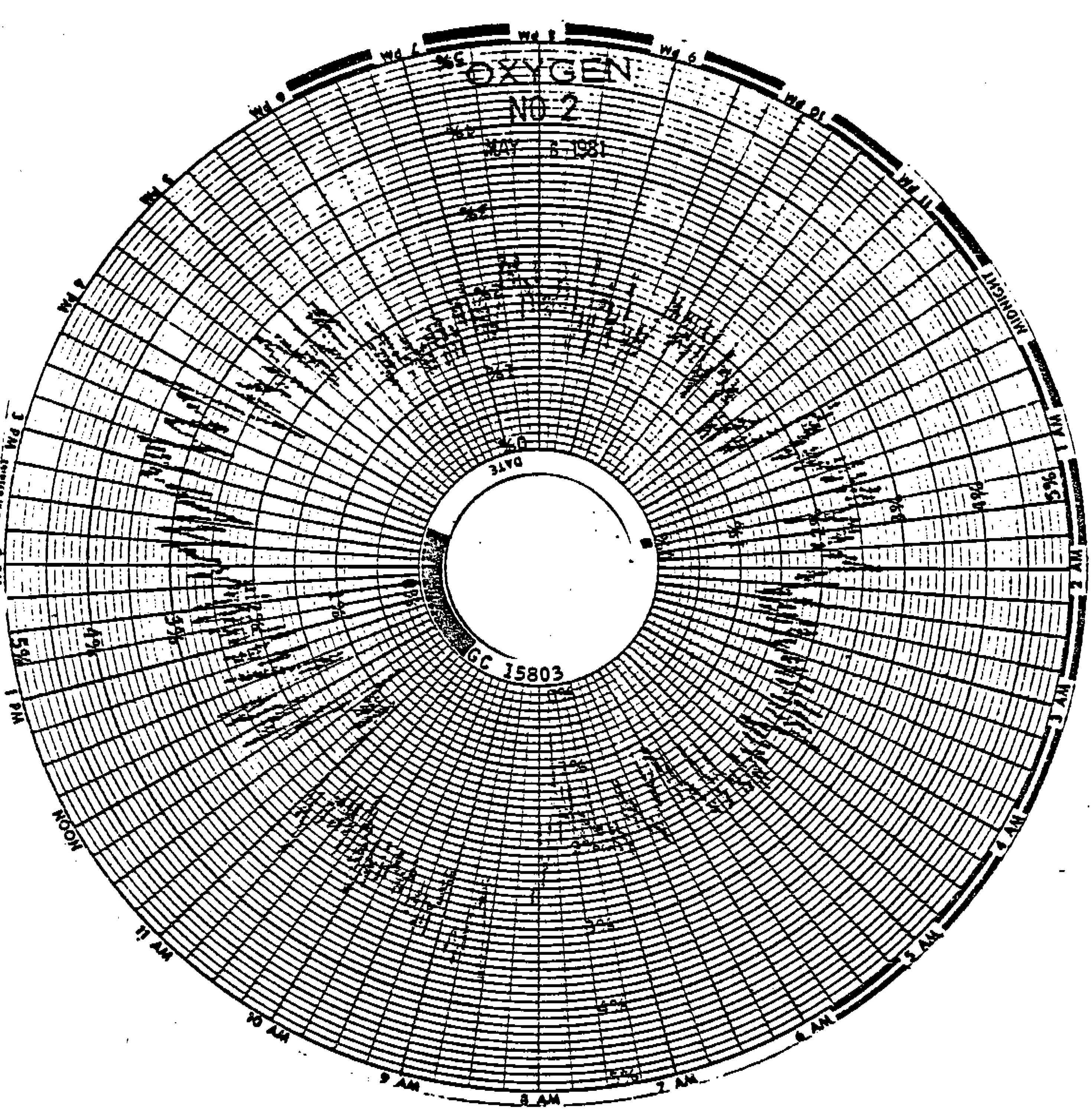
OXYGEN
NO 2
MAY 6 1981
GC 15803
DATE
MIDNIGHT
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APPENDIX G

CLINKER ANALYSIS SUMMARIES
April 30 - May 6, 1981

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0			32.1	96.7	78.4	✓	I	[illegible]	5.63	3.39	[illegible]	✓	1.28	.28	.21	1.13	[illegible]	52.6	[illegible]	[illegible]	[illegible]	.93	2.80	2.21	.77	[illegible]	95	1.73
1			31.7	98.0	78.3	44.0	✓	[illegible]	[illegible]	3.44	[illegible]	1.95	1.35	.11	.20	1.05	[illegible]	55.3	✓	✓	✓	.91	2.86	2.25	1.18	[illegible]	✓	1.74
2			[illegible]	[illegible]	[illegible]	✓	✓	[illegible]	[illegible]	[illegible]	[illegible]	✓	1.33	.18	.23	1.05	[illegible]	55.1	20.0	10.6	9.4	.94	[illegible]	2.36	.86	[illegible]	93	[illegible]
3			[illegible]	97.3	[illegible]	44.1	✓	[illegible]	[illegible]	[illegible]	[illegible]	1.80	1.49	.06	.25	1.10	[illegible]	55.0	18.5	11.2	9.3	.97	[illegible]	2.30	.83	[illegible]	94	[illegible]
4			31.5	98.0	[illegible]	✓	I	[illegible]	[illegible]	[illegible]	65.53	1.84	1.30	.03	.23	.94	[illegible]	[illegible]	15.3	10.8	9.8	.85	2.94	2.26	.83	[illegible]	95	[illegible]
5			31.5	97.9	78.8	44.0	I								.20	.94						.84						
6			[illegible]	[illegible]	77.8	[illegible]	I	[illegible]	[illegible]	[illegible]	[illegible]	1.65	1.32	.17	.21	1.–	[illegible]	[illegible]	15.6	10.5	11.0	.87	2.73	[illegible]	.32	[illegible]	[illegible]	[illegible]
7			[illegible]	✓	[illegible]	[illegible]	I	[illegible]	[illegible]	[illegible]	[illegible]	1.66	1.26	.07	.20	1.–	[illegible]	52.5	17.8	10.3	10.3	.86	[illegible]	[illegible]	.35	[illegible]	[illegible]	[illegible]
8			[illegible]	[illegible]	[illegible]	[illegible]	I	[illegible]	[illegible]	[illegible]	[illegible]	1.65	[illegible]	.11	.21	.93	[illegible]	55.8	19.8	10.1	[illegible]	.88	2.73	2.31	.77	[illegible]	93	[illegible]
9			[illegible]	[illegible]	[illegible]	[illegible]	I	[illegible]	[illegible]	[illegible]	[illegible]	1.76	1.54	.14	.23	[illegible]	[illegible]	55.5	[illegible]	10.9	9.6	.90	[illegible]	2.39	.73	[illegible]	94	1.84
0			[illegible]	[illegible]	79.3	[illegible]	I	[illegible]	[illegible]	[illegible]	[illegible]	1.80	[illegible]	.11	✓	✓	[illegible]	[illegible]	[illegible]	9.6	9.4	.95	[illegible]	2.49	.67	[illegible]	.94	[illegible]
1																												

IM 011 3003 (REV. 11-72)

DAILY SUMMARY

A-151

PLANT Ada MONTH May, 1981

	CLAY		KILN FEED				CLINKER																					
	% H_2O	−200	% H_2O	−50	−200	$\frac{CaO}{CaCO_3}$	Type	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Loss	Na_2O	K_2O	Total	C_3S	C_2S	C_3A	C_4AF	Equiv. Na_2O	BI	SR	Free CaO	BF	SF	A/F
1			31.8	98.3	79.8	43.8	I	21.48	5.40	3.10	63.43	1.71	1.23	.08	.21	.93	99.50	61.9	14.0	9.1	9.4	.82	2.40	2.52	.43	111.3	96	1.74
2			31.5	98.4	79.1	44.0	I								.21	.93						✓						
3			31.3	98.8	79.9	44.1	I	21.70	5.69	3.37	65.68	1.66	1.42	.59	.24	.90	99.73	66.8	9.0	9.4	10.3	.83	3.40	2.23	.36	111.4	95	1.6
4			31.7	99.3	79.8	43.9	I	[illegible]	5.67	3.59	[illegible]	1.32	1.13	.13	.24	.99	99.97	66.0	9.4	9.0	10.9	.89	3.32	2.23	.42		.96	1.7
5			31.8	98.1	79.5	43.0	I	21.12	5.93	3.79	[illegible]	1.76	2.08	.10	.26	1.12	100.00	56.3	18.1	10.0	10.3	1.00	2.77	2.27	.55	102.1	.94	1.7
6			31.6	18.1	84.1	42.1	II	23.38	3.97	3.55	65.04	2.24	1.00	.14	.18	.62	100.12	55.3	25.3	4.5	10.8	.59	3.61	3.11	.48	111.7	.90	1.12
7																												
8																												
9			Type of raw product was changed on May 6.																									
0																												
1																												

Burnability factor, lime saturation, A/F

	F.O.W. ADL	FOW RM	Fireing Pipe R.M.	Fireing Pipe Ash	Fireing Pipe Fineness	CAR A.D.L.	CAR R.M.
		85728					8.4222
Date	4-29				+50m=0.00	4-29	
Gross wt.	1423	91.56	[illegible]		-100m=99.2	1799	9.3562
Tare wt.	335	8.1.5	[illegible]	[illegible]	-200m=81.8	353	83561
Net wt.	1088	[illegible]	[illegible]	[illegible]		1447	[illegible]
Dry wt.	1325	9.3.28	17.4122			1714	9.2358
	98			A: 2.33			
% H_2O	[illegible]	[illegible]				[illegible]	7.14

F.O.W. Total moisture 5.74 = 12.97

Fireing Pipe Total moisture = 2.77

Car Total moisture = 12.57

H2-6.59

	F.O.W. A.D.L.	FOW R.M.	Fireing Pipe R.M.	Fireing Pipe Ash	Fireing Pipe Fineness	CAR ADL	CAR R.M.
Date	4-30	8.0921					
Gross wt.	1417	90163	12.4356	11.4826	+50m=0.00		
Tare wt	335	8.0149	11.4397	[illegible]	-100m=99.0		
Net	[illegible]			.1029	-200m=84.9		
		1.371					
Dry wt	1343	8.9361	12.4097	[illegible]			
	74	362	[illegible]				
% H_2O	[illegible]	7.61					

F.O.W. Total moisture = 14.56

Fireing Pipe Total moisture = 3.09

Car Total moisture =

	F.O.W. A.D.L.	F.O.W. R.M.	Fireing Pipe RM	Fireing Pipe Ash	Fireing Pipe Fineness	CAR A.D.L.	CAR R.M.
							84133
Date	5-1	11.49	84179			5-1	[illegible]
Gross wt.	1203	12.384	9.3573	84179	+50m=0.0	1869	8.3562
Tare wt.	348	11.4397	83556	83556	-100m=99.0	356	[illegible]
Net wt.	855	.9987	10017	.0623	-200m=85.6	1539	7.72
		5.45					
Dry wt.	1140	12.3529	9.3233	A-6.23		1813	97671
			.0340				
% H_2O	7.36	8.56	3.39			4.93	7.

A-156

F.O.W. Total moisture = 15.29

Fireing Pipe Total moisture = 3.39

APPENDIX I

ESP POWER LEVELS FOR KILN 2
April 30 - May 6, 1981

Electrostatic Precipitator Operating Parameters #2   Date 5/1/81

Time of Day	Operating Mode		Inlet Electrical Field (No. 1)			Middle Electrical Field (No. 2)			Outlet Electrical Field (No. 3)		
	Auto	Man.	Primary Current (amps AC)	Primary Voltage (volts AC)	Sec. Current (mA DC)	Primary Current (amps AC)	Primary Voltage (volts AC)	Sec. Current (mA DC)	Primary Current (amps AC)	Primary Voltage (volts AC)	Sec. Current (mA DC)
0 - 1	✓		149	351	670	147	352	630	144	322	650
1 - 2	✓		148	359	665	147	352	630	144	322	650
2 - 3	✓		148	358	665	148	368	635	144	322	645
3 - 4	✓		148	352	662	148	360	638	144	320	645
4 - 5	✓		149	351	662	149	358	639	145	320	642
5 - 6	✓		147	352	660	149	362	640	143	320	642
6 - 7	✓		148	349	662	150	362	642	145	320	650
7 - 8	✓		149	350	665	150	367	645	144	322	640
8 - 9											
9 - 10											
10 - 11											
11 - 12											
12 - 13											
13 - 14											
14 - 15											
15 - 16											
16 - 17											
17 - 18											
18 - 19											
19 - 20											
20 - 21											
21 - 22											
22 - 23											
23 - 24											

Comments or Unusual Operating Conditions:

APPENDIX B

CALCULATIONS TO DETERMINE OBSTRUCTED AREA OF THE INLET DUCT TO KILN NO. 2 ELECTROSTATIC PRECIPITATOR UNIT

MIDWEST RESEARCH INSTITUTE

PROJECT DEVELOPMENT SKETCH

MRI-18

TITLE North Kiln Inlet Duct to ESP Unit - Obstructed Stack Area

Page 1 of 3

PROJECT NO. 4892-L(03) DRAWN MDH APPR. ______ DATE ______

I.D. = 96"

Stack area if not obstructed:

$$A_S = \pi \left(\frac{I.D.}{2} \right)^2$$

$$A_S = \pi \left(\frac{96''}{2} \right)^2 = 7{,}238.2295\ in^2 \div \frac{144\ in}{ft^2} =$$

$$\underline{50.265\ ft^2}$$

MIDWEST RESEARCH INSTITUTE

PROJECT DEVELOPMENT SKETCH

TITLE North Kiln Inlet Duct To ESP Unit – Obstructed Stack area.

PROJECT NO. 4892-L(03) DRAWN MDH APPR. ______ DATE ______

I.D. = 96"

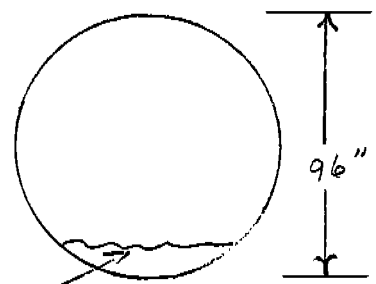
Calculation to correct for obstructed area in duct:

Formula – Segment of a circle

area = $\frac{1}{2} r^2(\text{rad } A - \sin A) = \frac{1}{2}[r(s-c) + ch]$,

where rad A = radian measure of angle A

c = chord, h = height, D = diameter of circle



Segments of Circles, given h/D (Table P. 1-35)

$\frac{h}{D} = \frac{17.00''}{96.00''} = 0.1770833''$

$\frac{c}{D} = \begin{matrix} .170 = .7513 \\ .180 = .7684 \end{matrix}$ From Table P. 1-35

$\frac{c}{D} = .177 = .7633$ (integration)

$\frac{c}{D} \times D = .7633 \times 96.00'' = 73.2768''$ length of C

$\frac{\text{area}}{D^2} = \begin{matrix} .170 = .0885 \\ .180 = .0961 \end{matrix}$ From Table P. 1-35

$\frac{\text{area}}{D^2} = .0938$ (integration)

area = $D^2 \times .0938$

$A_S = (96.00'')^2 \times .0938 = 864.4608 \text{ in}^2 \div \frac{144 \text{ in}}{\text{ft}^2} =$

6.0032 ft^2 of obstructed duct

TITLE North Kiln Inlet Duct to ESP Unit - Obstructed Stack area

PROJECT NO. 4892-L(03) DRAWN MDH APPR. DATE

Summary of Corrected Duct area (A_s)

A_s (without obstruction) = 50.265 ft^2

A_s (obstructed area) = $-$ 6.0032 ft^2 obstruction

44.2618 ft^2 unobstructed area

STANDARD HANDBOOK FOR MECHANICAL ENGINEERS

Revised by a Staff of Specialists

THEODORE BAUMEISTER, Editor

Consulting Engineer; Stevens Professor Emeritus,
Columbia University in the City of New York;
Adjunct Professor of Mechanical Engineering,
University of South Carolina

LIONEL S. MARKS, Editor, 1916 to 1951

Late Gordon McKay Professor of Mechanical
Engineering, Harvard University

Seventh Edition

McGRAW-HILL BOOK COMPANY

New York San Francisco Toronto London Sydney

$s = \frac{1}{2}(a + b + c)$, $t = \frac{1}{2}(m_1 + m_2 + m_3)$.
$r = \sqrt{(s-a)(s-b)(s-c)/s}$ = radius inscribed circle.
$R = \frac{1}{2}a/\sin A = \frac{1}{2}b/\sin B = \frac{1}{2}c/\sin C$ = radius circumscribed circle.
Area $= \frac{1}{2}$ base $\times$ altitude $= \frac{1}{2}ah = \frac{1}{2}ab \sin C = rs = abc/4R$,
$= \sqrt{s(s-a)(s-b)(s-c)} = \frac{4}{3}\sqrt{t(t-m_1)(t-m_2)(t-m_3)}$,
$= r^2 \cot \frac{1}{2}A \cot \frac{1}{2}B \cot \frac{1}{2}C = 2R^2 \sin A \sin B \sin C$,
$= \pm\frac{1}{2}[(x_1y_2 - x_2y_1) + (x_2y_3 - x_3y_2) + (x_3y_1 - x_1y_3)]$, where (x_1,y_1), (x_2,y_2), (x_3,y_3) are coordinates of vertices. See also p. 2-45.

Rectangle (Fig. 48). Area $= ab = \frac{1}{2}D^2 \sin u$, where u = angle between diagonals D, D.

Rhombus (Fig. 49). Area $= a^2 \sin C = \frac{1}{2}D_1D_2$, where C = angle between two adjacent sides; D_1, D_2 = diagonals.

Parallelogram (Fig. 50). Area $= bh = ab \sin C = \frac{1}{2}D_1D_2 \sin u$, where u = angle between diagonals D_1 and D_2; $D_1^2 + D_2^2 = 2(a^2 + b^2)$.

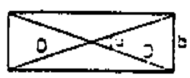


Fig. 48

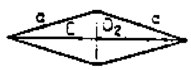


Fig. 49

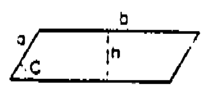


Fig. 50

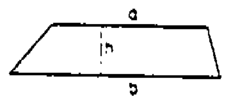


Fig. 51

Trapezoid (Fig. 51). Area $= \frac{1}{2}(a + b)h = \frac{1}{2}D_1D_2 \sin u$, where bases a and b are parallel; u = angle between diagonals D_1 and D_2.

Quadrilateral Inscribed in a Circle (Fig. 52).

Area $= \frac{1}{2}D_1D_2 \sin u = \sqrt{(s-a)(s-b)(s-c)(s-d)} = \frac{1}{2}(ac + bd) \sin u$, where $s = \frac{1}{2}(a + b + c + d)$.

Any Quadrilateral (Fig. 53). Area $= \frac{1}{2}D_1D_2 \sin u$.

NOTE. $a^2 + b^2 + c^2 + d^2 = D_1^2 + D_2^2 + 4m^2$, where m = distance between midpoints of D_1 and D_2.

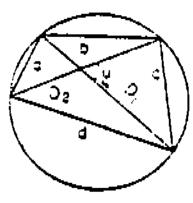


Fig. 52

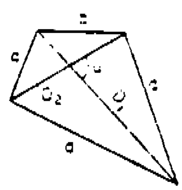


Fig. 53

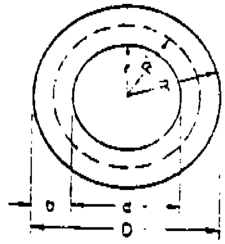


Fig. 54


Fig. 55

Polygons. See table p. 1-39.

Circle. Area $= \pi r^2 = \frac{1}{2}Cr = \frac{1}{4}Cd = \frac{1}{4}\pi d^2 = 0.785398d^2$ (table, p. 1-30), where r = radius, d = diameter, C = circumference $= 2\pi r = \pi d$ (table, p. 1-28).

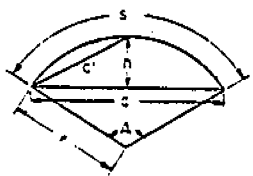
Annulus (Fig. 54). Area $= \pi(R^2 - r^2) = \pi(D^2 - d^2)/4 = 2\pi R'b$, where R' = mean radius $= \frac{1}{2}(R + r)$, and $b = R - r$.

Sector (Fig. 55). Area $= \frac{1}{2}rs = \pi r^2 A/360° = \frac{1}{2}r^2$ rad A, where rad A = radian measure of angle A, and s = length of arc $= r$ rad A (table, p. 1-44).

X **Segment** (Fig. 56). Area $= \frac{1}{2}r^2$(rad $A - \sin A) = \frac{1}{2}[r(s - c) + ch]$, where rad A = radian measure of angle A (table, pp. 1-34 to 1-35, 1-44). For small arcs, $s = \frac{1}{3}(8c' - c)$, where c' = chord of half of the arc (Huygen's approximation).

NOTE. $c = 2\sqrt{h(d - h)}$; $c' = \sqrt{dh}$ or $d = c'^2/h$, where d = diameter of circle; $h = r(1 - \cos \frac{1}{2}A)$, $s = 2r$ rad $\frac{1}{2}A$.

Ribbon bounded by two parallel curves (Fig. 57). If a straight line AB moves so that it is always perpendicular to the path traced by its middle point G, then the area of the ribbon or strip thus generated is equal to the length of AB times the length of the path traced by G. (It is assumed that the radius of curvature of G's path is never less than $\frac{1}{2}AB$, so that successive positions of the generating line will not intersect.)



X FIG. 56

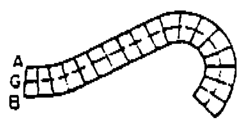


FIG. 57

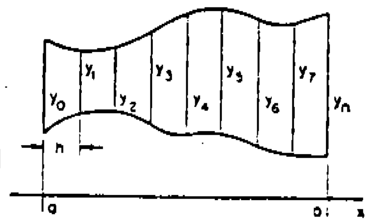


FIG. 58

Simpson's Rule (Fig. 58). Divide the given area into n panels (where n is some even number) by means of $n + 1$ parallel lines, called ordinates, drawn at constant distance h apart; and denote the lengths of these ordinates by $y_0, y_1, y_2, \ldots, y_n$. (Note that y_0 or y_n may be zero.) Area $= \frac{1}{3}h[(y_0 + y_n) + 4(y_1 + y_3 + y_5 \ldots) + 2(y_2 + y_4 + y_6 \cdots)]$, approx. The greater the number of divisions, the more accurate the result.

NOTE. Taking $y = f(x)$, where x varies from $x = a$ to $x = b$, and $h = (b - a)/n$, then the error $= -\frac{1}{180}\frac{(b-a)^5}{n^4}f''''(X)$, where $f''''(X)$ is the value of the fourth derivative of $f(x)$ for some (unknown) value $x = X$, between a and b.

Ellipse (Fig. 59; see also p. 2-51). Area of ellipse $= \pi ab$. Area of shaded segment $= xy + ab \sin^{-1}(x/a)$. Length of perimeter of ellipse $= \pi(a + b)K$, where $K = (1 + \frac{1}{4}m^2 + \frac{1}{64}m^4 + \frac{1}{256}m^6 + \cdots)$, $m = (a - b)/(a + b)$.

For m =	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
K =	1.002	1.010	1.023	1.040	1.064	1.092	1.127	1.168	1.216	1.273

Hyperbola (Fig. 60; see also p. 2-53). In any hyperbola, shaded area $A = ab \ln\left(\frac{x}{a} + \frac{y}{b}\right)$. In an equilateral hyperbola ($a = b$), area $A = a^2 \sinh^{-1}(y/a) = a^2 \cosh^{-1}(x/a)$. For tables of hyperbolic functions, see p. 1-60. Here x and y are coordinates of point P.

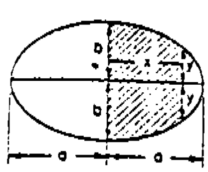


FIG. 59

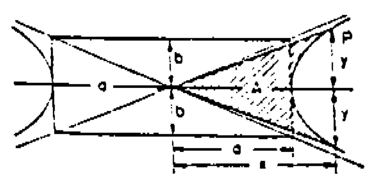


FIG. 60

Parabola (Fig. 61; see also p. 2-49). Shaded area $A = \frac{2}{3}ch$. In Fig. 62, length of arc $OP = s = \frac{1}{2}PT + \frac{1}{2}p \ln \cot \frac{1}{2}u$. Here c = any chord; p = semilatus rectum; PT = tangent at P.

NOTE. $OT = OM = x$.

For lengths and areas of other curves see pp. 2-56 to 2-63.

Segments of Circles, Given h/D

Given: h = height; D = diameter of circle. (For explanation of this table, see p. 1-38)

$\frac{h}{D}$	$\frac{Arc}{D}$	Diff	$\frac{Area}{D^2}$	Diff	Central angle, θ	Diff	$\frac{Chord}{D}$	Diff	$\frac{Arc}{Circum}$	Diff	$\frac{Area}{Circle}$	Diff
.00	0.000	2003	.0000	13	0.00°	2296	.0000	*1990	.0000	*638	.0000	17
1	.2003	*835	.0013	24	22.96	*956	.1990	*810	.0638	*265	.0017	31
2	.2838	*644	.0037	32	32.52	*738	.2800	*612	.0903	*205	.0048	39
3	.3482	*545	.0069	36	39.90	*625	.3412	*507	.1108	*174	.0087	47
4	.4027	*483	.0105	42	46.15	*553	.3919	*440	.1282	*154	.0134	53
.05	.4510	*439	.0147	45	51.68°	*504	.4359	*391	.1436	*139	.0187	58
6	.4949	*406	.0192	50	56.72	*465	.4750	*353	.1575	*130	.0245	63
7	.5355	*380	.0242	52	61.37	*435	.5103	*323	.1705	121	.0308	67
8	.5735	*359	.0294	56	65.72	*411	.5426	*298	.1826	114	.0375	71
9	.6094	*341	.0350	59	69.83	*391	.5724	*276	.1940	108	.0446	74
.10	.6435	*326	.0409	61	73.74°	*374	.6000	*258	.2048	104	.0520	78
1	.6761	*314	.0470	64	77.46	*359	.6258	*241	.2152	100	.0598	82
2	.7075	*302	.0534	66	81.07	*347	.6499	*227	.2252	96	.0680	84
3	.7377	*293	.0600	68	84.54	*335	.6726	*214	.2348	93	.0764	87
4	.7670	*284	.0668	71	87.89	*326	.6940	*201	.2441	91	.0851	90
.15	.7954	276	.0739	72	91.15°	316	.7141	*191	.2532	88	.0941	92
6	.8230	270	.0811	74	94.31	309	.7332	*181	.2620	86	.1033	94
7	.8500	263	.0885	76	97.40	302	.7513	*171	.2706	83	.1127	97
8	.8763	258	.0961	78	100.42	295	.7684	162	.2789	82	.1224	99
9	.9021	252	.1039	79	103.37	289	.7846	154	.2871	81	.1323	101
.20	0.9273	248	.1118	81	106.26°	284	.8000	146	.2952	79	.1424	103
1	0.9521	243	.1199	82	109.10	279	.8146	139	.3031	77	.1527	104
2	0.9764	240	.1281	84	111.89	274	.8285	132	.3108	76	.1631	107
3	1.0004	235	.1365	84	114.63	271	.8417	125	.3184	75	.1738	108
4	1.0239	233	.1449	86	117.34	266	.8542	118	.3259	74	.1846	109
.25	1.0472	229	.1535	88	120.00°	263	.8660	113	.3333	73	.1955	111
6	1.0701	227	.1623	88	122.63	260	.8773	106	.3406	72	.2066	112
7	1.0928	224	.1711	89	125.23	256	.8879	101	.3478	72	.2178	114
8	1.1152	222	.1800	90	127.79	254	.8980	95	.3550	70	.2292	115
9	1.1374	219	.1890	92	130.33	251	.9075	90	.3620	70	.2407	116
.30	1.1593	217	.1982	92	132.84°	249	.9165	85	.3690	69	.2523	117
1	1.1810	215	.2074	93	135.33	247	.9250	80	.3759	69	.2640	119
2	1.2025	214	.2167	93	137.80	245	.9330	74	.3828	68	.2759	119
3	1.2239	212	.2260	95	140.25	242	.9404	70	.3896	67	.2878	120
4	1.2451	210	.2355	95	142.67	241	.9474	65	.3963	67	.2998	121
.35	1.2661	209	.2450	96	145.08°	240	.9539	61	.4030	67	.3119	122
6	1.2870	208	.2546	96	147.48	238	.9600	56	.4097	66	.3241	123
7	1.3078	206	.2642	97	149.86	237	.9656	52	.4163	66	.3364	123
8	1.3284	206	.2739	97	152.23	235	.9708	47	.4229	65	.3487	124
9	1.3490	204	.2836	98	154.58	235	.9755	43	.4294	65	.3611	124
.40	1.3694	204	.2934	98	156.93°	233	.9798	39	.4359	65	.3735	125
1	1.3898	203	.3032	98	159.26	233	.9837	34	.4424	65	.3860	126
2	1.4101	202	.3130	99	161.59	231	.9871	31	.4489	64	.3986	126
3	1.4303	202	.3229	99	163.90	232	.9902	26	.4553	64	.4112	126
4	1.4505	201	.3328	100	166.22	230	.9928	22	.4617	64	.4238	126
.45	1.4706	201	.3428	99	168.52°	230	.9950	18	.4681	64	.4364	127
6	1.4907	201	.3527	100	170.82	230	.9968	14	.4745	64	.4491	127
7	1.5108	200	.3627	100	173.12	229	.9982	10	.4809	64	.4618	127
8	1.5308	200	.3727	100	175.41	230	.9992	6	.4873	63	.4745	128
9	1.5508	200	.3827	100	177.71	229	.9998	2	.4936	64	.4873	127
.50	1.5708		.3927		180.00°		1.0000		.5000		.5000	

* Interpolation may be inaccurate at these points.

Segments of Spheres

(h = height of segment; D = diam of sphere)

$\frac{h}{D}$	$\frac{\text{Vol segm}}{D^3}$	Diff	$\frac{\text{Vol segm}}{\text{Vol sphere}}$	Diff
0.00	0.0000		0.0000	
1	0.0002	2	0.0003	3
2	0.0006	4	0.0012	9
3	0.0014	8	0.0026	14
4	0.0024	10	0.0047	21
0.05	0.0038	14	0.0073	26
6	0.0054	16	0.0104	31
7	0.0073	19	0.0140	36
8	0.0095	22	0.0182	42
9	0.0120	25	0.0228	46
0.10	0.0147	27	0.0280	52
1	0.0176	29	0.0336	56
2	0.0208	32	0.0397	61
3	0.0242	34	0.0463	66
4	0.0279	37	0.0533	70
0.15	0.0318	39	0.0607	74
6	0.0359	41	0.0686	79
7	0.0403	44	0.0769	83
8	0.0448	45	0.0855	86
9	0.0495	47	0.0946	91
0.20	0.0545	50	0.1040	94
1	0.0596	51	0.1138	98
2	0.0649	53	0.1239	101
3	0.0704	55	0.1344	105
4	0.0760	56	0.1452	108
0.25	0.0818	58	0.1562	110
6	0.0878	60	0.1676	114
7	0.0939	61	0.1793	117
8	0.1002	63	0.1913	120
9	0.1066	64	0.2035	122
0.30	0.1131	65	0.2160	125
1	0.1198	67	0.2287	127
2	0.1265	67	0.2417	130
3	0.1334	69	0.2548	131
4	0.1404	70	0.2682	134
0.35	0.1475	71	0.2817	135
6	0.1547	72	0.2955	138
7	0.1620	73	0.3094	139
8	0.1694	74	0.3235	141
9	0.1768	74	0.3377	142
0.40	0.1843	75	0.3520	143
1	0.1919	76	0.3665	145
2	0.1995	76	0.3810	145
3	0.2072	77	0.3957	147
4	0.2149	77	0.4104	147
0.45	0.2227	78	0.4252	148
6	0.2305	78	0.4401	149
7	0.2383	78	0.4551	150
8	0.2461	78	0.4700	149
9	0.2539	78	0.4850	150
0.50	0.2618	79	0.5000	150

NOTE. Vol segm $= \frac{1}{6} \pi h^2 (3D - 2h)$.

Explanation of Table on this page

Given, h = height of segment,
D = diameter of sphere.

To find the volume of the segment, form the ratio h/D and find from the table the value of (vol $/D^3$); then, by a simple multiplication,

volume segment $= D^3 \times$ (vol $/D^3$)

The table gives also the ratio of the volume of the segment to the entire volume of the sphere.

NOTE. Area of zone $= \pi \times h \times D$.
(Use Table of Multiples of π, p. 1-28)

Explanation of Table on p. 1-34

Given, h = height of segment,
c = chord.

To find the diameter of the circle, the length of arc, or the area of the segment, form the ratio h/c and find from the table the value of (diam $/c$), (arc $/c$), or (area $/hc$); then, by a simple multiplication,

diam $= c \times$ (diam $/c$),
arc $= c \times$ (arc $/c$),
area $= h \times c \times$ (area $/hc$).

The table gives also the angle subtended at the center, and the ratio of h to D. See p. 2-17.

Explanation of Table on p. 1-35

Given, h = height of segment,
D = diameter of circle.

To find the chord, the length of arc, or the area of the segment, form the ratio h/D, and find from the table the value of (chord $/D$), (arc $/D$) or (area $/D^2$); then, by a simple multiplication,

chord $= D \times$ (chord $/D$),
arc $= D \times$ (arc $/D$),
area $= D^2 \times$ (area $/D^2$).

The table gives also the angle subtended at the center, the ratio of the arc of the segment to the whole circumference, and the ratio of the area of the segment to the area of the whole circle. See p. 2-17.

APPENDIX C

CALIBRATION DATA

Test number ________ Date 4-21-81 Meter box number 3 Plant Centralia, Wash.

Barometric pressure, P_b = 29.13 in. Hg Dry gas meter number 3 Pretest Y 1.015

Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i
	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), °F	Dry gas meter						$\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
				Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average[a] (t_d), °F				
1.7	10	9.871	70.0	90.67	73	81.84	14.193	11	1.031	
1.7	10	10.071	70.0	94.67	79.33	87.0	14.332	11	1.020	
1.7	10	10.234	70.0	98.5	82	90.25	14.248	11	1.010	
									Y =	1.020

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm 0.05Y$.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

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Test number ________ Date 5-13-81 Meter box number 3 Plant Ada, OK

Barometric pressure, P_b = 28.92 in. Hg Dry gas meter number 3 Pretest Y 1.020

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
2.1	~~10~~ 5	4.890	73.9	92.8	77.8	85.3	6.406	21	1.039	ΔH@ = 2.003
2.1	~~10~~ 6	5.916	73.9	97.1	80	88.6	7.681	21	1.037	1.991
2.1	~~10~~ 5	4.952	73.9	99.7	82.5	91.1	6.405	21	1.037	1.985
									Y = 1.038	ΔH@ 2.1 avg = 1.9[illegible]

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Test number ________ Date 4-20-81 Meter box number 9 Plant Centralia, Wash.

Barometric pressure, P_b = 29.24 in. Hg Dry gas meter number 9 Pretest Y 1.044

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \dfrac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1.60	10	9.645	71.8	84.8	76.2	80.5	14.127	19	1.050	
1.60	10	9.652	71.97			87.8	14.17	19	1.063	
1.60	10	9.741	71.9			91.33	14.163	19	1.060	
									Y = 1.058	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Y = +1.34% Pretest Y

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POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ______ Date 5-19-81 Meter box number 9 Plant Ada, OK 4892-L(03)

Barometric pressure, P_b = 29.12 in. Hg Dry gas meter number 9 Pretest Y 1.058

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i: $\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
2	~~10~~ 8	7.619	72.9	99.2	82	90.6	10.143	20	1.079	Yr = 1.834
2	10	9.602	72.9	102	84.8	93.4	12.670	20	1.076	1.822
2	10	9.484	72.9	105	87.7	96.4	12.662	20	1.095	1.810
									Y =	1.083

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

Avg. ΔH @ 2" = 1.822

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm$0.05Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Test number ______ Date FEB 6, 1981 Meter box number 2 Plant PFIZER

Barometric pressure, P_b = 29.35 in. Hg Dry gas meter number 2 Pretest Y 1.018

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average (t_d),[a] °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i $\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1.5	~~10~~ 5	5.007	72.3	81	77	79	7.2	15	1.007	ΔH@ = 1.779
1.5	~~10~~ 5	5.021	72.3	89	78	83	7.5	15	1.012	ΔH@ = 1.926
1.5	~~10~~ 5	5.040	72.4	94	80	87	7.4	15	1.015	ΔH@ = 1.869
									Y = 1.011	ΔH@ = 1.858

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ______ Date 5-19-81 Meter box number 2 Plant Ada, OK 4892-L(03)

Barometric pressure, P_b = 29.13 in. Hg Dry gas meter number 2 Pretest Y 1.011

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
2	10	9.905	73.2	101.7	81.3	91.5	13.091	20	1.039	Y_r = 1.959
2	10	10.036	73.2	110.5	85.7	98.1	12.928	20	1.038	= 1.895
2	10	10.148	73.23	114.5	90.3	102.4	13.142	20	1.034	= 1.942
									Y =	1.037

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

ΔH @ 2" = 1.932

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm$0.05Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

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METER BOX CALIBRATION DATA AND CALCULATION FORM
(English units)

Date 10-1-80　　　　　　　　　　Meter box number 11

Barometric pressure, P_b = ________ in. Hg.　　　　Calibrated by R. Stultz

Orifice manometer setting (ΔH), in. H_2O	Wet test meter (v_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature[a]: Wet test meter (t_w), °F	Dry gas meter: Inlet (t_{d_i}), °F	Dry gas meter: Outlet (t_{d_o}), °F	Dry gas meter: Average[a] (t_d), °F	Time (Θ), min	Y_i	$\Delta H@_i$
0.5	5								
2 ~~1.0~~	5	4.972	76.8	105.7	84.5	95.1	6.53	1.03	1.98
2 ~~1.5~~	~~10~~ 5	5.003	76.8	110.3	87.7	99.0	6.56	1.04	1.99
2.0	~~10~~ 5	5.038	76.9	114	90.7	102.4	6.57	1.03	1.99
3.0	10								
4.0	10								
							Average	1.03	1.99

ΔH	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b\ (t_d + 460)} \left[\frac{(t_w + 460)\ \Theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
1.5	0.110		
2.0	0.147		
3.0	0.221		
4.0	0.294		

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

Test number ______ Date 2-4-81 Meter box number 5 Plant PFIZER

Barometric pressure, P_b = 29.52 in. Hg Dry gas meter number 5 Pretest Y 1.0014

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
2.0	~~10~~ 5	5.053	72.4	86	74	80	6.35	15	0.999	ΔH@ = 1.839
2.0	~~10~~ 5	5.049	72.5	91	77	84	6.37	15	1.009	ΔH@ 1.841
2.0	~~10~~ 5	5.073	72.5	94	79	87	6.40	15	1.007	ΔH@ 1.851
									Y = 1.004	ΔH@ = 1.844

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm$0.05Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Pretest Calibration

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 4-15-81 Thermocouple number T.C. 6-1

Ambient temperature 80°F ~~°C~~ Barometric pressure 29.65 in. Hg

Calibrator RCP Reference: mercury-in-glass Yes

Digi-Sense X-5498 other ______

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %	
				Diff. °F	
1	Oil	~~333~~ 330	329	-1	-0.13%
2	"	316	315	-1	
3	"	298	298	0	
4	"	265	267	+2	
5	"	244	247	+3	+0.43%

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

[c]$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$

$\frac{\text{Ref }(\text{°F} + 460) - (\text{°F} + 460)}{\text{Ref }(\text{°F} + 460)}$

Posttest Calibration

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-13-81 Thermocouple number Probe 6-1

Ambient temperature ______ °C Barometric pressure ______ in. Hg

Calibrator RCS Reference: mercury-in-glass Yes

Digi-Sense X-6028 other ______

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
	Oil Bath	60°C (140°F)	138°F	-0.33%
	"	78°C (172°F)	171°F	-0.16%
	"	146°C (295°F)	293°F	-0.26%
	"	166°C (331°F)	327°F	-0.51%
	~	216.5°C (421.7°F)	417°F	-0.53%
		415°F	411°F	-0.46%

[a] Every 30°C (50°F) for each reference point.

[b] Type of calibration system used.

[c] $$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$$

Pretest Calibration

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 4-15-81 Thermocouple number Probe TC 6-2

Ambient temperature 80 °F ~~°C~~ Barometric pressure 29.65 in. Hg

Calibrator RCS Reference: mercury-in-glass ✓

Digi-Sense X-6028 other ______

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] Diff °F %
1	Oil	242°F	242°F	0
2	"	253	255	+2 +0.28%
3	"	271	271	0
4	"	291	291	0
5	"	306	304	-2 -0.26%
6	"	322	321	-1

[a] Every 30°C (50°F) for each reference point.

[b] Type of calibration system used.

[c] $$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$$

Posttest Calibration

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-13-81 Thermocouple number Probe 6-2

Ambient temperature ______ °C Barometric pressure ______ in. Hg

Calibrator RCS Reference: mercury-in-glass Yes

Digi-Scure X-6028 other ______

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
	Oil Bath	51°C (123.8°F)	122°F	−0.31%
	"	142°C (287.6°F)	288°F	+0.05%
	"	172°C (342°F)	339°F	−0.37%
	"	183°C (361°F)	360°F	−0.12%
	~	409°F	406°F	−0.35%

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

[c]$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$

Pretest Calibration

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 3-17-81 Thermocouple number 18-1

Ambient temperature ______ °C Barometric pressure ______ in. Hg

Calibrator Digi-Sense X-5498 Reference: mercury-in-glass Yes

other ______

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
0°	Ice Bath	0°C	32°F	0%
100°	Boiling H_2O	100°C	212°F	0%

[a] Every 30°C (50°F) for each reference point.

[b] Type of calibration system used.

[c] $$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$$

Post Test Calibration

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-13-81 Thermocouple number 18-1

Ambient temperature _______ °C Barometric pressure _______ in. Hg

Calibrator __________ Reference: mercury-in-glass Yes

Digi-Sense X-5498 other __________

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
	Oil Bath	93°C	200°F	+0.09%
	"	122°C	253°F	+0.20%
	"	169°C (334F)	337°F	+0.76%
	"	408°F	410°F	+0.23%

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

[c]
$$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$$

4892 - L (03) Ada, OK
Pretest Calib.

STACK TEMPERATURE ~~SENSOR~~ Meter CALIBRATION DATA FORM

Date 4-20-81 ~~Thermocouple~~ Potentiometer number 8024

Ambient temperature 21 °C Barometric pressure 29.21 in. Hg

Calibrator RCS Reference: mercury-in-glass Yes

other

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
	Boiling H_2O	101 °C	209 °F (98.3 °C)	−0.71
	Ice Bath	0 °C	27 °F (−2.8 °C)	−1.02

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

[c]$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$

Post Test Calibration

STACK TEMPERATURE ~~SENSOR~~ Meter CALIBRATION DATA FORM

Date 6-8-81 ~~Thermocouple~~ Potentiometer number Miniaite 8024

Ambient temperature ______ °C Barometric pressure ______ in. Hg

Calibrator RCS Reference: mercury-in-glass ASTM VIS 80F SN 1075001

Using T.C. 10-5 other ______

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
	Oil Bath	407	405	-0.23
	Ice Bath	32.0	31	-0.20
	Ref. Therm. = ASTM 63F #A06653			
	Boiling H_2O	210.5	210	-0.07
	Ref. Therm. = ASTM 67F #545743			

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

$$^{c}\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \le 1.5\%.$$

4892-L (03) Ada, Ok.
Pretest Calib.

STACK TEMPERATURE ~~SENSOR~~ Meter CALIBRATION DATA FORM

Date 4-20-81 ~~Thermocouple~~ Potentiometer number 8025

Ambient temperature 21 °C Barometric pressure 29.21 in. Hg

Calibrator RCS Reference: mercury-in-glass Yes

other

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
	Boiling H_2O	101 °C	215 °F (101.7 °C)	+ 0.18
	Ice Bath	0 °C	35 °F (1.7 °C)	+ 0.61

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

[c]$$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$$

PostTest Calibration

STACK TEMPERATURE ~~SENSOR~~ Meter CALIBRATION DATA FORM

Date 6-8-81 ~~Thermocouple~~ Potentiometer number Minimite 8025

Ambient temperature _______ °C Barometric pressure _______ in. Hg

Calibrator __________ Reference: mercury-in-glass ASTM VIS 80F #1075001

Using T.C. 10-5 other __________

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
	oil Bath	406	402	-0.46
	Ice Bath	32.0	26	-1.2
	Ref. Therm. = ASTM 63F #A 06653			
	Boiling H_2O	210.5	207	-0.37
	Ref. Therm. = ASTM 62F #545743			

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

[c] $\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$

Pretest Calibration

STACK TEMPERATURE ~~SENSOR~~ Meter CALIBRATION DATA FORM

Date 3-17-81 ~~Thermocouple~~ Digi-Sense number X-5498

Ambient temperature ______ °C Barometric pressure ______ in. Hg

Calibrator ________ Reference: mercury-in-glass Yes

other ________

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
0°	Ice Bath	0°C	33°F (+ 0.6°C)	+.22%
100°	Boiling H_2O	100.5°C	213°F (100.6°C)	+.027%

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

[c] $\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$

Post Test Calibration

STACK TEMPERATURE ~~SENSOR~~ Meter CALIBRATION DATA FORM

Date 6-8-81 ~~Thermocouple~~ Digital Therm. number Digi-Sense X-5498

Ambient temperature ______ °C Barometric pressure ______ in. Hg

Calibrator ________ Reference: mercury-in-glass ASTM V15 80F #1025001

Using T.C. 10-5 other ________

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
	Oil Bath	404	402	− 0.23
	Ice Bath	31.8	32	+0.04
	Ref. Thermometer =		ASTM 63F	# A06653
	Boiling H_2O	210.5	210	− 0.07
	Ref. Therm. =	ASTM	67F # 545743	

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

[c] $$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$$

Pretest Calibration

STACK TEMPERATURE ~~SENSOR~~ Meter CALIBRATION DATA FORM

Date 3-17-81 ~~Thermocouple~~ Digi-Sense number X-6028

Ambient temperature ______ °C Barometric pressure ______ in. Hg

Calibrator __________ Reference: mercury-in-glass Yes

other __________

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
0°	Ice Bath	0°C	30°F (-1.11°C)	-.41%
100°	Boiling H_2O	100°C	210°F (98.9°C)	-.29%

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

[c] $$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \le 1.5\%.$$

Post Test Calibration

STACK TEMPERATURE ~~SENSOR~~ meter CALIBRATION DATA FORM

Date 6-8-81 ~~Thermocouple~~ Digital Therm. number Digi-Sense X-6028

Ambient temperature ______ °C Barometric pressure ______ in. Hg

Calibrator __________ Reference: mercury-in-glass ASTM VIS 80F #1075001

Using T.C. 10-5 other __________

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[c] %
	Oil Bath	402.5	403	+ 0.06
	Ice Bath	31.8	35	+ 0.65
	Ref. Thermometer	= ASTM 63F	#A 06653	
	Boiling H_2O	210.5	212	+ 0.22
	Ref. Therm.	= ASTM 67F	# 545743	

[a]Every 30°C (50°F) for each reference point.

[b]Type of calibration system used.

[c]$$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$$

15 μm

NOZZLE CALIBRATION Presceparator - Particle Size Tests

Date 4-26-81 Calibrated by RCS

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
60 - 3.0	.117	.119	.119	.002	.118
60 - 3.5	.137	.138	.137	.001	.137
60 - 4.0	.156	.158	.156	.002	.157
60 - 4.5	.177	.176	.176	.001	.176
60 - 5.0	.197	.194	.195	.003	.195
60 - 6.0	.234	.234	.235	.001	.235
60 - 7.0	.274	.271	.275	.004	.273
60 - 8.5	.335	.332	.333	.003	.333
60 - 10	.392	.394	.394	.002	.393
60 - 12.0	.470	.471	.470	.001	.470
60 - 14.5	.565	.566	.568	.003	.566

where:

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

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

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

Nozzle calibration data.

NOZZLE CALIBRATION 15 μm Preseparator — Particle size Tests

Date 4-26-81 Calibrated by RCS

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
61 - 3.0	.115	.115	.113	.002	.114
61 - 3.5	.136	.137	.137	.001	.137
61 - 4.0	.156	.155	.156	.001	.156
61 - 4.5	.177	.176	.177	.001	.177
61 - 5.0	.194	.195	.195	.001	.195
61 - 6.0	.234	.235	.236	.002	.235
61 - 7.0	.275	.276	.275	.001	.275
61 - 8.5	.331	.334	.331	.003	.332
61 - 10.0	.394	.395	.396	.002	.395
61 - 12.0	.469	.472	.472	.003	.471
61 - 14.5	.567	.567	.568	.001	.567

where:

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

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

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

Nozzle calibration data.

Method 5 and Method 17

NOZZLE CALIBRATION

Date 3-20-81 Calibrated by RCS

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
1	.115	.115	.116	.001	.115
2	.120	.118	.117	.003	.118
3	.122	.123	.123	.001	.123
35	.122	.121	.122	.001	.122
36	.122	.122	.122	Zero	.122
5	.182	.182	.180	.002	.181
~~7~~	~~.186~~	~~.184~~	~~.183~~	~~.003~~	~~.184~~
See Page 2 for #43 ~~6~~	~~.184~~	~~.184~~	~~.183~~	~~.001~~	~~.184~~
11	.245	.246	.245	.001	.245
30	.247	.247	.247	Zero	.247
See Page 2 for # 10 24	.247	.247	.247	Zero	.247
42	.250	.249	.250	.001	.250
12	.297	.296	.297	.001	.297
13	.304	.303	.305	.002	.304
14	.362	.356	.361	.006	.360
15	.362	.362	.360	.002	.361
45	.375	.373	.374	.002	.374
34	.369	.368	.368	.001	.368
27	.377	.377	.377	Zero	.377
33	.376	.375	.374	.002	.375
32	.441	.438	.440	.003	.440

where:

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

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

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

Nozzle calibration data.

Method 5 and Method 17
NOZZLE CALIBRATION

Date 3-20-81 Calibrated by RCS

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
20	.463	.465	.467	.004	.465
22	.509	.505	.504	.005	.505
31	.495	.493	.494	.002	.494
21	.499	.491	.496	.008	.495
10	.248	.247	.249	.002	.248
43	.189	.188	.188	.001	.188

where:

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

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

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

Nozzle calibration data.

Method 5 and Method 17

NOZZLE CALIBRATION

Date 4-17-81 Calibrated by RCS

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
6	.184	.186	.187	.003	.186
7	.186	.185	.188	.003	.186

where:

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

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

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

Nozzle calibration data.

Pitot Tube Calibration

The pitot tubes used for this test program did not require recalibration prior to field use. All pitot tubes used were "S" type configuration according to EPA specifications and had been previously calibrated against a traceable reference pitot. All pitot tubes used were visually inspected prior to field use as recommended in the references listed below. Visual inspection included the following: assessment of proper alignment; damaged openings; and the potential of restricted flows due to blockage of the tubes.

"Quality Assurance Handbook for Air Pollution Measurement Systems," Vol. III, Stationary Source Specific Methods, U.S. Environmental Protection Agency, Office of Research and Development, Environmental Monitoring and Support Laboratory, Research Triangle Park, North Carolina, EPA-600/4-77-027b (August 1977).

PEDCo Environmental, Inc., "Environmental Protection Agency Performance Test Methods," Parts I and II, prepared for U.S. Environmental Protection Agency, Division of Stationary Source Enforcement, Office of Enforcement, Washington, D.C., EPA-340/1-78-011 (August 1, 1978).

U.S. Environmental Protection Agency, "Standards of Performance for New Stationary Sources," Revision to Reference Method 1-8, Federal Register, Vol. 42, No. 160, Part II, Thursday, August 18, 1977.

APPENDIX D

LABORATORY AND ANALYTICAL DATA - DUCTED SOURCES

D-1 Total Mass - EPA Method 5

Filter No.	Run I.D. No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	Average Weight
21		3.7906	BD	4/22/81	3.7908	BD	4/22/81				3.7907
22		3.8307	BD	"	3.8307	BD	"				3.8307
23		3.8421	BD	"	3.8423	BD	"				3.8422
24		3.8232	BD	"	3.8234	BD	"				3.8233
25		3.8080	BD	"	3.8078	BD	"				3.8079
26		3.7774	BD	"	3.7776	BD	"				3.7775
27		3.7679	BD	"	3.7681	BD	"				3.7680
28		3.7800	BD	"	3.7800	BD	"				3.7800
29		3.8314	BD	"	3.8314	BD	"				3.8314
30		3.7604	BD	4/22/81	3.7604	BD	"				3.7604
31		3.8002	BD	"	3.8004	BD	"				3.8003
32		3.8263	BD	"	3.8263	BD	"				3.8263
33		3.8162	BD	"	3.8162	BD	"				3.8162
34		3.7637	BD	"	3.7639	BD	"				3.7638
35		3.7938	BD	"	3.7938	BD	"				3.7938
36		3.8861	BD	"	3.8863	BD	"				3.8862
37		3.8554	BD	"	3.8554	BD	"				3.8554
38		3.8156	BD	"	3.8156	BD	"				3.8156
39		3.8003	BD	"	3.8003	BD	"				3.8003
40		3.8361	BD	4/22/81	3.8359	BD	4/22/81				3.8360

Remarks: TARE WEIGHT 4" METHOD 5 FILTERS

METOD 5 FINAL FILTER WEIGHT

Filter No.	Run I.D. No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	Average Weight
23		5.8186	DO	5/2/81	5.8183	DO	5/3/81				5,8185
24	ESP-I-1-2	9.5607	DO	5/5/81	6.2651	DO	5/6/81	6.2720 6.2724	JP DO	5/6/81 5/6/81	6.2722
25	ESP-I-3-1	5.5273	DO	5/2/81	5.5275	DO	5/2/81				5.5274
26	ESP-I-1-1	4.9834 ~~6.4959~~	DO	5/4/81	4.9839	JP	5-4-81				4.9837
27	ESP-I-4-1	6.4959	DO	5/4/81	6.5038	JP	5-4-81	6.5033	JP	5-4-81	6.5035
22	ESP-I-2-1	5.9895	DO	5/5/81	5.9936	JP	5/5/81	5.9931	JP	5/4/81	5.9933
28	ESP-I-2-2	6.8025	DO	5/6/81	6.8100 ~~5.8653~~	DO	5/6/81	6.8101	JP	5/6/81	6.8101
29	ESP-I-3-2	5.8623	DO	5/6/81	5.8653	DO	5/6/81	5.8653	JP	5/6/81	5.8653
31	ESP-I-4-2	3.9140	DO	5/7/81	3.9135	JP	5/7/81				3.9137

Remarks:

250 ml Beakers

BEAKER TARE WEIGHTS

Beaker No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	Average Weight
1	97.3440	EC	4-23-81	97.3445	EC	4-23-81				97.3443
2	95.7722	EC	4-23-81	95.7728	EC	4-23-81				95.7725
3	96.4225	EC	4-23-81	96.4223	EC	4-23-81				96.4224
4	96.5221	EC	4-23-81	96.5234	EC	4-23-81	96.5223	EC	4-24-81	next page
5	95.1494	EC	4-23-81	95.1503	EC	4-23-81				95.1499
6	97.4788	EC	4-23-81	97.4798	EC	4-23-81				97.4793
7	95.1007	EC	4-23-81	95.1002	EC	4-23-81				95.1005
8	96.0819	EC	4-23-81	96.0828	EC	4-23-81				96.0823
9	94.9700	EC	4-23-81	94.9722	EC	4-23-81	~~94.04~~ 94.9704	EC	4-24-81	next page
10	95.8480	EC	4-23-81	95.8488	EC	4-23-81				95.8484
11	96.2617	EC	4-23-81	96.2623	EC	4-23-81				96.2620
12	97.1767	EC	4-23-81	97.1772	EC	4-23-81				97.1769
13	99.1474	EC	4-23-81	99.1475	EC	4-23-81				99.1475
14	102.6960	EC	4-23-81	102.6975	EC	4-23-81	102.6958			next page
15	98.8170	EC	4-23-81	98.8176	EC	4-23-81				98.8173
16	95.0338	EC	4-23-81	95.0353	EC	4-23-81	95.0345	EC	4-24-81	95.0349
17	95.6965	EC	4-23-81	95.6969	EC	4-23-81				95.6967
18	96.5193	EC	4-23-81	96.5207	EC	4-23-81	96.5212	EC	4-24-81	96.5209
19	96.6848	EC	4-23-81	96.6856	EC	4-23-81				96.6852
20	95.6783	EC	4-23-81	95.6802	EC	4-23-81	95.6794	EC	4-24-81	95.6798
21	95.5503	EC	4-23-81	95.5508	EC	4-23-81				95.5505
22	96.7229	EC	4-23-81	96.7235	EC	4-23-81				96.7232
23	108.7139	EC	4-23-81	108.7151	EC	4-23-81	108.7141	EC	4-24-81	108.7146
24	96.5487	EC	4-23-81	96.5496	EC	4-23-81				96.5491
25	96.3604	EC	4-23-81	96.3613	EC	4-23-81				96.3609
26	98.6439	EC	4-23-81	98.6451	EC	4-23-81	98.6437	EC	4-24-81	next page
37	110.6737	EC	4-23-81	110.6739	EC	4-23-81				110.6738
41	109.2032	EC	4-23-81	109.2037	EC	4-23-81				109.2035
42	115.8665	EC	4-23-81	115.8660	EC	4-23-81				115.8663
50	112.1547	EC	4-23-81	112.1542	EC	4-23-81				112.1545
53	114.0922	EC	4-23-81	114.0914	EC	4-23-81				114.0918

Remarks These are used for Method 5 testing

250 ml beakers

BEAKER TARE WEIGHTS

Beaker No.	First Weigh Weight (g)	First Weigh By	First Weigh Date	Second Weigh Weight (g)	Second Weigh By	Second Weigh Date	Third Weigh Weight (g)	Third Weigh By	Third Weigh Date	Average Weight
58	115.3584	GC	4-23-81	115.3585	GC	4-23-81				115.3585
64	110.6769	GC	4-23-81	110.6775	GC	4-23-81				110.6772
71	111.8069	GC	4-23-81	111.8074	GC	4-23-81				111.8071
4	96.5232	GC	4-27-81							96.5227
9	94.9720	GC	4-27-81							94.9712
14	102.6966	GC	4-27-81							102.6962
26	98.6445	GC	4-27-81							98.6441

Remarks

Beaker 250 ml - PROBE RINSE FINAL WEIGHTS

~~Filter~~ No.	Run I.D. No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	Average Weight	Vol
~~24~~	~~ESP-I~~-1-1											
	4-30-81											
10	ESP-I-3-1	~~65~~ 102.9112	DO	5/2/81	102.6450	DO	5/2/81	102.6448			102.6449	240
7	ESP-I-3-1	96.1810	DO	5/2/81	96.1805	JP	5/2/81				96.1807	175
58	ESP-I-3-1	117.9031	DO	5/2/81	117.9027	JP	5/2/81				117.9029	180
24	ESP-I-1-1	97.7855	DO	5/5/81	97.7850	JP	5/5/81				97.7853	210
11	ESP-I-1-1	96.5833	DO	5/4/81	96.5838	JP	5/4/81				96.5835	100
37	ESP-I-4-1	112.6887	DO	5/3/81	112.6858	JP	5/5/81	112.6855	JP	5/5/81	112.6857	160
19	ESP-I-2-1	97.7902	DO	5-5-81	97.7867	JP	5/5/81	97.7862	JP	5/5/81	97.7865	160
25	ESP-I-1-2	97.7437	DO	5/6/81	97.7441	JP	5/5/81				97.7439	170
18	ESP-I-3-2	98.1808	DO	5/6/81	98.1813	JP	5/6/81				98.1810	155
5	ESP-I-2-2	96.1452	DO	5/7/81	96.1455	JP	5/7/81				96.1453	120
20	ESP-I-4-2	99.3504	DO	5/7/81	99.3506	JP	5/7/81				99.3505	160

Remarks: USED FOR METHOD 5

BEAKER TARE WEIGHTS

Beaker No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	Average Weight
01	76.6385	JJ	3/30	76.6379	JJ	3/31				76.6382
02	76.4574			76.9572						76.7073
03	67.9787			67.9783						67.9785
04	67.8377			67.8372						67.8375
05	66.4429			66.4427						66.4428
06	78.3493			78.3492						78.3693
07	68.0666			68.0661						68.0663
08	67.3476			67.3472						67.3474
09	78.4870			78.4882						78.4876
10	67.4462			67.4475						67.4469
11	78.1512			78.1507						78.1509
12	77.4620			77.4619						77.4619
13	67.6598			67.6597						67.6597
										~~[illegible]~~
15	67.9531			67.9528					67.9529	~~[illegible]~~
16	67.5981			67.5976						67.5979
17	76.7498			76.7499						76.7499
18	77.2507			77.2501						77.2504
19	68.6800			68.6799						68.6799
20	77.5382			77.5376						77.5379
21	67.9181			67.9177						67.9179
22	75.2348			75.2343						75.2345
23	77.3303			77.3304						77.3303
24	73.3232			73.3225						73.3229
25	76.9274			76.9266						76.9270
28	76.6561			76.6564						76.6563
30	75.8431			75.8432						75.8431
31.	77.2016	↓	↓	77.2008	↓	↓				77.2012

Remarks 150 ml beakers used for cyclone dry catch - Method 5 and probe rinse Method 17

BEAKER TARE WEIGHTS

Beaker No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	Average Weight
32	—	JJ	3/30		JJ	3/31				
33	78.9312			78.9305						78.9309
34	75.9393			75.9394						75.9393
36	76.3898			76.3895						76.3897
37	75.8845			75.8842						75.8843
38.	66.9839			66.9838						66.9839
39	76.7224			76.7224						76.7224
40	75.4413			75.4409						75.4411
41	68.6445			68.6447						68.6446
42	73.6093			73.6088						73.6091
43	78.0665			78.0665						78.0665
44	76.0463			76.0459						76.0461
45	72.6872			72.6862						72.6867
48	76.4029			76.4028						76.4029
49	75.6695			75.6692						75.6693
50	76.8903			76.8902						76.8903
51	75.7614			75.7608						75.7611
52	77.7598			77.7591						77.7595
54	77.2482			77.2481						77.2481
55	77.0066			77.0066			77.0065			77.0065
56	76.1332			76.1329						76.1331
57	74.4751			74.4748						74.4749
58	77.1138			77.1133						77.1135
59	76.3391			76.3385						76.3388
61	69.2801			69.2794						69.2797
62	66.5467	↓	↓	66.5460	↓	↓				66.5463

Remarks * 150 ml beakers used for cyclone dry catch - Method 5 and probe rinse Method 17

BEAKER TARE WEIGHTS

Beaker No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	Average Weight
63	67.2359	JJ	3/30	67.2351	JJ	3/31				67.2355
64	68.3091			68.3084						68.3087
65	66.9879			66.9872						66.8375
66	68.3997			68.3995						68.3996
67	67.9506			67.9505						67.9505
69	66.6634			66.6633						66.6633
70	67.8576			67.8579						67.8577
71	67.8963			67.8957						67.8960
72	68.2753			68.2750						68.2751
73	64.9525			64.9522						64.9523
74	66.7893			66.7837						66.7895
75	67.0885			67.0887						67.0886
76	67.3457			67.3458						67.3457
77	68.8886			68.8878						68.8882
78	68.1549			68.1545						68.1547
79	66.5470			66.5467						66.5469
80	67.6118			67.6115						67.6117
81	67.1193			67.1187						67.1190
82	67.8172			67.8166						67.8169
83	68.0966			~~68.0966~~						68.0966
84	67.0996			67.0995						67.0995
85	67.1645			67.1642						67.1643
86	67.1320			67.1318						67.1319
87	66.5107			665105						66.5106
88	66.9730			66.9729						66.9729
89	67.9851			67.9849						67.9850
90	66.2203			66.2199						66.2201
91	67.9380			67.9379						67.9379
92	66.7603			66.7600						66.7601
93	65.8187			65.8184						65.8185

Remarks
*90 66.2203 | 66.2199

150 ml beakers used for cyclone dry catch - Method 5 and nozzle rinse Method 17

BEAKER TARE WEIGHTS

Beaker No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	Average Weight
94	65.1296	JJ	3/30	65.1298	JJ	3/31				65.1297

Remarks 150 ml beakers used for cyclone dry catch — method 5 and for probe and nozzle rinse method 17.

150 ml Beaker DRY CATCH FINAL WEIGHTS

~~Filter~~ BEAKER No.	Run I.D. No.	First Weigh			Second Weigh			Third Weigh			Average Weight	
		Weight (g)	By	Date	Weight (g)	By	Date	Weight (g)	By	Date		
82	ESP-I-3-1	83.0753	GP	5-2-81	83,0834	JP	5-2-81	830837	DO	5/2/81	83.0835	4-30-
77	ESP-I-3-1	84.9570	DO	5-2-81	84.9594	DO	5/2/81	84.9599	GP	5-2-81	84.9597	5-1-8
10	ESP-I-1-1	103.0704	DO	5/4/81	103.1044	JP	5/4/81	103.1049	JP	5-4-81	103.1047	5-2-
61	ESP-I-4-1	103.9692	DO	5-2-81	103.9805	DO	5/4/81	~~103~~ 104.0232, 104.0241	JP	5-2-81	104.0239	5-2-81
72	ESP-I-2-1	111.3546	DO	5/5/81	111.4070	JP	5/5/81	111.4075	JP	5/5/81	111.4073	5-8-8
28	ESP-I-1-2	138.4117	DO	5/5/81	138.4770	JP	5/5/81	138.4775	JP	5/5/81	138.4773	5-4-81
8	ESP-I-3-2	91.8126	DO	5/6/81	91.8342	DO	5/6/81	91.8345	JP	5/6/81	91.8343	5-5-
34	ESP-I-2-2	110.1593	DO	5/6/81	110.1863	DO	5/6/81	110.1865	JP	5/6/81	110.1864	5-5-81
74	ESP-I-4-2	121.8082	DO	5/7/81	121.8085	JP	5/7/81				121.8084	5-6-8

Remarks:

D-2 Total Mass - EPA Method 17

METHOD 17
FILTER TARE WEIGHTS

Filter No.	First Weigh Weight (mg)	By	Date	Second Weigh Weight (mg)	By	Date	Third Weigh Weight (mg)	By	Date	Average Weight
1	1.5815	JJ	4/1/81	1.5816	JJ	4/3/81				1.5815
2	1.5862	JJ	4/1/81	1.5867	JJ	4/3/81				1.5865
3	1.5832	JJ	4/6/81	1.5834	JJ	4/7/81				1.5833
4	1.5829			1.5829						1.5829
5	1.5864			1.5867						1.5865
6	1.5841			1.5845						1.5843
7	1.5816			1.5819						1.5817
8	1.5796			1.5796						1.5796
9	1.5779			1.5778						1.5779
10	1.5766			1.5764	JJ	4/7/81				1.5765
11	1.5815			1.5817						1.5816
12	1.5774			1.5775						1.5775
13	1.5792			1.5793						1.5793
14	1.5808			1.5810						1.5809
15	1.5781			1.5784						1.5783
16	1.5807			1.5809	JJ	4/7/81				1.5808
17	1.5831			1.5830						1.5831
18	1.5862			1.5864						1.5863
19	1.5823			1.5827						1.5825
20	1.5790	JJ	4/6/81	1.5789						1.5789
21	1.5798			1.5800						1.5799
22	1.5817			1.5819						1.5817
23	1.5839			1.5839						1.5839
24	1.5794			1.5796						1.5796
25	1.5856			1.5854						
26	1.5807			1.5811						
27	1.5809			1.5809						
28	1.5790			1.5794						
29	1.5750			1.5750						
30	1.5802			1.5799						
31	1.5787			1.5789						

Remarks

METHOD 17
FILTER TARE WEIGHTS

Filter No.	First Weigh Weight (~~µ~~g)	By	Date	Second Weigh Weight (~~µ~~g)	By	Date	Third Weigh Weight (~~µ~~g)	By	Date	Average Weight
32	1.5818	[illegible]	4/6/81	1.5818	[illegible]	4/7/81				
33	1.5819			1.5819						
34	1.5807			1.5808						
35	1.5830			1.5830						
36	1.5778			1.5775						
37	1.5818			1.5819						
38	1.5796			1.5797						
39	1.5799			1.5799						
40	1.5819			1.5819						
41	1.5784	[illegible]	4/3/81	1.5789						
42	1.5804			1.5809						
43	1.5801			1.5806						
44	1.5819			1.5823						
45	1.5743	[illegible]	4/1/81	1.5748	[illegible]	4/3/81				
46	1.5779			1.5780						
47	1.5727			1.5728						
48	1.5724			1.5728						
49	1.5702			1.5703						1.5703
50	1.5843			1.5838						
51	1.5862			1.5862						
52	1.5874			1.5878						
53	1.5829			1.5833						
54	1.5741			1.5745						
55	1.5773			1.5769						
56	1.5798			1.5797						
57	1.5799			1.5790						
58	1.5770			1.5772						
59	1.5829			1.5833						
60	1.5936			1.5941						
61	1.5930			1.5933						
62	1.5868			1.5871						

Remarks

METHOD 17
FILTER TARE WEIGHTS

Filter No.	First Weigh Weight (mg)	By	Date	Second Weigh Weight (mg)	By	Date	Third Weigh Weight (mg)	By	Date	Average Weight
63	1.5774	[illegible]	4/1/81	1.5779	[illegible]	4/3/81				
64	1.5856			1.5866						
65	1.5845			1.5847						
66	1.5810			1.5808						
67	1.5834			1.5836						
68	1.5840			1.5843						
69	1.5852			1.5853						
70	1.5807			1.5808						

Remarks

BEAKER TARE WEIGHTS

Beaker No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	Average Weight
01	76.6385	JJ	3/30	76.6379	JJ	3/31				76.6382
02	76.4574			76.9572						76.7073
03	67.9787			67.9783						67.9785
04	67.8377			67.8372						67.8375
05	66.4429			66.4427						66.4428
06	78.3493			78.3492						78.3693
07	68.0666			68.0661						68.0663
08	67.3476			67.3472						67.3474
09	78.4870			78.4882						78.4876
10	67.4462			67.4475						67.4469
11	78.1512			78.1507						78.1509
12	77.4620			77.4619						77.4619
13	67.6598			67.6597						67.6597
										~~[illegible]~~
15	67.9531			67.9528					67.9524	~~[illegible]~~
16	67.5981			67.5976						67.5979
17	76.7498			76.7499						76.7499
18	77.2507			77.2501						77.2504
19	68.6800			68.6799						68.6799
20	77.5382			77.5376						77.5379
21	67.9181			67.9177						67.9179
22	75.2348			75.2343						75.2345
23	77.3303			77.3304						77.3303
24	73.3232			73.3225						73.3229
25	76.9274			76.9266						76.9270
28	76.6561			76.6564						76.6563
30	75.8431			75.8432						75.8431
31.	77.2016	↓	↓	77.2008	↓	↓				77.2012

Remarks 150 ml beakers used for method 17 probe rinse and cyclone dry catch method 5

BEAKER TARE WEIGHTS

Beaker No.	First Weigh Weight (g)	First Weigh By	First Weigh Date	Second Weigh Weight (g)	Second Weigh By	Second Weigh Date	Third Weigh Weight (g)	Third Weigh By	Third Weigh Date	Average Weight
32	—	JJ	3/30		JJ	3/31				
33	78.9312			78.9305						78.9309
34	75.9393			75.9394						75.9393
36	76.3898			76.3895						76.3897
37	75.8845			75.8842						75.8843
38.	66.9839			66.9838						66.9839
39	76.7224			76.7224						76.7224
40	75.4413			75.4409						75.4411
41	68.6445			68.6441						68.6446
42	73.6093			73.6088						73.6091
43	78.0665			78.0665						78.0665
44	76.0463			76.0459						76.0461
45	72.6872			72.6862						72.6867
48	76.4029			76.4028						76.4029
49	75.6695			75.6692						75.6693
50	76.8903			76.8902						76.8903
51	75.7614			75.7608						75.7611
52	77.7598			77.7591						77.7595
54	77.2482			77.2481						77.2481
55	77.0066			77.0066			77.0065			77.0065
56	76.1332			76.1329						76.1331
57	74.4751			74.4748						74.4749
58	77.1138			77.1133						77.1135
59	76.3391			76.3385						76.3388
61	69.2801			69.2794						69.2797
62	66.5467	↓	↓	66.5460	↓	↓				66.5463

Remarks * 150 ml beakers used for Method 17 probe rinse and cyclone dry catch Method 5

BEAKER TARE WEIGHTS

Beaker No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	Average Weight
63	67.2359	JJ	3/30	67.2351	JJ	3/31				67.2355
64	68.3091			68.3084						68.3087
65	66.9879			66.9872						66.8375
66	68.3997			68.3995						68.3996
67	67.9506			67.9505						67.9505
69	66.6634			66.6633						66.6633
70	67.8576			67.8579						67.8577
71	67.8963			67.8957						67.8960
72	68.2753			68.2750						68.2751
73	64.9525			64.9522						64.9523
74	66.7893			66.7837						66.7895
75	67.0885			67.0887						67.0886
76	67.3457			67.3458						67.3457
77	68.8886			68.8878						68.8882
78	68.1549			68.1545						68.1547
79	66.5470			66.5467						66.5469
80	67.6118			67.6115						67.6117
81	67.1193			67.1187						67.1190
82	67.8172			67.8166						67.8169
83	68.0966			~~68.0966~~						68.0966
84	67.0996			67.0995						67.0995
85	67.1645			67.1642						67.1643
86	67.1320			67.1318						67.1319
87	66.5107			66.5105						66.5106
88	66.9730			66.9729						66.9729
89	67.9851			67.9849						67.9850
90	66.2203			66.2199						66.2201
91	67.9380			67.9379						67.9379
92	66.7603			66.7600						66.7601
93	65.8187			65.8184						65.8185

Remarks

*90. 66.2203 | 66.2199

150 ml beakers used for method 17 probe rinse and cyclone dry catch method 5

BEAKER TARE WEIGHTS

Beaker No.	First Weigh			Second Weigh			Third Weigh			Average Weight
	Weight (g)	By	Date	Weight (g)	By	Date	Weight (g)	By	Date	
94	65.1296	JJ	3/30	65.1298	JJ	3/31				65.1297

Remarks 150 ml beakers used for Method 17 probe rinse and cyclone dry catch Method 5

METHOD 17

Run Number: ESP-0-1-1-A
Date of Run: 4-30-81

FILTER ANALYSIS

Filter No. 1	Date: 5-2-81 By: GP First Weigh (mg)	Date: 5-2-81 By: DO Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Final Weight	1.5923	1.5922		1.5923

Tare Weight: 1.5815 mg Blank Correction: -0.3 mg

PROBE RINSE ANALYSIS

Beaker No. 31	Date: 5-2-81 By: GP First Weigh (g)	Date: 5-2-81 By: GP Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
Final Weight	77.2239	77.2241		77.2240

Tare Weight: 77.2012 g Vol. of Probe Rinse: 30 ml

Acetone Blank Correction: -0.8 mg
Vol - 40ml

Remarks Problems possibly w/ particulate going through filter.

METHOD 17

Run Number: ESP-0-1-1-B
Date of Run: 4-30-81

FILTER ANALYSIS

Filter No. 2	Date: 5-2-81 By: GP First Weigh (mg)	Date: 5-2-81 By: DD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Final Weight	1.5978	1.5975		1.5977

Tare Weight: 1.5865 mg   Blank Correction: -0.3 mg

PROBE RINSE ANALYSIS

Beaker No. 52	Date: 5-2-81 By: GP First Weigh (g)	Date: 5-2-81 By: GP Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
Final Weight	77.7635	77.7636		77.7635

Tare Weight: 77.7595 g   Vol. of Probe Rinse: 25 ml

Acetone Blank Correction: -0.8 mg
Vol. = 40 ml

Remarks

METHOD 17

Run Number: ESP-0-2-1
Date of Run: 5-1-81

FILTER ANALYSIS

Filter No. 3	Date: 5-2-81 By: DO First Weigh (~~m~~g)	Date: 5-2-81 By: DC Second Weigh (~~m~~g)	Date: By: Third Weigh (mg)	Average Weight
Final Weight	1.6102	1.6101		1.6101

Tare Weight: 1.5833 ~~m~~g Blank Correction: - ~~0.6~~ 0.3 mg

PROBE RINSE ANALYSIS

Beaker No. 56	Date: 5/2/81 By: DO First Weigh (g)	Date: 5/2/81 By: DC Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
Final Weight	76.1363	76.1360		76.1361

Tare Weight: 76.133 g Vol. of Probe Rinse: 20 ml

Acetone Blank Correction: -0.8 mg
Vol = 40 ml

Remarks

METHOD 17

Run Number: ESP-0-3-1
Date of Run: 5-2-81

FILTER ANALYSIS

Filter No. 4	Date: 5-4-81 By: DS First Weigh (~~m~~g)	Date: 5-4-81 By: JP Second Weigh (~~m~~g)	Date: By: Third Weigh (~~m~~g)	Average Weight
Final Weight	1.6224	1.6223		1.6223

Tare Weight: 1.5829 mg Blank Correction: -0.1 mg

PROBE RINSE ANALYSIS

Beaker No. 42	Date: 5-4-81 By: DS First Weigh (g)	Date: 5-4-81 By: JP Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
Final Weight	73.6125	73.6124		73.6125

Tare Weight: 73.6096 g Vol. of Probe Rinse: 20 ml

Acetone Blank Correction: -0.8 mg
Vol. - 40 ml

Remarks

METHOD 17

Run Number: ESP-O-4-1
Date of Run: 5-2-81

FILTER ANALYSIS

Filter No. 5	Date: 5-4-81 By: DC First Weigh (mg)	Date: 5-4-81 By: JP Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Final Weight	1.6267	1.6267		1.6267

Tare Weight: 1.5865 mg Blank Correction: -0.1 mg

PROBE RINSE ANALYSIS

Beaker No. 62	Date: 5-4-82 By: DC First Weigh (g)	Date: 5-4-81 By: JP Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
Final Weight	66.5492	66.5492		66.5492

Tare Weight: 66.5463 g Vol. of Probe Rinse: 20 ml

Acetone Blank Correction: -0.8 mg
Vol. = 40 ml

Remarks

METHOD 17

Run Number: ESP-O-1-2
Date of Run: 5-4-81

FILTER ANALYSIS

Filter No. 6	Date: 5-5-81 By: DC First Weigh (mg)	Date: 5-5-81 By: JD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Final Weight	1.7161	1.7160		1.7161

Tare Weight: 1.5843 mg Blank Correction: +0.1 mg

PROBE RINSE ANALYSIS

Beaker No. 91	Date: 5-5-81 By: DC First Weigh (g)	Date: 5-5-81 By: JP Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
Final Weight	67.9444	67.9444		67.9444

Tare Weight: 67.9379 g Vol. of Probe Rinse: 20 ml

Acetone Blank Correction: -0.8 mg
Vol = 40 ml

Remarks

METHOD 17

Run Number: ESP-0-2-2-A
Date of Run: 5-4-81

FILTER ANALYSIS

Filter No. 7	Date: 5-5-81 By: DO First Weigh (mg)	Date: 5-5-81 By: JP Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Final Weight	1.6307	1.6305		1.6306

Tare Weight: 1.5817 mg Blank Correction: +0.1 mg

PROBE RINSE ANALYSIS

Beaker No. 1	Date: 5/6/81 By: DO First Weigh (g)	Date: 5/6/81 By: DO Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
Final Weight	76.6402	76.6406		

Tare Weight: 76.6382 g Vol. of Probe Rinse: 25 ml

Acetone Blank Correction: -0.8 mg
Vol. = 40 ml

Remarks

METHOD 17

Run Number: ESP-0-3-2
Date of Run: 5-5-81

FILTER ANALYSIS

Filter No. 8	Date: 5/6/81 By: DO First Weigh (mg)	Date: 5/6/81 By: DO Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Final Weight	1.5961	1.5963		1.5962

Tare Weight: 1.5796 mg Blank Correction: 0.43 mg

PROBE RINSE ANALYSIS

Beaker No. 18	Date: 5/6/81 By: DO First Weigh (g)	Date: 5/6/81 By: JP Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
Final Weight	77.2560	77.2555		77.2557

Tare Weight: 77.2503 g Vol. of Probe Rinse: 40 ml

Acetone Blank Correction: -0.8 mg
Vol. = 40 ml

Remarks

METHOD 17

Run Number: ESP-O-4-2
Date of Run: 5-5-81

FILTER ANALYSIS

Filter No. 9	Date: 5/6/81 By: DC First Weigh (mg)	Date: 5/6/81 By: DO Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Final Weight	1.5968	1.5970		1.5969

Tare Weight: 1.5779 mg Blank Correction: ~~0.02~~ 0.4.3 mg

PROBE RINSE ANALYSIS

Beaker No. 48	Date: 5/6/81 By: DO First Weigh (g)	Date: 5/6/81 By: JP Second Weigh (g)	Date: 5/6/81 By: JP Third Weigh (g)	Average Weight
Final Weight	75.6720	75.4050	75.4045	~~75.4047~~ ~~75.4938~~ 75.4047

Tare Weight: 76.4029 g Vol. of Probe Rinse: 20 ml

Acetone Blank Correction: -0.8 mg
Vol.: 40 ml

Remarks MDH (5/7/81
Beaker #48 yields a negative weight when subtracting final weight from tare weight. At MRI clean beaker #48 and fire as according to pre-test procedures. The beaker had visible material from field test in it when weighed in ~~the~~ field.

METHOD 17

Run Number: ESP-0-2-2(B)
Date of Run: 5-6-81

FILTER ANALYSIS

Filter No. 10	Date: 5/7/81 By: DO First Weigh (~~m~~g)	Date: 5/7/81 By: JP Second Weigh (~~m~~g)	Date: ______ By: ______ Third Weigh (~~m~~g)	Average Weight
Final Weight	1.7199	1.7203		1.7201

Tare Weight: 1.5765 ~~m~~g Blank Correction: 0.2 mg

PROBE RINSE ANALYSIS

Beaker No. 19	Date: 5/7/81 By: DO First Weigh (g)	Date: 5-7-81 By: JP Second Weigh (g)	Date: ______ By: ______ Third Weigh (g)	Average Weight
Final Weight	68.6945	68.6950		68.6947

Tare Weight: 68.6799g Vol. of Probe Rinse: 15 ml

Acetone Blank Correction: -0.8 mg
Vol. = 40ml

Remarks

METHOD 17

Run Number: ESP-O-1-1(C)
Date of Run: 5-6-81

FILTER ANALYSIS

Filter No. 11	Date: 5/7/81 By: DC First Weigh (mg)	Date: 5/7/81 By: JP Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Final Weight	1.6015	1.6018		1.6017

Tare Weight: 1.5816 mg Blank Correction: 0.2 mg

PROBE RINSE ANALYSIS

Beaker No. 43	Date: 5/7/81 By: DC First Weigh (g)	Date: 5/7/81 By: JP Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
Final Weight	65.8212	65.8217		65.8215

Tare Weight: 65.8185g Vol. of Probe Rinse: 15 ml

Acetone Blank Correction: -0.8 mg
Vol.= 40ml

Remarks

D-3 Andersen High Capacity Stack Sampler with 15 μm Preseparator Particle Size Tests

H.C.S.S.
THIMBLE FILTER TARE WEIGHTS

Filter No.	First Weigh Weight (~~mg~~ g)	By	Date	Second Weigh Weight (~~mg~~ g)	By	Date	Third Weigh Weight (~~mg~~ g)	By	Date	Average Weight
1	25.0305	BD	4/22/81	25.0306	EC	4-23-81				25.0305
2	24.0852	BD	"	24.0855	EC	4-23-81				24.0853
3	24.0864	BD	"	24.0876	EC	4-23-81	24.0867			24.0871
4	24.7759	BD	"	24.7766	EC	4-23-81				24.7763
5	24.1636	BD	"	24.1645	EC	4-23-81				24.1641
6	24.8061	BD	"	24.8066	EC	4-23-81				24.8063
7	24.5125	BD	"	24.5133	EC	4-23-81				24.5129
8	24.3350	BD	"	24.3353	EC	4-23-81				24.3351
9	24.6200	BD	"	24.6201	EC	4-23-81				24.6201
10	24.2112	BD	"	24.2125	EC	4-23-81	24.2115			24.2119
11	24.9340	BD	"	24.9337	EC	4-23-81				24.9339
12	24.9103	BD	"	24.9105	EC	4-23-81				24.9104
13	23.7939	BD	"	23.7940	EC	4-23-81				23.7939
14	24.5896	BD	"	24.5899	EC	4-23-81				24.5897
15	23.8624	BD	"	23.8629	EC	4-23-81				23.8627
16	24.3253	BD	"	24.3259	EC	4-23-81				24.3255
17	24.8825	BD	"	24.8844	EC	4-23-81	24.8811			next page (2)
18	24.3472	BD	"	24.3476	EC	4-23-81				24.3474
19	24.0430	BD	"	24.0439	EC	4-23-81				24.0435
20	24.1696	BD	4/22/81	24.1702	EC	4-23-81				24.1699
21	24.7318	BD	"	24.7316	EC	4-23-81				24.7317
22	24.1599	BD	"	24.1600	EC	4-23-81				24.1599
23	24.7563	BD	"	24.7568	EC	4-23-81				24.7565
24	24.1149	BD	"	24.1155	EC	4-23-81				24.1152
25	23.8784	BD	"	23.8787	EC	4-23-81				23.8785
26	23.7825	BD	"	23.7827	EC	4-23-81				23.7826
27	24.0835	BD	"	24.0839	EC	4-23-81				24.0836
28	24.1544	BD	"	24.1548	EC	4-23-81				24.1546
29	25.0399	BD	"	25.0403	EC	4-23-81				25.0401
30	24.1046	BD	"	24.1056	EC	4-23-81	24.1054			24.1055
31	24.3665	BD	4/22/81	24.3654	EC	4-23-81	24.3642			Next page 2

Remarks

H.C.S.S.
THIMBLE FILTER TARE WEIGHTS

Filter No.	First Weigh Weight (mg)	By	Date	Second Weigh Weight (mg)	By	Date	Third Weigh Weight (mg)	By	Date	Average Weight
32	24.8660	BD	4/22/81	24.8666	GC	4-23-81				24.8663
33	24.1829	BD	"	24.1836	GC	4-23-81				24.1833
34	24.5613	BD	"	24.5616	GC	4-23-81				24.5615
35	24.2642	BD	"	24.2637	GC	4-23-81				24.2639
36	24.0236	BD	"	24.0243	GC	4-23-81				24.0239
37	24.1812	BD	"	24.1816	GC	4-23-81				24.1812
38	24.3556	BD	"	24.3557	GC	4-23-81				24.3557
39	24.7400	BD	"	24.7400	GC	4-23-81				24.7400
40	24.2775	BD	4/22/81	24.2773	GC	4-23-81				24.2774
17	24.8813									24.8812
31	24.3635									24.3639

Remarks

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-3-1
Date of Run: 5-~~20~~-81

TARE WEIGHTS

Sample ID Set No.	Sample ID Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
1	1	1.4489	1.4489		1.4489
1	2	1.4393	1.4393		1.4393
1	3	1.4329	1.4330		1.4330
1	4	1.4312	1.4311		1.4312

Thimble Filter Tare Weight (~~mg~~ g) 24.1~~5~~812

FINAL WEIGHTS

Sample ID Set No.	Sample ID Stage No.	Date: 5-2-81 By: DO First Weigh (g)	Date: 5-2-81 By: DO Second Weigh (g)	Date: 5-2-81 By: GP Third Weigh (g)	Average Weight
1	1	13.6885	13.6904	13.6909	13.6907
1	2	2.0689	2.0688		2.0689
1	3	2.2652	2.2648		2.2650
1	4	2.3753	2.3751		2.3752
Thimble Filter #37		24.6437	24.6433		24.6435

Thimble Filter Blank Correction (mg) -0.5

Remarks Thimble No. 37
Thimble Tare 24.1812

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-3-1
Run Date 5-1-81
Observations Made by

Filter Set No. 37/1
Recovery Date 5-1-81
Proj. No. 4892-L-03

Stage	Observations *
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded 18

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I3-2
Date of Run: 5-1-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
2	1	1.4557	1.4558		1.4558
2	2	1.4390	1.4390		1.4390
2	3	1.4464	1.4464		1.4464
2	4	1.4429	1.4428		1.4428

Thimble Filter Tare Weight (~~m~~g) 24.3557

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5-2-81 By: DC First Weigh (g)	Date: 5-2-81 By: AP Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
2	1	15.5550	15.5555		15.5553
2	2	2.3414	2.3415		2.3415
2	3	2.1385	2.1387		2.1386
2	4	2.3243	2.3244		2.3243
Thimble Filter #38		24.5441	24.5437		24.5439

Thimble Filter Blank Correction (mg) ~~[illegible]~~ 0.5

Remarks Thimble Filter #38

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP- I - 3 - 2 Filter Set No. 38/2
Run Date 5-1-81 Recovery Date 5-1-81
Observations Made by JP Proj. No. 4892-L-03

Stage	Observations *
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded ______________

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-1-1
Date of Run: 5-2-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
3	1	1.4383	1.4382		1.4382
3	2	1.4382	1.4384		1.4383
3	3	1.4378	1.4380		1.4379
3	4	1.4415	1.4414		1.4414

Thimble Filter Tare Weight (~~mg~~g) 24.3474

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5/4/81 By: DO First Weigh (g)	Date: 5-4-81 By: JP Second Weigh (g)	Date: 5-4-81 By: DO Third Weigh (g)	Average Weight
3	1	26.5587	26.5980	26.6175 26.6180	26.6177
3	2	2.8385	2.8440	2.8452 2.8457	2.8455
3	3	2.5365	2.5410	2.5427 2.5429	2.5428
3	4	2.4687	2.4727	2.4753 2.4748	2.4751
Thimble Filter #18		24.8940	24.8945		24.8942

Thimble Filter Blank Correction (mg) ~~[illegible]~~ -0.7

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP- I- 1-1
Run Date 5-2-81
Observations Made by C Cobb

Filter Set No. 1813
Recovery Date 5-2-81
Proj. No. 4892-L-03

Stage	Observations *
1	Heavy loading - cut back on sampling time
2	OK
3	OK
4	Heavy loading - less sampling time needed - sticking to sides of cyclone - heat longer
5 (Thimble Filter)	light loading

Thimble Filter No. Reloaded 17

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-1-2
Date of Run: 5-2-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
4	1	1.4472	1.4471		1.4472
4	2	1.4572	1.4572		1.4572
4	3	1.4709	1.4708		1.4708
4	4	1.4702	1.4701		1.4702

Thimble Filter Tare Weight (~~m~~g) 24.8063

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5/4/81 By: DO First Weigh (g)	Date: 5-4-81 By: JP Second Weigh (g)	Date: 5-4-81 By: DO Third Weigh (g)	Average Weight
4	1	17.3095	17.3392	17.3550 17.3555	17.3557
4	2	2.1012	2.1044	2.1045	2.1044
4	3	2.0518	2.0545	2.0548	2.0546
4	4	2.0504	2.0527	2.0531 2.0536	2.0533
Thimble Filter #6		25.1431	25.1431		25.1431

Thimble Filter Blank Correction (mg) -0.7

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-1-2
Run Date 5-2-81
Observations Made by JP

Filter Set No. 614
Recovery Date 5-2-81
Proj. No. 4892-L-03

Stage	Observations*
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded 19

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-4-1
Date of Run: 5-2-81

TARE WEIGHTS

Sample ID Set No.	Sample ID Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
5	1	1.4627	1.4628		1.4628
5	2	1.4617	1.4617		1.4617
5	3	1.4675	1.4675		1.4675
5	4	1.4700	1.4699		1.4700

Thimble Filter Tare Weight (~~m~~g) 24.8812

FINAL WEIGHTS

Sample ID Set No.	Sample ID Stage No.	Date: 5/4/81 By: DO First Weigh (g)	Date: 5-4-81 By: JP Second Weigh (g)	Date: 5-4-81 By: DO Third Weigh (g)	Average Weight
5	1	.8610 17.~~8444~~	17.8866	17.9004 17.9006	17.9005
5	2	1.8976	1.8995	1.8997	1.8996
5	3	2.3605	2.3650	2.3655	2.3652
5	4	2.1195	2.1230	2.1232	2.1231
Thimble Filter #17		25.1250	25.1272	25.1277	25.1274

Thimble Filter Blank Correction (mg) -0.7

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-41
Run Date 5-2-81
Observations Made by JP

Filter Set No. 17/5
Recovery Date 5-2-81
Proj. No. 4892-L-03

Stage	Observations *
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	LIGHT LOADING

Thimble Filter No. Reloaded 10

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-4-2
Date of Run: 5-2-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
6	1	1.4594	1.4595		1.4594
6	2	1.4451	1.4451		1.4451
6	3	1.4434	1.4433		1.4434
6	4	1.4490	1.4490		1.4490

Thimble Filter Tare Weight (~~m~~g) 24.0435

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5-4-81 By: DO First Weigh (g)	Date: 5-4-81 By: JP Second Weigh (g)	Date: 5-4-81 By: DO Third Weigh (g)	Average Weight
6	1	19.2756	19.3024	19.3224 19.3229	19.3227
6	2	1.8864	1.8882	1.8879	1.8880
6	3	2.1258	2.1280	2.1292 2.1291	2.1291
6	4	2.3481	2.3516	2.3536 2.3540	2.3538
Thimble Filter #19		24.3356	24.3358		24.3357

Thimble Filter Blank Correction (mg) -0.7

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-4-2
Run Date 5-2-81
Observations Made by JT

Filter Set No. 19/6
Recovery Date 5-2-81
Proj. No. 4892-L-03

Stage	Observations *
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded 25

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-2-1
Date of Run: 5-4-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: 4/21/81 By: BD Third Weigh (g)	Average Weight
7	1	1.4553	1.4553		1.4553
7	2	1.4529	1.4529		1.4529
7	3	1.4568	1.4562	1.4564	1.4563
7	4	1.4561	1.4562		1.4562

Thimble Filter Tare Weight (~~mg~~) 23.8785

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5-5-81 By: DO First Weigh (g)	Date: 5/5/81 By: DO Second Weigh (g)	Date: 5/5/81 By: SP Third Weigh (g)	Average Weight
7	1	23.9483	23.9887	23.9891	23.9889
7	2	3.1146	3.1202 ~~3.1186~~	3.1223 3.1225	3.1224
7	3	2.4090	2.4122 ~~2.4112~~	2.4147 2.4151	2.4149
7	4	2.2440	2.2467 ~~2.2444~~	2.2471	2.2469
Thimble Filter #25		24.3482	24.3485		24.3483

Thimble Filter Blank Correction (mg) -0.5

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP - I - 21
Run Date 5-4-81
Observations Made by G Cobb

Filter Set No. 25/7
Recovery Date 5-4-81
Proj. No. 4892-L-03

Stage	Observations*
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded 36

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-2-2
Date of Run: 5-4-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
8	1	1.4532	1.4533		1.4532
8	2	1.4494	1.4495		1.4494
8	3	1.4449	1.4450		1.4450
8	4	1.4448	1.4447		1.4448

Thimble Filter Tare Weight (~~mg~~ g) 24.2119

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5-5-81 By: DO First Weigh (g)	Date: 5/5/81 By: DO Second Weigh (g)	Date: 5-5-81 By: JP Third Weigh (g)	Average Weight
8	1	26.0069	26.0533	26.0535	26.0534
8	2	2.4157	2.4204	2.4209	2.4207
8	3	2.1969	2.2001	2.2005	2.2003
8	4	2.4076	2.4118	2.4123	2.4120
Thimble Filter #10		24.5812	24.5812		24.5812

Thimble Filter Blank Correction (mg) -0.5 mg

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP- I-2-2
Run Date 5-4-81
Observations Made by C Cobb

Filter Set No. 10/B
Recovery Date 5-4-81
Proj. No. 4892-L-03

Stage	Observations *
1	OK heavy
2	OK
3	OK
4	OK heavy
5 (Thimble Filter)	OK light

Thimble Filter No. Reloaded 34

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-1-3(A)
Date of Run: 5-4-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
9	1	1.4370	1.4370		1.4370
9	2	1.4399	1.4399		1.4399
9	3	1.4486	1.4486		1.4486
9	4	1.4507	1.4508		1.4508

Thimble Filter Tare Weight (~~m~~g) 24.0239

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: By: First Weigh (g)	Date: By: Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
	1				
	2				
	3				
	4				
Thimble Filter #34					

Thimble Filter Blank Correction (mg) ________

Remarks
BAD RUN - FINAL WEIGHTS NOT RECORED

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP - I - 1 - 3 (A)
Run Date 5-4-81
Observations Made by JP.

Filter Set No. 36/9
Recovery Date 5-4-81
Proj. No. 4892-L-03

Stage	Observations *
1	
2	
3	
4	
5 (Thimble Filter)	

Thimble Filter No. Reloaded 39

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

BAD RUN

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-1-4
Date of Run: 5-4-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
10	1	1.4440	1.4440		1.4440
10	2	1.4396	1.4396		1.4396
10	3	1.4407	1.4408		1.4408
10	4	1.4503	1.4503		1.4503

Thimble Filter Tare Weight (~~mg~~g) 24.5615g

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5-5-81 By: DO First Weigh (g)	Date: 5-5-81 By: JP Second Weigh (g)	Date: 5/6/81 By: DO Third Weigh (g)	Average Weight
10	1	22.7679	22.7707	22.7743 22.7741	22.7742
10	2	2.2066	2.2098	2.2071	2.2068
10	3	2.1476	2.1509	2.1481	2.1478
10	4	2.0765	2.0816	2.0813 2.0790	2.0814 ~~2.0~~
Thimble Filter #34		24.6936	24.6931		24.6934

Thimble Filter Blank Correction (mg) -0.5

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-1-4
Run Date 5-4-81
Observations Made by JP

Filter Set No. 34/10
Recovery Date 5-4-81
Proj. No. 4892-L-03

Stage	Observations *
1 *	ok
2	ok
3	ok
4	ok
5 (Thimble Filter)	ok

Thimble Filter No. Reloaded 35

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

*SMALL AMOUNT OF SAMPLE FELL OUT OF NOZZLE, AND WAS RECOVERED

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-1-3-(B)
Date of Run: 5-4-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
11	1	1.4460	1.4460		1.4460
11	2	1.4406	1.4406		1.4406
11	3	1.4372	1.4371		1.4372
11	4	1.4481	1.4481		1.4481

Thimble Filter Tare Weight (~~mg~~) 24.7400g

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5-5-81 By: DC First Weigh (g)	Date: 5/5/81 By: DD Second Weigh (g)	Date: 5-5-81 By: JP Third Weigh (g)	Average Weight
11	1	24.1768	24.2337	24.2342	24.2339
11	2	2.4889	2.4941	2.4946	2.4943
11	3	2.2487	2.2544	2.2546	2.2545
11	4	2.2187	2.2238	2.2241	2.2239
Thimble Filter #39		24.8953	24.8958		24.8955

Thimble Filter Blank Correction (mg) -0.5

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-1-3-(B) Filter Set No. 39/11
Run Date 5-4-81 Recovery Date 5-4-81
Observations Made by J.P Proj. No. 4892-L-03

Stage	Observations *
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded ______

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-3-3
Date of Run: 5-5-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
12	1	1.4608	1.4607		1.4608
12	2	1.4497	1.4497		1.4497
12	3	1.4465	1.4464		1.4464
12	4	1.4402	1.4400		1.4401

Thimble Filter Tare Weight (~~mg~~) 24.2639g

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5/6/81 By: DO First Weigh (g)	Date: 5/6/81 By: DO Second Weigh (g)	Date: 5/6/81 By: SP Third Weigh (g)	Average Weight
12	1	24.0629	24.0863	24.0865	24.0864
12	2	2.0524	2.0536	2.0541	2.0539
12	3	2.0501	2.0506		2.0504
12	4	2.0894	2.0910	2.0915	2.0912
Thimble Filter #35		24.5102	24.5106		24.5104

Thimble Filter Blank Correction (mg) -0.6

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-3-3
Run Date 5-5-81
Observations Made by [signature]

Filter Set No. 35/12
Recovery Date 5-5-81
Proj. No. 4892-L-03

Stage	Observations *
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded B8

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-3-4
Date of Run: 5-5-81

TARE WEIGHTS

Sample ID Set No.	Sample ID Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
14	1	1.4341	1.4341		1.4341
14	2	1.4458	1.4456		1.4457
14	3	1.4479	1.4477		1.4478
14	4	1.4515	1.4513		1.4514

Thimble Filter Tare Weight (~~mg~~g) 24.5897g

FINAL WEIGHTS

Sample ID Set No.	Sample ID Stage No.	Date: 5/6/81 By: DO First Weigh (g)	Date: 5/6/81 By: DO Second Weigh (g)	Date: 5/6/81 By: JP Third Weigh (g)	Average Weight
14	1	15.2599	15.2764	15.2820 15.2825	15.2823
14	2	1.8228	~~2~~1.8227		1.8228
14	3	1.9587	1.9586		1.9586
14	4	2.1006	2.1011		2.1008
Thimble Filter #14		24.7325	24.7330		24.7328

Thimble Filter Blank Correction (mg) -0.6

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP. I-3-4

Run Date 5-5-81

Observations Made by JP

Filter Set No. 14-~~13~~ 14

Recovery Date 5-5-81

Proj. No. 4892-L-03

Stage	Observations*
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded 30

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-2-3
Date of Run: 5-5-81

TARE WEIGHTS

Sample ID Set No.	Sample ID Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
13	1	1.4446	1.4444		1.4445
13	2	1.4540	1.4540		1.4540
13	3	1.4402	1.4402		1.4402
13	4	1.4341	1.4340		1.4340

Thimble Filter Tare Weight (~~mg~~g) 24.3351 g

FINAL WEIGHTS

Sample ID Set No.	Sample ID Stage No.	Date: 5/6/81 By: DO First Weigh (g)	Date: 5/6/81 By: DO Second Weigh (g)	Date: 5/6/81 By: JP Third Weigh (g)	Average Weight
13	1	21.8596	21.8832	21.8912 21.8916	21.8914
13	2	2.3167	2.3180	2.3180	2.3180 ~~2.3177~~
13	3	2.0536	2.0540		2.0538
13	4	2.1563	2.1567		2.1565
Thimble Filter #8		24.4898	24.4897		24.4898

Thimble Filter Blank Correction (mg) -0.6

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-2-3
Run Date 5-5-81
Observations Made by JP

Filter Set No. 8/13
Recovery Date 5-5-81
Proj. No. 4892-L-03

Stage	Observations *
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded 21

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP·I-2-4
Date of Run: 5-5-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/21/81 By: BD First Weigh (g)	Date: 4/21/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
15	1	1.4444	1.4445		1.4444
15	2	1.4356	1.4356		1.4356
15	3	1.4398	1.4396		1.4397
15	4	1.4491	1.4491		1.4491

Thimble Filter Tare Weight (~~mg~~g) 24.1055g

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5/6/81 By: DO First Weigh (g)	Date: 5/6/81 By: DO Second Weigh (g)	Date: 5/6/81 By: JP Third Weigh (g)	Average Weight
15	1	24.7165	24.7420	24.7425	24.7423
15	2	2.1410	2.1415		2.1412
15	3	2.5055	2.5060		2.5058
15	4	2.2250	2.2254		2.2252
Thimble Filter #30		24.3070	24.3068		24.3069

Thimble Filter Blank Correction (mg) - 0.6

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-2-4
Run Date 5-5-81
Observations Made by JP

Filter Set No. 30/15
Recovery Date 5-5-81
Proj. No. 4892-L-03

Stage	Observations *
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded 22

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-43
Date of Run: 5-6-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/22/81 By: BD First Weigh (g)	Date: 4/22/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
16	1	1.4495	1.4496		1.4496
16	2	1.4545	1.4544		1.4544
16	3	1.4546	1.4546		1.4546
16	4	1.4607	1.4606		1.4606

Thimble Filter Tare Weight (~~mg~~) 24.7317g

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5/7/81 By: DD First Weigh (g)	Date: 5/7/81 By: JP Second Weigh (g)	Date: 5/7/81 By: JP Third Weigh (g)	Average Weight
16	1	27.1812	27.1815		27.1813
16	2	5.5100	5.5109	5.5107	5.5108
16	3	2.7718	2.7722		2.7720
16	4	2.8119	2.8124		2.8121
Thimble Filter #21		25.0142	25.0147		25.0145

Thimble Filter Blank Correction (mg) -1.0

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-4-3
Run Date 5-6-81
Observations Made by J.P.

Filter Set No. 21/16
Recovery Date 5-8-81
Proj. No. 4892-L-03

Stage	Observations *
1	OK
2	OK
3	OK
4	OK
5 (Thimble Filter)	OK

Thimble Filter No. Reloaded ______________

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

H.C.S.S. STAGE TARE AND FINAL WEIGHTS

Run Number: ESP-I-4-4
Date of Run: 5-6-81

TARE WEIGHTS

Sample ID Set No.	Stage No.	Date: 4/22/81 By: BD First Weigh (g)	Date: 4/22/81 By: BD Second Weigh (g)	Date: By: Third Weigh (g)	Average Weight
17	1	1.4565	1.4565		1.4565
17	2	1.4546	1.4548		1.4547
17	3	1.4562	1.4564		1.4563
17	4	1.4508	1.4509		1.4508

Thimble Filter Tare Weight (mg) 24.1599

FINAL WEIGHTS

Sample ID Set No.	Stage No.	Date: 5/7/81 By: DO First Weigh (g)	Date: 5/7/81 By: JP Second Weigh (g)	Date: 5/7/81 By: JP Third Weigh (g)	Average Weight
17	1	23.4284	23.4290	23.4288	23.4289
17	2	2.5430	2.5433		2.5431
17	3	2.4603	2.4608		2.4605
17	4	2.3216	2.3221		2.3219
Thimble Filter #22		24.5549	24.5551		24.5550

Thimble Filter Blank Correction (mg) -1.0

Remarks

RECOVERY OBSERVATIONS

Andersen High Capacity Stack Sampler with Cyclone Preseperator

Run No. ESP-I-44
Run Date 5-6-81
Observations Made by JP

Filter Set No. 22/17
Recovery Date 5-6-81
Proj. No. 4892-L-03

Stage	Observations*
1	LOOKING GOOD
2	NP
3	NP
4	NP
5 (Thimble Filter)	NP

Thimble Filter No. Reloaded

*i.e., Color, Wet or Dry, No Visible Loading, Torn Thimble Filter, Suspect Carry Over, Overloaded, etc.

D-4 Andersen Mark III Impactor with 15 μm Preseparator Particle Size Tests

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-1-1-A
Date of Run: 4-30-81

Filter Set Number: 1

TARE WEIGHTS

Stage	Date: 3/31/81 By: MDH First Weigh (mg)	Date: 4/1/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	242.28	242.30		242.29
0	388.79	388.82		388.81
1	387.17	387.20		387.19
2	399.93	399.97		399.95
3	376.68	376.71		376.70
4	404.56	404.57		404.57
5	396.71	396.72		396.72
6	392.14	392.16		392.15
7	379.73	379.73		379.73
F	451.93	451.91		451.92

FINAL WEIGHTS

Stage	Date: 5-1-81 By: JP First Weigh (mg)	Date: 5-1-81 By: DO Second Weigh (mg)	Date: 5-1-81 By: DO Third Weigh (mg)	Average Weight
Pres	242.18	242.19	—	242.18
0	387.92	388.15	388.13	388.14
1	386.12	386.30	386.31	386.30
2	398.93	399.10	399.12	399.11
3	375.65	375.83	375.86	375.84
4	403.60	403.78	403.81	403.80
5	395.83	396.07	396.10	396.08
6	391.44	391.58	391.60	391.59
7	379.05	379.19	379.19	379.19
F	453.03	453.20	453.21	453.20

Blank Weight Corrections (mg)

Cyclone:
Substrate Stages 0-7: -1.0 mg
Final Filter: -.91 mg

Remarks Pres. - used 200 mg counter weight.
stages 0-7 + F - used 300 mg counter weight. } Tare

2 hr Run Not long enough run.

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-~~I-3-1~~ 0-1-1-A
Run Date 4-30-81
Observations Made by JOEL PAVELONIS

Filter Set No. 1
Recovery Date 4-30-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	LIGHT LOADING
X-0	NO VISIBLE LOADING
X-1	"
X-2	"
X-3	"
X-4	"
X-5	" VERY LIGHT LOADING
X-6	"
X-7	"
X-F	"

Filter Set No. Reloaded 3

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

Insufficient Loading. Not long enough test time.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-1-1
Date of Run: 4-30-81

Filter Set Number: 2

TARE WEIGHTS

Stage	Date: 3/31/81 By: MDH First Weigh (mg)	Date: 4/1/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	242.01	242.01		242.01
0	396.97	396.98		396.98
1	390.21	390.21		390.21
2	397.30	397.31		397.31
3	378.78	378.80		378.79
4	388.54	388.55		388.55
5	385.00	385.01		385.01
6	374.06	374.07		374.07
7	383.36	383.39		383.38
F	456.56	456.57		456.57

FINAL WEIGHTS

Stage	Date: By: First Weigh (mg)	Date: By: Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres				
0				
1				
2				
3				
4				
5				
6				
7				
F				

Blank Weight Corrections (mg)

Cyclone: ________
Substrate Stages 0-7: ________
Final Filter: ________

Remarks See Set No. 1

BAD RUN - FINAL FILTERS NOT WEIGHED

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. BAD RUN -
Run Date 4-30-81
Observations Made by

Filter Set No. 2
Recovery Date 5-1-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	
X-0	
X-1	
X-2	
X-3	
X-4	
X-5	
X-6	
X-7	
X-F	

Filter Set No. Reloaded 4

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-1-1-B
Date of Run: 5-1-81

Filter Set Number: 3

TARE WEIGHTS

Stage	Date: 4/1/81 By: MDH First Weigh (mg)	Date: 4/1/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	251.61	251.63		251.62
0	376.24	376.25		376.25
1	397.94	397.96		397.95
2	384.47	384.49		384.48
3	386.79	386.78		386.79
4	380.18	380.19		380.19
5	380.78	380.82		380.80
6	397.30	397.31		397.31
7	395.88	395.87		395.88
F	446.81	446.81		446.81

FINAL WEIGHTS

Stage	Date: 5/1/81 By: DO First Weigh (mg)	Date: 5-1-81 By: GP Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	251.06	251.04		251.05
0	376.52	376.55		376.53
1	397.19	397.14		397.17
2	383.90	383.86		383.88
3	386.10	386.08		386.09
4	379.72	379.68		379.70
5	380.94	380.93		380.93
6	397.84	397.79		397.81
7	397.34	397.29		397.31
F	448.22	448.18		448.20

Blank Weight Corrections (mg)

Cyclone: —
Substrate Stages 0-7: - 1.0 mg
Final Filter: -.91 mg

Remarks Set Note Set No. 1
Three Hour Run

FINAL - STAGE 1 = 397.17

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-0-1-1-B
Run Date 5-1-81
Observations Made by JP

Filter Set No. 3
Recovery Date 5-1-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	No Visible Loading
X-0	"
X-1	"
X-2	Very Light Loading
X-3	"
X-4	"
X-5	Light Loading
X-6	"
X-7	OK
X-F	OK

Filter Set No. Reloaded 5

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-2-1-A
Date of Run: 5-2-81

Filter Set Number: 4

TARE WEIGHTS

Stage	Date: 4/1/81 By: MDH First Weigh (mg)	Date: 4/1/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	234.99	234.99		234.99
0	397.10	397.10		397.10
1	391.78	391.77		391.78
2	397.50	397.50		397.50
3	386.77	386.76		386.77
4	396.33	396.33		396.33
5	383.26	383.26		383.26
6	397.86	397.86		397.86
7	379.08	379.09		379.09
F	444.31	444.31		444.31

FINAL WEIGHTS

Stage	Date: 5-4-81 By: JP First Weigh (mg)	Date: 5-4-81 By: JP Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	236.39	236.35		236.37
0	396.44	396.49		396.47
1	391.06	391.11		391.09
2	397.18	397.23		397.21
3	386.32	386.35		386.33
4	396.32	396.37		396.35
5	384.39	384.44		384.41
6	401.24	401.27		401.25
7	384.65	384.70		384.67
F	349.22	349.25		349.23

Blank Weight Corrections (mg)

Cyclone: —
Substrate Stages 0-7: −0.43
Final Filter: −0.89

Remarks See Note Set No. 1

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-0-2-1-A ~~ESP-0-2-1~~
Run Date 5-2-81
Observations Made by JP

Filter Set No. 4
Recovery Date 5-2-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	No Visible Loading
X-0	No Visible Loading
X-1	Very Light Loading
X-2	"
X-3	"
X-4	Light Loading
X-5	OK
X-6	OK
X-7	OK
X-F	OK

Filter Set No. Reloaded 6

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-3-1
Date of Run: 5-2-81

Filter Set Number: 5

TARE WEIGHTS

Stage	Date: 4/1/81 By: MDH First Weigh (mg)	Date: 4/1/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	244.98	244.99		244.99
0	399.24	399.22		399.23
1	406.44	406.43		406.44
2	391.57	391.57		391.57
3	391.39	391.40		391.40
4	397.90	397.90		397.90
5	385.13	385.14		385.14
6	398.10	398.10		398.10
7	385.35	385.35		385.35
F	458.61	458.62		458.62

FINAL WEIGHTS

Stage	Date: 5-4-81 By: JP First Weigh (mg)	Date: 5-4-81 By: JP Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	245.06	245.10		245.08
0	400.42	400.47		400.45
1	405.52	405.57		405.55
2	390.58	390.61		390.60
3	390.31	390.33		390.32
4	396.98	396.99		396.99
5	384.24	384.27		384.26
6	397.13	397.18		397.15
7	384.23	384.25		384.24
F	464.23	464.25		464.24

Blank Weight Corrections (mg)

Cyclone:
Substrate Stages 0–7: -0.93
Final Filter: -0.89

Remarks See Note Set No. 1

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ~~ESP-O 4-1~~ ESP-O-3-1 (MDH)
Run Date 5-2-81
Observations Made by [illegible]

Filter Set No. 5
Recovery Date 5-2-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	LIGHT LOADING
X-0	WET SUBSTRATE
X-1	NO VISIBLE LOADING
X-2	"
X-3	"
X-4	"
X-5	"
X-6	"
X-7	"
X-F	"

Filter Set No. Reloaded 7

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-D-4-1
Date of Run: 5-4-81

Filter Set Number: 6

TARE WEIGHTS

Stage	Date: 4/1/81 By: MDH First Weigh (mg)	Date: 4/1/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	246.99	247.01		247.00
0	395.24	395.22		395.23
1	388.83	388.80		388.82
2	396.23	396.21		396.22
3	384.28	384.25		384.27
4	397.08	397.07		397.08
5	391.15	391.14		391.15
6	398.94	398.93		398.94
7	389.95	389.93		389.94
F	452.30	452.30		452.30

FINAL WEIGHTS

Stage	Date: 5/5/81 By: DC First Weigh (mg)	Date: 5/5/81 By: DO Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	536.73	536.71		536.72
0	402.06	402.11		402.08
1	389.40	389.42		389.41
2	397.92	397.94		397.93
3	384.90	384.94		384.92
4	397.45	397.49		397.47
5	391.10	391.15		391.12
6	399.18	399.21		399.20
7	391.26	391.27		391.26
F	454.26	454.30		454.28

Blank Weight Corrections (mg)

Cyclone: ____________
Substrate Stages 0-7: -1.01
Final Filter: -0.92

Remarks See Note Set No. 1

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-0-4-1
Run Date 5-4-81
Observations Made by JP

Filter Set No. 6
Recovery Date 5-4-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	GOOD LOADING
X-0	OK
X-1	OK
X-2	OK
X-3	OK
X-4	OK
X-5	OK
X-6	OK
X-7	OK
X-F	OK

Filter Set No. Reloaded 8

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

BEST ONE SO FAR

FANTASTIC ~ N.P.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-1-2
Date of Run: 5-4-81

Filter Set Number: 7

TARE WEIGHTS

Stage	Date: 4/1/81 By: MDH First Weigh (mg)	Date: 4/2/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	250.13	250.16		250.15
0	397.29	397.33		397.31
1	392.26	392.29		392.28
2	394.98	395.01		395.00
3	385.16	385.18		385.17
4	401.13	401.15		401.14
5	385.00	385.02		385.01
6	398.89	398.92		398.91
7	390.32	390.35		390.34
F	449.43	449.44		449.44

FINAL WEIGHTS

Stage	Date: 5/5/81 By: DO First Weigh (mg)	Date: 5/5/81 By: DO Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	254.39	254.41		254.40
0	397.22	397.18		397.20
1	~~391.47~~ 392.42	392.39		392.40
2	394.66	394.68		394.67
3	384.76	384.79		384.78
4	~~300.4~~ 400.32	400.37		400.34
5	384.79	384.83		384.81
6	398.73	398.73		398.73
7	390.24	390.25		390.24
F	449.90	449.94		449.92

Blank Weight Corrections (mg)

Cyclone: ____
Substrate Stages 0–7: -1.01
Final Filter: -0.92

Remarks See Note Set No. 1

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-O-1-2
Run Date 5-4-81
Observations Made by DD

Filter Set No. 7
Recovery Date 5-4-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	OK
X-0	NO VISIBLE LOADING
X-1	NO VISIBLE LOADING
X-2	NO VISIBLE LOADING
X-3	OK
X-4	OK
X-5	OK
X-6	OK
X-7	OK
X-F	NO VISIBLE LOADING

Filter Set No. Reloaded 9

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-2-2-A
Date of Run: 5-5-81

Filter Set Number: 8

TARE WEIGHTS

Stage	Date: 4/1/81 By: MDH First Weigh (mg)	Date: 4/2/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	238.91	238.92		238.92
0	392.95	392.97		392.96
1	384.71	384.73		384.72
2	398.35	398.35		398.35
3	383.55	383.55		383.55
4	400.54	400.54		400.54
5	390.80	390.80		390.80
6	398.78	398.78		398.78
7	385.86	385.86		385.86
F	457.52	457.54		457.53

FINAL WEIGHTS

Stage	Date: 5/6/81 By: DO First Weigh (mg)	Date: 5/6/81 By: DO Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	241.06	241.02		241.04
0	392.24	392.28		392.26
1	383.83	383.86		383.84
2	397.70	397.71		397.71
3	382.83	382.87		382.85
4	399.63	399.66		399.65
5	390.09	390.09		390.09
6	398.17	398.18		398.17
7	385.36	385.38		385.37
F	457.48	457.52		457.50

Blank Weight Corrections (mg)

Cyclone:
Substrate Stages 0-7: - 1.02
Final Filter: - 0.96

Remarks See Note Set No. 1

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-0-2-Z-A
Run Date 5-5-81
Observations Made by JP

Filter Set No. 8
Recovery Date 5-5-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	OK
X-0	NO VIBIBLE LOADING
X-1	"
X-2	LIGHT LOADING
X-3	"
X-4	OK
X-5	OK
X-6	OK
X-7	OK
X-F	OK

Filter Set No. Reloaded 10

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-3-2
Date of Run: 5-5-81

Filter Set Number: 9

TARE WEIGHTS

Stage	Date: 4/2/81 By: MDH First Weigh (mg)	Date: 4/3/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	260.23	260.22		260.23
0	401.99	402.00		402.00
1	351.75	351.78		351.77
2	372.17	372.21		372.19
3	376.24	376.26		376.25
4	394.01	394.05		3~~4~~94.03 GC.
5	398.92	398.96		398.94
6	396.99	397.01		397.00 GC
7	389.11	389.14		389.13
F	434.60	434.65		434.63

FINAL WEIGHTS

Stage	Date: 5/6/81 By: DO First Weigh (mg)	Date: 5/6/81 By: DO Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	261.09	261.06		261.07
0	400.95	400.98		400.97
1	350.86	350.89		350.87
2	371.45	371.48		371.47
3	375.42	375.46		375.44
4	393.12	393.17		393.15
5	397.98	398.0~~4~~2		398.00
6	396.01	396.05		396.03
7	388.05	388.09		388.07
F	434.02	434.02		434.02

Blank Weight Corrections (mg)

Cyclone:
Substrate Stages 0-7: -1.02
Final Filter: -0.96

Remarks See Note Set No. 1
4/3/81 - Humidity high

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-0-3-2
Run Date 5-5-81
Observations Made by Gcobb

Filter Set No. 9
Recovery Date 5-5-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	light
X-0	No visible loading
X-1	
X-2	very light loading
X-3	
X-4	
X-5	
X-6	
X-7	
X-F	

Filter Set No. Reloaded 11

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-4-2
Date of Run: 5-6-81

Filter Set Number: 10

TARE WEIGHTS

Stage	Date: 4/2/81 By: MDH First Weigh (mg)	Date: 4/3/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	224.05	224.06		224.06
0	386.27	386.30		386.29
1	379.35	379.38		379.37
2	400.27	400.28		400.28
3	378.88	378.91		378.90
4	394.93	394.95		394.94
5	385.13	385.15		385.14
6	394.57	394.60		394.59
7	387.86	387.89		387.88
F	451.77	451.80		451.79

FINAL WEIGHTS

Stage	Date: 5/6/81 By: DO First Weigh (mg)	Date: 5/6/81 By: JP Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	225.90	225.90		225.90
0	386.05	386.10		386.07
1	378.51	378.54		378.53
2	399.71	399.71		399.71
3	378.35	378.35		378.35
4	394.35	394.35		394.35
5	384.93	384.97		384.95
6	394.33	394.34		394.33
7	387.36	387.39		387.37
F	451.74	451.71		451.73

Blank Weight Corrections (mg)

Cyclone:
Substrate Stages 0-7: - 1.02
Final Filter: - 0.96

Remarks See Note Set No. 1
4/3/81 - humidity high

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-0-4-2 ~~ESP-0-2-2-(B)~~ Filter Set No. 10
Run Date 5-6-81 Recovery Date 5/6/81
Observations Made by DO Proj. No. 4892-L-03

Stage	Observations *
Pres	
X-0	no visible loading
X-1	no visible loading
X-2	no visible loading
X-3	light
X-4	OK
X-5	OK
X-6	OK
X-7	OK
X-F	very light loading

Filter Set No. Reloaded ________

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-2-1-(B)
Date of Run: 5-6-81

Filter Set Number: 11

TARE WEIGHTS

Stage	Date: 4/2/81 By: MDH First Weigh (mg)	Date: 4/3/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	239.01	239.01		239.01
0	387.14	387.15		387.15
1	400.76	400.76		400.76
2	401.95	401.97		401.96
3	386.76	386.75		386.76
4	392.06	392.08		392.07
5	395.28	395.28		395.28
6	400.17	400.19		400.18
7	386.30	386.31		386.30
F	450.59	450.64		450.62

FINAL WEIGHTS

Stage	Date: 5/7/81 By: DO First Weigh (mg)	Date: 5/7/81 By: DO Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	239.50	239.53		239.52
0	386.44	386.48		386.46
1	399.90	399.95		399.92
2	401.29	401.32		401.30
3	386.08	386.10		386.09
4	391.76	391.80		391.78
5	397.18	397.22		397.20
6	401.23	401.25		401.24
7	387.66	387.69		387.68
F	454.70	454.73		454.72

Blank Weight Corrections (mg)

Cyclone:
Substrate Stages 0-7: ~~-1.02~~ -1.0
Final Filter: ~~-0.96~~ -.93

Remarks See Note Set No. 1
4/3/81 - high humidity

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-D-2-1-(B)
Run Date 5-6-81
Observations Made by

Filter Set No. 11
Recovery Date 5/6/81
Proj. No. 4892-L-03

Stage	Observations *
Pres	OK
X-0	NO VISIBLE LOADING
X-1	"
X-2	LIGHT LOADING
X-3	"
X-4	OK
X-5	"
X-6	"
X-7	"
X-F	"

Filter Set No. Reloaded 13

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-O-1-1-(c)
Date of Run: 5-6-81
Filter Set Number: 12

TARE WEIGHTS

Stage	Date: 4/2/81 By: MDH First Weigh (mg)	Date: 4/3/81 By: MDH Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	248.06	248.05		248.06
0	394.35	394.35		394.35
1	393.32	393.33		393.32
2	399.49	399.50		399.50
3	386.96	386.97		386.96
4	394.02	394.03		394.02
5	386.46	386.48		386.47
6	399.63	399.65		399.64
7	381.10	381.13		381.12
F	452.26	452.29		452.28

FINAL WEIGHTS

Stage	Date: 5/7/81 By: DO First Weigh (mg)	Date: 5/7/81 By: DO Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Pres	249.23	249.27		249.25
0	393.79	393.84		393.82
1	392.35	392.38		392.36
2	398.73	398.71		398.72
3	386.29	386.33		386.31
4	393.55	393.58		393.56
5	387.25	387.26		387.26
6	400.55	400.57		400.56
7	383.63	383.61		383.62
F	457.07	457.10		457.08

Blank Weight Corrections (mg)

Cyclone:
Substrate Stages 0–7: -1.0
Final Filter: -0.93

Remarks See Note Set No. 1
4/3/81 - high humidity

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-O-ø-1-(a)
Run Date 5-6-81
Observations Made by QP

Filter Set No. 12
Recovery Date 5-6-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	OK
X-0	NO VISIBLE LOADING
X-1	"
X-2	LIGHT LOADING
X-3	OK
X-4	"
X-5	"
X-6	"
X-7	WET FILTER - VISIBLE LOADING
X-F	"

Filter Set No. Reloaded —

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

MOISTURE PRESENT ON LAST TWO STAGES

ANDERSEN SUBSTRATE AND FILTER ANALYSIS

Run Number: ESP-0-2-2-(B)
Date of Run: 5-6-81

Filter Set Number: 13

TARE WEIGHTS

Stage	Date: 4/2/81 By: MDH First Weigh (mg)	Date: 4/3/81 By: MDH Second Weigh (mg)	Date: 4/3/81 By: MDH Third Weigh (mg)	Average Weight
Pres	247.41	247.41		247.41
0	401.98	402.02		402.00
1	387.19	387.23		387.21
2	397.46	397.51		397.48
3	384.32	384.36		384.34
4	392.46	392.49		392.48
5	379.70	379.73		379.72
6	394.25	394.27		394.26
7	384.32	384.37		384.35
F	456.10	456.16	456.16	456.16

FINAL WEIGHTS

Stage	Date: 5/7/81 By: DO First Weigh (mg)	Date: 5/7/81 By: DO Second Weigh (mg)	Date: 5/7/81 By: DO Third Weigh (mg)	Average Weight
Pres	249.84	248.86	248.87	248.86
0	402.35	401.42	401.44	401.43
1	387.41	386.40	386.43	386.42
2	397.88	396.95	396.94	396.94
3	384.77	383.84	383.84	383.84
4	393.09	392.13	392.14	392.14
5	381.77	380.83	380.85	380.84
6	396.09	395.06	395.04	395.05
7	386.31	385.36	385.38	385.37
F	460.25	459.31	459.34	459.32

Blank Weight Corrections (mg)

Cyclone:
Substrate Stages 0–7: -1.0
Final Filter: -0.93

Remarks See Note Set No. 1
4/3/81 – High Humidity

RECOVERY OBSERVATIONS

Andersen Mark III with Cyclone Preseperator

Run No. ESP-0-2-2-(B)
Run Date 5-6-81
Observations Made by GP

Filter Set No. 13
Recovery Date 5-7-81
Proj. No. 4892-L-03

Stage	Observations *
Pres	VISIBLE LOADING
X-0	NO VISIBLE LOADING
X-1	"
X-2	VISIBLE LOADING - LIGHT
X-3	OK
X-4	"
X-5	"
X-6	"
X-7	"
X-F	"

NP

Filter Set No. Reloaded

* i.e., Color, Wet or Dry, No Visible Loading, Overloaded, Torn Substrate, etc.

D-5 Filter and Acetone Blanks

Filter Nos. 38, 39, 40

TARE WEIGHT AVERAGE = 3.8173

BLANK FILTER WEIGHTS

Filter No.	Run I.D. No.	First Weigh Weight (g)	By	Date	Second Weigh Weight (g)	By	Date	Third Weigh Weight (g)	By	Date	~~Average Weight~~ BLK. WEIGHT	
38		3.8158	DO	5/2/81								
39		3.8001	DO	5/2/81							0.1 mg	3.8174
40		3.8363	DO	5/2/81								
38		3.8159	DO	5/4/81								
39		3.8006	JP	5/4/81							0.2 mg	3.8175
40		3.8360	JP	5-4-81								
38		3.8159	JP	5/5/81								
39		3.8002	JP	5/5/81							0.1mg	3.8174
40		3.8362	DO	5/5/81								
38		3.8158	DO	5/6/81								
39		3.8006	DO	5/6/81							0.3mg	3.8176
40		3.8363	DO	5/6/81								
38		3.8160	DO	5/7/81								
39		3.8005	DO	5/7/81							0.3mg	3.8176
40		3.8362	DO	5/7/81								

Remarks: Method 5 Blank filter Final Weights.

METHOD 17

FILTER BLANK TARE WEIGHTS

Filter No.	First Weigh Weight (mg)	By	Date	Second Weigh Weight (mg)	By	Date	Third Weigh Weight (mg)	By	Date	Average Weight	Daily Average
16										1.5808	
17										1.5831	1.5834
18										1.5863	
19										1.5825	
20										1.5789	1.580
21										1.5799	
22										1.5817	
23										1.5839	1.58
24										1.5796	

Remarks

ANDERSEN MK III
FILTER BLANK TARE WEIGHTS

Filter Set No. 1-B

	Date: 4/20/81 By: B. Dent First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: ______ By: ______ Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	387.85	387.86	—	387.86
Final Filter	428.48	428.49	—	428.49

Filter Set No. 2-B

	Date: 4/20/81 By: B. Dent First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: ______ By: ______ Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	374.76	374.77	—	374.77
Final Filter	440.31	440.31	—	440.31

Filter Set No. 3-B

	Date: 4/20/81 By: B. D. First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: ______ By: ______ Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	386.69	386.69	—	386.69
Final Filter	437.99	437.96	—	437.98

Average of Three Sets (mg)

Cyclone: —

Substrate Stages 0-7: 383.11

Final Filter: 435.59

Remarks Used 300mg counterbalance weight.

ANDERSEN MK III
FILTER BLANK TARE WEIGHTS

Filter Set No. 4B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	–	–	–	–
Substrate Stages 0-7	376.22	376.20	–	376.21
Final Filter	439.12	439.11	–	439.12

Filter Set No. 5B

	Date: 4/20/81 By: B.D First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	–	–	–	–
Substrate Stages 0-7	382.67	382.64	–	382.66
Final Filter	439.63	439.63	–	439.63

Filter Set No. 6B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	–	–	–	–
Substrate Stages 0-7	362.53	362.53	–	362.53
Final Filter	428.70	428.70	–	428.70

Average of Three Sets (mg)

Cyclone: –

Substrate Stages 0-7: 373.80

Final Filter: 435.82

Remarks: used 300 mg counterbalance weight

ANDERSEN MK III
FILTER BLANK TARE WEIGHTS

Filter Set No. 7B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	374.80	374.80	—	374.80
Final Filter	422.92	422.93	—	422.93

Filter Set No. 8B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	381.49	381.50	—	381.50
Final Filter	441.18	441.18	—	441.18

Filter Set No. 9B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	387.36	387.35	—	387.36
Final Filter	441.49	441.49	—	441.49

Average of Three Sets (mg)

Cyclone: —

Substrate Stages 0-7: 381.22

Final Filter: 435.20

Remarks used 300 mg counterbalance weight

ANDERSEN MK III
FILTER BLANK TARE WEIGHTS

Filter Set No. 10B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	369.01	369.00	—	369.01
Final Filter	435.56	435.58	—	435.57

Filter Set No. 11B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	378.07	378.09	—	378.08
Final Filter	429.87	429.89	—	429.88

Filter Set No. 12B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	366.69	366.70	—	366.70
Final Filter	436.41	436.43	—	436.42

Average of Three Sets (mg)

Cyclone: —

Substrate Stages 0-7: 371.26

Final Filter: 433.96

Remarks: used 300 mg counterbalance weight

ANDERSEN MK III
FILTER BLANK TARE WEIGHTS

Filter Set No. 13 B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	377.88	377.89	—	377.89
Final Filter	430.74	430.75	—	430.75

Filter Set No. 14 B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	370.07	370.09	—	370.08
Final Filter	440.74	440.75	—	440.75

Filter Set No. 15 B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	388.19	388.20	—	388.20
Final Filter	435.69	435.70	—	435.70

Average of Three Sets (mg)

Cyclone: —

Substrate Stages 0-7: 378.72

Final Filter: 435.73

Remarks used 300 mg counterbalance wt.

ANDERSEN MK III
FILTER BLANK TARE WEIGHTS

Filter Set No. 16B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	366.68	366.70	—	366.69
Final Filter	438.38	438.35	—	438.37

Filter Set No. 17B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	384.84	384.84	—	384.84
Final Filter	429.56	429.57	—	429.57

Filter Set No. 18B

	Date: 4/20/81 By: BD First Weigh (mg)	Date: 4/20/81 By: BD Second Weigh (mg)	Date: By: Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0-7	368.98	368.99	—	368.99
Final Filter	438.55	438.56	—	438.56

Average of Three Sets (mg)

Cyclone: —
Substrate Stages 0-7: 373.51
Final Filter: 435.50

Remarks used 300 mg counterbalance wt.

Andersen
H.C.S.S.

THIMBLE FILTER BLANK TARE WEIGHTS

Filter	First Weigh			Second Weigh			Third Weigh			Average	Daily
No.	Weight (mg)	By	Date	Weight (mg)	By	Date	Weight (mg)	By	Date	Weight	Average
34										24.5615	
31										24.3639	24,3375
3										24.0871	
12										24.9104	
32										24.8663	24.6802
35										24.2639	
26										24.7826	
7										24.5129	24,4670
30										24.1055	
26										23.7826	~~24.3867~~
32										24.8[illegible]	~~[illegible]~~
7										24.5129	24.3873

Remarks

32 - 24.8663

BLANK WEIGHT FINAL ANALYSIS

Date: April 30, 1981
By: JP

METHOD 17

	Filter No. ______ First Weigh (mg)	Filter No. ______ Second Weigh (mg)	Filter No. ______ Third Weigh (mg)	Average Weight
Filter				

Average Tare Weight: ______ mg
Blank Weight: ______ mg

ANDERSEN MARK III

	Filter Set No. ____ First Weigh (mg)	Filter Set No. ____ Second Weigh (mg)	Filter Set No. ____ Third Weigh (mg)	Average Weight
Cyclone				
Substrate Stages 0-7				
Final Filter				

Average Tare Weights		Blank Weights
Cyclone:	______ mg	______ mg
Substrate (Stages 0-7):	______ mg	______ mg
Final Filter:	______ mg	______ mg

H.C.S.S.

	Filter No. ______ First Weigh (mg)	Filter No. ______ Second Weigh (mg)	Filter No. ______ Third Weigh (mg)	Average Weight
Thimble Filter				

Average Tare Weight: ______ mg
Blank Weight: ______ mg

ACETONE PROCEDURAL BLANK

Beaker No. 59	First Weigh (g)	Second Weigh (g)	Third Weigh (g)	Average Weight
	76.3404	76.3409		76.3407

Average Tare Weight: 76.3388 ~~mg~~
Blank Weight: 1.9 mg ~~mg~~

Remarks

BLANK WEIGHT FINAL ANALYSIS

Date: MAY 1, 1981
By: JP

METHOD 17

	Filter No. ____ First Weigh (mg)	Filter No. ____ Second Weigh (mg)	Filter No. ____ Third Weigh (mg)	Average Weight
Filter				

Average Tare Weight: ________ mg
Blank Weight: ________ mg

ANDERSEN MARK III

	Filter Set No. 1B First Weigh (mg)	Filter Set No. 2B Second Weigh (mg)	Filter Set No. 3B Third Weigh (mg)	Average Weight
Cyclone	—	—	—	—
Substrate Stages 0–7	386.91	373.77	385.66	382.11
Final Filter	427.72	439.37	436.94	434.68

Average Tare Weights		Blank Weights
Cyclone:	— mg	____ mg
Substrate (Stages 0–7):	383.11 mg	-1.0 mg
Final Filter:	435.59 mg	-0.91 mg

H.C.S.S.

	Filter No. ____ First Weigh (mg)	Filter No. ____ Second Weigh (mg)	Filter No. ____ Third Weigh (mg)	Average Weight
Thimble Filter				

Average Tare Weight: ________ mg
Blank Weight: ________ mg

ACETONE PROCEDURAL BLANK

Beaker No. 75

First Weigh (g)	Second Weigh (g)	Third Weigh (g)	Average Weight
67.0907	67.0905		67.0906

Average Tare Weight: 67.0886 mg
Blank Weight: 2.0 mg mg

Remarks

BLANK WEIGHT FINAL ANALYSIS

Date: MAY 2, 1981
By: JP

METHOD 17

	Filter No. 16 First Weigh (~~m~~g)	Filter No. 17 Second Weigh (~~m~~g)	Filter No. 18 Third Weigh (~~m~~g)	Average Weight
Filter	1.5808	1.5829	1.5857	1.5831

Average Tare Weight: 1.5834 ~~m~~g
Blank Weight: -0.3 mg

ANDERSEN MARK III

	Filter Set No. ____ First Weigh (mg)	Filter Set No. ____ Second Weigh (mg)	Filter Set No. ____ Third Weigh (mg)	Average Weight
Cyclone				
Substrate Stages 0-7				
Final Filter				

Average Tare Weights
Cyclone: ____ mg
Substrate (Stages 0-7): ____ mg
Final Filter: ____ mg

Blank Weights
____ mg
____ mg
____ mg

H.C.S.S.

	Filter No. 26 First Weigh (~~m~~g)	Filter No. 32 Second Weigh (~~m~~g)	Filter No. 7 Third Weigh (~~m~~g)	Average Weight
Thimble Filter	23.7820	24.8654	24.5129	24.3868

Average Tare Weight: 24.3873 ~~m~~g
Blank Weight: -0.5 mg

ACETONE PROCEDURAL BLANK

Beaker No. 30

First Weigh (g)	Second Weigh (g)	Third Weigh (g)	Average Weight
75.8447	75.8452		75.8449

Average Tare Weight: 75.8431 ~~mg~~
Blank Weight: 1.8mg ~~mg~~

Remarks

BLANK WEIGHT FINAL ANALYSIS

Date: May 4, 1981
By: JP

METHOD 17

	Filter No. 16 First Weigh (~~m~~g)	Filter No. 17 Second Weigh (~~m~~g)	Filter No. 18 Third Weigh (~~m~~g)	Average Weight
Filter	1.5809	1.5824	1.5858	1.5830

Average Tare Weight: 1.5831 ~~m~~g
Blank Weight: -0.1 mg

ANDERSEN MARK III

	Filter Set No. ___ First Weigh (mg)	Filter Set No. ___ Second Weigh (mg)	Filter Set No. ___ Third Weigh (~~m~~g)	Average Weight
Cyclone				
Substrate Stages 0–7	386.97	373.63	385.95	382.18
Final Filter	427.76	439.23	437.10	434.70

Average Tare Weights		Blank Weights
Cyclone:	mg	mg
Substrate (Stages 0–7):	383.11 mg	-0.93 mg
Final Filter:	435.59 mg	-0.89 mg

H.C.S.S.

	Filter No. 26 First Weigh (~~m~~g)	Filter No. 32 Second Weigh (~~m~~g)	Filter No. 7 Third Weigh (~~m~~g)	Average Weight
Thimble Filter	23.7833	24.8635	24.5131	24.3866

Average Tare Weight: 24.3873 ~~m~~g
Blank Weight: -0.7 mg

ACETONE PROCEDURAL BLANK

Beaker No. 7

First Weigh (g)	Second Weigh (g)	Third Weigh (g)	Average Weight
68.0679	68.0682		68.0681

Average Tare Weight: 68.0663 ~~m~~g
Blank Weight: 1.8 mg ~~mg~~

Remarks

BLANK WEIGHT FINAL ANALYSIS

Date: MAY 5, 1981
By: DC

METHOD 17

	Filter No. 16 First Weigh (mg)	Filter No. 17 Second Weigh (mg)	Filter No. 18 Third Weigh (mg)	Average Weight
Filter	1.5806	1.5831	1.5859	1.5832

Average Tare Weight: 1.5831 mg
Blank Weight: 0.1 mg

ANDERSEN MARK III

	Filter Set No. 1B First Weigh (mg)	Filter Set No. 2B Second Weigh (mg)	Filter Set No. 3B Third Weigh (mg)	Average Weight
Cyclone				
Substrate Stages 0-7	387.01	373.58	385.71	382.10
Final Filter	427.78	439.22	437.02	434.67

Average Tare Weights		Blank Weights
Cyclone:	mg	mg
Substrate (Stages 0-7):	383.11 mg	-1.01 mg
Final Filter:	435.59 mg	-0.92 mg

H.C.S.S.

	Filter No. 24 First Weigh (mg)	Filter No. 32 Second Weigh (mg)	Filter No. 7 Third Weigh (mg)	Average Weight
Thimble Filter	23.7831	24.8640	24.5134	24.3868

Average Tare Weight: 24.3873 mg
Blank Weight: -0.5 mg

ACETONE PROCEDURAL BLANK

Beaker No. 49	First Weigh (g)	Second Weigh (g)	Third Weigh (g)	Average Weight
	75.6715	75.6715		75.6715

Average Tare Weight: ~~1.5823~~ 75.6673 mg
Blank Weight: -2.2 mg

Remarks

BLANK WEIGHT FINAL ANALYSIS

Date: 5/6/81
By: DO

METHOD 17

	Filter No. 16 First Weigh (~~μg~~)	Filter No. 17 Second Weigh (~~μg~~)	Filter No. 18 Third Weigh (~~μg~~)	Average Weight
Filter	1.5809	1.5832	1.5861	1.5834

Average Tare Weight: 1.5831 ~~μg~~
Blank Weight: ~~0.40~~.3 mg

ANDERSEN MARK III

	Filter Set No. 1B First Weigh (mg)	Filter Set No. 2B Second Weigh (mg)	Filter Set No. 3B Third Weigh (mg)	Average Weight
Cyclone				
Substrate Stages 0-7	386.94	373.59	385.73	382.09
Final Filter	427.72	439.21	436.95	434.63

Average Tare Weights		Blank Weights
Cyclone:	mg	mg
Substrate (Stages 0-7):	383.11 mg	-1.02 mg
Final Filter:	435.59 mg	-0.96 mg

H.C.S.S.

	Filter No. 26 First Weigh (mg)	Filter No. 32 Second Weigh (mg)	Filter No. 7 Third Weigh (mg)	Average Weight
Thimble Filter	23.7829	24.8634	24.5139	24.3867

Average Tare Weight: 24.3873 mg
Blank Weight: -0.6 mg

ACETONE PROCEDURAL BLANK

Beaker No. 63

First Weigh (g)	Second Weigh (g)	Third Weigh (g)	Average Weight
67.2383	67.2385		67.2384

Average Tare Weight: 67.2355 ~~mg~~
Blank Weight: -2.9 mg ~~mg~~

Remarks

BLANK WEIGHT FINAL ANALYSIS

Date: 5/7/81
By: DO

METHOD 17

	Filter No. 16 First Weigh (mg)	Filter No. 17 Second Weigh (mg)	Filter No. 18 Third Weigh (mg)	Average Weight
Filter	1.5808	1.5831	1.5860	1.5833

Average Tare Weight: 1.5831 mg
Blank Weight: 0.2 mg

ANDERSEN MARK III

	Filter Set No. 18 First Weigh (mg)	Filter Set No. 28 Second Weigh (mg)	Filter Set No. 38 Third Weigh (mg)	Average Weight
Cyclone	¬			
Substrate Stages 0–7	386.98 ~~427.~~	373.64	385.72	382.11
Final Filter	427.71	439.26	437.00	434.66

Average Tare Weights — Blank Weights
Cyclone: ______ mg — ______ mg
Substrate (Stages 0–7): 383.11 mg — -1.0 mg
Final Filter: 435.59 mg — -0.93 mg

H.C.S.S.

	Filter No. 26 First Weigh (mg)	Filter No. 32 Second Weigh (mg)	Filter No. 7 Third Weigh (mg)	Average Weight
Thimble Filter	23.7819	24.8637	24.5132	24.3863

Average Tare Weight: 24.3873 mg
Blank Weight: -1.0 mg

ACETONE PROCEDURAL BLANK

Beaker No. ______	First Weigh (g)	Second Weigh (g)	Third Weigh (g)	Average Weight

Average Tare Weight: ______ mg
Blank Weight: ______ mg

Remarks

ACETONE BLANKS - COMPLETED AT MRI 5/18/81 setup.

	FINAL WEIGHTS (g)			
BEAKER NO	1 DATE:	2 DATE:	3 DATE:	AVERAGE
5	5/20/81 (MDH)	5/21/81 MDH	5/21/81 (MDH)	
TARE WT = 66.4428g	66.4419	66.4412	66.4412	66.4414
Vol = 40ml				
81	5/20/81 (MDH)	5/21/81 (MDH)	5/21/81 (MDH)	Avg.
TARE WT = 67.1190g	67.1189	67.1177	67.1186	
Vol = 40 ml	(4th weighing) 5/22/81 (J.P)	5th Weighing 5/22/81 (MDH)		67.1191
	67.1199	67.1202		
11	5/20/81 (MDH)	5/21/81 (MDH)	5/21/81 (MDH)	
TARE WT. - 78.1509	78.1504	78.1495	78.1499	78.1499
Vol = 40 ml				

AVERAGES OF THREE BEAKERS

FINAL Wt. = 70.5701 g
TARE Wt. = 70.5709 g
BLANK Wt. = -0.8 mg

D-6 Data Cross Reference Log

DATA CROSS-REFERENCE LOG

Page 1
Proj. No. 4892-L03

	Run No.	Date	Method 5 Filter No.	Mark III Set No.	HCSS Set No.	Beaker No.	Impactor No.	Sample Box No.	METHOD 17 FILTER NO	
	ESP-0-1-1-A	4-30-81				31			1	
*	ESP-I-3-1	↓	23			~~5~~10		10		
	ESP-0-1-1-B	↓				52			2	
	ESP-0-1-LA	↓		1			195			

* No accompanying particle size tests. Run Not counted

DATA CROSS-REFERENCE LOG

Page 2
Proj. No. 4893-L03

Probe Rinse Beaker	Run No.	Date	Method 5 Filter No.	Mark III Set No.	HCSS Set No.	Beaker* No.	Impactor No.	Sample Box No.	Method 17 Filter #	Dry Catch
58	ESP-I-3-1	5-1-81	25			7		10		77
	ESP-O-1-1	B		3						
	ESP-O-2-1					56			3	
	ESP-I-3-1				37/1					
	ESP-I-3-2				38/2					
		5-2-81								
	ESP-O-2-1-	(A)		4						
	ESP-O-3-1					42			4	
11	ESP-I-1-1		26			24		10		10
	ESP-I-1-1				18/3					
	ESP-I-1-2				6/4					
x	ESP-I-4-1		27			37		10		61
	ESP-O-3-1			5		62				
	ESP-O-4-1								5	
	ESP-I-4-1				17/5					
	ESP-I-4-2				19/6					
		5-4-81								
X	ESP-I-2-1		22			19		8		72
	ESP-O-4-1			6						
	ESP-O-1-2					91			6	
	ESP-I-2-1				25/7					
	ESP-I-2-2				10/8					
	ESP-I-1-2		24			25			[illegible]	28
	ESP-O-2-2	(A)				1			7	
	ESP-O-1-2			7						
NO GOOD ←	ESP-I-1-3	(A)			36/9					
	ESP-I-1-4				34/10					

* SOMETIMES 2 BEAKERS WERE USED TO EMPTY PROBE AND FILTER HOLDER (GLASSWARE) RINSE

DATA CROSS-REFERENCE LOG

Page 3
Proj. No. 4892-203

Run No.	Date	Method 5 Filter No.	Mark III Set No.	HCSS Set No.	Beaker No.	Impactor No.	Sample Box No.	Method 17 Filter #	Dry Catch Beaker #
$	5-4-81								
ESP-I-1-3(B)				39/11					
	5-5-81								
ESP-I-3-2		29			18				8
ESP-0-2-2-(A)			8						
ESP-0-3-2					18			8	
ESP-I-3-3				35/12					
ESP-I-3-4				14/~~13~~ 14					
ESP-I-2-2		28			5				34
ESP-0-4-2					48			9	
ESP-0-3-2			9						
ESP-I-2-3				8/13					
ESP-I-2-4				30/15					
	5-6-81								
ESP-0-2-2-B					19			~~[illegible]~~ 10	
ESP-0-4-2			10						
BUSTED U-TUBE ~~ESP-I-4-2~~		~~30~~							
ESP-I-4-2		31			20			~~[illegible]~~	74
ESP-I-4-3				21/16					
ESP-I-4-4				22/17					
ESP-0-2-1-(B)			11						
ESP-0-1-1-(C)					93			11	
ESP-0-1-1-(C)			12						
ESP-0-2-2-(B)			13						

APPENDIX E

PRELIMINARY VELOCITY TRAVERSE AND MOISTURE DETERMINATION DATA - DUCTED SOURCES

E-1 Electrostatic Precipitator Inlet

E-1-1 EPA Methods 1 and 2 Velocity Traverse
Raw Field Data

MIDWEST RESEARCH INSTITUTE

RUN Preliminary Traverse No. 1

MRI Project Number 4892-L(03)
Field Dates
Plant Ideal Cement Co.
Sampling Location ESP Inlet
Sampling Date 4/29/81

FIELD CREW

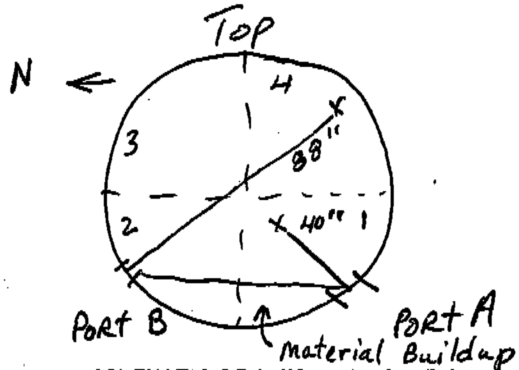
Crew Chief	Mark Hansen
Testing Engineer	1 Tom Walker
	2
	3
Engr. Technician	1 Mark Hansen
	2 Fritz Hoffmeister
	3
Lab Technician	1
	2
	3
Process Engineer	1
	2
Other	1
	2

MRI - Form PO (10/72)

(Copied from original)

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Ideal Cement Co.
DATE 4/29/81
SAMPLING LOCATION ESP Inlet
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 8'2½"
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 2½"
STACK I.D., (DISTANCE A - DISTANCE B) 8'
NEAREST UPSTREAM DISTURBANCE Approx. 14'
NEAREST DOWNSTREAM DISTURBANCE >8 duct dia.
CALCULATOR Tom Walker



SCHEMATIC OF SAMPLING LOCATION

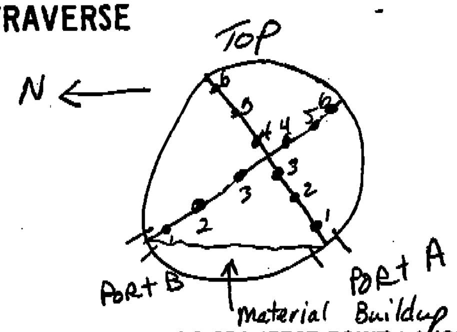
TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
6	95.6	8' (96")	91¾"	2½"	94¼"
5	85.4	↓	82"	↓	84½"
4	70.4	↓	67⅝"	↓	70⅛"
3	29.6	↓	28⅜"	↓	30⅞"
2	14.6	↓	14"	↓	16½"
1	4.4	↓	4¼"	↓	6¾"

EPA (Dur) 232
4-72

(copied from original)

PRELIMINARY VELOCITY TRAVERSE

PLANT Ideal Cement Co.
DATE 4/29/81
LOCATION ESP Inlet
STACK I.D. 8'
BAROMETRIC PRESSURE, in. Hg 29.00
STACK GAUGE PRESSURE, in. H_2O -5.8" at Point 3
OPERATORS Walker, Hansen, Hoffmeister



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
B-6	.77	386
B-5	1.40	395
B-4	1.40	398
B-3	1.30	378
B-2	1.70	330
B-1	1.50	245
A-6	1.10	393
A-5	1.00	398
A-4	1.00	398
A-3	.98	398
A-2	No Reading	370
A-1	No. Reading	305
AVERAGE	1.11	393

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

EPA (Dur) 233
4/72

only points 3,4,5,6 were averaged due to plugging of pitot lines from product buildup

(Copied from original)

MIDWEST RESEARCH INSTITUTE

RUN Preliminary Traverse No. 2

MRI Project Number 4892-L(03)
Field Dates
Plant Ideal Cement Co.
Sampling Location ESP Inlet
Sampling Date 5/1/81

FIELD CREW

Crew Chief Mark Hansen

Testing Engineer
1 Mark Hansen
2
3

Engr. Technician
1 Tom Walker
2 Fritz Hoffmeister
3

Lab Technician
1
2
3

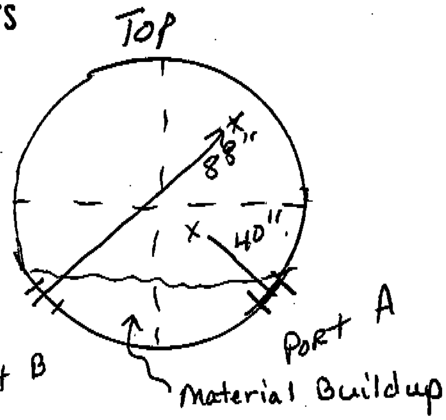
Process Engineer
1
2

Other
1
2

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Ideal Cement Co.
DATE 5/1/81
SAMPLING LOCATION ESP Inlet
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 8' 2 1/2"
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 2 1/2"
STACK I.D., (DISTANCE A - DISTANCE B) 8'
NEAREST UPSTREAM DISTURBANCE Approx 14'
NEAREST DOWNSTREAM DISTURBANCE > 8 duct dia.
CALCULATOR T. Walker

N ←



SCHEMATIC OF SAMPLING LOCATION

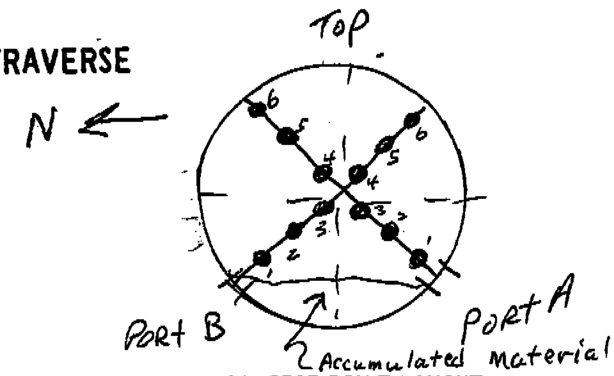
TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
6	95.6	8' (96")	91 3/4"	2 1/2"	94 1/4"
5	85.4	↓	82"	↓	84 1/2"
4	70.4	↓	67 5/8"	↓	70 1/8"
3	29.6	↓	28 3/8"	↓	30 7/8"
2	14.6	↓	14"	↓	16 1/2"
1	4.4	↓	4 1/4"	↓	6 3/4"

EPA (Dur) 232
4-72

(copied from original)

PRELIMINARY VELOCITY TRAVERSE

PLANT Ideal Cement Co.
DATE 5/1/81
LOCATION ESP Inlet
STACK I.D. 8'
BAROMETRIC PRESSURE, in. Hg 28.92
STACK GAUGE PRESSURE, in. H_2O -5.8"
OPERATORS T. Walker, M. Hansen, F. Hoffmeister



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-1	No Reading	
A-2	No Reading	
A-3	No reading	363
A-4	.89	378
A-5	.88	382
A-6	.70	370
B-1	No Reading	
B-2	No Reading	
B-3	No Reading	376
B-4	.94	390
B-5	1.00	379
B-6	1.25	387
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

EPA (Dur) 233
4/72

(copied from original)

E-1-2 EPA Methods 1 and 2 Velocity Traverse
Computer Data

FILE NAME - ESPNKI
RUN # - ESP NORTH KILN INLET
LOCATION - IDEAL
DATE - 4-29-81
PROJECT # - 4892-L03

BAROMETRIC PRESSURE (IN. HG)=	29.00
STATIC PRESSURE (INCHES H2O)=	-5.80
PERCENT OXYGEN=	8.30
PERCENT CARBON DIOXIDE=	20.30
MOISTURE COLLECTED (ML)=	8.0
PERCENT WATER=	25.31
AVERAGE DELTA P (IN. H2O)=	1.12
AVERAGE STACK TEMPERATURE (F.)=	393.0
DRY MOLECULAR WEIGHT=	31.580
WET MOLECULAR WEIGHT=	28.143
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	1.0529
PITOT COEFFICIENT=	0.8400
NOZZLE DIAMETER (INCHES)=	0.3000
STACK AXIS #1 (INCHES)=	96.00
STACK AXIS #2 (INCHES)=	84.50
CIRCULAR STACK	
STACK AREA (SQUARE FEET)=	44.244
STACK VELOCITY (ACTUAL, FEET/MIN)=	4,672
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	206,693
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	122,184
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	91,262

* * METRIC UNITS * *

BAROMETRIC PRESSURE (MM HG)=	736.60
STATIC PRESSURE (MM H2O)=	-147.3
PERCENT OXYGEN=	8.30
PERCENT CARBON DIOXIDE=	20.30
MOISTURE COLLECTED (ML)=	8.0
PERCENT WATER=	25.31
AVERAGE DELTA P (MM H2O)=	28.4
AVERAGE STACK TEMPERATURE (C.)=	200.6
DRY MOLECULAR WEIGHT=	31.580
WET MOLECULAR WEIGHT=	28.143
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	5.3062
PITOT COEFFICIENT=	0.8400
NOZZLE DIAMETER (MM)=	7.62
STACK AXIS #1 (METERS)=	2.438
STACK AXIS #2 (METERS)=	2.146
CIRCULAR STACK	
STACK AREA (SQUARE METERS)=	4.110
STACK VELOCITY (ACTUAL, M/MIN)=	1,424
FLOW RATE (ACTUAL, CUBIC M/MIN)=	5,853
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	3,460
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	2,584

FILE NAME - ESPNKI
RUN # - ESP NORTH KILN INLET
LOCATION - IDEAL
DATE - 4-29-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H2O)	STACK T. (F.)
1	0.98	398
2	1.00	398
3	1.00	398
4	1.10	393
5	1.30	378
6	1.40	398
7	1.40	395
8	0.77	386

E-1-3 EPA Method 4 - Moisture Determination
Raw Field Data

Run Number ESP Inlet
Date 4/29/81

MIDWEST RESEARCH INSTITUTE
PRELIMINARY
MOISTURE DETERMINATION

Recorded by TW
Assisted by MH

NOTE: Same as Run No. ______

A. Condensor and/or Silica Gel Method

Barometric Pressure, P_B = ______ in. Hg

☐ Barometer Location ______

Reading Time ______ by ______

☐ Elevation ______

	Clock Time	Dry Gas Meter Reading(cf)	Flowmeter Setting	Dry Gas Meter Temp (°F)	Impinger Water Volume (ml)
Final					
Initial					
Difference		Vm =			Wc =

Tube No.	Weight (Grams)		
	Final	Initial	Difference
Total Moisture Adsorbed:			Wa =

Meter Pressure, $P_B \approx P_m$ = ______ in. Hg

Average Meter Temperature, Tm = ______ °F

Total Weight of Moisture Collected, Wc + Wa = Wm = ______ gm

$$\text{Moisture Content} = \frac{100}{1 + \left[375 \dfrac{P_m V_m}{(T_m+460)\,W_m}\right]} = \text{\_\_\_\_\_\_ \% by Volume}$$

B. Wet/Dry Bulb Method

Dry Bulb Temperature = ______ °F

Wet Bulb Temperature = ______ °F

Moisture Content (from Ref. Table) = ______ % by Volume

C. Predetermined Value

% Moisture 27 Basis OUTLET DATA

MRI - Form P4 (10/72)

(Copied from original)

E-2 Electrostatic Precipitator Outlet

E-2-1 EPA Methods 1 and 2 Velocity Traverse
Raw Field Data

MIDWEST RESEARCH INSTITUTE

RUN Preliminary Velocity Traverse

MRI Project Number 4892-L(03)
Field Dates
Plant Ideal Cement Co.
Sampling Location ESP Outlet
Sampling Date 4/29/81

FIELD CREW

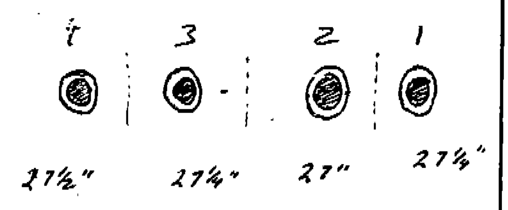
Crew Chief	Mark Hansen
Testing Engineer	1 E. Whited
	2
	3
Engr. Technician	1 Fritz Hoffmeister
	2 G. Cobb
	3
Lab Technician	1
	2
	3
Process Engineer	1
	2
Other	1
	2

MRI - Form PO (10/72) (Copied from original)

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

North Kiln
Square Stack

PLANT Ideal Cement Company
DATE 4/28/81
SAMPLING LOCATION ESP Outlet North Kiln
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 110.875"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) ~~N/A~~ 2"
STACK I.D., (DISTANCE A - DISTANCE B) 108.875"
NEAREST UPSTREAM DISTURBANCE 5'9" or 0.655 Diameters
NEAREST DOWNSTREAM DISTURBANCE 9'7" or 1.08 Diameters
CALCULATOR X-5738



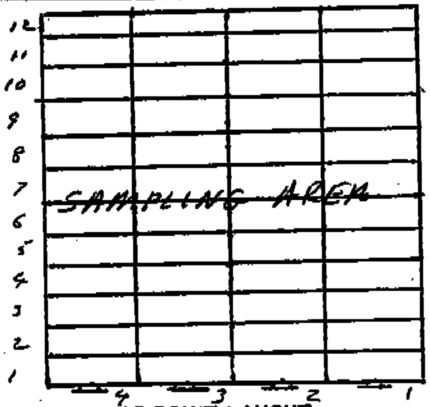
SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.04	108.875"		6.55	6 9/16
2	0.143	"		15.62	15 5/8
3	0.227	"		24.695	24 11/16
4	0.310	"		33.769	33 3/4
5	0.393	"		42.842	42 13/16
6	0.477	"		51.914	51 15/16
7	0.560	"		60.987	60 [illegible]/16
8	0.643	"		70.06	70 1/16
9	0.727	"		79.133	79 1/8
10	0.810	"		88.206	88 3/16
11	0.893	"		97.279	97 1/4
12	0.977	"		106.352	106 3/8

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Ideal Cement Co
DATE 4-29-81
LOCATION ESP Outlet North Kiln
STACK I.D. 108.875 "
BAROMETRIC PRESSURE, in. Hg 29.00
STACK GAUGE PRESSURE, in. H_2O -6.4" H_2O
OPERATORS Whited



SCHEMATIC OF TRAVERSE POINT LAYOUT

Quad 1

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.34	260
2	0.44	330
3	0.45	370
4	0.38	370
5	0.29	365
6	0.18	380
7	0.11	375
8	0.12	375
9	0.10	375
10	0.11	375
11	0.11	375
12	0.12	375
AVERAGE	0.229	360

Quad 2

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.30	320
2	0.44	340
3	0.42	360
4	0.33	360
5	0.23	365
6	0.15	370
7	0.08	370
8	0.05	370
9	0.10	370
10	0.12	370
11	0.16	375
12	0.24	370
Static	-6.4"	
AVERAGE	0.218	363.75

EPA (Dur) 233
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Idea Cement Co

DATE 4-29-81

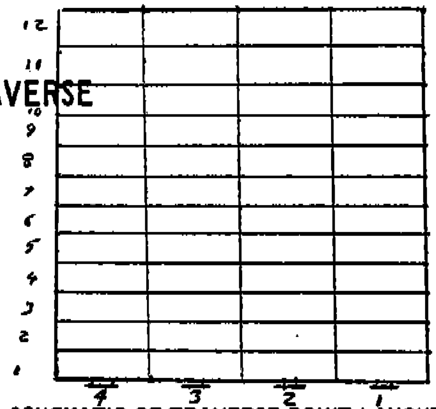
LOCATION ESP Outlet North Kiln

STACK I.D. 9' x 108.875"

BAROMETRIC PRESSURE, in. Hg 29.00

STACK GAUGE PRESSURE, in. H_2O -6.4" H_2O

OPERATORS Whited



SCHEMATIC OF TRAVERSE POINT LAYOUT

Quad #3

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.34	367
2	0.48	370
3	0.48	370
4	0.44	365
5	0.33	367
6	0.22	370
7	0.22	370
8	0.17	370
9	0.19	375
10	0.08	375
11	0.10	375
12	0.17	375
AVERAGE	0.268	370.75

Quad #4

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.48	380
2	0.53	385
3	0.51	385
4	0.47	380
5	0.44	365
6	0.42	390
7	0.40	365
8	0.35	380
9	0.24	375
10	0.17	325
11	0.14	370
12	0.04	360
AVERAGE	0.349	384.16

EPA (Dur) 233
4/72

E-2-2 EPA Methods 1 and 2 Velocity Traverse
Computer Data

FILE NAME - ESPNKO
RUN # - ESP NORTH KILN OUTLET
LOCATION - IDEAL
DATE - 4-29-81
PROJECT # - 4892-L03

BAROMETRIC PRESSURE (IN. HG)=	29.00
STATIC PRESSURE (INCHES H2O)=	-6.40
PERCENT OXYGEN=	8.00
PERCENT CARBON DIOXIDE=	15.00
MOISTURE COLLECTED (ML)=	8.0
PERCENT WATER=	25.31
AVERAGE DELTA P (IN. H2O)=	0.27
AVERAGE STACK TEMPERATURE (F.)=	367.1
DRY MOLECULAR WEIGHT=	30.720
WET MOLECULAR WEIGHT=	27.501
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.4937
PITOT COEFFICIENT=	0.8400
NOZZLE DIAMETER (INCHES)=	0.3000
STACK AXIS #1 (INCHES)=	108.00
STACK AXIS #2 (INCHES)=	107.88
RECTANGULAR STACK	
STACK AREA (SQUARE FEET)=	80.910
STACK VELOCITY (ACTUAL, FEET/MIN)=	2,184
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	176,685
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	107,549
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	80,331

* * METRIC UNITS * *

BAROMETRIC PRESSURE (MM HG)=	736.60
STATIC PRESSURE (MM H2O)=	-162.6
PERCENT OXYGEN=	8.00
PERCENT CARBON DIOXIDE=	15.00
MOISTURE COLLECTED (ML)=	8.0
PERCENT WATER=	25.31
AVERAGE DELTA P (MM H2O)=	6.8
AVERAGE STACK TEMPERATURE (C.)=	186.2
DRY MOLECULAR WEIGHT=	30.720
WET MOLECULAR WEIGHT=	27.501
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	2.4881
PITOT COEFFICIENT=	0.8400
NOZZLE DIAMETER (MM)=	7.62
STACK AXIS #1 (METERS)=	2.743
STACK AXIS #2 (METERS)=	2.740
RECTANGULAR STACK	
STACK AREA (SQUARE METERS)=	7.517
STACK VELOCITY (ACTUAL, M/MIN)=	666
FLOW RATE (ACTUAL, CUBIC M/MIN)=	5,003
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	3,045
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	2,275

FILE NAME - ESPNKO
RUN # - ESP NORTH KILN OUTLET
LOCATION - IDEAL
DATE - 4-29-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	STACK T. (F.)
1	0.34	260
2	0.44	330
3	0.45	370
4	0.38	370
5	0.29	365
6	0.18	380
7	0.11	375
8	0.12	375
9	0.10	375
10	0.11	375
11	0.12	375
12	0.11	375
13	0.30	320
14	0.44	340
15	0.42	360
16	0.33	360
17	0.23	365
18	0.15	370
19	0.08	370
20	0.05	370
21	0.10	370
22	0.12	370
23	0.16	375
24	0.24	370
25	0.34	367
26	0.48	367
27	0.48	370
28	0.44	365
29	0.33	367
30	0.22	370
31	0.22	370
32	0.17	370
33	0.19	375
34	0.08	375
35	0.10	375
36	0.17	375
37	0.48	380
38	0.53	385
39	0.51	385
40	0.47	380
41	0.44	365
42	0.42	390
43	0.40	365
44	0.35	380
45	0.24	375
46	0.17	375
47	0.14	370
48	0.04	360

E-2-3 EPA Method 4 - Moisture Determination
Raw Field Data

Run Number ESP Outlet

Date 4/29/81

MIDWEST RESEARCH INSTITUTE
PRELIMINARY
MOISTURE DETERMINATION

Recorded by E. Whited

Assisted by ________

NOTE: Same as Run No. ______

A. Condensor and/or Silica Gel Method

Barometric Pressure, P_B = 29.00 in. Hg

☐ Barometer Location Ideal LAB

Reading Time 1555 by Jim

☐ Elevation 1200' (Barometer setting)

	Clock Time	Dry Gas Meter Reading (cf)	Flowmeter Setting	Dry Gas Meter Temp (°F)	Impinger Water Volume (ml)
Final	1443	443.428		110	140.5
				100	
Initial	1415	422.428		94	0
Difference		Vm = 21.00			Wc = 140.5

Tube No.	Weight (Grams)		
	Final	Initial	Difference
1	481.8	471.1	10.7
Total Moisture Adsorbed:			Wa = 10.7

Meter Pressure, $P_B \approx P_m$ = 29.00 in. Hg

Average Meter Temperature, Tm = 101.3 °F

Total Weight of Moisture Collected, Wc + Wa = Wm = 151.20 gm

$$\text{Moisture Content} = \frac{100}{1 + \left[375 \frac{P_m V_m}{(T_m+460)\ W_m}\right]} = 27.09 \ \% \text{ by Volume}$$

B. Wet/Dry Bulb Method

Dry Bulb Temperature = ________ °F

Wet Bulb Temperature = ________ °F

Moisture Content (from Ref. Table) = ________ % by Volume

C. Predetermined Value

% Moisture ________ Basis ________

MRI - Form P4 (10/72)

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APPENDIX F

COMPUTER PRINTOUTS FOR TOTAL MASS

F-1 Electrostatic Precipitator Inlet
(EPA Method 5)

F-2 Electrostatic Precipitator Outlet
(EPA Method 17)

F-1 Electrostatic Precipitator Inlet
(EPA Method 5)

TABLE F-1-1. SUMMARY OF TOTAL MASS TEST RESULTS FOR ELECTROSTATIC PRECIPITATOR INLET

Run No.	Date	V_m (ft^3)[a]	Avg. Δ_p (in. H_2O)[b]	Avg. Δ_H (in. H_2O)[c]	Avg. T_s (°F)[d]	Avg. T_m (°F)[e]	P_b (in. Hg)[f]	Vm_{std} (ft^3)[g]	% H_2O[h]	M_d[i]	M_s[j]	Q_s (dscfm)[k]	% isok.[ℓ]	Total sample time (min)	Total particulate collected (g)	Emission rate (gr/dscf)[m]	Emission rate (lb/hr)[n]
ESP-I-1-1	5/2/81	6.232	0.59	0.91	391.3	68.5	28.89	6.023	31.50	31.580	27.30	61,798	105.4	12.0	38.4277	98.2470	52,032.7
ESP-I-2-1	5/4/81	6.885	0.63	1.16	416.5	66.3	28.67	6.636	31.17	31.743	27.52	62,707	114.5	12.0	45.9944	106.7330	57,358.4
ESP-I-3-1	5/1/81	11.342	1.00	2.12	397.4	67.8	28.92	11.022	29.54	31.580	27.56	81,850	116.5	15.0	21.4226	29.9313	20,995.5
ESP-I-4-1	5/2/81	18.707	0.79	1.25	353.4	85.4	28.83	17.499	22.02	31.580	28.59	81,627	92.8	30.0	39.4946	34.7575	24,314.4
ESP-I-1-2	5/4/81	6.069	0.50	0.82	366.3	72.9	28.72	5.782	31.50	31.743	27.41	57,071	109.6	12.0	65.6559	174.8690	85,528.2
ESP-I-2-2	5/5/81	8.772	0.63	1.88	348.3	71.0	28.88	8.456	30.82	31.743	27.50	66,055	98.1	12.0	38.2747	69.7048	39,459.0
ESP-I-3-2	5/5/81	11.536	0.93	1.37	372.5	72.4	28.82	11.054	31.17	31.743	27.46	78,454	101.6	18.0	28.1837	39.2648	26,399.6
ESP-I-4-2	5/6/81	12.770	0.84	1.33	350.9	63.3	28.87	12.470	31.63	31.680	27.35	75,282	102.4	21.0	58.8059	72.6211	46,852.7

[a] V_m (ft^3) = volume of dry gas at the meter.

[b] Avg. Δ_p (in. H_2O) = average stack gas velocity.

[c] Avg. Δ_H (in. H_2O) = average pressure drop across the meter.

[d] Avg. T_s (°F) = average stack temperature.

[e] Avg. T_m (°F) = average meter temperature.

[f] P_b (in. Hg) = barometric pressure (in. of mercury).

[g] Vm_{std} (ft^3) = volume of dry gas at the meter at standard conditions.

[h] % H_2O = percent moisture by volume.

[i] M_d = molecular weight, dry stack gas (lb/lb mole).

[j] M_s = molecular weight, stack gas (lb/lb mole).

[k] Q_s = stack flow rate, dry standard conditions (dscfm)

[ℓ] % isok. = % isokinetic.

[m] gr/dscf = grains per dry standard cubic foot.

[n] lb/hr = pounds per hour.

FILE NAME - ESPI11
RUN # - ESP-I-1-1
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	542.900
FINAL METER VOLUME (CUBIC FEET)=	549.010
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC FEET)=	6.232
GAS VOLUME (DRY STANDARD CUBIC FEET)=	6.023
BAROMETRIC PRESSURE (IN. HG)=	28.89
STATIC PRESSURE (INCHES H2O)=	-5.80
PERCENT OXYGEN=	8.30
PERCENT CARBON DIOXIDE=	20.30
MOISTURE COLLECTED (ML)=	58.8
PERCENT WATER=	31.50
AVERAGE METER TEMPERATURE (F.)=	68.5
AVERAGE DELTA H (IN. H2O)=	0.91
AVERAGE DELTA P (IN. H2O)=	0.59
AVERAGE STACK TEMPERATURE (F.)=	391.3
DRY MOLECULAR WEIGHT=	31.580
WET MOLECULAR WEIGHT=	27.303
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.7664
% ISOKINETIC=	105.4
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	12.0
NOZZLE DIAMETER (INCHES)=	0.2500
STACK AXIS #1 (INCHES)=	96.00
STACK AXIS #2 (INCHES)=	84.50
CIRCULAR STACK	
STACK AREA (SQUARE FEET)=	44.244
STACK VELOCITY (ACTUAL, FEET/MIN)=	3,455
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	152,884
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	90,212
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	61,798

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	38.4277
PARTICULATE LOADING, DRY STD. (GR./SCF)=	98.2470
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	39.6973
EMISSION RATE (LB/HR)=	52032.70

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	38.4277
PARTICULATE LOADING, DRY STD. (GR./SCF)=	98.2470
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	39.6973
EMISSION RATE (LB/HR)=	52032.70
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESPI11
RUN # - ESP-I-1-1
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	15.373
FINAL METER VOLUME (CUBIC METERS)=	15.546
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC METERS)=	0.176
GAS VOLUME (DRY STANDARD CUBIC METERS)=	0.171
BAROMETRIC PRESSURE (MM HG)=	733.81
STATIC PRESSURE (MM H2O)=	-147.3
PERCENT OXYGEN=	8.30
PERCENT CARBON DIOXIDE=	20.30
MOISTURE COLLECTED (ML)=	58.8
PERCENT WATER=	31.50
AVERAGE METER TEMPERATURE (C.)=	20.3
AVERAGE DELTA H (MM H2O)=	23.1
AVERAGE DELTA P (MM H2O)=	14.9
AVERAGE STACK TEMPERATURE (C.)=	199.6
DRY MOLECULAR WEIGHT=	31.580
WET MOLECULAR WEIGHT=	27.303
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	3.8623
% ISOKINETIC=	105.4
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	12.0
NOZZLE DIAMETER (MM)=	6.35
STACK AXIS #1 (METERS)=	2.438
STACK AXIS #2 (METERS)=	2.146
CIRCULAR STACK	
STACK AREA (SQUARE METERS)=	4.110
STACK VELOCITY (ACTUAL, M/MIN)=	1,053
FLOW RATE (ACTUAL, CUBIC M/MIN)=	4,329
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	2,555
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	1,750

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	38.4277
PARTICULATE LOADING, DRY STD. (G/CU. M)=	225.3030
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	91.0350
EMISSION RATE (KG/HR)=	23622.90

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	38.4277
PARTICULATE LOADING, DRY STD. (G/CU. M)=	225.3030
PARTICULATE LOADING, ACTUAL (G/CU. M)=	91.0350
EMISSION RATE (KG/HR)=	23622.90
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESPI11
RUN # - ESP-I-1-1
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.60	0.93	390	67	66
2	0.60	0.93	394	69	66
3	0.60	0.93	389	72	67
4	0.55	0.85	392	74	67

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	103.1050	67.4469	0.0000	35.6578
FILTER	4.9837	3.7775	0.0002	1.2060

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	194.3690	192.8110	310.0	1.5639
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESPI21
RUN # - ESP-I-2-1
LOCATION - IDEAL
DATE - 5-4-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	593.960
FINAL METER VOLUME (CUBIC FEET)=	600.710
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC FEET)=	6.885
GAS VOLUME (DRY STANDARD CUBIC FEET)=	6.636
BAROMETRIC PRESSURE (IN. HG)=	28.67
STATIC PRESSURE (INCHES H2O)=	-5.80
PERCENT OXYGEN=	8.25
PERCENT CARBON DIOXIDE=	21.33
MOISTURE COLLECTED (ML)=	63.8
PERCENT WATER=	31.17
AVERAGE METER TEMPERATURE (F.)=	66.3
AVERAGE DELTA H (IN. H2O)=	1.16
AVERAGE DELTA P (IN. H2O)=	0.63
AVERAGE STACK TEMPERATURE (F.)=	416.5
DRY MOLECULAR WEIGHT=	31.743
WET MOLECULAR WEIGHT=	27.459
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.7906
% ISOKINETIC=	114.5
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	12.0
NOZZLE DIAMETER (INCHES)=	0.2500
STACK AXIS #1 (INCHES)=	96.00
STACK AXIS #2 (INCHES)=	84.50
CIRCULAR STACK	
STACK AREA (SQUARE FEET)=	44.244
STACK VELOCITY (ACTUAL, FEET/MIN)=	3,621
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	160,208
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	91,101
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	62,707

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	45.9944
PARTICULATE LOADING, DRY STD. (GR./SCF)=	106.7330
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	41.7597
EMISSION RATE (LB/HR)=	57358.40

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	45.9944
PARTICULATE LOADING, DRY STD. (GR./SCF)=	106.7330
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	41.7597
EMISSION RATE (LB/HR)=	57358.40
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESPI21
RUN # - ESP-I-2-1
LOCATION - IDEAL
DATE - 5-4-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	16.819
FINAL METER VOLUME (CUBIC METERS)=	17.010
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC METERS)=	0.195
GAS VOLUME (DRY STANDARD CUBIC METERS)=	0.188
BAROMETRIC PRESSURE (MM HG)=	728.22
STATIC PRESSURE (MM H20)=	-147.3
PERCENT OXYGEN=	8.25
PERCENT CARBON DIOXIDE=	21.33
MOISTURE COLLECTED (ML)=	63.8
PERCENT WATER=	31.17
AVERAGE METER TEMPERATURE (C.)=	19.0
AVERAGE DELTA H (MM H20)=	29.4
AVERAGE DELTA P (MM H20)=	15.9
AVERAGE STACK TEMPERATURE (C.)=	213.6
DRY MOLECULAR WEIGHT=	31.743
WET MOLECULAR WEIGHT=	27.459
AVERAGE SQUARE ROOT OF DELTA P (MM H20)=	3.9846
% ISOKINETIC=	114.5
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	12.0
NOZZLE DIAMETER (MM)=	6.35
STACK AXIS #1 (METERS)=	2.438
STACK AXIS #2 (METERS)=	2.146
CIRCULAR STACK	
STACK AREA (SQUARE METERS)=	4.110
STACK VELOCITY (ACTUAL, M/MIN)=	1,104
FLOW RATE (ACTUAL, CUBIC M/MIN)=	4,537
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	2,580
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	1,776

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	45.9944
PARTICULATE LOADING, DRY STD. (G/CU. M)=	244.7640
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	95.7645
EMISSION RATE (KG/HR)=	26040.70

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	45.9944
PARTICULATE LOADING, DRY STD. (G/CU. M)=	244.7640
PARTICULATE LOADING, ACTUAL (G/CU. M)=	95.7645
EMISSION RATE (KG/HR)=	26040.70
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESPI21
RUN # - ESP-I-2-1
LOCATION - IDEAL
DATE - 5-4-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.64	1.30	410	65	65
2	0.75	1.40	416	67	65
3	0.58	0.98	418	68	65
4	0.54	0.95	422	70	65

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	111.4070	68.6799	0.0000	42.7274
FILTER	5.9933	3.8307	0.0001	2.1625

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	97.7865	96.6852	160.0	1.1045
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESPI31
RUN # - ESP-I-3-1
LOCATION - IDEAL
DATE - 5-1-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	515.700
FINAL METER VOLUME (CUBIC FEET)=	526.820
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC FEET)=	11.342
GAS VOLUME (DRY STANDARD CUBIC FEET)=	11.022
BAROMETRIC PRESSURE (IN. HG)=	28.92
STATIC PRESSURE (INCHES H2O)=	-5.80
PERCENT OXYGEN=	8.30
PERCENT CARBON DIOXIDE=	20.30
MOISTURE COLLECTED (ML)=	98.1
PERCENT WATER=	29.54
AVERAGE METER TEMPERATURE (F.)=	67.8
AVERAGE DELTA H (IN. H2O)=	2.12
AVERAGE DELTA P (IN. H2O)=	1.00
AVERAGE STACK TEMPERATURE (F.)=	397.4
DRY MOLECULAR WEIGHT=	31.580
WET MOLECULAR WEIGHT=	27.569
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.9946
% ISOKINETIC=	116.5
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	15.0
NOZZLE DIAMETER (INCHES)=	0.2500
STACK AXIS #1 (INCHES)=	96.00
STACK AXIS #2 (INCHES)=	84.50
CIRCULAR STACK	
STACK AREA (SQUARE FEET)=	44.244
STACK VELOCITY (ACTUAL, FEET/MIN)=	4,477
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	198,074
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	116,162
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	81,850

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	21.4226
PARTICULATE LOADING, DRY STD. (GR./SCF)=	29.9313
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	12.3635
EMISSION RATE (LB/HR)=	20995.50

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	21.4226
PARTICULATE LOADING, DRY STD. (GR./SCF)=	29.9313
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	12.3635
EMISSION RATE (LB/HR)=	20995.50
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESPI31
RUN # - ESP-I-3-1
LOCATION - IDEAL
DATE - 5-1-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	14.603
FINAL METER VOLUME (CUBIC METERS)=	14.917
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC METERS)=	0.321
GAS VOLUME (DRY STANDARD CUBIC METERS)=	0.312
BAROMETRIC PRESSURE (MM HG)=	734.57
STATIC PRESSURE (MM H20)=	-147.3
PERCENT OXYGEN=	8.30
PERCENT CARBON DIOXIDE=	20.30
MOISTURE COLLECTED (ML)=	98.1
PERCENT WATER=	29.54
AVERAGE METER TEMPERATURE (C.)=	19.9
AVERAGE DELTA H (MM H20)=	53.8
AVERAGE DELTA P (MM H20)=	25.5
AVERAGE STACK TEMPERATURE (C.)=	203.0
DRY MOLECULAR WEIGHT=	31.580
WET MOLECULAR WEIGHT=	27.569
AVERAGE SQUARE ROOT OF DELTA P (MM H20)=	5.0128
% ISOKINETIC=	116.5
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	15.0
NOZZLE DIAMETER (MM)=	6.35
STACK AXIS #1 (METERS)=	2.438
STACK AXIS #2 (METERS)=	2.146
CIRCULAR STACK	
STACK AREA (SQUARE METERS)=	4.110
STACK VELOCITY (ACTUAL, M/MIN)=	1,365
FLOW RATE (ACTUAL, CUBIC M/MIN)=	5,609
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	3,289
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	2,318

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	21.4226
PARTICULATE LOADING, DRY STD. (G/CU. M)=	68.6393
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	28.3524
EMISSION RATE (KG/HR)=	9531.95

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	21.4226
PARTICULATE LOADING, DRY STD. (G/CU. M)=	68.6393
PARTICULATE LOADING, ACTUAL (G/CU. M)=	28.3524
EMISSION RATE (KG/HR)=	9531.95
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESPI31
RUN # - ESP-I-3-1
LOCATION - IDEAL
DATE - 5-1-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.95	1.90	394	63	63
2	1.50	3.00	399	70	63
3	0.93	2.00	400	73	64
4	0.75	1.70	398	75	64
5	0.89	2.00	396	78	65

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	84.9597	68.8882	0.0000	16.0715
FILTER	5.5274	3.8079	0.0001	1.7194

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	214.0840	210.4590	355.0	3.6317
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESPI41
RUN # - ESP-I-4-1
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	560.680
FINAL METER VOLUME (CUBIC FEET)=	579.020
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC FEET)=	18.707
GAS VOLUME (DRY STANDARD CUBIC FEET)=	17.499
BAROMETRIC PRESSURE (IN. HG)=	28.83
STATIC PRESSURE (INCHES H2O)=	-5.80
PERCENT OXYGEN=	8.30
PERCENT CARBON DIOXIDE=	20.30
MOISTURE COLLECTED (ML)=	104.9
PERCENT WATER=	22.02
AVERAGE METER TEMPERATURE (F.)=	85.4
AVERAGE DELTA H (IN. H2O)=	1.25
AVERAGE DELTA P (IN. H2O)=	0.79
AVERAGE STACK TEMPERATURE (F.)=	353.4
DRY MOLECULAR WEIGHT=	31.580
WET MOLECULAR WEIGHT=	28.590
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.8904
% ISOKINETIC=	92.8
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	30.0
NOZZLE DIAMETER (INCHES)=	0.2500
STACK AXIS #1 (INCHES)=	96.00
STACK AXIS #2 (INCHES)=	84.50
CIRCULAR STACK	
STACK AREA (SQUARE FEET)=	44.244
STACK VELOCITY (ACTUAL, FEET/MIN)=	3,839
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	169,864
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	104,675
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	81,627

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	39.4946
PARTICULATE LOADING, DRY STD. (GR./SCF)=	34.7575
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	16.6958
EMISSION RATE (LB/HR)=	24314.40

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	39.4946
PARTICULATE LOADING, DRY STD. (GR./SCF)=	34.7575
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	16.6958
EMISSION RATE (LB/HR)=	24314.40
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESPI41
RUN # - ESP-I-4-1
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	15.876
FINAL METER VOLUME (CUBIC METERS)=	16.396
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC METERS)=	0.530
GAS VOLUME (DRY STANDARD CUBIC METERS)=	0.495
BAROMETRIC PRESSURE (MM HG)=	732.28
STATIC PRESSURE (MM H2O)=	-147.3
PERCENT OXYGEN=	8.30
PERCENT CARBON DIOXIDE=	20.30
MOISTURE COLLECTED (ML)=	104.9
PERCENT WATER=	22.02
AVERAGE METER TEMPERATURE (C.)=	29.7
AVERAGE DELTA H (MM H2O)=	31.8
AVERAGE DELTA P (MM H2O)=	20.1
AVERAGE STACK TEMPERATURE (C.)=	178.6
DRY MOLECULAR WEIGHT=	31.580
WET MOLECULAR WEIGHT=	28.590
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	4.4875
% ISOKINETIC=	92.8
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	30.0
NOZZLE DIAMETER (MM)=	6.35
STACK AXIS #1 (METERS)=	2.438
STACK AXIS #2 (METERS)=	2.146
CIRCULAR STACK	
STACK AREA (SQUARE METERS)=	4.110
STACK VELOCITY (ACTUAL, M/MIN)=	1,170
FLOW RATE (ACTUAL, CUBIC M/MIN)=	4,810
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	2,964
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	2,311

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	39.4946
PARTICULATE LOADING, DRY STD. (G/CU. M)=	79.7068
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	38.2874
EMISSION RATE (KG/HR)=	11038.80

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	39.4946
PARTICULATE LOADING, DRY STD. (G/CU. M)=	79.7068
PARTICULATE LOADING, ACTUAL (G/CU. M)=	38.2874
EMISSION RATE (KG/HR)=	11038.80
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESPI41
RUN # - ESP-I-4-1
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.80	1.40	360	80	79
2	0.79	1.20	350	83	80
3	0.78	1.10	352	85	80
4	0.77	1.10	350	86	81
5	0.77	1.20	340	88	81
6	0.79	1.30	358	90	82
7	0.77	1.30	342	92	83
8	0.79	1.30	357	94	84
9	0.83	1.40	360	95	85
10	0.84	1.20	365	95	85

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	104.0240	69.2797	0.0000	34.7442
FILTER	6.5035	3.7680	0.0002	2.7353

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	112.6860	110.6740	160.0	2.0151
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESPI12
RUN # - ESP-I-1-2
LOCATION - IDEAL
DATE - 5-4-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	614.940
FINAL METER VOLUME (CUBIC FEET)=	620.890
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC FEET)=	6.069
GAS VOLUME (DRY STANDARD CUBIC FEET)=	5.782
BAROMETRIC PRESSURE (IN. HG)=	28.72
STATIC PRESSURE (INCHES H2O)=	-5.80
PERCENT OXYGEN=	8.25
PERCENT CARBON DIOXIDE=	21.33
MOISTURE COLLECTED (ML)=	16.1
PERCENT WATER=	31.50
AVERAGE METER TEMPERATURE (F.)=	72.9
AVERAGE DELTA H (IN. H2O)=	0.82
AVERAGE DELTA P (IN. H2O)=	0.50
AVERAGE STACK TEMPERATURE (F.)=	366.3
DRY MOLECULAR WEIGHT=	31.743
WET MOLECULAR WEIGHT=	27.414
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.7008
% ISOKINETIC=	109.6
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	12.0
NOZZLE DIAMETER (INCHES)=	0.2500
STACK AXIS #1 (INCHES)=	96.00
STACK AXIS #2 (INCHES)=	84.50
CIRCULAR STACK	
STACK AREA (SQUARE FEET)=	44.244
STACK VELOCITY (ACTUAL, FEET/MIN)=	3,116
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	137,872
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	83,315
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	57,071

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	65.6559
PARTICULATE LOADING, DRY STD. (GR./SCF)=	174.8690
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	72.3567
EMISSION RATE (LB/HR)=	85528.20

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	65.6559
PARTICULATE LOADING, DRY STD. (GR./SCF)=	174.8690
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	72.3567
EMISSION RATE (LB/HR)=	85528.20
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESPI12
RUN # - ESP-I-1-2
LOCATION - IDEAL
DATE - 5-4-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	17.413
FINAL METER VOLUME (CUBIC METERS)=	17.581
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC METERS)=	0.172
GAS VOLUME (DRY STANDARD CUBIC METERS)=	0.164
BAROMETRIC PRESSURE (MM HG)=	729.49
STATIC PRESSURE (MM H2O)=	-147.3
PERCENT OXYGEN=	8.25
PERCENT CARBON DIOXIDE=	21.33
MOISTURE COLLECTED (ML)=	16.1
PERCENT WATER=	31.50
AVERAGE METER TEMPERATURE (C.)=	22.7
AVERAGE DELTA H (MM H2O)=	20.7
AVERAGE DELTA P (MM H2O)=	12.6
AVERAGE STACK TEMPERATURE (C.)=	185.7
DRY MOLECULAR WEIGHT=	31.743
WET MOLECULAR WEIGHT=	27.414
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	3.5319
% ISOKINETIC=	109.6
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	12.0
NOZZLE DIAMETER (MM)=	6.35
STACK AXIS #1 (METERS)=	2.438
STACK AXIS #2 (METERS)=	2.146
CIRCULAR STACK	
STACK AREA (SQUARE METERS)=	4.110
STACK VELOCITY (ACTUAL, M/MIN)=	950
FLOW RATE (ACTUAL, CUBIC M/MIN)=	3,904
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	2,359
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	1,616

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	65.6559
PARTICULATE LOADING, DRY STD. (G/CU. M)=	401.0150
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	165.9300
EMISSION RATE (KG/HR)=	38829.80

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	65.6559
PARTICULATE LOADING, DRY STD. (G/CU. M)=	401.0150
PARTICULATE LOADING, ACTUAL (G/CU. M)=	165.9300
EMISSION RATE (KG/HR)=	38829.80
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESPI12
RUN # - ESP-I-1-2
LOCATION - IDEAL
DATE - 5-4-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.52	0.85	350	71	71
2	0.63	1.10	351	74	71
3	0.42	0.68	368	72	72
4	0.41	0.63	396	80	72

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	138.4770	76.6563	0.0000	61.8207
FILTER	6.2722	3.8233	0.0001	2.4488

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	97.7439	96.3609	170.0	1.3864
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESPI22
RUN # - ESP-I-2-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	657.320
FINAL METER VOLUME (CUBIC FEET)=	665.920
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC FEET)=	8.772
GAS VOLUME (DRY STANDARD CUBIC FEET)=	8.456
BAROMETRIC PRESSURE (IN. HG)=	28.88
STATIC PRESSURE (INCHES H20)=	-5.80
PERCENT OXYGEN=	8.25
PERCENT CARBON DIOXIDE=	21.33
MOISTURE COLLECTED (ML)=	80.0
PERCENT WATER=	30.82
AVERAGE METER TEMPERATURE (F.)=	71.0
AVERAGE DELTA H (IN. H20)=	1.88
AVERAGE DELTA P (IN. H20)=	0.63
AVERAGE STACK TEMPERATURE (F.)=	348.3
DRY MOLECULAR WEIGHT=	31.743
WET MOLECULAR WEIGHT=	27.507
AVERAGE SQUARE ROOT OF DELTA P (IN. H20)=	0.7935
% ISOKINETIC=	98.1
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	12.0
NOZZLE DIAMETER (INCHES)=	0.2970
STACK AXIS #1 (INCHES)=	96.00
STACK AXIS #2 (INCHES)=	84.50
CIRCULAR STACK	
STACK AREA (SQUARE FEET)=	44.244
STACK VELOCITY (ACTUAL, FEET/MIN)=	3,474
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	153,705
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	95,488
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	66,055

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	38.2747
PARTICULATE LOADING, DRY STD. (GR./SCF)=	69.7048
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	29.9437
EMISSION RATE (LB/HR)=	39459.00

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	38.2747
PARTICULATE LOADING, DRY STD. (GR./SCF)=	69.7048
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	29.9437
EMISSION RATE (LB/HR)=	39459.00
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESPI22
RUN # - ESP-I-2-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	18.613
FINAL METER VOLUME (CUBIC METERS)=	18.856
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC METERS)=	0.248
GAS VOLUME (DRY STANDARD CUBIC METERS)=	0.239
BAROMETRIC PRESSURE (MM HG)=	733.55
STATIC PRESSURE (MM H2O)=	-147.3
PERCENT OXYGEN=	8.25
PERCENT CARBON DIOXIDE=	21.33
MOISTURE COLLECTED (ML)=	80.0
PERCENT WATER=	30.82
AVERAGE METER TEMPERATURE (C.)=	21.7
AVERAGE DELTA H (MM H2O)=	47.6
AVERAGE DELTA P (MM H2O)=	16.0
AVERAGE STACK TEMPERATURE (C.)=	175.7
DRY MOLECULAR WEIGHT=	31.743
WET MOLECULAR WEIGHT=	27.507
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	3.9991
% ISOKINETIC=	98.1
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	12.0
NOZZLE DIAMETER (MM)=	7.54
STACK AXIS #1 (METERS)=	2.438
STACK AXIS #2 (METERS)=	2.146
CIRCULAR STACK	
STACK AREA (SQUARE METERS)=	4.110
STACK VELOCITY (ACTUAL, M/MIN)=	1,059
FLOW RATE (ACTUAL, CUBIC M/MIN)=	4,352
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	2,704
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	1,870

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	38.2747
PARTICULATE LOADING, DRY STD. (G/CU. M)=	159.8490
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	68.6676
EMISSION RATE (KG/HR)=	17914.40

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	38.2747
PARTICULATE LOADING, DRY STD. (G/CU. M)=	159.8490
PARTICULATE LOADING, ACTUAL (G/CU. M)=	68.6676
EMISSION RATE (KG/HR)=	17914.40
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESPI22
RUN # - ESP-I-2-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.62	1.90	345	69	69
2	0.60	1.70	352	71	69
3	0.62	1.80	348	74	70
4	0.68	2.10	348	76	70

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	110.1860	75.9393	0.0000	34.2471
FILTER	6.8101	3.7800	0.0003	3.0298

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	96.1453	95.1499	120.0	0.9978
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESPI32
RUN # - ESP-I-3-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	635.250
FINAL METER VOLUME (CUBIC FEET)=	646.560
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC FEET)=	11.536
GAS VOLUME (DRY STANDARD CUBIC FEET)=	11.054
BAROMETRIC PRESSURE (IN. HG)=	28.82
STATIC PRESSURE (INCHES H2O)=	-5.80
PERCENT OXYGEN=	8.25
PERCENT CARBON DIOXIDE=	21.33
MOISTURE COLLECTED (ML)=	106.3
PERCENT WATER=	31.17
AVERAGE METER TEMPERATURE (F.)=	72.4
AVERAGE DELTA H (IN. H2O)=	1.37
AVERAGE DELTA P (IN. H2O)=	0.93
AVERAGE STACK TEMPERATURE (F.)=	372.5
DRY MOLECULAR WEIGHT=	31.743
WET MOLECULAR WEIGHT=	27.459
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.9615
% ISOKINETIC=	101.6
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	18.0
NOZZLE DIAMETER (INCHES)=	0.2500
STACK AXIS #1 (INCHES)=	96.00
STACK AXIS #2 (INCHES)=	84.50
CIRCULAR STACK	
STACK AREA (SQUARE FEET)=	44.244
STACK VELOCITY (ACTUAL, FEET/MIN)=	4,281
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	189,388
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	113,988
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	78,454

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	28.1837
PARTICULATE LOADING, DRY STD. (GR./SCF)=	39.2648
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	16.2589
EMISSION RATE (LB/HR)=	26399.60

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	28.1837
PARTICULATE LOADING, DRY STD. (GR./SCF)=	39.2648
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	16.2589
EMISSION RATE (LB/HR)=	26399.60
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESPI32
RUN # - ESP-I-3-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	17.988
FINAL METER VOLUME (CUBIC METERS)=	18.308
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC METERS)=	0.327
GAS VOLUME (DRY STANDARD CUBIC METERS)=	0.313
BAROMETRIC PRESSURE (MM HG)=	732.03
STATIC PRESSURE (MM H20)=	-147.3
PERCENT OXYGEN=	8.25
PERCENT CARBON DIOXIDE=	21.33
MOISTURE COLLECTED (ML)=	106.3
PERCENT WATER=	31.17
AVERAGE METER TEMPERATURE (C.)=	22.5
AVERAGE DELTA H (MM H20)=	34.7
AVERAGE DELTA P (MM H20)=	23.5
AVERAGE STACK TEMPERATURE (C.)=	189.2
DRY MOLECULAR WEIGHT=	31.743
WET MOLECULAR WEIGHT=	27.459
AVERAGE SQUARE ROOT OF DELTA P (MM H20)=	4.8459
% ISOKINETIC=	101.6
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	18.0
NOZZLE DIAMETER (MM)=	6.35
STACK AXIS #1 (METERS)=	2.438
STACK AXIS #2 (METERS)=	2.146
CIRCULAR STACK	
STACK AREA (SQUARE METERS)=	4.110
STACK VELOCITY (ACTUAL, M/MIN)=	1,305
FLOW RATE (ACTUAL, CUBIC M/MIN)=	5,363
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	3,228
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	2,222

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	28.1837
PARTICULATE LOADING, DRY STD. (G/CU. M)=	90.0432
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	37.2853
EMISSION RATE (KG/HR)=	11985.40

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	28.1837
PARTICULATE LOADING, DRY STD. (G/CU. M)=	90.0432
PARTICULATE LOADING, ACTUAL (G/CU. M)=	37.2853
EMISSION RATE (KG/HR)=	11985.40
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESPI32
RUN # - ESP-I-3-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.85	1.40	380	69	69
2	0.77	1.00	386	72	69
3	0.95	1.50	370	74	69
4	0.99	1.30	369	78	70
5	1.00	1.50	357	79	70
6	1.00	1.50	373	80	70

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	91.8343	67.3474	0.0000	24.4869
FILTER	5.8653	3.8314	0.0003	2.0336

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	98.1810	96.5209	155.0	1.6632
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESPI42
RUN # - ESP-I-4-2
LOCATION - IDEAL
DATE - 5-6-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	678.900
FINAL METER VOLUME (CUBIC FEET)=	691.420
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC FEET)=	12.770
GAS VOLUME (DRY STANDARD CUBIC FEET)=	12.470
BAROMETRIC PRESSURE (IN. HG)=	28.87
STATIC PRESSURE (INCHES H20)=	-5.80
PERCENT OXYGEN=	8.00
PERCENT CARBON DIOXIDE=	21.00
MOISTURE COLLECTED (ML)=	122.5
PERCENT WATER=	31.63
AVERAGE METER TEMPERATURE (F.)=	63.3
AVERAGE DELTA H (IN. H20)=	1.33
AVERAGE DELTA P (IN. H20)=	0.84
AVERAGE STACK TEMPERATURE (F.)=	350.9
DRY MOLECULAR WEIGHT=	31.680
WET MOLECULAR WEIGHT=	27.353
AVERAGE SQUARE ROOT OF DELTA P (IN. H20)=	0.9141
% ISOKINETIC=	102.4
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	21.0
NOZZLE DIAMETER (INCHES)=	0.2500
STACK AXIS #1 (INCHES)=	96.00
STACK AXIS #2 (INCHES)=	84.50
CIRCULAR STACK	
STACK AREA (SQUARE FEET)=	44.244
STACK VELOCITY (ACTUAL, FEET/MIN)=	4,020
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	177,880
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	110,113
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	75,282

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	58.8059
PARTICULATE LOADING, DRY STD. (GR./SCF)=	72.6211
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	30.7222
EMISSION RATE (LB/HR)=	46852.70

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	58.8059
PARTICULATE LOADING, DRY STD. (GR./SCF)=	72.6211
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	30.7222
EMISSION RATE (LB/HR)=	46852.70
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESPI42
RUN # - ESP-I-4-2
LOCATION - IDEAL
DATE - 5-6-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	19.224
FINAL METER VOLUME (CUBIC METERS)=	19.578
METER FACTOR= 1.02	
NET METER VOLUME (CUBIC METERS)=	0.362
GAS VOLUME (DRY STANDARD CUBIC METERS)=	0.353
BAROMETRIC PRESSURE (MM HG)=	733.30
STATIC PRESSURE (MM H2O)=	-147.3
PERCENT OXYGEN=	8.00
PERCENT CARBON DIOXIDE=	21.00
MOISTURE COLLECTED (ML)=	122.5
PERCENT WATER=	31.63
AVERAGE METER TEMPERATURE (C.)=	17.4
AVERAGE DELTA H (MM H2O)=	33.7
AVERAGE DELTA P (MM H2O)=	21.2
AVERAGE STACK TEMPERATURE (C.)=	177.1
DRY MOLECULAR WEIGHT=	31.680
WET MOLECULAR WEIGHT=	27.353
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	4.6069
% ISOKINETIC=	102.4
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	21.0
NOZZLE DIAMETER (MM)=	6.35
STACK AXIS #1 (METERS)=	2.438
STACK AXIS #2 (METERS)=	2.146
CIRCULAR STACK	
STACK AREA (SQUARE METERS)=	4.110
STACK VELOCITY (ACTUAL, M/MIN)=	1,225
FLOW RATE (ACTUAL, CUBIC M/MIN)=	5,037
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	3,118
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	2,132

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	58.8059
PARTICULATE LOADING, DRY STD. (G/CU. M)=	166.5370
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	70.4530
EMISSION RATE (KG/HR)=	21271.10

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	58.8059
PARTICULATE LOADING, DRY STD. (G/CU. M)=	166.5370
PARTICULATE LOADING, ACTUAL (G/CU. M)=	70.4530
EMISSION RATE (KG/HR)=	21271.10
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESPI42
RUN # - ESP-I-4-2
LOCATION - IDEAL
DATE - 5-6-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.86	1.50	345	60	59
2	0.82	1.30	356	62	59
3	0.83	1.20	340	65	59
4	0.81	1.30	362	67	60
5	0.82	1.30	353	69	61
6	0.84	1.30	349	70	62
7	0.87	1.40	351	71	62

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	121.8080	66.7895	0.0000	55.0189
FILTER	3.9137	3.8003	0.0003	0.1131

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	99.3505	95.6798	160.0	3.6739
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

F-2 Electrostatic Precipitator Outlet
(EPA Method 17)

TABLE F-2-1. SUMMARY OF TOTAL MASS TEST RESULTS FOR ELECTROSTATIC PRECIPITATOR OUTLET

Run No.	Date	V_m (ft^3)[a]	Avg. Δ_p (in. H_2O)[b]	Avg. Δ_H (in. H_2O)[c]	Avg. T_s (°F)[d]	Avg. T_m (°F)[e]	P_b (in. Hg)[f]	Vm_{std} (ft^3)[g]	% H_2O[h]	M_d[i]	M_s[j]	Q_s (dscfm)[k]	% isok.[ℓ]	Total sample time (min)	Total particulate collected (g)	Emission rate (gr/dscf)[m]	Emission rate (lb/hr)[n]
ESP-0-1-1 (C)	5/6/81	51.321	0.10	1.68	337.9	91.5	28.87	47.594	29.57	31.360	27.42	50,331	103.5	70.0	0.0232	0.0075	3.24
ESP-0-2-1	5/1/81	82.681	0.06	0.74	349.4	82.9	28.92	77.836	23.62	31.160	28.05	41,466	108.8	180.0	0.0305	0.0060	2.14
ESP-0-3-1	5/2/81	72.142	0.15	1.77	344.5	86.3	28.91	67.648	25.15	31.160	27.83	63,487	111.2	100.0	0.0433	0.0099	5.36
ESP-0-4-1	5/2/81	127.259	0.40	1.78	337.7	99.8	28.83	116.134	27.64	31.160	27.53	101,007	102.5	180.0	0.0436	0.0058	5.01
ESP-0-1-2	5/4/81	120.857	0.09	1.59	345.3	98.7	28.67	109.840	22.27	30.900	28.03	51,290	96.5	170.0	0.1386	0.0194	8.54
ESP-0-2-2 (B)	5/6/81	109.034	0.09	1.64	309.5	88.3	28.87	101.700	29.40	31.360	27.43	46,664	112.1	149.0	0.1585	0.0240	9.60
ESP-0-3-2	5/5/81	73.473	0.17	0.66	318.2	87.7	28.82	68.316	29.19	31.053	27.25	64,664	99.8	170.0	0.0225	0.0051	2.81
ESP-0-4-2	5/5/81	113.339	0.34	1.35	312.9	110.0	28.88	101.651	27.53	31.053	27.45	95,707	94.7	180.0	0.0187	0.0028	2.32

a V_m (ft^3) = volume of dry gas at the meter.

b Avg. Δ_p (in. H_2O) = average stack gas velocity.

c Avg. Δ_H (in. H_2O) = average pressure drop across the meter.

d Avg. T_s (°F) = average stack temperature.

e Avg. T_m (°F) = average meter temperature.

f P_b (in. Hg) = barometric pressure (in. of mercury).

g Vm_{std} (ft^3) = volume of dry gas at the meter at standard conditions.

h % H_2O = percent moisture by volume.

i M_d = molecular weight, dry stack gas (lb/lb mole).

j M_s = molecular weight, stack gas (lb/lb mole).

k Q_s = stack flow rate, dry standard conditions (dscfm).

ℓ % isok. = % isokinetic.

m gr/dscf = grains per dry standard cubic foot.

n lb/hr = pounds per hour.

FILE NAME - ESP011C
RUN # - ESP-0-1-1-C
LOCATION - IDEAL
DATE - 5-6-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	617.135
FINAL METER VOLUME (CUBIC FEET)=	665.643
METER FACTOR= 1.058	
NET METER VOLUME (CUBIC FEET)=	51.321
GAS VOLUME (DRY STANDARD CUBIC FEET)=	47.594
BAROMETRIC PRESSURE (IN. HG)=	28.87
STATIC PRESSURE (INCHES H2O)=	-6.40
PERCENT OXYGEN=	8.00
PERCENT CARBON DIOXIDE=	19.00
MOISTURE COLLECTED (ML)=	424.2
PERCENT WATER=	29.57
AVERAGE METER TEMPERATURE (F.)=	91.5
AVERAGE DELTA H (IN. H2O)=	1.68
AVERAGE DELTA P (IN. H2O)=	0.10
AVERAGE STACK TEMPERATURE (F.)=	337.9
DRY MOLECULAR WEIGHT=	31.360
WET MOLECULAR WEIGHT=	27.410
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.3224
% ISOKINETIC=	103.5
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	70.0
NOZZLE DIAMETER (INCHES)=	0.4400
STACK AXIS #1 (INCHES)=	108.00
STACK AXIS #2 (INCHES)=	107.88
RECTANGULAR STACK	
STACK AREA (SQUARE FEET)=	80.906
STACK VELOCITY (ACTUAL, FEET/MIN)=	1,406
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	113,765
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	71,460
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	50,331

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0232
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0075
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0033
EMISSION RATE (LB/HR)=	3.24

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0232
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0075
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0033
EMISSION RATE (LB/HR)=	3.24
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESP011C
RUN # - ESP-0-1-1-C
LOCATION - IDEAL
DATE - 5-6-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	17.475
FINAL METER VOLUME (CUBIC METERS)=	18.848
METER FACTOR= 1.058	
NET METER VOLUME (CUBIC METERS)=	1.453
GAS VOLUME (DRY STANDARD CUBIC METERS)=	1.348
BAROMETRIC PRESSURE (MM HG)=	733.30
STATIC PRESSURE (MM H2O)=	-162.6
PERCENT OXYGEN=	8.00
PERCENT CARBON DIOXIDE=	19.00
MOISTURE COLLECTED (ML)=	424.2
PERCENT WATER=	29.57
AVERAGE METER TEMPERATURE (C.)=	33.1
AVERAGE DELTA H (MM H2O)=	42.6
AVERAGE DELTA P (MM H2O)=	2.6
AVERAGE STACK TEMPERATURE (C.)=	169.9
DRY MOLECULAR WEIGHT=	31.360
WET MOLECULAR WEIGHT=	27.410
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	1.6248
% ISOKINETIC=	103.5
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	70.0
NOZZLE DIAMETER (MM)=	11.18
STACK AXIS #1 (METERS)=	2.743
STACK AXIS #2 (METERS)=	2.740
RECTANGULAR STACK	
STACK AREA (SQUARE METERS)=	7.516
STACK VELOCITY (ACTUAL, M/MIN)=	429
FLOW RATE (ACTUAL, CUBIC M/MIN)=	3,221
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	2,024
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	1,425

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0232
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0172
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	0.0076
EMISSION RATE (KG/HR)=	1.47

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0232
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0172
PARTICULATE LOADING, ACTUAL (G/CU. M)=	0.0076
EMISSION RATE (KG/HR)=	1.47
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESP011C
RUN # - ESP-O-1-1-C
LOCATION - IDEAL
DATE - 5-6-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H2O)	DELTA H (IN. H2O)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.08	1.35	340	80	80
2	0.11	1.60	335	85	80
3	0.10	1.70	340	95	85
4	0.11	1.90	335	100	84
5	0.12	1.90	330	102	88
6	0.11	1.70	345	110	90
7	0.10	1.60	340	110	92

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	1.6017	1.5816	0.0002	0.0199

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	65.8215	65.8185	15.0	0.0033
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESP021
RUN # - ESP-0-2-1
LOCATION - IDEAL
DATE - 5-1-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	541.622
FINAL METER VOLUME (CUBIC FEET)=	623.403
METER FACTOR= 1.011	
NET METER VOLUME (CUBIC FEET)=	82.681
GAS VOLUME (DRY STANDARD CUBIC FEET)=	77.836
BAROMETRIC PRESSURE (IN. HG)=	28.92
STATIC PRESSURE (INCHES H20)=	-6.40
PERCENT OXYGEN=	8.33
PERCENT CARBON DIOXIDE=	17.67
MOISTURE COLLECTED (ML)=	511.0
PERCENT WATER=	23.62
AVERAGE METER TEMPERATURE (F.)=	82.9
AVERAGE DELTA H (IN. H20)=	0.74
AVERAGE DELTA P (IN. H20)=	0.06
AVERAGE STACK TEMPERATURE (F.)=	349.4
DRY MOLECULAR WEIGHT=	31.160
WET MOLECULAR WEIGHT=	28.052
AVERAGE SQUARE ROOT OF DELTA P (IN. H20)=	0.2493
% ISOKINETIC=	108.8
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	180.0
NOZZLE DIAMETER (INCHES)=	0.3770
STACK AXIS #1 (INCHES)=	108.00
STACK AXIS #2 (INCHES)=	107.88
RECTANGULAR STACK	
STACK AREA (SQUARE FEET)=	80.906
STACK VELOCITY (ACTUAL, FEET/MIN)=	1,082
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	87,527
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	54,287
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	41,466

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0305
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0060
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0029
EMISSION RATE (LB/HR)=	2.14

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0305
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0060
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0029
EMISSION RATE (LB/HR)=	2.14
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESP021
RUN # - ESP-0-2-1
LOCATION - IDEAL
DATE - 5-1-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	15.337
FINAL METER VOLUME (CUBIC METERS)=	17.652
METER FACTOR= 1.011	
NET METER VOLUME (CUBIC METERS)=	2.341
GAS VOLUME (DRY STANDARD CUBIC METERS)=	2.204
BAROMETRIC PRESSURE (MM HG)=	734.57
STATIC PRESSURE (MM H2O)=	-162.6
PERCENT OXYGEN=	8.33
PERCENT CARBON DIOXIDE=	17.67
MOISTURE COLLECTED (ML)=	511.0
PERCENT WATER=	23.62
AVERAGE METER TEMPERATURE (C.)=	28.3
AVERAGE DELTA H (MM H2O)=	18.9
AVERAGE DELTA P (MM H2O)=	1.6
AVERAGE STACK TEMPERATURE (C.)=	176.4
DRY MOLECULAR WEIGHT=	31.160
WET MOLECULAR WEIGHT=	28.052
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	1.2566
% ISOKINETIC=	108.8
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	180.0
NOZZLE DIAMETER (MM)=	9.58
STACK AXIS #1 (METERS)=	2.743
STACK AXIS #2 (METERS)=	2.740
RECTANGULAR STACK	
STACK AREA (SQUARE METERS)=	7.516
STACK VELOCITY (ACTUAL, M/MIN)=	330
FLOW RATE (ACTUAL, CUBIC M/MIN)=	2,478
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	1,537
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	1,174

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0305
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0138
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	0.0066
EMISSION RATE (KG/HR)=	0.97

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0305
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0138
PARTICULATE LOADING, ACTUAL (G/CU. M)=	0.0066
EMISSION RATE (KG/HR)=	0.97
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESP021
RUN # - ESP-O-2-1
LOCATION - IDEAL
DATE - 5-1-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.10	1.20	365	68	68
2	0.10	1.00	360	69	69
3	0.08	0.92	360	72	69
4	0.08	1.00	360	75	69
5	0.08	1.00	360	76	69
6	0.06	0.79	360	77	68
7	0.06	0.78	360	79	70
8	0.06	0.79	360	79	70
9	0.07	0.80	350	79	72
10	0.07	0.90	350	80	72
11	0.08	0.99	350	80	74
12	0.07	0.75	350	82	74
13	0.07	0.85	355	81	74
14	0.06	0.85	350	83	75
15	0.07	0.90	345	83	75
16	0.07	0.85	340	83	75
17	0.07	0.88	340	85	79
18	0.07	0.82	340	84	79
19	0.05	0.50	340	84	79
20	0.03	0.35	340	82	78
21	0.04	0.52	340	82	80
22	0.06	0.66	340	82	80
23	0.05	0.55	340	83	79
24	0.06	0.68	345	84	79
25	0.05	0.55	345	87	79
26	0.07	0.80	345	88	79
27	0.07	0.85	350	89	79
28	0.06	0.75	350	100	80
29	0.06	0.64	345	110	87
30	0.05	0.51	355	110	90
31	0.05	0.54	355	110	90
32	0.04	0.46	355	111	91
33	0.05	0.53	355	110	90
34	0.05	0.55	345	110	92
35	0.06	0.70	340	109	91
36	0.05	0.60	340	110	91

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	1.6101	1.5833	-0.0003	0.0271

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	76.1361	76.1331	20.0	0.0034
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESP031
RUN # - ESP-O-3-1
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	163.555
FINAL METER VOLUME (CUBIC FEET)=	235.410
METER FACTOR= 1.004	
NET METER VOLUME (CUBIC FEET)=	72.142
GAS VOLUME (DRY STANDARD CUBIC FEET)=	67.648
BAROMETRIC PRESSURE (IN. HG)=	28.91
STATIC PRESSURE (INCHES H2O)=	-6.40
PERCENT OXYGEN=	8.33
PERCENT CARBON DIOXIDE=	17.67
MOISTURE COLLECTED (ML)=	482.6
PERCENT WATER=	25.15
AVERAGE METER TEMPERATURE (F.)=	86.3
AVERAGE DELTA H (IN. H2O)=	1.77
AVERAGE DELTA P (IN. H2O)=	0.15
AVERAGE STACK TEMPERATURE (F.)=	344.5
DRY MOLECULAR WEIGHT=	31.160
WET MOLECULAR WEIGHT=	27.851
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.3870
% ISOKINETIC=	111.2
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	100.0
NOZZLE DIAMETER (INCHES)=	0.3770
STACK AXIS #1 (INCHES)=	108.00
STACK AXIS #2 (INCHES)=	107.88
RECTANGULAR STACK	
STACK AREA (SQUARE FEET)=	80.906
STACK VELOCITY (ACTUAL, FEET/MIN)=	1,681
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	135,965
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	84,819
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	63,487

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0433
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0099
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0046
EMISSION RATE (LB/HR)=	5.36

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0433
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0099
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0046
EMISSION RATE (LB/HR)=	5.36
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESP031
RUN # - ESP-0-3-1
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	4.631
FINAL METER VOLUME (CUBIC METERS)=	6.666
METER FACTOR= 1.004	
NET METER VOLUME (CUBIC METERS)=	2.043
GAS VOLUME (DRY STANDARD CUBIC METERS)=	1.916
BAROMETRIC PRESSURE (MM HG)=	734.31
STATIC PRESSURE (MM H2O)=	-162.6
PERCENT OXYGEN=	8.33
PERCENT CARBON DIOXIDE=	17.67
MOISTURE COLLECTED (ML)=	482.6
PERCENT WATER=	25.15
AVERAGE METER TEMPERATURE (C.)=	30.2
AVERAGE DELTA H (MM H2O)=	45.0
AVERAGE DELTA P (MM H2O)=	3.8
AVERAGE STACK TEMPERATURE (C.)=	173.6
DRY MOLECULAR WEIGHT=	31.160
WET MOLECULAR WEIGHT=	27.851
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	1.9507
% ISOKINETIC=	111.2
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	100.0
NOZZLE DIAMETER (MM)=	9.58
STACK AXIS #1 (METERS)=	2.743
STACK AXIS #2 (METERS)=	2.740
RECTANGULAR STACK	
STACK AREA (SQUARE METERS)=	7.516
STACK VELOCITY (ACTUAL, M/MIN)=	512
FLOW RATE (ACTUAL, CUBIC M/MIN)=	3,850
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	2,402
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	1,798

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0433
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0226
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	0.0106
EMISSION RATE (KG/HR)=	2.44

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0433
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0226
PARTICULATE LOADING, ACTUAL (G/CU. M)=	0.0106
EMISSION RATE (KG/HR)=	2.44
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESP031
RUN # - ESP-0-3-1
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.15	1.80	345	80	80
2	0.17	2.00	340	85	77
3	0.17	2.20	345	87	78
4	0.15	1.80	345	92	80
5	0.15	1.60	345	92	82
6	0.14	1.60	350	92	83
7	0.14	1.60	345	93	84
8	0.14	1.60	350	94	85
9	0.15	1.90	340	95	85
10	0.14	1.60	340	96	86

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	1.6223	1.5829	-0.0001	0.0395

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	73.6125	73.6091	20.0	0.0038
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESP041
RUN # - ESP041
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	237.813
FINAL METER VOLUME (CUBIC FEET)=	364.565
METER FACTOR= 1.004	
NET METER VOLUME (CUBIC FEET)=	127.259
GAS VOLUME (DRY STANDARD CUBIC FEET)=	116.134
BAROMETRIC PRESSURE (IN. HG)=	28.83
STATIC PRESSURE (INCHES H20)=	-6.40
PERCENT OXYGEN=	8.33
PERCENT CARBON DIOXIDE=	17.67
MOISTURE COLLECTED (ML)=	941.8
PERCENT WATER=	27.64
AVERAGE METER TEMPERATURE (F.)=	99.8
AVERAGE DELTA H (IN. H20)=	1.78
AVERAGE DELTA P (IN. H20)=	0.40
AVERAGE STACK TEMPERATURE (F.)=	337.7
DRY MOLECULAR WEIGHT=	31.160
WET MOLECULAR WEIGHT=	27.523
AVERAGE SQUARE ROOT OF DELTA P (IN. H20)=	0.6314
% ISOKINETIC=	102.5
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	180.0
NOZZLE DIAMETER (INCHES)=	0.3040
STACK AXIS #1 (INCHES)=	108.00
STACK AXIS #2 (INCHES)=	107.88
RECTANGULAR STACK	
STACK AREA (SQUARE FEET)=	80.906
STACK VELOCITY (ACTUAL, FEET/MIN)=	2,750
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	222,485
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	139,588
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	101,007

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0436
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0058
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0026
EMISSION RATE (LB/HR)=	5.01

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0436
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0058
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0026
EMISSION RATE (LB/HR)=	5.01
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESP041
RUN # - ESP041
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	6.734
FINAL METER VOLUME (CUBIC METERS)=	10.323
METER FACTOR= 1.004	
NET METER VOLUME (CUBIC METERS)=	3.603
GAS VOLUME (DRY STANDARD CUBIC METERS)=	3.288
BAROMETRIC PRESSURE (MM HG)=	732.28
STATIC PRESSURE (MM H20)=	-162.6
PERCENT OXYGEN=	8.33
PERCENT CARBON DIOXIDE=	17.67
MOISTURE COLLECTED (ML)=	941.8
PERCENT WATER=	27.64
AVERAGE METER TEMPERATURE (C.)=	37.7
AVERAGE DELTA H (MM H20)=	45.2
AVERAGE DELTA P (MM H20)=	10.1
AVERAGE STACK TEMPERATURE (C.)=	169.8
DRY MOLECULAR WEIGHT=	31.160
WET MOLECULAR WEIGHT=	27.523
AVERAGE SQUARE ROOT OF DELTA P (MM H20)=	3.1822
% ISOKINETIC=	102.5
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	180.0
NOZZLE DIAMETER (MM)=	7.72
STACK AXIS #1 (METERS)=	2.743
STACK AXIS #2 (METERS)=	2.740
RECTANGULAR STACK	
STACK AREA (SQUARE METERS)=	7.516
STACK VELOCITY (ACTUAL, M/MIN)=	838
FLOW RATE (ACTUAL, CUBIC M/MIN)=	6,300
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	3,953
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	2,860

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0436
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0133
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	0.0060
EMISSION RATE (KG/HR)=	2.27

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0436
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0133
PARTICULATE LOADING, ACTUAL (G/CU. M)=	0.0060
EMISSION RATE (KG/HR)=	2.27
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESP041
RUN # - ESP041
LOCATION - IDEAL
DATE - 5-2-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.40	1.90	330	85	85
2	0.38	2.10	320	97	87
3	0.37	1.80	335	98	88
4	0.38	1.60	335	98	88
5	0.38	1.40	345	99	90
6	0.42	2.10	330	102	91
7	0.41	1.80	330	109	94
8	0.39	1.50	335	109	95
9	0.42	1.80	335	106	95
10	0.43	2.00	345	108	95
11	0.41	1.60	345	109	95
12	0.42	2.10	345	109	96
13	0.40	1.80	350	114	97
14	0.38	1.60	348	114	98
15	0.38	1.50	340	112	98
16	0.41	1.80	335	112	98
17	0.42	2.00	335	113	98
18	0.38	1.60	340	113	98

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	1.6267	1.5865	-0.0001	0.0403

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	66.5492	66.5463	20.0	0.0033
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESP012
RUN # - ESP012
LOCATION - IDEAL
DATE - 5-4-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	237.520
FINAL METER VOLUME (CUBIC FEET)=	351.752
METER FACTOR= 1.058	
NET METER VOLUME (CUBIC FEET)=	120.857
GAS VOLUME (DRY STANDARD CUBIC FEET)=	109.840
BAROMETRIC PRESSURE (IN. HG)=	28.67
STATIC PRESSURE (INCHES H2O)=	-6.40
PERCENT OXYGEN=	5.83
PERCENT CARBON DIOXIDE=	16.67
MOISTURE COLLECTED (ML)=	668.3
PERCENT WATER=	22.27
AVERAGE METER TEMPERATURE (F.)=	98.7
AVERAGE DELTA H (IN. H2O)=	1.59
AVERAGE DELTA P (IN. H2O)=	0.09
AVERAGE STACK TEMPERATURE (F.)=	345.3
DRY MOLECULAR WEIGHT=	30.900
WET MOLECULAR WEIGHT=	28.027
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.3035
% ISOKINETIC=	96.5
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	170.0
NOZZLE DIAMETER (INCHES)=	0.4400
STACK AXIS #1 (INCHES)=	108.00
STACK AXIS #2 (INCHES)=	107.88
RECTANGULAR STACK	
STACK AREA (SQUARE FEET)=	80.906
STACK VELOCITY (ACTUAL, FEET/MIN)=	1,320
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	106,783
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	65,988
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	51,290

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.1386
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0194
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0093
EMISSION RATE (LB/HR)=	8.54

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.1386
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0194
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0093
EMISSION RATE (LB/HR)=	8.54
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESP012
RUN # - ESP012
LOCATION - IDEAL
DATE - 5-4-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	6.726
FINAL METER VOLUME (CUBIC METERS)=	9.960
METER FACTOR= 1.058	
NET METER VOLUME (CUBIC METERS)=	3.422
GAS VOLUME (DRY STANDARD CUBIC METERS)=	3.110
BAROMETRIC PRESSURE (MM HG)=	728.22
STATIC PRESSURE (MM H2O)=	-162.6
PERCENT OXYGEN=	5.83
PERCENT CARBON DIOXIDE=	16.67
MOISTURE COLLECTED (ML)=	668.3
PERCENT WATER=	22.27
AVERAGE METER TEMPERATURE (C.)=	37.1
AVERAGE DELTA H (MM H2O)=	40.4
AVERAGE DELTA P (MM H2O)=	2.4
AVERAGE STACK TEMPERATURE (C.)=	174.1
DRY MOLECULAR WEIGHT=	30.900
WET MOLECULAR WEIGHT=	28.027
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	1.5296
% ISOKINETIC=	96.5
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	170.0
NOZZLE DIAMETER (MM)=	11.18
STACK AXIS #1 (METERS)=	2.743
STACK AXIS #2 (METERS)=	2.740
RECTANGULAR STACK	
STACK AREA (SQUARE METERS)=	7.516
STACK VELOCITY (ACTUAL, M/MIN)=	402
FLOW RATE (ACTUAL, CUBIC M/MIN)=	3,024
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	1,869
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	1,452

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.1386
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0446
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	0.0214
EMISSION RATE (KG/HR)=	3.88

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.1386
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0446
PARTICULATE LOADING, ACTUAL (G/CU. M)=	0.0214
EMISSION RATE (KG/HR)=	3.88
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESP012
RUN # - ESP012
LOCATION - IDEAL
DATE - 5-4-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.10	1.70	360	72	72
2	0.05	1.00	360	75	73
3	0.08	1.80	365	81	74
4	0.11	1.50	340	90	82
5	0.10	1.40	340	95	85
6	0.10	1.40	340	100	88
7	0.09	1.40	340	95	90
8	0.10	1.80	340	104	95
9	0.08	1.45	345	110	95
10	0.09	1.60	345	114	100
11	0.12	2.30	345	110	100
12	0.12	1.80	340	119	104
13	0.09	1.60	345	120	104
14	0.09	1.60	340	120	105
15	0.07	1.30	340	120	105
16	0.09	1.60	340	120	110
17	0.10	1.80	345	120	110

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	1.7161	1.5843	0.0001	0.1317

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	67.9444	67.9379	20.0	0.0069
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESP022B
RUN # - ESP022B
LOCATION - IDEAL
DATE - 5-6-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	513.973
FINAL METER VOLUME (CUBIC FEET)=	617.030
METER FACTOR= 1.058	
NET METER VOLUME (CUBIC FEET)=	109.034
GAS VOLUME (DRY STANDARD CUBIC FEET)=	101.700
BAROMETRIC PRESSURE (IN. HG)=	28.87
STATIC PRESSURE (INCHES H2O)=	-6.40
PERCENT OXYGEN=	8.00
PERCENT CARBON DIOXIDE=	19.00
MOISTURE COLLECTED (ML)=	899.0
PERCENT WATER=	29.40
AVERAGE METER TEMPERATURE (F.)=	88.3
AVERAGE DELTA H (IN. H2O)=	1.64
AVERAGE DELTA P (IN. H2O)=	0.09
AVERAGE STACK TEMPERATURE (F.)=	309.5
DRY MOLECULAR WEIGHT=	31.360
WET MOLECULAR WEIGHT=	27.433
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.2929
% ISOKINETIC=	112.1
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	149.0
NOZZLE DIAMETER (INCHES)=	0.4400
STACK AXIS #1 (INCHES)=	108.00
STACK AXIS #2 (INCHES)=	107.88
RECTANGULAR STACK	
STACK AREA (SQUARE FEET)=	80.906
STACK VELOCITY (ACTUAL, FEET/MIN)=	1,254
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	101,475
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	66,093
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	46,664

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.1585
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0240
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0110
EMISSION RATE (LB/HR)=	9.60

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.1585
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0240
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0110
EMISSION RATE (LB/HR)=	9.60
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESP022B
RUN # - ESP022B
LOCATION - IDEAL
DATE - 5-6-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	14.554
FINAL METER VOLUME (CUBIC METERS)=	17.472
METER FACTOR= 1.058	
NET METER VOLUME (CUBIC METERS)=	3.087
GAS VOLUME (DRY STANDARD CUBIC METERS)=	2.880
BAROMETRIC PRESSURE (MM HG)=	733.30
STATIC PRESSURE (MM H20)=	-162.6
PERCENT OXYGEN=	8.00
PERCENT CARBON DIOXIDE=	19.00
MOISTURE COLLECTED (ML)=	899.0
PERCENT WATER=	29.40
AVERAGE METER TEMPERATURE (C.)=	31.3
AVERAGE DELTA H (MM H20)=	41.6
AVERAGE DELTA P (MM H20)=	2.2
AVERAGE STACK TEMPERATURE (C.)=	154.1
DRY MOLECULAR WEIGHT=	31.360
WET MOLECULAR WEIGHT=	27.433
AVERAGE SQUARE ROOT OF DELTA P (MM H20)=	1.4764
% ISOKINETIC=	112.1
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	149.0
NOZZLE DIAMETER (MM)=	11.18
STACK AXIS #1 (METERS)=	2.743
STACK AXIS #2 (METERS)=	2.740
RECTANGULAR STACK	
STACK AREA (SQUARE METERS)=	7.516
STACK VELOCITY (ACTUAL, M/MIN)=	382
FLOW RATE (ACTUAL, CUBIC M/MIN)=	2,873
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	1,872
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	1,321

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.1585
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0550
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	0.0253
EMISSION RATE (KG/HR)=	4.36

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.1585
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0550
PARTICULATE LOADING, ACTUAL (G/CU. M)=	0.0253
EMISSION RATE (KG/HR)=	4.36
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESP022B
RUN # - ESP022B
LOCATION - IDEAL
DATE - 5-6-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H2O)	DELTA H (IN. H2O)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.10	1.80	315	58	58
2	0.08	1.50	300	72	60
3	0.08	1.70	305	79	65
4	0.09	2.00	310	85	69
5	0.07	1.30	310	90	72
6	0.08	1.50	312	85	75
7	0.09	1.70	310	90	85
8	0.08	1.50	305	100	90
9	0.09	1.70	305	100	84
10	0.08	1.50	310	110	92
11	0.08	1.30	310	110	90
12	0.09	1.70	315	110	90
13	0.09	1.75	310	110	101
14	0.09	1.75	310	110	101
15	0.10	1.85	315	110	97

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	1.7201	1.5765	0.0002	0.1434

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	68.6947	68.6799	15.0	0.0151
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESP032
RUN # - ESP-O-3-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	512.610
FINAL METER VOLUME (CUBIC FEET)=	585.790
METER FACTOR= 1.004	
NET METER VOLUME (CUBIC FEET)=	73.473
GAS VOLUME (DRY STANDARD CUBIC FEET)=	68.316
BAROMETRIC PRESSURE (IN. HG)=	28.82
STATIC PRESSURE (INCHES H2O)=	-6.40
PERCENT OXYGEN=	8.33
PERCENT CARBON DIOXIDE=	17.00
MOISTURE COLLECTED (ML)=	598.0
PERCENT WATER=	29.19
AVERAGE METER TEMPERATURE (F.)=	87.7
AVERAGE DELTA H (IN. H2O)=	0.66
AVERAGE DELTA P (IN. H2O)=	0.17
AVERAGE STACK TEMPERATURE (F.)=	318.2
DRY MOLECULAR WEIGHT=	31.053
WET MOLECULAR WEIGHT=	27.243
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.4060
% ISOKINETIC=	99.8
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	170.0
NOZZLE DIAMETER (INCHES)=	0.3040
STACK AXIS #1 (INCHES)=	108.00
STACK AXIS #2 (INCHES)=	107.88
RECTANGULAR STACK	
STACK AREA (SQUARE FEET)=	80.906
STACK VELOCITY (ACTUAL, FEET/MIN)=	1,756
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	142,062
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	91,324
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	64,664

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0225
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0051
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0023
EMISSION RATE (LB/HR)=	2.81

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0225
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0051
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0023
EMISSION RATE (LB/HR)=	2.81
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESP032
RUN # - ESP-0-3-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	14.515
FINAL METER VOLUME (CUBIC METERS)=	16.587
METER FACTOR= 1.004	
NET METER VOLUME (CUBIC METERS)=	2.080
GAS VOLUME (DRY STANDARD CUBIC METERS)=	1.934
BAROMETRIC PRESSURE (MM HG)=	732.03
STATIC PRESSURE (MM H20)=	-162.6
PERCENT OXYGEN=	8.33
PERCENT CARBON DIOXIDE=	17.00
MOISTURE COLLECTED (ML)=	598.0
PERCENT WATER=	29.19
AVERAGE METER TEMPERATURE (C.)=	30.9
AVERAGE DELTA H (MM H20)=	16.6
AVERAGE DELTA P (MM H20)=	4.2
AVERAGE STACK TEMPERATURE (C.)=	159.0
DRY MOLECULAR WEIGHT=	31.053
WET MOLECULAR WEIGHT=	27.243
AVERAGE SQUARE ROOT OF DELTA P (MM H20)=	2.0462
% ISOKINETIC=	99.8
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	170.0
NOZZLE DIAMETER (MM)=	7.72
STACK AXIS #1 (METERS)=	2.743
STACK AXIS #2 (METERS)=	2.740
RECTANGULAR STACK	
STACK AREA (SQUARE METERS)=	7.516
STACK VELOCITY (ACTUAL, M/MIN)=	535
FLOW RATE (ACTUAL, CUBIC M/MIN)=	4,023
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	2,586
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	1,831

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0225
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0116
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	0.0053
EMISSION RATE (KG/HR)=	1.28

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0225
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0116
PARTICULATE LOADING, ACTUAL (G/CU. M)=	0.0053
EMISSION RATE (KG/HR)=	1.28
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESP032
RUN # - ESP-O-3-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H2O)	DELTA H (IN. H2O)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.15	0.75	320	80	80
2	0.14	0.70	340	84	82
3	0.14	0.68	330	88	82
4	0.18	0.95	330	89	83
5	0.18	0.95	325	89	84
6	0.18	0.92	315	90	85
7	0.17	0.78	315	90	80
8	0.18	0.80	320	90	85
9	0.18	0.55	315	92	85
10	0.19	0.57	315	94	87
11	0.17	0.57	315	94	88
12	0.17	0.55	315	94	88
13	0.17	0.54	313	92	88
14	0.17	0.55	315	92	88
15	0.15	0.44	315	92	88
16	0.16	0.47	307	91	88
17	0.13	0.37	305	91	88

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	1.5962	1.5796	0.0003	0.0163

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	77.2557	77.2503	40.0	0.0062
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

FILE NAME - ESP042
RUN # - ESP-O-4-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC FEET)=	585.815
FINAL METER VOLUME (CUBIC FEET)=	698.702
METER FACTOR= 1.004	
NET METER VOLUME (CUBIC FEET)=	113.339
GAS VOLUME (DRY STANDARD CUBIC FEET)=	101.651
BAROMETRIC PRESSURE (IN. HG)=	28.88
STATIC PRESSURE (INCHES H2O)=	-6.40
PERCENT OXYGEN=	8.33
PERCENT CARBON DIOXIDE=	17.00
MOISTURE COLLECTED (ML)=	819.8
PERCENT WATER=	27.53
AVERAGE METER TEMPERATURE (F.)=	110.0
AVERAGE DELTA H (IN. H2O)=	1.35
AVERAGE DELTA P (IN. H2O)=	0.34
AVERAGE STACK TEMPERATURE (F.)=	312.9
DRY MOLECULAR WEIGHT=	31.053
WET MOLECULAR WEIGHT=	27.460
AVERAGE SQUARE ROOT OF DELTA P (IN. H2O)=	0.5868
% ISOKINETIC=	94.7
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	180.0
NOZZLE DIAMETER (INCHES)=	0.3040
STACK AXIS #1 (INCHES)=	108.00
STACK AXIS #2 (INCHES)=	107.88
RECTANGULAR STACK	
STACK AREA (SQUARE FEET)=	80.906
STACK VELOCITY (ACTUAL, FEET/MIN)=	2,516
FLOW RATE (ACTUAL, CUBIC FT/MIN)=	203,591
FLOW RATE (STANDARD, WET, CUBIC FT/MIN)=	132,061
FLOW RATE (STANDARD, DRY, CUBIC FT/MIN)=	95,707

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0187
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0028
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0013
EMISSION RATE (LB/HR)=	2.32

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0187
PARTICULATE LOADING, DRY STD. (GR./SCF)=	0.0028
PARTICULATE LOADING, ACTUAL (GR./CU. FT.)=	0.0013
EMISSION RATE (LB/HR)=	2.32
PERCENT IMPINGER CATCH=	0.0

* * METRIC UNITS * *

FILE NAME - ESP042
RUN # - ESP-O-4-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

INITIAL METER VOLUME (CUBIC METERS)=	16.588
FINAL METER VOLUME (CUBIC METERS)=	19.784
METER FACTOR= 1.004	
NET METER VOLUME (CUBIC METERS)=	3.209
GAS VOLUME (DRY STANDARD CUBIC METERS)=	2.878
BAROMETRIC PRESSURE (MM HG)=	733.55
STATIC PRESSURE (MM H2O)=	-162.6
PERCENT OXYGEN=	8.33
PERCENT CARBON DIOXIDE=	17.00
MOISTURE COLLECTED (ML)=	819.8
PERCENT WATER=	27.53
AVERAGE METER TEMPERATURE (C.)=	43.3
AVERAGE DELTA H (MM H2O)=	34.4
AVERAGE DELTA P (MM H2O)=	8.7
AVERAGE STACK TEMPERATURE (C.)=	156.0
DRY MOLECULAR WEIGHT=	31.053
WET MOLECULAR WEIGHT=	27.460
AVERAGE SQUARE ROOT OF DELTA P (MM H2O)=	2.9575
% ISOKINETIC=	94.7
PITOT COEFFICIENT=	0.8400
SAMPLING TIME (MINUTES)=	180.0
NOZZLE DIAMETER (MM)=	7.72
STACK AXIS #1 (METERS)=	2.743
STACK AXIS #2 (METERS)=	2.740
RECTANGULAR STACK	
STACK AREA (SQUARE METERS)=	7.516
STACK VELOCITY (ACTUAL, M/MIN)=	767
FLOW RATE (ACTUAL, CUBIC M/MIN)=	5,765
FLOW RATE (STANDARD, WET, CUBIC M/MIN)=	3,740
FLOW RATE (STANDARD, DRY, CUBIC M/MIN)=	2,710

PARTICULATE LOADING - PARTIAL CATCH

PARTICULATE WEIGHT (G)=	0.0187
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0065
PARTICULATE LOADING, ACTUAL (G/CU. M.)=	0.0031
EMISSION RATE (KG/HR)=	1.05

PARTICULATE LOADING - TOTAL CATCH INCLUDING IMPINGERS

PARTICULATE WEIGHT (G)=	0.0187
PARTICULATE LOADING, DRY STD. (G/CU. M)=	0.0065
PARTICULATE LOADING, ACTUAL (G/CU. M)=	0.0031
EMISSION RATE (KG/HR)=	1.05
PERCENT IMPINGER CATCH=	0.0

FILE NAME - ESP042
RUN # - ESP-0-4-2
LOCATION - IDEAL
DATE - 5-5-81
PROJECT # - 4892-L03

POINT #	DELTA P (IN. H20)	DELTA H (IN. H20)	STACK T (F.)	METER T. IN(F.)	METER T. OUT(F.)
1	0.35	1.50	300	83	83
2	0.35	1.10	300	100	90
3	0.36	1.40	305	105	90
4	0.35	1.40	315	119	98
5	0.36	1.50	305	122	102
6	0.35	1.30	315	120	100
7	0.36	1.30	305	120	105
8	0.36	1.40	305	115	110
9	0.35	1.45	330	113	111
10	0.33	1.40	307	113	112
11	0.34	1.40	305	113	112
12	0.34	1.40	302	115	112
13	0.33	1.40	305	118	112
14	0.33	1.35	330	119	113
15	0.33	1.20	318	119	117
16	0.34	1.20	320	119	118
17	0.33	1.30	330	119	114
18	0.34	1.35	335	118	110

FRACTION	FINAL WT. (G)	TARE WT. (G)	BLANK WT. (G)	NET WT. (G)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	1.5969	1.5779	0.0003	0.0187

FRACTION	FINAL WT. (G)	TARE WT. (G)	VOL. (ML)	NET WT. (G)
PROBE RINSE	75.4047	76.4029	20.0	0.0000
IMPINGERS	0.0000	0.0000	0.0	0.0000

PROBE RINSE BLANK (MG/ML)=-.02
IMPINGER BLANK (MG/ML)= 0

APPENDIX G

PARTICLE SIZE COMPUTER PRINTOUTS

G-1 Electrostatic Precipitator Inlet - Andersen High Capacity Stack Sampler with 15 μm Preseparator

G-2 Electrostatic Precipitator Outlet - Andersen Mark III Impactor with 15 μm Preseparator

G-1 Electrostatic Precipitator Inlet - Andersen High Capacity Stack Sampler with 15 μm Preseparator

INPUT DATA FOR FILE ESPI11
TEST DATE - 5-2-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-1-1

% WATER= 25.50
% CARBON DIOXIDE= 20.30
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.30

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 404.4 DEGREES F.
BAR. PRESSURE= 28.91 INCHES HG
STATIC PRESSURE= -5.80 INCHES H2O
AVE. DELTA P= 0.74 INCHES H2O
PITOT COEFF.= .84
METER TEMP.= 74.0 DEGREES F.
PROBE DIA.= 0.177 INCHES

SAMPLING TIME= 24.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 404.4 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 6.015 CUBIC FEET
DELTA H= 0.19 INCHES H2O

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 5.747 CU. FT.
SAMPLE VOL.-WET STD.= 7.714 CU. FT.
STACK VELOCITY= 3850.2 FT./MIN.
NOZZLE VELOCITY= 3236.2 FT./MIN.
MASS COLLECTED= 29272.799 MG.
LOADING= 58.55968 GRAIN/SCF
LOADING(DRY)= 78.60359 GRAIN/SCF
RATE FOR 15 MICRON CYCLONE CUTOFF= 0.637 CU. FT/MIN

DRY MOLECULAR WT.= 31.58
WET MOLECULAR WT.= 28.12
% ISOKINETIC= 84.1
SAMPLING RATE-ACTUAL= 0.553 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	26617.70	2845.50	2542.80	2475.10	24894.20
TARE WT (MG)	1438.20	1438.30	1437.90	1441.40	24347.40
NET WT (MG) CORRECTED	25179.50	1407.20	1104.90	1033.70	547.50
FRACTION % OF TOTAL	86.02	4.81	3.77	3.53	1.87
CUM. % WITH FILTER	86.02	90.82	94.60	98.13	100.00
FRACTION % WITHOUT FILTER	87.66	4.90	3.85	3.60	
CUM. % WITHOUT FILTER	87.66	92.55	96.40	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	16.40	11.88	6.66	2.08	<2.08
DM/DLOGD (GRAINS/SCF)		20.09228	8.79081	4.09419	
GEO MEAN (MICRONS)		13.96	8.89	3.72	<3.72
PARTICLE COUNT		1.78D+08	1.22D+08	1.36D+08	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI21
TEST DATE - 5-4-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-2-1

% WATER= 30.51
% CARBON DIOXIDE= 21.33
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.25

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 376.3 DEGREES F.
BAR. PRESSURE= 28.69 INCHES HG
STATIC PRESSURE= -5.80 INCHES H2O
AVE. DELTA P= 0.63 INCHES H2O
PITOT COEFF.= .84
METER TEMP.= 73.9 DEGREES F.
PROBE DIA.= 0.177 INCHES

SAMPLING TIME= 24.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 376.9 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 6.250 CUBIC FEET
DELTA H= 0.22 INCHES H2O

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 5.928 CU. FT.
SAMPLE VOL.-WET STD.= 8.530 CU. FT.
STACK VELOCITY= 3543.8 FT./MIN.
NOZZLE VELOCITY= 3489.1 FT./MIN.
MASS COLLECTED= 26422.901 MG.
LOADING= 47.80217 GRAIN/SCF
LOADING(DRY)= 68.79000 GRAIN/SCF

DRY MOLECULAR WT.= 31.74
WET MOLECULAR WT.= 27.55
% ISOKINETIC= 98.5
SAMPLING RATE-ACTUAL= 0.596 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.606 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	23988.90	3122.40	2414.90	2246.90	24348.30
TARE WT (MG)	1455.30	1452.90	1456.30	1456.20	23878.50
NET WT (MG) CORRECTED	22533.60	1669.50	958.60	790.70	470.50
FRACTION % OF TOTAL	85.28	6.32	3.63	2.99	1.78
CUM. % WITH FILTER	85.28	91.60	95.23	98.22	100.00
FRACTION % WITHOUT FILTER	86.83	6.43	3.69	3.05	
CUM. % WITHOUT FILTER	86.83	93.26	96.95	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.15	11.40	6.33	1.92	<1.92
DM/DLOGD (GRAINS/SCF)		24.48814	6.78011	2.76442	
GEO MEAN (MICRONS)		13.14	8.49	3.49	<3.49
PARTICLE COUNT		2.31D+08	9.88D+07	9.81D+07	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI31
TEST DATE - 5-1-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-3-1

% WATER= 28.20
% CARBON DIOXIDE= 20.30
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.30

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 407.7 DEGREES F.
BAR. PRESSURE= 28.94 INCHES HG
STATIC PRESSURE= -5.80 INCHES H20
AVE. DELTA P= 0.84 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 75.1 DEGREES F.
PROBE DIA.= 0.157 INCHES

SAMPLING TIME= 30.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 407.7 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 7.765 CUBIC FEET
DELTA H= 0.21 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 7.413 CU. FT.
SAMPLE VOL.-WET STD.= 10.324 CU. FT.
STACK VELOCITY= 4134.8 FT./MIN.
NOZZLE VELOCITY= 4415.9 FT./MIN.
MASS COLLECTED= 15110.401 MG.
LOADING= 22.58737 GRAIN/SCF
LOADING(DRY)= 31.45873 GRAIN/SCF

DRY MOLECULAR WT.= 31.58
WET MOLECULAR WT.= 27.75
% ISOKINETIC= 106.8
SAMPLING RATE-ACTUAL= 0.594 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.641 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	13690.70	2068.90	2265.00	2375.20	24643.50
TARE WT (MG)	1448.90	1439.30	1433.00	1431.20	24181.20
NET WT (MG) CORRECTED	12241.80	629.60	832.00	944.00	463.00
FRACTION % OF TOTAL	81.02	4.17	5.51	6.25	3.06
CUM. % WITH FILTER	81.02	85.18	90.69	96.94	100.00
FRACTION % WITHOUT FILTER	83.58	4.30	5.68	6.44	
CUM. % WITHOUT FILTER	83.58	87.87	93.56	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.74	11.58	6.43	2.01	<2.01
DM/DLOGD (GRAINS/SCF)		7.05435	4.86628	2.79475	
GEO MEAN (MICRONS)		13.50	8.63	3.59	<3.59
PARTICLE COUNT		6.47D+07	6.98D+07	9.62D+07	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI41
TEST DATE - 5-2-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-4-1

% WATER= 29.20
% CARBON DIOXIDE= 20.30
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.30

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 379.3 DEGREES F.
BAR. PRESSURE= 28.77 INCHES HG
STATIC PRESSURE= -5.80 INCHES H20
AVE. DELTA P= 0.93 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 83.1 DEGREES F.
PROBE DIA.= 0.157 INCHES

SAMPLING TIME= 24.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 379.3 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 6.350 CUBIC FEET
DELTA H= 0.23 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 5.937 CU. FT.
SAMPLE VOL.-WET STD.= 8.386 CU. FT.
STACK VELOCITY= 4302.3 FT./MIN.
NOZZLE VELOCITY= 4362.9 FT./MIN.
MASS COLLECTED= 18673.300 MG.
LOADING= 34.36417 GRAIN/SCF
LOADING(DRY)= 48.53696 GRAIN/SCF
RATE FOR 15 MICRON CYCLONE CUTOFF= 0.608 CU. FT/MIN

DRY MOLECULAR WT.= 31.58
WET MOLECULAR WT.= 27.61
% ISOKINETIC= 101.4
SAMPLING RATE-ACTUAL= 0.587 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	17900.50	1899.60	2365.20	2123.10	25127.40
TARE WT (MG)	1462.80	1461.70	1467.50	1470.00	24881.20
NET WT (MG) CORRECTED	16437.70	437.90	897.70	653.10	246.90
FRACTION % OF TOTAL	88.03	2.35	4.81	3.50	1.32
CUM. % WITH FILTER	88.03	90.37	95.18	98.68	100.00
FRACTION % WITHOUT FILTER	89.21	2.38	4.87	3.54	
CUM. % WITHOUT FILTER	89.21	91.58	96.46	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.35	11.49	6.39	1.95	<1.95
DM/DLOGD (GRAINS/SCF)		6.40642	6.48443	2.32870	
GEO MEAN (MICRONS)		13.28	8.57	3.53	<3.53
PARTICLE COUNT		5.97D+07	9.37D+07	8.17D+07	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI12

TEST DATE	- 5-2-81	% WATER=	25.00
PROJECT #	- 4892-L03	% CARBON DIOXIDE=	20.30
TEST SITE	- IDEAL	% CARBON MONOXIDE=	0.00
RUN ID	- ESP-I-1-2	% OXYGEN=	8.30

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE=	384.0 DEGREES F.	SAMPLING TIME=	15.0 MIN.
BAR. PRESSURE=	28.88 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-5.80 INCHES H2O	SAMPLER TEMP. =	384.0 DEGREES F.
AVE. DELTA P=	0.62 INCHES H2O	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	4.160 CUBIC FEET
METER TEMP.=	82.3 DEGREES F.	DELTA H=	0.24 INCHES H2O
PROBE DIA.=	0.177 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	3.910 CU. FT.	DRY MOLECULAR WT.=	31.58
SAMPLE VOL.-WET STD.=	5.214 CU. FT.	WET MOLECULAR WT.=	28.19
STACK VELOCITY=	3474.4 FT./MIN.	% ISOKINETIC=	98.5
NOZZLE VELOCITY=	3420.6 FT./MIN.	SAMPLING RATE-ACTUAL=	0.584 CU. FT/MIN
MASS COLLECTED=	18060.098 MG.	CYCLONE BLANK=	0.000 MG.
LOADING=	53.45591 GRAIN/SCF	STAGE BLANK=	0.000 MG.
LOADING(DRY)=	71.27455 GRAIN/SCF	FILTER BLANK=	-0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.614 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	17355.70	2104.40	2054.60	2053.30	25143.10
TARE WT (MG)	1447.20	1457.20	1470.80	1470.20	24806.30
NET WT (MG) CORRECTED	15908.50	647.20	583.80	583.10	337.50
FRACTION % OF TOTAL	88.09	3.58	3.23	3.23	1.87
CUM. % WITH FILTER	88.09	91.67	94.90	98.13	100.00
FRACTION % WITHOUT FILTER	89.76	3.65	3.29	3.29	
CUM. % WITHOUT FILTER	89.76	93.42	96.71	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.47	11.53	6.42	1.96	<1.96
DM/DLOGD (GRAINS/SCF)		15.00950	6.78918	3.35611	
GEO MEAN (MICRONS)		13.35	8.60	3.55	<3.55
PARTICLE COUNT		1.39D+08	9.77D+07	1.17D+08	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI22

TEST DATE	- 5-4-81	% WATER=	31.15
PROJECT #	- 4892-L03	% CARBON DIOXIDE=	21.33
TEST SITE	- IDEAL	% CARBON MONOXIDE=	0.00
RUN ID	- ESP-I-2-2	% OXYGEN=	8.25

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE=	364.0 DEGREES F.	SAMPLING TIME=	24.0 MIN.
BAR. PRESSURE=	28.73 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-5.80 INCHES H20	SAMPLER TEMP. =	364.0 DEGREES F.
AVE. DELTA P=	0.82 INCHES H20	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	6.250 CUBIC FEET
METER TEMP.=	77.6 DEGREES F.	DELTA H=	0.21 INCHES H20
PROBE DIA.=	0.177 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	5.895 CU. FT.	DRY MOLECULAR WT.=	31.74
SAMPLE VOL.-WET STD.=	8.562 CU. FT.	WET MOLECULAR WT.=	27.46
STACK VELOCITY=	4016.8 FT./MIN.	% ISOKINETIC=	85.8
NOZZLE VELOCITY=	3445.8 FT./MIN.	SAMPLING RATE-ACTUAL=	0.589 CU. FT/MIN
MASS COLLECTED=	27664.000 MG.	CYCLONE BLANK=	0.000 MG.
LOADING=	49.86135 GRAIN/SCF	STAGE BLANK=	0.000 MG.
LOADING(DRY)=	72.42026 GRAIN/SCF	FILTER BLANK=	-0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.591 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	26053.40	2420.70	2200.30	2412.00	24581.20
TARE WT (MG)	1453.20	1449.40	1445.00	1444.80	24211.90
NET WT (MG) CORRECTED	24600.20	971.30	755.30	967.20	370.00
FRACTION % OF TOTAL	88.92	3.51	2.73	3.50	1.34
CUM. % WITH FILTER	88.92	92.44	95.17	98.66	100.00
FRACTION % WITHOUT FILTER	90.13	3.56	2.77	3.54	
CUM. % WITHOUT FILTER	90.13	93.69	96.46	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.03	11.39	6.34	1.90	<1.90
DM/DLOGD (GRAINS/SCF)		14.55492	5.33990	3.33599	
GEO MEAN (MICRONS)		13.09	8.50	3.47	<3.47
PARTICLE COUNT		1.38D+08	7.78D+07	1.19D+08	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI32
TEST DATE - 5-1-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-3-2

% WATER= 29.20
% CARBON DIOXIDE= 20.30
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.30

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 390.6 DEGREES F.
BAR. PRESSURE= 28.94 INCHES HG
STATIC PRESSURE= -5.80 INCHES H20
AVE. DELTA P= 0.77 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 84.6 DEGREES F.
PROBE DIA.= 0.156 INCHES

SAMPLING TIME= 24.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 390.6 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 6.330 CUBIC FEET
DELTA H= 0.21 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 5.937 CU. FT.
SAMPLE VOL.-WET STD.= 8.385 CU. FT.
STACK VELOCITY= 3916.5 FT./MIN.
NOZZLE VELOCITY= 4451.5 FT./MIN.
MASS COLLECTED= 16764.601 MG.
LOADING= 30.85355 GRAIN/SCF
LOADING(DRY)= 43.57846 GRAIN/SCF

DRY MOLECULAR WT.= 31.58
WET MOLECULAR WT.= 27.61
% ISOKINETIC= 113.7
SAMPLING RATE-ACTUAL= 0.591 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.621 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	15555.30	2341.50	2138.60	2324.30	24543.90
TARE WT (MG)	1455.80	1439.00	1446.40	1442.80	24355.70
NET WT (MG) CORRECTED	14099.50	902.50	692.20	881.50	188.90
FRACTION % OF TOTAL	84.10	5.38	4.13	5.26	1.13
CUM. % WITH FILTER	84.10	89.49	93.62	98.87	100.00
FRACTION % WITHOUT FILTER	85.06	5.44	4.18	5.32	
CUM. % WITHOUT FILTER	85.06	90.51	94.68	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.48	11.51	6.40	1.97	<1.97
DM/DLOGD (GRAINS/SCF)		12.91544	4.99139	3.17041	
GEO MEAN (MICRONS)		13.35	8.58	3.55	<3.55
PARTICLE COUNT		1.20D+08	7.20D+07	1.11D+08	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI42
TEST DATE - 5-2-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-4-2

% WATER= 28.60
% CARBON DIOXIDE= 20.30
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.30

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE=	385.6 DEGREES F.	SAMPLING TIME=	24.0 MIN.
BAR. PRESSURE=	28.75 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-5.80 INCHES H20	SAMPLER TEMP. =	385.6 DEGREES F.
AVE. DELTA P=	0.98 INCHES H20	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	6.290 CUBIC FEET
METER TEMP.=	79.9 DEGREES F.	DELTA H=	0.22 INCHES H20
PROBE DIA.=	0.157 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	5.912 CU. FT.	DRY MOLECULAR WT.=	31.58
SAMPLE VOL.-WET STD.=	8.280 CU. FT.	WET MOLECULAR WT.=	27.70
STACK VELOCITY=	4428.0 FT./MIN.	% ISOKINETIC=	98.1
NOZZLE VELOCITY=	4343.1 FT./MIN.	SAMPLING RATE-ACTUAL=	0.584 CU. FT/MIN
MASS COLLECTED=	20189.598 MG.	CYCLONE BLANK=	0.000 MG.
LOADING=	37.63062 GRAIN/SCF	STAGE BLANK=	0.000 MG.
LOADING(DRY)=	52.70395 GRAIN/SCF	FILTER BLANK=	-0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.615 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	19322.70	1888.00	2129.10	2353.80	24335.70
TARE WT (MG)	1459.40	1445.10	1443.40	1449.00	24043.50
NET WT (MG) CORRECTED	17863.30	442.90	685.70	904.80	292.90
FRACTION % OF TOTAL	88.48	2.19	3.40	4.48	1.45
CUM. % WITH FILTER	88.48	90.67	94.07	98.55	100.00
FRACTION % WITHOUT FILTER	89.78	2.23	3.45	4.55	
CUM. % WITHOUT FILTER	89.78	92.01	95.45	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.51	11.54	6.42	1.97	<1.97
DM/DLOGD (GRAINS/SCF)		6.43241	5.02128	3.28449	
GEO MEAN (MICRONS)		13.38	8.61	3.56	<3.56
PARTICLE COUNT		5.95D+07	7.22D+07	1.14D+08	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI13B
TEST DATE - 5-4-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-1-3-B

% WATER= 27.70
% CARBON DIOXIDE= 21.33
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.25

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 382.0 DEGREES F.
BAR. PRESSURE= 28.72 INCHES HG
STATIC PRESSURE= -5.80 INCHES H2O
AVE. DELTA P= 0.77 INCHES H2O
PITOT COEFF.= .84
METER TEMP.= 73.0 DEGREES F.
PROBE DIA.= 0.157 INCHES

SAMPLING TIME= 15.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 382.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 3.770 CUBIC FEET
DELTA H= 0.19 INCHES H2O

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 3.585 CU. FT.
SAMPLE VOL.-WET STD.= 4.959 CU. FT.
STACK VELOCITY= 3901.8 FT./MIN.
NOZZLE VELOCITY= 4148.4 FT./MIN.
MASS COLLECTED= 25590.900 MG.
LOADING= 79.64325 GRAIN/SCF
LOADING(DRY)= 110.15664 GRAIN/SCF

DRY MOLECULAR WT.= 31.74
WET MOLECULAR WT.= 27.94
% ISOKINETIC= 106.3
SAMPLING RATE-ACTUAL= 0.558 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.611 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	24233.90	2494.30	2254.50	2223.90	24895.50
TARE WT (MG)	1446.00	1440.60	1437.20	1448.10	24740.00
NET WT (MG) CORRECTED	22787.90	1053.70	817.30	775.80	156.20
FRACTION % OF TOTAL	89.05	4.12	3.19	3.03	0.61
CUM. % WITH FILTER	89.05	93.16	96.36	99.39	100.00
FRACTION % WITHOUT FILTER	89.59	4.14	3.21	3.05	
CUM. % WITHOUT FILTER	89.59	93.74	96.95	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.89	11.72	6.56	2.01	<2.01
DM/DLOGD (GRAINS/SCF)		24.81587	10.09922	4.69900	
GEO MEAN (MICRONS)		13.65	8.77	3.63	<3.63
PARTICLE COUNT		2.25D+08	1.42D+08	1.60D+08	

THE CYCLONE D50 ASSUMES A (-.63) POWER OF FLOW RATE (SRI CYCLONE I).

INPUT DATA FOR FILE ESPI23
TEST DATE - 5-5-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-2-3

% WATER= 29.90
% CARBON DIOXIDE= 21.33
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.25

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 344.3 DEGREES F.
BAR. PRESSURE= 28.85 INCHES HG
STATIC PRESSURE= -5.80 INCHES H2O
AVE. DELTA P= 0.75 INCHES H2O
PITOT COEFF.= .84
METER TEMP.= 76.0 DEGREES F.
PROBE DIA.= 0.176 INCHES

SAMPLING TIME= 21.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 344.3 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 5.260 CUBIC FEET
DELTA H= 0.20 INCHES H2O

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 4.997 CU. FT.
SAMPLE VOL.-WET STD.= 7.128 CU. FT.
STACK VELOCITY= 3775.5 FT./MIN.
NOZZLE VELOCITY= 3222.8 FT./MIN.
MASS COLLECTED= 22802.402 MG.
LOADING= 49.36799 GRAIN/SCF
LOADING(DRY)= 70.42509 GRAIN/SCF

DRY MOLECULAR WT.= 31.74
WET MOLECULAR WT.= 27.63
% ISOKINETIC= 85.4
SAMPLING RATE-ACTUAL= 0.544 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.568 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	21891.40	2318.00	2053.80	2156.50	24489.80
TARE WT (MG)	1444.50	1454.00	1440.20	1434.00	24335.10
NET WT (MG) CORRECTED	20446.90	864.00	613.60	722.50	155.40
FRACTION % OF TOTAL	89.67	3.79	2.69	3.17	0.68
CUM. % WITH FILTER	89.67	93.46	96.15	99.32	100.00
FRACTION % WITHOUT FILTER	90.29	3.82	2.71	3.19	
CUM. % WITHOUT FILTER	90.29	94.10	96.81	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.41	11.64	6.54	1.94	<1.94
DM/DLOGD (GRAINS/SCF)		15.35030	5.30636	2.96217	
GEO MEAN (MICRONS)		13.39	8.72	3.56	<3.56
PARTICLE COUNT		1.42D+08	7.53D+07	1.03D+08	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI33
TEST DATE - 5-5-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-3-3

% WATER= 32.20
% CARBON DIOXIDE= 21.33
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.25

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 364.0 DEGREES F.
BAR. PRESSURE= 28.84 INCHES HG
STATIC PRESSURE= -5.80 INCHES H20
AVE. DELTA P= 0.89 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 63.9 DEGREES F.
PROBE DIA.= 0.157 INCHES

SAMPLING TIME= 21.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 364.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 5.240 CUBIC FEET
DELTA H= 0.20 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 5.091 CU. FT.
SAMPLE VOL.-WET STD.= 7.509 CU. FT.
STACK VELOCITY= 4187.6 FT./MIN.
NOZZLE VELOCITY= 4372.4 FT./MIN.
MASS COLLECTED= 24732.099 MG.
LOADING= 50.83122 GRAIN/SCF
LOADING(DRY)= 74.97229 GRAIN/SCF

DRY MOLECULAR WT.= 31.74
WET MOLECULAR WT.= 27.32
% ISOKINETIC= 104.4
SAMPLING RATE-ACTUAL= 0.588 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.591 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	24086.40	2053.90	2050.40	2091.20	24510.40
TARE WT (MG)	1460.80	1449.70	1446.40	1440.10	24263.90
NET WT (MG) CORRECTED	22625.60	604.20	604.00	651.10	247.20
FRACTION % OF TOTAL	91.48	2.44	2.44	2.63	1.00
CUM. % WITH FILTER	91.48	93.93	96.37	99.00	100.00
FRACTION % WITHOUT FILTER	92.41	2.47	2.47	2.66	
CUM. % WITHOUT FILTER	92.41	94.87	97.34	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.05	11.40	6.34	1.90	<1.90
DM/DLOGD (GRAINS/SCF)		10.30935	4.87128	2.56097	
GEO MEAN (MICRONS)		13.10	8.50	3.47	<3.47
PARTICLE COUNT		9.74D+07	7.09D+07	9.12D+07	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI43
TEST DATE - 5-6-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-4-3

% WATER= 31.50
% CARBON DIOXIDE= 21.00
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.00

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 362.9 DEGREES F.
BAR. PRESSURE= 28.88 INCHES HG
STATIC PRESSURE= -5.80 INCHES H20
AVE. DELTA P= 1.03 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 63.7 DEGREES F.
PROBE DIA.= 0.157 INCHES

SAMPLING TIME= 21.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 362.9 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 5.470 CUBIC FEET
DELTA H= 0.21 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 5.324 CU. FT.
SAMPLE VOL.-WET STD.= 7.772 CU. FT.
STACK VELOCITY= 4494.4 FT./MIN.
NOZZLE VELOCITY= 4513.5 FT./MIN.
MASS COLLECTED= 32740.502 MG.
LOADING= 65.00883 GRAIN/SCF
LOADING(DRY)= 94.90339 GRAIN/SCF

DRY MOLECULAR WT.= 31.68
WET MOLECULAR WT.= 27.37
% ISOKINETIC= 100.4
SAMPLING RATE-ACTUAL= 0.607 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.589 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	27181.30	5510.80	2772.00	2812.10	25014.50
TARE WT (MG)	1449.60	1454.40	1454.60	1460.60	24731.70
NET WT (MG) CORRECTED	25731.70	4056.40	1317.40	1351.50	283.50
FRACTION % OF TOTAL	78.59	12.39	4.02	4.13	0.87
CUM. % WITH FILTER	78.59	90.98	95.01	99.13	100.00
FRACTION % WITHOUT FILTER	79.28	12.50	4.06	4.16	
CUM. % WITHOUT FILTER	79.28	91.78	95.84	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	14.73	11.26	6.24	1.87	<1.87
DM/DLOGD (GRAINS/SCF)		69.10830	10.18979	5.12250	
GEO MEAN (MICRONS)		12.88	8.38	3.41	<3.41
PARTICLE COUNT		6.64D+08	1.50D+08	1.86D+08	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI14
TEST DATE - 5-4-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-1-4

% WATER= 27.70
% CARBON DIOXIDE= 21.33
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.25

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE=	374.0 DEGREES F.	SAMPLING TIME=	15.0 MIN.
BAR. PRESSURE=	28.72 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-5.80 INCHES H20	SAMPLER TEMP. =	374.0 DEGREES F.
AVE. DELTA P=	0.71 INCHES H20	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	3.900 CUBIC FEET
METER TEMP.=	73.8 DEGREES F.	DELTA H=	0.21 INCHES H20
PROBE DIA.=	0.157 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	3.703 CU. FT.	DRY MOLECULAR WT.=	31.74
SAMPLE VOL.-WET STD.=	5.122 CU. FT.	WET MOLECULAR WT.=	27.94
STACK VELOCITY=	3718.4 FT./MIN.	% ISOKINETIC=	114.1
NOZZLE VELOCITY=	4244.5 FT./MIN.	SAMPLING RATE-ACTUAL=	0.571 CU. FT/MIN
MASS COLLECTED=	23568.100 MG.	CYCLONE BLANK=	0.000 MG.
LOADING=	71.00580 GRAIN/SCF	STAGE BLANK=	0.000 MG.
LOADING(DRY)=	98.20996 GRAIN/SCF	FILTER BLANK=	-0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.602 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	22774.20	2206.80	2147.80	2081.40	24693.40
TARE WT (MG)	1444.00	1439.60	1440.80	1450.30	24561.50
NET WT (MG) CORRECTED	21330.20	767.20	707.00	631.10	132.60
FRACTION % OF TOTAL	90.50	3.26	3.00	2.68	0.56
CUM. % WITH FILTER	90.50	93.76	96.76	99.44	100.00
FRACTION % WITHOUT FILTER	91.02	3.27	3.02	2.69	
CUM. % WITHOUT FILTER	91.02	94.29	97.31	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.52	11.58	6.47	1.96	<1.96
DM/DLOGD (GRAINS/SCF)		18.19587	8.41490	3.67318	
GEO MEAN (MICRONS)		13.41	8.65	3.56	<3.56
PARTICLE COUNT		1.68D+08	1.20D+08	1.28D+08	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI24
TEST DATE - 5-5-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-2-4

% WATER= 27.56
% CARBON DIOXIDE= 21.33
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.25

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 359.3 DEGREES F.
BAR. PRESSURE= 28.82 INCHES HG
STATIC PRESSURE= -5.80 INCHES H20
AVE. DELTA P= 0.71 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 74.4 DEGREES F.
PROBE DIA.= 0.176 INCHES

SAMPLING TIME= 21.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 359.3 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 5.260 CUBIC FEET
DELTA H= 0.20 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 5.006 CU. FT.
SAMPLE VOL.-WET STD.= 6.911 CU. FT.
STACK VELOCITY= 3688.1 FT./MIN.
NOZZLE VELOCITY= 3186.5 FT./MIN.
MASS COLLECTED= 26047.801 MG.
LOADING= 58.16338 GRAIN/SCF
LOADING(DRY)= 80.29180 GRAIN/SCF

DRY MOLECULAR WT.= 31.74
WET MOLECULAR WT.= 27.96
% ISOKINETIC= 86.4
SAMPLING RATE-ACTUAL= 0.538 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.585 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	24742.30	2141.20	2505.80	2225.20	24306.90
TARE WT (MG)	1444.40	1435.60	1439.70	1449.10	24105.50
NET WT (MG) CORRECTED	23297.90	705.60	1066.10	776.10	202.10
FRACTION % OF TOTAL	89.44	2.71	4.09	2.98	0.78
CUM. % WITH FILTER	89.44	92.15	96.24	99.22	100.00
FRACTION % WITHOUT FILTER	90.14	2.73	4.12	3.00	
CUM. % WITHOUT FILTER	90.14	92.87	97.00	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.81	11.77	6.62	1.99	<1.99
DM/DLOGD (GRAINS/SCF)		12.27902	9.53081	3.32223	
GEO MEAN (MICRONS)		13.64	8.83	3.63	<3.63
PARTICLE COUNT		1.11D+08	1.34D+08	1.13D+08	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI34
TEST DATE - 5-5-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-3-4

% WATER= 32.10
% CARBON DIOXIDE= 21.33
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.25

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 346.0 DEGREES F.
BAR. PRESSURE= 28.88 INCHES HG
STATIC PRESSURE= -5.80 INCHES H20
AVE. DELTA P= 0.83 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 63.0 DEGREES F.
PROBE DIA.= 0.157 INCHES

SAMPLING TIME= 21.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 346.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 5.060 CUBIC FEET
DELTA H= 0.18 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 4.931 CU. FT.
SAMPLE VOL.-WET STD.= 7.262 CU. FT.
STACK VELOCITY= 3995.8 FT./MIN.
NOZZLE VELOCITY= 4130.8 FT./MIN.
MASS COLLECTED= 15529.302 MG.
LOADING= 32.99950 GRAIN/SCF
LOADING(DRY)= 48.60014 GRAIN/SCF

DRY MOLECULAR WT.= 31.74
WET MOLECULAR WT.= 27.33
% ISOKINETIC= 103.4
SAMPLING RATE-ACTUAL= 0.555 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.570 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	15282.30	1822.80	1958.60	2100.80	24732.80
TARE WT (MG)	1434.10	1445.70	1447.80	1451.40	24589.70
NET WT (MG) CORRECTED	13848.20	377.10	510.80	649.40	143.80
FRACTION % OF TOTAL	89.17	2.43	3.29	4.18	0.93
CUM. % WITH FILTER	89.17	91.60	94.89	99.07	100.00
FRACTION % WITHOUT FILTER	90.01	2.45	3.32	4.22	
CUM. % WITHOUT FILTER	90.01	92.46	95.78	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	15.25	11.56	6.48	1.92	<1.92
DM/DLOGD (GRAINS/SCF)		6.65720	4.31621	2.61283	
GEO MEAN (MICRONS)		13.28	8.65	3.53	<3.53
PARTICLE COUNT		6.21D+07	6.17D+07	9.17D+07	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESPI44
TEST DATE - 5-6-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-I-4-4

% WATER= 24.00
% CARBON DIOXIDE= 21.00
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.00

ANDERSEN MODEL HCSS IMPACTOR W/15 MICRON CYCLONE

STACK TEMPERATURE= 382.0 DEGREES F.
BAR. PRESSURE= 28.84 INCHES HG
STATIC PRESSURE= -5.80 INCHES H20
AVE. DELTA P= 1.00 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 66.4 DEGREES F.
PROBE DIA.= 0.157 INCHES

SAMPLING TIME= 18.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 382.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 4.570 CUBIC FEET
DELTA H= 0.20 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 4.419 CU. FT.
SAMPLE VOL.-WET STD.= 5.814 CU. FT.
STACK VELOCITY= 4401.0 FT./MIN.
NOZZLE VELOCITY= 4036.4 FT./MIN.
MASS COLLECTED= 25331.900 MG.
LOADING= 67.23561 GRAIN/SCF
LOADING(DRY)= 88.46791 GRAIN/SCF

DRY MOLECULAR WT.= 31.68
WET MOLECULAR WT.= 28.40
% ISOKINETIC= 91.7
SAMPLING RATE-ACTUAL= 0.543 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= 0.000 MG.
FILTER BLANK= -0.700 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.611 CU. FT/MIN

STAGE #	15 MICRON	1	2	CYCLONE	FILTER
FINAL WT (MG)	23428.90	2543.10	2460.50	2321.90	24555.00
TARE WT (MG)	1456.50	1454.70	1456.30	1450.80	24159.90
NET WT (MG) CORRECTED	21972.40	1088.40	1004.20	871.10	395.80
FRACTION % OF TOTAL	86.74	4.30	3.96	3.44	1.56
CUM. % WITH FILTER	86.74	91.03	95.00	98.44	100.00
FRACTION % WITHOUT FILTER	88.11	4.36	4.03	3.49	
CUM. % WITHOUT FILTER	88.11	92.48	96.51	100.00	
JET VEL. (CM/SEC)	0	0	0	0	
D50 SIZE (MICRONS)	16.17	11.85	6.66	2.04	<2.04
DM/DLOGD (GRAINS/SCF)		21.39597	10.64957	4.50558	
GEO MEAN (MICRONS)		13.84	8.88	3.69	<3.69
PARTICLE COUNT		1.91D+08	1.48D+08	1.51D+08	

THE CYCLONE D50 ASSUMES A (-.63) POWER OF FLOW RATE (SRI CYCLONE I).

G-2 Electrostatic Precipitator Outlet - Andersen Mark III Impactor with 15 μm Preseparator

INPUT DATA FOR FILE ESP011C

TEST DATE - 5-6-81		% WATER=	29.70
PROJECT # - 4892-L03		% CARBON DIOXIDE=	19.00
TEST SITE - IDEAL		% CARBON MONOXIDE=	0.00
RUN ID - ESP-0-1-1-C		% OXYGEN=	8.00

ANDERSEN MODEL III IMPACTOR W/CYCLONE

STACK TEMPERATURE=	316.5 DEGREES F.	SAMPLING TIME=	180.0 MIN.
BAR. PRESSURE=	28.82 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-6.40 INCHES H20	SAMPLER TEMP. =	316.5 DEGREES F.
AVE. DELTA P=	0.10 INCHES H20	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	48.730 CUBIC FEET
METER TEMP.=	89.3 DEGREES F.	DELTA H=	0.18 INCHES H20
PROBE DIA.=	0.275 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	45.121 CU. FT.	DRY MOLECULAR WT.=	31.36
SAMPLE VOL.-WET STD.=	64.184 CU. FT.	WET MOLECULAR WT.=	27.39
STACK VELOCITY=	1348.6 FT./MIN.	% ISOKINETIC=	99.5
NOZZLE VELOCITY=	1342.3 FT./MIN.	SAMPLING RATE-ACTUAL=	0.554 CU. FT/MIN
MASS COLLECTED=	15.750 MG.	CYCLONE BLANK=	0.000 MG.
LOADING=	0.00379 GRAIN/SCF	STAGE BLANK=	-1.000 MG.
LOADING(DRY)=	0.00539 GRAIN/SCF	FILTER BLANK=	-0.930 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.536 CU. FT/MIN

STAGE #	CYCLONE	0	1	2	3	4	5	6	7	FILTER
FINAL WT (MG)	249.25	393.82	392.36	398.72	386.31	393.56	387.26	400.56	383.62	457.08
TARE WT (MG)	248.06	394.35	393.32	399.50	386.96	394.02	386.47	399.64	381.12	452.28
NET WT (MG) CORRECTED	1.19	0.47	0.04	0.22	0.35	0.54	1.79	1.92	3.50	5.73
FRACTION % OF TOTAL	7.56	2.98	0.25	1.40	2.22	3.43	11.37	12.19	22.22	36.38
CUM. % WITH FILTER	7.56	10.54	10.79	12.19	14.41	17.84	29.21	41.40	63.62	100.00
FRACTION % WITHOUT FILTER	11.88	4.69	0.40	2.20	3.49	5.39	17.86	19.16	34.93	
CUM. % WITHOUT FILTER	11.88	16.57	16.97	19.16	22.65	28.04	45.91	65.07	100.00	
JET VEL. (CM/SEC)	0	48	90	151	249	443	1072	1953	3306	
D50 SIZE (MICRONS)	14.70	14.26	8.89	6.01	4.08	2.60	1.28	0.77	0.56	<0.56
DM/DLOGD (GRAINS/SCF)		0.00854	0.00005	0.00031	0.00050	0.00067	0.00139	0.00209	0.00618	
GEO MEAN (MICRONS)		14.48	11.26	7.31	4.95	3.26	1.82	0.99	0.66	<0.66
PARTICLE COUNT		7.3D+04	5.1D+02	5.3D+03	1.3D+04	2.5D+04	9.5D+04	2.6D+05	1.2D+06	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESP021B
TEST DATE - 5-6-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-0-2-1-B

% WATER= 28.40
% CARBON DIOXIDE= 19.00
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.00

ANDERSEN MODEL III IMPACTOR W/CYCLONE

STACK TEMPERATURE= 330.2 DEGREES F.
BAR. PRESSURE= 28.87 INCHES HG
STATIC PRESSURE= -6.40 INCHES H20
AVE. DELTA P= 0.08 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 88.5 DEGREES F.
PROBE DIA.= 0.273 INCHES

SAMPLING TIME= 180.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 330.2 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 44.438 CUBIC FEET
DELTA H= 0.18 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 41.278 CU. FT.
SAMPLE VOL.-WET STD.= 57.651 CU. FT.
STACK VELOCITY= 1239.5 FT./MIN.
NOZZLE VELOCITY= 1242.8 FT./MIN.
MASS COLLECTED= 14.750 MG.
LOADING= 0.00395 GRAIN/SCF
LOADING(DRY)= 0.00551 GRAIN/SCF

DRY MOLECULAR WT.= 31.36
WET MOLECULAR WT.= 27.57
% ISOKINETIC= 100.3
SAMPLING RATE-ACTUAL= 0.505 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= -1.000 MG.
FILTER BLANK= -0.930 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.552 CU. FT/MIN

STAGE #	CYCLONE	0	1	2	3	4	5	6	7	FILTER
FINAL WT (MG)	239.52	386.46	399.92	401.30	386.09	391.78	397.20	401.24	387.68	454.72
TARE WT (MG)	239.01	387.15	400.76	401.96	386.76	392.07	395.28	400.18	386.30	450.62
NET WT (MG) CORRECTED	0.51	0.31	0.16	0.34	0.33	0.71	2.92	2.06	2.38	5.03
FRACTION % OF TOTAL	3.46	2.10	1.08	2.30	2.24	4.81	19.80	13.97	16.14	34.10
CUM. % WITH FILTER	3.46	5.56	6.64	8.95	11.19	16.00	35.80	49.76	65.90	100.00
FRACTION % WITHOUT FILTER	5.25	3.19	1.65	3.50	3.39	7.30	30.04	21.19	24.49	
CUM. % WITHOUT FILTER	5.25	8.44	10.08	13.58	16.97	24.28	54.32	75.51	100.00	
JET VEL. (CM/SEC)	0	44	82	138	227	404	978	1782	3016	
D50 SIZE (MICRONS)	15.86	15.03	9.37	6.34	4.30	2.75	1.35	0.82	0.60	<0.60
DM/DLOGD (GRAINS/SCF)		0.00355	0.00021	0.00054	0.00053	0.00098	0.00254	0.00251	0.00471	
GEO MEAN (MICRONS)		15.44	11.87	7.70	5.22	3.44	1.93	1.05	0.70	<0.70
PARTICLE COUNT		2.8D+04	2.2D+03	8.6D+03	1.2D+04	3.5D+04	1.6D+05	3.0D+05	8.4D+05	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESP031

TEST DATE	- 5-2-81	% WATER=	27.70
PROJECT #	- 4892-L03	% CARBON DIOXIDE=	17.67
TEST SITE	- IDEAL	% CARBON MONOXIDE=	0.00
RUN ID	- ESP-0-3-1	% OXYGEN=	8.33

ANDERSEN MODEL III IMPACTOR W/CYCLONE

STACK TEMPERATURE=	341.4 DEGREES F.	SAMPLING TIME=	180.0 MIN.
BAR. PRESSURE=	28.83 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-6.40 INCHES H20	SAMPLER TEMP. =	341.4 DEGREES F.
AVE. DELTA P=	0.24 INCHES H20	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	54.024 CUBIC FEET
METER TEMP.=	97.6 DEGREES F.	DELTA H=	0.24 INCHES H20
PROBE DIA.=	0.235 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	49.307 CU. FT.	DRY MOLECULAR WT.=	31.16
SAMPLE VOL.-WET STD.=	68.197 CU. FT.	WET MOLECULAR WT.=	27.51
STACK VELOCITY=	2138.9 FT./MIN.	% ISOKINETIC=	94.2
NOZZLE VELOCITY=	2015.1 FT./MIN.	SAMPLING RATE-ACTUAL=	0.607 CU. FT/MIN
MASS COLLECTED=	8.860 MG.	CYCLONE BLANK=	0.000 MG.
LOADING=	0.00200 GRAIN/SCF	STAGE BLANK=	-0.930 MG.
LOADING(DRY)=	0.00277 GRAIN/SCF	FILTER BLANK=	-0.890 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.565 CU. FT/MIN

STAGE #	CYCLONE	0	1	2	3	4	5	6	7	FILTER
FINAL WT (MG)	245.08	400.45	405.55	390.60	390.32	396.99	384.26	397.15	384.24	464.24
TARE WT (MG)	244.99	399.23	406.44	391.57	391.40	397.90	385.14	398.10	385.35	458.62
NET WT (MG) CORRECTED	0.09	2.15	0.04	0.00	0.00	0.02	0.05	0.00	0.00	6.51
FRACTION % OF TOTAL	1.02	24.27	0.45	0.00	0.00	0.23	0.56	0.00	0.00	73.48
CUM. % WITH FILTER	1.02	25.28	25.73	25.73	25.73	25.96	26.52	26.52	26.52	100.00
FRACTION % WITHOUT FILTER	3.83	91.49	1.70	0.00	0.00	0.85	2.13	0.00	0.00	
CUM. % WITHOUT FILTER	3.83	95.32	97.02	97.02	97.02	97.87	100.00	100.00	100.00	
JET VEL. (CM/SEC)	0	53	99	165	273	486	1175	2141	3624	
D50 SIZE (MICRONS)	14.34	13.77	8.58	5.80	3.93	2.51	1.23	0.74	0.53	<0.53
DM/DLOGD (GRAINS/SCF)		0.02782	0.00004	0.00000	0.00000	0.00002	0.00004	0.00000	0.00000	
GEO MEAN (MICRONS)		14.05	10.87	7.05	4.77	3.14	1.75	0.95	0.63	<0.63
PARTICLE COUNT		2.5D+05	5.0D+02	0.0D+00	0.0D+00	9.1D+02	2.6D+03	0.0D+00	0.0D+00	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESP041
TEST DATE - 5-4-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-0-4-1

% WATER= 29.70
% CARBON DIOXIDE= 16.67
% CARBON MONOXIDE= 0.00
% OXYGEN= 5.83

ANDERSEN MODEL III IMPACTOR W/CYCLONE

STACK TEMPERATURE= 341.0 DEGREES F.
BAR. PRESSURE= 28.67 INCHES HG
STATIC PRESSURE= -6.40 INCHES H20
AVE. DELTA P= 0.38 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 97.8 DEGREES F.
PROBE DIA.= 0.195 INCHES

SAMPLING TIME= 180.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 341.0 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 49.865 CUBIC FEET
DELTA H= 0.21 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 45.235 CU. FT.
SAMPLE VOL.-WET STD.= 64.346 CU. FT.
STACK VELOCITY= 2720.5 FT./MIN.
NOZZLE VELOCITY= 2775.5 FT./MIN.
MASS COLLECTED= 312.440 MG.
LOADING= 0.07493 GRAIN/SCF
LOADING(DRY)= 0.10659 GRAIN/SCF

DRY MOLECULAR WT.= 30.90
WET MOLECULAR WT.= 27.07
% ISOKINETIC= 102.0
SAMPLING RATE-ACTUAL= 0.576 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= -1.010 MG.
FILTER BLANK= -0.920 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.564 CU. FT/MIN

STAGE #	CYCLONE	0	1	2	3	4	5	6	7	FILTER
FINAL WT (MG)	536.72	402.08	389.41	397.93	384.92	397.47	391.12	399.20	391.26	454.28
TARE WT (MG)	247.00	395.23	388.82	396.22	384.27	397.08	391.15	398.94	389.94	452.30
NET WT (MG) CORRECTED	289.72	7.86	1.60	2.72	1.66	1.40	0.98	1.27	2.33	2.90
FRACTION % OF TOTAL	92.73	2.52	0.51	0.87	0.53	0.45	0.31	0.41	0.75	0.93
CUM. % WITH FILTER	92.73	95.24	95.76	96.63	97.16	97.61	97.92	98.33	99.07	100.00
FRACTION % WITHOUT FILTER	93.60	2.54	0.52	0.88	0.54	0.45	0.32	0.41	0.75	
CUM. % WITHOUT FILTER	93.60	96.14	96.65	97.53	98.07	98.52	98.84	99.25	100.00	
JET VEL. (CM/SEC)	0	50	94	157	259	461	1114	2031	3437	
D50 SIZE (MICRONS)	14.81	14.14	8.81	5.95	4.04	2.57	1.26	0.76	0.55	<0.55
DM/DLOGD (GRAINS/SCF)		0.09297	0.00187	0.00384	0.00236	0.00172	0.00076	0.00137	0.00406	
GEO MEAN (MICRONS)		14.47	11.16	7.24	4.90	3.22	1.80	0.98	0.65	<0.65
PARTICLE COUNT		8.0D+05	2.1D+04	6.6D+04	6.0D+04	6.6D+04	5.2D+04	1.7D+05	7.8D+05	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESP012
TEST DATE - 5-4-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-O-1-2

% WATER= 34.50
% CARBON DIOXIDE= 16.67
% CARBON MONOXIDE= 0.00
% OXYGEN= 5.83

ANDERSEN MODEL III IMPACTOR W/CYCLONE

STACK TEMPERATURE= 321.6 DEGREES F.
BAR. PRESSURE= 28.72 INCHES HG
STATIC PRESSURE= -6.40 INCHES H20
AVE. DELTA P= 0.11 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 101.1 DEGREES F.
PROBE DIA.= 0.273 INCHES

SAMPLING TIME= 180.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 321.6 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 53.953 CUBIC FEET
DELTA H= 0.23 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 48.743 CU. FT.
SAMPLE VOL.-WET STD.= 74.417 CU. FT.
STACK VELOCITY= 1461.4 FT./MIN.
NOZZLE VELOCITY= 1595.2 FT./MIN.
MASS COLLECTED= 11.740 MG.
LOADING= 0.00243 GRAIN/SCF
LOADING(DRY)= 0.00372 GRAIN/SCF

DRY MOLECULAR WT.= 30.90
WET MOLECULAR WT.= 26.45
% ISOKINETIC= 109.2
SAMPLING RATE-ACTUAL= 0.648 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= -1.010 MG.
FILTER BLANK= -0.920 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.542 CU. FT/MIN

STAGE #	CYCLONE	0	1	2	3	4	5	6	7	FILTER
FINAL WT (MG)	254.40	397.20	392.40	394.67	384.78	400.34	384.81	398.73	390.24	449.92
TARE WT (MG)	250.15	397.31	392.28	395.00	385.17	401.14	385.01	398.91	390.34	449.44
NET WT (MG) CORRECTED	4.25	0.90	1.13	0.68	0.62	0.21	0.81	0.83	0.91	1.40
FRACTION % OF TOTAL	36.20	7.67	9.63	5.79	5.28	1.79	6.90	7.07	7.75	11.93
CUM. % WITH FILTER	36.20	43.87	53.49	59.28	64.57	66.35	73.25	80.32	88.07	100.00
FRACTION % WITHOUT FILTER	41.10	8.70	10.93	6.58	6.00	2.03	7.83	8.03	8.80	
CUM. % WITHOUT FILTER	41.10	49.81	60.74	67.31	73.31	75.34	83.17	91.20	100.00	
JET VEL. (CM/SEC)	0	57	106	177	292	519	1255	2288	3872	
D50 SIZE (MICRONS)	13.40	13.19	8.22	5.55	3.76	2.40	1.17	0.70	0.51	<0.51
DM/DLOGD (GRAINS/SCF)		0.02785	0.00114	0.00083	0.00076	0.00022	0.00054	0.00077	0.00136	
GEO MEAN (MICRONS)		13.30	10.41	6.75	4.57	3.00	1.68	0.91	0.60	<0.60
PARTICLE COUNT		2.60D+05	1.40D+04	1.50D+04	2.10D+04	9.20D+03	4.00D+04	1.10D+05	2.80D+05	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESP022B
TEST DATE - 5-6-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-0-2-2-B

% WATER= 28.96
% CARBON DIOXIDE= 19.00
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.00

ANDERSEN MODEL III IMPACTOR W/CYCLONE

STACK TEMPERATURE= 300.6 DEGREES F.
BAR. PRESSURE= 28.81 INCHES HG
STATIC PRESSURE= -6.40 INCHES H20
AVE. DELTA P= 0.08 INCHES H20
PITOT COEFF.= .84
METER TEMP.= 91.1 DEGREES F.
PROBE DIA.= 0.273 INCHES

SAMPLING TIME= 180.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 300.6 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 44.438 CUBIC FEET
DELTA H= 0.18 INCHES H20

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 40.998 CU. FT.
SAMPLE VOL.-WET STD.= 57.711 CU. FT.
STACK VELOCITY= 1204.0 FT./MIN.
NOZZLE VELOCITY= 1200.1 FT./MIN.
MASS COLLECTED= 13.730 MG.
LOADING= 0.00367 GRAIN/SCF
LOADING(DRY)= 0.00517 GRAIN/SCF

DRY MOLECULAR WT.= 31.36
WET MOLECULAR WT.= 27.49
% ISOKINETIC= 99.7
SAMPLING RATE-ACTUAL= 0.488 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= -1.000 MG.
FILTER BLANK= -0.930 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.518 CU. FT/MIN

STAGE #	CYCLONE	0	1	2	3	4	5	6	7	FILTER
FINAL WT (MG)	248.86	401.43	386.42	396.94	383.84	392.14	380.84	395.05	385.37	459.32
TARE WT (MG)	247.41	402.00	387.21	397.48	384.34	392.48	379.72	394.26	384.35	456.16
NET WT (MG) CORRECTED	1.45	0.43	0.21	0.46	0.50	0.66	2.12	1.79	2.02	4.09
FRACTION % OF TOTAL	10.56	3.13	1.53	3.35	3.64	4.81	15.44	13.04	14.71	29.79
CUM. % WITH FILTER	10.56	13.69	15.22	18.57	22.21	27.02	42.46	55.50	70.21	100.00
FRACTION % WITHOUT FILTER	15.04	4.46	2.18	4.77	5.19	6.85	21.99	18.57	20.95	
CUM. % WITHOUT FILTER	15.04	19.50	21.68	26.45	31.64	38.49	60.48	79.05	100.00	
JET VEL. (CM/SEC)	0	43	80	133	220	390	944	1721	2913	
D50 SIZE (MICRONS)	15.58	15.09	9.41	6.37	4.32	2.76	1.36	0.82	0.61	<0.61
DM/DLOGD (GRAINS/SCF)		0.00828	0.00027	0.00073	0.00080	0.00091	0.00185	0.00219	0.00403	
GEO MEAN (MICRONS)		15.33	11.91	7.74	5.25	3.46	1.94	1.06	0.71	<0.71
PARTICLE COUNT		6.7D+04	2.8D+03	1.2D+04	1.9D+04	3.2D+04	1.2D+05	2.6D+05	7.1D+05	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESP032

TEST DATE	- 5-5-81	% WATER=	29.20
PROJECT #	- 4892-L03	% CARBON DIOXIDE=	17.00
TEST SITE	- IDEAL	% CARBON MONOXIDE=	0.00
RUN ID	- ESP-O-3-2	% OXYGEN=	8.33

ANDERSEN MODEL III IMPACTOR W/CYCLONE

STACK TEMPERATURE=	308.2 DEGREES F.	SAMPLING TIME=	180.0 MIN.
BAR. PRESSURE=	28.88 INCHES HG	PRESSURE DROP=	0.00 INCHES HG
STATIC PRESSURE=	-6.40 INCHES H20	SAMPLER TEMP. =	308.2 DEGREES F.
AVE. DELTA P=	0.15 INCHES H20	PARTICLE DENS=	1
PITOT COEFF.=	.84	METER VOL.=	47.387 CUBIC FEET
METER TEMP.=	79.0 DEGREES F.	DELTA H=	0.19 INCHES H20
PROBE DIA.=	0.235 INCHES		

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.=	44.808 CU. FT.	DRY MOLECULAR WT.=	31.05
SAMPLE VOL.-WET STD.=	63.287 CU. FT.	WET MOLECULAR WT.=	27.24
STACK VELOCITY=	1656.8 FT./MIN.	% ISOKINETIC=	108.0
NOZZLE VELOCITY=	1789.4 FT./MIN.	SAMPLING RATE-ACTUAL=	0.539 CU. FT/MIN
MASS COLLECTED=	2.090 MG.	CYCLONE BLANK=	0.000 MG.
LOADING=	0.00051 GRAIN/SCF	STAGE BLANK=	-1.020 MG.
LOADING(DRY)=	0.00072 GRAIN/SCF	FILTER BLANK=	-0.960 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.527 CU. FT/MIN

STAGE #	CYCLONE	0	1	2	3	4	5	6	7	FILTER
FINAL WT (MG)	261.07	400.97	350.87	371.47	375.44	393.15	398.00	396.03	388.07	434.02
TARE WT (MG)	260.23	402.00	351.77	372.19	376.25	394.03	398.94	397.00	389.13	434.63
NET WT (MG) CORRECTED	0.84	0.00	0.12	0.30	0.21	0.14	0.08	0.05	0.00	0.35
FRACTION % OF TOTAL	40.19	0.00	5.74	14.35	10.05	6.70	3.83	2.39	0.00	16.75
CUM. % WITH FILTER	40.19	40.19	45.93	60.29	70.33	77.03	80.86	83.25	83.25	100.00
FRACTION % WITHOUT FILTER	48.28	0.00	6.90	17.24	12.07	8.05	4.60	2.87	0.00	
CUM. % WITHOUT FILTER	48.28	48.28	55.17	72.41	84.48	92.53	97.13	100.00	100.00	
JET VEL. (CM/SEC)	0	47	88	147	243	431	1043	1902	3218	
D50 SIZE (MICRONS)	14.79	14.40	8.97	6.07	4.12	2.63	1.29	0.78	0.57	<0.57
DM/DLOGD (GRAINS/SCF)		0.00000	0.00014	0.00043	0.00030	0.00018	0.00006	0.00006	0.00000	
GEO MEAN (MICRONS)		14.59	11.37	7.38	5.00	3.29	1.85	1.00	0.67	<0.67
PARTICLE COUNT		0.0D+00	1.6D+03	7.2D+03	7.5D+03	6.6D+03	4.2D+03	6.8D+03	0.0D+00	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

INPUT DATA FOR FILE ESP042
TEST DATE - 5-6-81
PROJECT # - 4892-L03
TEST SITE - IDEAL
RUN ID - ESP-0-4-2

% WATER= 28.40
% CARBON DIOXIDE= 19.00
% CARBON MONOXIDE= 0.00
% OXYGEN= 8.00

ANDERSEN MODEL III IMPACTOR W/CYCLONE

STACK TEMPERATURE= 316.1 DEGREES F.
BAR. PRESSURE= 28.87 INCHES HG
STATIC PRESSURE= -6.40 INCHES H2O
AVE. DELTA P= 0.36 INCHES H2O
PITOT COEFF.= .84
METER TEMP.= 83.5 DEGREES F.
PROBE DIA.= 0.195 INCHES

SAMPLING TIME= 180.0 MIN.
PRESSURE DROP= 0.00 INCHES HG
SAMPLER TEMP. = 316.1 DEGREES F.
PARTICLE DENS= 1
METER VOL.= 47.012 CUBIC FEET
DELTA H= 0.20 INCHES H2O

CALCULATED RESULTS

SAMPLE VOL.-DRY STD.= 44.073 CU. FT.
SAMPLE VOL.-WET STD.= 61.554 CU. FT.
STACK VELOCITY= 2573.7 FT./MIN.
NOZZLE VELOCITY= 2554.5 FT./MIN.
MASS COLLECTED= 7.170 MG.
LOADING= 0.00180 GRAIN/SCF
LOADING(DRY)= 0.00251 GRAIN/SCF

DRY MOLECULAR WT.= 31.36
WET MOLECULAR WT.= 27.57
% ISOKINETIC= 99.3
SAMPLING RATE-ACTUAL= 0.530 CU. FT/MIN
CYCLONE BLANK= 0.000 MG.
STAGE BLANK= -1.020 MG.
FILTER BLANK= -0.960 MG.

RATE FOR 15 MICRON CYCLONE CUTOFF= 0.536 CU. FT/MIN

STAGE #	CYCLONE	0	1	2	3	4	5	6	7	FILTER
FINAL WT (MG)	225.90	386.07	378.53	399.71	378.35	394.35	384.95	394.33	387.37	451.73
TARE WT (MG)	224.06	386.29	379.37	400.28	378.90	394.94	385.14	394.59	387.88	451.79
NET WT (MG) CORRECTED	1.84	0.80	0.18	0.45	0.47	0.43	0.83	0.76	0.51	0.90
FRACTION % OF TOTAL	25.66	11.16	2.51	6.28	6.56	6.00	11.58	10.60	7.11	12.55
CUM. % WITH FILTER	25.66	36.82	39.33	45.61	52.16	58.16	69.74	80.34	87.45	100.00
FRACTION % WITHOUT FILTER	29.35	12.76	2.87	7.18	7.50	6.86	13.24	12.12	8.13	
CUM. % WITHOUT FILTER	29.35	42.10	44.98	52.15	59.65	66.51	79.74	91.87	100.00	
JET VEL. (CM/SEC)	0	46	86	144	238	424	1026	1869	3163	
D50 SIZE (MICRONS)	15.11	14.58	9.09	6.15	4.17	2.66	1.31	0.79	0.58	<0.58
DM/DLOGD (GRAINS/SCF)		0.01297	0.00022	0.00066	0.00070	0.00055	0.00068	0.00087	0.00094	
GEO MEAN (MICRONS)		14.84	11.51	7.47	5.06	3.33	1.87	1.02	0.68	<0.68
PARTICLE COUNT		1.1D+05	2.4D+03	1.1D+04	1.7D+04	2.1D+04	4.5D+04	1.1D+05	1.7D+05	

THE D50 VALUE SHOWN FOR THE CYCLONE IS AN ESTIMATE ASSUMING THE (-.63) POWER OF FLOW RATE OF SRI CYCLONE I.

APPENDIX H

SAMPLING LOGS

TABLE H-1. GENERAL SUMMARY LOG FOR SAMPLING

4/27/81	Truck leaves
4/28/81	Crew arrives for setup
4/28/81	Setup ↓
4/30/81	Finish setup
4/30/81	Begin testing ESP Paved road tested
5/6/81	Finish testing ESP
5/7/81	Complete field weighings Tear down Crew return to MRI Truck leaves for MRI
5/8/81	Truck arrives at MRI

TABLE H-2. SAMPLING LOG

Date	Time	ESP inlet: Mass EPA Method 5	ESP inlet: Particle size Andersen HCSS with 15 μm preseparator	ESP outlet: Mass EPA Method 17	ESP outlet: Particle size Andersen Mark III with 15 μm preseparator
April 30, 1981	1441			Begin ESP-0-1-1(A)	
	1516			End ESP-0-1-1(A)	
	1650	Begin ESP-I-3-1			
	1653				Begin ESP-0-1-1(A)
	1705	End ESP-I-3-1			
	1853				End ESP-0-1-1(A)
	1942			Begin ESP-0-1-1(B)	
	2032			End ESP-0-1-1(B)	
May 1, 1981	0925			Begin ESP-0-2-1	
	0942	Begin ESP-I-3-1			
	0957	End ESP-I-3-1			
	1122				Begin ESP-0-1-1(B)
	1135		Begin ESP-I-3-1		
	1205		End ESP-I-3-1		
	1225			End ESP-0-2-1	
	1422				End ESP-0-1-1(B)
	1657		Begin ESP-I-3-2		
	1721		End ESP-I-3-2		
May 2, 1981	0930			Begin ESP-0-3-1	
	0935				Begin ESP-0-2-1(A)
	0945	Begin ESP-I-1-1			
	0957	End ESP-I-1-1			
	1110			End ESP-0-3-1	
	1130		Begin ESP-I-1-1		
	1154		End ESP-I-1-1		
	1258				End ESP-0-2-1(A)
	1332		Begin ESP-I-1-2		
	1347		End ESP-I-1-2		
	1537	Begin ESP-I-4-1			
	1538			Begin ESP-0-4-1	
	1607	End ESP-I-4-1			
	1642				Begin ESP-0-3-1
	1718		Begin ESP-I-4-1		
	1741		End ESP-I-4-1		
	1850		Begin ESP-I-4-2	End ESP-0-4-1	
	1914		End ESP-I-4-2		
	1933				End ESP-0-3-1
May 4, 1981	0840			Begin ESP-0-1-2	
	0844	Begin ESP-I-2-1			
	0857	End ESP-I-2-1			
	1108				Begin ESP-0-4-1
	1137		Begin ESP-I-2-1		
	1201		End ESP-I-2-1		
	1325		Begin ESP-I-2-2		
	1347			End ESP-0-1-2	
	1349		End ESP-I-2-2		
	1414				End ESP-0-4-1
	1610			Begin ESP-0-2-2(A)	
	1611	Begin ESP-I-1-2			
	1623	End ESP-I-1-2			
	1723				Begin ESP-0-1-2
	1800		Begin ESP-I-1-3(A)		
	1824		End ESP-I-1-3(A)		
	1943		Begin ESP-I-1-4		
	1958		End ESP-I-1-4		
	2012			End ESP-0-2-2(A)	
	2036				End ESP-0-1-2
	2110		Begin ESP-I-1-3(B)		
	2125		End ESP-I-1-3(B)		

(continued)

TABLE H-2. (continued)

Date	Time	ESP inlet: Mass EPA Method 5	ESP inlet: Particle size Andersen HCSS with 15 μm preseparator	ESP outlet: Mass EPA Method 17	ESP outlet: Particle size Andersen Mark III with 15 μm preseparator	
May 5, 1981	0826	Begin ESP-I-3-2				
	0844	End ESP-I-3-2				
	0855			Begin ESP-0-3-2		
	0942				Begin ESP-0-2-2(A)	
	1000		Begin ESP-I-3-3			
	1021		End ESP-I-3-3			
	1142		Begin ESP-I-3-4			
	1145			End ESP-0-3-2		
	1203		End ESP-I-3-4			
	1242				End ESP-0-2-2(A)	
	1443	Begin ESP-I-2-2				
	1447				Begin ESP-0-3-2	
	1455	End ESP-I-2-2				
	1526			Begin ESP-0-4-2		
	1610		Begin ESP-I-2-3			
	1631		End ESP-I-2-3			
	1742		Begin ESP-I-2-4			
	1747				End ESP-0-3-2	
	1803		End ESP-I-2-4			
	1826			End ESP-0-4-2		
May 6, 1981	0830				Begin ESP-0-4-2	
	0905			Begin ESP-0-2-2(B)		
	1006	Begin ESP-I-4-2				
	1027	End ESP-I-4-2				
	1130				End ESP-0-4-2	
	1135			End ESP-0-2-2(B)		
	1210		Begin ESP-I-4-3			
	1231		End ESP-I-4-3			
	1300				Begin ESP-0-2-1(B)	
	1323			Begin ESP-0-1-1(C)		
	1425		Begin ESP-I-4-4			
	1433			End ESP-0-1-1(C)		
	1443		End ESP-I-4-4			
	1600				End ESP-0-2-1(B)	
	1635				Begin ESP-0-1-1(C)	
	1743					Begin ESP-0-2-2(B)
	1935				End ESP-0-1-1(C)	
	2043					End ESP-0-2-2(B)