EPA-R2-73-189

April 1973

Environmental Protection Technology Series

Baseline Measurement Test Results for the Cat-Ox Demonstration Program

Office of Research and Monitoring
U.S. Environmental Protection Agency
Washington, D.C. 20460

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Baseline Measurement Test Results for the Cat-Ox Demonstration Program

by

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Interagency Agreement No. F192628-71-C-0002
and
Contract No. 68-02-0650

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Prepared for

OFFICE OF RESEARCH AND MONITORING
U. S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D. C. 20460

April 1973

This report has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for us.

ABSTRACT

This report summarizes the results of the Baseline Measurement Test conducted for the Cat-Ox Demonstration Program. The test was carried out on Steam Generator Unit No. 4 of the Wood River Station of the Illinois Power Company in November and December 1971. The report describes the measurement program for the test and procedures used to process: data output from the continuous measurement system; steam generator operating data; and data obtained from manual measurements. It also provides information on the data reduction system, and the contents of the data base used for baseline test calculations. It presents test results for: net and gross efficiency--varying load level, excess air, and fuel type; gas mass flow and gas volume flow--varying load level and fuel type; and grain loading--varying load level, fuel type, and the soot blowing cycle. It also presents results for an overall sulfur balance, and for comparing continuous measurement results with manual measurements and with theoretical values.

This report was submitted in partial fulfillment of Contracts F19268-71-C-002 and 68-02-0650, under the sponsorship of the Environmental Protection Agency.

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SECTION I

CONCLUSIONS

All primary objectives of the Baseline Measurement Test were achieved in the five week period of testing on Steam Generator Unit No. 4 of the Wood River Station of the Illinois Power Company.

A relationship was defined between control settings and operating conditions for Unit No. 4 and flue gas properties at the Cat-Ox/Steam Generator interface; baseline performance of the steam generator was characterized in terms of emission levels and quantitative data were obtained which can be used to support the establishment of realistic performance standards. Operating experience was also obtained in the testing and calibration of the measurement procedures and hardware to be used in the one-year demonstration test, and quantitative information was obtained on the overall operability and reliability of Steam Generator Unit No. 4.

Data are provided in this report in the form of tabular results for a set of twenty-one separate tests, each at different operating conditions. To maintain these conditions during each test (a period of approximately ten hours), it was necessary to control the following: load factor, fuel type, soot blowing, and excess air.

In general, no test results were found which were significantly different from anticipated results, either in terms of magnitude or in terms of effects of the parameters examined.

Net and gross efficiencies were on the average higher at a 75 MW load level when compared with average values at 100 MW and 50 MW load levels; but the differences were not of the magnitude to be significant. No significant differences were found in net and gross efficiencies for the three types of fuel tested at the 100 MW level.

Measured gas mass flow rates for sulfur dioxide were consistent with control settings and sulfur content of the fuel. Measured gas flow rates for carbon dioxide were not significantly different for the three types of fuel tested. Oxygen mass flow rates decreased with decreasing load level, and were found not to be significantly different for two of the fuel types for a fixed load level. Measured gas mass flow rates for nitric oxide were significantly lower for tests performed with the fuel type that was predominantly natural gas than for tests performed with the other two fuel types.

Total gas mass flow rates were derived from the measured flow rates for individual gases and, as such, showed the same relationships as the individual gases (i.e., same decrease with decreasing load level and same increase with increased excess air).

The results of a sulfur balance computation, comparing measurements of sulfur flow input to the system in the fuel with sulfur flow output from the system in the stack gas, were in good agreement for all tests. These results led to the conclusion that the total combined error in sulfur dioxide and gas flow measurements was low.

Grain loading measurements were found to be consistent with the ash content of the fuels utilized and the soot blowing cycle employed. No specific patterns were found in the analysis of results in terms of mechanical collection efficiencies.

In the comparisons between manual sampling and continuous measurement results with theoretical expected values of gaseous concentrations, closer agreement was found between the continuous measurement results and the theoretical values.

The proximate and ultimate analyses of the coal and the elemental analyses of pulverizer rejects, furnace bottom ash, and fly ash did not provide any specific pattern beyond the expected results. The elemental analyses are of special value, however, in that they do provide the means for determining emission rates to the ambient atmosphere for a number of elements not usually examined in emission testing programs.

SECTION II

INTRODUCTION

BACKGROUND

The Environmental Protection Agency (EPA) is actively engaged in a number of programs to demonstrate sulfur oxide emission control processes applicable to stationary sources. These demonstration programs are based upon operation of an emission control system of such size and for such duration as to permit technical and economic scale-up of operating factors to define the commercial practicality of the process for potential industrial users. Among the candidate processes to be evaluated is the Cat-Ox process developed by Monsanto Enviro-Chem Systems Inc. under contract to the Illinois Power Company and the Environmental Protection Agency. The Cat-Ox process as developed by Monsanto is based upon the catalytic oxidation of sulfur dioxide to sulfur trioxide and subsequent reaction with water in the flue gas to form sulfuric acid. The sulfuric acid formed is to be sold to offset the operating costs associated with the process.

Four major task areas have been defined by MITRE under contract to EPA to provide "Test Program Development Work of the Cat-Ox Demonstration Unit (CPA 70-161)." The first of the task areas concerns the "Definition of Test Requirements," determined by means of an examination of the requirements of potential users, an examination of the stated technical and economic capabilities of the Cat-Ox process, and the performance of a requirements analysis defining the types and levels of test data required to quantify the operability, reliability, and emission control effectiveness of the Cat-Ox process. The second of the task areas concerns a "Baseline Measurement Test," in which the baseline operability, reliability, and emission levels of the stationary source are determined prior to installation of the control process. The third task area concerns the performance of a "One-Year Demonstration Test" wherein a measurement program is conducted which will fully characterize the Cat-Ox process emission control performance; quantify the operating economics of the process; and establish the operability, reliability, and maintainability of the Cat-Ox process and the resulting effects on the steam generator with which it is integrated. The fourth task area concerns the "Demonstration Evaluation" where reduced test data are translated into quantified statements on the technical and economic adequacy of the process.

To date, the first two of the major task areas have been completed. Requirements for testing have been defined in part in a baseline measurement test plan for the Cat-Ox Demonstration Program, and the baseline measurement test was conducted under the second major task in conformance with this test plan.

TEST OBJECTIVES

The objectives of the Baseline Measurement Test are to: 1) determine the relationship between control settings and operating conditions for Unit No. 4, and flue gas properties at the Cat-Ox/Steam Generator interface, 2) characterize baseline performance in terms of operability, reliability, and emission levels of Unit No. 4 prior to installation of the process, 3) test and calibrate measurement procedures and hardware to be used in the one-year demonstration test, and 4) obtain quantitative data supporting the establishment of realistic performance standards for all emitted pollutants.

SCOPE OF TEST

To meet these objectives, a test program was developed which consisted of twenty-one (21) separate tests, each of approximately ten hours duration. These twenty-one tests were conducted over a five-week period beginning November 8, 1971 and ending December 9, 1971.

Each of the twenty-one tests represented a particular combination of operating levels for the major steam generator parameters (load factor, fuel type, soot blowing, and excess air). The combinations of operating levels were selected so as to provide the maximum of information in a minimum number of tests, varying the parameters on a "one-at-a-time" basis.

Two supplementary gas traversal tests were also conducted to determine the pattern of leakage at the air heater (measurement position No. 2) and the gas flow pattern midway in the stack (measurement position No. 3).

A supplementary test was also conducted in which all factors were held constant except for burner angle, which was varied in steps from the minimum to maximum position.

For all of the tests, key steam generator operating parameters were monitored, samples of coal and ash were obtained at various points in the steam generator, gas samples were manually obtained, particulate grain loadings were determined by manual sampling, and temperatures, pressures, gas flows and gas concentrations were monitored by a MITRE designed continuous measurement system.

SECTION III

MEASUREMENT PROGRAM

This section describes the procedures followed by the MITRE test team in preparing for the test program, the steps followed in conducting the tests, and the data management procedures utilized throughout the measurement program.

Descriptive information is also provided in this section concerning the measurement locations, measurement parameters, and the steam generator operating conditions defined for each test.

PRELIMINARY MEASUREMENTS

As part of the Baseline Measurement Program, a number of preliminary measurements were made prior to the initiation of the twenty-one tests.

The objective of this preliminary measurement effort was to provide the necessary background information on isokinetic sampling techniques, rates of particulate loading in sampling equipment, and effects of power plant ambient conditions on the measurements.

This information was then used to determine ranges of gas and particulate concentrations to be encountered in the measurement program, to confirm the sampling frequency and sampling positions utilized in the measurement program, and to identify any changes in operating procedures or modifications in test equipment necessary for the primary measurement effort.

The preliminary measurements were conducted over a two-week period beginning September 28, 1971. A summary of the test schedule and test conditions followed during this preliminary measurement effort is shown in Table 1. As noted in Table 1, all preliminary runs were conducted using Type A Peabody coal. Five of the preliminary runs were conducted at the 100 MW load level representing the maximum gas flow conditions. A sixth preliminary run was made at the 35 MW load level. In these preliminary runs, excess air was varied from 115% to 145%. One preliminary run was made with soot blowers in operation to measure the maximum fly ash dust loading of the system.

TABLE 1

TEST SCHEDULE FOR PRELIMINARY MEASUREMENT SUBTASK

DATE	TEST CONDITIONS	*MEASUREMENTS	REMARKS
(9/28) (9/29)	100 MW Load 115% Excess Air Coal Type A No Soot Blowing	• Temperature & Velocity Traverse at Economizer • Orsat & Moisture Content at Economizer • 40-point mass loading at front duct of air heater (ports 1 and 2)	Two days were required to conduct the test, due to time necessary for test preparation
9/30	100 MW Load 125% Excess Air Coal Type A No Soot Blowing	• Economizer Measurements same as above • 40-point mass loading at front duct of air heater (ports 1 and 2) • Velocity Survey of air heater back duct (ports 3 and 4)	
10/1	100 MW Load 125% Excess Air Coal Type A No Soot Blowing	• Economizer Measurements same as above • 40-point mass loading at back duct of air heater (ports 3 and 4) • Velocity Survey of air heater front duct (ports 1 and 2)	

*All tests also include static pressure measurements, moisture content, and Orsat analysis for O_2 and CO_2

TABLE 1 (CONTINUED)

TEST SCHEDULE FOR PRELIMINARY MEASUREMENT SUBTASK

DATE	TEST CONDITIONS	MEASUREMENTS	REMARKS
10/5	100 MW Load 125% Excess Air Coal Type A Soot Blowing over period of test	• Economizer Measurements same as above • 40-point mass loading at back duct of air heater (ports 3 and 4)	Test to show effect of soot blowing (i.e., maximum fly-ash concentrations)
10/6	100 MW Load 125% Excess Air Coal Type A No Soot Blowing	• Economizer Measurements same as above • 2-separate single point mass loading measurements at back duct of air heater • Velocity Survey of air heater front duct and half of rear duct	Test to show effectiveness of single or ten-point mass loading measurement for subsequent tests
10/8	35 MW Load 145% Excess Air Coal Type A No Soot Blwoing	• Economizer Measurements same as above • 40-point mass loading at back duct of air heater	Test to show lowest extreme in gas flow and mass loading

The preliminary measurements conducted at the air heater on 10/6/71 were intended to provide a comparison between (1) a 40-point, 2-probe traverse of the rear duct (ports 3 and 4) and (2) a 10-point, single probe traverse of half of the rear duct (port 4) with (3) a single point, single probe sample from the rear duct (port 3, port 4).

From the results of this test, it was determined that the best method for measuring grain loading at location 2 would consist of a 20-point, 2-probe traverse in one-half of each duct (a total of 40 points). The halves selected are to be varied for the range of test conducted at each load factor to insure thorough sampling of the total duct.

A complete summary of the results of the preliminary measurements effort is provided in Appendix A.

MAIN MEASUREMENT PROGRAM

The main measurement program was initiated on November 8, 1971 following the completion of the preliminary measurement effort, and the completion of all required facility modifications (ports, sheds, and stack access platform).

A summary of the Baseline test conditions is presented in Table 2. As noted in Table 2, four load levels were examined in the tests: 100 MW, 75 MW, 50 MW, and 35 MW.

The four fuel types shown in Table 2 included Type A Peabody Coal (approximately 2.7 lbs $S/10^6$ BTU), Type B Freeman Coal (approximately 1.6 lbs $S/10^6$ BTU), Type C Coal, a mixture of Freeman Coal and Natural Gas (approximately 1.0 lbs $S/10^6$ BTU), and Type D metallurgical coal (source location undefined, sulfur content approximately 1.0 lbs $S/10^6$ BTU).

Two levels of soot blowing were investigated - no soot blowing and maximum soot blowing. However, on one test early in the series, an intermediate level of soot blowing was examined.

Three levels of excess air were examined as shown in Table 1 - minimum excess air, normal excess air, and maximum excess air.

TABLE 2

SUMMARY OF BASELINE TEST CONDITIONS

TEST NUMBER	DATE	LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR
11	NOV 8	100 MW	A	NO	NORMAL
9	NOV 9	100 MW	A	NO	MINIMUM
8	NOV 10	100 MW	A	NO	MAXIMUM
12	NOV 11	100 MW	A	YES*	NORMAL
7	NOV 12	100 MW	A	YES	NORMAL
6	NOV 15-16	100 MW	B	NO	NORMAL
1	NOV 14-15	75 MW	B	NO	NORMAL
18	NOV 16-17	50 MW	B	NO	NORMAL
13	NOV 17-18	35 MW	B	NO	NORMAL
4	NOV 18-19	75 MW	A	NO	MINIMUM
5	NOV 21-22	75 MW	C	NO	NORMAL
10	NOV 22-23	100 MW	C	YES	NORMAL
20	NOV 23-24	50 MW	C	NO	NORMAL
2	NOV 29-30	75 MW	A	NO	NORMAL
3	NOV 30-DEC 1	75 MW	A	NO	MAXIMUM
17	DEC 1-2	50 MW	A	YES	NORMAL
19	DEC 2-3	50 MW	A	NO	MAXIMUM
21	DEC 3-4	35 MW	A	NO	NORMAL
14	DEC 6-7	50 MW	A	NO	NORMAL
15	DEC 7-8	50 MW	A	NO	MINIMUM
22	DEC 8-9	75 MW	D	NO	NORMAL

*Reduced level of soot blowing

TEST OPERATING PROCEDURES

Of the 21 tests in the main measurement program, the first five tests were performed during the normal day shift (approximately 8:00 a.m. to 4:00 p.m.). The remaining tests were conducted during the evening shift (approximately 12:00 a.m. to 8:00 a.m.), in order to minimize the interference with higher-load daytime operations. In all cases, test personnel were on-site for a period of 1-2 hours preceding the start of the test. During this pre-test period, filters in the sampling lines were cleaned and preheated, sampling probes were inserted in the ports, and the instrumentation systems were calibrated.

Approximately one hour before the test, boiler controls were adjusted to provide the required excess air and power settings. Excess air was determined by MITRE gas measurements, and interative adjustments were made until the desired level was reached. The boiler system was then allowed to stabilize. When the system was stabilized and no variations in power level and excess air were observed, test personnel were notified to start their respective assignments.

Assignments for the various test personnel varied somewhat for the specific tests, but in general the following data collection efforts were carried out:

1. Key steam generator operating parameters were recorded from the control room instrumentation and from various gauges on the steam generator. These readings were entered in an "Operating Conditions Log," generally on an hourly basis.
2. Samples of coal were obtained from each of the four coal mills using the cyclone samplers and the techniques described in the test plan. Ash samples were also taken from the furnace bottom and from the air heater and mechanical collector. The coal samples and the ash samples were obtained over the period of test operation

(8-10 hours) and blended at the conclusion of the test so as to form single representative one quart samples.

3. Data log tapes were generated (using the steam generator control computer) and "printouts" were developed from the tapes on an hourly basis.

4. Relative humidity measurements were taken on an hourly basis at the forced draft fan inlet using a sling psychrometer.

5. The continuous measurement instrumentation system was placed in operation at location 1 and location 2. Strip charts and digital output derived from the system were collected and logged at the conclusion of the test.

6. Gas samples were taken manually at location 1 and location 3; grain loading samples were taken at location 2 and location 3 as required for the specific test.

7. On-site calculations were made with the programmable calculator as described in the Test Plan.

Data from all of the above efforts were collected at the conclusion of each test, marked with the appropriate identification number, noted in the Master Data Log, and filed in a data test package (in accordance with the data management procedures described in the Test Plan).

CONTINUOUS MEASUREMENT SYSTEM

The MITRE continuous measurement system consisted of a number of gas sensors, velocity, pressure, and temperature transducers, a sample handling system to condense water vapor, strip chart recorders, and digital tape printers, and the necessary filters, probes, heated lines, and valves to control the flow of flue gases to the sensors. The system was designed to clean sampling line filters on a periodic basis by "blowback" with pressurized air; and to maintain calibration of the sensors by the periodic introduction of known concentrations of test gases into the system.

The continuous measurement system was constructed in two major sections, each section separately contained in a shed enclosure for environmental protection. The first section of the system was located at the economizer of the steam generator (measurement location 1). This portion of the system consisted of a water vapor condenser, a sulfur dioxide analyzer, an oxygen analyzer, and a velocity measurement system with strip chart output. A temperature monitoring system with a digital output was also located at this position. The second section of the continuous measurement system was located in a shed mounted on the roof of the steam generator building at a position opposite the midpoint of the stack. At this location, the system included a water vapor condenser, a sulfur dioxide analyzer, an analyzer for nitrogen dioxide and nitrogen oxide, a carbon dioxide analyzer, a carbon monoxide analyzer, a hydrocarbon analyzer, an oxygen analyzer, and a velocity measurement system with strip chart output. The system at this location also included a particulate monitoring system with digital output.

MANUAL MEASUREMENTS

Manual measurements were made during the Baseline Test program by the MITRE test team and by a stack sampling subcontractor (Midwest Research Institute).

The measurements by the MITRE test team included the observation and recording of all major gauge board readings from the steam generator control room, observation and recording of coal scale readings, measurement of atmospheric pressure, and measurement of moisture content of air at the forced draft fan inlet to the steam generator. The efforts of the MITRE test team also included the collection of coal and ash samples at various points in the steam generator.

The manual measurements by the Midwest Research Institute team included the collection of gas samples at the economizer (measurement location 1) and midway in the stack (measurement location 3). Particulate samples were also obtained by the Midwest Research Institute team at the air heater (measurement location 2) and midway in the stack, Orsat analyzers of the flue gas at the air heater were also conducted by Midwest Research Institute.

MEASUREMENT PARAMETERS

The parameters monitored at each of the three measurement locations are indicated in Table 3. The parameters shown as being monitored by the continuous measurement system were normally measured on all of the twenty-one tests. The manual measurements shown in Table 3, in most cases, were varied for specific tests.

As mentioned previously, the parameters monitored by the MITRE test team included the observation and recording of all major gauge board readings from the control room, observation and recording of coal scale readings, measurement of atmospheric pressure, and measurement of the moisture content of the air at the forced draft fan inlet to the steam generator. A listing of these parameters is provided in Table 4.

Information was also obtained from the steam generator control system in the form of hourly printouts from the control system computer. Key temperatures, pressures, flow rates, and electrical measurements were recorded on these data log printouts, as well as several calculated values (i.e., boiler efficiencies, integrated fuel flows).

MEASUREMENT LOCATIONS

The three locations utilized in the Baseline Measurement included: location 1 - the flue section between the secondary superheater and economizer, location 2 - in the inspection window area between the upper and lower sections of the air preheater ducting, and location 3 - midway in the stack.

The first of these locations, prior to the economizer, was selected to provide data at the relatively high temperatures corresponding to the inlet to a Cat-Ox system designed for installation in new steam generators. Four ports were in existence at this location. Three

TABLE 3

BASELINE MEASUREMENT PARAMETERS (CONTINUOUS AND MANUAL MEASUREMENTS)

	CONTINUOUS MEASUREMENT SYSTEM	MANUAL MEASUREMENTS
LOCATION 1 (PRIOR TO ECONOMIZER)	O_2	SO_3
	SO_2	SO_2
	TEMPERATURE, AIR HEATER, AIR IN	NO_x
	TEMPERATURE, AIR HEATER, AIR OUT	CO
	TEMPERATURE, AIR HEATER, GAS IN	CO_2
	TEMPERATURE, AIR HEATER, GAS OUT	ORSAT O_2
	TEMPERATURE, AIR ENTERING FORCED DRAFT FAN	ORSAT CO_2
	HUMIDITY, AIR ENTERING FORCED DRAFT FAN	ORSAT CO
	PITOT TUBE ΔP, STATIC PRESSURE, FLUE GAS TEMPERATURE } GAS FLOW MEASUREMENT	
LOCATION 2 (BETWEEN UPPER AND LOWER TUBES OF AIR HEATER)	(NO CONTINUOUS MEASUREMENT AT THIS LOCATION)	GRAIN LOADING
		PARTICULATE SIZE DISTRIBUTION
		ELEMENTAL ANALYSIS OF PARTICLES
		BOUND CONSTITUENTS ON PARTICLES
		PITOT TUBE ΔP, STATIC PRESSURE, FLUE GAS TEMPERATURE } GAS FLOW MEASUREMENT

TABLE 3 (CONCLUDED)

BASELINE MEASUREMENT PARAMETERS (CONTINUOUS AND MANUAL MEASUREMENTS)

	CONTINUOUS MEASUREMENT SYSTEM	MANUAL MEASUREMENTS	
LOCATION 3 (MIDWAY IN STACK)	PITOT TUBE ΔP, STATIC PRESSURE, FLUE GAS TEMPERATURE } GAS FLOW MEASUREMENT	SO_3	ORSAT O_2
	GRAIN LOADING	SO_2	ORSAT CO_2
	SO_2	NO_x	ORSAT CO
	NO_x	CO	H_g VAPOR
	O_2	CO_2	
	HYDROCARBON	GRAIN LOADING	
	CO	PARTICLE SIZE DISTRIBUTION	
	CO_2	ELEMENTAL ANALYSIS OF PARTICLES	
		BOUND CONSTITUENTS ON PARTICLES	
		PITOT TUBES ΔP, STATIC PRESSURE, FLUE GAS TEMPERATURE } GAS FLOW MEASUREMENT	
OTHER LOCATIONS	(NO CONTINUOUS MEASUREMENTS AT OTHER LOCATIONS)	PROXIMATE & ULTIMATE ANALYSIS OF COAL	
		ELEMENTAL ANALYSIS OF COAL	
		ELEMENTAL ANALYSIS OF BOTTOM ASH	
		ELEMENTAL ANALYSIS OF AIR HEATER ASH	
		ELEMENTAL ANALYSIS OF MECHANICAL SEPARATOR ASH	
		PROXIMATE ANALYSIS OF PYRITE REJECTS	
		PROXIMATE ANALYSIS OF BOTTOM ASH	
		PROXIMATE ANALYSIS OF AIR HEATER ASH	
		PROXIMATE ANALYSIS OF MECHANICAL SEPARATOR ASH	
		ELEMENTAL ANALYSIS OF PYRITE REJECTS	

TABLE 4

BASELINE MEASUREMENT PARAMETERS
(STEAM GENERATOR GAUGE BOARD READINGS)

CONDENSER VACUUM (PSI)

ATM PRESS. AT AIR INTAKE (IN OF H_g)

HUMIDITY AT AIR INTAKE (%)
(INTEGRATOR LOG READINGS)
- BOILER STEAM FLOW (LBS./HR.)
- BOILER FW FLOW (LBS./HR.)
- BEVEL GAS FLOW (LBS./HR.)
- SH SPRAY FLOW (4TH FLOOR) (LBS./HR.)
- RH SPRAY FLOW (4TH FLOOR) (LBS./HR.)
- 'A' COAL SCALE (CLICKS)
- 'B' COAL SCALE (CLICKS)
- 'C' COAL SCALE (CLICKS)
- 'D' COAL SCALE (CLICKS)

(GAUGE BOARD READINGS)
- (UTILITIES SECTION)
  - CONDENSER PRESSURE (IN OF H_g)
- (FEEDWATER & STEAM SECTION)
  - DRUM PRESS (PSI)
  - D.C. HEATER PRESS (PSI)
  - 4A BFP DISCH (PSI)
  - 4B BFP DISCH (PSI)
  - BLR FEED HDR (PSI)
  - FW FLOW TO BLR (LBS./HR.)
  - MAINSTREAM TEMP (°F)
  - THROTTLE PRESSURE (PSI)
  - HOT REHT TEMP. (°F)
  - COLD REHT TEMP. (°F)
  - 4A RH SPRAY VALVE (%)
  - 4B RH SPRAY VALVE (%)
  - BURNER TILT (%)
  - 4A SH SPRAY VALVE (%)
  - 4B SH SPRAY VALVE (%)
- AIR & FUEL SECTION
  - 4A FD FAN DISCH. (IN OF H_2O)
  - 4B FD FAN DISCH. (IN OF H_2O)
  - FURN. DRAFT (IN OF H_2O)
  - RHTR. OUTLET (IN OF H_2O)
  - SUPHTR OUTLET (IN OF H_2O)
  - ECON. OUT (IN OF H_2O)

TABLE 4 (CONCLUDED)

BASELINE MEASUREMENT PARAMETERS
(STEAM GENERATOR GAUGE BOARD READINGS)

4A AIR HEATER OUT (IN OF H_2O)
4B AIR HEATER OUT (IN OF H_2O)
4A DUST COL. OUT (IN OF H_2O)
4B DUST COL. OUT (IN OF H_2O)
STACK INLET (IN OF H_2O)
FLUE GAS O_2 (%)
STEAM FLOW (LBS./HR.)
AIR FLOW (LBS./HR.)
UNIT GROSS GEN. (MW)
AH 4A GAS OUT (°F)
AH 4B GAS OUT (°F)
4A MILL (AMPS)
4B MILL (AMPS)
4C MILL (AMPS)
4D MILL (AMPS)
4A ID FAN (AMPS)
4B ID FAN (AMPS)
4A FD FAN (AMPS)
4B FD FAN (AMPS)
4A MILL FEEDER (%)
4B MILL FEEDER (%)
4C MILL FEEDER (%)
4D MILL FEEDER (%)
GAS VALVE (%)
4A ID FAN SPEED (RPM)
4B ID FAN SPEED (RPM)
4A ID FAN DAMPER (%)
4B ID FAN DAMPER (%)
4A FD FAN SHTOFF DAMP. (%)
4B FD FAN SHTOFF DAMP. (%)
4A FD FAN VANES (%)
4B FD FAN VANES (%)
FUEL AIR RATIO SET PT. (%)

additional ports were constructed to bring the total to seven ports at this location. Four measurement points were selected for each port so as to provide the proper number and distribution of measurement points in accordance with ASTM Standard D2928-71. "Standard Method for Sampling Stacks for Particulate Matter." The numbers assigned to the ports and points at location 1 and the associated dimensions are shown in Figure 1.

Location 2, between the upper and lower sections of the air preheater, was selected as representative of a lower temperature condition prior to any existing or planned flue gas treatment system. This location was selected as the best available point prior to the mechanical collector for the measurement of particulate. The ports and sampling points for this location are shown in Figure 2. At location 2 there are two identical ducts, only one of which is shown in Figure 2. The twenty sampling points which are shown directly in the line with the ports were reached with a seventeen-foot sampling probe. The twenty sampling points which are not directly in line with the ports were reached by an "offset" modification attached to the seventeen-foot probe.

Location 3, approximately 135 feet above the foundation of the 250-foot stack, was selected to provide a condition representative of the flue gas emitted to the atmosphere (and, in this instance, conditions which will be seen at the reheat Cat-Ox/steam generator interface). Access at this location was achieved by installing a platform around the stack with a walkway to the adjacent power station roof. Four ports were installed in the stack at this location as shown in Figure 3. Nine measurement points were selected for each port to provide the proper number and distribution of measurement points consistent with ASTM Standard D2928-71.

MANUAL SAMPLING SCHEDULE

Table 5 provides a summary of the test conditions followed in the Baseline Measurement program. Table 5 also presents a summary of the schedule followed in obtaining manual samples at the three measurement locations.

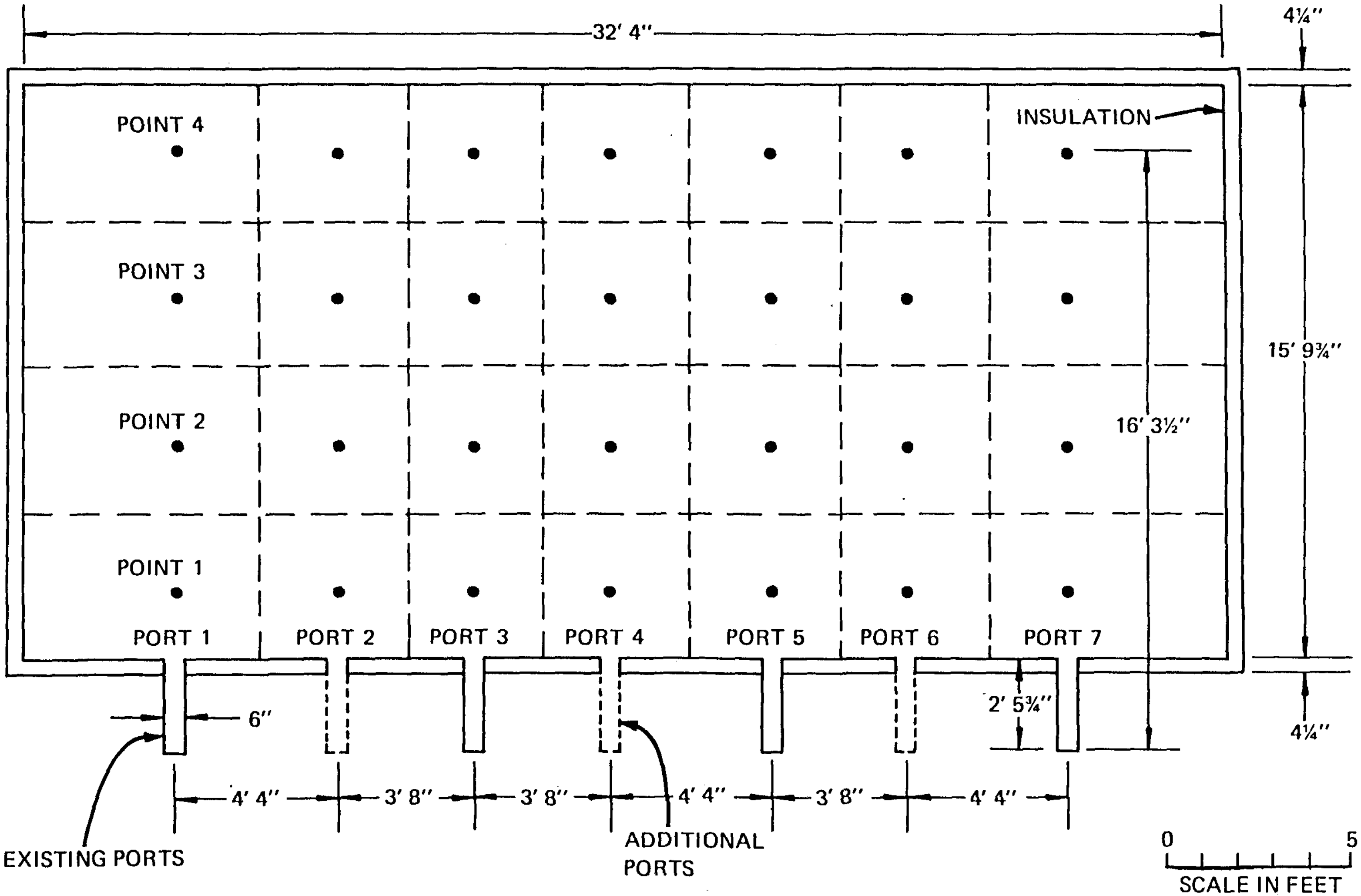

FIGURE 1
CROSS SECTION OF DUCT AT LOCATION 1, PRIOR TO ECONOMIZER, SHOWING MEASUREMENT POINTS

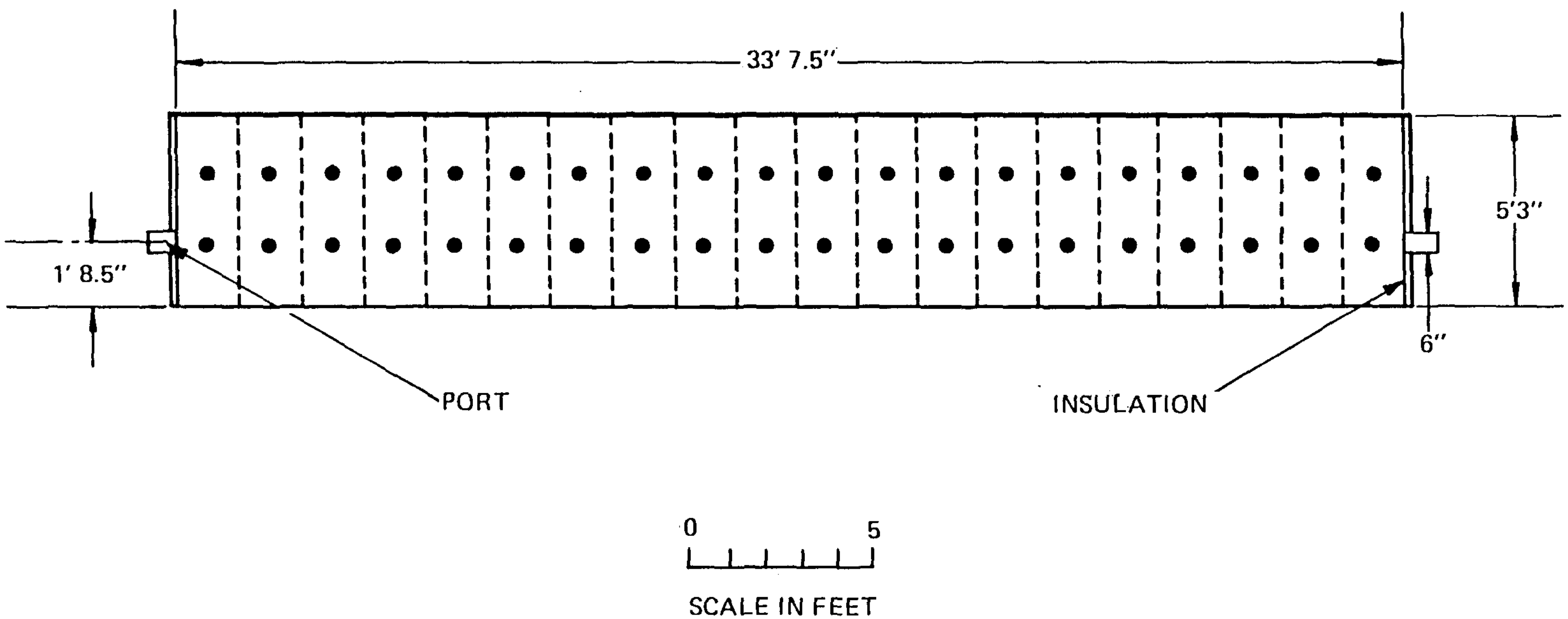

FIGURE 2
CROSS SECTION OF DUCT AT LOCATION 2, IN AIR PREHEATER, SHOWING MEASUREMENT POINTS

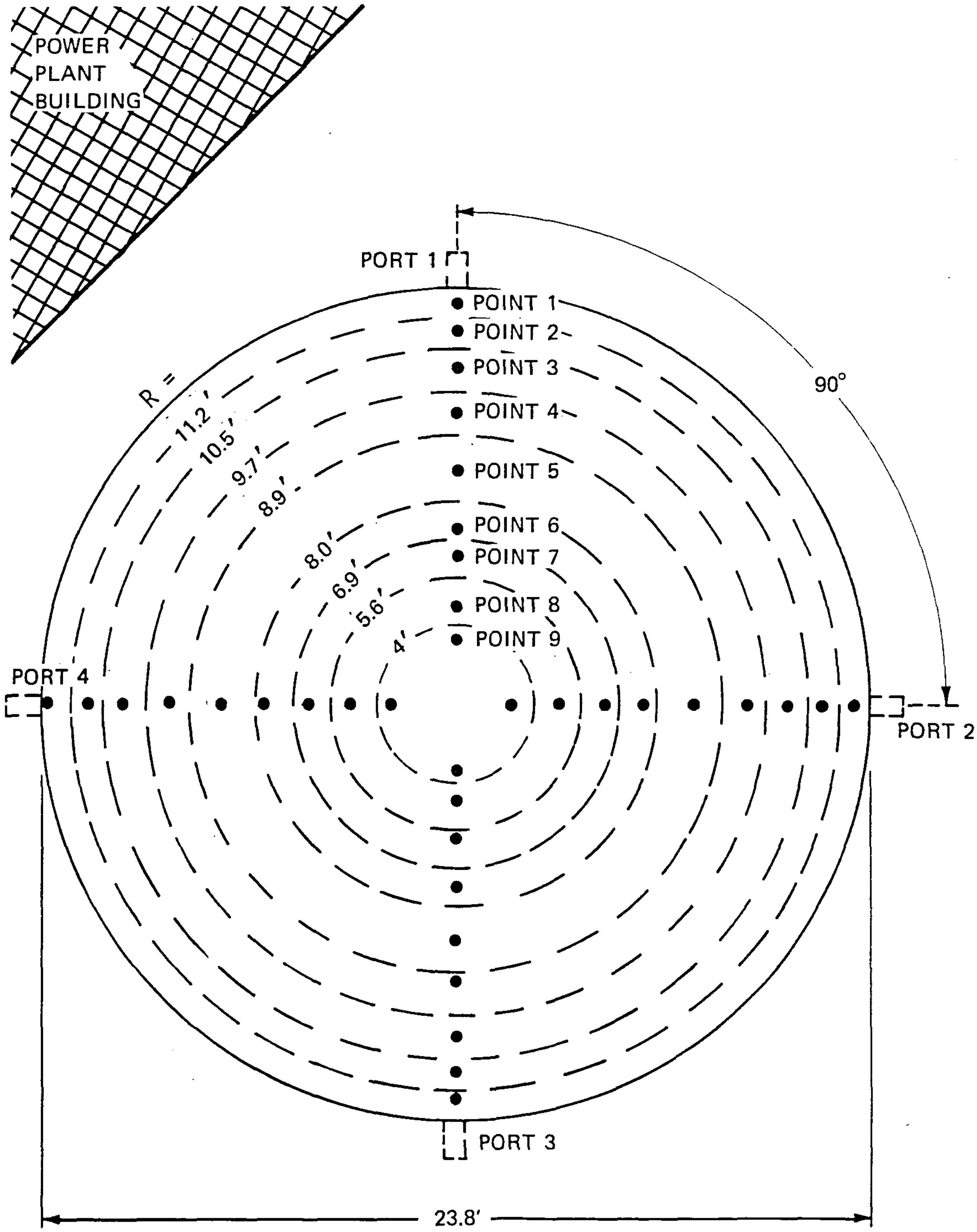

FIGURE 3
CROSS SECTION OF DUCT AT POINT 3, IN STACK,
SHOWING MEASUREMENT POINTS

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AVAILABLE

DIGITALLY

As noted in Table 5, emphasis was placed on the measurement of SO_2, NO_x, CO, and CO_2 concentrations, and in the determination of mass loading. These measurements were originally scheduled for all twenty-one tests for correlation against the measurements obtained from the continuous measurement instrumentation system. The gas measurements were subsequently rescheduled as shown in Table 5 so as to provide the maximum coverage of test conditions with the resources allocated for the program. Mass loading samples were obtained for all of the tests, since it was anticipated that the portion of the continuous measurement system that measured this parameter (β-tape sampling) would not be operable early in the test schedule.

Particle size distributions were originally scheduled for each fuel type (A, B, C, and D) with an extra sample scheduled for fuel type A. However, difficulties were encountered on the B fuel test (test No. 6) and an insufficient sample was obtained for the measurement.

Elemental analysis of the fly ash was scheduled for each of the fuel types with extra samples scheduled for two 50 MW tests (test 17 and test 19) to note any possible effect from soot blowing.

Bound constituents were determined (both by photoelectron spectroscopy and chemical analysis) for tests representing the four fuel types, with an extra sample scheduled for fuel type A.

Ultimate and proximate analysis of coal was scheduled for all of the twenty-one tests, since these results were required for the calculation of efficiencies and for other material balances.

Analyses of the ash at the various locations within the steam generator system were scheduled as shown in Table 5 so as to provde a maximum of information on a materials balance within the system.

MANAGEMENT OF DATA

The data management system used during the Baseline Measurement test included a uniform labeling system for all data samples, and log sheets forwarded from the test site.

The purpose of the labeling system was to provide full and manageable control of all data. Fourteen items were specified to be included on the label; however, not all data, samples, or logs required all the items The fourteen items included:

1. Label ID: XXYYZZ
   (Where XX = type sample, i.e., CS = coal sample, PA = pit ash sample, etc.; XY = test number, and ZZ = consecutive sample number)
2. Parameters Measured
3. Date: (Day/Month/Year)
4. Location
5. Port of Measurement
6. Depth of Probe (inches)
7. Time of Samples (Time Range for Strip Charts)
8. Names of Data Collector
9. Name of I.P. Shift Supervisor
10. Fuel Type (A, B, C, or D)
11. Load Factor (MW)
12. Excess Air Ratio (Normal, Max, or Min)
13. Soot Blowers (Yes or No)
14. Burner Angle (Normal, Max, Min).

In addition to the uniform labeling system, a data management log was used to verify the location and status of the various data packages. This log, which served as the primary control log for all data packages, was completed by a member of the MITRE test team at the completion of each day's test run. The log included the following major entries:

1. Test Number and Date
2. Expected Variables
3. Coal and Refuse Sampling
4. Temperature Monitoring
5. Continuous Flue Gas Monitoring
6. Manual Flue Gas Sampling

7. Operating Conditions
8. On-Site Calculations Performed
9. Personnel
10. Test Director Notes.

A full description of the complete data management log is provided in Appendix II.

After the log sheet was completed for the test run, it was shipped along with the continuous measurement data to the MITRE Washington facility. The log sheet was then maintained in a MITRE control log in which MITRE personnel noted the receipt and condition of the other data packages associated with that day's test run.

After the data were received and logged at the MITRE Washington facility, they were then stored in a central archive with controlled access. These data were stored in labeled fiberboard file boxes (one box per test day) under the custody and control of the MITRE Task Leader.

SECTION IV

DATA PROCESSING

This section describes the procedures followed by the MITRE test team in processing the data output from the continuous measurement system, steam generator operating data, and data obtained from the manual measurements made by the Midwest Research Institute. Information is also provided in this section on the data reduction system developed for MITRE's IBM 360/50 computer, and on the structure and contents of the data base as used for baseline test calculations.

CONTINUOUSLY MEASURED DATA

The data output from MITRE's continuous measurement system consisted of strip chart outputs from the sulfur dioxide analyzer at the economizer, the oxygen analyzer at the economizer, the economizer velocity measurement system, the sulfur dioxide analyzer at the stack, the stack analyzer for nitrogen dioxide and nitrogen oxide, the carbon dioxide analyzer at the stack, the carbon monoxide analyzer at the stack, the stack hydrocarbon analyzer, the oxygen analyzer at the stack, and the stack velocity measurement system. The continuous measurement system data output also included the digital tape output from the temperature monitoring system at the economizer, and strip chart output from a continuous recording barometer.

Data from the strip charts were transcribed at hourly intervals based on a visual averaging of the data over a one-hour period. If gaps in the chart prevented transcription for a particular hour, the average value for the test was substituted. Since the instruments were calibrated prior to each test and were adjusted during the test as required, the transcribed values needed only to be corrected for zero level offset.

The transcription process was straightforward for all gases except NO_x. Here, the analyzer provided both NO_2 and $NO + NO_2$ values. The NO_2 data, being within instrumental noise, were assumed to be zero and the $NO + NO_2$ data were transcribed as NO only.

STEAM GENERATOR OPERATING DATA

The steam generator operating data recorded for the Baseline Test included all major gaugeboard readings, coal scale readings, atmospheric pressure, and moisture content of the air at the inlet to the forced draft fan as recorded manually on the operating conditions log sheet. These data were recorded at approximately hourly intervals throughout the duration of the test. Additional data in the form of key temperatures, pressures, and flow rates were also obtained on an hourly basis in the form of printouts from the control system computer. No further transcription was required of the steam generator operating data beyond the original log sheet entries and the printouts, with the exception of the fuel consumption rates.

The total coal consumption was obtained from the integrator dial on the coal scales which indicated the number of 400-pound units supplied. To obtain the consumption rate the dial reading at the beginning of a test was subtracted from that at the end of the test, multiplied by 400, and divided by the time interval. Consumption rates were computed for each of the four coal scales and added to obtain the total coal consumption rate for the test.

The gas consumption rate was computed in a similar manner. Integrator meter values indicating 10^4 cubic foot units were used to calculate an average value for the test. Gas pressure and temperature test averages were also computed.

MANUAL MEASUREMENTS

Data obtained by the Midwest Research Institute as part of their manual measurement program were entered directly on series of MRI field test forms. Copies of these completed field test forms were forwarded to MITRE; however, no further transcription of the data was performed by MITRE. The data on the field test results were utilized along with the analytical laboratory results to provide the required information on grain loadings, gas concentrations, particulate mass flows, and gas mass flows. All calculations required to provide this information were performed by the Midwest Research Institute using standard computational procedures.

Data sheets reporting the results of analysis of natural gas samples (as analyzed by MRI and the Illinois Geological Survey) were also received at MITRE and utilized without further transcription.

DATA REDUCTION SYSTEM

As an aid to the analysis of baseline test results, a data reduction system was developed for the IBM 360/50 computer at the MITRE/Washington facility. The following discussion describes the structure of this system and gives an inventory of the data base contents.

Data Reduction System Structure

The data reduction system consists of a data base of measurement values and a PL/1 computer program. The data base, although large in terms of manual processing, is relatively small from a computer standpoint and does not require any specialized storage techniques or access methods. It consists of unit records (i.e., card or card images on tape) accessed in a conventional sequential fashion. Each record consists of measurements of a single type identified in the following manner:

1. Type of Data
   - 1 - Coal Composition
   - 2 - Gas Composition
   - 3 - Flue Gas Composition
   - 4 - Refuse Characteristics
   - 5 - Fuel Composition
   - 6 - Air Heater Temperature
   - 7 - Ambient Conditions
   - 8 - Electrical Power
   - 9 - Operating Conditions
   - A - Miscellaneous Constants
   - B - Flow Characteristics
   - C - Duct Characteristics

2. Test Number
3. Date
4. Time
5. Location (does not apply to some data types)
   1 - Economizer
   2 - Air Heater
   3 - Stack
6. Measurement Method (does not apply to some data types)
   0 - Manual
   X - Manual (Orsat)
   1 - Continuous (MITRE Instrumentation)
   2 - Continuous (IPC automatic data log)

The basic record format is given in Table 6. Detailed formats for each data type are given in Tables 7 through 18.

The computer program to process the data has been designed as a main program "shell" into which modules for the individual calculations can be inserted. This main program reads the system control cards and accesses individual records in the data base. Each module selects the specific data values that are required for its calculations, performs these calculations, and prints the results. If some of the required data items cannot be found, the module will omit those calculations which depend upon the missing items, but will perform the remainder of its calculations. In addition, data items of a single type which have the same test number, time, and data may reside on physically separate records as long as they are placed in the proper columns. This flexibility simplifies data transcription since measurements which should reside in the same record may not be available at the same time or recorded on the same source document. The modules being implemented are as follows:

1. Efficiency Calculation
2. Excess Air Calculation
3. Volume and Mass Flow Calculations for Flue Gases

Table 19 summarizes the characteristics of these modules.

TABLE 6

BASIC RECORD FORMAT

COLUMNS	DESCRIPTION
1	Type of Data
2 - 3	Test Number
4 - 9	Date
4 - 5	Day
6 - 7	Month
7 - 9	Year
10 - 13	Time (24-hour clock)
14	Location
15	Measurement Method
16 - 20	Measurement Values
21 - 25	
26 - 30	
31 - 35	
36 - 40	
41 - 45	
46 - 50	
51 - 55	
56 - 60	
61 - 65	
66 - 70	
71 - 75	
76 - 80	

TABLE 7

COAL COMPOSITION RECORD FORMAT

COLUMNS	DESCRIPTION
1	"1"
2 - 9	Identification (Test Number and Date)
10 - 15	Unused
16 - 20	Ash Fraction
21 - 25	Carbon Fraction
26 - 30	Hydrogen Fraction
31 - 35	Nitrogen Fraction
36 - 40	Sulfur Fraction
41 - 45	Moisture Fraction
46 - 50	Heat Content (BTU/lb.)

TABLE 8

GAS COMPOSITION RECORD FORMAT

COLUMNS	DESCRIPTION
1	"2"
2 - 9	Identification (Test Number and Date)
10 - 15	Unused
16 - 20	Unused
21 - 25	Carbon Fraction
26 - 30	Hydrogen Fraction
31 - 35	Nitrogen Fraction
36 - 40	Sulfur Fraction
41 - 45	Unused
46 - 50	Heat Content (BTU/lb.)
51 - 56	Specific Gravity

TABLE 9

FLUE GAS COMPOSITION RECORD

COLUMNS	DESCRIPTION
1	"3"
2 - 15	Identification (Test Number, Date, Time, Location, Method)
16 - 20	CO_2 Fraction*
21 - 25	O_2 Fraction*
26 - 30	CO Fraction*
31 - 35	N_2 Fraction*
36 - 40	SO_2 Fraction*
41 - 45	Hydrocarbon Fraction*
46 - 50	Hydrocarbon Molecular Weight
51 - 55	Hydrocarbon Heating Value (BTU/ft^3)
56 - 60	NO Fraction*
61 - 65	NO_2 Fraction*

* A fraction value >1 implies that the units are ppm.

TABLE 10

REFUSE CHARACTERISTICS RECORD FORMAT

COLUMNS	DESCRIPTION
1	"4"
2 - 9	Identification (Test Number, Date)
10 - 15	Unused
16 - 20	Pit Ash Heating Value (BTU/lb.)
21 - 25	Fly Ash Heating Value (BTU/lb.)
26 - 30	Flue Gas Particulate Mass Flow Rate (lb./hr.)

TABLE 11

FUEL CONSUMPTION RECORD FORMAT

COLUMNS	DESCRIPTION
1	"5"
2 - 13	Identification (Test Number, Date, Time)
14 - 15	Unused
16 - 20	Coal Consumption Rate (lb/hr.) x 10^{-3}
21 - 25	Fuel Air Mixture Temperature (°F)
26 - 30	Gas Flow Rate (ft^3/hr. x 10^{-3})
31 - 35	Gas Pressure (lb/in^2)
36 - 40	Gas Temperature (°F)

TABLE 12

AIR HEATER TEMPERATURE RECORD FORMAT

COLUMNS	DESCRIPTION
1	"6"
2 - 13	Identification (Test Number, Date, Time)
14 - 15	Unused
16 - 20	Air Heater Entering Air Temperature (°F)
21 - 25	Air Heater Exit Gas Temperature (°F)

TABLE 13

AMBIENT CONDITIONS RECORD FORMAT

COLUMNS	DESCRIPTION
1	"7"
2 - 13	Identification (Test Number, Date, Time)
14	Unused
15	Identification (Method)
16 - 20	Ambient Temperature at Forced Draft Fan (°F)
21 - 25	Relative Humidity Fraction at Forced Draft Fan
26 - 30	Ambient Pressure at Forced Draft Fan (inches Hg.)

TABLE 14

ELECTRICAL POWER RECORD FORMAT

COLUMNS	DESCRIPTION
1	"8"
2 - 13	Identification (Test Number, Date, Time)
14 - 15	Unused
16 - 20	Pulverizer No. 1 Current (amperes)
21 - 25	Pulverizer No. 2 Current (amperes)
26 - 30	Pulverizer No. 3 Current (amperes)
31 - 35	Pulverizer No. 4 Current (amperes)
36 - 40	Forced Draft Fan No. 1 Current (amperes)
41 - 45	Forced Draft Fan No. 2 Current (amperes)
46 - 50	I. D. Fan No. 1 Current (amperes)
51 - 55	I. D. Fan No. 2 Current (amperes)

TABLE 15

OPERATING CONDITIONS RECORD FORMAT

COLUMNS	DESCRIPTION
1	"9"
2 - 13	Identification (Test Number, Date, Time)
14 - 15	Unused
16 - 20	Steam Flow (lb./hr. x 10^{-3})

TABLE 16

MISCELLANEOUS CONSTANTS RECORD FORMAT

COLUMNS	DESCRIPTION
1	"A"
2 - 9	Identification (Test Number, Date)
10 - 15	Unused
16 - 20	Air Heater Leakage Fraction

TABLE 17

FLOW CHARACTERISTICS RECORD FORMAT

COLUMNS	DESCRIPTION
1	"B"
2 - 15	Identification (Test Number, Date, Time, Location, Method)
16 - 20	Flue Gas Temperature (°F)
21 - 25	Duct Static Pressure (inches H_2O)
26 - 30	Flue Gas Velocity (ft/min.)

TABLE 18

DUCT CHARACTERISTICS RECORD FORMAT

COLUMNS	DESCRIPTION
1	"C"
2 - 13	Unused
14	Identification (Location)
15	Unused
16 - 20	Area (ft^2)

TABLE 19

COMPUTATION MODULES

NAME OF MODULE	REQUIRED DATA BASE RECORDS	PRINTED OUTPUT
EFFICIENCY	1, 2, 3, 4, 5, 6, 7, 8, 9, A	Net Efficiency Gross Efficiency Electrical Power Inputs Individual Losses Radiation Loss
EXCESS AIR	3	Excess Air Percentage
FLOW	3, 7, B, C,	For Each Flue Gas Constituent: Volume Flow (Actual) Volume Flow (Standard Conditions) Mass Flow

Contents of the Data Base

The previous discussion of the data reduction system described the data base with respect to its format and data storage capabilities. The following discussion will describe the data base as it was actually used for baseline test calculations. An inventory of all information contained in the present version of the data base is given, together with an indication of the data selected for the final computations. The data base itself is reproduced in Appendix C.

1. Coal Composition

   The data base contains the as-received ash, carbon, hydrogen, nitrogen, sulfur, moisture and heat value of the coal for all 21 tests as analyzed by Midwest Research Institute.

2. Gas Composition

   For the three tests which used natural gas the data base contains the as-received carbon, hydrogen, nitrogen, sulfur and heat value of the gas as well as specific gravity.

3. Flue Gas Composition

   Table 20 is an inventory of the flue gas measurements by location, measurement type and gas constituent. It also indicates which measurements were used in the final calculations. The manual and Orsat measurements consisted of a single test value or, in some cases, the average of two values. The continuous measurements consisted of hourly average values transcribed from MITRE strip charts. The column entries which appear on Table 20 and on Table 21 and 22 which are capital letters (C, M, and O) indicate whether, for these particular gases and at these locations, continuous, manual, or Orsat analysis results were used in the computations. Conversely, a lower case entry (c, m, and o) indicates where the data could not be used in the computation (incidences where data were suspect, or lacking because of equipment failure).

TABLE 20

FLUE GAS DATA INVENTORY FOR LOCATIONS 1, 2, AND 3

MITRE TEST NUMBER	LOCATION 1									LOCATION 2									LOCATION 3								
	O_2			CO_2			SO_2			O_2			CO_2			O_2			CO_2			SO_2			NO		
	M	C	O	M	C	O	M	C	O	M	C	O	M	C	O	M	C	O	M	C	O	M	C	O	M	C	O
11		C						C										O	m		O				M		
9		C		M				C				o			o			O	m		O				M		
8		C		M			m	C				o			o			O	m		O	M			M		
12		C		M			m	C				o			o			O	m		O	m	C		M		
7		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
1		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
6		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
18		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
13		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
4		C	o	M		o	m	C				o			o		C	o	m	C	o	m	C		m	C	
5		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
10		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
20		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
2		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
3		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
17		C		M			m	C				o			o		C	o	m	C	o		C		m	C	
19		C	o	M		o	m	C				o			o		C	o	m	C	o	m	C		M		
21		C		M			m	C				o			o		C	o	m	C	o	m	C		m	C	
14		C						C				o			o		C	o		C	o		C			C	
15		C						C				o			o		C	o		C	o					C	
22		C						C				o			o		C	o		C	o		C			C	

DATA USED IN COMPUTATION OF EFFICIENCY, VOLUME FLOW, AND MASS FLOW

C - CONTINUOUS (MITRE)
M - MANUAL
O - ORSAT

DATA NOT USED IN COMPUTATIONS

m - MANUAL
o - ORSAT

4. Fuel Consumption

The data base contains the coal consumption rate, the fuel air mixture temperature (assumed fixed at 150°F) and the natural gas volume flow rates, pressures, and temperatures. These measurements were obtained from Illinois Power continuous monitoring instruments. Average values for each test were inserted into the data base.

5. Air Heater Temperatures

Air input and gas output temperatures in the air heater were obtained on an hourly basis from both the Illinois Power automatic data log and the MITRE continuous measurements recorded on digital tape. Table 21 is an inventory of these measurements which indicates the data used in the computations.

6. Ambient Conditions

The data base contains the average ambient temperature, relative humidity and barometric pressure for each of the 21 tests. These values were obtained from a dry bulb thermometer, a sling psychrometer, and a mercury column barometer, respectively. The measurements were made near the forced draft fan inlet.

7. Electrical Currents

The pulverizer, forced draft fan and ID fan electrical current consumptions were recorded from the Illinois Power continuous monitoring instruments. The data base contains average values for these currents for each of the 21 tests.

8. Steam Flow

For each test an average steam flow was obtained from the Illinois Power continuous monitoring instruments.

9. Air Heater Leakage

A constant value of 10% was used as suggested by Illinois Power.

10. Flue Gas Flow Rates

Table 22 is an inventory of flue gas temperatures, static pressures and velocities for each loaction. The continuous measurements were taken from MITRE strip charts. An average

TABLE 21

AIR HEATER TEMPERATURE INVENTORY

MITRE TEST NUMBER	AIR INPUT C	AIR INPUT D	GAS OUTPUT C	GAS OUTPUT D
11		D		D
9		D		D
8		D		D
12		D		D
7		D		D
1	C	d	C	d
6	C	d	C	d
18	C	d	C	d
13	C	d	C	d
4	C	d	C	d
5	C	d	C	d
10	C	d	C	d
20	C	d	C	d
2	C	d	C	d
3	C	d	C	d
17	C	d	C	d
19	C	d	C	d
21	C	d	C	d
14	C	d	C	d
15	C	d	C	d
22	C	d	C	d

Data used in computation of efficiency:

C - Continuous (MITRE)
D - Automatic Data Log

Data not used in computations:

d - Automatic Data Log

TABLE 22

FLUE GAS FLOW RATE INVENTORY

MITRE TEST NUMBER	LOCATION 1									LOCATION 2									LOCATION 3								
	TEMP.			PRESS.			VELOCITY			TEMP.			PRESS.			VELOCITY			TEMP.			PRESS.			VELOCITY		
	C	M	A	C	M	A	C	M	A	C	M	A	C	M	A	C	M	A	C	M	A	C	M	A	C	M	A
11	C			C					A		M			M			M			M			M			M	
9	C			C					A		M			M			M			M			M			M	
8	C			C					A		M			M			M			M			M			M	
12	C			C					A		M			M			M			M			M			M	
7	C			C					A		M			M			M			M			M			M	
1	C			C					A		M			M			M			M			M			M	
6	C			C					A		M			M			M			M			M			M	
18	C			C					A		M			M			M			M			M			M	
13	C			C					A		M			M			M			M			M			M	
4	C			C					A		M			M			M			M			M			M	
5	C			C					A		M			M			M			M			M			M	
10	C			C					A		M			M			M			M			M			M	
20	C			C					A		M			M			M			M			M			M	
2	C			C					A		M			M			M			M			M			M	
3	C			C					A		M			M			M			M			M			M	
17	C			C					A		M			M			M			M			M			M	
19	C			C					A		M			M			M			M			M			M	
21	C			C					A		M			M			M			M			M			M	
14	C			C					A		M			M			M			M			M			M	
15	C			C					A		M			M			M			M			M			M	
22	C			C					A		M			M			M			M			M			M	

DATA USED IN COMPUTATION
OF GAS FLOWS

C - CONTINUOUS (MITRE)
M - MANUAL
A - ARTIFICIAL (COMPUTED FROM ANOTHER LOCATION)

test value was used. The manual measurements were taken once per day by Midwest Research Institute and represent an average value across the duct. It should be noted that the Location 1 velocities were calculated from the manual Location 2 velocities according to the following equation.

$$Vol_1 + L_{1,2} = Vol_2$$

$$A_1V_1\left(\frac{P_1}{T_1}\frac{460}{29.92}\right) + F_{1,2}A_1V_1\left(\frac{P_1}{T_1}\frac{460}{29.92}\right) = A_2V_2\left(\frac{P_2}{T_2}\frac{460}{29.92}\right)$$

$$V_1 = \left(\frac{A_2}{A_1}\right)\left(\frac{P_2}{P_1}\right)\left(\frac{T_1}{T_2}\right)\frac{V_2}{1+F_{1,2}}$$

$$= \left(\frac{347.5}{511.3}\right)\left(\frac{P_2}{P_1}\right)\left(\frac{T_1}{T_2}\right)\frac{V_2}{1+.100}$$

$$V_1 = .61785\left(\frac{P_2}{P_1}\right)\left(\frac{T_1}{T_2}\right)V_2$$

where

Vol_i - location i volume flow

$L_{i,j}$ - leakage from location i to location j

A_i - location i area

V_i - location i velocity

P_i - location i pressure

T_i - location i temperature

$F_{i,j}$ - leakage fraction from location i to j

9. Duct Area

The data base contains average areas for the flue gas ducts at locations 1, 2, and 3.

SECTION V

ANALYSIS OF DATA

This section describes the computational procedures utilized in the analysis of test results. Tabular displays of test results are presented for net and gross efficiency varying load level and excess air; gas mass flow and gas volume flow varying load level and excess air; and gas mass flow and gas volume flow varying load level and fuel type (excess air fixed). Results are also presented for an overall sulfur balance, for grain loading varying load level and soot blowing (fixed fuel type), comparison of continuous measurement results with manual measurements and with theoretical values, and for grain loading varying load level and fuel type.

NET AND GROSS EFFICIENCY AS A VARYING LOAD LEVEL AND EXCESS AIR

Computational Procedures

Net and gross efficiencies were computed for all of the 21 tests in the Baseline Measurement Program.

The efficiency calculations performed were basically those of the ASME publication PTC 4.1 using the heat loss method. Adjustments have been made, where required, based on the Illinois Power Company's computer performance calculations.

The efficiency factor (η) is given by the following equations:

$$\eta_g = 1 - \frac{L}{H_{fuel} + B_{el}} - .015 - R$$

$$\eta_n = 1 - \frac{L}{H_{fuel} + B_{el} + B_{e2}} - .015 - R$$

η_g = gross efficiency factor

η_n = net efficiency factor

L = heat losses (BTU/lb, as-fired fuel)

H_{fuel} = heating value (BTU/lb, as-fired fuel)

B_{e1} = electrical power consumed within system envelope (BTU/lb, as-fired fuel)

B_{e2} = electrical power consumed outside system envelope (BTU/lb, as-fired fuel)

R = radiation loss

The heat losses come from a variety of sources. The major ones are indicated in the following equation.

$$L = L_{UC} + L_{CO} + L_d + L_G + L_{UHC} + L_{mA} + L_{mf} + L_H$$

L_{UC} = heat loss due to unburned carbon in refuse

L_{CO} = heat loss due to formation of carbon monoxide

L_d = heat loss due to sensible heat in flue dust

L_G = heat loss due to heat in dry flue gas

L_{UHC} = heat loss due to unburned hydrocarbons

L_{mA} = heat loss due to moisture in the air

L_{mf} = heat loss due to moisture in the fuel

L_H = heat loss due to moisture from burning of hydrogen

The major sources of electrical power consumption are indicated by the following equations.

$$B_{e1} = (B_{P1} + B_{P2} + B_{P3} + B_{P4})\ (1-R)$$

$$B_{e2} = B_{F1} + B_{F2} + B_{I1} + B_{I2} + B_S + B_w$$

B_{P1} = electric power consumption of pulverizer No. 1

B_{P2} = electric power consumption of pulverizer No. 2

B_{P3} = electric power consumption of pulverizer No. 3

B_{P4} = electric power consumption of pulverizer No. 4

B_{F1} = electric power consumption of F.D. fan 1

B_{F2} = electric power consumption of F.D. fan 2

B_{I1} = electric power consumption of I.D. fan 1

B_{I2} = electric power consumption of I.D. fan 2

B_S = electric power consumption of ash sluice pump

B_w = electric power consumption of service water pump

R = pyrite rejection fraction

Heat Losses -

$$L_{UC} = \frac{W_d}{W_f} H_{fly} + \frac{Ash_f}{1-C_f} H_{pit}$$

$$L_{CO} = \frac{CO_g}{CO_g + CO_{2g}} \times 10160\ C_b$$

$$C_b = C_f - \frac{L_{UC}}{14500}$$

$$L_d = 0.2 \times (t_g - t_{fA}) \frac{W_d}{W_f}$$

$$t_G = t_g + F_L (t_g - t_a)$$

$$L_G = 0.24 \times W_G (t_G - t_a)$$

$$W_G = \frac{44CO_{2g} + 32O_{2g} + 28(N_{2g} + CO_g)}{12(CO_{2g} + CO_g)} \left[C_b + S_f/2.67\right]$$

$$L_{UHC} = \frac{UHC_g\ W_G\ K_{UHC}}{W_g}$$

$$W_g = \frac{CO_{2g}}{8.76} + \frac{O_{2g}}{12.04} + \frac{CO_g + N_{2g}}{13.75} + \frac{SO_{2g}}{6.01} + \frac{UHC_g}{385.29\ M_{HC}}$$

$$L_{mA} = W_{mA} W_A (h_V - h_{RV})$$

$$W_A = \frac{\frac{2.33\ N_{2g}}{CO_g + CO_{2g}} \left[C_b + \frac{S_f}{2.67} \right] - N_f}{0.7685}$$

$$L_{mf} = M_f\ (1048 - t_{fA} + .48t_G)$$

$$L_H = 8.936\ H_f\ (1048 - t_{fA} + .48t_G)$$

W_d = flue gas particulate mass flow rate (lb/hr)
W_f = coal consumption rate (lb/hr)
H_{fly} = heating value for fly ash (BTU/lb)
H_{pit} = heating value for pit ash (BTU/lb)
Ash_f = lb ash per lb fuel
C_f = lb carbon per lb fuel
S_f = lb sulfur per lb fuel
H_f = lb hydrogen per lb fuel
M_f = lb water per lb fuel
N_f = lb nitrogen per lb fuel
C_b = lb carbon burned per lb fuel
CO_{2g} = ft^3 carbon monoxide per ft^3 dry flue gas
O_{2g} = ft^3 oxygen per ft^3 dry flue gas
CO_g = ft^3 carbon monoxide per ft^3 dry flue gas
SO_{2g} = ft^3 sulfur dioxide per ft^3 dry flue gas
UHC_g = ft^3 unburned hydrocarbons per ft^3 dry flue gas
K_{UHC} = BTU/ft^3 of hydrocarbons
N_{2g} = ft^3 nitrogen per ft^3 dry flue gas (by difference)
M_{HC} = molecular weight of hydrocarbons
t_G = corrected air heater exit gas temperature (°F)
t_g = air heater exit gas temperature (°F)
t_{fA} = fuel, air mixture temperature (°F)
t_a = air heater entering air temperature (°F)

W_G = lb dry flue gas per lb fuel

W_g = flue gas specific weight

W_{mA} = lb water vapor per lb dry air

W_A = lb dry air supplied per lb fuel

F_L = lb air leakage per lb air to heater

h_V = enthalpy of vapor at t_G

h_{PV} = enthalpy of vapor at partial pressure corresponding to ambient temperature and relative humidity

Electrical Power Consumption -

$$B = \frac{5.911 \times \text{Volt} \times \text{Amp} \times \text{PF}}{W_f}$$

Volt = voltage (volts)

Amp = current (amperes)

PF = power factor fraction

W_f = coal consumption rate (lb/hr)

Dual Fuel Operation - When natural gas is burned along with coal, corrections must be applied to fuel composition values to convert natural gas to an equivalent amount of coal.

$$V_c = \frac{W_c}{W_c + W_g}$$

$$C_f = V_c\,(C_c - C_g) + C_g$$

$$S_f = V_c\,(S_c - S_g) + S_g$$

$H_f = V_c(H_c - H_g) + H_g$

$N_f = V_c(N_c - N_g) + N_g$

$M_f = V_c M_c$

$H_{fuel} = V_c(H_{coal} - H_{gas}) + H_{gas}$

f	=	subscript for adjusted fuel values
c	=	coal
g	=	natural gas
W_c	=	coal consumption rate (lb/hr)
W_g	=	gas consumption rate (lb/hr)
C,S,H,N,M	=	coal composition as defined previously
H_{fuel}	=	adjusted fuel heating value (BTU/lb)
H_{coal}	=	coal heating value (BTU/lb)
H_{gas}	=	natural gas heating value (BTU/lb)

Analysis and Interpretation of Results

As noted from Table 23 the average net efficiency for the tests performed at the 100 MW load level and with A type fuel (Tests 11, 9, 8, 12, and 7) is 88.5%. The average gross efficiency for these same tests is 88.4%.

The average net efficiency for the tests performed at the 75 MW load level and with A type fuel (Tests 4, 2, and 3) is 90.9%. The average gross efficiency for these same tests is 90.8%.

The average net efficiency for the tests performed at the 50 MW load level and with A type fuel (Tests 17, 19, 14, and 15) is 89.5%. The average gross efficiency for these same tests is 89.4%.

As expected from the computational procedures, gross efficiencies are always equal to or less than net efficiences for the same test.

The averaged net and gross efficiencies for the three load levels do show higher values at the 75MW load level when compared to the average values at the 100 MW and 50 MW load level. However, these differences are not of a magnitude to be significant.

A comparison of the average net and gross efficiencies for 100 MW A fuel tests with the 100 MW B fuel test and the 100 MW C fuel test shows no significant differences.

Similarly, no significant differences are shown between 75 MW A, B, and C fuel tests and 50 MW A, B, and C fuel tests.

TABLE 23

NET AND GROSS EFFICIENCY

DATE	MITRE TEST NUMBER	TEST CONDITIONS: LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	NET EFFICIENCY (%)	GROSS EFFICIENCY (%)
11/8/71	11	100	A	NO	NORM.	NORM.	87.8	87.7
11/9/71	9	100	A	NO	MIN.	NORM.	88.6	88.6
11/10/71	8	100	A	NO	MAX.	NORM.	88.2	88.1
11/11/71	12	100	A	YES*	NORM.	NORM.	88.8	88.8
11/12/71	7	100	A	YES	NORM.	NORM.	88.9	88.9
11/15/71	1	75	B	NO	NORM.	NORM.	90.0	89.9
11/16/71	6	100	B	NO	NORM.	NORM.	89.9	89.8
11/17/71	18	50	B	YES	NORM.	NORM.	90.7	90.6
11/18/71	13	35	B	NO	NORM.	NORM.	90.8	90.7
11/19/71	4	75	A	NO	MIN.	NORM.	90.9	90.9
11/22/71	5	75	C	NO	NORM.	NORM.	88.8	88.7
11/23/71	10	100	C	YES	NORM.	NORM.	88.9	88.8
11/24/71	20	50	C	NO	NORM.	NORM.	88.5	88.4
11/30/71	2	75	A	NO	NORM.	NORM.	90.8	90.7
12/1/71	3	75	A	NO	MAX.	NORM.	91.0	90.7
12/2/71	17	50	A	YES	NORM.	NORM.	90.9	90.8
12/3/71	19	50	A	NO	MAX.	NORM.	89.0	88.9
12/4/71	21	35	A	NO	NORM.	NORM.	88.6	88.4
12/7/71	14	50	A	NO	NORM.	MIN.	88.1	88.0
12/8/71	15	50	A	NO	MIN.	NORM.	89.9	89.8
12/9/71	22	75	D	NO	NORM.	NORM.	90.7	90.7

* REDUCED LEVEL OF SOOT BLOWING

GAS MASS FLOW AND GAS VOLUME FLOW VARYING LOAD LEVEL, EXCESS AIR, AND FUEL TYPE

Computational Procedures

Gas mass flows and gas volume flows were computed for Location 1 (economizer) for SO_2, CO_2, O_2, N_2, and total gases. Mass flows and volume flows were also computed at Location 3 (midway in stack) for NO, CO_2, O_2, N_2, and for total gases.

The flow rates for these gases at the two locations were based upon manual velocity measurements as determined by the Midwest Research Institute stack sampling team. These velocity measurements were, in turn, computed by MRI using the following.

$$U_S = 174 \, F_{PT} \sqrt{\frac{28.84}{MW_S} \times \frac{29.92}{P_{static}}} \sqrt{T_S \, \Delta P}$$

$$MW_S = 44CO_2 + 32O_2 + 28N_2 + 18H_2O$$

$$P_{static} = P_A - P_{stack}/13.6$$

U_S = velocity (ft/min)

F_{PT} = pitot correction factor (.9)

MW_S = molecular weight of stack gas

P_{static} = static duct pressure (in. H_g)

T_S = stack temperature (°R = °F + 460)

ΔP = stack (pitot) pressure (in. H_g)

CO_2, O_2, N_2 = flue gas constituents (fraction by volume moisture free)

N_2 = $1 - CO_2 - O_2 - H_2O$

H_2O = flue gas moisture fraction

P_A = atmospheric pressure (in. H_g)

P_{stack} = stack pressure (in. H_2O)

As described in Section IV, manual velocity measurements at Location 2 (air heater) were adjusted with respect to pressure, temperature, duct area, and duct leakage to provide estimates of velocities at Loaction 1 (economizer). This procedure was necessary because the velocity measuring instrumentation at Location 1 did not function properly for the major portion of the test program.

Volume flow rates were then calculated at the two locations for each constituent using the measured velocities by means of the following formula.

$$V_m = AV \times Vol_{gas}$$

V_m		volume flow (ft^3/min)
A		duct area (ft^2)
V		velocity (ft/Min)
Vol_{gas}	=	fraction by volume of gas constituent (as measured by instrumentation system)

Mas flow rates were also calculated for the various gaseous constituents for the total gases using the formula:

$$R_m = \frac{\left[V_m\right] \times \left[MW_{gas} / \left(359\ ft^3/lb\ mole\right)\right]}{\left[\left(T_G + 460\right)/P_{static}\right]\ \left[29.92/\left(460 + 32\right)\right]}$$

$$R_m = .0458\ \frac{\left[\left(V_m\right)\left(MW_{gas}\right)\right]}{\left[\left(T_G + 460\right)/P_{static}\right]}$$

R_m	=	mass flow (lb/min)
MW_{gas}	=	molecular weight of gas constituent

TABLE 24

FLOW RATES FOR SO_2 AT LOCATION 1

DATE	MITRE TEST NUMBER	TEST CONDITIONS: LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	1615.9	680.2	121.4
11/11/71	12	100	A	YES*	NORM.	NORM.	1474.7	619.9	110.6
11/12/71	7	100	A	YES	NORM.	NORM.	1615.5	673.8	120.2
11/15/71	1	75	B	NO	NORM.	NORM.	1118.8	471.2	84.1
11/16/71	6	100	B	NO	NORM.	NORM.	1615.4	630.3	112.5
11/17/71	18	50	B	YES	NORM.	NORM.	679.6	282.4	50.4
11/18/71	13	35	B	NO	NORM.	NORM.	491.8	212.3	37.9
11/19/71	4	75	A	NO	MIN.	NORM.	1144.3	474.3	84.6
11/22/71	5	75	C	NO	NORM.	NORM.	196.3	81.8	14.6
11/23/71	10	100	C	YES	NORM.	NORM.	257.0	104.9	18.7
11/24/71	20	50	C	NO	NORM.	NORM.	173.9	75.1	13.4
11/30/71	2	75	A	NO	NORM.	NORM.	990.3	416.6	74.3
12/1/71	3	75	A	NO	MAX.	NORM.	1276.6	534.8	95.4
12/2/71	17	50	A	YES	NORM.	NORM.	673.7	305.9	54.6
12/3/71	19	50	A	NO	MAX.	NORM.	785.9	335.2	59.8
12/4/71	21	35	A	NO	NORM.	NORM.			
12/7/71	14	50	A	NO	NORM.	MIN.	589.3	246.7	44.0
12/8/71	15	50	A	NO	MIN.	NORM.	738.1	313.1	55.9
12/9/71	22	75	D	NO	NORM.	NORM.	404.4	160.7	28.7

* REDUCED LEVEL OF SOOT BLOWING

TABLE 25

FLOW RATES FOR CO_2 AT LOCATION 1

DATE	MITRE TEST NUMBER	TEST CONDITIONS					VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
		LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE			
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	52,496	22,097	2,709
11/11/71	12	100	A	YES*	NORM.	NORM.			
11/12/71	7	100	A	YES	NORM.	NORM.	49,606	20,690	2,536
11/15/71	1	75	B	NO	NORM.	NORM.	32,095	13,519	1,657
11/16/71	6	100	B	NO	NORM.	NORM.	61,879	24,142	2,959
11/17/71	18	50	B	YES	NORM.	NORM.	41,805	17,374	2,130
11/18/71	13	35	B	NO	NORM.	NORM.	29,212	12,610	1,546
11/19/71	4	75	A	NO	MIN.	NORM.	44,388	18,397	2,255
11/20/71	5	75	C	NO	NORM.	NORM.	31,738	13,226	1,621
11/23/71	10	100	C	YES	NORM.	NORM.	50,692	20,695	2,537
11/24/71	20	50	C	NO	NORM.	NORM.	32,441	14,004	1,717
11/30/71	2	75	A	NO	NORM.	NORM.	58,996	24,821	3,042
12/1/71	3	75	A	NO	MAX.	NORM.	50,973	21,354	2,617
12/2/71	17	50	A	YES	NORM.	NORM.	34,738	15,771	1,933
12/3/71	19	50	A	NO	MAX.	NORM.	32,097	13,689	1,678
12/4/71	21	35	A	NO	NORM.	NORM.			
12/7/71	14	50	A	NO	NORM.	MIN.			
12/8/71	15	50	A	NO	MIN.	NORM.			
12/9/71	22	75	D	NO	NORM.	NORM.			

* REDUCED LEVEL OF SOOT BLOWING

TABLE 26

FLOW RATES FOR O_2 AT LOCATION 1

DATE	MITRE TEST NUMBER	TEST CONDITIONS: LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	36,456	15,345	1,368
11/11/71	12	100	A	YES*	NORM.	NORM.	23,993	10,086	899
11/12/71	7	100	A	YES	NORM.	NORM.	23,683	9,878	880
11/15/71	1	75	B	NO	NORM.	NORM.	24,176	10,183	908
11/16/71	6	100	B	NO	NORM.	NORM.	34,897	13,615	1,213
11/17/71	18	50	B	YES	NORM.	NORM.	19,240	7,996	713
11/18/71	13	35	B	NO	NORM.	NORM.	19,274	8,320	742
11/19/71	4	75	A	NO	MIN.	NORM.	14,817	6,141	547
11/22/71	5	75	C	NO	NORM.	NORM.	12,806	5,337	476
11/23/71	10	100	C	YES	NORM.	NORM.	13,537	5,526	493
11/24/71	20	50	C	NO	NORM.	NORM.	11,375	4,911	438
11/30/71	2	75	A	NO	NORM.	NORM.	20,304	8,542	761
12/1/71	3	75	A	NO	MAX.	NORM.	33,311	13,955	1,244
12/2/71	17	50	A	YES	NORM.	NORM.	12,118	5,501	490
12/3/71	19	50	A	NO	MAX.	NORM.	24,573	10,480	934
12/4/71	21	35	A	NO	NORM.	NORM.			
12/7/71	14	50	A	NO	NORM.	MIN.	12,632	5,288	471
12/8/71	15	50	A	NO	MIN.	NORM.	13,178	5,589	498
12/9/71	22	75	D	NO	NORM.	NORM.	23,107	9,181	818

* REDUCED LEVEL OF SOOT BLOWING

TABLE 27

FLOW RATES FOR N_2 AT LOCATION 1

(NO FRACTION COUNTED AS N_2)

DATE	MITRE TEST NUMBER	TEST CONDITIONS LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	638,546	268,778	20,968
11/11/71	12	100	A	YES*	NORM.	NORM.			
11/12/71	7	100	A	YES	NORM.	NORM.	600,010	250,261	19,524
11/15/71	1	75	B	NO	NORM.	NORM.	482,031	203,034	15,839
11/16/71	6	100	B	NO	NORM.	NORM.	710,484	277,195	21,625
11/17/71	18	50	B	YES	NORM.	NORM.	334,532	139,029	10,846
11/18/71	13	35	B	NO	NORM.	NORM.	252,178	108,861	8,493
11/19/71	4	75	A	NO	MIN.	NORM.	435,611	180,539	14,084
11/22/71	5	75	C	NO	NORM.	NORM.	512,065	213,394	16,648
11/23/71	10	100	C	YES	NORM.	NORM.	598,158	244,201	19,051
11/24/71	20	50	C	NO	NORM.	NORM.	324,657	140,152	10,934
11/30/71	2	75	A	NO	NORM.	NORM.	430,498	181,120	14,130
12/1/71	3	75	A	NO	MAX.	NORM.	510,615	213,906	16,688
12/2/71	17	50	A	YES	NORM.	NORM.	275,612	125,127	9,762
12/3/71	19	50	A	NO	MAX.	NORM.	356,697	152,125	11,868
12/4/71	21	35	A	NO	NORM.	NORM.			
12/7/71	14	50	A	NO	NORM.	MIN.			
12/8/71	15	50	A	NO	MIN.	NORM.			
12/9/71	22	75	D	NO	NORM.	NORM.			

* REDUCED LEVEL OF SOOT BLOWING

TABLE 28

FLOW RATES FOR ALL GASES AT LOCATION 1
(SO_2, CO_2, O_2, N_2 WITH
NO FRACTION COUNTED AS N_2)

DATE	MITRE TEST NUMBER	TEST CONDITIONS					VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
		LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE			
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	729,113	306,900	25,166
11/11/71	12	100	A	YES*	NORM.	NORM.	646,283	271,668	21,598
11/12/71	7	100	A	YES	NORM.	NORM.	674,916	281,504	23,061
11/15/71	1	75	B	NO	NORM.	NORM.	539,421	227,207	18,488
11/16/71	6	100	B	NO	NORM.	NORM.	808,876	315,582	25,910
11/17/71	18	50	B	YES	NORM.	NORM.	396,257	164,682	13,739
11/18/71	13	35	B	NO	NORM.	NORM.	301,155	130,003	10,818
11/19/71	4	75	A	NO	MIN.	NORM.	495,961	205,551	16,971
11/22/71	5	75	C	NO	NORM.	NORM.	556,805	232,039	18,759
11/23/71	10	100	C	YES	NORM.	NORM.	662,644	270,528	22,099
11/24/71	20	50	C	NO	NORM.	NORM.	368,647	159,142	13,101
11/30/71	2	75	A	NO	NORM.	NORM.	510,788	214,900	18,008
12/1/71	3	75	A	NO	MAX.	NORM.	596,175	249,749	20,644
12/2/71	17	50	A	YES	NORM.	NORM.	323,141	146,705	12,240
12/3/71	19	50	A	NO	MAX.	NORM.	414,153	176,629	14,540
12/4/71	21	35	A	NO	NORM.	NORM.			
12/7/71	14	50	A	NO	NORM.	MIN.			
12/8/71	15	50	A	NO	MIN.	NORM.			
12/9/71	22	75	D	NO	NORM.	NORM.			

* REDUCED LEVEL OF SOOT BLOWING

TABLE 29

FLOW RATES FOR NO AT LOCATION 3

DATE	MITRE TEST NUMBER	TEST CONDITIONS LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	221.8	142.3	11.9
11/11/71	12	100	A	YES*	NORM.	NORM.	151.7	97.5	8.1
11/12/71	7	100	A	YES	NORM.	NORM.	149.7	94.7	7.9
11/15/71	1	75	B	NO	NORM.	NORM.	118.5	75.3	6.3
11/16/71	6	100	B	NO	NORM.	NORM.	115.0	73.3	6.1
11/17/71	18	50	B	YES	NORM.	NORM.	74.4	48.8	4.1
11/18/71	13	35	B	NO	NORM.	NORM.	55.7	37.2	3.1
11/19/71	4	75	A	NO	MIN.	NORM.	102.4	66.5	5.6
11/22/71	5	75	C	NO	NORM.	NORM.	56.6	38.0	3.2
11/23/71	10	100	C	YES	NORM.	NORM.	35.5	23.3	1.9
11/24/71	20	50	C	NO	NORM.	NORM.	26.5	18.2	1.5
11/30/71	2	75	A	NO	NORM.	NORM.	88.8	58.2	4.9
12/1/71	3	75	A	NO	MAX.	NORM.	109.5	72.5	6.1
12/2/71	17	50	A	YES	NORM.	NORM.	62.3	42.1	3.5
12/3/71	19	50	A	NO	MAX.	NORM.	84.8	57.0	4.8
12/4/71	21	35	A	NO	NORM.	NORM.	30.9	21.0	1.8
12/7/71	14	50	A	NO	NORM.	MIN.	38.8	25.2	2.1
12/8/71	15	50	A	NO	MIN.	NORM.	47.1	31.3	2.6
12/9/71	22	75	D	NO	NORM.	NORM.	57.9	36.9	3.1

* REDUCED LEVEL OF SOOT BLOWING

TABLE 30

FLOW RATES FOR SO_2 AT LOCATION 3

DATE	MITRE TEST NUMBER	TEST CONDITIONS					VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
		LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE			
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	554.9	356.0	63.5
11/11/71	12	100	A	YES*	NORM.	NORM.	679.3	436.0	77.9
11/12/71	7	100	A	YES	NORM.	NORM.	806.8	510.2	91.0
11/15/71	1	75	B	NO	NORM.	NORM.	608.5	386.6	69.0
11/16/71	6	100	B	NO	NORM.	NORM.	765.7	488.1	87.1
11/17/71	18	50	B	YES	NORM.	NORM.	304.7	199.9	35.7
11/18/71	13	35	B	NO	NORM.	NORM.	219.6	146.8	26.2
11/19/71	4	75	A	NO	MIN.	NORM.	606.1	393.6	70.2
11/22/71	5	75	C	NO	NORM.	NORM.	167.1	112.1	20.0
11/23/71	10	100	C	YES	NORM.	NORM.	192.5	126.1	22.5
11/24/71	20	50	C	NO	NORM.	NORM.	102.0	70.1	12.5
11/30/71	2	75	A	NO	NORM.	NORM.	452.1	296.5	52.9
12/1/71	3	75	A	NO	MAX.	NORM.	586.4	388.5	69.3
12/2/71	17	50	A	YES	NORM.	NORM.	361.2	243.9	43.5
12/3/71	19	50	A	NO	MAX.	NORM.	381.1	256.2	45.7
12/4/71	21	35	A	NO	NORM.	NORM.	259.4	176.1	31.4
12/7/71	14	50	A	NO	NORM.	MIN.	341.1	221.6	39.6
12/8/71	15	50	A	NO	MIN.	NORM.			
12/9/71	22	75	D	NO	NORM.	NORM.	589.1	374.9	66.9

* REDUCED LEVEL OF SOOT BLOWING

TABLE 31

FLOW RATES FOR CO_2 AT LOCATION 3

DATE	MITRE TEST NUMBER	TEST CONDITIONS: LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	46,737	29,281	3,675
11/11/71	12	100	A	YES*	NORM.	NORM.	47,415	30,454	3,733
11/12/71	7	100	A	YES	NORM.	NORM.	53,335	33,728	4,134
11/15/71	1	75	B	NO	NORM.	NORM.	45,041	28,611	3,507
11/16/71	6	100	B	NO	NORM.	NORM.	55,686	35,502	4,352
11/17/71	18	50	B	YES	NORM.	NORM.	27,973	18,351	2,249
11/18/71	13	35	B	NO	NORM.	NORM.	20,501	13,705	1,680
11/19/71	4	75	A	NO	MIN.	NORM.	41,380	26,869	3,293
11/22/71	5	75	C	NO	NORM.	NORM.	32,880	22,059	2,704
11/23/71	10	100	C	YES	NORM.	NORM.	47,093	30,837	3,780
11/24/71	20	50	C	NO	NORM.	NORM.	22,775	15,656	1,919
11/30/71	2	75	A	NO	NORM.	NORM.	36,375	23,856	2,924
12/1/71	3	75	A	NO	MAX.	NORM.	41,285	27,350	3,352
12/2/71	17	50	A	YES	NORM.	NORM.	24,589	16,605	2,035
12/3/71	19	50	A	NO	MAX.	NORM.	26,459	17,789	2,180
12/4/71	21	35	A	NO	NORM.	NORM.	19,297	13,102	1,606
12/7/71	14	50	A	NO	NORM.	MIN.	27,002	17,547	2,151
12/8/71	15	50	A	NO	MIN.	NORM.	25,786	17,116	2,098
12/9/71	22	75	D	NO	NORM.	NORM.	39,472	25,120	3,079

* REDUCED LEVEL OF SOOT BLOWING

TABLE 32

FLOW RATES FOR O_2 AT LOCATION 3

DATE	MITRE TEST NUMBER	TEST CONDITIONS LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	29,742	19,079	1,700
11/11/71	12	100	A	YES*	NORM.	NORM.	30,965	19,888	1,773
11/12/71	7	100	A	YES	NORM.	NORM.	24,720	15,632	1,393
11/15/71	1	75	B	NO	NORM.	NORM.	22,680	14,407	1,284
11/16/71	6	100	B	NO	NORM.	NORM.	27,238	17,365	1,548
11/17/71	18	50	B	YES	NORM.	NORM.	15,408	10,108	901
11/18/71	13	35	B	NO	NORM.	NORM.	13,646	9,122	813
11/19/71	4	75	A	NO	MIN.	NORM.	18,067	11,731	1,046
11/22/71	5	75	C	NO	NORM.	NORM.	8,485	5,693	507
11/23/71	10	100	C	YES	NORM.	NORM.	21,542	14,106	1,257
11/24/71	20	50	C	NO	NORM.	NORM.	12,721	8,744	779
11/30/71	2	75	A	NO	NORM.	NORM.	15,979	10,479	934
12/1/71	3	75	A	NO	MAX.	NORM.	25,256	16,731	1,491
12/2/71	17	50	A	YES	NORM.	NORM.	13,498	9,116	812
12/3/71	19	50	A	NO	MAX.	NORM.	18,059	12,142	1,082
12/4/71	21	35	A	NO	NORM.	NORM.	11,990	8,141	726
12/7/71	14	50	A	NO	NORM.	MIN.	13,501	8,773	782
12/8/71	15	50	A	NO	MIN.	NORM.	12,987	8,620	768
12/9/71	22	75	D	NO	NORM.	NORM.	16,412	10,445	931

* REDUCED LEVEL OF SOOT BLOWING

TABLE 33

FLOW RATES FOR N_2 AT LOCATION 3

DATE	MITRE TEST NUMBER	TEST CONDITIONS					VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
		LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE			
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	347,624	222,996	17,397
11/11/71	12	100	A	YES*	NORM.	NORM.	307,852	197,725	15,425
11/12/71	7	100	A	YES	NORM.	NORM.	316,059	199,870	15,593
11/15/71	1	75	B	NO	NORM.	NORM.	250,990	159,437	12,438
11/16/71	6	100	B	NO	NORM.	NORM.	319,719	203,830	15,902
11/17/71	18	50	B	YES	NORM.	NORM.	162,228	106,427	8,303
11/18/71	13	35	B	NO	NORM.	NORM.	125,742	84,060	6,558
11/19/71	4	75	A	NO	MIN.	NORM.	231,253	150,157	11,714
11/22/71	5	75	C	NO	NORM.	NORM.	223,571	149,993	11,701
11/23/71	10	100	C	YES	NORM.	NORM.	290,170	190,009	14,823
11/24/71	20	50	C	NO	NORM.	NORM.	144,559	99,370	7,752
11/30/71	2	75	A	NO	NORM.	NORM.	206,926	135,709	10,587
12/1/71	3	75	A	NO	MAX.	NORM.	245,528	162,654	12,689
12/2/71	17	50	A	YES	NORM.	NORM.	143,898	97,177	7,581
12/3/71	19	50	A	NO	MAX.	NORM.	165,008	110,937	8,655
12/4/71	21	35	A	NO	NORM.	NORM.	122,802	83,378	6,505
12/7/71	14	50	A	NO	NORM.	MIN.	150,424	97,752	7,626
12/8/71	15	50	A	NO	MIN.	NORM.	148,038	98,260	7,666
12/9/71	22	75	D	NO	NORM.	NORM.	233,098	148,345	11,573

* REDUCED LEVEL OF SOOT BLOWING

TABLE 34

FLOW RATES FOR ALL GASES AT LOCATION 3
(NO, SO_2, CO_2, O_2, & N_2)

DATE	MITRE TEST NUMBER	TEST CONDITIONS: LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	VOLUME FLOW (ACTUAL FT^3 PER MIN.)	VOLUME FLOW (STANDARD FT^3 PER MIN.)	MASS FLOW (LB. PER MIN.)
11/8/71	11	100	A	NO	NORM.	NORM.			
11/9/71	9	100	A	NO	MIN.	NORM.			
11/10/71	8	100	A	NO	MAX.	NORM.	424,879	272,554	22,848
11/11/71	12	100	A	YES*	NORM.	NORM.	387,063	248,601	21,017
11/12/71	7	100	A	YES	NORM.	NORM.	395,070	249,835	21,219
11/15/71	1	75	B	NO	NORM.	NORM.	319,438	202,917	17,305
11/16/71	6	100	B	NO	NORM.	NORM.	403,524	257,258	21,894
11/17/71	18	50	B	YES	NORM.	NORM.	205,988	135,135	11,493
11/18/71	13	35	B	NO	NORM.	NORM.	160,163	107,071	9,080
11/19/71	4	75	A	NO	MIN.	NORM.	291,409	189,217	16,129
11/22/71	5	75	C	NO	NORM.	NORM.	265,160	177,894	14,936
11/23/71	10	100	C	YES	NORM.	NORM.	359,034	235,102	19,885
11/24/71	20	50	C	NO	NORM.	NORM.	180,184	123,858	10,465
11/30/71	2	75	A	NO	NORM.	NORM.	259,821	170,399	14,503
12/1/71	3	75	A	NO	MAX.	NORM.	312,764	207,196	17,608
12/2/71	17	50	A	YES	NORM.	NORM.	182,408	123,184	10,476
12/3/71	19	50	A	NO	MAX.	NORM.	209,992	141,181	11,968
12/4/71	21	35	A	NO	NORM.	NORM.	154,380	104,818	8,869
12/7/71	14	50	A	NO	NORM.	MIN.	191,306	124,319	10,600
12/8/71	15	50	A	NO	MIN.	NORM.	186,857	124,027	10,534
12/9/71	22	75	D	NO	NORM.	NORM.	289,629	184,322	15,653

* REDUCED LEVEL OF SOOT BLOWING

Gas	MW_{gas}
CO	28.01
CO_2	44.01
O_2	32.00
N_2	28.01
SO_2	64.07
NO_2	46.01
NO	30.01

t_G = gas temperature (°F)

P_{static} = see velocity calculation

The results of these calculations are provided in Table 24 through 34. Where no entries appear on these tables for volume flow and for mass flow, the computations could not be performed because of insufficient data (due to either equipment failure or instrument failure).

Analysis and Interpretation of Results

As noted in Table 24, the SO_2 flow rate at location 1 (stated in terms of mass flow - lbs per minute) appears to be consistent with the sulfur content of the fuel. The average mass flow for three 100 MW A fuel tests (tests 8, 12, and 7) is 117.4 lbs/minute. The average sulfur content of the coal consumed in these three A fuel tests was 3.42% (on "as fired" dry basis). This average is greater than the 112.5 lbs per minute recorded for test 6, a 100 MW B fuel test which consumed fuel with a 2.88% sulfur content. Both sets of tests in turn showed greater SO_2 mass flow than test 10, a 100 MW C fuel test (simulated 1.08% sulfur fuel). In a similar comparison, the average SO_2 flow rate for three 75 MW A fuel tests (tests 4, 2, and 3) is 84.8 lbs/minute. These three tests utilized coal of 3.32% average sulfur content. This average was approximately equal to the 75MW B fuel test (test 1) which utilized coal with an average sulfur content of 3.29% sulfur. Both the A and B fuel tests showed a greater mass flow of SO_2 than the 75 MW C fuel test (test 5) which utilized gas and coal to simulate a 0.86% sulfur coal. The 75MW D fuel test (test 22) produced an SO_2 mass flow that was higher than expected; however, the analysis of the coal consumed in this test showed it to be of 1.4% sulfur content rather than the expected .5% sulfur content. The SO_2 mass flows noted for this test were therefore consistent with this measured sulfur content. Similar relationships were found in the 50 MW tests with A, B, and C fuels. No significant changes in SO_2 mass flow were found which were traceable to changes in the soot blowing cycle or in excess air settings.

Table 25 provides the CO_2 flow rate at location 1 for the various tests. An examination of the mass flow of CO_2 (in lbs per minute) shows that for a fixed fuel type the CO_2 mass flow decreases with decreasing load levels (as would be expected with the reduced coal feed rates associated with the lower loads). Table 25 also illustrates that, for a fixed load level, the CO_2 mass flow rates were not significantly different for fuel types A, B, and C.

Table 26 provides results on the O_2 flow rates at location 1. These results show that the O_2 mass flow rate decreases with decreasing load level, and for a fixed load level is not significantly different for fuel types A and B. Tests performed on C type fuel produced O_2 mass flow rates which were both greater and lower than the corresponding tests with A and B fuel dependent upon the load level. The greatest differences were found between tests with fixed load level and fixed fuel types where excess air was the parameter varied.

Flow rates for N_2 mass flow are shown on Table 27. These results show that the N_2 mass flow rate decreases with decreasing load level, and for fixed load levels are not significantly different for fuel types A, B, and C. For fixed load levels and fixed fuel types, greater N_2 mass flow was found for the maximum excess air test.

The flow rates for all gases shown in Table 28 represent the total of the previous four tables and, as such, show the same relationships as the individual gases (i.e., same decrease with decreasing load level and same increase with increased excess air).

Table 29 provides results on the NO flow rates as measured at location 3. Tests performed on A type fuel produced NO mass flow rates which were both greater and lower than the corresponding tests with B fuel dependent upon the load level. However, for all load levels, the NO flow rates with C fuel (predominantly natural gas) were significantly lower than the tests performed with A and B fuels.

Table 30 provides the SO_2 flow rates measured at location 3. The relationships noted in Table 30 are similar to those noted in Table 24 for location 1, i.e., for a fixed fuel type the SO_2 mass flow is reduced for reduced load levels. Inconsistencies were found in the comparison between the 100 MW A fuel test (tests 8, 12, and 7) and the 100 MW B fuel test (test 6). Although the sulfur content was lower for the B fuel, the SO_2 mass flow measured on test 6 was greater than the average SO_2 mass flow for tests 8, 12, and 7. The results from test 10 did show the lower levels for SO_2 mass flow expected for a 100 MW C fuel test. The average SO_2 mass flow rate for the three 75 MW A fuel tests (tests 4, 2, and 3) is approximately equal to the mass flow for the 75 MW B fuel test (test 1); however, as was previously noted, the sulfur content of the coal consumed in these tests was approximately equal. As was true of the measurements at location 1, the A and B fuel tests performed at the 75 MW load level produced higher SO_2 mass flows than measured in the 75 MW C fuel test. Similar relationships were found in the 50 MW tests with A, B, and C fuels.

The CO_2 flow rates measured at location 3 are provided in Table 31. As shown in Table 31, for fixed fuel types, the CO_2 mass flow decreases with decreasing levels. Table 31 also illustrates that for a fixed load level, the CO_2 mass flow rates were not significantly different for fuel types A, B, and C.

Flow rates for O_2 at location 3 are provided in Table 32. These results show that the O_2 mass flow rate decreases with decreasing load level and for a fixed load level is not significantly different for fuel types A and B. Tests performed with C fuel produced O_2 mass flows which were both greater and lower than the corresponding tests with A and B fuel dependent upon the load level. Differences were found in O_2 mass flow rate between tests at the 50 MW load level with A fuel where excess air was varied (tests 19, 14, and 15). Similar differences were not found for 100 MW A fuel tests where excess air was varied.

Flow rates for N_2 at location 3, as shown in Table 33, illustrate that the N_2 mass flow rates decrease with decreasing load levels, and for fixed load levels are not significantly different for fuel types A, B, and C. For fixed load levels and fixed fuel types, greater N_2 flow was found for the maximum excess air tests.

The flow rates for all gases shown in Table 34 are based upon the totals for all measured gases. The same relationships are therefore shown as for the individual gases (i.e., same decrease in flow rate with decreasing load level and same increase with increased excess air).

SULFUR BALANCE

Computational Procedures

For each of the tests performed in the baseline program, the average coal consumption rate was determined utilizing the manual coal scale readings. The average sulfur content of the coal (as determined by chemical analysis) was then used with the coal scale readings to determine the rate of sulfur feed to the steam generator. Average SO_2 mass flow readings from the continuous instrumentation system at the stack were then used to determine the average sulfur flow at the stack (where lbs sulfur/minute = lbs SO_2/minute x $\frac{\text{molecular weight sulfur}}{\text{molecular weight } SO_2}$ = lbs SO_2/minute x .50). The rate of sulfur feed into the steam generator was then compared with the rate of sulfur flow through the stack.

Analysis and Interpretation of Results

The results of the sulfur balance calculations are summarized in Table 35. These results are based upon measurement of the SO_2 concentration of the stack gas with the exception of test 15 in which SO_2 concentrations measured at location 1 (economizer) were corrected using estimated system leakage values to provide an estimate of SO_2 concentration in the stack. In all cases, the measurements of SO_2 concentrations do not include measurement of the sulfur exhausted from the stack as SO_3 or the sulfur adsorbed on the ash as SO_2 and SO_3. The results provided in Table 35 show good agreement on the sulfur balance leading to the conclusion that the total combined error in SO_2 and gas flow measurements

TABLE 35

SULFUR BALANCE

DATE	MITRE TEST NO.	LOAD (MW)	FUEL	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	AVERAGE COAL FLOW(1) (10^3 LB/HR)	% SULFUR IN COAL(2)	AVERAGE SULFUR FEED (LB/HR)	AVERAGE SULFUR FEED (LB/MIN)	AVERAGE SO_2 FLOW(3) (LB/MIN)	AVERAGE SULFUR FLOW (LB/MIN)	SULFUR FEED-FLOW (LB/MIN)
11/8/71	11	100	A	NO	NORM	NORM	85.0	3.37	2865	47.7			
11/9/71	9	100	A	NO	MIN	NORM	83.5	3.40	2839	47.3			
11/10/71	8	100	A	NO	MAX	NORM	63.7	3.37	2147	35.8	63.5	31.8	4.0
11/11/71	12	100	A	YES*	NORM	NORM	83.9	3.24	2718	45.3	77.9	39.0	6.3
11/12/71	7	100	A	YES	NORM	NORM	84.2	3.28	2762	46.0	91.0	45.5	0.5
11/15/71	1	75	B	NO	NORM	NORM	64.8	3.16	2048	34.1	69.0	34.5	-0.4
11/16/71	6	100	B	NO	NORM	NORM	90.1	2.76	2514	41.9	87.1	43.6	-1.7
11/17/71	18	50	B	YES	NORM	NORM	48.3	2.57	1241	20.7	35.7	17.9	2.8
11/18/71	13	35	B	NO	NORM	NORM	32.3	2.51	811	13.5	26.2	13.1	0.4
11/19/71	4	75	A	NO	MIN	NORM	63.2	3.37	2130	35.5	70.2	35.1	0.4
11/22/71	5	75	C	NO	NORM	NORM	34.0	1.83	622	10.4	20.0	10.0	0.4
11/23/71	10	100	C	YES	NORM	NORM	46.4	1.65	766	12.8	22.5	11.3	1.5
11/24/71	20	50	C	NO	NORM	NORM	26.0	1.68	437	7.3	12.5	6.3	1.0
11/30/71	2	75	A	NO	NORM	NORM	66.2	2.87	1900	31.7	52.9	26.5	5.2
12/1/71	3	75	A	NO	MAX	NORM	65.2	3.31	2158	36.0	69.3	34.7	1.3
12/2/71	17	50	A	YES	NORM	NORM	45.4	3.46	1571	26.2	43.5	21.8	4.4
12/3/71	19	50	A	NO	MAX	NORM	50.5	3.47	1752	29.2	45.7	22.9	6.3
12/4/71	21	35	A	NO	NORM	NORM	32.4	3.09	1001	16.7	31.4	15.7	1.0
12/7/71	14	50	A	NO	NORM	MIN	47.0	2.74	1288	21.5	39.6	19.8	1.7
12/8/71	15	50	A	NO	MIN	NORM	46.3	3.37	1560	26.0	46.6**	23.3**	2.7
12/9/71	22	75	D	NO	NORM	NORM	63.2	1.33	841	14.0	24.2	12.1	1.9

* Reduced level of soot blowing
** Location 1

(1) Coal Scale Measurement
(2) Midwest & ICS Average
(3) MITRE Measurement at Location 3

was low. As noted in Table 35, in all cases except two cases (tests 1 and 6), the sulfur feed rate exceeded the sulfur flow rate measured in the stack indicating that there were, in fact, small unmeasured losses of sulfur.

GRAIN LOADING VARYING LOAD LEVEL, FUEL TYPE, AND SOOT BLOWING

Computational Procedures

Grain loadings were determined at location 2 and location 3 for all tests by means of manual measurements. These manual measurements were taken by the Midwest Research Institute using the sampling train and the operating techniques specified in the Federal Register of December 23, 1971 (Volume 36, Number 247).

As noted previously, the results of the preliminary measurement program indicated that the best method for measuring grain loading at location 2 was a 20-point, two-probe traverse in one-half of each of the two ducts (a total of 40 points). The halves selected were varied from test to test to provide representative sampling of the total duct.

A location 3, the grain loading for the total stack was determined by a 32-point traverse to obtain representative samples.

A summary of the grain loading results is provided in Table 36. The emission rates shown in Table 36 were computed using the measured grain loadings and the manually determined gas mass flow with the appropriate conversion factors to provide values in terms of pounds of particulates per hour.

The mechanical collection efficiencies shown in Table 36 were calculated using the emission rates for the two locations (location 2 prior to collection and location 3 after collection). Because of the configuration of the ducting, this collection efficiency reflects an ash removal capability that is a result, not only of the effects of the mechanical collector proper but, also, of the lower tubes of the air heater, and the ducting between the air heater and the stack. For this reason, the efficiencies shown are not absolute values but are to be considered as relative measurements to be used only in test-to-test comparisons.

TABLE 36

GRAIN LOADING MEASUREMENTS

DATE	MITRE TEST NO. (OLD)	LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	AIR BURNER ANGLE	GRAIN LOADING: GRAINS/SCF LOCATION 2	GRAIN LOADING: GRAINS/SCF LOCATION 3	GRAIN LOADING: GRAINS/ACF LOCATION 2	GRAIN LOADING: GRAINS/ACF LOCATION 3	EMISSION RATE LB/HR. LOCATION 2	EMISSION RATE LB/HR. LOCATION 3	MECHANICAL COLLECTOR EFFICIENCY (%)	ASH CONTENT OF COAL AS RECEIVED BASIS
11/8/71	11	100	A	NO	NORM.	NORM.	4.15	0.95	2.42	0.61	9128	--	--	10.03
11/9/71	9	100	A	NO	MIN.	NORM.	4.58	0.88	2.64	0.58	8460	--	--	9.89
11/10/71	8	100	A	NO	MAX.	NORM.	4.41	0.94	2.55	0.60	9796	2166	77.8	10.25
11/11/71	12	100	A	YES*	NORM.	NORM.	4.25	1.16	2.44	0.75	8252	2474	70.0	10.75
11/12/71	7	100	A	YES	NORM.	NORM.	5.09 5.38	1.44 1.50	2.94 2.96	0.91 0.93	10596	3104	70.5	10.07
11/16/71	6	100	B	NO	NORM.	NORM.	4.48	1.34	2.49	0.85	9808	2930	70.0	11.30
11/15/71	1	75	B	NO	NORM.	NORM.	5.58	1.08	3.14	0.68	8990	1856	79.5	10.42
11/17/71	18	50	B	YES	NORM.	NORM.	7.80 9.70	1.50 1.42	4.57 5.67	0.98 0.93	9830	1672	83.0	12.15
11/18/71	13	35	B	NO	NORM.	NORM.	3.79	1.00	2.30	0.68	3408	926	72.9	13.13
11/19/71	4	75	A	NO	MIN.	NORM.	4.27	0.66	2.45	0.43	6176	1072	82.7	10.35
11/22/71	5	75	C	NO	NORM.	NORM.	3.23	0.89	1.89	0.59	4978	1335	73.2	13.57
11/23/71	10	100	C	YES	NORM.	NORM.	5.71 6.12	1.24 1.38	3.23 3.49	0.78 0.90	11160	2573	76.9	16.69
11/24/71	20	50	C	NO	NORM.	NORM.	3.63	1.12	2.20	0.76	3676	1164	68.5	15.94
11/30/71	2	75	A	NO	NORM.	NORM.	6.03	0.87	3.52	0.57	9096	1268	86.0	9.85
12/1/71	3	75	A	NO	MAX.	NORM.	4.18	0.68	2.47	0.45	7256	1215	83.3	10.00
12/2/71	17	50	A	YES	NORM.	NORM.	6.35 7.05	1.15 0.85	3.85 4.28	0.79 0.60	7080	1067	84.9	10.14
12/3/71	19	50	A	NO	MAX.	NORM.	3.72	0.54	2.27	0.37	4482	659	85.3	9.56
12/4/71	21	35	A	NO	NORM.	NORM.	2.69	1.12	1.62	0.77	2412	1023	57.5	9.14
12/7/71	14	50	A	NO	NORM.	MIN.	4.82	1.16	2.76	0.76	4862	1248	74.4	10.78
12/8/71	15	50	A	NO	MIN.	NORM.	4.10	0.90	2.40	0.60	4222	956	77.5	10.44
12/9/71	22	75	D	NO	NORM.	NORM.	2.80	0.75	1.62	0.48	4286	1200	72.0	6.61

*Reduced level of soot blowing

The ash content of the coal is determined by laboratory analysis is also provided in Table 36 as a factor affecting the measured grain loading.

Analysis and Interpretation of Results

As noted in Table 36, tests were performed with type A fuel at two load levels (100 MW and 50 MW) in which operating conditions were held constant except for soot blowing.

In the first of these comparisons, test 7, an average value of 5.23 grains/SCF was measured at location 2. This represents an increase over the average grain loading measured in tests 11, 9, and 8 (4.38 grains/SCF). For these three tests, no soot blowing was used during the period of the test. The average ash content of the coal for tests 11, 9, and 8 was approximately equal to that measured for test 7, indicating that the differences in grain loading were not attributable to this source.

For these same tests, the grain loading measurements at location 3 were also higher for the test in which soot blowing was conducted.

At the 50 MW level, the average grain loading measured at location 2 was 6.70 grains/SCF for test 17. In this test, soot blowing was used during the test. This result is higher than any of the grain loading measurements obtained for the 50 MW A fuel tests in which soot blowing was not conducted (tests 19, 14, and 15). As was the case with the 100 MW comparisons, these 50 MW tests utilized coal of approximately the same ash content.

Two tests were run in which soot blowing was used and all other operating parameters were constant except for fuel type. In the first of these tests (test 18), B fuel was utilized. This fuel has a higher ash content than the A fuel, and for this B fuel test an average grain loading of 8.75 grains/SCF was recorded at location 2. This represents an increase over the results recorded for test 17, in which A fuel was utilized. For the A fuel test, an average grain loading of 6.70 grains/SCF was measured. These two tests indicate the degree of change in grain loading that is attributable to differences in ash content of the coal.

No specific patterns were found in the analysis of results in terms of the mechanical collection efficiencies. However, in general it was noted that greater efficiencies were noted for the tests in which B fuel was utilized.

COMPARISON OF CONTINUOUS MEASUREMENT RESULTS WITH MANUAL MEASUREMENTS AND WITH THEORETICAL VALUES

Computational Procedures

As described in a previous section, the scope of the Baseline Measurement Test included manual measurements as well as measurements obtained by the continuous measurement systems. The manual gas measurements for NO_x, CO, CO_2, and SO_2 were determined by laboratory analysis of a grab sample. Measurements of O_2 and CO_2 were made by means of Orsat Analysis. In this section the results obtained from these manual measurements are compared with the results obtained from the continuous measurement system, and, where appropriate, a comparison is made with theoretical expected gas concentrations.

The first of the comparisons is provided in Table 37. In Table 37, the manual measurements, continuous measurement results, and theoretical gas concentrations are provided for SO_2 in ppm as measured at location 1 and location 2. Where no values are shown, a measurement was not possible because of equipment failure or loss or contamination of the sample. The theoretical SO_2 values shown in Table 37 are based upon the standard methods for estimating stack gas products as described in the "Manual for Process Engineering Calculations" by Clarke and Davidson. The theoretical SO_2 values shown for location 3 were based upon the assumption that there is a 15% leakage between location 1 and location 3. The values for SO_2 at location 2 are therefore 85% of the theoretical values shown for location 2.

A comparison of continuous and manual measurements for NO_x in ppm is provided in Table 38 for location 3. The manual measurement results for NO_x are also provided in Table 38 for location 2. These results from location 2 are presented for the purpose of comparison with the results

TABLE 37

COMPARISON OF CONTINUOUS AND MANUAL SO_2 AT LOCATIONS 1 AND 3 WITH THEORETICAL VALUES

DATE	MITRE TEST NUMBER	TEST CONDITIONS: LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	LOCATION 1: MANUAL	CONT.	THEORETICAL SO_2 AT LOCATION 1	LOCATION 3: MANUAL	CONT.	THEORETICAL SO_2 AT LOCATION 3
11/8/71	11	100	A	NO	NORM.	NORM.		2055.0				
11/9/71	9	100	A	NO	MIN.	NORM.		2220.0				
11/10/71	8	100	A	NO	MAX.	NORM.	2541.3	2216.3	2075	1306		1764
11/11/71	12	100	A	YES*	NORM.	NORM.	1884.4	2281.9	2211	1703	1755.0	1879
11/12/71	7	100	A	YES	NORM.	NORM.	1571.1	2393.6	2340	1800	2042.1	1989
11/15/71	1	75	B	NO	NORM.	NORM.	1582.1	2074.1	1957	1854	1905	1663
11/16/71	6	100	B	NO	NORM.	NORM.	1272.8	1997.1	1949	1767	1897.5	1657
11/17/71	18	50	B	YES	NORM.	NORM.	1569.0	1715.0	1480	1154	1479.0	1258
11/18/71	13	35	B	NO	NORM.	NORM.	1847.5	1632.1	1366	752	1371.0	1161
11/19/71	4	75	A	NO	MIN.	NORM.	1995.8	2307.3	2551	1917	2080.0	2168
11/22/71	5	75	C	NO	NORM.	NORM.	538.8	352.5	888	443	630.0	755
11/23/71	10	100	C	YES	NORM.	NORM.	561.7	387.9	683	426	536.3	580
11/24/71	20	50	C	NO	NORM.	NORM.	546.5	471.9	627	386	566.3	533
11/30/71	2	75	A	NO	NORM.	NORM.	1812.9	1938.8	2098	1429	1740.0	1783
12/1/71	3	75	A	NO	MAX.	NORM.	1762.2	2141.3	2220	1305	1875.0	1887
12/2/71	17	50	A	YES	NORM.	NORM.	1543.9	2085.0	2480		1980.0	2108
12/3/71	19	50	A	NO	MAX.	NORM.	1732.6	1897.5	2070	861	1815.0	1759
12/4/71	21	35	A	NO	NORM.	NORM.	1415.2	1875.0	2221	451	1680.0	1888
12/7/71	14	50	A	NO	NORM.	MIN.		1743.8			1782.9	
12/8/71	15	50	A	NO	MIN.	NORM.		2107.5				
12/9/71	22	75	D	NO	NORM.	NORM.		735.0			2062.5	

* REDUCED LEVEL OF SOOT BLOWING

TABLE 38

COMPARISON OF CONTINUOUS AND MANUAL NO_x AT LOCATION 3

DATE	MITRE TEST NO. (OLD)	TEST CONDITIONS: LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	MEASURED EXCESS AIR: LOCATION 2	MEASURED EXCESS AIR: LOCATION 3	BURNER ANGLE	MANUAL NO_x LOCATION 2	MANUAL NO_x LOCATION 3	CONTINUOUS NO MEASUREMENTS LOCATION 3
11/8/71	11	100	A	NO	NORM.	81.5	64.2	NORM.	397	651	
11/9/71	9	100	A	NO	MIN.	64.2	36.6	NORM.	304	378	
11/9/71	9	100	A	NO	MIN.	64.2	36.6	NORM.	390	411	
11/10/71	8	100	A	NO	MAX.	59.6	47.3	NORM.	433	453	
11/10/71	8	100	A	NO	MAX.	59.6	47.3	NORM.		591	
11/11/71	12	100	A	YES*	NORM.	43.2	60.5	NORM.	513	349	
11/11/71	12	100	A	YES*	NORM.	43.2	60.5	NORM.	505	436	
11/12/71	7	100	A	YES	NORM.	38.6	38.3	NORM.	287	321	
11/12/71	7	100	A	YES	NORM.	38.6	38.3	NORM.	363	437	
11/16/71	6	100	B	NO	NORM.	42.7	40.3	NORM.	447	466	
11/16/71	6	100	B	NO	NORM.	42.7	40.3	NORM.	481	466	285
11/15/71	1	75	B	NO	NORM.	61.9	57.4	NORM.	464	419	350
11/15/71	1	75	B	NO	NORM.	61.9	57.4	NORM.	463	461	395
11/17/71	18	50	B	YES	NORM.	72.5	58.5	NORM.	246	570	
11/17/71	18	50	B	YES	NORM.	72.5	58.5	NORM.	485	684	365
11/18/71	13	35	B	NO	NORM.	87.8	69.3	NORM.	464	387	
11/18/71	13	35	B	NO	NORM.	87.8	69.3	NORM.	587	443	335
11/19/71	4	75	A	NO	MIN.	30.7	27.4	NORM.	319	330	375
11/19/71	4	75	A	NO	MIN.	30.7	27.4	NORM.	385	271	333
11/22/71	5	75	C	NO	NORM.	35.4	42.5	NORM.	339	308	240
11/22/71	5	75	C	NO	NORM.	35.4	42.5	NORM.	328		
11/23/71	10	100	C	YES	NORM.	52.7	41.3	NORM.	223	367	100
11/23/71	10	100	C	YES	NORM.	52.7	41.3	NORM.	243	264	105
11/24/71	20	50	C	NO	NORM.	30.3	34.4	NORM.	279	235	150
11/24/71	20	50	C	NO	NORM.	30.3	34.4	NORM.	267	262	145
11/30/71	2	75	A	NO	NORM.	35.0	36.8	NORM.	467	412	345
11/30/71	2	75	A	NO	NORM.	35.0	36.8	NORM.	552	450	335
12/1/71	3	75	A	NO	MAX.	47.1	52.5	NORM.	294	426	
12/1/71	3	75	A	NO	MAX.	47.1	52.5	NORM.	410	558	340
12/2/71	17	50	A	YES	NORM.	38.5	38.3	NORM.	341	323	
12/2/71	17	50	A	YES	NORM.	38.5	38.3	NORM.	347	295	345
12/3/71	19	50	A	NO	MAX.	64.3	69.3	NORM.	436	406	
12/3/71	19	50	A	NO	MAX.	64.3	69.3	NORM.	358	403	
12/4/71	21	35	A	NO	NORM.	51.7	61.2	NORM.	344	368	
12/4/71	21	35	A	NO	NORM.	51.7	61.2	NORM.	389	276	195

* REDUCED LEVEL OF SOOT BLOWING

at location 3. A comparison with continuous measurements is not provided since continuous NO_x measurements were not taken at location 2. Theoretical values for NO_x were not presented since there is no convenient algorithm for estimating NO_x concentrations as a function of fuel and operating parameters. As noted in Table 38, the continuous measurement results at location 3 are reported in terms of NO concentration rather than the total NO_x levels. These NO results do, however, represent a close approximation of the total NO_x levels since the NO_2 results were considered to be of small magnitude and close to the noise level of the instrument.

A comparison of continuous O_2 and CO_2 measurements and Orsat measurements is provided for location 3 in Table 39. The values shown in Table 39 are in terms of decimal fractions (i.e., .075 equals 7.5%). Grab samples of CO_2 were also taken at location 1 and location 3 for laboratory analysis. However, subsequent to the Baseline Test, it was determined that these sample containers had leaked and the analytical results were therefore invalid.

Grab samples of CO were taken at location 1 and location 3 for laboratory analysis. No evidence of CO was found in the grab samples and in addition no evidence of CO was found in the readings of the continuous measurement CO monitor located in the stack.

Analysis and Interpretation of Results

As noted on Table 37, there were several tests for which data were not available from the manual and/or the continuous measurement methods for SO_2 analysis (due to either equipment failure or loss of sample). For those tests where data were available from both the manual and continuous measurements a comparison shows that at location 1 the average of the manual samples is 82% of the average of the theoretical values. For these same tests, the average of the continuous measurements is 95% of the average of the theoretical values. The extremes of the manual measurements occur in test 5 where the manual value is 61% of the theoretical value, and test 13 where the manual value is 135% of the

TABLE 39

COMPARISON OF CONTINUOUS O_2 AND CO_2 WITH ORSAT MEASUREMENTS AT LOCATION 3

DATE	MITRE TEST NUMBER	TEST CONDITIONS					O_2		CO_2	
		LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	CONT.	ORSAT	CONT.	ORSAT
11/8/71	11	100	A	NO	NORM.	NORM.	----	.084	----	.108
11/9/71	9	100	A	NO	MIN.	NORM.	----	.058	----	.128
11/10/71	8	100	A	NO	MAX.	NORM.	----	.070	----	.110
11/11/71	12	100	A	YES*	NORM.	NORM.	----	.080	----	.1225
11/12/71	7	100	A	YES	NORM.	NORM.	.0625	.060	.135	.125
11/15/71	1	75	B	NO	NORM.	NORM.	.071	.078	.141	.118
11/16/71	6	100	B	NO	NORM.	NORM.	.0675	.062	.138	.126
11/17/71	18	50	B	YES	NORM.	NORM.	.075	.079	.1355	.116
11/18/71	13	35	B	NO	NORM.	NORM.	.0852	.088	.128	.104
11/19/71	4	75	A	NO	MIN.	NORM.	.062	.047	.142	.131
11/22/71	5	75	C	NO	NORM.	NORM.	.032	.065	.124	.103
11/23/71	10	100	C	NO	NORM.	NORM.	.060	.065	.1311	.099
11/24/71	20	50	C	NO	NORM.	NORM.	.0706	.057	.1264	.106
11/30/71	2	75	A	NO	NORM.	NORM.	.0615	.058	.140	.131
12/1/71	3	75	A	NO	MAX.	NORM.	.0807	.074	.132	.118
12/2/71	17	50	A	YES	NORM.	NORM.	.074	.066	.1348	.126
12/3/71	19	50	A	NO	MAX.	NORM.	.086	.088	.126	.104
12/4/71	21	35	A	NO	NORM.	NORM.	.0776	.082	.125	.106
12/7/71	14	50	A	NO	NORM.	MIN.	.0705	.061	.1411	.126
12/8/71	15	50	A	NO	MIN.	NORM.	.0695	.067	.138	.122
12/9/71	22	75	D	NO	NORM.	NORM.	.0565	.063	.1362	.126

* REDUCED LEVEL OF SOOT BLOWING

theoretical value. The extremes for the continuous measurement at location 1 occur in test 5 where the continuous measurement is 40% of the theoretical value and test 13 where the continuous measurement is 119% of the theoretical value.

At location 3, the average of the manual measurements is 76% of the average of the theoretical values for the tests having both manual and continuous measurements. For these same tests, the average of the continuous measurement is 100% of the average of the theoretical values. The extremes for the manual measurements occur in test 21 where the manual value is 24% of the theoretical value and test 1 where the manual value is 111% of the theorectical value. The extremes for the continuous measurement occur in test 21 where the continuous measurement is 89% of the theoretical value and test 1 where the continuous measurement is 114% of the theoretical value.

Table 38 provides a comparison of the continuous and manual measurements for NO_x at location 3. Manual measurements taken at location 2 are also provided in this Table. No consistent patterns are noted in Table 38 with respect to the effect of test conditions on NO_x concentrations, with the exception of fuel type. For the test performed with C fuel (gas and coal mixed) the NO_x levels were significantly lower than for the tests performed with A and B fuel.

A comparison of continuous O_2 and CO_2 measurements and Orsat measurements is provided in Table 39. A comparison of the average of the continuous O_2 and the Orsat O_2 measurements shows good agreement whereas the average of the continuous CO_2 measurements were higher than the average of the Orsat CO_2 measurements.

ANALYSES OF COAL, PULVERIZER REJECTS, FURNACE BOTTOM ASH, AND FLY ASH

Results of Ultimate and Proximate Analyses

As indicated in Table 5 in Section 2, ultimate and proximate analyses of pulverized coal from the coal mills were performed for each of the 21 tests in the Baseline Program. These analyses were performed both on an "as received" basis and on a "dry" basis. The analyses were performed by two separate laboratories, the Industrial Testing Laboratories (subcontractor to the Midwest Research Institute) and the Illinois Geological Survey. The results from the laboratories were then averaged as shown in Table 40 and Table 41. The first and second digit of the sample number shown on these Tables and on subsequent Tables correspond to the MITRE test numbers (i.e., CS 01002 corresponds to a coal sample from MITRE test number 1).

Proximate analyses were also performed on samples of fly ash removed from the dust collector and the air heater. These analyses were performed by the Industrial Testing Laboratories (subcontractor to the Midwest Research Institute) for selected tests in the program and are summarized in Table 42 and 43.

Proximate analyses were also performed on samples of ash taken from the furnace bottom (slag samples) and from the pulverizer reject chute on the coal mills. The results of these analyses as reported by the Industrial Testing Laboratories are summarized in Table 44 and Table 45.

Results of Elemental Analyses

Trace element concentrations were determined on four of the tests in the Baseline Program in the coal pulverizer rejects from the coal mills; bottom ash (slag); and the fly ash collected in the air heater, the mechanical collector, and locations 2 and 3. The results of these analyses are summarized in Tables 46, 47, 48, and 49.

Trace element concentrations were also determined for samples of fly ash collected from location 2 and location 3, for four tests in the program. The results of these analyses are summarized in Tables 50 through Table 54.

Additional trace elemental analyses were provided by EPA on pulverized coal for six of the test runs as summarized in Table 55.

Except for Table 55, which provides the results as parts-per-million, all results of the elemental analyses are reported in terms of weight percent. In the case of the analysis of fly ash at location 3, the results must be multiplied with the fly ash emission rate to determine emission rates to the ambient atmosphere.

TABLE 40

PROXIMATE AND ULTIMATE ANALYSES OF COAL

SAMPLE NUMBER	DRY BASIS									SOURCE OF ANALYSIS
	PROXIMATE ANALYSES			ULTIMATE ANALYSES						
	ASH	VOLATILE MATTER	FIXED CARBON	CARBON	HYDROGEN	NITROGEN	SULFUR	OXYGEN	HEATING VALUE, BTU/LB.	
CS01002	10.86 11.0 10.9	38.74 41.2 40.0	50.40 47.8 49.1	70.25 70.07 70.16	4.94 4.89 4.92	1.39 1.32 1.36	3.23 3.35 3.29	9.33 9.39 9.36	12,624 12,632 12,628	ITL* ISGS** AVERAGE
CS02002	10.32 10.7 10.5	37.85 40.6 39.2	51.83 48.6 50.2	71.30 70.41 70.86	4.85 4.88 4.87	1.22 1.41 1.32	3.01 2.99 3.00	9.30 9.60 9.45	12,664 12,655 12,660	ITL ISGS AVERAGE
CS03002	10.43 10.7 10.6	38.07 41.2 39.6	51.50 48.1 49.8	70.69 70.29 70.49	4.79 4.85 4.82	1.31 1.40 1.36	3.44 3.46 3.45	9.34 9.35 9.35	12,138 12,656 12,397	ITL ISGS AVERAGE
CS04002	10.82 11.1 11.0	38.45 40.0 39.2	50.74 48.9 49.8	70.79 70.15 70.47	4.92 4.86 4.89	1.36 1.39 1.38	3.48 3.55 3.52	8.63 8.93 8.78	12,630 12,546 12,588	ITL ISGS AVERAGE
CS05002	14.09 14.8 14.4	35.21 37.0 36.1	50.70 48.2 49.5	69.28 68.19 68.74	4.74 4.55 4.65	1.52 1.36 1.44	1.89 1.91 1.90	8.48 9.21 8.84	12,267 12,151 12,209	ITL ISGS AVERAGE
CS06002	11.8	40.4	47.9	70.10	4.85	1.30	2.88	9.09	12,570	ITL
CS07002	10.42 10.2 10.3	38.62 41.6 40.1	50.96 48.2 49.6	71.99 70.48 71.24	4.93 4.81 4.87	1.31 1.23 1.27	3.40 3.42 3.41	7.95 9.82 8.89	12,645 12,694 12,670	ITL ISGS AVERAGE
CS08002	10.64 10.8 10.7	38.53 40.9 39.7	50.83 48.3 49.6	71.54 69.97 70.76	4.97 4.87 4.92	1.28 1.28 1.28	3.50 3.51 3.51	8.07 9.62 8.85	12,625 12,613 12,619	ITL ISGS AVERAGE
CS09002	10.27 10.3 10.3	38.67 40.7 39.7	51.06 49.0 50.0	71.86 70.21 71.04	5.02 4.73 4.88	1.37 1.27 1.32	3.50 3.57 3.54	7.98 9.93 8.96	12,697 12,677 12,687	ITL ISGS AVERAGE
CS10002	17.26	33.04	49.70	66.46	4.42	1.48	1.71	8.67	11,719	ITL
CS11002	10.43 10.3 10.4	39.23 41.6 40.4	50.34 48.1 49.2	70.93 70.52 70.73	4.95 4.80 4.88	1.31 1.26 1.29	3.47 3.54 3.51	8.91 9.55 9.23	12,595 12,656 12,626	ITL ISGS AVERAGE
CS12002	11.15 10.8 11.0	37.79 41.3 39.5	51.06 47.9 49.5	70.22 69.92 70.07	4.84 4.83 4.84	1.30 1.26 1.28	3.31 3.41 3.36	9.18 9.77 9.48	12,500 12,589 12,544	ITL ISGS AVERAGE
CS13002	13.60 14.2 13.9	35.95 38.5 37.2	50.45 47.3 48.9	68.82 67.99 68.41	4.73 4.59 4.66	1.39 1.33 1.36	2.58 2.62 2.60	8.88 9.25 9.07	12,260 12,148 12,204	ITL ISGS AVERAGE
CS14002	11.30 11.5 11.4	37.13 40.5 38.8	51.57 48.1 49.8	70.58 70.10 70.34	4.77 4.87 4.82	1.39 1.32 1.36	2.87 2.88 2.88	9.09 9.37 9.23	12,641 12,561 12,601	ITL ISGS AVERAGE

* INDUSTRIAL TESTING LABORATORIES

** ILLINOIS STATE GEOLOGICAL SURVEY

TABLE 40 (CONCLUDED)

PROXIMATE AND ULTIMATE ANALYSES OF COAL

SAMPLE NUMBER	DRY BASIS: PROXIMATE ANALYSES: ASH	VOLATILE MATTER	FIXED CARBON	ULTIMATE ANALYSES: CARBON	HYDROGEN	NITROGEN	SULFUR	OXYGEN	HEATING VALUE, BTU/LB.	SOURCE OF ANALYSIS
CS15002	10.91	38.50	50.59	70.53	4.81	1.36	3.61	8.78	12,557	ITL
	10.6	41.3	48.1	70.83	4.86	1.35	3.45	8.92	12,631	ISGS
	10.8	39.9	49.3	70.68	4.83	1.36	3.53	8.85	12,594	AVERAGE
CS17002	10.58	38.95	50.47	70.58	4.83	1.17	3.57	9.27	12,637	ITL
	10.4	41.5	48.1	70.73	4.84	1.36	3.65	9.01	12,681	ISGS
	10.4	40.2	49.3	70.66	4.84	1.27	3.61	9.14	12,659	AVERAGE
CS18002	12.64	36.31	51.05	69.71	4.78	1.55	2.61	8.71	12,299	ITL
	12.7	38.8	48.5	69.49	4.62	1.40	2.73	9.05	12,347	ISGS
	12.7	37.6	49.8	69.60	4.70	1.48	2.67	8.88	12,323	AVERAGE
CS19002	9.97	39.62	50.41	71.09	4.86	1.18	3.54	9.36	12,732	ITL
	10.2	42.3	47.4	71.41	4.91	1.33	3.72	8.41	12,730	ISGS
	10.1	41.0	48.9	71.25	4.89	1.26	3.63	8.89	12,731	AVERAGE
CS20002	16.61	32.85	50.54	67.52	4.45	1.36	1.75	8.31	11,654	ITL
CS21002	9.52	56.43	34.05	71.72	4.87	1.39	3.15	9.35	12,858	ITL
	9.4	41.6	49.0	72.07	4.97	1.33	3.31	8.97	12,821	ISGS
	9.5			71.90	4.92	1.36	3.23	9.16	12,840	AVERAGE
CS22002	6.94	35.46	57.60	75.85	4.97	1.75	1.39	9.13	13,413	ITL
	6.7	37.4	55.9	76.13	4.93	1.62	1.41	9.20	13,393	ISGS
	6.8	36.4	56.8	76.00	4.95	1.69	1.40	9.17	13,403	AVERAGE

TABLE 41

PROXIMATE AND ULTIMATE ANALYSES OF COAL

SAMPLE NUMBER	AS RECEIVED BASIS: PROXIMATE ANALYSES: MOISTURE	ASH	VOLATILE MATTER	FIXED CARBON	ULTIMATE ANALYSES: CARBON	HYDROGEN	NITROGEN	SULFUR	OXYGEN	HEATING VALUE, BTU/LB.	SOURCE OF ANALYSIS
CS01002	4.02	10.42	37.18	48.38	67.43	5.19	1.33	3.10	12.53	12,117	ITL*
	4.2	10.5	39.5	45.8	67.13	5.15	1.27	3.21	12.73	12,101	ISGS**
	4.1	10.5	38.3	47.1	67.3	5.17	1.30	3.16	12.63	12,109	AVERAGE
CS02002	4.52	9.85	36.14	49.49	68.08	5.13	1.16	2.87	12.99	12,092	ITL
	4.3	10.3	38.9	46.5	67.39	5.15	1.35	2.86	13.01	12,111	ISGS
	4.4	10.1	37.5	48.0	67.74	5.14	1.26	2.87	13.00	12,102	AVERAGE
CS03002	4.13	10.00	36.50	49.37	67.77	5.05	1.26	3.30	12.62	12,138	ITL
	4.0	10.2	39.6	46.2	67.48	5.10	1.34	3.32	12.53	12,149	ISGS
	4.1	10.1	38.1	47.8	67.63	5.08	1.30	3.31	12.58	12,144	AVERAGE
CS04002	4.31	10.35	36.79	48.55	67.74	5.19	1.30	3.33	12.09	12,086	ITL
	4.2	10.6	38.3	46.8	67.20	5.13	1.33	3.40	12.29	12,020	ISGS
	4.3	10.5	37.5	46.7	67.47	5.16	1.32	3.37	12.19	12,053	AVERAGE
CS05002	3.69	13.57	33.91	48.83	66.72	4.98	1.46	1.82	11.45	11,814	ITL
	3.6	14.3	35.7	46.4	65.73	4.79	1.31	1.84	12.08	11,713	ISGS
	3.6	13.9	34.8	47.6	66.23	4.89	1.39	1.83	11.77	11,764	AVERAGE
CS06002	4.1	11.3	38.7	45.9	67.22	5.10	1.24	2.76	12.36	12,055	ISGS
CS07002	3.89	10.01	37.12	48.98	69.19	5.17	1.26	3.27	11.10	12,153	ITL
	4.0	9.8	39.9	46.3	67.66	5.07	1.18	3.28	12.98	12,186	ISGS
	3.9	9.9	38.5	47.6	68.43	5.12	1.22	3.28	12.04	12,170	AVERAGE
CS08002	3.66	10.25	37.12	48.97	68.92	5.19	1.23	3.37	11.04	12,163	ITL
	4.0	10.3	39.3	46.4	67.17	5.12	1.22	3.37	12.79	12,109	ISGS
	3.8	10.3	38.2	47.7	68.05	5.16	1.23	3.37	11.92	12,136	AVERAGE
CS09002	3.66	9.89	37.26	49.19	69.23	5.24	1.32	3.37	10.95	12,163	ITL
	4.0	9.9	39.1	47.0	67.40	4.99	1.22	3.43	13.08	12,169	ISGS
	3.8	9.9	38.2	48.1	68.32	5.12	1.27	3.40	12.02	12,201	AVERAGE
CS10002	3.29	16.69	31.95	48.07	64.27	4.64	1.43	1.65	11.32	11,333	ITL
CS11001	3.84	10.03	37.22	48.41	68.19	5.20	1.26	3.34	11.98	12,111	ITL
	4.3	9.9	39.8	46.0	67.49	5.07	1.21	3.39	12.96	12,112	ISGS
	4.1	10.0	38.5	47.2	67.8[illegible]	5.14	1.24	3.37	12.47	12,112	AVERAGE

* INDUSTRIAL TESTING LABORATORIES

** ILLINOIS STATE GEOLOGICAL SURVEY

TABLE 41 (CONCLUDED)

PROXIMATE AND ULTIMATE ANALYSES OF COAL

SAMPLE NUMBER	AS RECEIVED BASIS										
	MOISTURE	ASH	VOLATILE MATTER	FIXED CARBON	CARBON	HYDROGEN	NITROGEN	SULFUR	OXYGEN	HEATING VALUE, BTU/LB.	SOURCE OF ANALYSIS
CS12002	3.59	10.75	36.43	49.23	67.70	5.06	1.25	3.19	9.18	12,051	ITL
	3.9	10.4	39.7	46.0	67.19	5.07	1.22	3.28	12.85	12,097	ISGS
	3.7	10.6	38.1	47.6	67.45	5.07	1.24	3.24	11.01	12,080	AVERAGE
CS13002	3.45	13.13	34.71	48.71	66.45	4.95	1.34	2.49	11.64	11,837	ITL
	3.8	13.7	37.0	45.5	65.41	4.83	1.28	2.52	12.28	11,686	ISGS
	3.6	13.4	35.9	47.1	65.93	4.89	1.31	2.51	11.96	11,762	AVERAGE
CS14002	4.58	10.78	35.43	49.21	67.35	5.06	1.33	2.74	12.74	12,062	ITL
	4.4	11.0	38.7	45.9	67.01	5.15	1.26	2.75	12.87	12,009	ISGS
	4.5	10.9	37.1	47.6	67.18	5.11	1.30	2.74	12.81	12,034	AVERAGE
CS15002	4.30	10.44	36.84	48.42	67.50	5.08	1.30	3.45	12.23	12,017	ITL
	4.6	10.1	39.4	45.9	67.57	5.15	1.29	3.29	12.60	12,050	ISGS
	4.5	10.3	38.1	47.2	67.54	5.12	1.29	3.37	12.42	12,034	AVERAGE
CS17002	4.12	10.14	37.35	48.39	67.67	5.09	1.12	3.42	12.56	12,116	ITL
	4.4	9.9	39.7	45.9	67.62	5.11	1.30	3.49	12.52	12,123	ISGS
	4.3	10.0	38.5	47.1	67.65	5.10	1.21	3.46	12.54	12,120	AVERAGE
CS18002	3.88	12.15	34.90	49.07	67.00	5.03	1.49	2.51	11.82	11,813	ITL
	4.2	12.2	37.2	46.4	66.57	4.90	1.35	2.62	12.40	11,829	ISGS
	4.0	12.2	36.1	47.7	66.79	4.97	1.42	2.57	12.11	11,821	AVERAGE
CS19002	4.08	9.56	38.00	48.36	68.19	5.12	1.13	3.39	12.61	12,213	ITL
	4.6	9.8	40.4	45.2	68.12	5.20	1.27	3.55	12.11	12,144	ISGS
	4.3	9.7	39.2	46.8	68.16	5.16	1.20	3.47	12.36	12,179	AVERAGE
CS20002	4.04	15.94	31.53	48.50	64.80	4.72	1.30	1.68	11.56	11,184	ITL
CS21002	4.00	9.14	54.17	32.69	68.85	5.12	1.33	3.02	12.54	12,344	ITL
	4.6	8.9	39.7	46.8	68.75	5.25	1.27	3.16	12.65	12,231	ISGS
	4.3	9.1			68.80	5.19	1.30	3.09	12.60	12,288	
CS22002	4.71	6.61	33.79	54.89	72.28	5.23	1.67	1.32	12.89	12,781	ITL
	5.0	6.4	35.5	53.1	72.32	5.24	1.54	1.34	13.18	12,724	ISGS
	4.9	6.5	34.6	54.0	72.30	5.24	1.61	1.33	13.04	12,753	AVERAGE

TABLE 42

PROXIMATE ANALYSIS OF FLY ASH FROM DUST COLLECTOR

SAMPLE NUMBER	AS RECEIVED						DRY BASIS				
	PROXIMATE ANALYSIS, %						PROXIMATE ANALYSIS, %				
	MOISTURE	ASH	VOLATILE MATTER	FIXED CARBON	SULFUR	HEATING VALUE, BTU/LB.	ASH	VOLATILE MATTER	FIXED CARBON	SULFUR	HEATING VALUE, BTU/LB.
SA01004	0.16	99.61	0.78	--	0.38	20	99.77	0.78	--	0.38	20
SA03004	0.19	99.00	1.11	--	0.26	30	99.19	1.11	--	0.26	30
SA05004	0.10	99.02	0.91	--	0.30	48	99.12	0.91	--	0.30	48
SA06004	0.23	99.29	0.86	--	0.26	0	99.52	0.86	--	0.26	0
SA08004	0.11	98.62	1.86	--	0.61	91	98.77	1.86	--	0.61	91
SA10004	0.15	99.14	0.72	--	0.36	12	99.30	0.72	--	0.36	12
SA13004	0.24	97.61	1.13	1.02	0.53	80	97.84	1.13	1.02	0.53	80
SA18004	0.23	98.95	0.80	0.02	0.41	0	99.18	0.80	0.02	0.41	0
SA20004	0.16	97.46	0.29	2.09	0.30	146	97.62	0.29	2.09	0.30	146
SA21004	0.25	97.38	1.85	0.52	0.66	148	97.62	1.85	0.53	0.66	148
SA22004	0.16	97.69	0.87	1.28	0.27	167	97.85	0.87	1.28	0.27	167

TABLE 43

PROXIMATE ANALYSIS OF AIR HEATER HOPPER ASH

SAMPLE NUMBER	AS RECEIVED: PROXIMATE ANALYSIS, %: MOISTURE	AS RECEIVED: PROXIMATE ANALYSIS, %: ASH	AS RECEIVED: PROXIMATE ANALYSIS, %: VOLATILE MATTER	AS RECEIVED: PROXIMATE ANALYSIS, %: FIXED CARBON	AS RECEIVED: PROXIMATE ANALYSIS, %: SULFUR	AS RECEIVED: HEATING VALUE, BTU/LB.	DRY BASIS: PROXIMATE ANALYSIS, %: ASH	DRY BASIS: PROXIMATE ANALYSIS, %: VOLATILE MATTER	DRY BASIS: PROXIMATE ANALYSIS, %: FIXED CARBON	DRY BASIS: PROXIMATE ANALYSIS, %: SULFUR	DRY BASIS: HEATING VALUE, BTU/LB.
SA01002	0.26	98.52	1.72	--	0.52	168	98.78	1.72	--	0.52	168
SA05002	0.18	98.82	2.26	--	0.84	68	99.00	2.26	--	0.84	68
SA06002	0.12	99.21	2.12	--	0.67	46	99.33	2.12	--	0.67	46
SA08002	0.17	98.43	2.79	--	0.74	120	98.60	2.79	--	0.74	120
SA10002	0.19	97.78	2.38	--	0.39	195	97.97	2.38	--	0.39	195
SA13002	0.19	98.03	0.94	0.84	0.61	143	98.22	0.94	0.84	0.61	143
SA18002	0.20	98.17	1.10	0.53	0.39	135	98.37	1.10	0.53	0.39	135
SA21002	0.25	98.13	1.36	0.26	0.58	120	98.38	1.36	0.26	0.58	120
SA22002	0.21	97.17	1.76	0.86	0.57	271	97.37	1.76	0.87	0.57	272

TABLE 44

PROXIMATE ANALYSIS OF SLAG SAMPLES

SAMPLE NUMBER	AS RECEIVED						DRY BASIS				
	PROXIMATE ANALYSIS, %						PROXIMATE ANALYSIS, %				
	MOISTURE	ASH	VOLATILE MATTER	FIXED CARBON	SULFUR	HEATING VALUE, BTU/LB.	ASH	VOLATILE MATTER	FIXED CARBON	SULFUR	HEATING VALUE, BTU/LB.
PA01001	10.32	86.74	2.11	0.83	0.48	374	96.72	2.35	0.93	0.53	417
PA03001	34.24	63.52	1.66	0.58	0.39	241	96.60	2.52	0.88	0.59	366
PA05001	11.53	88.26	0.38	--	0.03	13	99.76	0.43	--	0.05	15
PA10001	36.85	61.74	1.19	0.22	0.12	145	97.77	1.88	0.35	0.19	230
PA21001	40.56	58.00	1.08	0.36	0.24	113	97.58	1.81	0.61	0.41	190
PA22001	35.83	63.93	0.19	0.05	0.14	16	99.62	0.30	0.08	0.22	25

TABLE 45

PROXIMATE ANALYSIS OF PULVERIZER REJECT SAMPLES

SAMPLE NUMBER	AS RECEIVED						DRY BASIS				
	PROXIMATE ANALYSIS, %						PROXIMATE ANALYSIS, %				
	MOISTURE	ASH	VOLATILE MATTER	FIXED CARBON	SULFUR	HEATING VALUE, BTU/LB.	ASH	VOLATILE MATTER	FIXED CARBON	SULFUR	HEATING VALUE, BTU/LB.
RJ01001	0.81	54.26	20.88	24.05	26.07	4,567	54.70	21.05	24.25	26.28	4,604
RJ03001	1.28	50.93	10.45	37.34	27.61	4,994	51.59	10.59	37.82	27.97	5,059
RJ05001	3.90	33.94	26.72	15.44	16.95	8,143	35.15	27.67	15.99	17.56	8,434
RJ10001	3.40	38.94	24.51	33.15	11.27	7,521	40.31	25.37	34.32	11.67	7,786
RJ21001	0.78	53.19	15.21	30.82	20.86	4,354	53.61	15.33	31.06	21.02	4,388
RJ22001	0.54	51.11	18.48	29.87	20.68	4,794	51.39	18.58	30.03	20.79	4,820

TABLE 46

COMPARISON OF ELEMENTAL CONCENTRATIONS IN COAL, PULVERIZER REJECTS, SLAG, AND FLY ASH
(MITRE TEST NO. 1, 75 MW, B FUEL, NO SOOT BLOWING, NORMAL EXCESS AIR, NORMAL BURNER ANGLE)

ELEMENTAL CONTENT BY WEIGHT (WEIGHT PERCENT)							
ELEMENT	PULVERIZED COAL, CS01002*	PULVERIZER REJECTS, RJ01001*	SLAG, PA01001*	FLY ASH FROM AIR HEATER ASH HOPPER, SA01002*	FLY ASH FROM MECHANICAL SEPARATOR, SA01004*	FLUE GAS PARTICULATES, LOCATION 2, AIR HEATER, DUCT, 206-2**	FLUE GAS PARTICULATES, LOCATION 3, STACK, 206-3**
Al	0.960	0.490	9.25	7.20	8.05	9.40	9.24
Ba	<0.03	<0.03	0.3	0.02	0.03	<0.04	<0.04
Be	<0.0002	<0.0002	0.0004	0.001	0.0008	0.001	0.001
Ca	0.250	1.61	3.45	4.88	1.96	2.38	0.970
Cd	0.0006	0.0004	<0.005	0.0009	0.002	0.016	0.002
Co	0.000	<0.003	0.006	0.004	0.004	0.006	0.007
Cr	0.002	0.002	0.016	0.010	0.013	0.05	0.740
Cu	0.002	0.003	0.007	0.008	0.007	0.010	0.020
Fe	0.995	13.1	16.2	14.8	10.7	11.7	11.1
Ga	0.08	<0.07	<0.02	<0.07	<0.08	<0.06	<0.06
Ge	0.0	0.0	<0.07	0.0	0.0	0.0	0.0
Hg	<0.0002	0.00006	0.0003	0.00003	0.00004	<0.00002	0.002
K	0.155	0.127	1.48	1.48	1.80	1.84	2.36
Mg	0.073	0.071	0.519	0.500	0.280	0.620	0.660
Mn	0.009	0.007	0.057	0.090	0.036	0.050	0.080
Mo	<0.002	<0.002	0.00	<0.002	0.002	<0.003	<0.003
Na	0.06	0.044	0.379	0.270	0.460	0.590	2.06
Ni	0.009	0.0009	0.013	0.010	0.040	0.05	0.200
Pb	<0.003	<0.003	0.009	0.003	<0.003	0.020	0.020
Sb	<0.07	<0.07	0.06	<0.06	<0.07	<0.06	<0.06
Se	<0.06	<0.06	<0.05	<0.06	<0.07	<0.05	<0.05
Sn	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05
Sr	<0.0005	<0.0005	0.004	0.004	0.003	0.003	<0.001
Ti	<0.098	<0.094	1.31	0.380	0.550	0.580	0.660
Tl	<0.01	0.006	0.008	0.006	<0.01	0.010	0.005
V	<0.02	<0.02	0.04	<0.02	<0.02	0.02	0.03
Zn	0.11	0.011	0.038	0.040	0.057	0.59	0.090

* MITRE SAMPLE NUMBER

** MIDWEST RESEARCH INSTITUTE SAMPLE NUMBER

TABLE 47

COMPARISON OF ELEMENTAL CONCENTRATIONS IN COAL, PULVERIZER REJECTS, SLAG & FLY ASH (MITRE TEST NO. 3, 75 MW, A FUEL, NO SOOT BLOWING, MAXIMUM EXCESS AIR, NORMAL BURNER ANGLE)

ELEMENTAL CONTENT BY WEIGHT (WEIGHT PERCENT)				
ELEMENT	PULVERIZED COAL, CS03002*	PULVERIZER REJECT, RJ03001*	SLAG, PA03001*	FLY ASH FROM MECHANICAL SEPARATOR, SA03004
Al	0.900	0.900	8.50	8.60
Ba	<0.2	<0.2	0.3	0.3
Be	<0.0002	<0.0002	0.0004	0.0008
Ca	0.480	0.210	4.27	3.30
Cd				
Co	<0.005	0.003	0.006	0.005
Cr	0.000	0.004	0.016	0.014
Cu	0.0005	0.003	0.007	0.008
Fe	1.24	19.3	16.8	12.2
Ga	<0.05	<0.03	<0.02	<0.03
Ge	<0.07	<0.07	<0.07	<0.07
Hg	0.00000	0.00000	0.00000	0.00004
K	0.165	0.150	1.36	1.50
Mg	0.055	0.050	0.575	0.512
Mn	0.006	0.010	0.082	0.060
Mo	0.00	0.00	0.00	0.00
Na	0.073	0.080	0.400	0.650
Ni	<0.002	0.002	0.012	0.015
Pb	<0.005	0.009	0.011	0.006
Sb	<0.05	0.04	0.06	0.03
Se	<0.09	<0.05	<0.05	0.04
Sn	<0.1	<0.01	<0.1	<0.1
Sr	<0.0005	0.0005	0.008	<0.003
Ti	0.060	0.050	1.15	1.34
Tl	<0.008	0.004	0.008	0.006
V	<0.04	<0.04	<0.04	<0.04
Zn	0.009	0.427	0.032	0.044

* MITRE SAMPLE NUMBER

TABLE 48

COMPARISON OF ELEMENTAL CONCENTRATIONS IN COAL, PYRITES, SLAG, AND FLY ASH
(MITRE TEST No. 22, 75 MW, D FUEL, NO SOOT BLOWING, NORMAL EXCESS AIR, NORMAL BURNER ANGLE)

	ELEMENTAL CONTENT BY WEIGHT (WEIGHT PERCENT)						
ELEMENT	PULVERIZED COAL, CS22002*	PULVERIZER REJECT, RJ22001*	SLAG, PA22001*	FLY ASH FROM AIR HEATER HOPPER, SA22002*	FLY ASH FROM MECHANICAL SEPARATOR, SA22004*	FLUE GAS PARTICULATES, LOCATION 2, AIR HEATER, 221-2**	FLUE GAS PARTICULATES, LOCATION 3, STACK, 221-3**
Al	0.600	0.500	8.40	6.40	9.50	10.0	9.50
Ba	<0.2	<0.2	0.4	0.4	<0.2	0.3	0.3
Be	<0.0002	<0.0002	0.0008	0.0006	0.001	0.001	0.002
Ca	0.250	1.28	4.55	7.90	1.78	2.09	1.33
Cd							
Co	<0.005	0.005	0.007	0.006	0.007	0.018	0.014
Cr	<0.002	0.004	0.018	0.020	0.023	0.342	0.626
Cu	0.0005	0.002	0.006	0.008	0.009	0.012	0.021
Fe	0.520	17.3	16.6	17.0	6.70	7.84	8.24
Ga	<0.05	<0.02	<0.02	<0.03	<0.03	<0.02	<0.02
Ge	<0.07	<0.07	<0.07	<0.007	<0.007	<0.07	<0.07
Hg	0.0001	0.00000	0.00000	0.00006	<0.00001	0.0004	0.0001
K	0.131	0.110	0.253	0.835	1.75	1.62	1.80
Mg	0.050	0.105	0.567	0.461	0.480	0.530	0.505
Mn	0.002	0.014	0.073	0.117	0.038	0.070	0.124
Mo	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Na	0.053	0.063	0.400	0.312	0.624	0.529	0.722
Ni	<0.002	0.001	0.010	0.013	0.026	0.165	0.390
Pb	<0.005	0.011	0.008	0.006	0.007	0.015	0.020
Sb	<0.05	0.04	0.02	0.03	0.03	0.03	0.04
Se	<0.09	0.08	<0.05	0.03	0.05	0.08	0.05
Sn	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sr	<0.0005	0.003	0.007	0.009	0.000	0.003	<0.0005
Ti	0.065	0.040	1.22	0.780	1.78	1.61	1.64
Tl	<0.008	0.006	0.008	0.004	0.004	0.01	0.008
V	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Zn	0.011	0.087	0.026	0.030	0.046	0.064	0.127

* MITRE SAMPLE NUMBER

** MIDWEST RESEARCH INSTITUTE SAMPLE NUMBER

TABLE 49

COMPARISON OF ELEMENTAL CONCENTRATIONS IN COAL, PULVERIZER REJECTS, AND FLY ASH (MITRE TEST NO. 5, 75 MW, C FUEL, NO SOOT BLOWING, NORMAL EXCESS AIR, NORMAL BURNER ANGLE)

ELEMENTAL CONTENT BY WEIGHT (WEIGHT PERCENT)							
ELEMENT	PULVERIZED COAL, CS05002*	PULVERIZER REJECT, RJ05001*	SLAG, PA05001*	FLY ASH FROM AIR HEATER HOPPER, SA05002*	FLY ASH FROM MECHANICAL SEPARATOR, SA05004	FLUE GAS PARTICULATES, LOCATION 2, AIR HEATER DUCT, 211-2**	FLUE GAS PARTICULATES, LOCATION 3, STACK, 211-3**
Al		1.55	10.2	7.20	10.15	9.56	7.35
Ba		0.00	<0.04	0.3	0.4	0.5	0.3
Be		<0.0002	0.0006	0.0004	0.0006	0.0008	0.0007
Ca		0.120	5.36	7.00	3.35	3.40	1.39
Cd		0.002	0.021				
Co		<0.004	0.004	0.007	0.006	0.014	0.016
Cr		0.000	0.009	0.025	0.013	0.249	1.08
Cu		0.002	0.009	0.010	0.009	0.011	0.016
Fe		2.30	9.43	19.7	6.63	7.27	10.8
Ga		<0.06	<0.06	<0.03	<0.03	0.03	<0.06
Ge		0.0	0.00	<0.007	<0.007	<0.07	<0.07
Hg		<0.00003	0.00002	0.00000	<0.00001	0.00005	0.00008
K		0.290	2.68	0.935	1.87	1.77	1.50
Mg		0.085	0.720	0.424	0.580	0.533	0.422
Mn		0.006	0.075	0.114	0.051	0.073	0.200
Mo		<0.003	<0.002	0.00	0.00	<0.04	0.00
Na		0.10	0.635	0.370	0.220	0.991	0.750
Ni		0.004	0.031	0.010	0.017	0.239	0.600
Pb		0.007	0.009	0.010	0.007	0.018	0.014
Sb		<0.06	<0.06	0.02	0.04	0.04	<0.06
Se		<0.05	<0.05	0.05	0.02	0.060	<0.05
Sn		<0.05	<0.5	<0.1	<0.1	<0.1	<0.1
Sr		<0.001	0.009	0.006	0.009	0.004	<0.003
Ti		0.200	0.575	0.870	1.69	1.40	0.965
Tl		<0.005	0.008	0.008	0.006	0.006	0.008
V		<0.02	0.02	<0.04	<0.04	<0.04	<0.04
Zn		0.007	0.045	0.030	0.060	0.072	0.10

* MITRE SAMPLE NUMBER (OLD)

** MIDWEST RESEARCH INSTITUTE SAMPLE NUMBER

TABLE 50

ELEMENTAL CONTENT OF FLUE GAS PARTICULATE MATTER

MITRE TEST NO. 13: 35 MW, B FUEL, NO SOOT BLOWING, NORM. EXCESS AIR, NORM. BURNER ANGLE

ELEMENT	ELEMENTAL CONTENT, WEIGHT PERCENT LOCATION 2, AIR HEATER. NO. 209-2*	LOCATION 3, STACK, NO. 209-3*
Al	21.7	13.65
Ba	.08	<.04
Be	.0009	.0007
Ca	1.82	.62
Cd	.0009	.001
Co	.01	.011
Cr	.15	1.68
Cu	.01	.016
Fe	8.22	8.7
Ga	<.04	<.05
Ge		
Hg		
K	2.2	1.74
Mg	.89	.51
Mn	.06	.14
Mo	.003	<.002
Na	6.29	.88
Ni	.08	.63
Pb	.03	.02
Sb	<.04	<.06
Se	<.04	<.05
Sn	<.04	<.05
Sr	.001	<.0009
Ti	.59	.50
Tl	.006	.005
V	.04	.03
Zn	.08	.11
As		
Si		

* Midwest Research Institute's Sample Number

TABLE 51

ELEMENTAL CONTENT OF FLUE GAS PARTICULATE MATTER

MITRE Test No. 8: 100 MW, A Fuel, No Soot Blowing, Maximum Excess Air, Normal Burner Angle

	ELEMENTAL CONTENT, WEIGHT PERCENT	
ELEMENT	LOCATION 2, AIR HEATER, SAMPLE NO. 203-2*	LOCATION 3, STACK, SAMPLE NO. 203-3*
Al	30.9	31.8
Ba	0.4	0.6
Be	0.002	0.002
Ca	1.33	1.14
Cd	0.004	0.003
Co	0.030	0.020
Cr	0.050	0.220
Cu	0.030	0.040
Fe	14.8	11.7
Ga	0.07	<0.08
Ge	<0.09	0.00
Hg	0.0006	0.0004
K	2.54	2.42
Mg	0.770	0.670
Mn	0.090	0.080
Mo	<0.002	0.008
Na	83.6	48.6
Ni	0.05	0.09
Pb	0.110	0.160
Sb	0.170	0.130
Se	0.150	0.06
Sn	0.07	0.07
Sr	0.003	<0.0005
Ti	0.790	0.930
Tl	0.020	0.010
V	0.02	<0.02
Zn	0.060	0.080

* Midwest Research Institute's Sample Number

TABLE 52

ELEMENTAL CONTENT OF FLUE GAS PARTICULATE MATTER

MITRE Test No. 20: 50 MW, C Fuel, No Soot Blowing, Normal Excess Air, Normal Burner Angle

ELEMENT	ELEMENTAL CONTENT, WEIGHT PERCENT LOCATION 2, AIR HEATER, SAMPLE NO. 213-2*	LOCATION 3, STACK, SAMPLE NO. 213-3*
Al	9.90	9.51
Ba	0.3	0.3
Be	0.0005	0.0008
Ca	2.62	1.10
Cd	<0.0005	0.0026
Co	0.012	0.011
Cr	0.175	0.926
Cu	0.012	0.019
Fe	5.60	6.47
Ga	0.06	<0.02
Ge	0.07	0.07
Hg	0.0000	0.0003
K	3.25	2.28
Mg	0.570	0.560
Mn	0.067	0.107
Mo	0.04	0.00
Na	0.581	0.911
Ni	0.135	0.515
Pb	0.014	0.017
Sb	0.06	0.04
Se	0.05	0.005
Sn	0.1	<0.1
Sr	0.006	0.003
Ti	1.40	1.37
Tl	0.005	0.004
V	0.04	<0.04
Zn	0.08	0.16

* Midwest Research Institute's Sample Number

TABLE 53

ELEMENTAL CONTENT OF FLUE GAS PARTICULATE MATTER

MITRE Test No. 19: 50 MW, A Fuel, No Soot Blowing, Maximum Excess Air, Normal Burner Angle

ELEMENT	ELEMENTAL CONTENT, WEIGHT PERCENT LOCATION 2, AIR HEATER, SAMPLE NO. 217-2*	LOCATION 3, STACK, SAMPLE NO. 217-3*
Al	9.00	7.75
Ba	0.3	<0.2
Be	0.001	0.001
Ca	2.80	1.17
Cd	0.0022	0.001
Co	0.008	0.013
Cr	0.125	0.725
Cu	0.010	0.020
Fe	11.9	11.4
Ga	<0.02	<0.02
Ge	<0.07	<0.07
Hg	0.0001	0.0002
K	1.54	1.42
Mg	0.470	0.430
Mn	0.049	0.149
Mo	0.00	0.00
Na	0.570	0.738
Ni	0.120	0.493
Pb	0.007	0.005
Sb	0.04	0.04
Se	0.04	0.04
Sn	<0.1	<0.1
Sr	<0.003	<0.003
Ti	1.25	1.21
Tl	0.008	0.006
V	<0.04	<0.04
Zn	0.066	0.088

* Midwest Research Institute's Sample Number

TABLE 54

ELEMENTAL CONTENT OF FLUE GAS PARTICULATE MATTER

MITRE TEST NO. 17: 50 MW, A Fuel, Maximum Soot Blowing, Normal Excess Air, Normal Burner Angle

ELEMENT	ELEMENTAL CONTENT, WEIGHT PERCENT LOCATION 2, AIR HEATER, SAMPLE NO. 216-2*	LOCATION 3, STACK, SAMPLE NO. 216-3*
Al	8.40	5.90
Ba	<0.2	<0.2
Be	0.001	0.0008
Ca	2.57	0.660
Cd	<0.0005	<0.0012
Co	0.010	0.019
Cr	0.330	1.58
Cu	0.026	0.020
Fe	10.9	11.1
Ga	<0.02	<0.02
Ge	<0.07	<0.07
Hg	0.0001	0.0002
K	1.50	1.20
Mg	0.485	0.351
Mn	0.063	0.230
Mo	<0.04	0.00
Na	0.591	0.570
Ni	0.237	1.37
Pb	0.015	0.012
Sb	0.04	0.04
Se	0.05	0.05
Sn	<0.1	<0.1
Sr	0.005	<0.003
Ti	1.28	0.920
Tl	0.006	0.006
V	<0.04	<0.04
Zn	0.168	0.075

*Midwest Research Institute's Sample Number

TABLE 55

ELEMENTAL ANALYSES OF COAL FOR CAT-OX BASELINE PROGRAM*

(Concentrations in ppm)

Element and Isotope / MITRE Test No.	3	5	14	18	20	22
Ag^{110}	<.7	<.6	<.2	<.6	<.9	<.2
Al^{28}	8080	13,300	10,800	12,100	17,200	6170
As^{76}	<1.2	4.8	2.44	<5	7.00	1.6
Au^{198}	.10	0.7	.06	0.15	.003	.02
Ba^{139}	34	48	45	53	92	29
Br^{80}	20	3.9	3.4	32.5	7	4.4
Br^{82}	3	22	9.0	19	20	16
Ca^{49}	3640	5640	3290	<50	7740	1910
Cd^{115}	<110	<110	<200	<90	<300	30
Ce^{141}	8.83	16.2	10.6	13.0	21.1	8.97
Cl^{38}	1220	2760	1250	1450	2820	2350
Co^{58}	<30	<80	<60	<70	<90	<30
Co^{60}	3.07	5.22	3.84	4.40	5.98	4.02
Cr^{51}	18.0	21.4	19.3	19.4	24.2	12.2
Ce^{134}	1.56	2.58	2.03	2.35	3.32	1.13
Cu^{64}	29	<20	<20	<20	<30	<20
Cu^{66}	<20	<40	<50	<20	<60	<30
Dy^{165}	0.58	0.76	0.67	0.77	1.2	0.42
Eu^{152m1}	0.2	0.32	.30	0.31	0.56	.18
Eu^{152m8}	.13	.26	.19	0.20	0.32	.12
Fe^{59}	13,700	9500	11,600	10,900	8970	4550
Ga^{72}	<2	4.0	5.5	4.2	7.2	2.9
Gd^{159}	<60	<40	<4	<30	<70	<20
Ge^{75}	<4	<120	<150	<40	<70	<150
Hf^{181}	.50	.81	.60	.65	1.05	.42
Hg^{203}	<.5	<.6	.16	1.91	<.7	<.3
I^{128}	<1	<.05	<2	1.8	<.2	.65
In^{116}	<0.03	<0.02	0.029	.073	<0.05	<0.01
Ir^{192}	1.9	2.2	1.6	6.7	5.3	1.8

*Analyses performed by NASA Plumbrook Laboratory

TABLE 55 (CONTINUED)

ELEMENTAL ANALYSES OF COAL FOR CAT-OX BASELINE PROGRAM*
(Concentrations in ppm)

Element and Isotope	MITRE Test No. 3	5	14	18	20	22
K^{42}	2464	3932	3429	3748	7130	1690
La^{140}	5.7	7.2	7.3	26	17.2	5.4
Lu^{77}	.36	.42	.35	.32	.58	.22
Mg^{27}	<850	<1200	586	<4000	<450	<600
Mn^{56}	53	62	38	49	95	25
Mo^{99}	<700	<260	<300	<350	<600	<200
Mo^{101}	<10	<100	<70	<40	<50	<10
Na^{24}	882	1070	757	833	1250	487
Nd^{14}	<2	<2	<7	<5	<7	<3
Ni^{65}	<50	<400	<600	<300	<1000	<200
Pt^{197}	<170	<160	<200	<230	<300	<100
Rb^{86}	12.3	20.7	16.8	21.4	25.6	7.98
Rb^{88}	<550	<200	<120	<300	<300	<400
Re^{186}	<0.2	<0.2	<.4	<.3	<.3	<.3
Rh^{104}	<0.09	<0.04	<.06	<.2	<0.03	<.06
S^{37}	<90,000	<53,000	<9060	<7000	**	<30,000
Sc^{46}	2.67	3.84	3.17	3.42	4.56	3.02
Sb^{124}	0.84	1.12	.62	.93	1.39	.86
Se^{75}	3.12	2.99	2.86	3.19	4.15	1.77
Sm^{153}	.82	1.2	1.1	1.2	2.23	0.81
Sr^{87}	<30	36	<40	<20	56	<20
Sn^{117}	<40	74.2	50	66	76.5	34
Sn^{123}	<50	<40	<15	<20	<50	<2
Sn^{125}	<200	<40	<10	<70	<500	<150
Ta^{182}	.12	.27	.18	.25	.35	.17
Tb^{160}	.018	.027	.022	.025	.036	.015
Th^{232}	2.16	3.23	2.84	2.84	4.19	1.73
Ti^{51}	912	608	903	930	1680	529
U^{23q}	0.96	0.82	0.82	1.14	1.5	0.65
V^{52}	23	26	23	27	34	15
W^{187}	<0.3	<0.4	<2	<2	<4	<2
Yb^{175}	1.88	4.06	.46	1.83	3.68	.91
Zn^{65}	<3000	220	118	148	264	<400
Zr^{95}	<50	<50	<50	<40	<50	<30

*Analyses performed by NASA Plumbrook Laboratory
**Data missing

Results of Analysis of Bound SO_2, SO_3, and Polynuclear Aromatic Compounds

Bound constituents were determined by chemical analysis by the Midwest Research Institute for fly ash samples collected at location 2 and location 3. The results of these analyses are provided in Tables 56 and 57.

As noted in Table 56, the bound SO_2 concentration (measured as sulfates) ranges from .15 microgram to .88 microgram per milligram of particulate. For the two tests representing these extremes (test 22 and test 8), the measured particulate emission rates at location 3 were respectively 1200 lbs/hour and 2166 lbs/hour. The measured gaseous SO_2 mass flow rates at location 3 for these tests were 1452 lbs/hour and 3810 lbs/hour, respectively. Multiplying the bound SO_2 concentration ranges by the particulate emission rates provides a mass emission rate of bound SO_2 in terms of lbs/hour. Comparison of the mass rate against the gaseous mass flow rates shows that the amount of bound SO_2 released to the atmosphere is on the order of 10^{-10} of the mass released in gaseous form.

Measurement of gaseous SO_3 mass flow rates was not successfully accomplished in the baseline test due to problems with sample handling. For this reason, no comparison can be made between the adsorbed SO_3 (measured as sulfites) and the gaseous SO_3.

Table 57 is self-explanatory and provides the polynuclear aromatic hydrocarbons bound to the surface of the particulates. Highest confidence should be placed on those tests with the highest % of recovery (i.e., the percentage of the original mass which can be accounted for as extracted organic material and particulate fly ash). As noted in Table 57, the organic materials found were Benzo(α)Pyrene, and possibly Anthanthrene, Chrysene, and 1,2-Benzanthrecene.

The chemical state of the sulfur adsorbed on the surface of fly ash samples was also determined by the Oak Ridge National Laboratory. The results of these analyses are provided in the Laboratory's final report which appears as Appendix D. Three techniques were used by the Oak Ridge National Laboratory to examine each of ten fly ash samples: photoelectron

TABLE 56

DETERMINATION OF BOUND SO_2 AND SO_3 BY CHEMICAL ANALYSIS

TEST NO.	LOAD FACTOR	FUEL TYPE	SOOT BLOWER	EXCESS AIR	BURNER ANGLE	SO_2 MICROGRAM/ MILLIGRAM PARTICULATE	SO_3 MICROGRAM/ MILLIGRAM PARTICULATE	LOCATION
8	100	A	NONE	MAX.	NORM.	.77	5.77	2
8	100	A	NONE	MAX.	NORM.	.88	7.65	3
1	75	B	NONE	NORM.	NORM.	.30	9.34	2
1	75	B	NONE	NORM.	NORM.	.39	24.10	3
5	75	C	NONE	NORM.	NORM.	.16	0.67	2
5	75	C	NONE	NORM.	NORM.	.16	15.84	3
17	50	A	MAX.	NORM.	NORM.	.37	13.69	2
17	50	A	MAX.	NORM.	NORM.	.35	3.77	3
22	75	D	NONE	NORM.	NORM.	.4	2.25	2
22	75	D	NONE	NORM.	NORM.	.15	1.63	3

TABLE 57

DETERMINATION OF POLYNUCLEAR AROMATIC COMPOUNDS BOUND TO THE SURFACE OF FLUE GAS PARTICULATES

DATE:	11/10/71	11/15/71	11/22/71	12/2/71	12/9/71
MITRE TEST NO.:	8	1	5	17*	22
TEST CONDITIONS					
Load Factor:	100	75	75	50	75
Fuel Type:	A	B	C	A	D
Soot Blower:	None	None	None	Maximum	None
Excess Air:	Maximum	Normal	Normal	Normal	Normal
Burner Angle:	Normal	Normal	Normal	Normal	
TOTAL					
RECOVERY %					
Location 2	100.0	No Peaks	91.7	25.0	37.5
Location 3	100.0	17.7	100.0	31.2	No peaks
BENZO(α)PYRENE (μg)					
Location 2			21.80	200.00	74.67
Location 3		259.89	126.00	185.90	
CONCENTRATION (μg/mg)					
Location 2			0.17	0.72	1.16
Location 3		3.00	0.87	0.83	
OTHER POSSIBLE COMPONENTS					
Location 2	Anthanthrene				
Location 3	Anthanthrene			Chrysene; 1,2-Benzanthrecene	

* Two samples were collected at each location during this test. Both samples were combined for the determination of surface adsorbed polynuclear aromatic compounds.

spectroscopy (ESCA); surface area determination by the BET method; total sulfur determination by combustion analysis. One of the specimens was also examined by infrared spectroscopy.

The following are firm conclusions that can be made:

1. The photoelectron spectroscopy results show that the oxidation state of sulfur on the surfaces of all ten samples is +6.

2. The high intensities of photoelectron peaks arising from sulfur indicate that in all samples most of the sulfur is segregated at the surface rather than distributed homogeneously in the solid phase.

3. Surface area measurements and total sulfur determinations show that the degree of surface coverage by sulfate salts varies 5-40 monolayers.

4. The spectrum of the sample studied by infrared spectroscopy shows that sulfur is present on the surface as sulfate rather than as adsorbed SO_3. Apparent discrepencies between this conclusion and the findings of MRI can be explained by the greater sensitivity of the wet chemical methods used by MRI as compared with infrared spectroscopy.

The following observations were also made; however, it was felt that more study would be needed before they could be stated as firm conclusions:

1. Binding energies of S_2 p electrons, determined by photoelectron spectroscopy, closely match those for sulfates of polyvalent cations such as Fe^{+2}, Fe^{+3}, and Ca^{+2}. The sulfur may be present on the fly ash surfaces as calcium or iron sulfate.

2. Photoelectron peaks for silicon were broadened. This suggests the presence of more than one chemical state of silicon. The +4 oxidation state, indicating silicates of SiO_2, is definitely present, but lower oxidation states may be present also. Different glass phases containing silicon may also have caused the peak broadening. More study is necessary to be sure that the broadening of the silicon peaks is not due to interference by other elements.

SECTION VI

APPENDICES

APPENDIX A

RESULTS OF PRELIMINARY MEASUREMENT TEST

TABLE A1

VELOCITY TRAVERSE AT ECONOMIZER (LOCATION 1)

TEST: 9/28 - 9/29
100 MW LOAD
115% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

PERCENT O_2 BY VOLUME (ORSAT)	3.3%
PERCENT CO_2 BY VOLUME (ORSAT)	15.7%
PERCENT MOISTURE	5.6%

PORT	POINT	MEASURED VELOCITY (FEET/MINUTE)
1	1	1378
	2	970
	3	1214
	4	1081
2	1	1643
	2	1612
	3	1057
	4	1262

TABLE A2

VELOCITY TRAVERSE AT ECONOMIZER (LOCATION 1)

TEST: 9/30
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

PERCENT O_2 BY VOLUME (ORSAT)	4.3%
PERCENT CO_2 BY VOLUME (ORSAT)	14.9%
PERCENT MOISTURE	6.1%

PORT	POINT	MEASURED VELOCITY (FEET/MINUTE)
1	1	1150
	2	1116
	3	1537
	4	1409
2	1	1522
	2	888
	3	1537
	4	1370
3	1	1597
	2	851
	3	1052
	4	1323
4	1	1465
	2	1098
	3	2052
	4	1720
5	1	1185
	2	1051
	3	1154
	4	927
6	1	2069
	2	916
	3	1076
	4	918
7	1	689
	2	873
	3	-
	4	-

TABLE A3

VELOCITY TRAVERSE AT ECONOMIZER (LOCATION 1)

TEST: 10/1
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

PERCENT O_2 BY VOLUME (ORSAT)	8.0%
PERCENT CO_2 BY VOLUME (ORSAT)	12.0%
PERCENT MOISTURE	8.7%

PORT	POINT	MEASURED VELOCITY (FEET/MINUTE)
2	1	1740
	2	1001
	3	1087
	4	1582
4	1	1427
	2	1208
	3	1415
	4	1457
6	1	1007
	2	1085
	3	1100
	4	1177

TABLE A4

VELOCITY TRAVERSE AT ECONOMIZER (LOCATION 1)

TEST: 10/5
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
SOOT BLOWING OVER PERIOD OF TEST

PERCENT O_2 BY VOLUME (ORSAT) 4.2%
PERCENT CO_2 BY VOLUME (ORSAT) 14.7%
PERCENT MOISTURE 6.25%

PORT	POINT	MEASURED VELOCITY (FEET/MINUTE)
1	1	855
	2	1020
	3	1025
	4	850
2	1	1591
	2	885
	3	795
	4	1372
3	1	1470
	2	840
	3	1090
	4	1040
4	1	1155
	2	960
	3	930
	4	890
5	1	1255
	2	1035
	3	1010
	4	995
6	1	1480
	2	940
	3	740
	4	978
7	1	1270
	2	940
	3	-
	4	-

TABLE A5

VELOCITY TRAVERSE AT ECONOMIZER (LOCATION 1)

TEST: 10/6
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

PERCENT O_2 BY VOLUME (ORSAT) 4.2%
PERCENT CO_2 BY VOLUME (ORSAT) 14.4%
PERCENT MOISTURE 4.8%

PORT	POINT	MEASURED VELOCITY (FEET/MINUTE)
1	1	836
	2	902
	3	864
	4	1389
2	1	1514
	2	770
	3	942
	4	1409
3	1	1644
	2	857
	3	983
	4	1156
4	1	1370
	2	1106
	3	1131
	4	1563
5	1	1491
	2	723
	3	975
	4	1270
6	1	1531
	2	695
	3	940
	4	1480
7	1	1223
	2	858
	3	–
	4	–

TABLE A6

VELOCITY TRAVERSE AT ECONOMIZER (LOCATION 1)

TEST: 10/8
35 MW LOAD
145% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

PERCENT O_2 BY VOLUME (ORSAT) 5.6%
PERCENT CO_2 BY VOLUME (ORSAT) 13.2%
PERCENT MOISTURE 2.3%

PORT	POINT	MEASURED VELOCITY (FEET/MINUTE)
1	1	404
	2	397
	3	394
	4	584
2	1	576
	2	362
	3	362
	4	399
3	1	598
	2	363
	3	363
	4	567
4	1	522
	2	491
	3	326
	4	494
5	1	437
	2	399
	3	516
	4	633
6	1	621
	2	399
	3	399
	4	695
7	1	614
	2	323
	3	-
	4	-

TABLE A7

COAL ANALYSES FOR PRELIMINARY TEST RUNS

DATE	TEST CONDITIONS	MOISTURE	ASH	SULFUR	BTU'S AS RECEIVED	BTU DRY	BTU, MOISTURE AND ASH FREE
10/28 10/29	100 MW LOAD 115% EXCESS AIR COAL TYPE A NO SOOT BLOWING	11.40	10.02	3.01	11,041	12,462	14,051
9/30	100 MW LOAD 125% EXCESS AIR COAL TYPE A NO SOOT BLOWING	11.95	9.48	2.96	11,032	12,529	14,040
10/1	100 MW LOAD 125% EXCESS AIR COAL TYPE A NO SOOT BLOWING	11.75	10.13	2.87	11,027	12,495	14,115
10/5	100 MW LOAD 125% EXCESS AIR COAL TYPE A SOOT BLOWING OVER PERIOD OF TEST	11.15	10.67	2.91	11,072	12,462	14,163
10/6	100 MW LOAD 125% EXCESS AIR COAL TYPE A NO SOOT BLOWING	12.98	10.42	2.87	10,797	12,407	14,094
10/8	35 MW LOAD 145% EXCESS AIR COAL TYPE A NO SOOT BLOWING	13.02	10.72	2.95	10,780	12,394	14,137

TABLE A8

GRAIN LOADING AT AIR HEATER (LOCATION 2)

TEST	DATE
101	92871

AIR TEMP.	ATM. PRESS.	STACK VAC.	CONDENSATE	PARTICULATE	STACK AREA	INIT. VOL.	PO2	PCO2
90.00	29.420	8.5000	97.10000	7.27270	173.70700	855.8300	.0910	.0970

PORT	TIME	METER VOL	DELTA P	TEMP. IN	TEMP. OUT	TRAIN VAC.	STK. TEMP.	BOX TEMP.	PROBE DIA.	VELOCITY
1 1	2.00	857.0100	.083	92.000	92.000	6.5000	350.000	-80.000	.3750	1241.91
1 2	2.00	858.3100	.090	94.000	92.000	7.1000	385.000	-67.000	.3750	1320.86
1 3	2.00	859.3500	.065	95.000	92.000	5.0000	385.000	-77.000	.3750	1122.52
1 4	2.00	850.2000	.033	98.000	92.000	4.0000	385.000	-75.000	.3750	799.82
1 5	2.00	861.2600	.093	100.000	92.000	6.0000	385.000	-75.000	.3750	1342.70
1 6	2.00	862.3800	.080	100.000	93.000	6.5000	385.000	-80.000	.3750	1245.32
1 7	2.00	863.6000	.100	102.000	94.000	8.0000	385.000	-70.000	.3750	1392.31
1 8	2.00	864.9700	.100	106.000	96.000	8.0000	385.000	-65.000	.3750	1392.31
1 9	2.00	866.1300	.100	109.000	96.000	8.0000	385.000	-75.000	.3750	1392.31
1 10	2.00	867.4100	.100	112.000	96.000	8.0000	385.000	-76.000	.3750	1392.31
1 11	2.00	868.6000	.086	96.000	96.000	7.0000	405.000	-70.000	.3750	1306.37
1 12	2.00	869.8300	.094	100.000	96.000	8.0000	405.000	-65.000	.3750	1365.78
1 13	2.00	871.0300	.085	100.000	96.000	8.0000	405.000	-65.000	.3750	1298.75
1 14	2.00	872.1400	.073	104.000	96.000	7.0000	400.000	-65.000	.3750	1200.10
1 15	2.00	873.3100	.090	106.000	96.000	8.0000	415.000	-65.000	.3750	1344.10
1 16	2.00	874.4700	.084	100.000	96.000	7.0000	410.000	-75.000	.3750	1294.81
1 17	2.00	875.7200	.100	103.000	98.000	9.0000	410.000	-70.000	.3750	1412.76
1 18	2.00	877.0000	.100	107.000	98.000	9.0000	420.000	-70.000	.3750	1420.85
1 19	2.00	878.2000	.093	110.000	98.000	8.0000	410.000	-75.000	.3750	1362.41
1 20	2.00	879.3800	.094	113.000	98.000	8.0000	410.000	-75.000	.3750	1369.72
2 1	2.00	880.3300	.058	100.000	100.000	5.0000	410.000	-80.000	.3750	1075.92
2 2	2.00	881.4000	.083	102.000	100.000	7.0000	410.000	-75.000	.3750	1287.08
2 3	2.00	882.5000	.075	106.000	100.000	7.0000	415.000	-65.000	.3750	1226.99
2 4	2.00	883.5800	.070	108.000	100.000	7.0000	410.000	-70.000	.3750	1182.00
2 5	2.00	884.7100	.092	112.000	100.000	8.0000	420.000	-65.000	.3750	1362.83
2 6	2.00	885.8400	.076	110.000	102.000	8.0000	420.000	-80.000	.3750	1254.86
2 7	2.00	886.9300	.075	110.000	104.000	6.0000	420.000	-80.000	.3750	1230.49
2 8	2.00	887.9500	.062	110.000	104.000	7.0000	420.000	-75.000	.3750	1118.78
2 9	2.00	888.9300	.060	112.000	104.000	7.0000	430.000	-80.000	.3750	1106.82
2 10	2.00	889.8500	.052	113.000	106.000	7.0000	430.000	-80.000	.3750	1030.40
2 11	2.00	891.0000	.150	106.000	106.000	9.0000	418.000	-75.000	.3750	1738.20
2 12	2.00	692.1400	.080	108.000	106.000	9.0000	418.000	-70.000	.3750	1269.40
2 13	2.00	893.2500	.090	110.000	106.000	9.0000	418.000	-70.000	.3750	1346.41
2 14	2.00	894.3600	.080	112.000	106.000	9.0000	418.000	-70.000	.3750	1269.40
2 15	2.00	895.5500	.093	116.000	106.000	10.0000	418.000	-70.000	.3750	1368.66
2 16	2.00	896.6800	.078	120.000	106.000	10.0000	418.000	-75.000	.3750	1253.44
2 17	2.00	897.9200	.115	122.000	108.000	12.0000	418.000	-75.000	.3750	1521.96
2 18	2.00	899.2400	.115	126.000	108.000	13.0000	418.000	-75.000	.3750	1521.96
2 19	2.00	900.6000	.110	130.000	110.000	13.0000	418.000	-80.000	.3750	1488.51
2 20	2.00	901.8000	.082	132.000	110.000	10.0000	418.000	-80.000	.3750	1285.17

P MOIST.	AVE. VEL.	FLOWRATE	ISO. RATIO	EMIS. RATE	PART. LOAD	STD. LOAD
.0976	1298.9334	225633.8	1.0039	2708.6811	1.4006	2.3818

TEST: 9/28 - 9/29
100 MW LOAD
115% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

	UNDER 5 MICRONS	5 TO 80 MICRONS	OVER 80 MICRONS
ANISO CORRECTION FACTOR	1.0000	1.0019	1.0039
EMISSION RATE	2708.6811	2713.8870	2719.1129
PART. LOAD	1.4006	1.4032	1.4059
STD. LOAD	2.3818	2.3864	2.3910

TABLE A9

GRAIN LOADING AT AIR HEATER (LOCATION 2)

TEST	DATE
102	93071

AIR TEMP.	ATM. PRESS.	STACK VAC.	CONDENSATE	PARTICULATE	STACK AREA	INIT. VOL.	PO2	PCO2
90.00	29.420	8.1000	62.20000	3.22910	173.70700	880.1500	.0900	.0980

PORT	TIME	METER VOL	DELTA P	TEMP. IN	TEMP. OUT	TRAIN VAC.	STK. TEMP.	BOX TEMP.	PROBE DIA.	VELOCITY
2 1	2.00	881.0000	.145	100.000	100.000	6.0000	200.000	-70.000	.2500	1481.13
2 2	2.00	881.9500	.065	100.000	100.000	4.0000	300.000	-80.000	.2500	1064.14
2 3	2.00	882.8700	.080	102.000	100.000	4.0000	360.000	-80.000	.2500	1226.28
2 4	2.00	883.7900	.075	106.000	100.000	5.0000	390.000	-75.000	.2500	1208.86
2 5	2.00	884.7500	.087	108.000	100.000	5.0000	405.000	-75.000	.2500	1313.42
2 6	2.00	885.6900	.080	108.000	100.000	5.0000	405.000	-90.000	.2500	1259.48
2 7	2.00	886.6900	.095	110.000	100.000	5.0000	410.000	-80.000	.2500	1376.44
2 8	2.00	887.6600	.085	112.000	100.000	5.0000	405.000	-75.000	.2500	1298.24
2 9	2.00	888.6100	.085	114.000	102.000	5.0000	400.000	-80.000	.2500	1294.48
2 10	2.00	889.5500	.080	116.000	104.000	5.0000	400.000	-80.000	.2500	1255.83
2 11	2.00	890.3700	.058	104.000	104.000	5.0000	410.000	-90.000	.2500	1075.50
2 12	2.00	891.2900	.086	106.000	106.000	5.0000	410.000	-85.000	.2500	1309.62
2 13	2.00	892.2300	.086	108.000	106.000	5.0000	410.000	-80.000	.2500	1309.62
2 14	2.00	893.1300	.073	110.000	106.000	5.0000	410.000	-80.000	.2500	1206.58
2 15	2.00	894.1000	.092	112.000	106.000	6.0000	420.000	-80.000	.2500	1362.30
2 16	2.00	895.0400	.087	110.000	106.000	6.0000	420.000	-85.000	.2500	1324.76
2 17	2.00	895.9800	.080	110.000	106.000	6.0000	425.000	-80.000	.2500	1273.95
2 18	2.00	896.8800	.077	114.000	106.000	6.0000	430.000	-80.000	.2500	1253.36
2 19	2.00	897.7900	.077	116.000	107.000	6.0000	430.000	-80.000	.2500	1253.36
2 20	2.00	898.6700	.060	118.000	108.000	6.0000	450.000	-80.000	.2500	1118.75
1 1	2.00	899.2900	.081	98.000	99.000	3.0000	415.000	-90.000	.2500	1274.63
1 2	2.00	899.7300	.094	98.000	100.000	3.0000	415.000	-90.000	.2500	1373.11
1 3	2.00	900.2800	.085	100.000	100.000	3.0000	415.000	-90.000	.2500	1305.72
1 4	2.00	900.8700	.070	100.000	100.000	3.0000	405.000	-85.000	.2500	1178.13
1 5	2.00	901.3100	.085	102.000	100.000	3.0000	425.000	-85.000	.2500	1313.16
1 6	2.00	901.8300	.078	103.000	100.000	3.5000	425.000	-85.000	.2500	1257.93
1 7	2.00	902.4900	.095	104.000	100.000	4.0000	425.000	-95.000	.2500	1388.26
1 8	2.00	903.0700	.089	105.000	101.000	4.0000	426.000	-90.000	.2500	1344.46
1 9	2.00	903.5100	.087	106.000	102.000	4.0000	430.000	-90.000	.2500	1332.27
1 10	2.00	904.0500	.084	107.000	102.000	4.0000	453.000	-90.000	.2500	1325.90
1 11	2.00	904.6100	.080	100.000	100.000	3.0000	395.000	-90.000	.2500	1252.17
1 12	2.00	905.1400	.084	100.000	102.000	3.0000	395.000	-85.000	.2500	1283.10
1 13	2.00	905.7400	.065	101.000	102.000	3.0000	400.000	-80.000	.2500	1131.99
1 14	2.00	906.0800	.030	101.000	102.000	2.0000	390.000	-85.000	.2500	764.55
1 15	2.00	906.5900	.085	103.000	102.000	4.0000	414.000	-90.000	.2500	1304.97
1 16	2.00	907.0900	.069	104.000	102.000	4.0000	414.000	-90.000	.2500	1175.75
1 17	2.00	907.5300	.095	105.000	102.000	4.0000	420.000	-90.000	.2500	1384.33
1 18	2.00	908.1000	.090	106.000	102.000	4.0000	420.000	-90.000	.2500	1347.41
1 19	2.00	908.7500	.090	107.000	103.000	4.0000	420.000	-90.000	.2500	1347.41
1 20	2.00	909.2200	.090	108.000	103.000	4.0000	429.000	-90.000	.2500	1354.28

P MOIST.	AVE. VEL.	FLOWRATE	ISO. RATIO	EMIS. RATE	PART. LOAD	STD. LOAD
.0991	1267.6408	220198.1	1.4563	1865.3039	.9883	1.6758

	UNDER 5 MICRONS	5 TO 80 MICRONS	OVER 80 MICRONS
ANISO CORRECTION FACTOR	1.0000	1.1858	1.4563
EMISSION RATE	1865.3039	2211.8061	2716.4116
PART. LOAD	.9883	1.1719	1.4392
STD. LOAD	1.6758	1.9871	2.4404

TEST: 9/30
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

TABLE A10

GRAIN LOADING AT AIR HEATER (LOCATION 2)

TEST	DATE
103	100171

AIR TEMP.	ATM. PRESS.	STACK VAC.	CONDENSATE	PARTICULATE	STACK AREA	INIT. VOL.	PO2	PCO2
90.00	29.420	7.9000	42.10000	3.25640	173.70700	923.3700	.0800	.1200

PORT		TIME	METER VOL	DELTA P	TEMP. IN	TEMP. OUT	TRAIN VAC.	STK. TEMP.	BOX TEMP.	PROBE DIA.	VELOCITY
3	1	2.00	923.9500	.066	96.000	96.000	2.2000	224.000	-80.000	.2500	1010.72
3	2	2.00	924.5300	.095	98.000	96.000	2.2000	350.000	-85.000	.2500	1319.57
3	3	2.00	925.1800	.089	98.000	96.000	2.5000	376.000	-80.000	.2500	1297.56
3	4	2.00	925.6800	.072	99.000	97.000	2.5000	390.000	-80.000	.2500	1176.80
3	5	2.00	926.1200	.090	100.000	97.000	2.5000	395.000	-85.000	.2500	1319.57
3	6	2.00	926.6100	.074	102.000	98.000	2.0000	400.000	-85.000	.2500	1200.03
3	7	2.00	927.2600	.094	103.000	98.000	3.0000	410.000	-85.000	.2500	1360.36
3	8	2.00	927.8400	.096	104.000	98.000	3.0000	405.000	-85.000	.2500	1370.79
3	9	2.00	928.3900	.095	106.000	98.000	3.0000	415.000	-85.000	.2500	1371.50
3	10	2.00	928.8500	.090	107.000	100.000	3.0000	415.000	-85.000	.2500	1334.92
3	11	2.00	929.4900	.085	99.000	99.000	2.5000	415.000	-85.000	.2500	1297.31
3	12	2.00	930.0200	.085	100.000	101.000	3.0000	403.000	-80.000	.2500	1288.38
3	13	2.00	930.5600	.085	101.000	101.000	3.0000	410.000	-80.000	.2500	1293.59
3	14	2.00	931.0500	.065	103.000	102.000	2.3000	410.000	-80.000	.2500	1131.21
3	15	2.00	931.5500	.085	104.000	101.000	3.0000	413.000	-80.000	.2500	1295.82
3	16	2.00	932.0800	.075	105.000	102.000	3.0000	421.000	-80.000	.2500	1222.78
3	17	2.00	932.5700	.084	106.000	102.000	2.0000	421.000	-80.000	.2500	1294.07
3	18	2.00	933.0000	.084	108.000	102.000	2.0000	425.000	-80.000	.2500	1297.00
3	19	2.00	933.6000	.081	110.000	103.000	2.0000	430.000	-80.000	.2500	1277.22
3	20	2.00	934.1500	.089	112.000	104.000	3.0000	445.000	-80.000	.2500	1350.04
4	1	2.00	934.6700	.084	96.000	96.000	2.5000	404.000	-100.000	.2500	1281.52
4	2	2.00	935.1900	.084	96.000	96.000	3.0000	394.000	-90.000	.2500	1274.08
4	3	2.00	935.6100	.079	97.000	96.000	2.5000	400.000	-90.000	.2500	1239.91
4	4	2.00	936.1700	.060	98.000	97.000	2.0000	400.000	-85.000	.2500	1080.57
4	5	2.00	936.6700	.079	100.000	97.000	3.0000	415.000	-85.000	.2500	1250.68
4	6	2.00	937.1800	.078	100.000	97.000	3.0000	415.000	-85.000	.2500	1242.74
4	7	2.00	937.6000	.081	102.000	97.000	3.0000	420.000	-85.000	.2500	1270.03
4	8	2.00	938.1900	.075	103.000	98.000	3.0000	420.000	-85.000	.2500	1222.08
4	9	2.00	938.6900	.075	104.000	98.000	3.0000	425.000	-85.000	.2500	1225.55
4	10	2.00	939.1000	.079	105.000	98.000	3.0000	435.000	-85.000	.2500	1264.89
4	11	2.00	939.6600	.065	96.000	96.000	2.0000	363.000	-90.000	.2500	1100.23
4	12	2.00	940.1700	.090	96.000	97.000	3.0000	378.000	-90.000	.2500	1306.39
4	13	2.00	940.6300	.094	97.000	97.000	3.0000	385.000	-85.000	.2500	1340.67
4	14	2.00	941.1400	.074	98.000	97.000	3.0000	385.000	-85.000	.2500	1189.52
4	15	2.00	941.7800	.087	100.000	97.000	3.0000	410.000	-80.000	.2500	1308.72
4	16	2.00	942.2400	.089	101.000	97.000	3.0000	400.000	-80.000	.2500	1316.05
4	17	2.00	942.8100	.099	102.000	97.000	3.0000	410.000	-80.000	.2500	1396.07
4	18	2.00	943.3500	.084	103.000	97.000	3.0000	400.000	-80.000	.2500	1278.55
4	19	2.00	943.8200	.057	103.000	97.000	2.0000	404.000	-85.000	.2500	1055.66
4	20	2.00	944.3500	.090	104.000	97.000	3.0000	415.000	-85.000	.2500	1334.92

P MOIST.	AVE. VEL.	FLOWRATE	ISO. RATIO	EMIS. RATE	PART. LOAD	STD. LOAD
.0927	1262.2019	219253.3	1.0537	2599.8540	1.3834	2.3358

	UNDER 5 MICRONS	5 TO 80 MICRONS	OVER 80 MICRONS
ANISO CORRECTION FACTOR	1.0000	1.0261	1.0537
EMISSION RATE	2599.8540	2667.7926	2739.3771
PART. LOAD	1.3834	1.4196	1.4576
STD. LOAD	2.3358	2.3968	2.4611

TEST: 10/1
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

TABLE A11

GRAIN LOADING AT AIR HEATER (LOCATION 2)

TEST	DATE
104	100571

AIR TEMP.	ATM. PRESS.	STACK VAC.	CONDENSATE	PARTICULATE	STACK AREA	INIT. VOL.	PO2	PCO2
90.00	29.420	7.8000	33.20000	4.08360	173.70700	962.2200	.0740	.1140

PORT	TIME	METER VOL	DELTA P	TEMP. IN	TEMP. OUT	TRAIN VAC.	STK. TEMP.	BOX TEMP.	PROBE DIA.	VELOCITY
4 1	2.00	962.7100	.080	82.000	82.000	3.0000	385.000	-78.000	.2500	1234.22
4 2	2.00	963.2200	.070	82.000	82.000	3.0000	370.000	-72.000	.2500	1144.22
4 3	2.00	963.7200	.075	84.000	82.000	3.0000	380.000	-72.000	.2500	1191.49
4 4	2.00	964.1400	.050	85.000	83.000	2.0000	382.000	-75.000	.2500	974.01
4 5	2.00	964.6200	.074	87.000	83.000	3.0000	395.000	-75.000	.2500	1194.04
4 6	2.00	965.1250	.075	88.000	84.000	3.0000	405.000	-75.000	.2500	1209.09
4 7	2.00	965.6250	.075	89.000	84.000	3.0000	395.000	-75.000	.2500	1202.08
4 8	2.00	966.1100	.069	90.000	85.000	3.0000	381.000	-75.000	.2500	1143.52
4 9	2.00	966.6100	.070	91.000	85.000	3.0000	398.000	-80.000	.2500	1163.36
4 10	2.00	967.0800	.067	92.000	86.000	3.0000	410.000	-80.000	.2500	1146.09
4 11	2.00	967.6800	.110	87.000	87.000	4.0000	277.000	-85.000	.2500	1351.61
4 12	2.00	968.5500	.088	88.000	87.000	4.0000	337.000	-85.000	.2500	1257.16
4 13	2.00	968.7800	.080	89.000	88.000	4.0000	355.000	-85.000	.2500	1212.12
4 14	2.00	969.2500	.060	90.000	88.000	3.0000	355.000	-85.000	.2500	1049.72
4 15	2.00	969.7450	.075	91.000	88.000	4.0000	371.000	-85.000	.2500	1185.09
4 16	2.00	970.2480	.068	92.000	88.000	4.0000	373.000	-85.000	.2500	1129.79
4 17	2.00	970.7450	.075	93.000	89.000	4.0000	391.000	-85.000	.2500	1199.27
4 18	2.00	971.2550	.075	94.000	89.000	4.0000	378.000	-85.000	.2500	1190.07
4 19	2.00	971.7650	.072	95.000	90.000	3.0000	382.000	-85.000	.2500	1168.81
4 20	2.00	972.2520	.067	96.000	90.000	3.0000	396.000	-90.000	.2500	1136.83
3 1	2.00	972.7950	.073	86.000	87.000	3.0000	221.000	-85.000	.2500	1058.41
3 2	2.00	973.3400	.085	87.000	87.000	3.0000	389.000	-80.000	.2500	1275.22
3 3	2.00	973.8500	.079	88.000	87.000	3.0000	353.000	-80.000	.2500	1203.04
3 4	2.00	974.3200	.057	89.000	87.000	3.0000	362.000	-80.000	.2500	1027.53
3 5	2.00	974.8250	.078	90.000	88.000	3.0000	375.000	-80.000	.2500	1211.47
3 6	2.00	975.3240	.068	91.000	88.000	3.0000	371.000	-80.000	.2500	1126.43
3 7	2.00	975.8400	.083	92.000	88.000	3.0000	376.000	-80.000	.2500	1250.44
3 8	2.00	976.3820	.086	93.000	89.000	3.0000	370.000	-80.000	.2500	1268.26
3 9	2.00	976.9400	.085	94.000	89.000	3.0000	387.000	-80.000	.2500	1273.71
3 10	2.00	977.4700	.075	95.000	90.000	3.0000	390.000	-85.000	.2500	1198.56
3 11	2.00	978.0100	.080	88.000	89.000	3.0000	380.000	-80.000	.2500	1230.57
3 12	2.00	978.4650	.050	89.000	89.000	3.0000	373.000	-77.000	.2500	968.79
3 13	2.00	978.8500	.077	90.000	90.000	3.0000	377.000	-77.000	.2500	1205.12
3 14	2.00	979.5700	.080	92.000	90.000	3.0000	382.000	-80.000	.2500	1232.03
3 15	2.00	980.0000	.087	93.000	90.000	4.0000	385.000	-83.000	.2500	1287.09
3 16	2.00	980.5300	.075	94.000	90.000	4.0000	392.000	-83.000	.2500	1199.97
3 17	2.00	981.1320	.118	95.000	91.000	4.0000	385.000	-85.000	.2500	1498.96
3 18	2.00	981.7400	.097	96.000	91.000	4.0000	397.000	-85.000	.2500	1368.66
3 19	2.00	982.3080	.090	98.000	92.000	4.0000	400.000	-83.000	.2500	1320.66
3 20	2.00	982.8920	.100	98.000	92.000	4.0000	425.000	-83.000	.2500	1412.19

P MOIST.	AVE. VEL.	FLOWRATE	ISO. RATIO	EMIS. RATE	PART. LOAD	STD. LOAD
.0742	1202.5424	208890.0	1.0557	3254.1344	1.8175	2.9755

TEST: 10/5
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
SOOT BLOWING OVER PERIOD OF TEST

	UNDER 5 MICRONS	5 TO 80 MICRONS	OVER 80 MICRONS
ANISO CORRECTION FACTOR	1.0000	1.0271	1.0557
EMISSION RATE	3254.1344	3342.2363	3435.2415
PART. LOAD	1.8175	1.8667	1.9186
STD. LOAD	2.9755	3.0561	3.1411

TABLE A12

GRAIN LOADING AT AIR HEATER (LOCATION 2)

TEST	DATE
105	100671

AIR TEMP.	ATM. PRESS.	STACK VAC.	CONDENSATE	PARTICULATE	STACK AREA	INIT. VOL.	PO2	PCO2
90.00	29.420	7.2000	24.00000	3.54770	43.42700	15.7500	.0700	.1180

PORT	TIME	METER VOL	DELTA P	TEMP. IN	TEMP. OUT	TRAIN VAC.	STK. TEMP.	BOX TEMP.	PROBE DIA.	VELOCITY
4 1	5.00	17.1000	.076	88.000	84.000	2.5000	360.000	-75.000	.2500	1185.23
4 2	5.00	18.4440	.096	91.000	85.000	2.5000	359.000	-75.000	.2500	1331.27
4 3	5.00	19.8550	.088	95.000	87.000	2.5000	358.000	-75.000	.2500	1273.82
4 4	5.00	21.1600	.072	98.000	89.000	2.5000	360.000	-75.000	.2500	1153.62
4 5	5.00	22.5260	.084	100.000	90.000	2.5000	375.000	-75.000	.2500	1257.40
4 6	5.00	23.8600	.070	102.000	93.000	2.5000	371.000	-75.000	.2500	1145.09
4 7	5.00	25.2660	.090	104.000	94.000	2.5000	382.000	-75.000	.2500	1306.97
4 8	5.00	26.6750	.085	106.000	96.000	2.5000	379.000	-75.000	.2500	1267.89
4 9	5.00	27.8720	.057	107.000	98.000	2.5000	380.000	-75.000	.2500	1038.88
4 10	5.00	29.2450	.087	108.000	100.000	3.0000	392.000	-75.000	.2500	1292.62

P MOIST.	AVE. VEL.	FLOWRATE	ISO. RATIO	EMIS. RATE	PART. LOAD	STD. LOAD
.0823	1225.2793	53210.2	1.0736	1111.9656	2.4381	3.9653

	UNDER 5 MICRONS	5 TO 80 MICRONS	OVER 80 MICRONS
ANISO CORRECTION FACTOR	1.0000	1.0355	1.0736
EMISSION RATE	1111.9656	1151.4202	1193.7777
PART. LOAD	2.4381	2.5246	2.6174
STD. LOAD	3.9653	4.1060	4.2570

TEST: 10/6
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

TABLE A13

GRAIN LOADING AT AIR HEATER (LOCATION 2)

TEST	DATE
106	100671

AIR TEMP.	ATM. PRESS.	STACK VAC.	CONDENSATE	PARTICULATE	STACK AREA	INIT. VOL.	PO2	PCO2
90.00	29.420	7.2000	35.25000	4.38390	4.34270	29.2450	.0700	.1180

PORT		TIME	METER VOL	DELTA P	TEMP. IN	TEMP. OUT	TRAIN VAC.	STK. TEMP.	BOX TEMP.	PROBE DIA.	VELOCITY
4	7	5.00	30.6900	.086	90.000	92.000	2.5000	390.000	-75.000	.2500	1286.27
4	7	5.00	32.1670	.089	93.000	93.000	2.5000	390.000	-75.000	.2500	1308.52
4	7	5.00	33.6450	.087	99.000	93.000	2.5000	390.000	-75.000	.2500	1293.73
4	7	5.00	35.1100	.087	101.000	94.000	2.5000	387.000	-75.000	.2500	1291.45
4	7	5.00	36.5850	.087	105.000	95.000	3.0000	386.000	-75.000	.2500	1290.68
4	7	5.00	38.0620	.088	107.000	96.000	3.0000	388.000	-75.000	.2500	1299.61
4	7	5.00	39.5400	.087	109.000	98.000	3.0000	388.000	-75.000	.2500	1292.21
4	7	5.00	41.0200	.088	110.000	100.000	3.0000	388.000	-75.000	.2500	1299.61
4	7	5.00	42.5050	.086	111.000	101.000	3.0000	387.000	-75.000	.2500	1284.00
4	7	5.00	43.9920	.088	113.000	102.000	3.5000	390.000	-75.000	.2500	1301.15
4	7	5.00	45.4750	.086	114.000	103.000	3.5000	390.000	-75.000	.2500	1286.27
4	7	5.00	46.9610	.087	115.000	104.000	3.5000	387.000	-75.000	.2500	1291.45

P MOIST.	AVE. VEL.	FLOWRATE	ISO. RATIO	EMIS. RATE	PART. LOAD	STD. LOAD
.0921	1293.7468	5618.4	1.1351	108.2997	2.2489	3.7314

TEST: 10/6
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

	UNDER 5 MICRONS	5 TO 80 MICRONS	OVER 80 MICRONS
ANISO CORRECTION FACTOR	1.0000	1.0633	1.1351
EMISSION RATE	108.2997	115.1518	122.9295
PART. LOAD	2.2489	2.3912	2.5527
STD. LOAD	3.7314	3.9675	4.2354

TABLE A14

GRAIN LOADING AT AIR HEATER (LOCATION 2)

TEST	DATE
107	100671

AIR TEMP.	ATM. PRESS.	STACK VAC.	CONDENSATE	PARTICULATE	STACK AREA	INIT. VOL.	PO2	PCO2
90.00	29.420	7.2000	31.50000	4.06110	4.34270	46.9610	.0700	.1180

PORT		TIME	METER VOL	DELTA P	TEMP. IN	TEMP. OUT	TRAIN VAC.	STK. TEMP.	BOX TEMP.	PROBE DIA.	VELOCITY
4	7	5.00	48.4770	.103	90.000	92.000	2.5000	393.000	-75.000	.2500	1406.44
4	7	5.00	50.0250	.101	94.000	92.000	2.5000	393.000	-75.000	.2500	1392.72
4	7	5.00	51.5620	.100	97.000	93.000	2.5000	393.000	-75.000	.2500	1385.81
4	7	5.00	53.0950	.100	102.000	94.000	2.5000	390.000	-75.000	.2500	1383.37
4	7	5.00	54.6200	.103	105.000	95.000	3.0000	393.000	-75.000	.2500	1406.44
4	7	5.00	56.1660	.102	107.000	96.000	3.0000	394.000	-75.000	.2500	1400.42
4	7	5.00	57.7390	.104	109.000	97.000	3.0000	396.000	-72.000	.2500	1415.73
4	7	5.00	59.3200	.102	112.000	99.000	3.5000	396.000	-72.000	.2500	1402.06
4	7	5.00	60.8850	.104	112.000	100.000	3.5000	395.000	-72.000	.2500	1414.91
4	7	5.00	62.4480	.104	113.000	101.000	3.5000	393.000	-72.000	.2500	1413.25
4	7	5.00	64.0050	.103	114.000	102.000	3.5000	394.000	-72.000	.2500	1407.26
4	7	5.00	65.5630	.102	114.000	104.000	3.5000	394.000	-72.000	.2500	1400.42

P MOIST.	AVE. VEL.	FLOWRATE	ISO. RATIO	EMIS. RATE	PART. LOAD	STD. LOAD
.0794	1402.4014	6090.2	1.0914	104.3398	1.9988	3.3369

TEST: 10/6
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

	UNDER 5 MICRONS	5 TO 80 MICRONS	OVER 80 MICRONS
ANISO CORRECTION FACTOR	1.0000	1.0437	1.0914
EMISSION RATE	104.3398	108.9004	113.8778
PART. LOAD	1.9988	2.0861	2.1815
STD. LOAD	3.3369	3.4828	3.6420

TABLE A15

GRAIN LOADING AT AIR HEATER (LOCATION 2)

TEST	DATE
108	100671

AIR TEMP.	ATM. PRESS.	STACK VAC.	CONDENSATE	PARTICULATE	STACK AREA	INIT. VOL.	PO2	PCO2
90.00	29.420	7.2000	23.25000	3.18820	43.42700	65.5630	.0700	.1180

PORT	TIME	METER VOL	DELTA P	TEMP. IN	TEMP. OUT	TRAIN VAC.	STK. TEMP.	BOX TEMP.	PROBE DIA.	VELOCITY
4 1	5.00	66.8580	.076	84.000	86.000	2.5000	327.000	-75.000	.2500	1160.14
4 2	5.00	68.4100	.102	87.000	86.000	2.5000	357.000	-75.000	.2500	1365.40
4 3	5.00	69.7680	.098	92.000	87.000	3.0000	362.000	-68.000	.2500	1346.38
4 4	5.00	71.0850	.075	95.000	88.000	3.0000	365.000	-70.000	.2500	1179.98
4 5	5.00	72.4660	.091	97.000	89.000	3.0000	381.000	-70.000	.2500	1312.31
4 6	5.00	73.8960	.075	99.000	91.000	3.0000	375.000	-75.000	.2500	1187.11
4 7	5.00	75.2580	.105	101.000	92.000	3.5000	385.000	-70.000	.2500	1413.00
4 8	5.00	76.7170	.106	103.000	93.000	3.5000	377.000	-70.000	.2500	1412.97
4 9	5.00	77.9520	.061	104.000	94.000	3.0000	382.000	-73.000	.2500	1075.08
4 10	5.00	79.3290	.095	104.000	95.000	3.5000	399.000	-70.000	.2500	1355.12

P MOIST.	AVE. VEL.	FLOWRATE	ISO. RATIO	EMIS. RATE	PART. LOAD	STD. LOAD
.0782	1281.1488	55636.4	1.0465	1025.1626	2.1497	3.4949

	UNDER 5 MICRONS	5 TO 80 MICRONS	OVER 80 MICRONS
ANISO CORRECTION FACTOR	1.0000	1.0227	1.0465
EMISSION RATE	1025.1626	1048.4445	1072.8083
PART. LOAD	2.1497	2.1985	2.2496
STD. LOAD	3.4949	3.5743	3.6573

TEST: 10/6
100 MW LOAD
125% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

TABLE A16
GRAIN LOADING AT AIR HEATER (LOCATION 2)

TEST	DATE
109	100871

AIR TEMP.	ATM. PRESS.	STACK VAC.	CONDENSATE	PARTICULATE	STACK AREA	INIT. VOL.	PO2	PCO2
90.00	29.420	2.1500	59.95000	5.11370	173.70700	105.8460	.1080	.0840

PORT	TIME	METER VOL	DELTA P	TEMP. IN	TEMP. OUT	TRAIN VAC.	STK. TEMP.	BOX TEMP.	PROBE DI..	VELOCITY
4 1	2.00	106.9040	.020	77.000	80.000	3.5000	320.000	-65.000	.5000	591.10
4 2	2.00	107.9800	.022	81.000	82.000	3.5000	323.000	-60.000	.5000	621.14
4 3	2.00	109.1770	.023	84.000	82.000	3.5000	326.000	-60.000	.5000	630.32
4 4	2.00	110.1650	.022	88.000	82.000	3.5000	326.000	-60.000	.5000	622.33
4 5	2.00	111.1800	.017	92.000	82.000	3.0000	330.000	-60.000	.5000	548.45
4 6	2.00	112.1250	.015	94.000	82.000	3.0000	332.000	-60.000	.5000	519.83
4 7	2.00	113.0700	.017	95.000	83.000	3.0000	332.000	-60.000	.5000	549.14
4 8	2.00	114.0300	.017	97.000	83.000	3.0000	332.000	-60.000	.5000	549.14
4 9	2.00	114.9000	.012	97.000	83.000	2.5000	333.000	-60.000	.5000	461.66
4 10	2.00	115.7960	.016	97.000	84.000	3.0000	339.000	-65.000	.5000	535.10
4 11	2.00	116.7350	.016	79.000	80.000	3.5000	340.000	-65.000	.5000	535.43
4 12	2.00	117.7500	.015	81.000	80.000	3.0000	338.000	-60.000	.5000	517.78
4 13	2.00	118.5820	.017	82.000	80.000	3.5000	341.000	-60.000	.5000	552.25
4 14	2.00	119.5400	.017	85.000	81.000	3.5000	341.000	-60.000	.5000	552.25
4 15	2.00	120.5650	.015	88.000	81.000	3.0000	347.000	-60.000	.5000	520.69
4 16	2.00	121.4100	.017	90.000	82.000	3.5000	348.000	-60.000	.5000	554.66
4 17	2.00	122.3270	.015	92.000	82.000	3.5000	348.000	-60.000	.5000	521.01
4 18	2.00	123.2810	.017	93.000	83.000	3.5000	346.000	-60.000	.5000	554.66
4 19	2.00	124.2250	.016	94.000	83.000	3.5000	355.000	-60.000	.5000	540.43
4 20	2.00	125.1640	.016	95.000	83.000	3.5000	364.000	-60.000	.5000	543.40
3 1	2.00	125.8900	.008	69.000	70.000	2.5000	310.000	-60.000	.5000	371.44
3 2	2.00	126.7920	.010	70.000	70.000	2.5000	332.000	-55.000	.5000	421.17
3 3	2.00	127.6280	.017	72.000	70.000	3.5000	334.000	-55.000	.5000	549.84
3 4	2.00	128.5530	.012	75.000	70.000	3.5000	333.000	-53.000	.5000	461.66
3 5	2.00	129.3940	.010	77.000	71.000	3.0000	335.000	-53.000	.5000	421.97
3 6	2.00	130.2270	.010	79.000	71.000	3.0000	335.000	-53.000	.5000	421.97
3 7	2.00	131.1620	.015	82.000	72.000	4.0000	344.000	-55.000	.5000	519.72
3 8	2.00	133.1100	.017	69.000	70.000	4.0000	340.000	-65.000	.5000	551.91
3 9	2.00	134.0600	.016	70.000	71.000	3.5000	346.000	-60.000	.5000	537.44
3 10	2.00	134.9610	.015	73.000	71.000	3.5000	347.000	-60.000	.5000	520.69
3 11	2.00	135.8250	.014	68.000	70.000	3.5000	340.000	-60.000	.5000	500.85
3 12	2.00	136.7930	.015	70.000	70.000	3.5000	332.000	-55.000	.5000	515.83
3 13	2.00	137.5970	.017	73.000	70.000	4.0000	336.000	-53.000	.5000	550.53
3 14	2.00	138.5280	.016	75.000	71.000	4.0000	338.000	-53.000	.5000	534.76
3 15	2.00	139.4340	.015	79.000	71.000	4.0000	343.000	-53.000	.5000	517.46
3 16	2.00	140.3700	.017	80.000	72.000	4.0000	354.000	-53.000	.5000	556.72
3 17	2.00	141.4360	.035	86.000	82.000	5.5000	354.000	-53.000	.5000	798.81
3 18	2.00	142.9150	.055	89.000	83.000	8.0000	356.000	-55.000	.5000	1002.59
3 19	2.00	144.6810	.060	93.000	84.000	8.0000	355.000	-55.000	.5000	1046.53
3 20	2.00	146.4930	.090	99.000	75.000	12.0000	375.000	-55.000	.5000	1297.37

P MOIST.	AVE. VEL.	FLOWRATE	ISO. RATIO	EMIS. RATE	PART. LOAD	STD. LOAD
.0675	578.1004	100420.1	1.0308	1043.3370	1.2121	1.8758

TEST: 10/8
35 MW LOAD
145% EXCESS AIR
COAL TYPE A
NO SOOT BLOWING

	UNDER 5 MICRONS	5 TO 80 MICRONS	OVER 80 MICRONS
ANISO CORRECTION FACTOR	1.0000	1.0152	1.0308
EMISSION RATE	1043.3370	1059.1491	1075.4478
PART. LOAD	1.2121	1.2305	1.2494
STD. LOAD	1.8758	1.9042	1.9335

APPENDIX B

DATA MANAGEMENT LOG

DATA MANAGEMENT LOG

TEST NO. ____________________ DATE ______________________

TEST START TIME _____________

TEST END TIME _____________

EXPECTED VARIABLES

LOAD FACTOR - 35 50 75 100

FUEL TYPE - A B C

SOOT BLOWER - NONE MAX MIN

EXCESS AIR - NORMAL MAX MIN

BURNER ANGLE - NORMAL MAX MIN

COAL AND REFUSE SAMPLING

	NO. OF SAMPLES	AGG LABELED	LABEL ID	SENT TO ISGS	SENTO MRI	ANALYSIS RCVD MITRE
COAL						
MECH SEP. ASH						
PIT ASH						

COMMENTS ON COAL AND REFUSE SUBSYSTEM:

DATA MANAGEMENT LOG

TEST NO. ____ (CONT) P. 2

TEMP. MONITORING

	TIME START	TIME END	HOURS OF DATA	LABEL ID	SENT TO MITRE	RCVD MITRE
AIR TEMP. ENT AH						
AIR TEMP. LV AH						
GAS TEMP. LV ECON						
GAS TEMP. LV AH						
AIR TEMP. ENT FD FAN						
HUMIDITY ENT FD FAN						
TEMP. REF. JUNCTION						

COMMENTS ON TEMPERATURE SUBSYSTEM:

CONTINUOUS FLUE GAS MONITORING

	TIME START	TIME END	HOURS OF DATA	LABEL ID	SENT TO MITRE	RCVD MITRE
LOC 1 TEMP						
LOC 1 PRESSURE						

DATA MANAGEMENT LOG

TEST NO. ____ (CONT) P. 3

	TIME START	TIME END	HOURS OF DATA	LABEL ID	SENT TO MITRE	RCVD MITRE
LOC 1 FLOW						
LOC 1 SO_2						
LOC 1 O_2						
LOC 2 TEMP.						
LOC 2 PRESSURE						
LOC 2 FLOW						
LOC 2 PARTICULATES						
LOC 3 TEMP.						
LOC 3 PRESSURE						
LOC 3 FLOW						
LOC 3 PARTICULATES						
LOC 3 SO_2						
LOC 3 NO_x						
LOC 3 CO & CO_2						
LOC 3 HC						
LOC 3 O_2						
LOC 3 H_2OVAPOR						

COMMENTS ON CONTINUOUS FLUE GAS MONITORING:

DATA MANAGEMENT LOG

TEST NO. ____ (CONT) P. 4

MANUAL FLUE GAS SAMPLING

	NO. OF SAMPLES	SAMPLE TIME	LABEL ID	SENT TO MRI	RCVD MITRE
LOC 1 SO_2					
LOC 1 NO_x					
LOC 1 CO & CO_2					
LOC 2 MASS LOADING					
LOC 3 MASS LOADING					
LOC 3 H_2SO_4 MIST					
LOC 3 SO_2					
LOC 3 NO_x					
LOC 3 CO & CO_2					

COMMENTS ON MANUAL FLUE GAS SAMPLING:

OPERATING CONDITIONS LOG

SAMPLE HOURS ______________ OCLOCK ______________ OCLOCK

______________ OCLOCK ______________ OCLOCK

DATA MANAGEMENT LOG

TEST NO. ____ (CONT) P. 5

	______	OCLOCK	______	OCLOCK
	______	OCLOCK	______	OCLOCK
	______	OCLOCK	______	OCLOCK
PRINT OUTS	______	OCLOCK	______	OCLOCK
	______	OCLOCK	______	OCLOCK
	______	OCLOCK	______	OCLOCK
	______	OCLOCK	______	OCLOCK
	______	OCLOCK	______	OCLOCK

	LABEL ID	SENT TO MITRE	RCVD MITRE
OP. COND. LOG			
PRINT OUTS			

COMMENTS ON OPERATING CONDITIONS:

QUICK LOOK LOG AND COMPUTATIONS

NET EFF COMPUTATION	______	OCLOCK	______	OCLOCK	______	OCLOCK
GROSS EFF COMPUTATION	______	OCLOCK	______	OCLOCK	______	OCLOCK
FLOW COMPUTATION	______	OCLOCK	______	OCLOCK	______	OCLOCK

DATA MANAGEMENT LOG

TEST NO. ____ (CONT) P. 6

MASS FLOW COMPUTATION _______ OCLOCK ______ OCLOCK ______ OCLOCK

OTHER COMPUTATION _______ OCLOCK ______ OCLOCK ______ OCLOCK

NUMBER OF DATA SHEETS _______

	LABEL ID	SENT TO MITRE	RCVD MITRE
QUICK LOOK LOG			
QUICK LOOK COMPUTATIONS			
DATA SHEETS			

COMMENTS ON QUICK LOOK:

PERSONNEL

MITRE	MRI	WOODRIVER
TEST DIRECTOR	PARTY CHIEF	SUPERVISOR
DATA HANDLER	OTHERS	
OTHERS		

DATA MANAGEMENT LOG

TEST NO. ____ (CONT) P. 7

COMMENTS OF TEST DIRECTOR

TEST DIRECTOR SIGNATURE

DATA HANDLER SIGNATURE

APPENDIX C

DATA BASE

SELECTION CARDS
01
02
03
04
05
06
07
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EFFICIENCY OPTION CARDS

EXCESS AIR OPTION CARDS

FLOW RATE OPTION CARDS

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
CONSTANTS						LEAKAGE =	.1				
FLOW	11			1	1	TEMPERATURE =	700	STATIC PRES =	2	VELOCITY =	
FLOW	09			1	1	TEMPERATURE =	700	STATIC PRES =	2	VELOCITY =	
FLOW	08			1	1	TEMPERATURE =	700	STATIC PRES =	2	VELOCITY =	
FLOW	12			1	1	TEMPERATURE =	700	STATIC PRES =	2	VELOCITY =	
FLOW	07			1	1	TEMPERATURE =	700	STATIC PRES =	2	VELOCITY =	
FLOW	01			1	1	TEMPERATURE =	700	STATIC PRES =	2	VELOCITY =	
FLOW	06			1	1	TEMPERATURE =	782	STATIC PRES =	5.2	VELOCITY =	
FLOW	18			1	1	TEMPERATURE =	712	STATIC PRES =	1.9	VELOCITY =	
FLOW	13			1	1	TEMPERATURE =	662	STATIC PRES =	1.3	VELOCITY =	
FLOW	04			1	1	TEMPERATURE =	712	STATIC PRES =	2.6	VELOCITY =	
FLOW	05			1	1	TEMPERATURE =	712	STATIC PRES =	2.7	VELOCITY =	
FLOW	10			1	1	TEMPERATURE =	732	STATIC PRES =	4.3	VELOCITY =	
FLOW	20			1	1	TEMPERATURE =	672	STATIC PRES =	1.8	VELOCITY =	
FLOW	02			1	1	TEMPERATURE =	692	STATIC PRES =	2.8	VELOCITY =	
FLOW	03			1	1	TEMPERATURE =	712	STATIC PRES =	3.3	VELOCITY =	
FLOW	17			1	1	TEMPERATURE =	632	STATIC PRES =	1.65	VELOCITY =	
FLOW	19			1	1	TEMPERATURE =	692	STATIC PRES =	1.8	VELOCITY =	
FLOW	21			1	1	TEMPERATURE =	662	STATIC PRES =	1.2	VELOCITY =	
FLOW	14			1	1	TEMPERATURE =	692	STATIC PRES =	1.5	VELOCITY =	
FLOW	15			1	1	TEMPERATURE =	692	STATIC PRES =	1.6	VELOCITY =	
FLOW	22			1	1	TEMPERATURE =	742	STATIC PRES =	2.4	VELOCITY =	
FLOW	11			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1468
FLOW	09			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1222
FLOW	08			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1426
FLOW	12			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1264
FLOW	07			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1320

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
FLOW	01			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1055
FLOW	06			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1582
FLOW	18			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	775
FLOW	13			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	589
FLOW	04			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	970
FLOW	05			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1089
FLOW	10			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1296
FLOW	20			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	721
FLOW	02			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	999
FLOW	03			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1166
FLOW	17			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	632
FLOW	19			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	810
FLOW	21			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	565
FLOW	14			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	661
FLOW	15			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	685
FLOW	22			1	0	TEMPERATURE =		STATIC PRES =		VELOCITY =	1076
FLOW	11			2	0	TEMPERATURE =	363	STATIC PRES =	7	VELOCITY =	1267
FLOW	09			2	0	TEMPERATURE =	368	STATIC PRES =	7	VELOCITY =	1076
FLOW	08			2	0	TEMPERATURE =	376	STATIC PRES =	8.9	VELOCITY =	1290
FLOW	12			2	0	TEMPERATURE =	375	STATIC PRES =	6.5	VELOCITY =	1134
FLOW	07			2	0	TEMPERATURE =	381	STATIC PRES =	7.7	VELOCITY =	1207
FLOW	01			2	0	TEMPERATURE =	382	STATIC PRES =	5.25	VELOCITY =	961
FLOW	06			2	0	TEMPERATURE =	392	STATIC PRES =	7.85	VELOCITY =	1321
FLOW	18			2	0	TEMPERATURE =	357	STATIC PRES =	3	VELOCITY =	645
FLOW	13			2	0	TEMPERATURE =	337	STATIC PRES =	2.10	VELOCITY =	498
FLOW	04			2	0	TEMPERATURE =	373	STATIC PRES =	4.50	VELOCITY =	845
FLOW	05			2	0	TEMPERATURE =	348	STATIC PRES =	4.85	VELOCITY =	886

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
FLOW	10			2	0	TEMPERATURE =	360	STATIC PRES =	7.20	VELOCITY =	1063
FLOW	20			2	0	TEMPERATURE =	315	STATIC PRES =	2.70	VELOCITY =	561
FLOW	02			2	0	TEMPERATURE =	361	STATIC PRES =	4.60	VELOCITY =	867
FLOW	03			2	0	TEMPERATURE =	366	STATIC PRES =	5.50	VELOCITY =	988
FLOW	17			2	0	TEMPERATURE =	353	STATIC PRES =	2.70	VELOCITY =	586
FLOW	19			2	0	TEMPERATURE =	340	STATIC PRES =	3.25	VELOCITY =	662
FLOW	21			2	0	TEMPERATURE =	353	STATIC PRES =	2.10	VELOCITY =	500
FLOW	14			2	0	TEMPERATURE =	374	STATIC PRES =	2.65	VELOCITY =	553
FLOW	15			2	0	TEMPERATURE =	359	STATIC PRES =	2.75	VELOCITY =	590
FLOW	22			2	0	TEMPERATURE =	368	STATIC PRES =	4.85	VELOCITY =	889
FLOW	11			3	0	TEMPERATURE =	296	STATIC PRES =	.57	VELOCITY =	2032
FLOW	09			3	0	TEMPERATURE =	292	STATIC PRES =	.64	VELOCITY =	1934
FLOW	08			3	0	TEMPERATURE =	304	STATIC PRES =	.49	VELOCITY =	555
FLOW	12			3	0	TEMPERATURE =	302	STATIC PRES =	.51	VELOCITY =	870
FLOW	07			3	0	TEMPERATURE =	308	STATIC PRES =	.48	VELOCITY =	888
FLOW	01			3	0	TEMPERATURE =	312	STATIC PRES =	.51	VELOCITY =	718
FLOW	06			3	0	TEMPERATURE =	309	STATIC PRES =	.49	VELOCITY =	907
FLOW	18			3	0	TEMPERATURE =	285	STATIC PRES =	.52	VELOCITY =	463
FLOW	13			3	0	TEMPERATURE =	266	STATIC PRES =	.46	VELOCITY =	360
FLOW	04			3	0	TEMPERATURE =	292	STATIC PRES =	.49	VELOCITY =	655
FLOW	05			3	0	TEMPERATURE =	272	STATIC PRES =	.48	VELOCITY =	596
FLOW	10			3	0	TEMPERATURE =	290	STATIC PRES =	.60	VELOCITY =	807
FLOW	20			3	0	TEMPERATURE =	253	STATIC PRES =	.61	VELOCITY =	405
FLOW	02			3	0	TEMPERATURE =	283	STATIC PRES =	.64	VELOCITY =	584
FLOW	03			3	0	TEMPERATURE =	286	STATIC PRES =	.63	VELOCITY =	703
FLOW	17			3	0	TEMPERATURE =	276	STATIC PRES =	.60	VELOCITY =	410
FLOW	19			3	0	TEMPERATURE =	273	STATIC PRES =	.56	VELOCITY =	472

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLOW	21			3	0	TEMPERATURE =	261	STATIC PRES =	.55	VELOCITY =	347		
FLOW	14			3	0	TEMPERATURE =	284	STATIC PRES =	.52	VELOCITY =	430		
FLOW	15			3	0	TEMPERATURE =	278	STATIC PRES =	.56	VELOCITY =	420		
FLOW	22			3	0	TEMPERATURE =	294	STATIC PRES =	.53	VELOCITY =	651		
DUCT				1		AREA	= 511.3						
DUCT				2		AREA	= 347.5						
DUCT				3		AREA	= 444.9						
COAL	11					ASH	= .1003	CARBON	= .6819	HYDROGEN	= .0520	NITROGEN	= .0126
						SULFUR	= .0334	MOISTURE	= .0384	HEAT VALUE	= 12111		
COAL	09					ASH	= .0989	CARBON	= .6923	HYDROGEN	= .0524	NITROGEN	= .0132
						SULFUR	= .0337	MOISTURE	= .0366	HEAT VALUE	= 12232		
COAL	08					ASH	= .1025	CARBON	= .6892	HYDROGEN	= .0519	NITROGEN	= .0123
						SULFUR	= .0337	MOISTURE	= .0366	HEAT VALUE	= 12163		
COAL	12					ASH	= .1075	CARBON	= .6770	HYDROGEN	= .0506	NITROGEN	= .0125
						SULFUR	= .0319	MOISTURE	= .0359	HEAT VALUE	= 12051		
COAL	07					ASH	= .1001	CARBON	= .6919	HYDROGEN	= .0517	NITROGEN	= .0126
						SULFUR	= .0327	MOISTURE	= .0389	HEAT VALUE	= 12153		
COAL	01					ASH	= .1042	CARBON	= .6743	HYDROGEN	= .0519	NITROGEN	= .0133
						SULFUR	= .0310	MOISTURE	= .0402	HEAT VALUE	= 12117		
COAL	06					ASH	= .1130	CARBON	= .6722	HYDROGEN	= .0510	NITROGEN	= .0124
						SULFUR	= .0276	MOISTURE	= .0410	HEAT VALUE	= 12055		
COAL	18					ASH	= .1215	CARBON	= .6700	HYDROGEN	= .0503	NITROGEN	= .0149
						SULFUR	= .0251	MOISTURE	= .0388	HEAT VALUE	= 11813		
COAL	13					ASH	= .1313	CARBON	= .6645	HYDROGEN	= .0495	NITROGEN	= .0134
						SULFUR	= .0249	MOISTURE	= .0345	HEAT VALUE	= 11837		
COAL	04					ASH	= .1035	CARBON	= .6774	HYDROGEN	= .0519	NITROGEN	= .0130
						SULFUR	= .0333	MOISTURE	= .0431	HEAT VALUE	= 12086		
COAL	05					ASH	= .1357	CARBON	= .6672	HYDROGEN	= .0458	NITROGEN	= .0146
						SULFUR	= .0182	MOISTURE	= .0369	HEAT VALUE	= 11814		
COAL	10					ASH	= .1669	CARBON	= .6427	HYDROGEN	= .0464	NITROGEN	= .0143
						SULFUR	= .0165	MOISTURE	= .0329	HEAT VALUE	= 11333		
COAL	20					ASH	= .1594	CARBON	= .6480	HYDROGEN	= .0472	NITROGEN	= .0130
						SULFUR	= .0168	MOISTURE	= .0404	HEAT VALUE	= 11184		
COAL	02					ASH	= .0985	CARBON	= .6808	HYDROGEN	= .0513	NITROGEN	= .0116
						SULFUR	= .0287	MOISTURE	= .0452	HEAT VALUE	= 12092		

RECORD TYPE	TEST	DATE	TIME	LCC	METH								
CCAL	03					ASH	= .1000	CARBON	= .6777	HYDROGEN	= .0505	NITROGEN	= .0126
						SULFUR	= .0330	MOISTURE	= .0413	HEAT VALUE	= 12138		
CCAL	17					ASH	= .1014	CARBCN	= .6767	HYCRCGEN	= .0509	NITROGEN	= .0112
						SULFUR	= .0342	MOISTURE	= .0412	HEAT VALUE	= 12116		
COAL	19					ASH	= .0956	CARBON	= .6819	HYDROGEN	= .0512	NITROGEN	= .0113
						SULFUR	= .0339	MOISTURE	= .0408	HEAT VALUE	= 12213		
COAL	21					ASH	= .0914	CARBON	= .6885	HYDROGEN	= .0512	NITROGEN	= .0133
						SULFUR	= .0302	MOISTURE	= .0400	HEAT VALUE	= 12344		
COAL	14					ASH	= .1078	CARBON	= .6735	HYDROGEN	= .0506	NITROGEN	= .0133
						SULFUR	= .0274	MOISTURE	= .0458	HEAT VALUE	= 12062		
COAL	15					ASH	= .1044	CARBCN	= .6750	HYDROGEN	= .0508	NITROGEN	= .0130
						SULFUR	= .0345	MOISTURE	= .0430	HEAT VALUE	= 12017		
COAL	22					ASH	= .0661	CARBON	= .7228	HYDROGEN	= .0523	NITROGEN	= .0167
						SULFUR	= .0132	MOISTURE	= .0417	HEAT VALUE	= 12781		
GAS	05					CARBCN	= .7238	HYDROGEN	= .2545	NITROGEN	= .0049	SULFUR	= 0
						HEAT VALUE	= 22447	SP. GR.	= .588				
GAS	10					CARBON	= .7240	HYDROGEN	= .2450	NITROGEN	= .0075	SULFUR	= 0
						HEAT VALUE	= 22460	SP. GR.	= .587				
GAS	20					CARBON	= .7360	HYDROGEN	= .2450	NITROGEN	= .0057	SULFUR	= 0
						HEAT VALUE	= 22630	SP. GR.	= .585				
FLUE GAS	11			1	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	11	081171	2200	1	1	CO2	=	O2	=	CO	=	N2	=
						SO2	= 1965	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	11	081171	2300	1	1	CO2	=	O2	= .046	CO	=	N2	=
						SO2	= 2085	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	11	081171	0000	1	1	CO2	=	O2	= .046	CO	=	N2	=
						SO2	= 2085	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	11	091171	0100	1	1	CO2	=	O2	= .046	CO	=	N2	=
						SO2	= 2085	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	11			2	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 397	NO2	=				

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	11			2	X	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	11			3	0	CO2 =	.0770	O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	651	NO2 =					
FLUE GAS	11			3	X	CO2 =	.1080	O2 =	.0840	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09			1	0	CO2 =	.1025	O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09	091171	1200	1	1	CO2 =		O2 =	.027	CO =		N2 =	
						SO2 =	2400	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09	091171	1300	1	1	CO2 =		O2 =	.027	CO =		N2 =	
						SO2 =	2400	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09	091171	1400	1	1	CO2 =		O2 =	.028	CO =		N2 =	
						SO2 =	2370	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09	091171	1500	1	1	CO2 =		O2 =	.028	CO =		N2 =	
						SO2 =	1980	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09	091171	1600	1	1	CO2 =		O2 =	.029	CO =		N2 =	
						SO2 =	2040	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09	091171	1700	1	1	CO2 =		O2 =	.026	CO =		N2 =	
						SO2 =	2070	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09	091171	1800	1	1	CO2 =		O2 =	.025	CO =		N2 =	
						SO2 =	2160	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09	091171	1900	1	1	CO2 =		O2 =	.027	CO =		N2 =	
						SO2 =	2220	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09	091171	2000	1	1	CO2 =		O2 =	.036	CO =		N2 =	
						SO2 =	2340	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	347	NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	09			2	X	CO2 =	.1080	O2 =	.0840	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	09			3	0	CO2 =	.0230	O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	394	NO2 =					
FLUE GAS	09			3	X	CO2 =	.1280	O2 =	.0580	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	08			1	0	CO2 =	.0720	O2 =		CO =		N2 =	
						SO2 =	2541	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	08	101171	1500	1	1	CO2 =		O2 =	.050	CO =		N2 =	
						SO2 =	2220	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	08	101171	1600	1	1	CO2 =		O2 =	.050	CO =		N2 =	
						SO2 =	2205	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	08	101171	1700	1	1	CO2 =		O2 =	.050	CO =		N2 =	
						SO2 =	2205	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	08	101171	1800	1	1	CO2 =		O2 =	.050	CO =		N2 =	
						SO2 =	2235	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	08			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	433	NO2 =					
FLUE GAS	08			2	X	CO2 =	.1150	O2 =	.0800	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	08			3	0	CO2 =	.0860	O2 =		CO =		N2 =	
						SO2 =	1306	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	522	NO2 =					
FLUE GAS	08			3	X	CO2 =	.1100	O2 =	.0700	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	12			1	0	CO2 =	.0190	O2 =		CO =		N2 =	
						SO2 =	1884	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	12	111171	1100	1	1	CO2 =		O2 =	.037	CO =		N2 =	
						SO2 =	2370	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	12	111171	1200	1	1	CO2	=	O2	= .036	CO	=	N2	=
						SO2	= 2340	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	12	111171	1300	1	1	CO2	=	O2	= .035	CO	=	N2	=
						SO2	= 2295	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	12	111171	1400	1	1	CO2	=	O2	= .037	CO	=	N2	=
						SO2	= 2265	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	12	111171	1500	1	1	CO2	=	O2	= .039	CO	=	N2	=
						SO2	= 2250	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	12	111171	1600	1	1	CO2	=	O2	= .038	CO	=	N2	=
						SO2	= 2250	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	12	111171	1700	1	1	CO2	=	O2	= .038	CO	=	N2	=
						SO2	= 2235	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	12	111171	1800	1	1	CO2	=	O2	= .037	CO	=	N2	=
						SO2	= 2250	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	12			2	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 509	NO2	=				
FLUE GAS	12			2	X	CO2	= .1250	O2	= .0650	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	12			3	0	CO2	= .0780	O2	=	CO	=	N2	=
						SO2	= 1703	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 392	NO2	=				
FLUE GAS	12	111171	1600	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	= 1755	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	12			3	X	CO2	= .1225	O2	= .0800	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07			1	0	CO2	= .0735	O2	=	CO	=	N2	=
						SO2	= 1571	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07	121171	0900	1	1	CO2	=	O2	= .035	CO	=	N2	=
						SO2	= 2295	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	07	121171	1000	1	1	CO2	=	O2	= .035	CO	=	N2	=
						SO2	= 2340	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07	121171	1100	1	1	CO2	=	O2	= .037	CO	=	N2	=
						SO2	= 2295	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07	121171	1200	1	1	CO2	=	O2	= .037	CO	=	N2	=
						SO2	= 2280	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07	121171	1300	1	1	CO2	=	O2	= .036	CO	=	N2	=
						SO2	= 2325	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07	121171	1400	1	1	CO2	=	O2	= .034	CO	=	N2	=
						SO2	= 2355	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07	121171	1500	1	1	CO2	=	O2	= .033	CO	=	N2	=
						SO2	= 2885	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07	121171	1600	1	1	CO2	=	O2	= .034	CO	=	N2	=
						SO2	= 2370	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07	121171	1700	1	1	CO2	=	O2	= .035	CO	=	N2	=
						SO2	= 2370	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07	121171	1800	1	1	CO2	=	O2	= .035	CO	=	N2	=
						SO2	= 2370	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07	121171	1900	1	1	CO2	=	O2	= .035	CO	=	N2	=
						SO2	= 2445	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07			2	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 325	NO2	=				
FLUE GAS	07			2	X	CO2	= .1300	O2	= .0600	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	07			3	0	CO2	= .0235	O2	=	CO	=	N2	=
						SO2	= 1800	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 379	NO2	=				
FLUE GAS	07	121171	1300	3	1	CO2	= .135	O2	= .044	CO	=	N2	=
						SO2	= 1935	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	07	121171	1400	3	1	CO2 =	.135	O2 =	.062	CO =		N2 =	
						SO2 =	1965	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	07	121171	1500	3	1	CO2 =	.135	O2 =	.062	CO =		N2 =	
						SO2 =	1995	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	07	121171	1600	3	1	CO2 =	.135	O2 =	.066	CO =		N2 =	
						SO2 =	2100	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	07	121171	1700	3	1	CO2 =	.135	O2 =	.068	CO =		N2 =	
						SO2 =	2085	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	07	121171	1800	3	1	CO2 =	.135	O2 =	.069	CO =		N2 =	
						SO2 =	2085	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	07	121171	1900	3	1	CO2 =	.135	O2 =	.067	CO =		N2 =	
						SO2 =	2130	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	07			3	X	CO2 =	.1250	O2 =	.0600	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01			1	C	CO2 =	.0595	O2 =		CO =		N2 =	
						SO2 =	1582	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	141171	2100	1	1	CO2 =		O2 =	.039	CO =		N2 =	
						SO2 =	2130	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	141171	2200	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	2100	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	141171	2300	1	1	CO2 =		O2 =	.048	CO =		N2 =	
						SO2 =	2040	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0000	1	1	CO2 =		O2 =	.049	CO =		N2 =	
						SO2 =	2040	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0100	1	1	CO2 =		O2 =	.045	CO =		N2 =	
						SO2 =	2070	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0200	1	1	CO2 =		O2 =	.045	CO =		N2 =	
						SO2 =	2070	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					

RECORD TYPE	TEST	DATE	TIME	LCC	METH								
FLUE GAS	01	151171	0300	1	1	CO2 =		O2 =	.046	CO =		N2 =	
						SO2 =	2055	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0400	1	1	CO2 =		O2 =	.045	CO =		N2 =	
						SO2 =	2070	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0500	1	1	CO2 =		O2 =	.045	CO =		N2 =	
						SO2 =	2070	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0600	1	1	CO2 =		O2 =	.044	CO =		N2 =	
						SO2 =	2085	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0700	1	1	CO2 =		O2 =	.045	CO =		N2 =	
						SO2 =	2085	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	463	NO2 =					
FLUE GAS	01			2	X	CO2 =	.1120	O2 =	.0820	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01			3	0	CO2 =	.0595	O2 =		CO =		N2 =	
						SO2 =	1854	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	440	NO2 =					
FLUE GAS	01	151171	0300	3	1	CO2 =	.140	O2 =	.072	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0300	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	350	NO2 =					
FLUE GAS	01	151171	0400	3	1	CO2 =	.140	O2 =	.072	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0400	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	370	NO2 =					
FLUE GAS	01	151171	0500	3	1	CO2 =	.142	O2 =	.072	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0500	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	380	NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	01	151171	0600	3	1	CO2 =	.141	O2 =	.070	CO =		N2 =	
						SO2 =	1860	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0600	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	360	NO2 =					
FLUE GAS	01	151171	0700	3	1	CO2 =	.142	O2 =	.069	CO =		N2 =	
						SO2 =	1950	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	01	151171	0700	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	395	NO2 =					
FLUE GAS	01			3	X	CO2 =	.1180	O2 =	.0780	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06			1	0	CO2 =	.0765	O2 =		CO =		N2 =	
						SO2 =	1272	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06	151171	2300	1	1	CO2 =		O2 =	.039	CO =		N2 =	
						SO2 =	1950	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06	161171	0000	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	1950	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06	161171	0100	1	1	CO2 =		O2 =	.044	CO =		N2 =	
						SO2 =	1905	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06	161171	0200	1	1	CO2 =		O2 =	.044	CO =		N2 =	
						SO2 =	1920	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06	161171	0300	1	1	CO2 =		O2 =	.045	CO =		N2 =	
						SO2 =	1950	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06	161171	0700	1	1	CO2 =		O2 =	.044	CO =		N2 =	
						SO2 =	2115	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06	161171	0800	1	1	CO2 =		O2 =	.044	CO =		N2 =	
						SO2 =	2190	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	464	NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	06			2	X	CO2 =	.1180	O2 =	.0650	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06			3	0	CO2 =	.0905	O2 =		CO =		N2 =	
						SO2 =	1768	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	466	NO2 =					
FLUE GAS	06	161171	0700	3	1	CO2 =	.138	O2 =	.067	CO =		N2 =	
						SO2 =	1905	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06	161171	0700	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	285	NO2 =					
FLUE GAS	06	161171	0800	3	1	CO2 =	.138	O2 =	.068	CO =		N2 =	
						SO2 =	1890	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	06	161171	0800	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	285	NO2 =					
FLUE GAS	06			3	X	CO2 =	.1260	O2 =	.0620	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18			1	0	CO2 =	.1055	O2 =		CO =		N2 =	
						SO2 =	1569	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	161171	2300	1	1	CO2 =		O2 =	.046	CO =		N2 =	
						SO2 =	1695	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0000	1	1	CO2 =		O2 =	.045	CO =		N2 =	
						SO2 =	1740	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0100	1	1	CO2 =		O2 =	.045	CO =		N2 =	
						SO2 =	1725	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0200	1	1	CO2 =		O2 =	.045	CO =		N2 =	
						SO2 =	1710	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0300	1	1	CO2 =		O2 =	.046	CO =		N2 =	
						SO2 =	1680	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0400	1	1	CO2 =		O2 =	.052	CO =		N2 =	
						SO2 =	1710	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	18	171171	0500	1	1	CO2 =		O2 =	.052	CO =		N2 =	
						SO2 =	1725	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0600	1	1	CO2 =		O2 =	.056	CO =		N2 =	
						SO2 =	1725	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0700	1	1	CO2 =		O2 =	.050	CO =		N2 =	
						SO2 =	1725	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	365	NO2 =					
FLUE GAS	18			2	X	CO2 =	.1025	O2 =	.0900	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18			3	0	CO2 =	.0485	O2 =		CO =		N2 =	
						SO2 =	1154	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	627	NO2 =					
FLUE GAS	18	171171	0300	3	1	CO2 =	.136	O2 =	.075	CO =		N2 =	
						SO2 =	1455	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0300	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	365	NO2 =					
FLUE GAS	18	171171	0400	3	1	CO2 =	.136	O2 =	.075	CO =		N2 =	
						SO2 =	1470	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0400	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	355	NO2 =					
FLUE GAS	18	171171	0500	3	1	CO2 =	.136	O2 =	.074	CO =		N2 =	
						SO2 =	1500	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0500	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	360	NO2 =					
FLUE GAS	18	171171	0600	3	1	CO2 =	.135	O2 =	.076	CO =		N2 =	
						SO2 =	1485	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	18	171171	0600	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	365	NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	18	171171	0700	3	1	CO2	= .136	O2	= .074	CO	=	N2	=
						SO2	= 1485	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	18	171171	0700	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 360	NO2	=				
FLUE GAS	18			3	X	CO2	= .1160	O2	= .0790	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13			1	0	CO2	= .0970	O2	=	CO	=	N2	=
						SO2	= 1848	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	171171	2300	1	1	CO2	=	O2	= .065	CO	=	N2	=
						SO2	= 1560	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0000	1	1	CO2	=	O2	= .068	CO	=	N2	=
						SO2	= 1680	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0100	1	1	CO2	=	O2	= .062	CO	=	N2	=
						SO2	= 1740	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0200	1	1	CO2	=	O2	= .062	CO	=	N2	=
						SO2	= 1740	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0300	1	1	CO2	=	O2	= .063	CO	=	N2	=
						SO2	= 1680	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0400	1	1	CO2	=	O2	= .063	CO	=	N2	=
						SO2	= 1605	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0500	1	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0600	1	1	CO2	=	O2	= .063	CO	=	N2	=
						SO2	= 1560	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0700	1	1	CO2	=	O2	= .062	CO	=	N2	=
						SO2	= 1500	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13			2	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 525	NO2	=				

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	13			2	X	CO2	= .0960	O2	= .1000	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13			3	0	CO2	= .0370	O2	=	CO	=	N2	=
						SO2	= 752	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 415	NO2	=				
FLUE GAS	13	181171	0300	3	1	CO2	= .128	O2	= .073	CO	=	N2	=
						SO2	= 1350	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0400	3	1	CO2	= .128	O2	= .088	CO	=	N2	=
						SO2	= 1425	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0400	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 335	NO2	=				
FLUE GAS	13	181171	0500	3	1	CO2	= .128	O2	= .087	CO	=	N2	=
						SO2	= 1380	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0500	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 360	NO2	=				
FLUE GAS	13	181171	0600	3	1	CO2	= .128	O2	= .087	CO	=	N2	=
						SO2	= 1365	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0600	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 355	NO2	=				
FLUE GAS	13	181171	0700	3	1	CO2	= .128	O2	= .091	CO	=	N2	=
						SO2	= 1335	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	13	181171	0700	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 340	NO2	=				
FLUE GAS	13			3	X	CO2	= .1040	O2	= .0880	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04			1	0	CO2	= .0895	O2	=	CO	=	N2	=
						SO2	= 1996	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04	191171	0000	1	1	CO2	=	O2	= .031	CO	=	N2	=
						SO2	= 2216	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	04	191171	0100	1	1	CO2	=	O2	= .031	CO	=	N2	=
						SO2	= 2334	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04	191171	0200	1	1	CO2	=	O2	= .031	CO	=	N2	=
						SO2	= 2334	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04	191171	0300	1	1	CO2	=	O2	= .030	CO	=	N2	=
						SO2	= 2394	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04	191171	0400	1	1	CO2	=	O2	= .029	CO	=	N2	=
						SO2	= 2355	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04	191171	0500	1	1	CO2	=	O2	= .029	CO	=	N2	=
						SO2	= 2325	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04	191171	0600	1	1	CO2	=	O2	= .028	CO	=	N2	=
						SO2	= 2250	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04	191171	0700	1	1	CO2	=	O2	= .030	CO	=	N2	=
						SO2	= 2250	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04			1	X	CO2	= .1420	O2	= .0420	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04			2	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 352	NO2	=				
FLUE GAS	04			2	X	CO2	= .1320	O2	= .0510	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04			3	0	CO2	= .0755	O2	=	CO	=	N2	=
						SO2	= 1918	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 300	NO2	=				
FLUE GAS	04	191171	0400	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 375	NO2	=				
FLUE GAS	04	191171	0500	3	1	CO2	= .142	O2	= .062	CO	=	N2	=
						SO2	= 2130	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04	191171	0500	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 365	NO2	=				

RECORU TYPE	TEST	DATE	TIPE	LCC	METH								
FLLE GAS	04	191171	0600	3	1	CO2	= .142	O2	=	CO	=	N2	=
						SO2	= 2070	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04	191171	0600	3	1	CC2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 340	NO2	=				
FLUE GAS	04	191171	0700	3	1	CO2	= .142	O2	= .062	CO	=	N2	=
						SO2	= 2040	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	04	191171	0700	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 325	NO2	=				
FLUE GAS	04			3	X	CO2	= .1310	C2	= .0470	CC	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	05			1	0	CC2	= .0570	O2	=	CC	=	N2	=
						SO2	= 539	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	05	211171	2300	1	1	CC2	=	O2	= .C23	CC	=	N2	=
						SO2	= 210	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NC	=	NO2	=				
FLUE GAS	05	221171	0000	1	1	CO2	=	O2	= .023	CO	=	N2	=
						SO2	= 210	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLLE GAS	05	221171	0100	1	1	CO2	=	O2	=	CO	=	N2	=
						SO2	= 420	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLLE GAS	05	221171	C700	1	1	CO2	=	O2	= .C23	CO	=	N2	=
						SO2	= 570	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	05			2	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 333	NO2	=				
FLUE GAS	05			2	X	CC2	= .1080	O2	= .0580	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	05			3	0	CO2	= .0735	O2	=	CO	=	N2	=
						SO2	= 443	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 308	NO2	=				
FLUE GAS	05	221171	0400	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 200	NO2	=				

RECORD TYPE	TEST	DATE	TIME	LCC	METH	CO2	O2	CO	N2	SO2	UHC	MOL WGT(HC)	HEAT(UHC)	NO	NO2
FLUE GAS	05	221171	0500	3	1	.124	.029			660					
FLUE GAS	05	221171	0500	3	1									240	
FLUE GAS	05	221171	0600	3	1					630					
FLUE GAS	05	221171	0600	3	1									200	
FLUE GAS	05	221171	0700	3	1	.124	.035			600					
FLUE GAS	05			3	X	.1030	.0650								
FLUE GAS	10			1	0	.0765				562					
FLUE GAS	10	231171	0000	1	1		.021			375					
FLUE GAS	10	231171	0100	1	1		.021			360					
FLUE GAS	10	231171	0200	1	1		.021			360					
FLUE GAS	10	231171	0300	1	1		.021			375					
FLUE GAS	10	231171	0400	1	1		.021			375					
FLUE GAS	10	231171	0600	1	1		.019			420					
FLUE GAS	10	231171	0700	1	1		.019			450					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	10			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	233	NO2 =					
FLUE GAS	10			2	X	CO2 =	.0960	O2 =	.0760	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	10			3	0	CO2 =	.0300	O2 =		CO =		N2 =	
						SO2 =	426	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	315	NO2 =					
FLUE GAS	10	231171	0200	3	1	CO2 =	.130	O2 =	.060	CO =		N2 =	
						SO2 =	510	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	10	231171	0300	3	1	CO2 =	.130	O2 =	.060	CO =		N2 =	
						SO2 =	540	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	10	231171	0300	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	85	NO2 =					
FLUE GAS	10	231171	0400	3	1	CO2 =	.131	O2 =	.060	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	10	231171	0400	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	100	NO2 =					
FLUE GAS	10	231171	0500	3	1	CO2 =	.132	O2 =	.060	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	10	231171	0500	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	100	NO2 =					
FLUE GAS	10	231171	0600	3	1	CO2 =	.132	O2 =		CO =		N2 =	
						SO2 =	585	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	10	231171	0600	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	100	NO2 =					
FLUE GAS	10	231171	0700	3	1	CO2 =	.132	O2 =	.060	CO =		N2 =	
						SO2 =	510	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	10	231171	0700	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	110	NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH				
FLUE GAS	10			3	X	CO2 = .0990	O2 = .0650	CO =	N2 =
						SO2 =	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20			1	0	CO2 = .0880	O2 =	CO =	N2 =
						SO2 = 547	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20	241171	0000	1	1	CO2 =	O2 = .030	CO =	N2 =
						SO2 = 525	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20	241171	0100	1	1	CO2 =	O2 = .030	CO =	N2 =
						SO2 = 465	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20	241171	0200	1	1	CO2 =	O2 = .028	CO =	N2 =
						SO2 = 480	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20	241171	0300	1	1	CO2 =	O2 = .030	CO =	N2 =
						SO2 = 450	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20	241171	0400	1	1	CO2 =	O2 = .030	CO =	N2 =
						SO2 = 450	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20	241171	0500	1	1	CO2 =	O2 = .032	CO =	N2 =
						SO2 = 465	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20	241171	0600	1	1	CO2 =	O2 = .036	CO =	N2 =
						SO2 = 468	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20			2	0	CO2 =	O2 =	CO =	N2 =
						SO2 =	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO = 273	NO2 =		
FLUE GAS	20			2	X	CO2 = .1080	O2 = .0520	CO =	N2 =
						SO2 =	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20			3	0	CO2 = .0340	O2 =	CO =	N2 =
						SO2 = 386	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO = 248	NO2 =		
FLUE GAS	20	241171	0300	3	1	CO2 = .126	O2 = .068	CO =	N2 =
						SO2 = 510	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
FLUE GAS	20	241171	0200	3	1	CO2 =	O2 =	CO =	N2 =
						SO2 =	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO = 150	NO2 =		

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	20	241171	0400	3	1	CO2 =	.126	O2 =	.070	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	20	241171	0400	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	140	NO2 =					
FLUE GAS	20	241171	0500	3	1	CO2 =	.128	O2 =	.068	CO =		N2 =	
						SO2 =	555	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	20	241171	0500	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	135	NO2 =					
FLUE GAS	20	241171	0600	3	1	CO2 =	.126	O2 =	.073	CO =		N2 =	
						SO2 =	600	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	20	241171	0600	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	155	NO2 =					
FLUE GAS	20	241171	0700	3	1	CO2 =	.126	O2 =	.074	CO =		N2 =	
						SO2 =	600	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	20	241171	0700	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	155	NO2 =					
FLUE GAS	20			3	X	CO2 =	.1060	O2 =	.0570	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	02			1	0	CO2 =	.1155	O2 =		CO =		N2 =	
						SO2 =	1813	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	02	301171	0000	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	2025	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	02	301171	0100	1	1	CO2 =		O2 =	.040	CO =		N2 =	
						SO2 =	2040	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	02	301171	0200	1	1	CO2 =		O2 =	.040	CO =		N2 =	
						SO2 =	2040	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	02	301171	0300	1	1	CO2 =		O2 =	.041	CO =		N2 =	
						SO2 =	1980	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					

RECORD TYPE	TEST	DATE	TIME	LCC	METH								
FLUE GAS	02	301171	0400	1	1	CO2	=	O2	= .040	CO	=	N2	=
						SO2	= 1950	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	02	301171	0500	1	1	CO2	=	O2	= .039	CO	=	N2	=
						SO2	= 2010	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	02	301171	0600	1	1	CO2	=	O2	= .038	CO	=	N2	=
						SO2	= 1740	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	02	301171	0700	1	1	CO2	=	O2	= .038	CO	=	N2	=
						SO2	= 1725	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	02			2	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 509	NO2	=				
FLUE GAS	02			2	X	CO2	= .1320	O2	= .0560	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	02			3	0	CO2	= .0910	O2	=	CO	=	N2	=
						SO2	= 1429	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 431	NO2	=				
FLUE GAS	02	301171	0200	3	1	CO2	= .138	O2	= .064	CO	=	N2	=
						SO2	= 1740	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	02	301171	0200	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 336	NO2	=				
FLUE GAS	02	301171	0300	3	1	CO2	= .140	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	02	301171	0300	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 345	NO2	=				
FLUE GAS	02	301171	0400	3	1	CO2	= .140	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	02	301171	0400	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 325	NO2	=				
FLUE GAS	02	301171	0500	3	1	CO2	= .140	O2	= .060	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	02	301171	0500	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 340	NO2	=				
FLUE GAS	02	301171	0600	3	1	CO2	= .140	O2	= .060	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	02	301171	0600	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 335	NO2	=				
FLUE GAS	02	301171	0700	3	1	CO2	= .142	O2	= .062	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	02	301171	0700	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 370	NO2	=				
FLUE GAS	02			2	X	CO2	= .1310	O2	= .0580	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	03			1	0	CO2	= .0855	O2	=	CO	=	N2	=
						SO2	= 1763	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	03	011271	0000	1	1	CO2	=	O2	= .054	CO	=	N2	=
						SO2	= 2160	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	03	011271	0100	1	1	CO2	=	O2	= .056	CO	=	N2	=
						SO2	= 2145	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	03	011271	0200	1	1	CO2	=	O2	= .057	CO	=	N2	=
						SO2	= 2145	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	03	011271	0300	1	1	CO2	=	O2	= .056	CO	=	N2	=
						SO2	= 2145	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	03	011271	0400	1	1	CO2	=	O2	= .056	CO	=	N2	=
						SO2	= 2160	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	03	011271	0500	1	1	CO2	=	O2	= .056	CO	=	N2	=
						SO2	= 2130	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	03	011271	0600	1	1	CO2	=	O2	= .056	CO	=	N2	=
						SO2	= 2130	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	03	011271	0700	1	1	CO2 =		O2 =	.056	CO =		N2 =	
						SO2 =	2115	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	03			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	352	NO2 =					
FLUE GAS	03			2	X	CO2 =	.1210	O2 =	.0690	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	03			3	0	CO2 =	.0435	O2 =		CO =		N2 =	
						SO2 =	1305	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	492	NO2 =					
FLUE GAS	03	011271	0400	3	1	CO2 =	.132	O2 =	.082	CO =		N2 =	
						SO2 =	1905	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	03	011271	0400	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	335	NO2 =					
FLUE GAS	03	011271	0500	3	1	CO2 =	.132	O2 =	.081	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	03	011271	0500	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	340	NO2 =					
FLUE GAS	03	011271	0600	3	1	CO2 =	.132	O2 =	.080	CO =		N2 =	
						SO2 =	1845	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	03	011271	0600	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	365	NO2 =					
FLUE GAS	03	011271	0700	3	1	CO2 =	.132	O2 =	.080	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	03	011271	0700	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	360	NO2 =					
FLUE GAS	03			3	X	CO2 =	.1180	O2 =	.0740	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	17			1	0	CO2 =	.1075	O2 =		CO =		N2 =	
						SO2 =	1544	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
FLUE GAS	17	021271	0000	1	1	CO2 =		O2 =	.042	CO =	N2 =
						SO2 =	2040	UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17	021271	0100	1	1	CO2 =		O2 =	.034	CO =	N2 =
						SO2 =	2100	UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17	021271	0200	1	1	CO2 =		O2 =	.037	CO =	N2 =
						SO2 =	2085	UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17	021271	0300	1	1	CO2 =		O2 =	.036	CO =	N2 =
						SO2 =	2070	UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17	021271	0400	1	1	CO2 =		O2 =	.036	CO =	N2 =
						SO2 =	2100	UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17	021271	0500	1	1	CO2 =		O2 =	.037	CO =	N2 =
						SO2 =	2100	UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17	021271	0600	1	1	CO2 =		O2 =	.038	CO =	N2 =
						SO2 =	2085	UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17	021271	0700	1	1	CO2 =		O2 =	.040	CO =	N2 =
						SO2 =	2100	UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17			2	0	CO2 =		O2 =		CO =	N2 =
						SO2 =		UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =	344	NO2 =			
FLUE GAS	17			2	X	CO2 =	.1280	O2 =	.0600	CO =	N2 =
						SO2 =		UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17			3	0	CO2 =	.0845	O2 =		CO =	N2 =
						SO2 =		UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =	309	NO2 =			
FLUE GAS	17	021271	0300	3	1	CO2 =	.134	O2 =	.073	CO =	N2 =
						SO2 =	1950	UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17	021271	0400	3	1	CO2 =	.134	O2 =	.074	CO =	N2 =
						SO2 =		UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =		NO2 =			
FLUE GAS	17	021271	0500	3	1	CO2 =		O2 =		CO =	N2 =
						SO2 =		UHC =		MOL WGT(HC) =	HEAT(UHC) =
						NO =	340	NO2 =			

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	17	021271	0500	3	1	CO2	= .134	O2	= .075	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	17	021271	0600	3	1	CO2	= .136	O2	= .074	CO	=	N2	=
						SO2	= 2010	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	17	021271	0600	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 340	NO2	=				
FLUE GAS	17	021271	0700	3	1	CO2	= .136	O2	= .074	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	17	021271	0700	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 345	NO2	=				
FLUE GAS	17			3	X	CO2	= .1260	O2	= .0660	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	19			1	C	CO2	= .0775	O2	=	CO	=	N2	=
						SO2	= 1733	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	19	031271	0200	1	1	CO2	=	O2	= .060	CO	=	N2	=
						SO2	= 1905	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	19	031271	0300	1	1	CO2	=	O2	= .060	CO	=	N2	=
						SO2	= 1890	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	19	031271	0400	1	1	CO2	=	O2	= .059	CO	=	N2	=
						SO2	= 1875	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	19	031271	0500	1	1	CO2	=	O2	= .059	CO	=	N2	=
						SO2	= 1890	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	19	031271	0600	1	1	CO2	=	O2	= .058	CO	=	N2	=
						SO2	= 1905	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	19	031271	0700	1	1	CO2	=	O2	= .060	CO	=	N2	=
						SO2	= 1920	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	19			1	X	CO2	= .1280	O2	= .0620	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				

RECORD TYPE	TEST	DATE	TIME	LCC	METH								
FLUE GAS	19			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	394	NO2 =					
FLUE GAS	19			2	X	CO2 =	.1090	O2 =	.0840	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	19			3	0	CO2 =	.0395	O2 =		CO =		N2 =	
						SO2 =	861	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	404	NO2 =					
FLUE GAS	19	71		3	1	CO2 =	.126	O2 =	.086	CO =		N2 =	
						SO2 =	1815	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	19	71		3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	19			3	X	CO2 =	.1040	O2 =	.0880	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21			1	0	CO2 =	.0755	O2 =		CO =		N2 =	
						SO2 =	1415	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0100	1	1	CO2 =		O2 =	.054	CO =		N2 =	
						SO2 =	1860	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0200	1	1	CO2 =		O2 =	.054	CO =		N2 =	
						SO2 =	1875	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0300	1	1	CO2 =		O2 =	.054	CO =		N2 =	
						SO2 =	1860	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0400	1	1	CO2 =		O2 =	.054	CO =		N2 =	
						SO2 =	1875	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0500	1	1	CO2 =		O2 =	.054	CO =		N2 =	
						SO2 =	1860	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0600	1	1	CO2 =		O2 =	.054	CO =		N2 =	
						SO2 =	1890	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0700	1	1	CO2 =		O2 =	.054	CO =		N2 =	
						SO2 =	1905	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	21			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	366	NO2 =					
FLUE GAS	21			2	X	CO2 =	.1100	O2 =	.0740	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21			3	0	CO2 =	.0565	O2 =		CO =		N2 =	
						SO2 =	451	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	322	NO2 =					
FLUE GAS	21	041271	0200	3	1	CO2 =	.124	O2 =	.078	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0300	3	1	CO2 =	.126	O2 =	.077	CO =		N2 =	
						SO2 =	1710	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0300	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	195	NO2 =					
FLUE GAS	21	041271	0400	3	1	CO2 =	.126	O2 =	.077	CO =		N2 =	
						SO2 =	1575	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0400	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	195	NO2 =					
FLUE GAS	21	041271	0500	3	1	CO2 =	.124	O2 =	.078	CO =		N2 =	
						SO2 =	1665	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0500	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	195	NO2 =					
FLUE GAS	21	041271	0600	3	1	CO2 =	.126	O2 =	.078	CO =		N2 =	
						SO2 =	1710	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0600	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	205	NO2 =					
FLUE GAS	21	041271	0700	3	1	CO2 =	.124	O2 =	.078	CO =		N2 =	
						SO2 =	1740	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	21	041271	0700	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	210	NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	21			3	X	CO2 =	.1060	O2 =	.0820	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14			1	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0000	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	1710	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0100	1	1	CO2 =		O2 =	.036	CO =		N2 =	
						SO2 =	1725	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0200	1	1	CO2 =		O2 =	.037	CO =		N2 =	
						SO2 =	1710	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0300	1	1	CO2 =		O2 =	.037	CO =		N2 =	
						SO2 =	1695	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0400	1	1	CO2 =		O2 =	.037	CO =		N2 =	
						SO2 =	1740	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0500	1	1	CO2 =		O2 =	.036	CO =		N2 =	
						SO2 =	1770	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0600	1	1	CO2 =		O2 =	.037	CO =		N2 =	
						SO2 =	1785	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0700	1	1	CO2 =		O2 =	.037	CO =		N2 =	
						SO2 =	1815	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14			2	X	CO2 =	.1220	O2 =	.0660	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14			3	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0100	3	1	CO2 =	.140	O2 =	.068	CO =		N2 =	
						SO2 =	1785	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	14	071271	0100	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	205	NO2 =					
FLUE GAS	14	071271	0200	3	1	CO2 =	.142	O2 =	.072	CO =		N2 =	
						SO2 =	1725	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0200	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	200	NO2 =					
FLUE GAS	14	071271	0300	3	1	CO2 =	.142	O2 =	.071	CO =		N2 =	
						SO2 =	1755	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0300	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	200	NO2 =					
FLUE GAS	14	071271	0400	3	1	CO2 =	.140	O2 =	.071	CO =		N2 =	
						SO2 =	1785	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0400	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	195	NO2 =					
FLUE GAS	14	071271	0500	3	1	CO2 =	.140	O2 =	.071	CO =		N2 =	
						SO2 =	1830	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0500	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	210	NO2 =					
FLUE GAS	14	071271	0600	3	1	CO2 =	.142	O2 =	.070	CO =		N2 =	
						SO2 =	1815	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0600	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	205	NO2 =					
FLUE GAS	14	071271	0700	3	1	CO2 =	.142	O2 =	.071	CO =		N2 =	
						SO2 =	1785	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	14	071271	0700	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	205	NO2 =					
FLUE GAS	14			3	X	CO2 =	.1260	O2 =	.0610	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	15			1	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15	081271	0000	1	1	CO2	=	O2	= .046	CO	=	N2	=
						SO2	= 2070	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15	081271	0100	1	1	CO2	=	O2	= .037	CO	=	N2	=
						SO2	= 2115	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15	081271	0200	1	1	CO2	=	O2	= .036	CO	=	N2	=
						SO2	= 2115	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15	081271	0300	1	1	CO2	=	O2	= .037	CO	=	N2	=
						SO2	= 2100	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15	081271	0400	1	1	CO2	=	O2	= .036	CO	=	N2	=
						SO2	= 2115	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15	081271	0500	1	1	CO2	=	O2	= .036	CO	=	N2	=
						SO2	= 2115	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15	081271	0600	1	1	CO2	=	O2	= .037	CO	=	N2	=
						SO2	= 2115	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15	081271	0700	1	1	CO2	=	O2	= .036	CO	=	N2	=
						SO2	= 2115	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15			2	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15			2	X	CO2	= .1220	O2	= .0660	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15			3	0	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15	081271	0100	3	1	CO2	= .138	O2	= .070	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	=	NO2	=				
FLUE GAS	15	081271	0100	3	1	CO2	=	O2	=	CO	=	N2	=
						SO2	=	UHC	=	MOL WGT(HC)	=	HEAT(UHC)	=
						NO	= 275	NO2	=				

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	15	081271	0200	3	1	CO2 =	.138	O2 =	.069	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	15	081271	0200	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	265	NO2 =					
FLUE GAS	15	081271	0300	3	1	CO2 =	.136	O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	15	081271	0500	3	1	CO2 =	.140	O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	15	081271	0500	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	240	NO2 =					
FLUE GAS	15	081271	0600	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	235	NO2 =					
FLUE GAS	15	081271	0700	3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	245	NO2 =					
FLUE GAS	15			3	X	CO2 =	.1220	O2 =	.0670	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22			1	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0000	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	930	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0100	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	855	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0200	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	750	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0300	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	750	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0400	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	675	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH								
FLUE GAS	22	091271	0500	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	600	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0600	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	630	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0700	1	1	CO2 =		O2 =	.042	CO =		N2 =	
						SO2 =	690	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22			2	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22			2	X	CO2 =	.1310	O2 =	.0560	CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22			3	0	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0100	3	1	CO2 =	.138	O2 =	.056	CO =		N2 =	
						SO2 =	1920	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0200	3	1	CO2 =	.138	O2 =	.058	CO =		N2 =	
						SO2 =	2040	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0300	3	1	CO2 =	.138	O2 =	.056	CO =		N2 =	
						SO2 =	2040	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0400	3	1	CO2 =	.136	O2 =		CO =		N2 =	
						SO2 =	2040	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0500	3	1	CO2 =	.134	O2 =		CO =		N2 =	
						SO2 =	2130	UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0600	3	1	CO2 =	.134	O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22	091271	0700	3	1	CO2 =	.136	O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =		NO2 =					
FLUE GAS	22			3	1	CO2 =		O2 =		CO =		N2 =	
						SO2 =		UHC =		MOL WGT(HC) =		HEAT(UHC) =	
						NO =	200	NO2 =					

RECORD TYPE	TEST	DATE	TIME	LOC	METH				
FLUE GAS	22			3	X	CO2 = .1260	C2 = .0630	CO =	N2 =
						SO2 =	UHC =	MOL WGT(HC) =	HEAT(UHC) =
						NO =	NO2 =		
CONSUMPTION	11					COAL = 85.0	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	09					COAL = 83.5	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	08					COAL = 63.7	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	12					COAL = 83.9	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	07					COAL = 84.2	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	06					COAL = 90.1	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	01					COAL = 64.8	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	18					COAL = 48.3	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	13					COAL = 32.3	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	04					COAL = 63.2	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	05					COAL = 34.0	TEMP(FA) = 150	GAS FLOW = 252	GAS PRES = 15.7
						GAS TEMP = 64.0			
CONSUMPTION	10					COAL = 46.4	TEMP(FA) = 150	GAS FLOW = 400	GAS PRES = 16.3
						GAS TEMP = 65.0			
CONSUMPTION	20					COAL = 26.0	TEMP(FA) = 150	GAS FLOW = 374	GAS PRES = 15.2
						GAS TEMP = 66.9			
CONSUMPTION	02					COAL = 66.2	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	03					COAL = 65.2	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	17					COAL = 45.4	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			
CONSUMPTION	19					COAL = 50.5	TEMP(FA) = 150	GAS FLOW =	GAS PRES =
						GAS TEMP =			

RECORD TYPE	TEST	DATE	TIME	LOC	METH											
CONSUMPTION	21					COAL	=	32.4	TEMP(FA)	=	150	GAS FLOW	=		GAS PRES	=
						GAS TEMP	=									
CONSUMPTION	14					COAL	=	47.0	TEMP(FA)	=	150	GAS FLOW	=		GAS PRES	=
						GAS TEMP	=									
CONSUMPTION	15					COAL	=	46.3	TEMP(FA)	=	150	GAS FLOW	=		GAS PRES	=
						GAS TEMP	=									
CONSUMPTION	22					COAL	=	63.2	TEMP(FA)	=	150	GAS FLOW	=		GAS PRES	=
						GAS TEMP	=									
AIR HEATER	01	151171	0600		1	TEMP(AIR)	=	223	TEMP(GAS)	=	329					
AIR HEATER	06	151171	2200		1	TEMP(AIR)	=	226	TEMP(GAS)	=	332					
AIR HEATER	06	151171	2300		1	TEMP(AIR)	=	228	TEMP(GAS)	=	331					
AIR HEATER	06	161171	0000		1	TEMP(AIR)	=	228	TEMP(GAS)	=	331					
AIR HEATER	06	161171	0100		1	TEMP(AIR)	=	228	TEMP(GAS)	=	331					
AIR HEATER	06	161171	0200		1	TEMP(AIR)	=	228	TEMP(GAS)	=	331					
AIR HEATER	06	161171	0300		1	TEMP(AIR)	=	228	TEMP(GAS)	=	330					
AIR HEATER	06	161171	0400		1	TEMP(AIR)	=	228	TEMP(GAS)	=	330					
AIR HEATER	06	161171	0500		1	TEMP(AIR)	=	233	TEMP(GAS)	=	331					
AIR HEATER	06	161171	0600		1	TEMP(AIR)	=	237	TEMP(GAS)	=	332					
AIR HEATER	18	161171	2300		1	TEMP(AIR)	=		TEMP(GAS)	=						
AIR HEATER	18	171171	0000		1	TEMP(AIR)	=	237	TEMP(GAS)	=	321					
AIR HEATER	18	171171	0100		1	TEMP(AIR)	=	237	TEMP(GAS)	=	320					
AIR HEATER	18	171171	0200		1	TEMP(AIR)	=	236	TEMP(GAS)	=	320					
AIR HEATER	18	171171	0300		1	TEMP(AIR)	=	236	TEMP(GAS)	=	320					
AIR HEATER	18	171171	0400		1	TEMP(AIR)	=	236	TEMP(GAS)	=	320					
AIR HEATER	18	171171	0500		1	TEMP(AIR)	=	236	TEMP(GAS)	=	320					
AIR HEATER	18	171171	0600		1	TEMP(AIR)	=	237	TEMP(GAS)	=	319					
AIR HEATER	13	171171	2300		1	TEMP(AIR)	=	240	TEMP(GAS)	=	316					
AIR HEATER	13	181171	0000		1	TEMP(AIR)	=	240	TEMP(GAS)	=	316					
AIR HEATER	13	181171	0100		1	TEMP(AIR)	=	242	TEMP(GAS)	=	316					

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
AIR HEATER	13	181171	0200		1	TEMP(AIR)	=	238	TEMP(GAS)	=	315
AIR HEATER	13	181171	0300		1	TEMP(AIR)	=	234	TEMP(GAS)	=	314
AIR HEATER	13	181171	0400		1	TEMP(AIR)	=	235	TEMP(GAS)	=	314
AIR HEATER	13	181171	0500		1	TEMP(AIR)	=	232	TEMP(GAS)	=	313
AIR HEATER	13	181171	0600		1	TEMP(AIR)	=	233	TEMP(GAS)	=	314
AIR HEATER	04	181171	2300		1	TEMP(AIR)	=	234	TEMP(GAS)	=	320
AIR HEATER	04	191171	0000		1	TEMP(AIR)	=	234	TEMP(GAS)	=	321
AIR HEATER	04	191171	0100		1	TEMP(AIR)	=	235	TEMP(GAS)	=	321
AIR HEATER	04	191171	0200		1	TEMP(AIR)	=	235	TEMP(GAS)	=	322
AIR HEATER	04	191171	0300		1	TEMP(AIR)	=	236	TEMP(GAS)	=	322
AIR HEATER	04	191171	0400		1	TEMP(AIR)	=	236	TEMP(GAS)	=	321
AIR HEATER	04	191171	0500		1	TEMP(AIR)	=	236	TEMP(GAS)	=	321
AIR HEATER	04	191171	0600		1	TEMP(AIR)	=	235	TEMP(GAS)	=	321
AIR HEATER	05	211171	2300		1	TEMP(AIR)	=	235	TEMP(GAS)	=	309
AIR HEATER	05	221171	0000		1	TEMP(AIR)	=	236	TEMP(GAS)	=	312
AIR HEATER	05	221171	0100		1	TEMP(AIR)	=	235	TEMP(GAS)	=	312
AIR HEATER	05	221171	0200		1	TEMP(AIR)	=	235	TEMP(GAS)	=	312
AIR HEATER	05	221171	0300		1	TEMP(AIR)	=	235	TEMP(GAS)	=	313
AIR HEATER	05	221171	0400		1	TEMP(AIR)	=	235	TEMP(GAS)	=	313
AIR HEATER	05	221171	0500		1	TEMP(AIR)	=	235	TEMP(GAS)	=	314
AIR HEATER	05	221171	0600		1	TEMP(AIR)	=	235	TEMP(GAS)	=	314
AIR HEATER	05	221171	0700		1	TEMP(AIR)	=	235	TEMP(GAS)	=	317
AIR HEATER	10	231171	0000		1	TEMP(AIR)	=	235	TEMP(GAS)	=	323
AIR HEATER	10	231171	0100		1	TEMP(AIR)	=	235	TEMP(GAS)	=	321
AIR HEATER	10	231171	0200		1	TEMP(AIR)	=	236	TEMP(GAS)	=	322
AIR HEATER	10	231171	0300		1	TEMP(AIR)	=	236	TEMP(GAS)	=	323
AIR HEATER	10	231171	0400		1	TEMP(AIR)	=	237	TEMP(GAS)	=	323

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
AIR HEATER	10	231171	0500		1	TEMP(AIR)	=	236	TEMP(GAS)	=	323
AIR HEATER	10	231171	0600		1	TEMP(AIR)	=	236	TEMP(GAS)	=	323
AIR HEATER	10	231171	0700		1	TEMP(AIR)	=	234	TEMP(GAS)	=	324
AIR HEATER	20	241171	0000		1	TEMP(AIR)	=	234	TEMP(GAS)	=	306
AIR HEATER	20	241171	0100		1	TEMP(AIR)	=	234	TEMP(GAS)	=	306
AIR HEATER	20	241171	0200		1	TEMP(AIR)	=	234	TEMP(GAS)	=	306
AIR HEATER	20	241171	0300		1	TEMP(AIR)	=	234	TEMP(GAS)	=	306
AIR HEATER	20	241171	0400		1	TEMP(AIR)	=	234	TEMP(GAS)	=	306
AIR HEATER	20	241171	0500		1	TEMP(AIR)	=	234	TEMP(GAS)	=	306
AIR HEATER	20	241171	0600		1	TEMP(AIR)	=	234	TEMP(GAS)	=	306
AIR HEATER	20	241171	0700		1	TEMP(AIR)	=	234	TEMP(GAS)	=	306
AIR HEATER	02	251171	0230		1	TEMP(AIR)	=	233	TEMP(GAS)	=	323
AIR HEATER	02	301171	0000		1	TEMP(AIR)	=	233	TEMP(GAS)	=	323
AIR HEATER	02	301171	0100		1	TEMP(AIR)	=	233	TEMP(GAS)	=	323
AIR HEATER	02	301171	0200		1	TEMP(AIR)	=	233	TEMP(GAS)	=	324
AIR HEATER	02	301171	0300		1	TEMP(AIR)	=	233	TEMP(GAS)	=	325
AIR HEATER	02	301171	0400		1	TEMP(AIR)	=	233	TEMP(GAS)	=	326
AIR HEATER	02	301171	0500		1	TEMP(AIR)	=	233	TEMP(GAS)	=	326
AIR HEATER	02	301171	0600		1	TEMP(AIR)	=	234	TEMP(GAS)	=	326
AIR HEATER	02	301171	0700		1	TEMP(AIR)	=	234	TEMP(GAS)	=	327
AIR HEATER	03	301171	2300		1	TEMP(AIR)	=	234	TEMP(GAS)	=	327
AIR HEATER	03	011271	0000		1	TEMP(AIR)	=	234	TEMP(GAS)	=	327
AIR HEATER	03	011271	0100		1	TEMP(AIR)	=	234	TEMP(GAS)	=	327
AIR HEATER	03	011271	0200		1	TEMP(AIR)	=	234	TEMP(GAS)	=	327
AIR HEATER	03	011271	0300		1	TEMP(AIR)	=	234	TEMP(GAS)	=	327
AIR HEATER	03	011271	0400		1	TEMP(AIR)	=	234	TEMP(GAS)	=	327
AIR HEATER	03	011271	0500		1	TEMP(AIR)	=	234	TEMP(GAS)	=	327

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
AIR HEATER	03	011271	0600		1	TEMP(AIR)	=	234	TEMP(GAS)	=	328
AIR HEATER	17	011271	2300		1	TEMP(AIR)	=	223	TEMP(GAS)	=	319
AIR HEATER	17	021271	0000		1	TEMP(AIR)	=	223	TEMP(GAS)	=	319
AIR HEATER	17	021271	0100		1	TEMP(AIR)	=	223	TEMP(GAS)	=	319
AIR HEATER	17	021271	0200		1	TEMP(AIR)	=	223	TEMP(GAS)	=	319
AIR HEATER	17	021271	0300		1	TEMP(AIR)	=	223	TEMP(GAS)	=	318
AIR HEATER	17	021271	0400		1	TEMP(AIR)	=	223	TEMP(GAS)	=	318
AIR HEATER	17	021271	0500		1	TEMP(AIR)	=	231	TEMP(GAS)	=	318
AIR HEATER	17	021271	0600		1	TEMP(AIR)	=	242	TEMP(GAS)	=	316
AIR HEATER	17	021271	0700		1	TEMP(AIR)	=	238	TEMP(GAS)	=	315
AIR HEATER	19	011271	2100		1	TEMP(AIR)	=	235	TEMP(GAS)	=	412
AIR HEATER	19	011271	2200		1	TEMP(AIR)	=	235	TEMP(GAS)	=	413
AIR HEATER	19	011271	2300		1	TEMP(AIR)	=	235	TEMP(GAS)	=	417
AIR HEATER	19	021271	0000		1	TEMP(AIR)	=	236	TEMP(GAS)	=	422
AIR HEATER	19	021271	0100		1	TEMP(AIR)	=	236	TEMP(GAS)	=	352
AIR HEATER	19	021271	0200		1	TEMP(AIR)	=	236	TEMP(GAS)	=	348
AIR HEATER	19	021271	0300		1	TEMP(AIR)	=	236	TEMP(GAS)	=	349
AIR HEATER	19	021271	0400		1	TEMP(AIR)	=	236	TEMP(GAS)	=	351
AIR HEATER	19	021271	0500		1	TEMP(AIR)	=	236	TEMP(GAS)	=	352
AIR HEATER	19	021271	0600		1	TEMP(AIR)	=	236	TEMP(GAS)	=	353
AIR HEATER	19	021271	0700		1	TEMP(AIR)	=	235	TEMP(GAS)	=	393
AIR HEATER	21	031271	2300		1	TEMP(AIR)	=	234	TEMP(GAS)	=	440
AIR HEATER	21	041271	0000		1	TEMP(AIR)	=	233	TEMP(GAS)	=	439
AIR HEATER	21	041271	0100		1	TEMP(AIR)	=	232	TEMP(GAS)	=	422
AIR HEATER	21	041271	0200		1	TEMP(AIR)	=	232	TEMP(GAS)	=	415
AIR HEATER	21	041271	0300		1	TEMP(AIR)	=	232	TEMP(GAS)	=	413
AIR HEATER	21	041271	0400		1	TEMP(AIR)	=	232	TEMP(GAS)	=	375

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
AIR HEATER	21	041271	0500		1	TEMP(AIR)	=	232	TEMP(GAS)	=	336
AIR HEATER	21	041271	0600		1	TEMP(AIR)	=	232	TEMP(GAS)	=	335
AIR HEATER	21	041271	0700		1	TEMP(AIR)	=	234	TEMP(GAS)	=	339
AIR HEATER	14	061271	2300		1	TEMP(AIR)	=		TEMP(GAS)	=	
AIR HEATER	14	071271	0000		1	TEMP(AIR)	=		TEMP(GAS)	=	
AIR HEATER	14	071271	0100		1	TEMP(AIR)	=	233	TEMP(GAS)	=	420
AIR HEATER	14	071271	0200		1	TEMP(AIR)	=	217	TEMP(GAS)	=	399
AIR HEATER	14	071271	0300		1	TEMP(AIR)	=	199	TEMP(GAS)	=	391
AIR HEATER	14	071271	0400		1	TEMP(AIR)	=	199	TEMP(GAS)	=	388
AIR HEATER	14	071271	0500		1	TEMP(AIR)	=	216	TEMP(GAS)	=	388
AIR HEATER	14	071271	0600		1	TEMP(AIR)	=	232	TEMP(GAS)	=	391
AIR HEATER	14	071271	0700		1	TEMP(AIR)	=	235	TEMP(GAS)	=	393
AIR HEATER	15	081271	0000		1	TEMP(AIR)	=	237	TEMP(GAS)	=	385
AIR HEATER	15	081271	0100		1	TEMP(AIR)	=	237	TEMP(GAS)	=	385
AIR HEATER	15	081271	0200		1	TEMP(AIR)	=	237	TEMP(GAS)	=	396
AIR HEATER	15	081271	0300		1	TEMP(AIR)	=	262	TEMP(GAS)	=	355
AIR HEATER	15	081271	0400		1	TEMP(AIR)	=	257	TEMP(GAS)	=	332
AIR HEATER	15	081271	0500		1	TEMP(AIR)	=	257	TEMP(GAS)	=	377
AIR HEATER	15	081271	0600		1	TEMP(AIR)	=	257	TEMP(GAS)	=	370
AIR HEATER	15	081271	0700		1	TEMP(AIR)	=	263	TEMP(GAS)	=	367
AIR HEATER	22	091271	0000		1	TEMP(AIR)	=	312	TEMP(GAS)	=	406
AIR HEATER	22	091271	0100		1	TEMP(AIR)	=	319	TEMP(GAS)	=	400
AIR HEATER	22	091271	0200		1	TEMP(AIR)	=	322	TEMP(GAS)	=	397
AIR HEATER	22	091271	0300		1	TEMP(AIR)	=	320	TEMP(GAS)	=	398
AIR HEATER	22	091271	0400		1	TEMP(AIR)	=	322	TEMP(GAS)	=	398
AIR HEATER	22	091271	0500		1	TEMP(AIR)	=	322	TEMP(GAS)	=	399
AIR HEATER	11	081171	1400		2	TEMP(AIR)	=	162	TEMP(GAS)	=	300

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
AIR HEATER	11	081171	1500		2	TEMP(AIR)	=	158	TEMP(GAS)	=	301
AIR HEATER	11	081171	1600		2	TEMP(AIR)	=	166	TEMP(GAS)	=	300
AIR HEATER	11	081171	1700		2	TEMP(AIR)	=	169	TEMP(GAS)	=	302
AIR HEATER	11	081171	1800		2	TEMP(AIR)	=	173	TEMP(GAS)	=	304
AIR HEATER	11	081171	1900		2	TEMP(AIR)	=	163	TEMP(GAS)	=	302
AIR HEATER	11	081171	2000		2	TEMP(AIR)	=	165	TEMP(GAS)	=	308
AIR HEATER	11	081171	2100		2	TEMP(AIR)	=	169	TEMP(GAS)	=	300
AIR HEATER	11	081171	2200		2	TEMP(AIR)	=	169	TEMP(GAS)	=	302
AIR HEATER	11	081171	2300		2	TEMP(AIR)	=	169	TEMP(GAS)	=	303
AIR HEATER	11	081171	0000		2	TEMP(AIR)	=	170	TEMP(GAS)	=	302
AIR HEATER	09	091171	0900		2	TEMP(AIR)	=	163	TEMP(GAS)	=	299
AIR HEATER	09	091171	1000		2	TEMP(AIR)	=	160	TEMP(GAS)	=	299
AIR HEATER	09	091171	1100		2	TEMP(AIR)	=	158	TEMP(GAS)	=	298
AIR HEATER	09	091171	1200		2	TEMP(AIR)	=	157	TEMP(GAS)	=	299
AIR HEATER	09	091171	1300		2	TEMP(AIR)	=	156	TEMP(GAS)	=	299
AIR HEATER	09	091171	1400		2	TEMP(AIR)	=	157	TEMP(GAS)	=	301
AIR HEATER	09	091171	1500		2	TEMP(AIR)	=	160	TEMP(GAS)	=	303
AIR HEATER	09	091171	1600		2	TEMP(AIR)	=	161	TEMP(GAS)	=	301
AIR HEATER	09	091171	1700		2	TEMP(AIR)	=	163	TEMP(GAS)	=	302
AIR HEATER	09	091171	1800		2	TEMP(AIR)	=	164	TEMP(GAS)	=	303
AIR HEATER	09	091171	1900		2	TEMP(AIR)	=	160	TEMP(GAS)	=	300
AIR HEATER	08	101071	0900		2	TEMP(AIR)	=	162	TEMP(GAS)	=	303
AIR HEATER	08	101071	1000		2	TEMP(AIR)	=	164	TEMP(GAS)	=	302
AIR HEATER	08	101071	1100		2	TEMP(AIR)	=	170	TEMP(GAS)	=	305
AIR HEATER	08	101071	1200		2	TEMP(AIR)	=	175	TEMP(GAS)	=	308
AIR HEATER	08	101071	1300		2	TEMP(AIR)	=	178	TEMP(GAS)	=	310
AIR HEATER	08	101071	1400		2	TEMP(AIR)	=	178	TEMP(GAS)	=	310

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
AIR HEATER	08	101071	1500		2	TEMP(AIR)	=	180	TEMP(GAS)	=	308
AIR HEATER	08	101071	1600		2	TEMP(AIR)	=	178	TEMP(GAS)	=	310
AIR HEATER	08	101071	1700		2	TEMP(AIR)	=	175	TEMP(GAS)	=	311
AIR HEATER	08	101071	1800		2	TEMP(AIR)	=	176	TEMP(GAS)	=	313
AIR HEATER	12	111171	0900		2	TEMP(AIR)	=	173	TEMP(GAS)	=	303
AIR HEATER	12	111171	1000		2	TEMP(AIR)	=	175	TEMP(GAS)	=	306
AIR HEATER	12	111171	1100		2	TEMP(AIR)	=	170	TEMP(GAS)	=	304
AIR HEATER	12	111171	1200		2	TEMP(AIR)	=	170	TEMP(GAS)	=	306
AIR HEATER	12	111171	1300		2	TEMP(AIR)	=	174	TEMP(GAS)	=	307
AIR HEATER	12	111171	1400		2	TEMP(AIR)	=	173	TEMP(GAS)	=	309
AIR HEATER	12	111171	1500		2	TEMP(AIR)	=	175	TEMP(GAS)	=	310
AIR HEATER	12	111171	1600		2	TEMP(AIR)	=	175	TEMP(GAS)	=	309
AIR HEATER	12	111171	1700		2	TEMP(AIR)	=	180	TEMP(GAS)	=	310
AIR HEATER	12	111171	1800		2	TEMP(AIR)	=	175	TEMP(GAS)	=	310
AIR HEATER	07	121171	0900		2	TEMP(AIR)	=	164	TEMP(GAS)	=	305
AIR HEATER	07	121171	1000		2	TEMP(AIR)	=	172	TEMP(GAS)	=	310
AIR HEATER	07	121171	1100		2	TEMP(AIR)	=	175	TEMP(GAS)	=	310
AIR HEATER	07	121171	1200		2	TEMP(AIR)	=	178	TEMP(GAS)	=	311
AIR HEATER	07	121171	1300		2	TEMP(AIR)	=	182	TEMP(GAS)	=	312
AIR HEATER	07	121171	1400		2	TEMP(AIR)	=	185	TEMP(GAS)	=	311
AIR HEATER	07	121171	1500		2	TEMP(AIR)	=	178	TEMP(GAS)	=	313
AIR HEATER	07	121171	1600		2	TEMP(AIR)	=	177	TEMP(GAS)	=	316
AIR HEATER	07	121171	1700		2	TEMP(AIR)	=	176	TEMP(GAS)	=	312
AIR HEATER	01	141171	2200		2	TEMP(AIR)	=	158	TEMP(GAS)	=	315
AIR HEATER	01	141171	2300		2	TEMP(AIR)	=	159	TEMP(GAS)	=	312
AIR HEATER	01	151171	0000		2	TEMP(AIR)	=	159	TEMP(GAS)	=	311
AIR HEATER	01	151171	0100		2	TEMP(AIR)	=	157	TEMP(GAS)	=	310

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
AIR HEATER	01	151171	0200		2	TEMP(AIR)	=	159	TEMP(GAS)	=	308
AIR HEATER	01	151171	0300		2	TEMP(AIR)	=	163	TEMP(GAS)	=	308
AIR HEATER	01	151171	0400		2	TEMP(AIR)	=	163	TEMP(GAS)	=	308
AIR HEATER	01	151171	0500		2	TEMP(AIR)	=	163	TEMP(GAS)	=	311
AIR HEATER	01	151171	0600		2	TEMP(AIR)	=	163	TEMP(GAS)	=	312
AIR HEATER	06	161171	200		2	TEMP(AIR)	=	163	TEMP(GAS)	=	314
AIR HEATER	06	161171	0300		2	TEMP(AIR)	=	161	TEMP(GAS)	=	313
AIR HEATER	06	161171	0400		2	TEMP(AIR)	=	160	TEMP(GAS)	=	308
AIR HEATER	06	161171	0500		2	TEMP(AIR)	=	160	TEMP(GAS)	=	322
AIR HEATER	06	161171	0600		2	TEMP(AIR)	=		TEMP(GAS)	=	
AIR HEATER	18	161171	2300		2	TEMP(AIR)	=	181	TEMP(GAS)	=	305
AIR HEATER	13	171171	0000		2	TEMP(AIR)	=	175	TEMP(GAS)	=	300
AIR HEATER	18	171171	0100		2	TEMP(AIR)	=	165	TEMP(GAS)	=	301
AIR HEATER	13	171171	0200		2	TEMP(AIR)	=	147	TEMP(GAS)	=	302
AIR HEATER	18	171171	0300		2	TEMP(AIR)	=	166	TEMP(GAS)	=	298
AIR HEATER	18	171171	0400		2	TEMP(AIR)	=	169	TEMP(GAS)	=	296
AIR HEATER	18	171171	0500		2	TEMP(AIR)	=	168	TEMP(GAS)	=	296
AIR HEATER	18	171171	0600		2	TEMP(AIR)	=	167	TEMP(GAS)	=	297
AIR HEATER	18	171171	0700		2	TEMP(AIR)	=	161	TEMP(GAS)	=	300
AIR HEATER	13	181171	0000		2	TEMP(AIR)	=	207	TEMP(GAS)	=	299
AIR HEATER	13	181171	0100		2	TEMP(AIR)	=	200	TEMP(GAS)	=	292
AIR HEATER	13	181171	0200		2	TEMP(AIR)	=	199	TEMP(GAS)	=	291
AIR HEATER	13	181171	0300		2	TEMP(AIR)	=	199	TEMP(GAS)	=	285
AIR HEATER	13	181171	0400		2	TEMP(AIR)	=	201	TEMP(GAS)	=	286
AIR HEATER	13	181171	0500		2	TEMP(AIR)	=	203	TEMP(GAS)	=	288
AIR HEATER	13	181171	0600		2	TEMP(AIR)	=	222	TEMP(GAS)	=	288
AIR HEATER	13	181171	0700		2	TEMP(AIR)	=	202	TEMP(GAS)	=	288

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
AIR HEATER	04	181171	2300		2	TEMP(AIR)	=	155	TEMP(GAS)	=	306
AIR HEATER	04	191171	0000		2	TEMP(AIR)	=	149	TEMP(GAS)	=	305
AIR HEATER	04	191171	0100		2	TEMP(AIR)	=	154	TEMP(GAS)	=	304
AIR HEATER	04	191171	0200		2	TEMP(AIR)	=	166	TEMP(GAS)	=	305
AIR HEATER	04	191171	0300		2	TEMP(AIR)	=		TEMP(GAS)	=	
AIR HEATER	04	191171	0400			TEMP(AIR)	=		TEMP(GAS)	=	
AIR HEATER	04	191171	0500			TEMP(AIR)	=		TEMP(GAS)	=	
AIR HEATER	04	191171	0600			TEMP(AIR)	=	167	TEMP(GAS)	=	306
AIR HEATER	05	211171	2300		2	TEMP(AIR)	=	171	TEMP(GAS)	=	280
AIR HEATER	05	221171	0000		2	TEMP(AIR)	=	166	TEMP(GAS)	=	284
AIR HEATER	05	221171	0100		2	TEMP(AIR)	=	167	TEMP(GAS)	=	287
AIR HEATER	05	221171	0200		2	TEMP(AIR)	=	167	TEMP(GAS)	=	288
AIR HEATER	05	221171	0300		2	TEMP(AIR)	=	165	TEMP(GAS)	=	287
AIR HEATER	05	221171	0400		2	TEMP(AIR)	=	165	TEMP(GAS)	=	288
AIR HEATER	05	221171	0500		2	TEMP(AIR)	=	164	TEMP(GAS)	=	288
AIR HEATER	05	221171	0600		2	TEMP(AIR)	=	170	TEMP(GAS)	=	293
AIR HEATER	05	221171	0700		2	TEMP(AIR)	=	163	TEMP(GAS)	=	288
AIR HEATER	10	231171	0000		2	TEMP(AIR)	=	162	TEMP(GAS)	=	304
AIR HEATER	10	231171	0100		2	TEMP(AIR)	=	161	TEMP(GAS)	=	297
AIR HEATER	10	231171	0200		2	TEMP(AIR)	=	159	TEMP(GAS)	=	298
AIR HEATER	10	231171	0300		2	TEMP(AIR)	=	161	TEMP(GAS)	=	298
AIR HEATER	10	231171	0400		2	TEMP(AIR)	=	166	TEMP(GAS)	=	299
AIR HEATER	10	231171	0500		2	TEMP(AIR)	=	161	TEMP(GAS)	=	299
AIR HEATER	10	231171	0600		2	TEMP(AIR)	=	152	TEMP(GAS)	=	299
AIR HEATER	10	231171	0700		2	TEMP(AIR)	=	163	TEMP(GAS)	=	298
AIR HEATER	20	241171	0000		2	TEMP(AIR)	=	184	TEMP(GAS)	=	280
AIR HEATER	20	241171	0100		2	TEMP(AIR)	=	193	TEMP(GAS)	=	277

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
AIR HEATER	20	241171	0200		2	TEMP(AIR)	=	202	TEMP(GAS)	=	276
AIR HEATER	20	241171	0300		2	TEMP(AIR)	=	197	TEMP(GAS)	=	276
AIR HEATER	20	241171	0400		2	TEMP(AIR)	=	193	TEMP(GAS)	=	277
AIR HEATER	20	241171	0500		2	TEMP(AIR)	=	196	TEMP(GAS)	=	276
AIR HEATER	20	241171	0600		2	TEMP(AIR)	=	196	TEMP(GAS)	=	276
AIR HEATER	20	241171	0700		2	TEMP(AIR)	=	185	TEMP(GAS)	=	282
AIR HEATER	02	301171	0000		2	TEMP(AIR)	=	162	TEMP(GAS)	=	295
AIR HEATER	02	301171	0100		2	TEMP(AIR)	=	168	TEMP(GAS)	=	297
AIR HEATER	02	301171	0200		2	TEMP(AIR)	=	167	TEMP(GAS)	=	299
AIR HEATER	02	301171	0300		2	TEMP(AIR)	=	167	TEMP(GAS)	=	299
AIR HEATER	02	301171	0400		2	TEMP(AIR)	=	172	TEMP(GAS)	=	306
AIR HEATER	02	301171	0500		2	TEMP(AIR)	=	169	TEMP(GAS)	=	302
AIR HEATER	02	301171	0600		2	TEMP(AIR)	=	168	TEMP(GAS)	=	310
AIR HEATER	02	301171	0700		2	TEMP(AIR)	=		TEMP(GAS)	=	302
AIR HEATER	03	301171	2300		2	TEMP(AIR)	=	157	TEMP(GAS)	=	291
AIR HEATER	03	011271	0000		2	TEMP(AIR)	=	159	TEMP(GAS)	=	298
AIR HEATER	03	011271	0100		2	TEMP(AIR)	=	156	TEMP(GAS)	=	291
AIR HEATER	03	011271	0200		2	TEMP(AIR)	=	152	TEMP(GAS)	=	290
AIR HEATER	03	011271	0300		2	TEMP(AIR)	=	158	TEMP(GAS)	=	297
AIR HEATER	03	011271	0400		2	TEMP(AIR)	=	158	TEMP(GAS)	=	298
AIR HEATER	03	011271	0500		2	TEMP(AIR)	=	162	TEMP(GAS)	=	299
AIR HEATER	03	011271	0600		2	TEMP(AIR)	=	163	TEMP(GAS)	=	299
AIR HEATER	03	011271	0700		2	TEMP(AIR)	=	165	TEMP(GAS)	=	299
AIR HEATER	17	011271	2300		2	TEMP(AIR)	=	185	TEMP(GAS)	=	297
AIR HEATER	17	021271	0000		2	TEMP(AIR)	=	177	TEMP(GAS)	=	295
AIR HEATER	17	021271	0100		2	TEMP(AIR)	=	159	TEMP(GAS)	=	295
AIR HEATER	17	021271	0200		2	TEMP(AIR)	=	156	TEMP(GAS)	=	294

RECORD TYPE	TEST	DATE	TIME	LOC	METH						
AIR HEATER	17	021271	0300		2	TEMP(AIR)	=	155	TEMP(GAS)	=	292
AIR HEATER	17	021271	0400		2	TEMP(AIR)	=	154	TEMP(GAS)	=	291
AIR HEATER	17	021271	0500		2	TEMP(AIR)	=	144	TEMP(GAS)	=	290
AIR HEATER	17	021271	0600		2	TEMP(AIR)	=	148	TEMP(GAS)	=	289
AIR HEATER	17	021271	0700		2	TEMP(AIR)	=	154	TEMP(GAS)	=	288
AIR HEATER	19	021271	2100		2	TEMP(AIR)	=	177	TEMP(GAS)	=	294
AIR HEATER	19	021271	2200		2	TEMP(AIR)	=	177	TEMP(GAS)	=	286
AIR HEATER	19	021271	2300		2	TEMP(AIR)	=	178	TEMP(GAS)	=	284
AIR HEATER	19	031271	0000		2	TEMP(AIR)	=	178	TEMP(GAS)	=	291
AIR HEATER	19	031271	0100		2	TEMP(AIR)	=	177	TEMP(GAS)	=	286
AIR HEATER	19	031271	0200		2	TEMP(AIR)	=	181	TEMP(GAS)	=	285
AIR HEATER	19	031271	0300		2	TEMP(AIR)	=	185	TEMP(GAS)	=	286
AIR HEATER	19	031271	0400		2	TEMP(AIR)	=	183	TEMP(GAS)	=	286
AIR HEATER	19	031271	0500		2	TEMP(AIR)	=	184	TEMP(GAS)	=	287
AIR HEATER	19	031271	0600		2	TEMP(AIR)	=	185	TEMP(GAS)	=	289
AIR HEATER	19	031271	0700		2	TEMP(AIR)	=	188	TEMP(GAS)	=	290
AIR HEATER	21	041271	0000		2	TEMP(AIR)	=	141	TEMP(GAS)	=	284
AIR HEATER	21	041271	0100		2	TEMP(AIR)	=	107	TEMP(GAS)	=	280
AIR HEATER	21	041271	0200		2	TEMP(AIR)	=	102	TEMP(GAS)	=	282
AIR HEATER	21	041271	0300		2	TEMP(AIR)	=	101	TEMP(GAS)	=	286
AIR HEATER	21	041271	0400		2	TEMP(AIR)	=	101	TEMP(GAS)	=	284
AIR HEATER	21	041271	0500		2	TEMP(AIR)	=	99	TEMP(GAS)	=	280
AIR HEATER	21	041271	0600		2	TEMP(AIR)	=	100	TEMP(GAS)	=	278
AIR HEATER	21	041271	0700		2	TEMP(AIR)	=	98	TEMP(GAS)	=	283
AIR HEATER	14	071271	0000		2	TEMP(AIR)	=	113	TEMP(GAS)	=	298
AIR HEATER	14	071271	0100		2	TEMP(AIR)	=	104	TEMP(GAS)	=	302
AIR HEATER	14	071271	0200		2	TEMP(AIR)	=	100	TEMP(GAS)	=	299

RECORD TYPE	TEST	DATE	TIME	LOC	METH									
AIR HEATER	14	071271	0300		2	TEMP(AIR)	=	99	TEMP(GAS)	=	297			
AIR HEATER	14	071271	0400		2	TEMP(AIR)	=	98	TEMP(GAS)	=	297			
AIR HEATER	14	071271	0500		2	TEMP(AIR)	=	98	TEMP(GAS)	=	297			
AIR HEATER	14	071271	0600		2	TEMP(AIR)	=	98	TEMP(GAS)	=	298			
AIR HEATER	14	071271	0700		2	TEMP(AIR)	=	98	TEMP(GAS)	=	293			
AIR HEATER	15	081271	0100		2	TEMP(AIR)	=	168	TEMP(GAS)	=	301			
AIR HEATER	15	081271	0200		2	TEMP(AIR)	=	166	TEMP(GAS)	=	300			
AIR HEATER	15	081271	0300		2	TEMP(AIR)	=	164	TEMP(GAS)	=	300			
AIR HEATER	15	081271	0400		2	TEMP(AIR)	=	166	TEMP(GAS)	=	301			
AIR HEATER	15	081271	0500		2	TEMP(AIR)	=	166	TEMP(GAS)	=	302			
AIR HEATER	15	081271	0600		2	TEMP(AIR)	=	168	TEMP(GAS)	=	303			
AIR HEATER	22	081271	2300		2	TEMP(AIR)	=	167	TEMP(GAS)	=	304			
AIR HEATER	22	091271	0000		2	TEMP(AIR)	=	169	TEMP(GAS)	=	303			
AIR HEATER	22	091271	0100		2	TEMP(AIR)	=	169	TEMP(GAS)	=	303			
AIR HEATER	22	091271	0200		2	TEMP(AIR)	=	168	TEMP(GAS)	=	304			
AIR HEATER	22	091271	0300		2	TEMP(AIR)	=	167	TEMP(GAS)	=	304			
AIR HEATER	22	091271	0400		2	TEMP(AIR)	=	168	TEMP(GAS)	=	305			
AIR HEATER	22	091271	0500		2	TEMP(AIR)	=	167	TEMP(GAS)	=	305			
AMBIENT	09				0	TEMP	=	78.6	REL HUMID	=	.43	PRESSURE	=	29.92
AMBIENT	08				0	TEMP	=	86.2	REL HUMID	=	.31	PRESSURE	=	29.84
AMBIENT	12				0	TEMP	=	88.3	REL HUMID	=	.29	PRESSURE	=	29.80
AMBIENT	07				0	TEMP	=	93.5	REL HUMID	=	.30	PRESSURE	=	29.57
AMBIENT	01				0	TEMP	=	89.9	REL HUMID	=	.45	PRESSURE	=	29.86
AMBIENT	06				0	TEMP	=	95.6	REL HUMID	=	.32	PRESSURE	=	29.85
AMBIENT	18				0	TEMP	=	84.7	REL HUMID	=	.37	PRESSURE	=	29.76
AMBIENT	13				0	TEMP	=	87.5	REL HUMID	=	.39	PRESSURE	=	29.55
AMBIENT	04				0	TEMP	=	78.1	REL HUMID	=	.30	PRESSURE	=	29.73

RECORD TYPE	TEST	DATE	TIME	LOC	METH				
AMBIENT	05				0	TEMP = 70.9	REL HUMID = .32	PRESSURE = 29.90	
AMBIENT	10				0	TEMP = 69.8	REL HUMID = .29	PRESSURE = 29.91	
AMBIENT	20				0	TEMP = 70.0	REL HUMID = .40	PRESSURE = 29.85	
AMBIENT	02				0	TEMP = 77.5	REL HUMID = .29	PRESSURE = 29.68	
AMBIENT	03				0	TEMP = 74.5	REL HUMID = .29	PRESSURE = 30.10	
AMBIENT	17				0	TEMP = 67.0	REL HUMID = .39	PRESSURE = 30.27	
AMBIENT	19				0	TEMP = 70.9	REL HUMID = .32	PRESSURE = 30.01	
AMBIENT	21				0	TEMP = 70.5	REL HUMID = .34	PRESSURE = 29.81	
AMBIENT	14				0	TEMP = 71.3	REL HUMID = .55	PRESSURE = 29.44	
AMBIENT	15				0	TEMP = 76.0	REL HUMID = .37	PRESSURE = 29.83	
AMBIENT	11				0	TEMP = 72.0	REL HUMID = .55	PRESSURE = 29.88	
AMBIENT	22				0	TEMP = 81.0	REL HUMID = .41	PRESSURE = 29.22	
ELECTRICAL	11					PULV 1 = 67.0 F. D. FAN 1 = 101.2	PULV 2 = 67.4 F. D. FAN 2 = 102.2	PULV 3 = 64.8 I. D. FAN 1 = 183.0	PULV 4 = 65.4 I. D. FAN 2 = 157.0
ELECTRICAL	09					PULV 1 = 64.9 F. D. FAN 1 = 94.8	PULV 2 = 64.0 F. D. FAN 2 = 101.6	PULV 3 = 65.6 I. D. FAN 1 = 177.1	PULV 4 = 64.9 I. D. FAN 2 = 141.1
ELECTRICAL	08					PULV 1 = 68.9 F. D. FAN 1 = 102.0	PULV 2 = 68.9 F. D. FAN 2 = 108.9	PULV 3 = 64.0 I. D. FAN 1 = 190.8	PULV 4 = 65.6 I. D. FAN 2 = 172.9
ELECTRICAL	12					PULV 1 = 67.1 F. D. FAN 1 = 97.7	PULV 2 = 68.3 F. D. FAN 2 = 90.9	PULV 3 = 63.6 I. D. FAN 1 = 194.1	PULV 4 = 65.3 I. D. FAN 2 = 155.6
ELECTRICAL	07					PULV 1 = 67.3 F. D. FAN 1 = 95.0	PULV 2 = 67.6 F. D. FAN 2 = 103.4	PULV 3 = 63.7 I. D. FAN 1 = 191.2	PULV 4 = 63.3 I. D. FAN 2 = 153.7
ELECTRICAL	06					PULV 1 = 71.0 F. D. FAN 1 = 99.2	PULV 2 = 71.6 F. D. FAN 2 = 109.8	PULV 3 = 62.8 I. D. FAN 1 = 184.0	PULV 4 = 61.7 I. D. FAN 2 = 172.5
ELECTRICAL	01					PULV 1 = 60.1 F. D. FAN 1 = 86.1	PULV 2 = 61.5 F. D. FAN 2 = 93.3	PULV 3 = 57.7 I. D. FAN 1 = 162.3	PULV 4 = 57.0 I. D. FAN 2 = 129.0
ELECTRICAL	18					PULV 1 = 00.0 F. D. FAN 1 = 79.0	PULV 2 = 59.3 F. D. FAN 2 = 84.5	PULV 3 = 56.5 I. D. FAN 1 = 109.0	PULV 4 = 55.5 I. D. FAN 2 = 84.5
ELECTRICAL	13					PULV 1 = 00.0 F. D. FAN 1 = 75.1	PULV 2 = 00.0 F. D. FAN 2 = 80.1	PULV 3 = 57.3 I. D. FAN 1 = 80.7	PULV 4 = 58.3 I. D. FAN 2 = 54.8
ELECTRICAL	04					PULV 1 = 57.8 F. D. FAN 1 = 85.9	PULV 2 = 61.9 F. D. FAN 2 = 91.0	PULV 3 = 57.9 I. D. FAN 1 = 155.9	PULV 4 = 59.0 I. D. FAN 2 = 40.9

RECORD TYPE	TEST	DATE	TIME	LCC	METH				
ELECTRICAL	05					PULV 1 = 60.0	PULV 2 = 60.3	PULV 3 = 00.0	PULV 4 = 00.0
						F. D. FAN 1 = 88.8	F. D. FAN 2 = 97.1	I. D. FAN 1 = 110.0	I. D. FAN 2 = 95.6
ELECTRICAL	10					PULV 1 = 64.6	PULV 2 = 68.4	PULV 3 = 00.0	PULV 4 = 00.0
						F. D. FAN 1 = 100.0	F. D. FAN 2 = 110.0	I. D. FAN 1 = 150.0	I. D. FAN 2 = 137.1
ELECTRICAL	20					PULV 1 = 81.4	PULV 2 = 67.5	PULV 3 = 8.8	PULV 4 = 5.8
						F. D. FAN 1 = 89.9	F. D. FAN 2 = 94.3	I. D. FAN 1 = 81.4	I. D. FAN 2 = 62.9
ELECTRICAL	02					PULV 1 = 59.7	PULV 2 = 64.4	PULV 3 = 58.0	PULV 4 = 57.6
						F. D. FAN 1 = 90.0	F. D. FAN 2 = 99.3	I. D. FAN 1 = 125.0	I. D. FAN 2 = 110.0
ELECTRICAL	03					PULV 1 = 58.0	PULV 2 = 60.6	PULV 3 = 60.3	PULV 4 = 60.3
						F. D. FAN 1 = 95.0	F. D. FAN 2 = 106.4	I. D. FAN 1 = 120.0	I. D. FAN 2 = 110.0
ELECTRICAL	17					PULV 1 = 00.0	PULV 2 = 56.0	PULV 3 = 58.1	PULV 4 = 57.0
						F. D. FAN 1 = 74.3	F. D. FAN 2 = 77.4	I. D. FAN 1 = 96.4	I. D. FAN 2 = 76.4
ELECTRICAL	19					PULV 1 = 00.0	PULV 2 = 56.9	PULV 3 = 58.8	PULV 4 = 57.7
						F. D. FAN 1 = 83.3	F. D. FAN 2 = 88.8	I. D. FAN 1 = 92.4	I. D. FAN 2 = 78.6
ELECTRICAL	21					PULV 1 = 59.8	PULV 2 = 60.3	PULV 3 = 00.0	PULV 4 = 00.0
						F. D. FAN 1 = 76.8	F. D. FAN 2 = 77.7	I. D. FAN 1 = 77.8	I. D. FAN 2 = 60.8
ELECTRICAL	14					PULV 1 = 00.0	PULV 2 = 57.0	PULV 3 = 55.3	PULV 4 = 56.1
						F. D. FAN 1 = 78.0	F. D. FAN 2 = 79.7	I. D. FAN 1 = 93.5	I. D. FAN 2 = 91.4
ELECTRICAL	15					PULV 1 = 00.0	PULV 2 = 56.1	PULV 3 = 57.2	PULV 4 = 56.6
						F. D. FAN 1 = 79.7	F. D. FAN 2 = 84.2	I. D. FAN 1 = 78.0	I. D. FAN 2 = 57.0
ELECTRICAL	22					PULV 1 = 59.6	PULV 2 = 59.9	PULV 3 = 57.0	PULV 4 = 56.1
						F. D. FAN 1 = 86.2	F. D. FAN 2 = 94.5	I. D. FAN 1 = 107.6	I. D. FAN 2 = 96.1
CONDITIONS	11					STEAM FLOW = 786.0			
CONDITIONS	09					STEAM FLOW = 787.8			
CONDITIONS	08					STEAM FLOW = 789.8			
CONDITIONS	12					STEAM FLOW = 791.9			
CONDITIONS	07					STEAM FLOW = 794.0			
CONDITIONS	06					STEAM FLOW = 801.1			
CONDITIONS	01					STEAM FLOW = 799.0			
CONDITIONS	18					STEAM FLOW = 803.1			
CONDITIONS	13					STEAM FLOW = 804.8			
CONDITIONS	04					STEAM FLOW = 806.5			
CONDITIONS	05					STEAM FLOW = 810.1			

RECORD TYPE	TEST	DATE	TIME	LOC	METH	
CONDITIONS	10					STEAM FLOW = 812.1
CONDITIONS	20					STEAM FLOW = 813.1
CONDITIONS	02					STEAM FLOW = 825.3
CONDITIONS	03					STEAM FLOW = 827.1
CONDITIONS	17					STEAM FLOW = 828.8
CONDITIONS	19					STEAM FLOW = 830.2
CONDITIONS	21					STEAM FLOW = 831.9
CONDITIONS	14					STEAM FLOW = 835.8
CONDITIONS	15					STEAM FLOW = 837.5
CONDITIONS	22					STEAM FLOW = 839.2

APPENDIX D

STUDIES OF THE CHEMICAL STATE
OF SULFUR ADSORBED ON SURFACES OF FLY ASH

APPENDIX D

STUDIES OF THE CHEMICAL STATE OF SULFUR ADSORBED ON SURFACES OF FLY ASH

DISCUSSION OF RESULTS OF PHOTOELECTRON SPECTRA OF ADSORBED SULFUR

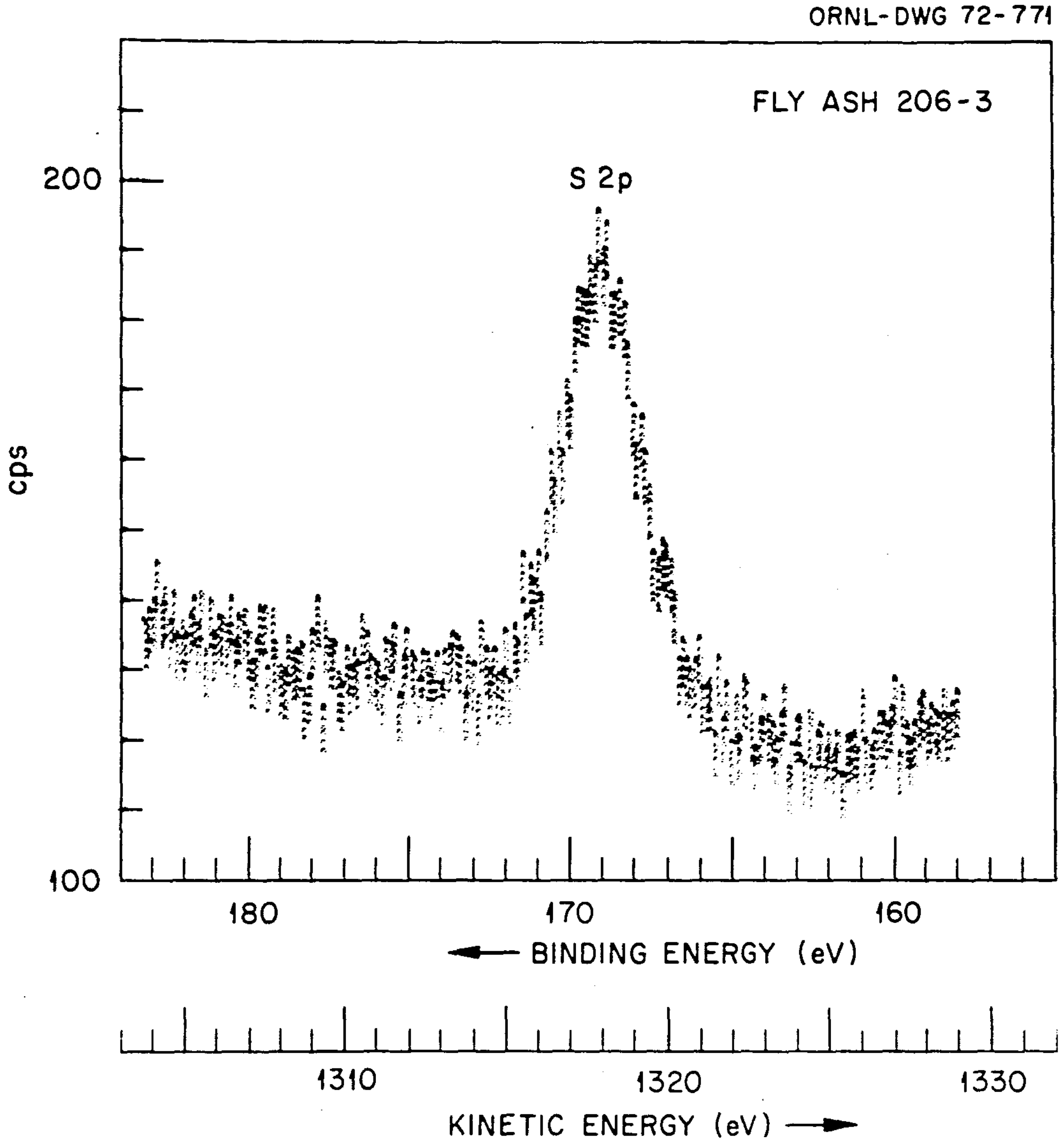
The photoelectron spectrum of sulfur has two intense peaks which allow easy identification of the element. These arise from electrons being ejected from the 2p and 2s levels; they are referred to as the "S2p" and "S2s" peaks in spectra. Both peaks were found for the fly ash samples. Thus, there is not question that sulfur is present in high concentrations on the surfaces of all the specimens. The S2p peak is the more intense, allowing good statistics. Long counts were takne for this peak in order to get accurate binding energy measurements of electrons in the S2p state. It has been shown that chemical states of elements can be deduced from binding energy measurements.[1,2]

Figures D1-D10 show the 2p spectra of sulfur adsorbed on the specimens submitted. Figures D4-D10 include also a peak due to the ejection of electrons from the 2s electron level of silicon. The second peak in Figures D3-D10 will be called the Si 2s peak. The Si 2s peaks were measured simultaneously with the S2p peaks because it was convenient to do so at the spectrometer settings used. For all spectra shown in the report, the upper scale on the abscissa indicates binding energy. The lower scale indicates kinetic energy. The relationship between the two scales is:

KINETIC ENERGY = 1487 ev - BINDING ENERGY

This relationship is discussed more thoroughly in attached references.[1,2] Figures D11 and D12 show S2p spectra of sulfur in K_2SO_4 and $CsSO_4$, used as standards.

The first column of Table D1 lists binding energies measured from the peaks in Figures D1-D10. The second column lists binding energies of standard compounds K_2SO_4, $CaSO_4$, $FeSO_4$, $Fe(SO_4)_3$, S°, Na_2S. The binding energies for K_2SO_4 and $CaSO_4$ were measured in this laboratory. The rest were taken from literature.[1] It is seen that the binding energy of sulfur and the fly ash samples is too high to correspond to any valence state lower that +6. Also, there is a closer match to the binding energies of sulfates of polyvalent cations than to monovalent cations.



ORNL-DWG 72-771
FLY ASH 206-3
S 2p
200
100
cps
180
170
160
BINDING ENERGY (eV)
1310
1320
1330
KINETIC ENERGY (eV)

Figure D1

ORNL-DWG 72-759

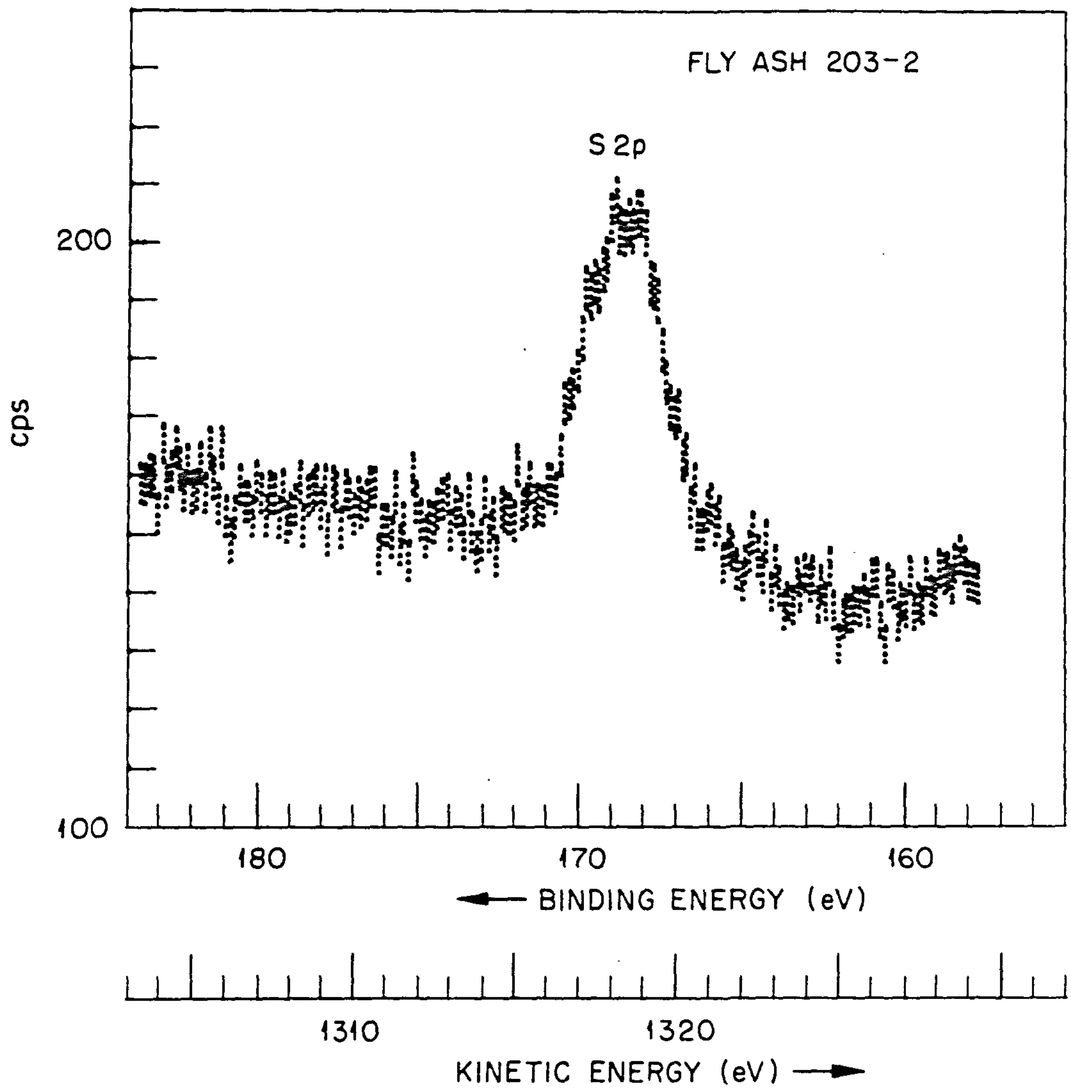


Figure D2

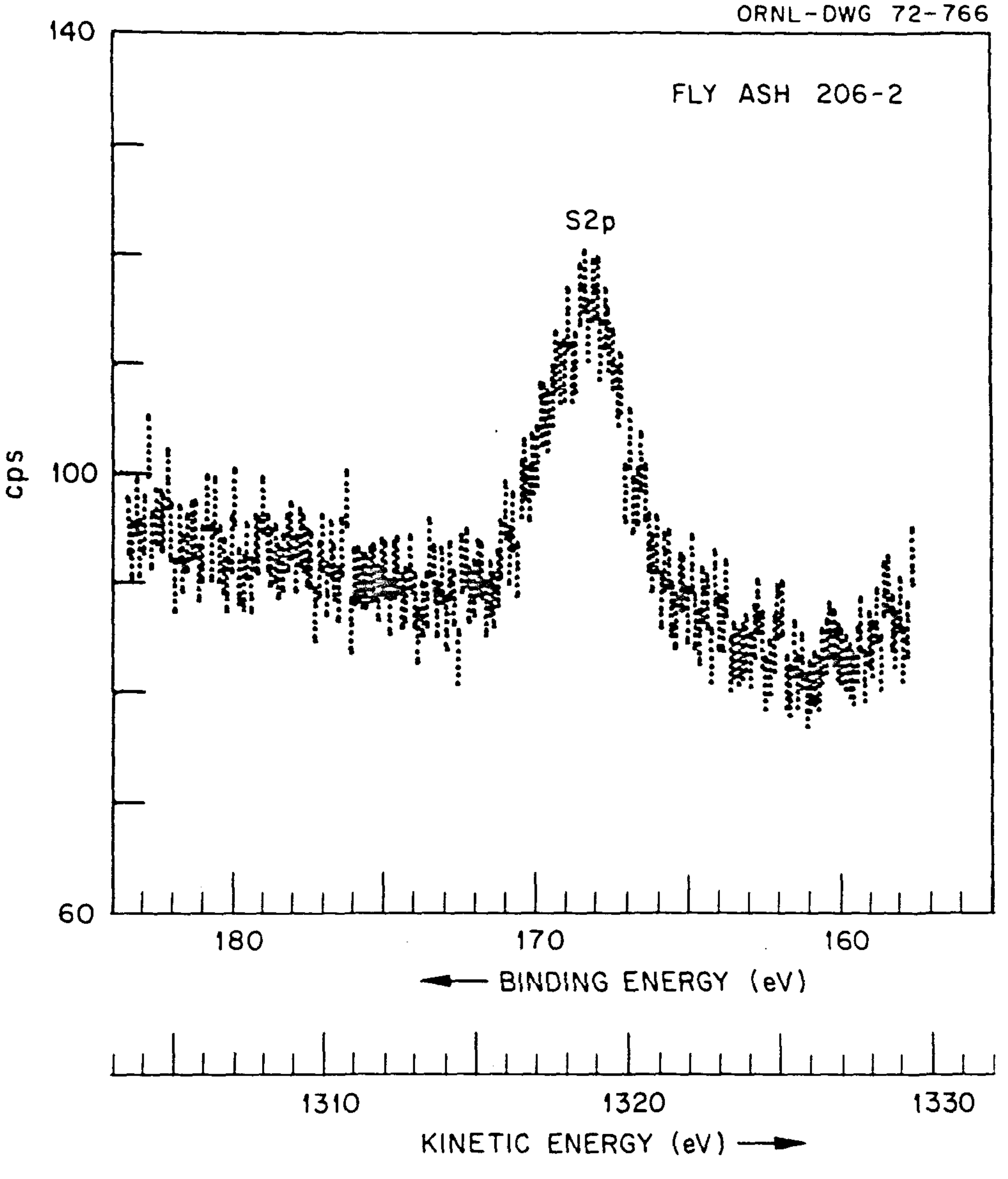

ORNL-DWG 72-766
FLY ASH 206-2
S2p
cps
140
100
60
180
170
160
BINDING ENERGY (eV)
1310
1320
1330
KINETIC ENERGY (eV)

Figure D3

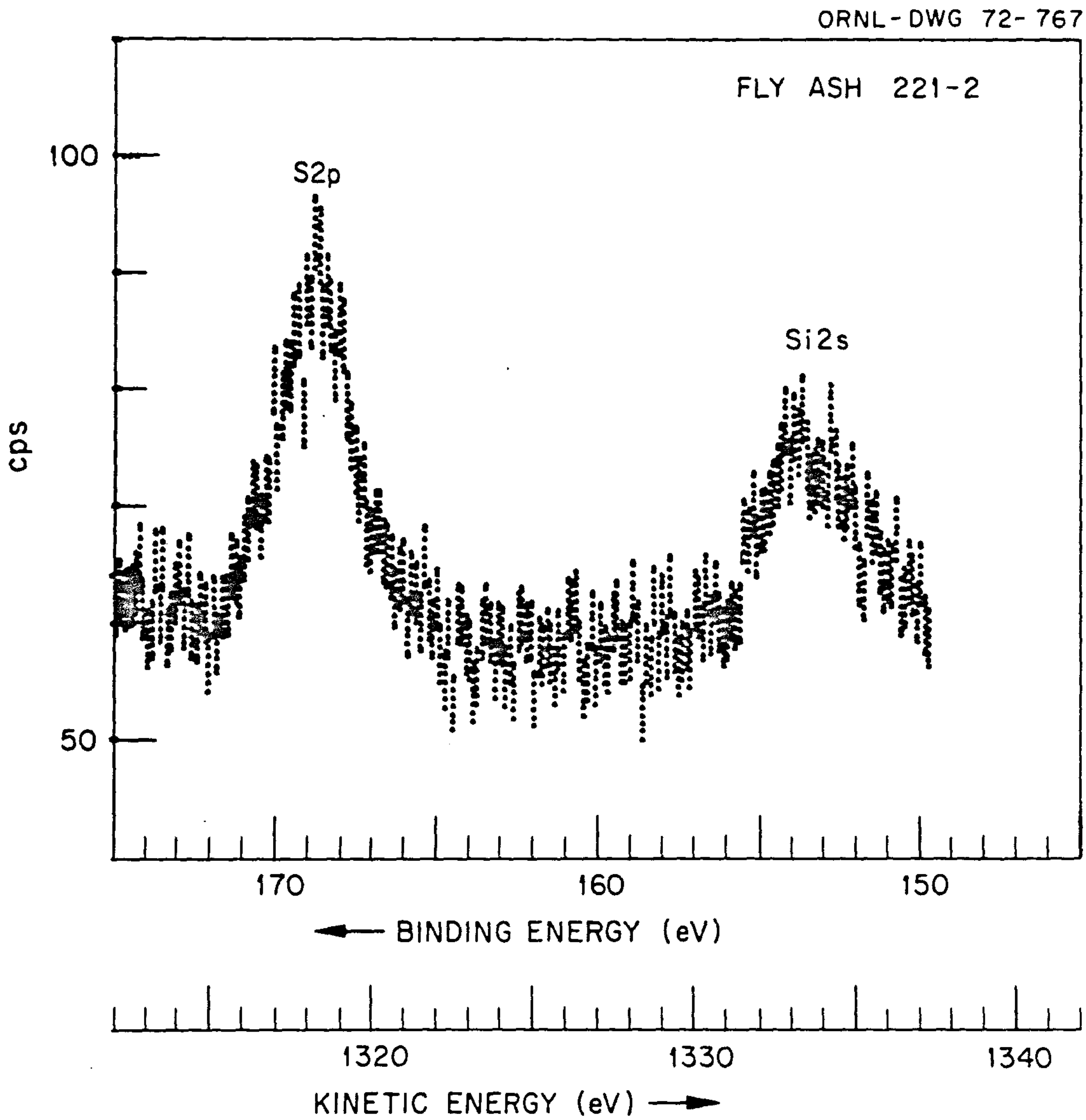

ORNL-DWG 72-767
FLY ASH 221-2
100
50
cps
S2p
Si2s
170
160
150
BINDING ENERGY (eV)
1320
1330
1340
KINETIC ENERGY (eV)

Figure D4

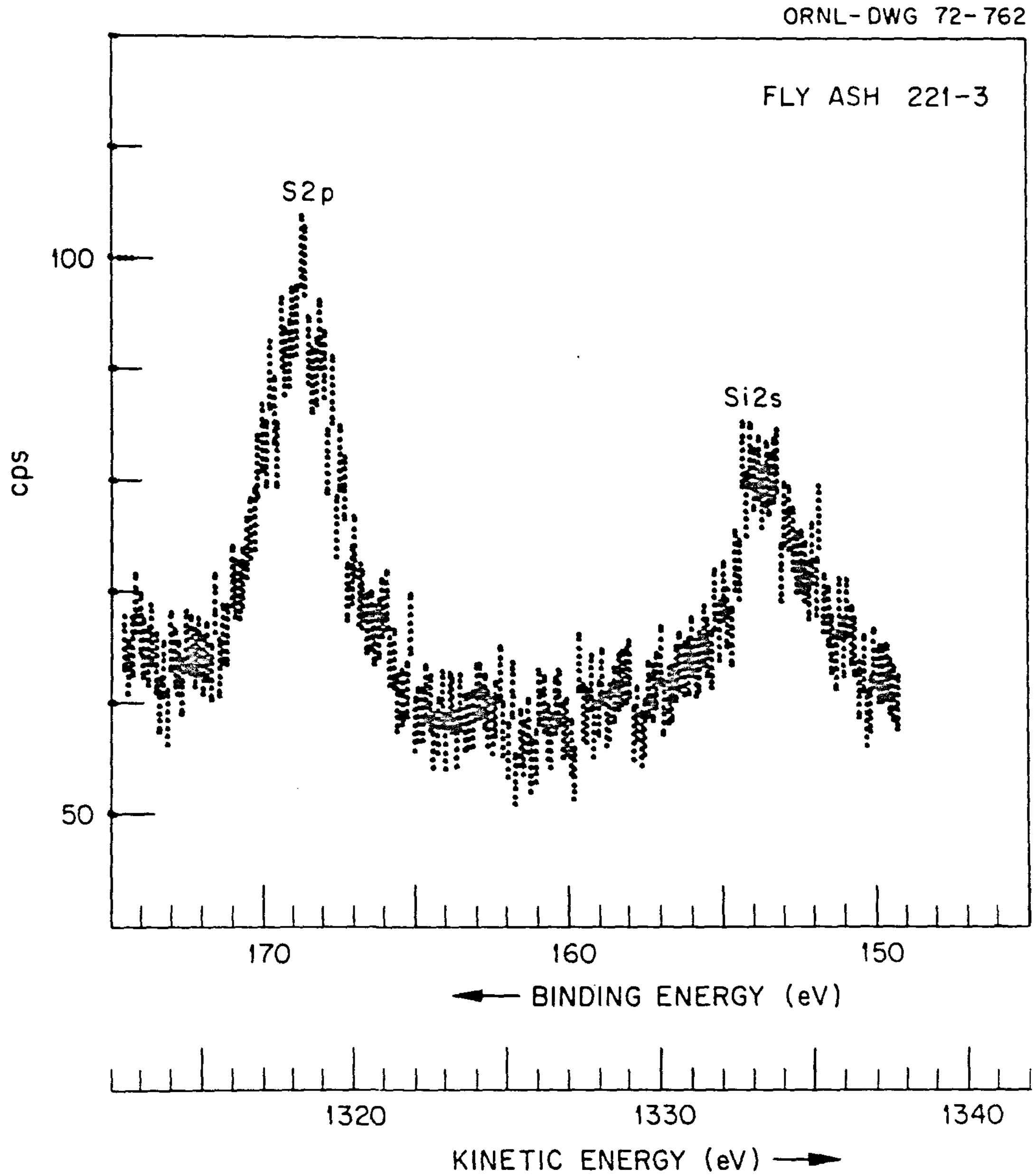

ORNL-DWG 72-762
FLY ASH 221-3
S2p
Si2s
cps
100
50
170
160
150
BINDING ENERGY (eV)
1320
1330
1340
KINETIC ENERGY (eV)

Figure D5

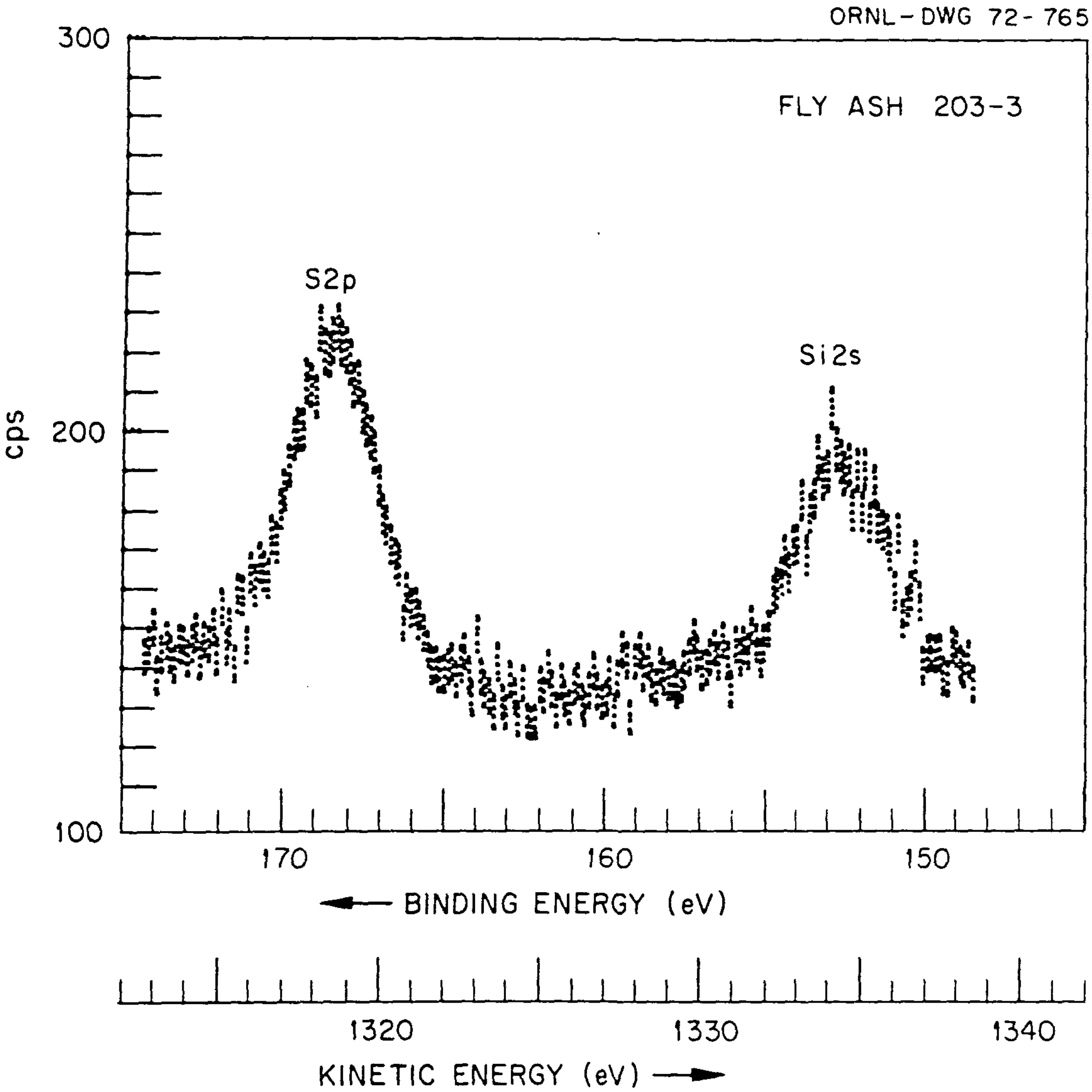

ORNL-DWG 72-765
FLY ASH 203-3
300
200
100
cps
S2p
Si2s
170
160
150
BINDING ENERGY (eV)
1320
1330
1340
KINETIC ENERGY (eV)

Figure D6

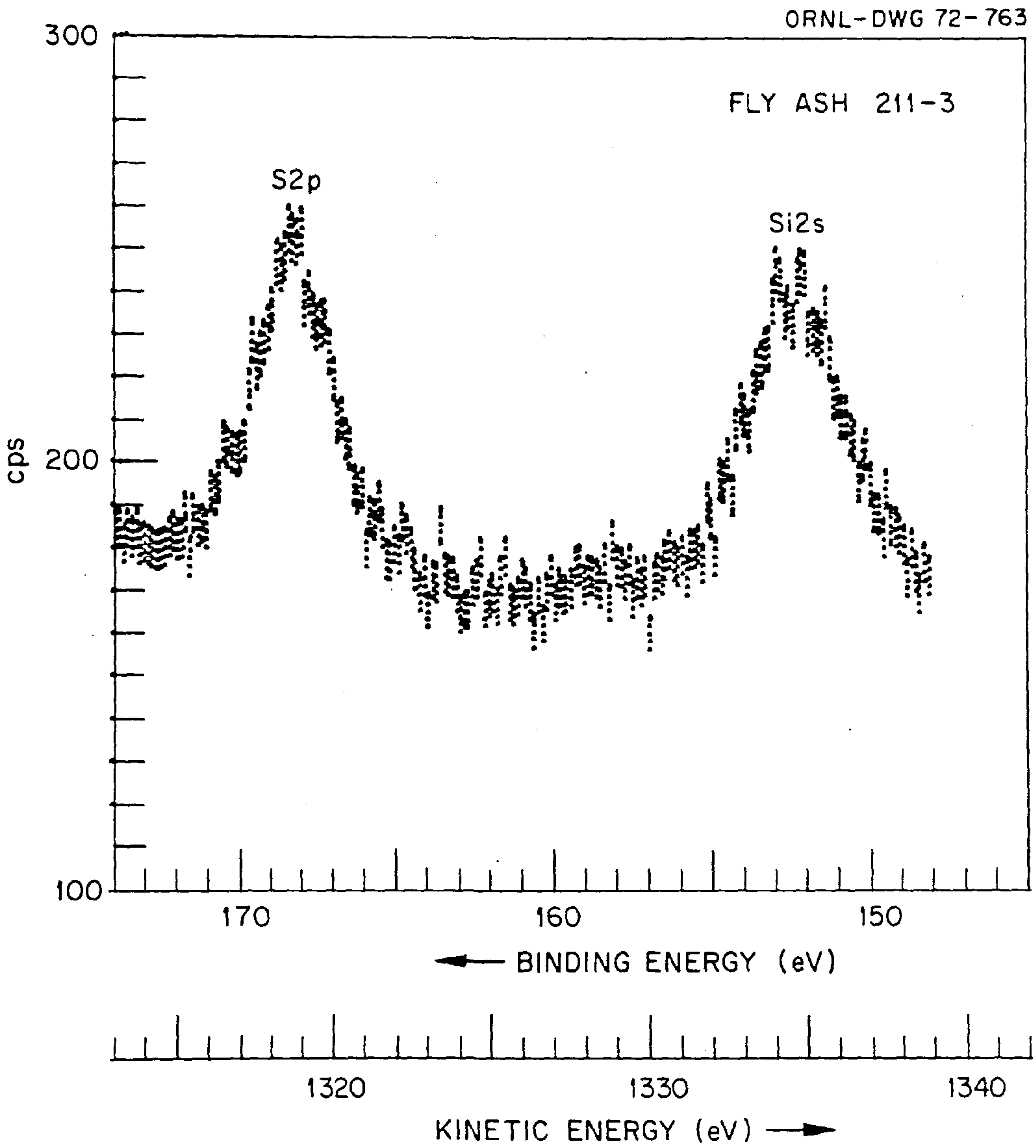

ORNL-DWG 72-763
FLY ASH 211-3
S2p
Si2s
300
200
100
cps
170
160
150
BINDING ENERGY (eV)
1320
1330
1340
KINETIC ENERGY (eV)

Figure D7

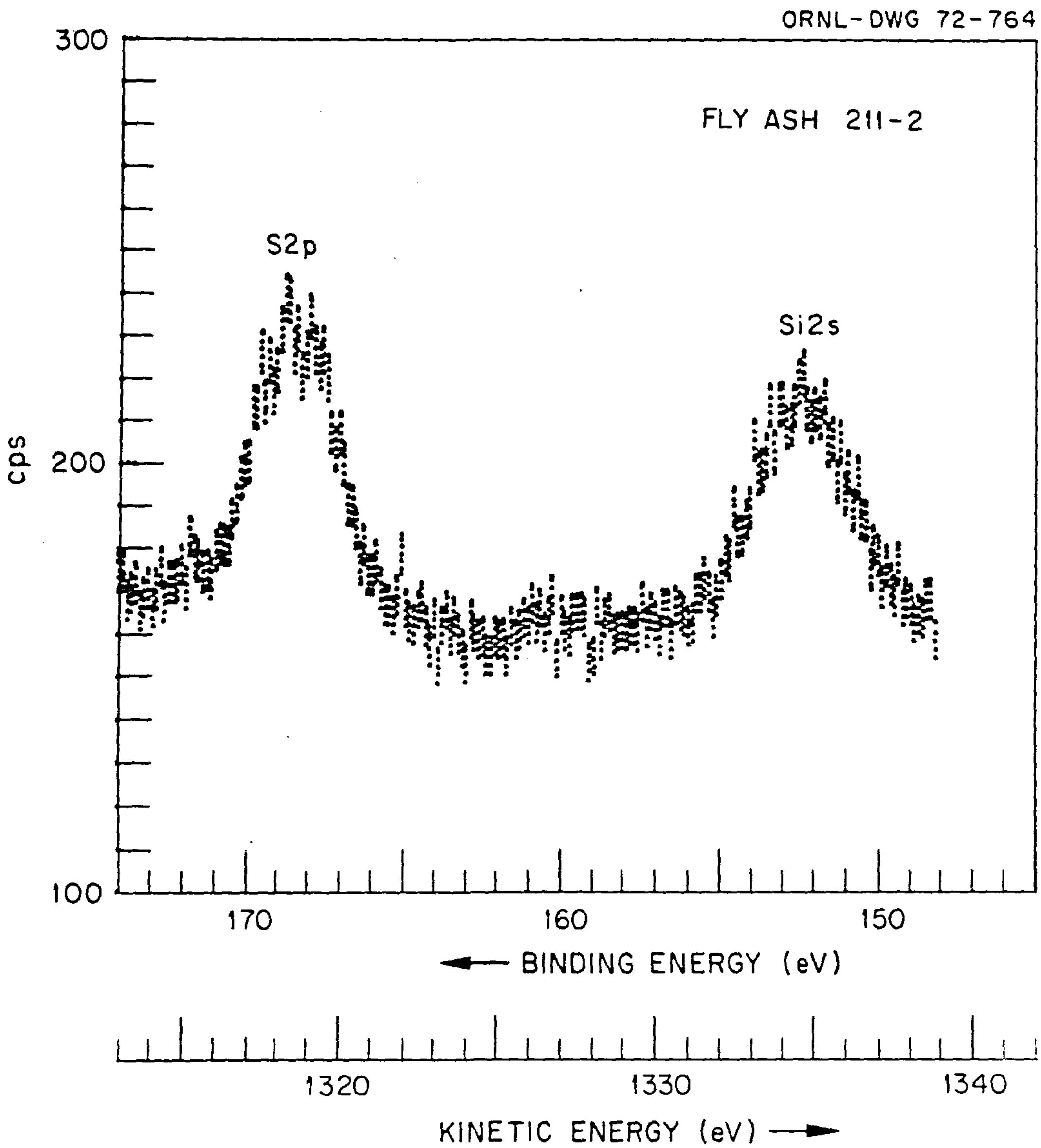

ORNL-DWG 72-764
FLY ASH 211-2
S2p
Si2s
cps
300
200
100
170
160
150
BINDING ENERGY (eV)
1320
1330
1340
KINETIC ENERGY (eV)

Figure D8

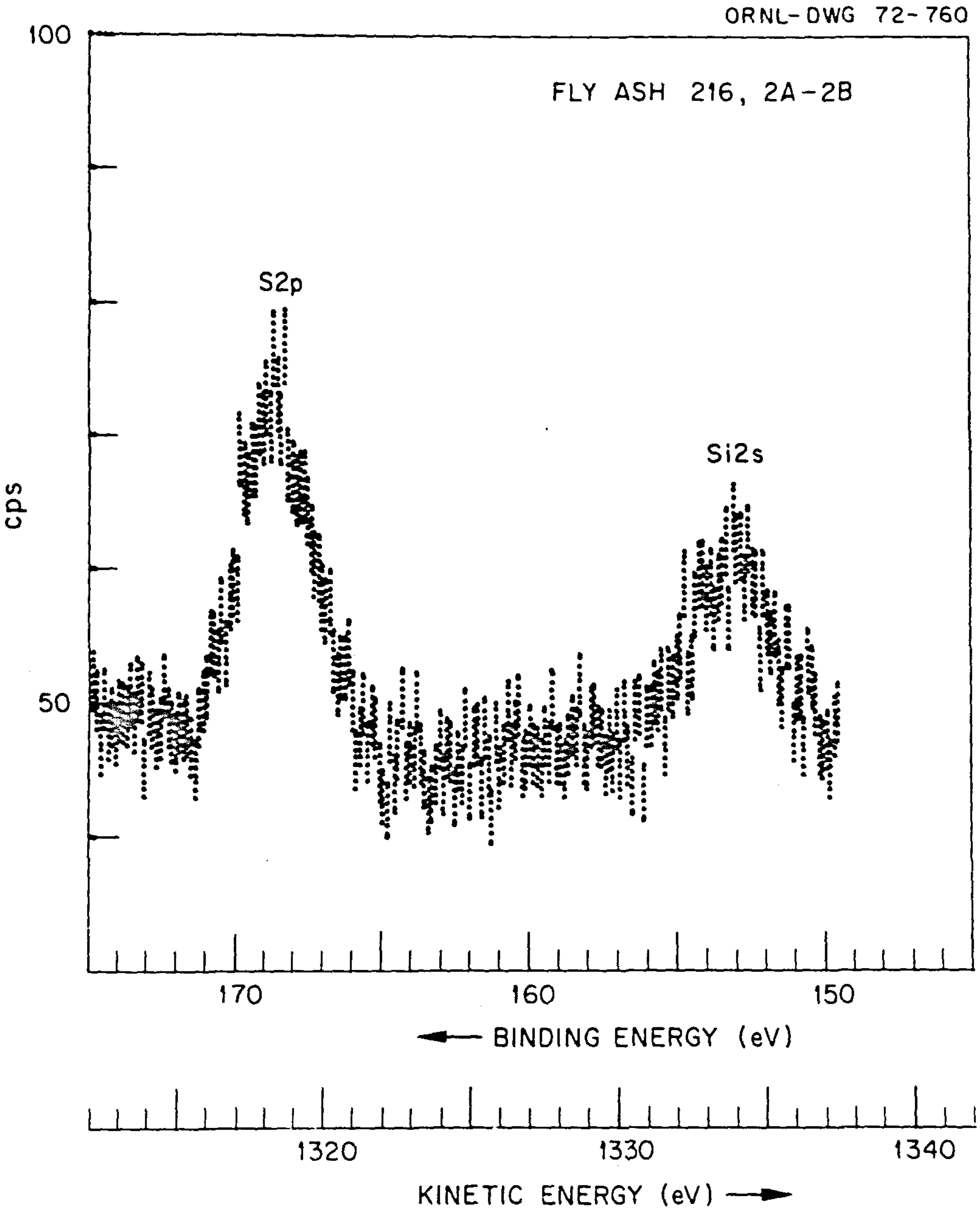

ORNL-DWG 72-760
100
FLY ASH 216, 2A-2B
S2p
Si2s
cps
50
170
160
150
BINDING ENERGY (eV)
1320
1330
1340
KINETIC ENERGY (eV)

Figure D9

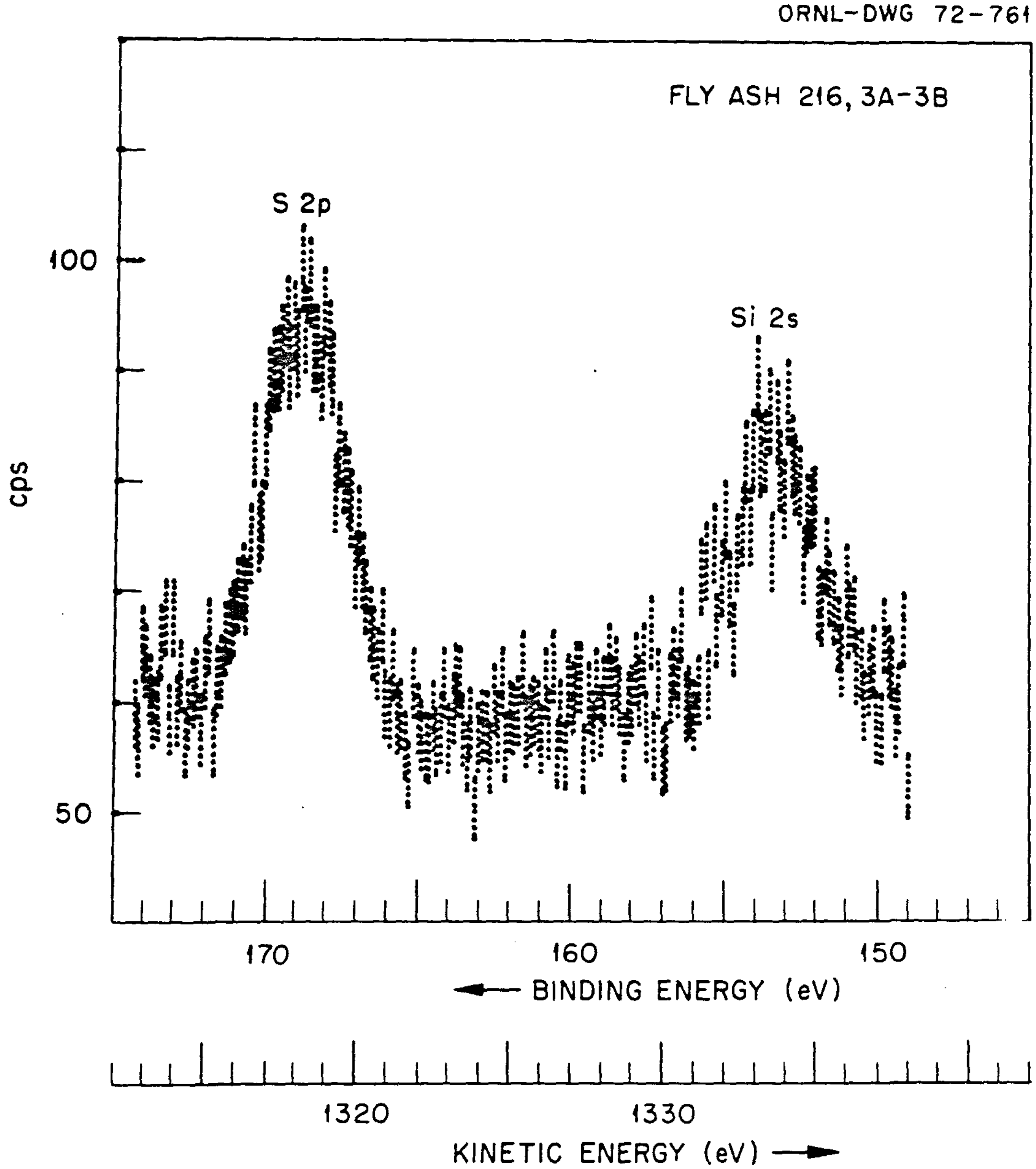

ORNL-DWG 72-761
FLY ASH 216, 3A-3B
S 2p
Si 2s
100
50
cps
170
160
150
BINDING ENERGY (eV)
1320
1330
KINETIC ENERGY (eV)

Figure D10

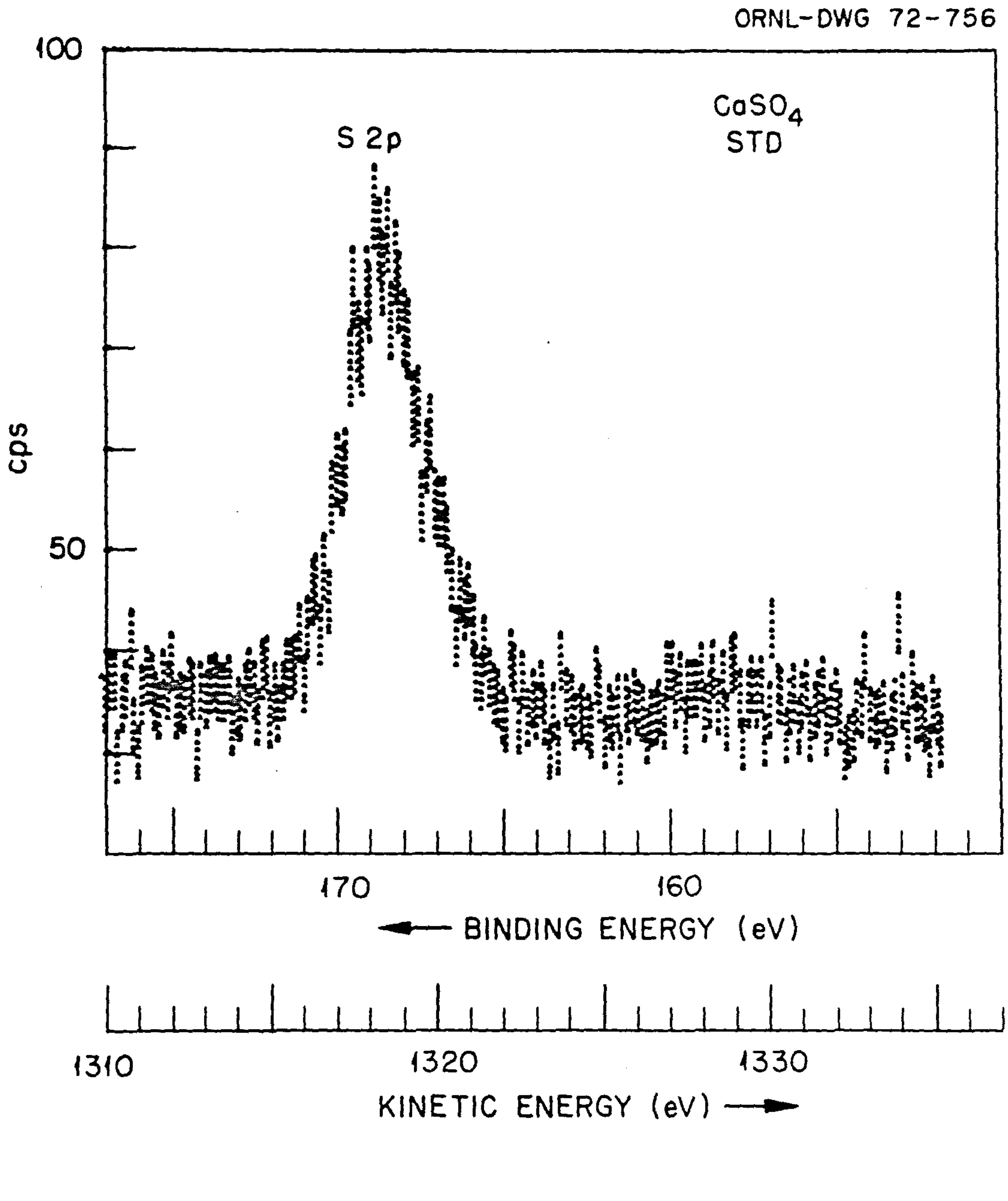

ORNL-DWG 72-756
100
50
cps
S 2p
CaSO4
STD
170
160
BINDING ENERGY (eV)
1310
1320
1330
KINETIC ENERGY (eV)

Figure D11

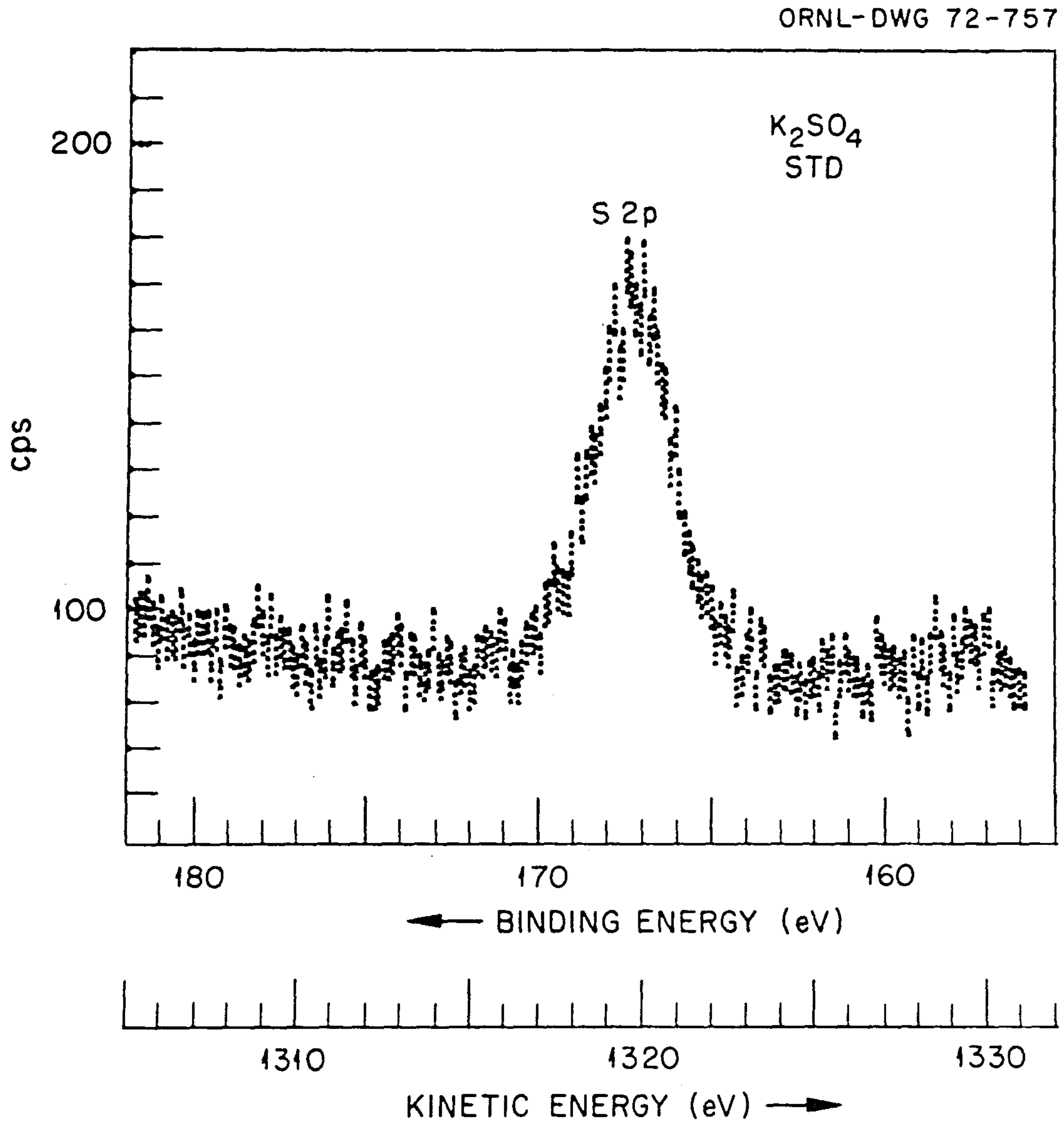

ORNL-DWG 72-757
K$_2$SO$_4$
STD
S 2p
200
100
cps
180
170
160
BINDING ENERGY (eV)
1310
1320
1330
KINETIC ENERGY (eV)

Figure D12

TABLE D1

FLY ASH SAMPLE NO.	52p BINDING ENERGY, ev	STANDARDS	52p BINDING ENERGY, ev
203-2	168.6	$CaSO_4$	168.6
206-2	168.1	$FeSO_4$	168.0
206-3	169.0	$Fe_2(SO_4)_3$	168.3
203-3	168.5	K_2SO_4	167.3
211-2	168.5	Na_2SO_3	165.8
211-3	168.2	S	164.3
216-3A-313	168.8	Na_2S	160.8
216-2A-2B	168.7		
221-3	168.8		
221-2	168.8		

DISCUSSION OF THE RESULTS OF SURFACE AREA MEASUREMENTS AND TOTAL SULFUR CONCENTRATION

The second column of Table D2 lists the surface areas (meters/gram) measured for each of the fly ash samples. The technique for measurement involved the adsorption of Krypton, using the theory of Brunauer, Emmett and Teller (BET) for interpreting the results. The second column lists the total concentration of sulfur (weight percent) for each sample. For this analysis, a weighed portion of the specimen was decomposed in a bomb with sodium metal. The H_2S produced was vented from the bomb, trapped, and measured titrimetrically.

The data in columns 2 and 3 of Table D2 were used to estimate the maximum degree to which the fly ash surfaces could be covered with absorbed sulfur compounds. To do this, it was assumed that the sulfur was entirely segregated at the surface and that it was in the form of calcium sulfate. For calcium sulfate the crystallographic unit cell dimensions are approximately 6.1 Å x 6.9 Å x 6.9 Å. Each unit cell contains four molecules of $CaSO_4$. With these assumptions, and the total sulfur concentration data, one can calculate the volume of $CaSO_4$ that would coat each specimen. Dividing by the respective surface areas, the average thickness of the surface layers is obtained. It will be assumed that a "monomolecular layer" is one unit cell length in thickness, about 6.5 Å (average of 6.1 Å and 6.9 Å). Dividing by this thickness, the surface coverages in monolayers are obtained. They are listed in column 4 of Table D2.

Thicknesses as great as those in Table D2 would cause the fly ash specimens to behave as if they were pure $CaSO_4$; and it appears that this is the case. If a comparison of the intensities (above background) for the S2p peaks of the fly ash specimens to those of the $CaSO_4$ and K_2SO_4 standards is made, it is found that they are approximately the same.* Because photoelectrons have a limited escape depth from solids, this technique is able to examine only very thin surface layers of specimens. The calculated thicknesses in Table D2 are, in most cases, greater than the escape depth.

*In comparing peak intensities, corrections must be made for changes in x-ray tube power. Some specimens were run at a power 50% lower than that used for the other specimens: 221-2, 216, 2A-2B; 216, 3A-3B; 221-3, $CaSO_4$.

TABLE D2

FLY ASH SAMPLE	BET SURFACE AREA, M^2/gm	TOTAL CONC. SULFUR, %	THICKNESS OF COVERAGE, MONOLAYERS
221-2	1.94	0.58	6
221-3	1.63	1.04	13
216-2A-2B	0.42	0.78	39
216-3A-3B	1.39	1.52	23
206-3	0.70	0.80	24
211-3	1.50	0.52	7
203-3	1.49	1.67	23
211-2	2.12	0.55	5
206-2	0.65	0.615	20
203-2	2.80	2.48	18

The calculated surface thickness in Table D2 is thus consistent with the assumption that almost all of the sulfate of the specimens is concentrated at the surface. The magnitude of the S2p peaks support this also. If the sulfate had been dispersed homogeneously in the solid phase, the photoelectron peaks would have been 20-40 times less intense.

OBSERVATIONS OF SILICON PEAKS

In Figures D4-D10, the Si 2S peak is presented along with the S2p peaks. In figures D13-D14 Si 2p peaks for two of the fly ash specimens are shown. The broadening of the silicon peaks toward lower binding energies suggests that there may be more than one chemical state present. The binding energy of the maximum of the peak corresponds to silicon as silicates or as SiO_2, but there may be lower oxidation states (silicon carbide?). The broadening could also be due to silicon being present in several types of glass phases. A firm statement cannot be made at this time about whether or not silicon is present in more than one chemical state. Further study is necessary to be sure that photoelectron peaks or Auger peaks[1] from other elements are not causing the broadening of the silicon peaks.

EXAMINATION OF FLY ASH SAMPLE NO. 203-2 BY INFRARED SPECTROSCOPY

Experiments were performed to establish the feasibility of obtaining information regarding the composition and nature of fly ash by a direct measurement of the infrared absorption spectrum. Sample No. 203-2 was mulled with nujol and spread on a AgBr window. The spectrum of this sample was measured with a Perkin-Elmer model 621 spectrophotometer and with a Digilab FTS-20 Fourier transform spectrophotometer. The results are shown in Figure D15. Spectrum A was recorded on the 621, and spectrum B was recorded using the FTS-20 system.

The absorption bands in the 450 cm^{-1}, 600 cm^{-1}, and 1000-1200 cm^{-1}, regions are due to SO_4^{2-} ion vibrations. The bands at 675, 730, 780, and 795 cm^{-1} may be due to CO_3^{2-} ion vibrations; a few additional experiments could confirm this assignment. These measurements show that infrared spectral studies with fly ash samples can provide rapid qualitative

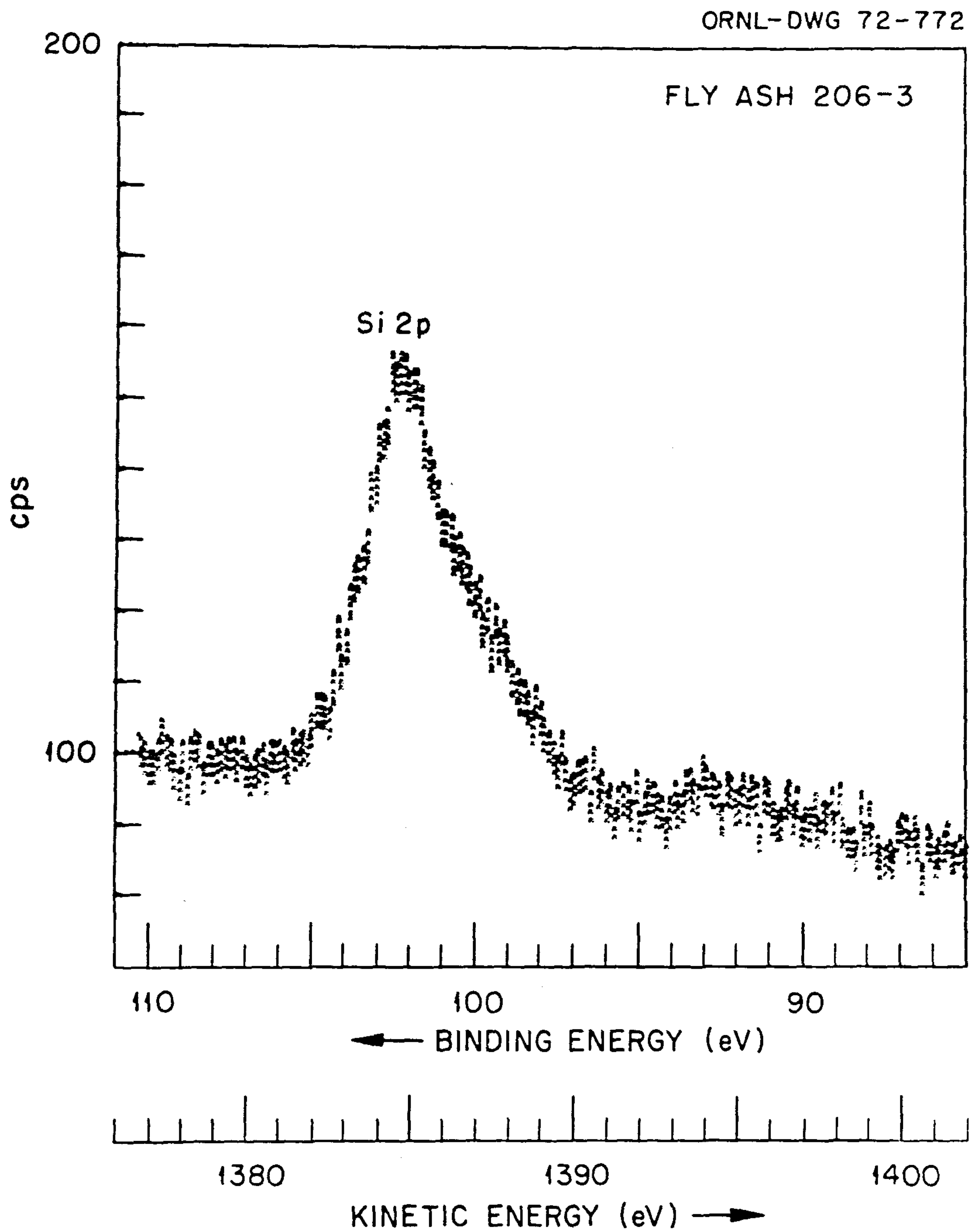

ORNL-DWG 72-772
FLY ASH 206-3
Si 2p
cps
200
100
110
100
90
BINDING ENERGY (eV)
1380
1390
1400
KINETIC ENERGY (eV)

Figure D13

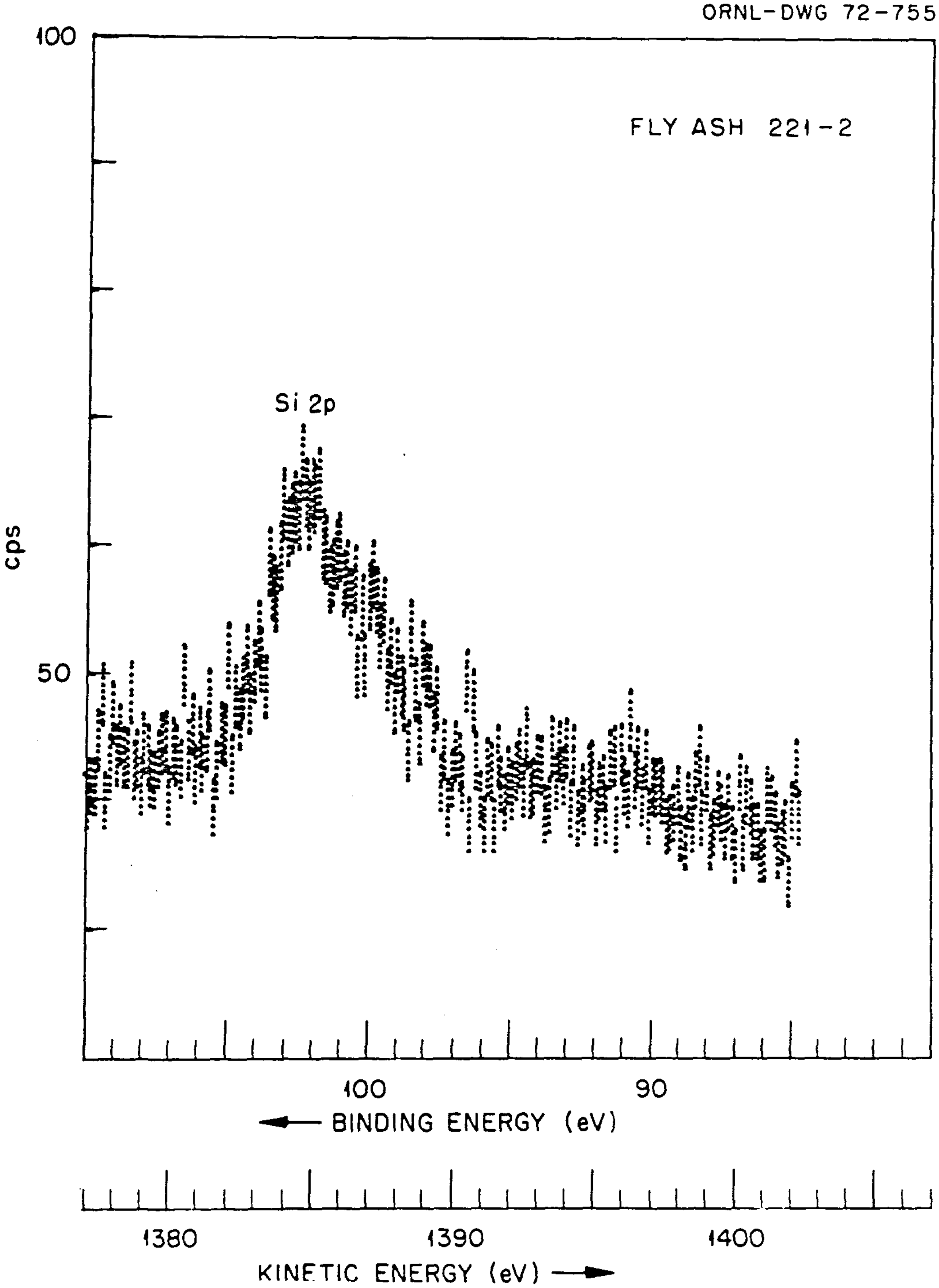

ORNL-DWG 72-755
FLY ASH 221-2
Si 2p
100
50
cps
100
90
BINDING ENERGY (eV)
1380
1390
1400
KINETIC ENERGY (eV)

Figure D14

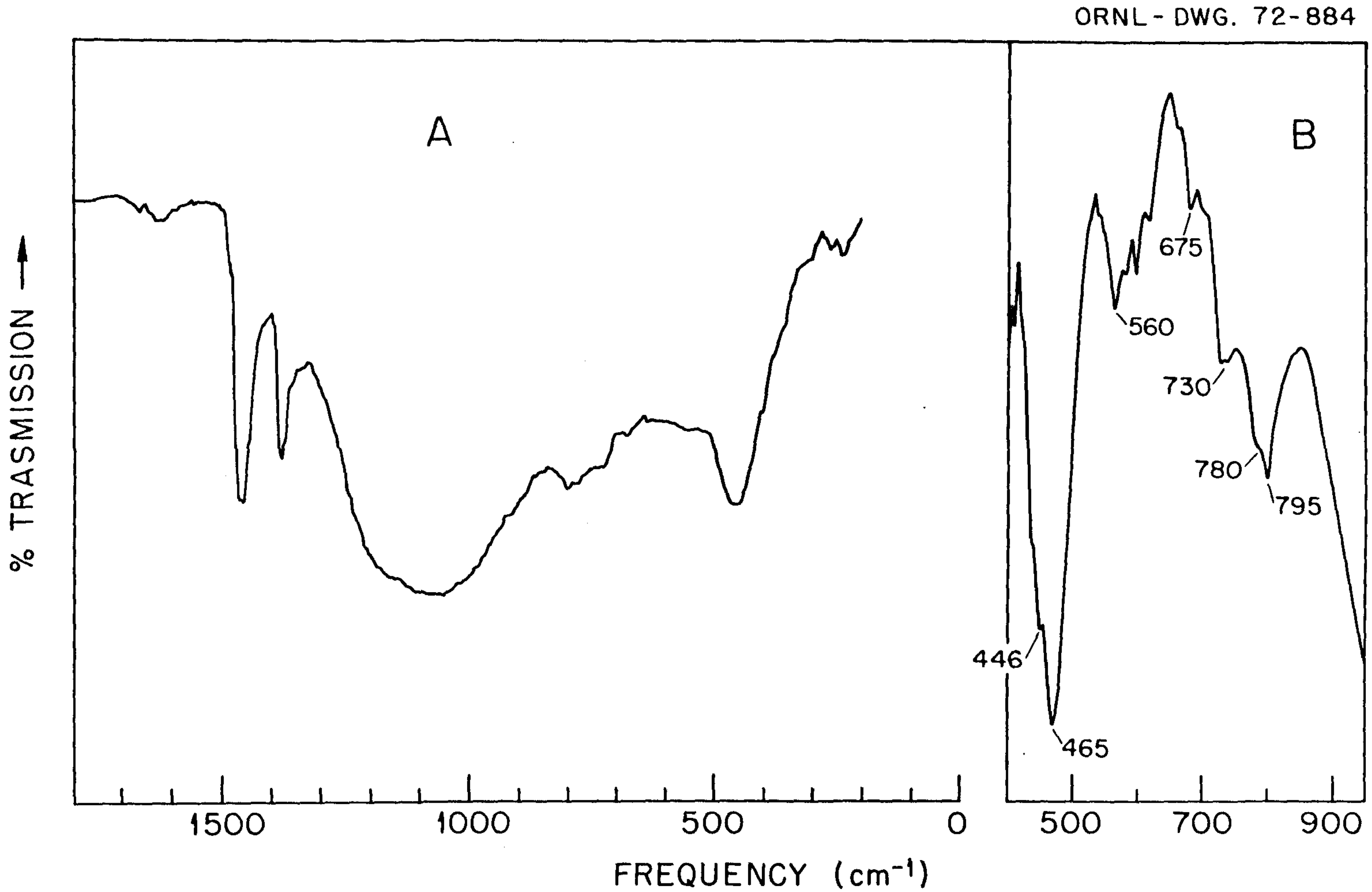

ORNL-DWG. 72-884
A
B
% TRASMISSION
675
560
730
780
795
446
465
1500
1000
500
0
500
700
900
FREQUENCY (cm-1)

Figure D15

answers as to composition. With some simple procedures in sample treatment, Raman spectroscopy could be applied as well in providing additional information.

REFERENCES

1. K. Siegbohn *et al*. *ESCA: Atomic Molecular and Solid State Structure* Studied by Means of Electron Spectroscopy (Almquist, Uppala, Sweden, 1967).

2. L. S. Hulett, R. A. Carlson, B. R. Fish, F. L. Durham, *Proceedings of the Symposium on Air Quality*, 161st National Meeting of ACS, Plenum Publishing Corp., New York, N. Y.

BIBLIOGRAPHIC DATA SHEET

1. Report No. EPA-R2-73-189	2.	3. Recipient's Accession No.	

4. Title and Subtitle

Baseline Measurement Test Results for the Cat-Ox Demonstration Program

5. Report Date: April 1973

6.

7. Author(s) J. Burton, G. Erskine, E. Jamgochian, J. Morris, R. Reale, and W. Wheaton

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

The Mitre Corporation
Westgate Research Park
McLean, Virginia 22101

10. Project/Task/Work Unit No.

11. Contract/Grant No. 68-02-0650 and IAG F192628-71-C-0002

12. Sponsoring Organization Name and Address

EPA, Office of Research and Monitoring
NERC/RTP, Control Systems Laboratory
Research Triangle Park, North Carolina 27711

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstracts The report summarizes the results of the Baseline Measurement Test conducted for the Cat-Ox Demonstration Program. The test was carried out on Steam Generator Unit No. 4 of the Wood River Station of the Illinois Power Company in November and December 1971. The report describes the measurement program for the test and procedures used to process: data output from the continuous measurement system; steam generator operating data; and data obtained from manual measurements. It also provides information on the data reduction system, and the contents of the data base used for baseline test calculations. It presents test results for: net and gross efficiency--varying load level, excess air, and fuel type; gas mass flow and gas volume flow--varying load level and fuel type; and grain loading--varying load level, fuel type, and the soot blowing cycle. It also presents results for an overall sulfur balance, and for comparing continuous measurement results with manual measurements and with theoretical values

17. Key Words and Document Analysis. 17a. Descriptors

Air Pollution
Boilers
Efficiency
Sulfur
Flue Gases
*Desulfurization
Measurement
Catalysis
Oxidation
Data Processing
Continuous Sampling

17b. Identifiers/Open-Ended Terms

Air Pollution Control
Stationary Sources
*Cat-Ox Process
*Baseline Measurement Test
Catalytic Oxidation
Manual Measurements

17c. COSATI Field/Group 13B

18. Availability Statement Unlimited	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages
	20. Security Class (This Page) UNCLASSIFIED	22. Price