Background Report Reference

AP-42 Section Number: 10.6.1

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Reference Number: 25

Title: Louisiana-Pacific Corporation Regenerative Thermal Oxidizer CO And Flow CEMS, Chilco, Idaho

Am Test-Air Quality, Inc.

September 1994

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PERFORMANCE SPECIFICATION TEST (PST) REPORT

September 29, 1994

Prepared For:

LOUISIANA-PACIFIC CORPORATION
REGENERATIVE THERMAL OXIDIZER
CO AND FLOW CEMS
CHILCO, IDAHO
SEPTEMBER 16, 1994

Submitted by:

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We certify that the information contained herein is accurate and complete to the best of our knowledge.

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1.0
INTRODUCTION

The purpose of this performance specification test (PST) was to verify acceptable performance of a Graseby STI continuous emission monitoring system (CEMS) and continuous emission rate monitoring system (CERMS) installed at the Regenerative Thermal Oxidizer (RTO) exhaust stack at Lousiana-Pacific Corporation's oriented strandboard manufacturing plant in Chilco, Idaho. The CEMS measures the concentration of carbon monoxide (CO) from the RTO exhaust stack. The CERMS incorporates a flow rate monitor to measure the exhaust gas flow rate.

Louisiana-Pacific contracted Am Test-Air Quality, Inc. based in Preston, Washington to conduct relative accuracy (RA) tests using Environmental Protection Agency (EPA) reference methods. The concentration of CO in the gas stream was measured concurrently by the Graseby STI CEMS, and by Am Test using EPA reference methods. The CEMS results were compared to the reference method results to calculate the relative accuracy of the CEMS using procedures described in the July 1, 1993 document Title 40, Code of Federal Regulations, Part 60 (40 CFR 60), Appendix B, Performance Specification 4 and 4A, "Specifications and Test Procedures for Carbon Monoxide Continuous Emission Monitoring Systems in Stationary Sources" and Performance Specification 6, "Specifications and Test Procedures for Continuous Emission Rate Monitoring Systems in Stationary Sources".

Am Test measured the concentration of CO in the stack gas using the EPA sampling and analysis method described in 40 CFR 60, Appendix A, Method 10. Method 10 was performed to measure the parts per million (ppm) carbon monoxide (CO) using a gas filter correlation non-dispersive infrared (NDIR) analyzer. EPA Methods 1, 2, 3A and 4 were also performed to calculate the stack gas airflow in units of actual cubic feet per minute (acf/min) to compare to the continuous flow rate monitor. EPA Methods 1 and 2 were performed to measure the gas velocity and temperature for calculating the volumetric flow rate. Method 3A was used to calculate the molecular weight of the stack gas. Method 4 was performed to measure the moisture content of the stack gas. A total of twelve (12) Method 1, 2, 3A, 4 and 10 tests were performed at the RTO exhaust stack on September 16, 1994.

Mr. Douglas M. Albertson and Mr. David A. Newman of Am Test-Air Quality, Inc. performed the field sampling. Data reduction, final report preparation and quality assurance review were performed by Mr. Kris A. Hansen, Ms. Angela F. Blaisdell, Ms. Amy M. Brotherton and Ms. Cassie B. Heaton of Am Test-Air Quality, Inc. Mr. Bob Schultz of Lousiana-Pacific's Engineering office in Haywood, Wisconsin coordinated this project. Mr. Mike Hermanson of Louisiana-Pacific (Chilco) provided Am Test with the CEMS data.

2.0

SUMMARY OF RESULTS

The following subsections of this report present relative accuracy comparisons for each component of the continuous emission rate monitoring system. Refer to the Table of Contents to locate specific information for each type of test. Computer printouts of the average emission concentration during the twelve (12) reference method tests are included in Appendix A of this report. Computer printouts of results for the individual moisture and airflow tests are included in Appendix A of this report in printouts titled, "Methods 1, 2, 3A and 4". The average reference method (RM) data were corrected for calibration drift during each test period. The bias corrected data are presented on printouts titled "Calibration Summary - Gaseous Emission Monitors". Copies of the Graseby STI CEMS outputs are included in Appendix B of this report along with opacity monitor certification data. Example calculations of the relative accuracy test results are included in Appendix C of this report, along with reference method field data sheets and copies of raw 1-minute RM data. Supporting information is included in Appendix D of this report.

2.1 Carbon Monoxide CEMS

The relative accuracy of the carbon monoxide (CO) analyzer in the continuous emission monitoring system (CEMS) installed to monitor emissions from the RTO exhaust stack was evaluated on September 16, 1994. Data from the Graseby STI CEMS were continuously recorded and 15-minute averages were calculated using a computerized data acquisition system. The data acquisition system records CO values on a dry parts per million (ppm) basis. Louisiana-Pacific provided Am Test with the CEMS 15-minute averages and Am Test personnel calculated the values for each reference method test period.

Am Test conducted a series of twelve (12) 30-minute Method 10 (CO) reference method (RM) tests on September 16, 1994. RM data were recorded once per minute, with a calibration check after every run. The relative accuracy of the CO CEMS was compared on an emission concentration basis of ppm on a dry basis. The RM CO data from runs 2-5, 7 and 9-12 were averaged ("best" 9 of 12), as were the corresponding CEMS CO data. The relative accuracy (RA) test results for the CO CEMS are summarized in Table 2.1 below and on the following computer printout titled "Relative Accuracy Test".

Table 2.1 Summary of the relative accuracy (RA) test results for the Thermo Environmental Model 48 carbon monoxide monitor installed at the RTO exhaust stack at Louisiana-Pacific Corporation's facility in Chilco, Idaho.

Parameter	Test Results	Specification
Relative Accuracy	18.7% of RM mean 0.6 ppm CO	≤ 10% of reference method mean, or 5% of the emission standard, or 5 ppm

Performance Specification 4, Section 2.3, states that the relative accuracy of CO CEMS must be no greater than 10% of the reference method mean, or 5% of the applicable standard, whichever is greater. Performance Specification 4A, Section 2.5, states that the relative accuracy of carbon monoxide CEMS must be no greater than 10% of the reference method mean, or 5 ppm difference, whichever is greater. The relative accuracy of this CEMS was 18.7% or a difference of 0.6 ppm CO.

AMTEST AIR QUALITY, INC.

RELATIVE ACCURACY TEST
AM TEST - AIR QUALITY, INC.

FILE NAME:	R309\LPCHILCO
CLIENT:	Louisiana-Pacific Corporation
LOCATION:	Chilco, Idaho
MONITOR LOCATION:	RTO Exhaust Stack
MONITOR DESCRIPTION:	Thermo Environmental Model 48 Carbon Monoxide (CO) Analyzer
DATE OF TESTS:	September 16, 1994

TEST #	CLOCK-TIME	REFERENCE METHOD CO ppm dry	CEMS READINGS CO ppm dry	DIFFERENCES Xi	DIFFERENCES Xi^2
2	1500-1530	3.6	3.0	-0.6	0.36
3	1545-1615	3.7	3.2	-0.5	0.25
4	1630-1700	3.8	3.5	-0.3	0.09
5	1715-1745	3.3	2.8	-0.5	0.25
7	1845-1915	3.2	2.5	-0.7	0.49
9	2015-2045	3.4	2.7	-0.7	0.49
10	2100-2130	2.9	2.5	-0.4	0.16
11	2145-2215	3.1	2.6	-0.5	0.25
12	2230-2300	3.5	2.9	-0.6	0.36
MEAN:		3.39	2.86	-0.53	
SUM OF THE SQUARED DIFFERENCES:					2.70
SUM OF THE DIFFERENCES SQUARED:				23.04	

CONFIDENCE COEFFICIENT:	0.1 ppm CO
RELATIVE ACCURACY:	18.7 % of reference method mean
RELATIVE ACCURACY:	0.6 ppm CO
SPECIFICATION:	< or = 10% of reference method mean or 5% of emission standard or 5 ppm difference

Runs 1, 6 and 8 were rejected.

2.2 Flow Rate Analyzer

The relative accuracy of the volumetric flow rate monitor in the continuous emission rate monitoring system (CERMS) installed at the RTO exhaust stack was evaluated on September 16, 1994. Data from the United Sciences flow rate monitor were continuously recorded and 15-minute averages were calculated using a computerized data acquisition system. The data acquisition system records the volumetric flow rate in units of thousand actual cubic feet per minute (kacfm). Louisiana-Pacific provided Am Test with the CEMS 15-minute averages and Am Test personnel calculated the values for each reference method test period.

Am Test conducted a series of twelve (12) 30-minute Method 1, 2, 3A and 4 reference method (RM) tests on September 16, 1994. The volumetric flow rate from runs 2-4, 6-8 and 10-12 were averaged ("best" 9 of 12), as were the corresponding CERMS flow rate measurements. The relative accuracy (RA) test results for the flow rate monitor are summarized in Table 2.2 below and on the following computer printout titled "Relative Accuracy Test".

Table 2.2 Summary of the relative accuracy (RA) test results for the United Sciences, Inc. Model 100 flow rate monitor installed at the RTO exhaust stack at Louisiana-Pacific Corporation's facility in Chilco, Idaho.

Parameter	Test Results	Specification
Relative Accuracy	2.3% of RM mean 3.6 kacf/min	$\leq$ 20% of mean value or 10% of the emission standard

Performance Specification 6, Section 3.3, states that the relative accuracy of the CERMS must be no greater than 20% of the reference method mean, or 10% of the emission standard, whichever is greater. The relative accuracy of this monitor was 2.3%.

AMTEST AIR QUALITY, INC

RELATIVE ACCURACY TEST
AM TEST-AIR QUALITY, INC.

FILE NAME: R313\LPFLOW2
CLIENT: Louisiana-Pacific Corporation
LOCATION: Chilco, Idaho
MONITOR LOCATION: RTO Exhaust Stack
MONITOR MANUFACTURER: United Sciences, Inc. Model 100
MONITOR DESCRIPTION: Flow Rate Monitor
DATE OF TESTS: September 16, 1994

TEST #	CLOCK-TIME	REFERENCE METHOD kacf/min	CEMS READINGS kacf/min	DIFFERENCES Xi	Xi^2
2	1500-1530	154.8	157.0	2.2	4.84
3	1545-1615	161.6	156.1	-5.5	30.25
4	1630-1700	156.1	155.5	-0.6	0.36
6	1800-1830	156.3	157.6	1.3	1.69
7	1845-1915	153.6	153.8	0.2	0.04
8	1930-2000	155.7	152.5	-3.2	10.24
10	2100-2130	152.6	149.5	-3.1	9.61
11	2145-2215	152.9	150.8	-2.1	4.41
12	2230-2300	151.9	148.2	-3.7	13.69
MEAN:		155.06	153.44	-1.61	
SUM OF THE SQUARED DIFFERENCES:					75.13
SUM OF THE DIFFERENCES SQUARED:				210.25	

CONFIDENCE COEFFICIENT: 2.0 kacf/min

RELATIVE ACCURACY: 2.3 % of reference method mean

RELATIVE ACCURACY: 3.6 kacf/min

SPECIFICATION: < or = 20% of reference method mean
or 10% of the emission standard

Runs 1, 5 and 9 were rejected.

3.0
PROJECT OVERVIEW/EXCEPTIONS

An acceptable leak check of less than 0.02 cfm at the highest vacuum rate (or greater) used during the test preceded and followed each Method 4. Acceptable bias checks were obtained for each gaseous emission test.

4.0 SOURCE AND CEMS DESCRIPTION

Louisiana-Pacific Corporation operates an oriented strandboard manufacturing plant in Chilco, Idaho. The plant is equipped with a natural gas fired Regenerative Thermal Oxidizer (RTO) to control emissions from the press and dryer. The production rate during the relative accuracy test was approximately 11 tons per hour (tph), which is an 84% production rate.

The CO analyzer utilized in the Graseby STI CEMS is a Thermo Environmental Instruments, Inc. Model 48 gas filter correlation non-dispersive infrared (NDIR) analyzer. The range of the analyzer is 0-50 parts per million (ppm). The analyzer is spanned with 45 ppm CO calibration gas.

The airflow monitor utilized in the CERMS is a United Sciences, Inc. Model 100 ultrasonic gas flow and temperature monitor. Flow values are calculated in thousand actual cubic feet per minute (kacfm).

5.0

SAMPLING AND ANALYSIS PROCEDURES

5.1 Methods 1 and 2 - Velocity, Temperature, and Airflow

EPA Method 1 procedures were used to assure that representative measurements of volumetric flow rate were obtained by dividing the cross-section of the stack or duct into a number of equal areas, and then locating a traverse point within each of the equal areas. Refer to the "Stack Schematic and Location of Sample Points" data sheet and/or the figure titled, "Location of Sampling Ports and Traverse Points", located in the appendices of this report, for a schematic of the stack and the point locations selected for testing. Method 2 was performed to measure the stack gas velocity using a type S or a standard pitot tube, and the gas temperature using a calibrated thermocouple probe connected to a digital thermocouple indicator. The type S pitot tubes were connected with tubing to an oil-filled inclined manometer, a hook gauge manometer or magnehelic gauges to obtain velocity measurements. The pitot tube lines were leak-checked and the pressure measurement device was leveled and zeroed prior to use. Calibration information for each pressure and temperature measurement device used are included in the appendices of this report.

5.2 EPA Method 3A - Molecular Weight

The stack gas composition was determined using EPA Method 3A procedures, which allow the use of instrumental analyzers. A paramagnetic analyzer was used to measure the percent (%) oxygen (O_2), a non-dispersive infrared (NDIR) analyzer was used to measure the % carbon dioxide (CO_2) and a gas filter correlation NDIR analyzer was used to measure the parts per million (ppm) carbon monoxide (CO). The manufacturer and model number for the specific analyzers used are detailed on the "Continuous Analyzer Checklist" in the appendices of this report. Certified O_2, CO_2 and CO gases were utilized to check the calibration of the instruments after each test. The O_2, CO_2 and CO data were used to calculate the molecular weight of the stack gas.

The Method 3A sample system is illustrated in the figure titled "EPA Method 3A, 6C, 7E and 10 Sample Train" in the appendices of this report. Also included in the appendices are specifications for the analyzers used along with copies of the certificates of analysis for the calibration gases used. An effluent gas sample was drawn through a stainless steel sampling probe and out-of-stack filter which were sufficiently heated to prevent condensation. A calibration valve was connected to the inlet of the probe for the purpose of introducing calibration gas to flood the probe. The gas sample passed through a refrigerator type moisture removal system which continuously removed condensate from the sample gas. A Teflon sample line was used to transport the gas sample to the continuous monitoring system. A Teflon coated leak-free pump was utilized to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system. A sample flow rate control valve and rotameter were used to maintain a constant sampling rate within 10 percent. Data from the instruments were recorded once per minute using a data acquisition system.

The combustion gas measurement system was assembled on-site and calibration gases were introduced and adjustments were made to calibrate the instrument. The sampling system components were adjusted to achieve appropriate sampling rates. Sampling was continuous, with a calibration check (calibrated upstream of the analyzers) at the end of every test run and a sampling system bias check (calibrated through the probe) at the end of every three (3) runs (maximum).

5.3 EPA Method 4 - Moisture

The sample train used for moisture sampling was an EPA Method 4 design as illustrated in the figure titled "Method 4 Sample Train" in the appendices of this report. The gas was pulled through a heated probe liner using a pump into an impinger train which was immersed in an ice water bath. The first impinger was a modified Greenburg-Smith type containing 100 milliliters of deionized water. The second Greenburg-Smith impinger also contained 100 ml of water. The third impinger was empty, and the fourth bubbler contained indicating silica gel desiccant to absorb any moisture from the stack gas before it entered the control box. The impinger section was maintained at a temperature below 68° F by keeping ice on the impingers. The temperature at the outlet of the silica gel bubbler was monitored to verify that it did not exceed 68° F during a test. Prior to each run, the sample train was leak-checked following the procedures in Method 5. Upon completion of each test, the probe was removed from the stack and a post-test leak check was performed.

The sample train was connected to a control box by means of an umbilical cord which contains a vacuum hose, pitot lines, thermocouple wires and a 4-wire electrical cord. The control box (meter box) is used to monitor stack conditions. The control box consists of a leak-free pump used to pull the gas through the sample train, fine and coarse metering valves to control the sampling rate, a vacuum gauge which measures the pressure drop from the sampling nozzle to the metering valves, and a calibrated dry gas meter readable to 0.001 cubic feet. The dry gas meter inlet and outlet temperatures were monitored by thermocouples which are connected to the multichannel thermocouple indicator. The dry gas meter calibration factor, Y, is determined by calibrating the meter against a standard laboratory dry gas meter.

Before and after each run, the impingers in the sample train were removed and weighed with a readability of 0.1 grams using an electronic top loading balance. The difference between the initial and final weights of the condenser section constitute the amount of moisture gained during the run.

5.4 EPA Method 10 - Carbon Monoxide Reference Method

Carbon monoxide (CO) reference method data were collected using Method 10, which is an instrumental method. A gas filter correlation non-dispersive infrared analyzer was used to measure the parts per million (ppm) CO on a dry basis. The manufacturer and model number for the specific analyzer used is detailed on the "Continuous Analyzer Checklist" included in the appendices of this report. Measurements from the instrument were recorded once per minute.

The Method 10 sample system is illustrated in the figure titled "EPA Method 3A, 6C, 7E and 10 Sample Train" in the appendices of this report. An effluent gas sample was drawn through the same sample conditioning system described for Method 3A testing. A linearity check was performed prior to sampling using zero, mid-range and high-range span gas. Sampling was continuous, with a calibration check using zero and span gas after each run.

6.0

QUALITY ASSURANCE PLAN

The purpose of the quality assurance plan is to provide guidelines for achieving quality control in air pollution measurements. The detailed procedures which are utilized are included in the Environmental Protection Agency's (EPA's) reference manual titled Quality Assurance Handbook for Air Pollution Measurement Systems, Volume 3, EPA-600/4-77-027b. These procedures are followed throughout equipment preparation, field sampling, sample recovery, analysis and data reduction. Am Test-Air Quality, Inc.'s quality assurance procedures are discussed below.

6.1 Calibration Procedures and Frequency

Field equipment utilized for on-site measurements is calibrated at a frequency recommended by the equipment manufacturer or industry practice. Prior to field use, each instrument is calibrated and the calibration value is recorded. If any measuring or test device requiring calibration cannot immediately be removed from service, the Project Manager may extend the calibration cycle providing a review of the equipment's history warrants the issuance of an extension. No equipment will be extended more than twice a calibration cycle, nor will the extension exceed one-half the prescribed calibration cycle. Test equipment consistently found to be out of calibration will be repaired or replaced.

The gaseous measurement systems are capable of meeting the system performance specifications detailed in 40 CFR 60, Appendix A, Method 6C, Section 4. For meeting these specifications, the analyzer's calibration error must be less than ± 2

percent of the span for the zero, mid-range, and high-range calibration gases. The sampling system bias must be less than ±5% of the span for the zero, and mid- or high-range calibration gases. The zero drift must be less than ±3% of the span over the period of each run. The calibration drift must be less than ±3% of the span over the period of each run. Copies of the certificates of analysis for each tank of calibration gas used are included in the appendices of this report. The calibration gases were analyzed following the EPA Traceability Protocol Number 1, or next best available. Purified nitrogen was utilized for the zero gas.

Support equipment is defined as all equipment, not previously discussed, that is required for completing an environmental monitoring or measurement task. This equipment may include storage and transportation containers, sample recovery glassware and communications gear. Support equipment is periodically inspected to maintain the performance standards necessary for proper and efficient execution of all tasks and responsibilities.

During a project, a systems audit is performed, consisting of an on-site qualitative inspection and review of the total measurement system. This inspection is conducted on a daily basis by the Project Leader. During the systems audit, the auditor observes the procedures and techniques of the field team in the following general areas:

- Setting up and leak testing the sample train
- Final leak check of the sample train
- Sample recovery

Visual inspections of pitot tubes, glassware, and other equipment are also made. The main purpose of a systems audit is to ensure that the measurement system will generate valid data, if operated properly.

6.2 Sample Recovery and Field Documentation

Data collected during each test, are immediately inspected for completeness and placed under the custody of the Project Leader until custody is transferred when the samples are returned to the Air Quality laboratory. Sample recovery is carried out in a suitable area free from particulate matter contamination. Each sample is assigned an identifying lab number to assist the chemists in tracking the sample.

6.3 Data Reduction, Validation and Reporting

Raw data are handled according to strict guidelines when being transposed into computer files or to other logs. The guidelines include document receipt control procedures, file review, and sign-off by a project assistant. Raw data are entered into the appropriate computer spreadsheet by a "processor", then the entered figures are checked for accuracy by a "checker", different from the "processor". Any mistakes are corrected, and figures are rechecked and signed off by the "checker". In addition, a by-hand calculation check of each spreadsheet is made using a hand-held calculator to validate the computer output. All data generated by each phase of a laboratory or field sampling program are reviewed by the senior reviewer. The data package is signed off by the senior reviewer prior to releasing the data for report preparation.

The test results are calculated according to EPA 40 CFR 60 criteria. Copies of the pertinent equations used to derive these results are included in the appendices of this report. Standard conditions are 68° F and 29.92 inches of mercury. The average values from instrumental analyzer readings were computed and bias corrected for each test period. The average gas effluent concentration was determined from the average gas concentration displayed by the analyzer, adjusted for the zero and upscale sampling system bias checks. Calculations are on a dry basis using the following equation:

$$C_{gas} = (C - C_o) * (C_{ma}/(C_m - C_o)$$

where:

C_{gas} = Effluent gas concentration, dry basis

C = Average gas concentration indicated by analyzer, dry basis

C_o = Average of initial and final system calibration bias check responses for the zero gas

C_{ma} = Actual concentration of the upscale calibration gas

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas

7.0
METHODOLOGY REFERENCES

EPA. Title 40 Code of Federal Regulations, Parts 53-60 (40 CFR 60), Appendix A, Reference Methods 1, 2, 3A, 4 and 10, and Appendix B, Performance Specifications 4, 4A and 6. July 1, 1993.

EPA. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume 3, EPA-60/4-77-027b.

APPENDIX A

Computer Printouts of Reference Method Data

AMTEST AIR QUALITY, INC.

SUMMARY OF RESULTS - METHODS 1, 2, 3A, 4 AND 10
AM TEST - AIR QUALITY, INC.

FILE NAME: R313\LPSUM
CLIENT: LOUISIANA-PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO

	RTO EXHAUST STACK											
	RUN #1	RUN #2	RUN #3	RUN #4	RUN #5	RUN #6	RUN #7	RUN #8	RUN #9	RUN #10	RUN #11	RUN #12
LAB #:	6650	6651	6652	6653	6654	6655	6656	6657	6658	6659	6660	6661
DATE:	9/16/94	9/16/94	9/16/94	9/16/94	9/16/94	9/16/94	9/16/94	9/16/94	9/16/94	9/16/94	9/16/94	9/16/94
START TIME:	14:15	15:00	15:45	16:30	17:15	18:00	18:45	19:30	20:15	21:00	21:45	22:30
STOP TIME:	14:45	15:30	16:15	17:00	17:45	18:30	19:15	20:00	20:45	21:30	22:15	23:00
SAMPLE LENGTH (minutes):	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
VOLUME SAMPLED (cubic feet):	25.282	25.282	23.346	23.346	21.898	21.898	21.139	21.139	20.933	20.933	20.027	20.027
VOLUME SAMPLED (dry std. cubic feet):	22.550	22.550	20.782	20.782	19.496	19.496	19.043	19.043	19.092	19.092	18.435	18.435
VOLUME SAMPLED (dry std. cubic meters):	0.639	0.639	0.589	0.589	0.552	0.552	0.539	0.539	0.541	0.541	0.522	0.522
STACK GAS MOISTURE (percent):	6.78	6.78	6.09	6.09	6.00	6.00	5.72	5.72	6.10	6.10	6.41	6.41
BAROMETRIC PRESURE (inches of Hg):	27.68	27.68	27.68	27.68	27.65	27.65	27.65	27.65	27.65	27.65	27.65	27.65
STATIC PRESSURE (inches of H2O):	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
STACK PRESSURE (inches of Hg):	27.64	27.64	27.64	27.64	27.61	27.61	27.61	27.61	27.61	27.61	27.61	27.61
STACK TEMPERATURE (degrees F.):	222.5	221.6	222.3	223.4	224.9	221.0	220.9	220.6	219.8	216.8	216.8	218.2
STACK TEMPERATURE (degrees R.):	682.5	681.6	682.3	683.4	684.9	681.0	680.9	680.6	679.8	676.8	676.8	678.2
CARBON DIOXIDE (percent):	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.8	0.9
OXYGEN (percent):	19.9	19.9	20.1	20.1	20.0	19.9	20.0	20.0	19.8	19.8	20.0	19.9
MOLECULAR WEIGHT (dry, lb/lb-mole):	28.94	28.94	28.93	28.93	28.93	28.92	28.93	28.93	28.94	28.94	28.93	28.94
MOLECULAR WEIGHT (wet, lb/lb-mole):	28.20	28.20	28.27	28.27	28.27	28.27	28.30	28.30	28.27	28.27	28.23	28.24
AVERAGE VELOCITY HEAD (inches of H2O):	0.641	0.594	0.648	0.603	0.638	0.606	0.587	0.603	0.597	0.581	0.583	0.574
PITOT TUBE Cp:	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
STACK GAS VELOCITY (feet/second):	53.8	51.7	54.0	52.1	53.7	52.2	51.3	52.0	51.8	51.0	51.1	50.8
STACK DIAMETER (inches):	95.63	95.63	95.63	95.63	95.63	95.63	95.63	95.63	95.63	95.63	95.63	95.63
STACK AREA (square feet):	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9
AIRFLOW (dry std. cubic feet per min.):	107305.6	103303.8	108501.9	104609.4	107529.4	105119.6	103668.7	105130.0	104282.8	103148.8	103058.3	102144.8
AIRFLOW (actual cubic feet per min.):	161052.6	154847.7	161608.3	156067.5	160792.9	156285.8	153639.5	155733.6	154917.7	152556.9	152937.8	151904.2
AIRFLOW (thousand actual cubic feet per min.):	161.1	154.8	161.6	156.1	160.8	156.3	153.6	155.7	154.9	152.6	152.9	151.9

METHOD 10 - CARBON MONOXIDE (CO)

CARBON MONOXIDE EMISSION CONCENTRATION (ppm):	3.8	3.6	3.7	3.8	3.3	3.4	3.2	3.4	3.4	2.9	3.1	3.5
CO EMISSION RATE (lb/hr):	1.8	1.6	1.8	1.7	1.5	1.6	1.4	1.6	1.5	1.3	1.4	1.6
CO EMISSION RATE (tons/yr):	7.8	7.1	7.7	7.6	6.8	6.8	6.3	6.8	6.8	5.7	6.1	6.8

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R1	LAB #:	6650
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	14:15 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	14:45 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	1 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
654.1	627.5	26.6
635.7	634.7	1.0
548.6	547.3	1.3
771.8	765.9	5.9

TOTAL H2O GAIN:	34.8
TOTAL VOLUME (SCF):	1.64
PERCENT MOISTURE:	6.78
Bws:	0.0678

PITOT TUBE Cp:	0.84
STACK DIAMETER:	95.63 inches
STACK AREA:	49.9 sq. feet
METER TEMPERATURE:	89.1 degrees F
BAROMETRIC PRES.:	27.68 inches Hg
STATIC PRESSURE:	-0.5 inches H2O
STACK PRESSURE:	27.64 inches Hg
ORIFICE PRESSURE:	1.0 inches H2O
METER PRESSURE:	27.75 inches Hg

INIT. METER VOLUME:	68.802	AVERAGE CONC. CO2:	0.9 percent
FINAL METER VOLUME:	94.084	AVERAGE CONC. O2:	19.9 percent
VOLUME SAMPLED:	25.282	AVERAGE CONC. CO:	3.8 ppm
STD VOLUME (DSCF):	22.550	MOLECULAR WEIGHT:	28.94 g/g-mole-dry
STD VOLUME (DSCM):	0.639	MOLECULAR WEIGHT:	28.20 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.111

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
S 1	0.76	210	W 1	0.64	223
2	0.90	216	2	0.68	224
3	0.84	228	3	0.74	219
4	0.62	222	4	0.62	221
5	0.64	219	5	0.66	225
6	0.56	222	6	0.64	230
7	0.52	223	7	0.52	229
8	0.50	224	8	0.50	225

STACK TEMPERATURE:	222.5 degrees F	682.5 degrees R
AVERAGE VELOCITY HEAD:	0.641 inches of H2O	
STACK GAS VELOCITY:		53.8 ft/sec
STACK GAS AIR FLOW:	161052.6 acf/min	107305.6 dscf/min

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R2	LAB #:	6651
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	15:00 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	15:30 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	2 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
654.1	627.5	26.6
635.7	634.7	1.0
548.6	547.3	1.3
771.8	765.9	5.9

TOTAL H2O GAIN:	34.8
TOTAL VOLUME (SCF):	1.64
PERCENT MOISTURE:	6.78
Bws:	0.0678

PITOT TUBE Cp:	0.84
STACK DIAMETER:	95.63 inches
STACK AREA:	49.9 sq. feet
METER TEMPERATURE:	89.1 degrees F
BAROMETRIC PRES.:	27.68 inches Hg
STATIC PRESSURE:	-0.5 inches H2O
STACK PRESSURE:	27.64 inches Hg
ORIFICE PRESSURE:	1.0 inches H2O
METER PRESSURE:	27.75 inches Hg

INIT. METER VOLUME:	68.802	AVERAGE CONC. CO2:	0.9 percent
FINAL METER VOLUME:	94.084	AVERAGE CONC. O2:	19.9 percent
VOLUME SAMPLED:	25.282	AVERAGE CONC. CO:	3.6 ppm
STD VOLUME (DSCF):	22.550	MOLECULAR WEIGHT:	28.94 g/g-mole-dry
STD VOLUME (DSCM):	0.639	MOLECULAR WEIGHT:	28.20 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.111

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
W 1	0.56	201	S 1	0.62	222
2	0.68	221	2	0.80	219
3	0.74	219	3	0.62	222
4	0.60	221	4	0.73	225
5	0.58	223	5	0.55	229
6	0.58	226	6	0.50	225
7	0.56	229	7	0.54	220
8	0.44	226	8	0.46	218

STACK TEMPERATURE:	221.6 degrees F	681.6 degrees R
AVERAGE VELOCITY HEAD:	0.594 inches of H2O	
STACK GAS VELOCITY:		51.7 ft/sec
STACK GAS AIR FLOW:	154847.7 acf/min	103303.8 dscf/min

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R3	LAB #:	6652
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	15:45 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	16:15 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	3 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
659.9	639.6	20.3
646.0	642.9	3.1
532.0	531.6	0.4
805.7	800.9	4.8

TOTAL H2O GAIN:	28.6
TOTAL VOLUME (SCF):	1.35
PERCENT MOISTURE:	6.09
Bws:	0.0609

PITOT TUBE Cp:	0.84
STACK DIAMETER:	95.63 inches
STACK AREA:	49.9 sq. feet
METER TEMPERATURE:	90.2 degrees F
BAROMETRIC PRES.:	27.68 inches Hg
STATIC PRESSURE:	-0.5 inches H2O
STACK PRESSURE:	27.64 inches Hg
ORIFICE PRESSURE:	1.0 inches H2O
METER PRESSURE:	27.75 inches Hg

INIT. METER VOLUME:	94.348	AVERAGE CONC. CO2:	0.8 percent
FINAL METER VOLUME:	117.694	AVERAGE CONC. O2:	20.1 percent
VOLUME SAMPLED:	23.346	AVERAGE CONC. CO:	3.7 ppm
STD VOLUME (DSCF):	20.782	MOLECULAR WEIGHT:	28.93 g/g-mole-dry
STD VOLUME (DSCM):	0.589	MOLECULAR WEIGHT:	28.27 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.000

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
S 1	0.75	216	W 1	0.62	202
2	0.76	216	2	0.80	214
3	0.85	218	3	0.70	221
4	0.72	222	4	0.62	224
5	0.52	225	5	0.60	231
6	0.58	226	6	0.62	230
7	0.62	229	7	0.58	229
8	0.48	231	8	0.60	223

STACK TEMPERATURE:	222.3 degrees F	682.3 degrees R
AVERAGE VELOCITY HEAD:	0.648 inches of H2O	
STACK GAS VELOCITY:		54.0 ft/sec
STACK GAS AIR FLOW:	161608.3 acf/min	108501.9 dscf/min

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R4	LAB #:	6653
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	16:30 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	17:00 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	4 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS				
FINAL grams	INITIAL grams	NET grams	PITOT TUBE Cp:	0.84
			STACK DIAMETER:	95.63 inches
			STACK AREA:	49.9 sq. feet
-----	-------	-----	METER TEMPERATURE:	90.2 degrees F
659.9	639.6	20.3	BAROMETRIC PRES.:	27.68 inches Hg
646.0	642.9	3.1	STATIC PRESSURE:	-0.5 inches H2O
532.0	531.6	0.4	STACK PRESSURE:	27.64 inches Hg
805.7	800.9	4.8	ORIFICE PRESSURE:	1.0 inches H2O
TOTAL H2O GAIN:		28.6	METER PRESSURE:	27.75 inches Hg
TOTAL VOLUME (SCF):		1.35		
PERCENT MOISTURE:		6.09		
Bws:		0.0609		

INIT. METER VOLUME:	94.348	AVERAGE CONC. CO2:	0.8 percent
FINAL METER VOLUME:	117.694	AVERAGE CONC. O2:	20.1 percent
VOLUME SAMPLED:	23.346	AVERAGE CONC. CO:	3.8 ppm
STD VOLUME (DSCF):	20.782	MOLECULAR WEIGHT:	28.93 g/g-mole-dry
STD VOLUME (DSCM):	0.589	MOLECULAR WEIGHT:	28.27 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.000

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
W 1	0.50	210	S 1	0.75	207
2	0.75	224	2	0.88	222
3	0.75	228	3	0.78	229
4	0.58	227	4	0.58	225
5	0.60	222	5	0.50	225
6	0.62	221	6	0.52	229
7	0.52	224	7	0.52	230
8	0.44	224	8	0.46	228

STACK TEMPERATURE:	223.4 degrees F	683.4 degrees R
AVERAGE VELOCITY HEAD:	0.603 inches of H2O	
STACK GAS VELOCITY:		52.1 ft/sec
STACK GAS AIR FLOW:	156067.5 acf/min	104609.4 dscf/min

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R5	LAB #:	6654
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	17:15 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	17:45 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	5 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
675.8	654.1	21.7
635.4	635.7	-0.3
549.2	548.6	0.6
776.2	771.8	4.4

TOTAL H2O GAIN:	26.4
TOTAL VOLUME (SCF):	1.24
PERCENT MOISTURE:	6.00
Bws:	0.0600

PITOT TUBE Cp:	0.84
STACK DIAMETER:	95.63 inches
STACK AREA:	49.9 sq. feet
METER TEMPERATURE:	89.5 degrees F
BAROMETRIC PRES.:	27.65 inches Hg
STATIC PRESSURE:	-0.5 inches H2O
STACK PRESSURE:	27.61 inches Hg
ORIFICE PRESSURE:	1.0 inches H2O
METER PRESSURE:	27.72 inches Hg

INIT. METER VOLUME:	117.856	AVERAGE CONC. CO2:	0.8 percent
FINAL METER VOLUME:	139.754	AVERAGE CONC. O2:	20.0 percent
VOLUME SAMPLED:	21.898	AVERAGE CONC. CO:	3.3 ppm
STD VOLUME (DSCF):	19.496	MOLECULAR WEIGHT:	28.93 g/g-mole-dry
STD VOLUME (DSCM):	0.552	MOLECULAR WEIGHT:	28.27 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.125

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
S 1	0.68	214	W 1	0.68	217
2	0.86	216	2	0.75	226
3	0.78	222	3	0.72	225
4	0.60	226	4	0.65	223
5	0.56	228	5	0.58	225
6	0.55	231	6	0.68	226
7	0.50	232	7	0.62	228
8	0.48	230	8	0.58	230

STACK TEMPERATURE:	224.9 degrees F	684.9 degrees R
AVERAGE VELOCITY HEAD:	0.638 inches of H2O	
STACK GAS VELOCITY:		53.7 ft/sec
STACK GAS AIR FLOW:	160792.9 acf/min	107529.4 dscf/min

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R6	LAB #:	6655
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	18:00 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	18:30 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	6 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
675.8	654.1	21.7
635.4	635.7	-0.3
549.2	548.6	0.6
776.2	771.8	4.4
TOTAL H2O GAIN:		26.4
TOTAL VOLUME (SCF):		1.24
PERCENT MOISTURE:		6.00
Bws:		0.0600

PITOT TUBE Cp:	0.84
STACK DIAMETER:	95.63 inches
STACK AREA:	49.9 sq. feet
METER TEMPERATURE:	89.5 degrees F
BAROMETRIC PRES.:	27.65 inches Hg
STATIC PRESSURE:	-0.5 inches H20
STACK PRESSURE:	27.61 inches Hg
ORIFICE PRESSURE:	1.0 inches H20
METER PRESSURE:	27.72 inches Hg

INIT. METER VOLUME:	117.856	AVERAGE CONC. CO2:	0.8 percent
FINAL METER VOLUME:	139.754	AVERAGE CONC. O2:	19.9 percent
VOLUME SAMPLED:	21.898	AVERAGE CONC. CO:	3.4 ppm
STD VOLUME (DSCF):	19.496	MOLECULAR WEIGHT:	28.92 g/g-mole-dry
STD VOLUME (DSCM):	0.552	MOLECULAR WEIGHT:	28.27 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.250

SAMPLE POINT	VELOCITY " H20	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H20	TEMPERATURE °F
W 1	0.48	215	S 1	0.64	210
2	0.72	217	2	0.80	222
3	0.68	226	3	0.80	225
4	0.58	225	4	0.60	227
5	0.58	220	5	0.54	220
6	0.62	220	6	0.54	219
7	0.62	222	7	0.50	221
8	0.60	224	8	0.46	223

STACK TEMPERATURE:	221.0 degrees F	681.0 degrees R
AVERAGE VELOCITY HEAD:	0.606 inches of H20	
STACK GAS VELOCITY:		52.2 ft/sec
STACK GAS AIR FLOW:	156285.8 acf/min	105119.6 dscf/min

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R7	LAB #:	6656
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	18:45 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	19:15 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	7 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
653.5	659.9	-6.4
668.6	646.0	22.6
536.1	532.0	4.1
809.9	805.7	4.2

TOTAL H2O GAIN:	24.5
TOTAL VOLUME (SCF):	1.16
PERCENT MOISTURE:	5.72
Bws:	0.0572

PITOT TUBE Cp:	0.84
STACK DIAMETER:	95.63 inches
STACK AREA:	49.9 sq. feet
METER TEMPERATURE:	83.1 degrees F
BAROMETRIC PRES.:	27.65 inches Hg
STATIC PRESSURE:	-0.5 inches H2O
STACK PRESSURE:	27.61 inches Hg
ORIFICE PRESSURE:	1.0 inches H2O
METER PRESSURE:	27.72 inches Hg

INIT. METER VOLUME:	140.040	AVERAGE CONC. CO2:	0.8 percent
FINAL METER VOLUME:	161.179	AVERAGE CONC. O2:	20.0 percent
VOLUME SAMPLED:	21.139	AVERAGE CONC. CO:	3.2 ppm
STD VOLUME (DSCF):	19.043	MOLECULAR WEIGHT:	28.93 g/g-mole-dry
STD VOLUME (DSCM):	0.539	MOLECULAR WEIGHT:	28.30 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.125

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
S 1	0.70	216	W 1	0.58	209
2	0.80	224	2	0.72	221
3	0.72	226	3	0.58	227
4	0.65	221	4	0.58	221
5	0.56	219	5	0.62	219
6	0.48	220	6	0.58	221
7	0.46	222	7	0.56	223
8	0.42	222	8	0.45	223

STACK TEMPERATURE:	220.9 degrees F	680.9 degrees R
AVERAGE VELOCITY HEAD:	0.587 inches of H2O	
STACK GAS VELOCITY:		51.3 ft/sec
STACK GAS AIR FLOW:	153639.5 acf/min	103668.7 dscf/min

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R8	LAB #:	6657
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	19:30 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	20:00 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	8 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
653.5	659.9	-6.4
668.6	646.0	22.6
536.1	532.0	4.1
809.9	805.7	4.2

TOTAL H2O GAIN:	24.5
TOTAL VOLUME (SCF):	1.16
PERCENT MOISTURE:	5.72
Bws:	0.0572

PITOT TUBE Cp:	0.84
STACK DIAMETER:	95.63 inches
STACK AREA:	49.9 sq. feet
METER TEMPERATURE:	83.1 degrees F
BAROMETRIC PRES.:	27.65 inches Hg
STATIC PRESSURE:	-0.5 inches H2O
STACK PRESSURE:	27.61 inches Hg
ORIFICE PRESSURE:	1.0 inches H2O
METER PRESSURE:	27.72 inches Hg

INIT. METER VOLUME:	140.040	AVERAGE CONC. CO2:	0.8 percent
FINAL METER VOLUME:	161.179	AVERAGE CONC. O2:	20.0 percent
VOLUME SAMPLED:	21.139	AVERAGE CONC. CO:	3.4 ppm
STD VOLUME (DSCF):	19.043	MOLECULAR WEIGHT:	28.93 g/g-mole-dry
STD VOLUME (DSCM):	0.539	MOLECULAR WEIGHT:	28.30 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.125

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
W 1	0.70	210	S 1	0.72	214
2	0.66	217	2	0.72	220
3	0.60	219	3	0.85	216
4	0.62	221	4	0.68	217
5	0.52	225	5	0.48	220
6	0.58	228	6	0.55	222
7	0.60	227	7	0.48	223
8	0.50	224	8	0.46	226

STACK TEMPERATURE:	220.6 degrees F	680.6 degrees R
AVERAGE VELOCITY HEAD:	0.603 inches of H2O	
STACK GAS VELOCITY:		52.0 ft/sec
STACK GAS AIR FLOW:	155733.6 acf/min	105130.0 dscf/min

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R9	LAB #:	6658
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	20:15 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	20:45 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	9 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
686.3	675.8	10.5
644.8	635.4	9.4
549.7	549.2	0.5
782.1	776.2	5.9

TOTAL H2O GAIN:	26.3
TOTAL VOLUME (SCF):	1.24
PERCENT MOISTURE:	6.10
Bws:	0.0610

PITOT TUBE Cp:	0.84
STACK DIAMETER:	95.63 inches
STACK AREA:	49.9 sq. feet
METER TEMPERATURE:	76.4 degrees F
BAROMETRIC PRES.:	27.65 inches Hg
STATIC PRESSURE:	-0.5 inches H20
STACK PRESSURE:	27.61 inches Hg
ORIFICE PRESSURE:	1.0 inches H20
METER PRESSURE:	27.72 inches Hg

INIT. METER VOLUME:	161.568	AVERAGE CONC. CO2:	0.9 percent
FINAL METER VOLUME:	182.501	AVERAGE CONC. O2:	19.8 percent
VOLUME SAMPLED:	20.933	AVERAGE CONC. CO:	3.4 ppm
STD VOLUME (DSCF):	19.092	MOLECULAR WEIGHT:	28.94 g/g-mole-dry
STD VOLUME (DSCM):	0.541	MOLECULAR WEIGHT:	28.27 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.222

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
S 1	0.66	213	W 1	0.62	213
2	0.76	216	2	0.75	215
3	0.66	219	3	0.72	216
4	0.68	221	4	0.60	219
5	0.52	225	5	0.56	219
6	0.48	226	6	0.58	223
7	0.48	225	7	0.60	224
8	0.50	219	8	0.44	223

STACK TEMPERATURE:	219.8 degrees F	679.8 degrees R
AVERAGE VELOCITY HEAD:	0.597 inches of H2O	
STACK GAS VELOCITY:		51.8 ft/sec
STACK GAS AIR FLOW:	154917.7 acf/min	104282.8 dscf/min

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R10	LAB #:	6659
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	21:00 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	21:30 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	10 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS				
FINAL grams	INITIAL grams	NET grams	PITOT TUBE Cp:	0.84
			STACK DIAMETER:	95.63 inches
			STACK AREA:	49.9 sq. feet
-----	-------	-----	METER TEMPERATURE:	76.4 degrees F
686.3	675.8	10.5	BAROMETRIC PRES.:	27.65 inches Hg
644.8	635.4	9.4	STATIC PRESSURE:	-0.5 inches H2O
549.7	549.2	0.5	STACK PRESSURE:	27.61 inches Hg
782.1	776.2	5.9	ORIFICE PRESSURE:	1.0 inches H2O
TOTAL H2O GAIN:		26.3	METER PRESSURE:	27.72 inches Hg
TOTAL VOLUME (SCF):		1.24		
PERCENT MOISTURE:		6.10		
Bws:		0.0610		

INIT. METER VOLUME:	161.568	AVERAGE CONC. CO2:	0.9 percent
FINAL METER VOLUME:	182.501	AVERAGE CONC. O2:	19.8 percent
VOLUME SAMPLED:	20.933	AVERAGE CONC. CO:	2.9 ppm
STD VOLUME (DSCF):	19.092	MOLECULAR WEIGHT:	28.94 g/g-mole-dry
STD VOLUME (DSCM):	0.541	MOLECULAR WEIGHT:	28.27 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.222

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
W 1	0.62	210	S 1	0.56	205
2	0.58	213	2	0.82	216
3	0.70	213	3	0.74	221
4	0.55	217	4	0.62	218
5	0.50	219	5	0.52	215
6	0.58	222	6	0.55	215
7	0.58	224	7	0.50	218
8	0.52	224	8	0.42	218

STACK TEMPERATURE:	216.8 degrees F	676.8 degrees R
AVERAGE VELOCITY HEAD:	0.581 inches of H2O	
STACK GAS VELOCITY:		51.0 ft/sec
STACK GAS AIR FLOW:	152556.9 acf/min	103148.8 dscf/min

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METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R11	LAB #:	6660
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	21:45 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	22:15 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	11 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS				
FINAL grams	INITIAL grams	NET grams	PITOT TUBE Cp:	0.84
			STACK DIAMETER:	95.63 inches
			STACK AREA:	49.9 sq. feet
			METER TEMPERATURE:	71.5 degrees F
573.1	653.5	-80.4	BAROMETRIC PRES.:	27.65 inches Hg
768.5	668.6	99.9	STATIC PRESSURE:	-0.5 inches H2O
536.3	536.1	0.2	STACK PRESSURE:	27.61 inches Hg
817.0	809.9	7.1	ORIFICE PRESSURE:	1.0 inches H2O
TOTAL H2O GAIN:		26.8	METER PRESSURE:	27.72 inches Hg
TOTAL VOLUME (SCF):		1.26		
PERCENT MOISTURE:		6.41		
Bws:		0.0641		

INIT. METER VOLUME:	182.871	AVERAGE CONC. CO2:	0.8 percent
FINAL METER VOLUME:	202.898	AVERAGE CONC. O2:	20.0 percent
VOLUME SAMPLED:	20.027	AVERAGE CONC. CO:	3.1 ppm
STD VOLUME (DSCF):	18.435	MOLECULAR WEIGHT:	28.93 g/g-mole-dry
STD VOLUME (DSCM):	0.522	MOLECULAR WEIGHT:	28.23 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.125

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
S 1	0.62	212	W 1	0.58	200
2	0.76	215	2	0.78	206
3	0.72	221	3	0.70	213
4	0.60	224	4	0.54	217
5	0.48	222	5	0.56	219
6	0.52	219	6	0.58	224
7	0.50	216	7	0.56	224
8	0.44	214	8	0.46	222

STACK TEMPERATURE:	216.8 degrees F	676.8 degrees R
AVERAGE VELOCITY HEAD:	0.583 inches of H20	
STACK GAS VELOCITY:		51.1 ft/sec
STACK GAS AIR FLOW:	152937.8 acf/min	103058.3 dscf/min

METHODS 1, 2, 3A AND 4
AM TEST-AIR QUALITY, INC.

FILE NAME:	R312\LPM4R12	LAB #:	6661
CLIENT:	LOUISIANA-PACIFIC CORP.	START TIME:	22:30 o'clock
LOCATION:	CHILCO, IDAHO	STOP TIME:	23:00 o'clock
SAMPLE SITE:	RTO EXHAUST STACK	SAMPLE LENGTH:	30.0 minutes
SAMPLE DATE:	SEPTEMBER 16, 1994		
RUN #:	12 - METHOD 4		
OPERATORS:	ALBERTSON/NEWMAN		

IMPINGER WEIGHTS

FINAL grams	INITIAL grams	NET grams
573.1	653.5	-80.4
768.5	668.6	99.9
536.3	536.1	0.2
817.0	809.9	7.1

TOTAL H2O GAIN:	26.8
TOTAL VOLUME (SCF):	1.26
PERCENT MOISTURE:	6.41
Bws:	0.0641

PITOT TUBE Cp:	0.84
STACK DIAMETER:	95.63 inches
STACK AREA:	49.9 sq. feet
METER TEMPERATURE:	71.5 degrees F
BAROMETRIC PRES.:	27.65 inches Hg
STATIC PRESSURE:	-0.5 inches H2O
STACK PRESSURE:	27.61 inches Hg
ORIFICE PRESSURE:	1.0 inches H2O
METER PRESSURE:	27.72 inches Hg

INIT. METER VOLUME:	182.871	AVERAGE CONC. CO2:	0.9 percent
FINAL METER VOLUME:	202.898	AVERAGE CONC. O2:	19.9 percent
VOLUME SAMPLED:	20.027	AVERAGE CONC. CO:	3.5 ppm
STD VOLUME (DSCF):	18.435	MOLECULAR WEIGHT:	28.94 g/g-mole-dry
STD VOLUME (DSCM):	0.522	MOLECULAR WEIGHT:	28.24 g/g-mole-wet
Y FACTOR:	1.000	Fo FACTOR:	1.111

SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F	SAMPLE POINT	VELOCITY " H2O	TEMPERATURE °F
W 1	0.48	218	S 1	0.66	214
2	0.72	213	2	0.66	217
3	0.64	215	3	0.80	217
4	0.58	217	4	0.64	216
5	0.58	218	5	0.44	218
6	0.60	221	6	0.50	218
7	0.54	224	7	0.52	221
8	0.45	223	8	0.45	221

STACK TEMPERATURE:	218.2 degrees F	678.2 degrees R
AVERAGE VELOCITY HEAD:	0.574 inches of H2O	
STACK GAS VELOCITY:		50.8 ft/sec
STACK GAS AIR FLOW:	151904.2 acf/min	102144.8 dscf/min

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL-1
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 1 - METHODS 3A AND 10
SAMPLE TIMES: 14:15-14:45

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.1	0.1	6.0	5.8	5.99	0.1	5.9	1.0
Oxygen (O2)	%	0.1	0.1	15.0	15.0	15.05	0.1	15.0	19.8
Carbon Monoxide (CO)	ppm	0.1	0.1	30.2	30.2	30.3	0.1	30.2	3.9

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.9 %
Oxygen (O2)	19.9 %
Carbon Monoxide (CO)	3.8 ppm

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL-2
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 2 - METHODS 3A AND 10
SAMPLE TIMES: 15:00-15:30

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.1	0.1	5.9	6.1	5.99	0.1	6.0	1.0
Oxygen (O2)	%	0.1	0.0	15.0	14.9	15.05	0.1	15.0	19.8
Carbon Monoxide (CO)	ppm	0.1	0.3	30.2	30.3	30.3	0.2	30.3	3.8

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.9 %
Oxygen (O2)	19.9 %
Carbon Monoxide (CO)	3.6 ppm

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL-3
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 3 - METHODS 3A AND 10
SAMPLE TIMES: 15:45-16:15

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.1	0.1	6.1	6.0	5.99	0.1	6.1	0.9
Oxygen (O2)	%	0.0	0.1	14.9	14.9	15.05	0.1	14.9	19.9
Carbon Monoxide (CO)	ppm	0.3	0.1	30.3	30.0	30.3	0.2	30.2	3.9

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.8 %
Oxygen (O2)	20.1 %
Carbon Monoxide (CO)	3.7 ppm

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL-4
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 4 - METHODS 3A AND 10
SAMPLE TIMES: 16:30-17:00

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.1	0.1	6.0	5.9	5.99	0.1	6.0	0.9
Oxygen (O2)	%	0.1	0.1	14.9	15.0	15.05	0.1	15.0	19.9
Carbon Monoxide (CO)	ppm	0.1	0.3	30.0	30.5	30.3	0.2	30.3	4.0

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.8 %
Oxygen (O2)	20.1 %
Carbon Monoxide (CO)	3.8 ppm

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CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL-5
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 5 - METHODS 3A AND 10
SAMPLE TIMES: 17:15-17:45

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.1	0.1	5.9	6.1	5.99	0.1	6.0	0.9
Oxygen (O2)	%	0.1	0.1	15.0	15.0	15.05	0.1	15.0	19.9
Carbon Monoxide (CO)	ppm	0.3	0.1	30.5	30.5	30.3	0.2	30.5	3.5

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.8 %
Oxygen (O2)	20.0 %
Carbon Monoxide (CO)	3.3 ppm

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL-6
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 6 - METHODS 3A AND 10
SAMPLE TIMES: 18:00-18:30

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.1	0.1	6.0	6.1	5.99	0.1	6.1	0.9
Oxygen (O2)	%	0.1	0.1	15.0	15.0	15.05	0.1	15.0	19.8
Carbon Monoxide (CO)	ppm	0.1	0.1	30.5	30.0	30.3	0.1	30.3	3.5

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.8 %
Oxygen (O2)	19.9 %
Carbon Monoxide (CO)	3.4 ppm

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL-7
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 7 - METHODS 3A AND 10
SAMPLE TIMES: 18:45-19:15

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.1	0.1	6.1	5.9	5.99	0.1	6.0	0.9
Oxygen (O2)	%	0.1	-0.1	15.0	15.0	15.05	0.0	15.0	19.9
Carbon Monoxide (CO)	ppm	0.1	0.3	30.0	30.5	30.3	0.2	30.3	3.4

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.8 %
Oxygen (O2)	20.0 %
Carbon Monoxide (CO)	3.2 ppm

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CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL-8
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 8 - METHODS 3A AND 10
SAMPLE TIMES: 19:30-20:00

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.1	0.1	5.9	5.9	5.99	0.1	5.9	0.9
Oxygen (O2)	%	-0.1	0.1	15.0	15.0	15.05	0.0	15.0	19.9
Carbon Monoxide (CO)	ppm	0.3	0.2	30.5	30.3	30.3	0.3	30.4	3.6

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.8 %
Oxygen (O2)	20.0 %
Carbon Monoxide (CO)	3.4 ppm

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CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME:	R313\LPCHIL-9
CLIENT:	LOUISIANA PACIFIC CORPORATION
LOCATION:	CHILCO, IDAHO
SITE LOCATION:	RTO EXHAUST STACK
SAMPLE DATE:	SEPTEMBER 16, 1994
RUN #:	9 - METHODS 3A AND 10
SAMPLE TIMES:	20:15-20:45

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.1	0.2	5.9	6.0	5.99	0.2	6.0	1.0
Oxygen (O2)	%	0.1	0.1	15.0	15.1	15.05	0.1	15.1	19.8
Carbon Monoxide (CO)	ppm	0.2	0.5	30.3	30.4	30.3	0.4	30.4	3.7

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.9 %
Oxygen (O2)	19.8 %
Carbon Monoxide (CO)	3.4 ppm

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL10
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 10 - METHODS 3A AND 10
SAMPLE TIMES: 21:00-21:30

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.2	0.1	6.0	6.1	5.99	0.2	6.1	1.0
Oxygen (O2)	%	0.1	0.1	15.1	15.0	15.05	0.1	15.1	19.8
Carbon Monoxide (CO)	ppm	0.5	0.4	30.4	30.5	30.3	0.5	30.5	3.3

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.9 %
Oxygen (O2)	19.8 %
Carbon Monoxide (CO)	2.9 ppm

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL11
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 11 - METHODS 3A AND 10
SAMPLE TIMES: 21:45-22:15

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.1	0.2	6.1	5.9	5.99	0.2	6.0	0.9
Oxygen (O2)	%	0.1	0.0	15.0	15.0	15.05	0.1	15.0	19.9
Carbon Monoxide (CO)	ppm	0.4	0.4	30.5	30.4	30.3	0.4	30.5	3.5

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.8 %
Oxygen (O2)	20.0 %
Carbon Monoxide (CO)	3.1 ppm

CALIBRATION SUMMARY - GASEOUS EMISSION MONITORS

FILE NAME: R313\LPCHIL12
CLIENT: LOUISIANA PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SITE LOCATION: RTO EXHAUST STACK
SAMPLE DATE: SEPTEMBER 16, 1994
RUN #: 12 - METHODS 3A AND 10
SAMPLE TIMES: 22:30-23:00

PARAMETER	MEASUREMENT UNIT	INITIAL ZERO CHECK	FINAL ZERO CHECK	INITIAL SPAN CHECK	FINAL SPAN CHECK	UPSCALE CAL. GAS VALUE Cma	AVERAGE ZERO BIAS Co	AVERAGE SPAN BIAS Cm	AVERAGE MEASURED CONC. C
Carbon Dioxide (CO2)	%	0.2	0.1	5.9	5.9	5.99	0.2	5.9	1.0
Oxygen (O2)	%	0.0	0.1	15.0	15.0	15.05	0.1	15.0	19.8
Carbon Monoxide (CO)	ppm	0.4	0.4	30.4	30.3	30.3	0.4	30.4	3.9

PARAMETER	EFFLUENT GAS CONCENTRATION Cgas
Carbon Dioxide (CO2)	0.9 %
Oxygen (O2)	19.9 %
Carbon Monoxide (CO)	3.5 ppm

SUMMARY OF RESULTS - METHODS 1, 2, 3A AND 4
AM TEST - AIR QUALITY, INC.

FILE NAME: R313\LPTEMP
CLIENT: LOUISIANA-PACIFIC CORPORATION
LOCATION: CHILCO, IDAHO
SAMPLE SITE: RTO EXHAUST STACK

RUN#	RUN TIME	AM TEST TEMPERATURE °F	LOUISIANA PACIFIC TEMPERATURE °F	DIFFERENCE
1	1415-1445	222.5	220.6	-1.9
2	1500-1530	221.6	223.4	1.8
3	1545-1615	222.3	223.2	0.9
4	1630-1700	223.4	221.0	-2.4
5	1715-1745	224.9	220.1	-4.8
6	1800-1830	221.0	219.7	-1.3
7	1845-1915	220.9	221.3	0.4
8	1930-2000	220.6	217.1	-3.5
9	2015-2045	219.8	216.4	-3.4
10	2100-2130	216.8	214.6	-2.2
11	2145-2215	216.8	213.9	-2.9
12	2230-2300	218.2	214.3	-3.9

APPENDIX B

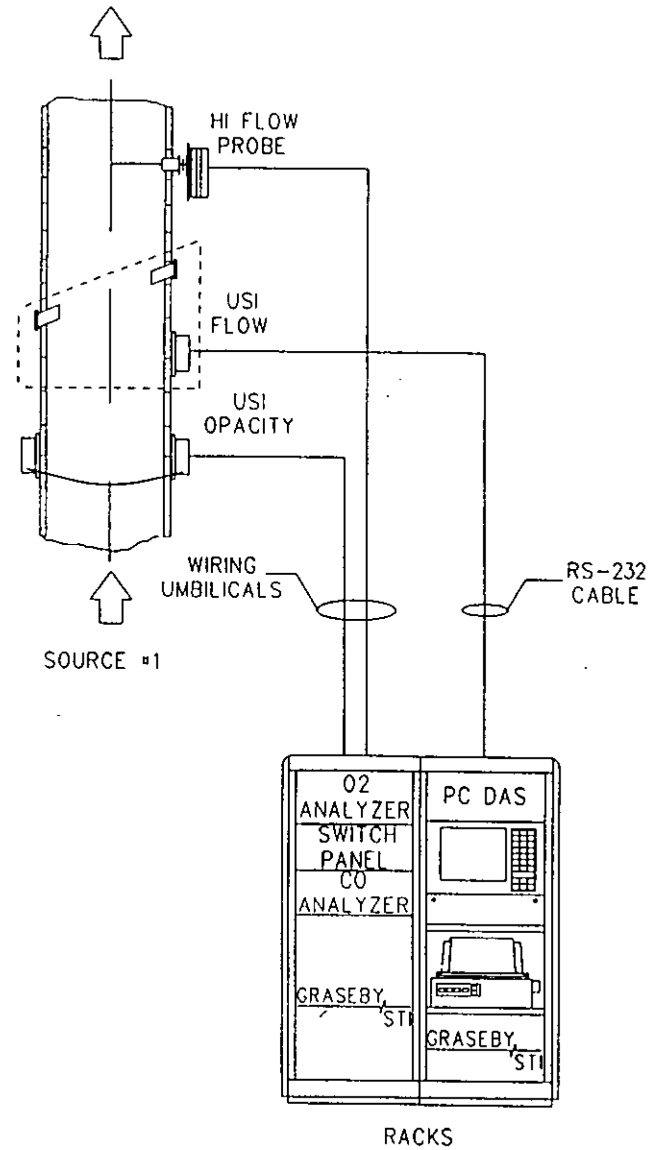
Louisiana Pacific CEMS Data

Louisiana-Pacific Chilco OSB CEMS RATA 9/16/94

Time	Press Loads
1300-1330	8
1330-1400	6
1400-1430	5
1430-1500	5
1500-1530	5
1530-1600	6
1600-1630	7
1630-1700	6
1700-1730	7
1730-1800	7
1800-1830	6
1830-1900	7
1900-1930	7
1930-2000	7
2000-2030	7
2030-2100	7
2100-2130	7
2130-2200	7
2200-2230	8
2230-2300	8
2300-2330	8
Total	141

1 press load = 1640 lbs
production capacity = 16 press loads per hour or 13.12 tons unfinished product per hour

production rate during RATA = 11.01 tons per hour, or 84% production rate



REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED

NOTE:
BID CONCEPT DRAWING ONLY
DO NOT USE FOR CONSTRUCTION

LOUISIANA PACIFIC	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± DECIMALS ± ANGLES ±	CONTRACT NO: W.O. #	GRASEBY STI
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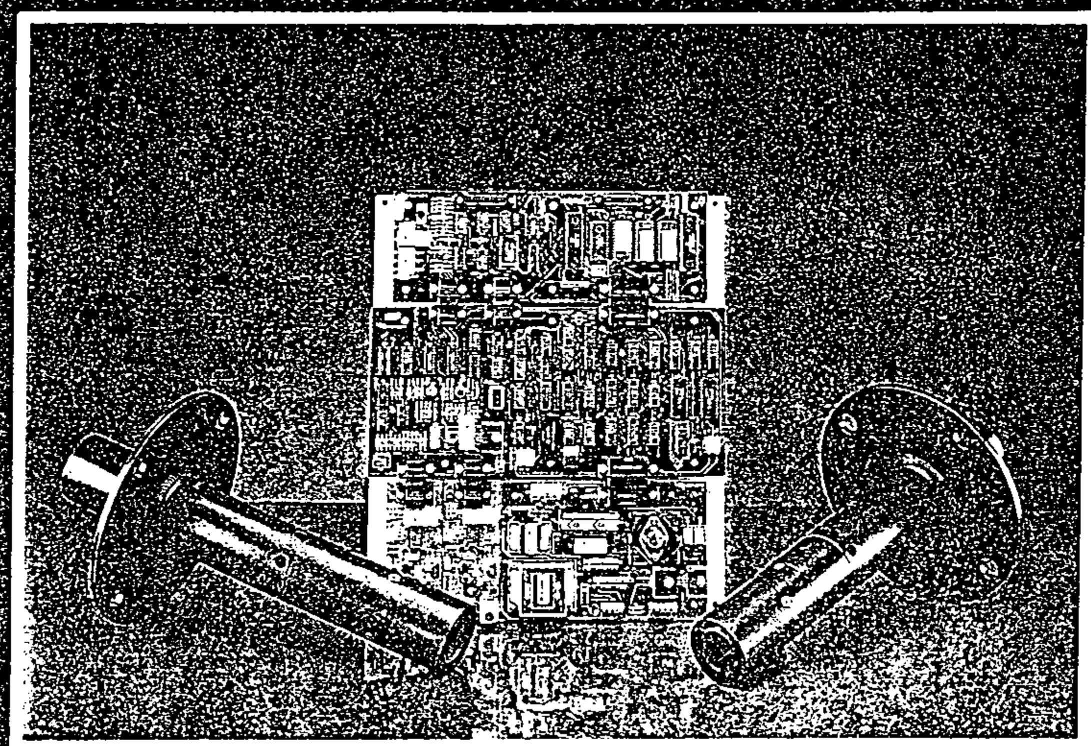
		DRAWN K. WENGERT	SINGLE STREAM GENERAL OUTLINE
		CHECKED	
		ISSUED	SIZE A / CAD NAME: / DWG. NO: / REV
	DO NOT SCALE DRAWING		SCALE N/A / SHEET

ULTRAFLOW™

model 100

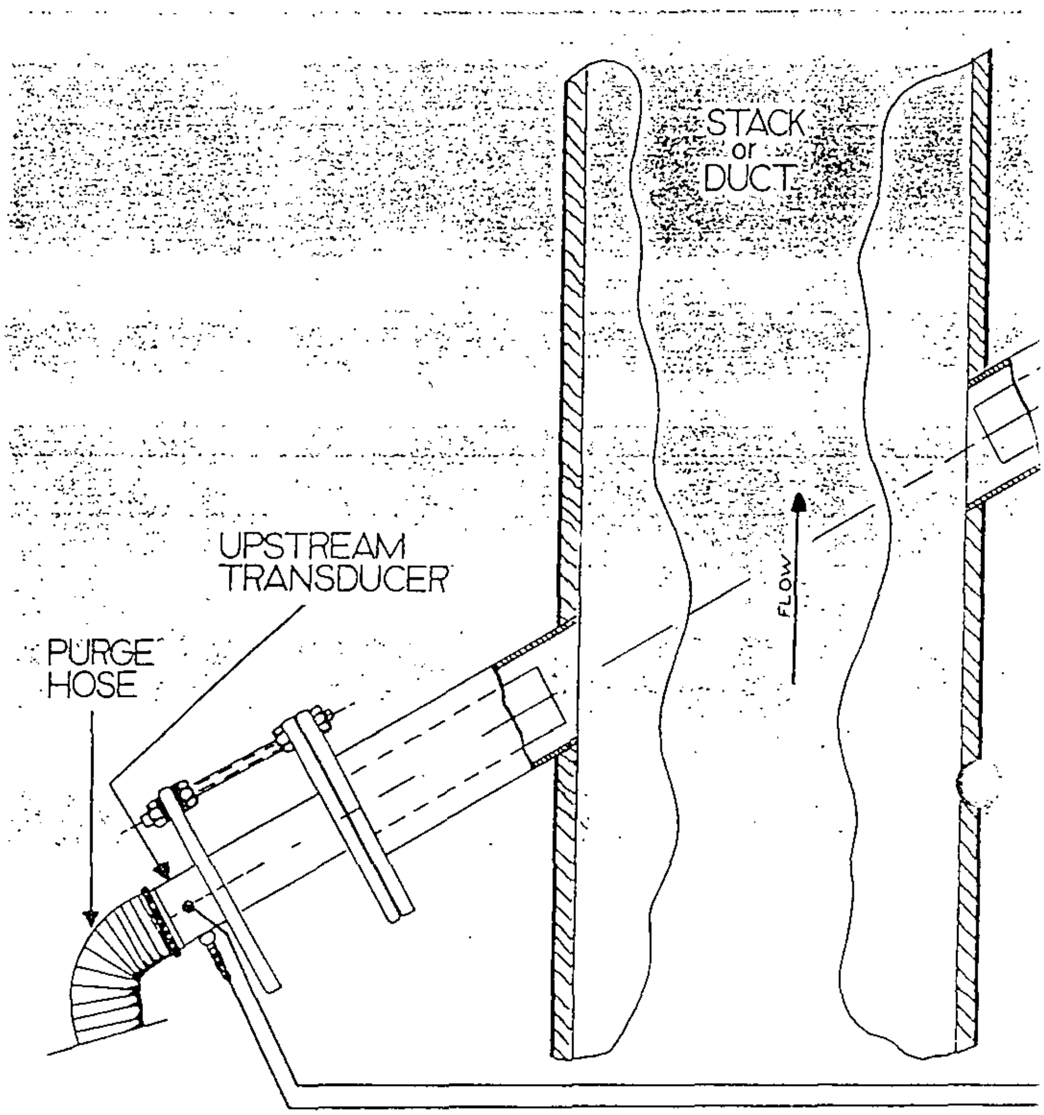


gas flow and
temperature monitor

United Sciences Inc.

ULTRAFLOW 100™

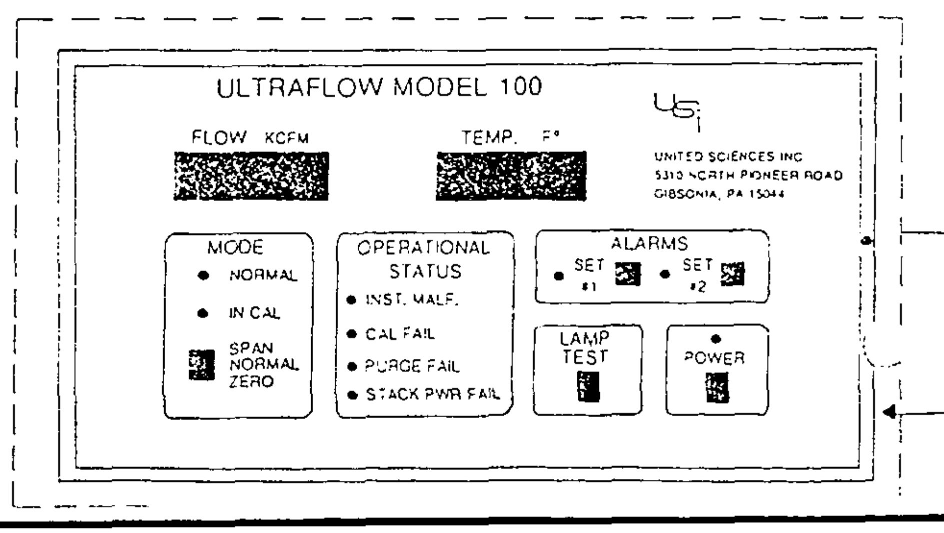
The **Ultraflow 100** represents a patented breakthrough in the measurement of flow and temperature in large stacks and ducts. By the use of unique digital signal processing and modern transducers, the **Ultraflow 100** has achieved the ability to make measurements using an ultrasonic technique. This measurement technique was previously thought to be unachievable, while at the same time felt to be the most desirable approach. The positive features of this approach when executed by a superbly designed instrument are listed below:



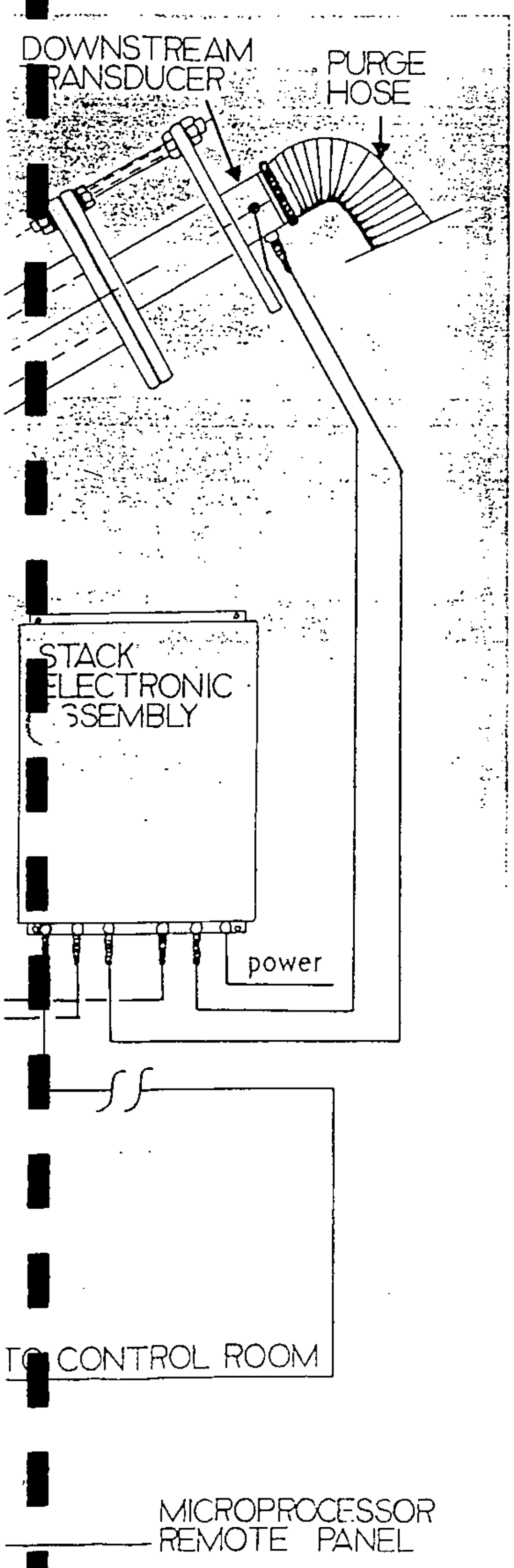
Meets EPA Requirements
The Ultraflow 100 meets all the requirements stated in 40 CFR, Part 60, Sections 60.13 and Appendix B, as well as 40 CFR, Part 52, Appendix E.

Non-Contacting
Other stack flow monitors suffer from a series of problems, many of which are related to their inability to withstand the environment to which they are exposed. The Ultraflow 100 transducers do not contact a medium and, therefore, avoids these problems. The system uses two transducers mounted on opposite sides of the stack. One transducer is located approximately ten feet downstream from the other.

Ease of Installation
The Ultraflow 100 system is easy to install. The transducers are mounted on flanges which are attached to a standard 3.5 inch schedule 40 pipe. There is an electronic assembly mounted near the transducers in a Nema 4 type enclosure. A simple data cable is used to connect the stack mounted electronics to the remote panel. A stand-alone purge system is provided which keeps the two transducers free from contamination by the stack effluent. The remote panel is installed either in a standard 19 inch rack or in any standard panel using four mounting screws.



A Breakthrough in the Measurement of Flow for Large Stacks and Ducts.



Line Average Response
The Ultraflow 100 system produces a response which represents the average of the flow velocity and temperature between the two transducers. This means the system avoids the inaccuracies associated with point source measurements.

Highly Accurate
The system is designed with the unique digital processing system which insures a long-term accurate response. The accuracy is better than 1.5 percent of the reading with a resolution of .3 feet per second.

High Resolution
Through the use of the unique digital processing, a resolution of .3 feet per second flow velocity is achieved. This resolution represents negligible error on typical stacks and ducts.

Flow Measurement Independent of Temperature, Density, and Viscosity
One of the most important features of the Ultraflow 100 is that it is capable of measuring flow accurately without the need for temperature compensation, density, or viscosity corrections. The reason for this is that the system measures the flow velocity directly. The system accurately measures flow over the entire stack temperature range of -40 to +450° Fahrenheit. (Higher stack temperatures can be measured. Consult factory.)

Accurate Temperature Measurement
The system accurately determines the speed of sound in the medium. It is a simple matter to use the speed of sound to calculate the temperature of the stack gas. The accuracy of this measurement is typically within ±3° Fahrenheit and is a true average of the temperature across the path between the two transducers. This temperature measurement enables the remote panel to calculate standard cubic feet per minute (SCFM) if pressure is provided to the system by the user or by USI's Pressure option.

In-Stack Zero and Span Checks
Unlike any known flow monitor on the market today, the Ultraflow 100 is capable of truly checking its zero and span calibration while the stack is in operation. The EPA requires daily span and zero checks in a compliance flow monitor. This is achieved in the Ultraflow 100 with the actual transducers that are being used during normal measurement. The calibration checks are interrogated by the remote panel. A cal fail lamp and contact closure will indicate if tolerances are not met. Calibration occurs automatically every hour. The most recent span and zero may be displayed at any time, without loss of stack data. Once per day, the cal values are output while a contact closure is made.

Well Designed Microprocessor Based Remote Panel
The remote panel used in the Ultraflow 100 system is an easy to read, easy to operate panel with access to the complete system through the front. Rear access is not required for maintenance. It mounts on a standard 19" rack or can be mounted to any panel with four screws. The two displays use 8/10" high, red LED digits; four are used for flow and three for temperature. There are two alarm pushbuttons which will indicate on the display the alarm values when depressed. The calibration set points are also easily displayed. Contact closures are provided for the alarm values as well as system malfunction. The system malfunction closure is activated whenever any of the following conditions exist: Stack Power Fail, Purge Fail, Cal Fail, or Instrument Malfunction. There are four analog outputs which are true current sources of 4-20ma.

ULTRAFLOW 100

PRODUCT SPECIFICATIONS

FLOW MEASUREMENT

Range: 0 - 200 ft/sec (0-60m/sec).
Resolution: 0.1 ft/sec (0.03m/sec).
Accuracy: ±0.3 ft/sec (±0.1m/sec).
Relative Accuracy: Site dependent
Typically <5% of reading above 10 ft/sec for most application conditions.
Response Time: 30 seconds to 15 minutes. (Media dependent)
Media Temperature:
-40 to 550° F (-40 to 288° C)

INITIAL CALIBRATION

Factory, Duct geometry basis.
Factory, Flow data plus geometry basis.
Site specific against Pitot tube traverses.

CALIBRATION CHECKS ON ACTIVE PROCESS

Zero and span checks are performed twelve times each 24 hours, by sending ultrasonic signals through the media, along the measuring path, verifying all system components and the monitor calibration.

DRIFT

≤ 1% reading, 98 to 132 VAC, 48 to 62 Hz
≤ 0.5% reading, -40° to 150° F stack ambient.
≤ 0.5% reading, 10° F to 120° F display panel.
Long term drift: < 0.5% of reading per year

MEDIA CONDITIONS:

Temperature: -40 to 550° F (-40 to 288° C)
(Consult factory for higher temperatures.)
Pressure: -10 to 30 Inches H2O.
Moisture: Dry to saturated, including condensing.
Particulate: Not critical.
Duct Diameter: 2 to 40 feet.

TEMPERATURE CALCULATION

Accuracy: ±3° F (1.7° C)
DISPLAY **Resolution:** 1 Degree

POWER, ENVIRONMENT

Power: 115/230 ±15%, VAC, 50/60 Hz.
Blowers: Dual, ratings for each:
300 VA full load, 950 VA inrush.
Motors are TEFC, Class B, with a service factor of 1.15.
Stack Electronics: 50 VA
Remote display panel: 50 VA
Ambient Temperature Limits:
Stack Area: -40° to 150° F (-40 to 66° C)
Remote Panel: 10° to 120° F (-12 to 49° C)

MECHANICAL, SIGNAL OUTPUTS

TRANSDUCER CONSTRUCTION

Teflon, 316ss, gold foil covered mylar, anodized, epoxy painted aluminum. Optional metallurgy or plastic materials for nozzles available. Includes purge/power fail alarm and connecting cables. Consult factory for application criterea.

MOUNTING:

Process Connection:
Mounting plates furnished for welding to 3 1/2" schedule 40 pipe (by others) with squeeze rings, seals and stainless steel hardware provided.

Stack Electronics:

ENCLOSURE: NEMA 4X, 304ss.
Size: 14.5 W x 16.5 H x 6 D (inches)
36.8 W x 41.9 H x 15.2 D (centimeters)
Weight: 28 lbs (12.7 Kg).
Output:
RS-232C, 300 Baud, to remote display panel.
Fiber optic interface is optional. 1500 ft. limit, both.

Remote Display Panel:

ENCLOSURE: General purpose 19 inch rack mount.
Size: 19 W x 8.75 H x 8 D (inches)
48.3 W x 22.2 H x 20.3 D (centimeters)
Weight: 11 lbs (5 Kg).
Displays: 0.8 inch (2 cm) LED for KCFM and °F (°C).
Controls: Pushbuttons for Alarm Set & Lamp Test.
Power & Mode (Span, Normal, Zero) Switches.
Status LED's for Malfunction, Cal Fail, Purge Fail, and Stack Power Fail.
Alarms: 4 SPDT, two assigned.
Rating: 1 amp 24 VDC, 2 amps 115VAC
Instrument malfunction/power failure.
Calibration data output.
Analog Inputs:
Inputs of pressure, ppm, steam flow, fuel flow, etc., may be used for calculations.
Analog Outputs:
Two standard, two optional, current or voltage.
Output Parameters: Flow (ACF, SCF), Temperature, Velocity, Mass, barometric pressure, and others.
Serial Input/Output: RS-232
All system parameters may be programmed and read via the serial interface. *Fiber optic interface optional.*
Additional Features:
Ability to display all system parameters plus speed of sound, and diagnostic status.

United Sciences, Inc.
5310 North Pioneer Road, Gibsonia, PA 15044 (412) 443-8610, FAX: (412) 443-4025

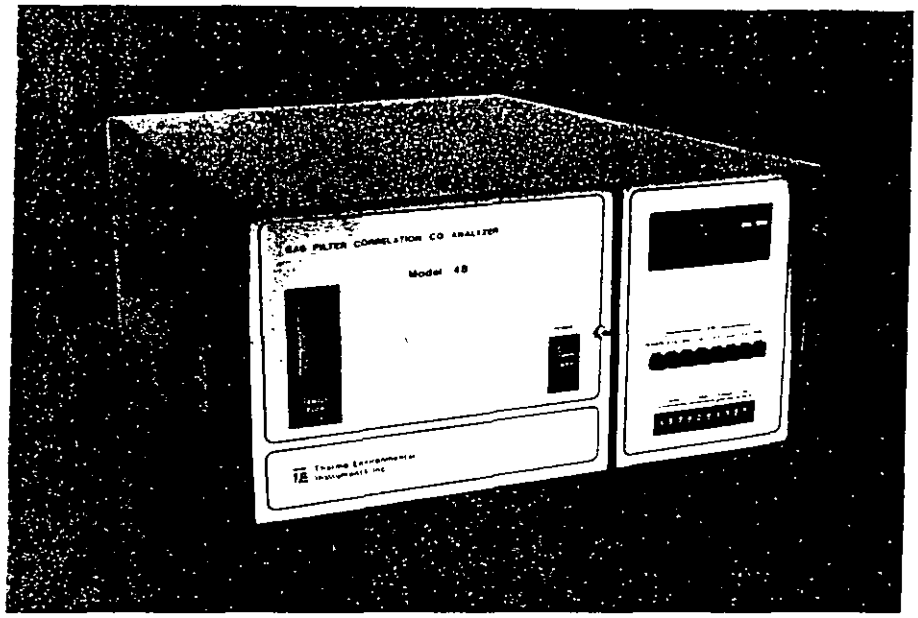
Thermo Environmental Instruments Inc.

Gas Filter Correlation CO Analyzer

53

Model 48

For Continuous Ambient Air Monitoring



Thermo Environmental's Microprocessor Based Model 48 Ambient CO Analyzer provides unequaled ease of operation, reliability, precision and specificity. The unique Gas Filter Correlation principle of operation offers the significant advantages of unequaled specificity and sensitivity and increased resistance to shock and vibration.

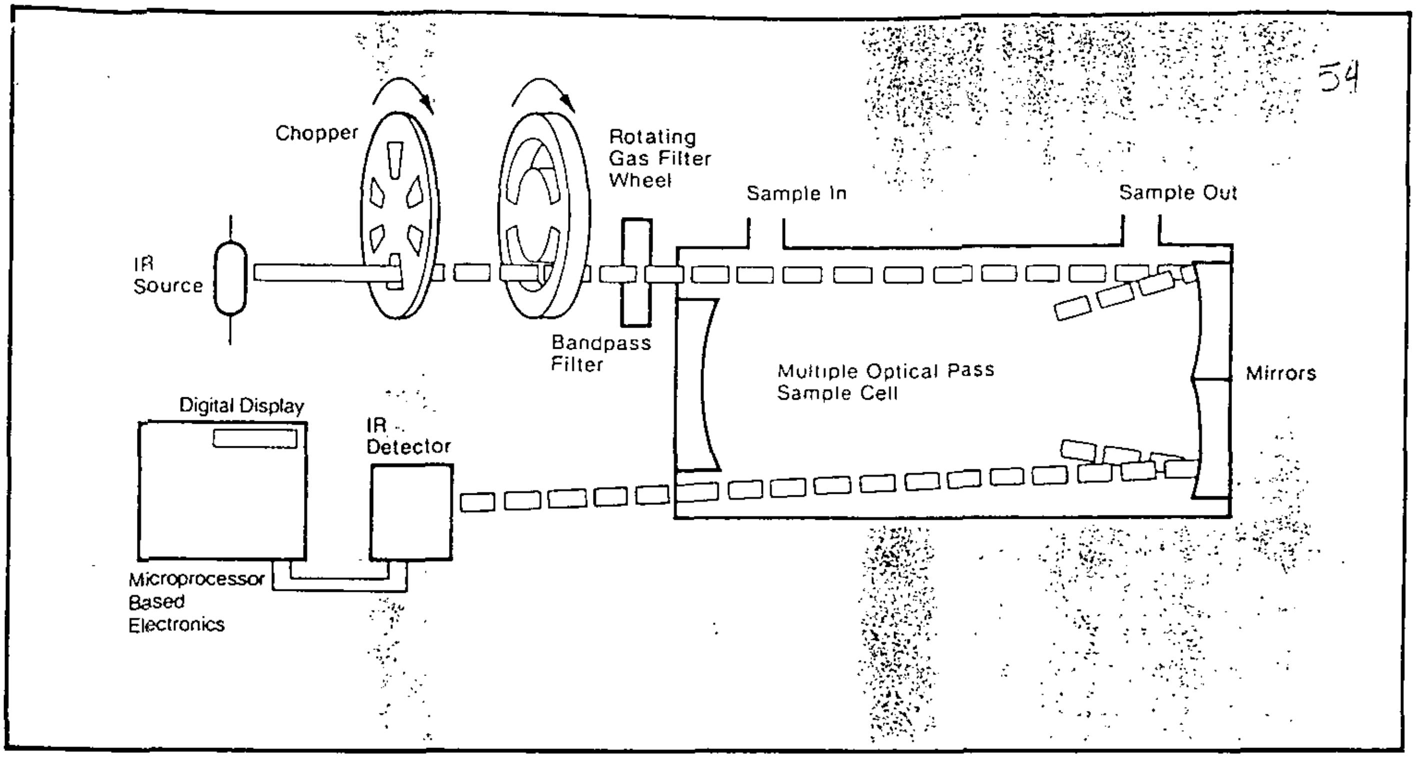
Key Features

- Microprocessor Based
- Automatic pressure and temperature correction
- Dual fully independent outputs standard
- Hourly average output standard
- Lower ranges, wide dynamic range (suitable for both ambient and source)
- Highly specific to CO
- Long term zero and span stability
- Vibration and shock resistant
- Powerful diagnostics made possible by microprocessor
- Linear through all ranges
- Unaffected by changes in flow
- Self-aligning optics
- U.S.A.—EPA reference method RFCA-0981-054, range 0-50ppm time constant — 30 seconds

Model 48 Specifications

Ranges	0-1, 0-2, 0-5, 0-10, 0-20, 0-50*, 0-100, 0-200, 0-500, 0-1000 ppm
Zero Noise	0.05 ppm RMS — With time constant = 30 seconds
Minimum Detectable Limit	0.10 ppm
Zero Drift, 24 Hours	±0.2 ppm
Span Drift, 24 hours	± 1% Full Scale
Rise/Fall Times (0-95%) (at 1ppm flow, 30 second integration time)	1 minute
Precision	±0.1 ppm
Linearity	± 1%
Flow Rate	1 lpm standard
Rejection Ratio	Negligible interference from water and CO_2
Operating Temperature	Performance specifications maintained over the range 15–35° C (may be operated safely over the range 5–45° C)
Power Requirements	100 Watts; 105–125 VAC, 60Hz; 220-240VAC 50Hz
Physical Dimensions	17" wide × 8¾" high × 23" deep
Weight	45 lbs.
Dual Outputs (standard)	Selectable to 0-10mV, 0-100mV 0-1V, 0-5V, 0-10V; digital display; 1 hour integrated value. Other outputs available upon request (4-20ma, IEEE488)

* See Federal Register, Tuesday, February 18, 1975, Volume 40, Number 33, Part II for definitions and Federal specifications. Performance specifications over 15-35°C range



Principle of Operation

The basic components of a Gas Correlation System are illustrated in the above diagram. Radiation from an infrared source is chopped and then passed through a gas filter which alternates between CO and N_2 due to Rotation of the filter wheel. The radiation then passes through a narrow bandpass filter and a multiple optical pass sample cell where absorption by the sample gas occurs. The IR radiation exits the sample cell and falls on a solid state IR detector.

The CO gas filter acts to produce a reference beam which cannot be further affected by CO in the sample chamber. The N_2 side of the filter wheel is transparent to IR radiation and therefore produces a measure beam which *can* be absorbed by CO. The chopped detector signal is modulated by the alternation between the two gas filters with an amplitude proportional to the concentration of CO in the sample chamber. Other gases do not cause modulation of the detector signal since they absorb the reference and measure beams equally. Thus, the Gas Filter Correlation System responds solely to CO.

Options

48-001 — Particulate Filter

48-002 — Rack Mounts

48-003 — Remote activation of zero and span solenoids.

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Printed in U.S.A. 4/91 5M

TECHNICAL DESCRIPTION

PCDAS

The Graseby STI PCDAS is a Data Acquisition, System Controller utilizing OPTO-22 digital/analog devices in conjuction with an IBM-Compatible 80386-33 Mhz computer.

All housekeeping needs and controller functions are done within the PCDAS software. All necessary factors (i.e., analyzer ranges, cal gas values and purge durations) are operator changeable and entered through keyboard interface. This can be password protected if needed.

Data Acquisition is also accomplished at the PCDAS. Data is stored in required averaging periods and a system status code is attached to each analyzer data point. This data is stored to hard disk for access and retrieval for a minimum of two(2) years. Calibration data is also archived and available for two(2) years. Report generation is standard with reports in compliance with 40 CFR, Part 60. All reports can be viewed on screen before or instead of hard copy, including excursion reports, and downtime summaries. These can be used for trouble shooting or review by environmental personnel before submittal.

Additional features supported by the PCDAS are graphing archived data (i.e., hourly, cal span amd cal zero values). Modem support is via remote access software. Please note that all features are done without interfering with data collection.

08/29/94
R. Schultz

Louisiana-Pacific Corporation
Chilco, ID

CEMS Computer program to calculate CO LB/HR (dry)

CO LB/HR = RD!*lbcf!*MW!*FF!*1000*Temp!*Pcmp!*Mcmp!*60
(dry)

Where:

Pb! = 13.52 psia, Local Barometric pressure based on altitude of 2311' ASL (27.51 "Hg.)
lbcf! = 2.6E-9, Conversion factor for ppm to lbcf without CO molecular weight
Temp! = (460 + 68)/(460 + FT!)
Pcmp! = Pb! / 14.696 psia
Mcmp! = (100 - Moisture!) / 100
MW! = 28.01, Molecular weight for CO
Moisture! = 7%
RD! = CO reading
FF! = Flow reading
FT! = Temperature reading

Therefore; to calculate CO LB/HR (dry) from the 15 minute averages of CO ppm; flow & temperature, substitute those values into this equation:

$$\text{CO LB/HR (dry)} = \frac{\text{CO ppm} \times \text{Flow}}{(460 + \text{Temperature})} \times 1.97406^{*}$$

* Constant based on 7% moisture content.

DAILY SUMMARY REPORT
RTO Stack HOURLY AVERAGES
LOUISIANA PACIFIC
Chilco, ID

REPORTING PERIOD September 16

r d	CO ppm	FLOW kcfm	TEMP Deg-F	CO #/HR
:0 to 1:00	3.5	146.6	179.7	1.665
:0 to 2:00	4.1	147.1	175.1	1.971
:00 to 3:00	3.0	140.9	175.4	1.372
:0 to 4:00	2.9	145.2	175.0	1.366
:0 to 5:00	2.7	143.0	174.0	1.250
:00 to 6:00	2.8	139.0	175.9	1.260
:00 to 7:00	3.2	143.9	177.1	1.490
:0 to 8:00	3.2	141.4	178.4	1.466
:00 to 9:00	3.3	141.3	180.6	1.494
:00 to 10:00	17.7	108.9	143.0	6.556
:0 to 11:00	5.4	152.8	216.6	2.502
:0 to 12:00	4.9	154.3	221.1	2.302
:00 to 13:00	17.9	156.6	228.0	8.374
:0 to 14:00	6.8	158.9	228.0	3.233
:0 to 15:00	3.0	155.5	220.6	1.413
:00 to 16:00	3.1	155.9	223.5	1.456
:00 to 17:00	3.3	155.9	221.5	1.541
:0 to 18:00	2.8	156.8	220.0	1.306
:0 to 19:00	2.5	155.8	220.1	1.180
:00 to 20:00	2.5	153.6	218.4	1.147
:0 to 21:00	2.6	150.2	216.0	1.208
:0 to 22:00	2.5	149.1	214.5	1.131
:00 to 23:00	2.9	149.7	213.7	1.303
:0 to 24:00	2.5	147.2	211.5	1.124
erages				
:0 to 12:00	4.7	142.0	181.0	2.2
:0 to 24:00	4.4	153.8	219.7	2.0
:00 to 24:00	4.5	147.9	200.3	2.1

Ba data not used for averages.

DAILY CO SUMMARY REPORT

RTO Stack CO ppm FIFTEEN MINUTE AVERAGES
LOUISIANA PACIFIC
Chilco, ID

DAY'S DATE: 09-20-1994
TIME: 13:59:09

REPORTING PERIOD
DAY: September 16

Period	15 Read.	15 Stat.	30 Read.	30 Stat.	45 Read.	45 Stat.	60 Read.	60 Stat.	Hr. AVG. Read.	Hr. AVG. Stat
Hour 0	3.3	0	3.3	0	3.4	0	4.2	0	3.5	0
Hour 1	4.0	0	4.8	0	4.5	0	3.3	0	4.1	0
Hour 2	3.2	0	3.1	0	3.0	0	2.8	0	3.0	0
Hour 3	2.8	0	2.9	0	2.9	0	3.0	0	2.9	0
Hour 4	2.6	0	2.8	0	2.8	0	2.7	0	2.7	0
Hour 5	2.7	0	2.8	0	2.8	0	2.8	0	2.8	0
Hour 6	2.9	0	3.1	0	3.4	0	3.4	0	3.2	0
Hour 7	3.2	0	3.1	0	3.3	0	3.3	0	3.2	0
Hour 8	3.2	0	3.1	0	3.4	0	3.4	0	3.3	0
Hour 9	4.3	0	6.0	128	43.7	0	5.0	0	17.7	0
Hour 10	6.8	0	5.3	0	4.6	0	4.9	0	5.4	0
Hour 11	4.8	0	3.9	0	4.9	0	6.2	0	4.9	0
Hour 12	14.5	0	15.9	0	21.7	0	19.5	0	17.9	0
Hour 13	16.6	0	4.0	0	4.0	0	2.7	0	6.8	0
Hour 14	3.1	0	3.1	0	2.9	0	3.0	0	3.0	0
Hour 15	3.0	0	3.0	0	3.2	0	3.2	0	3.1	0
Hour 16	3.1	0	3.2	0	3.0	0	3.9	0	3.3	0
Hour 17	2.9	0	2.8	0	2.7	0	2.6	0	2.8	0
Hour 18	2.5	0	2.5	0	2.6	0	2.5	0	2.5	0
Hour 19	2.4	0	2.5	0	2.5	0	2.4	0	2.5	0
Hour 20	2.6	0	2.6	0	2.7	0	2.6	0	2.6	0
Hour 21	2.7	0	2.3	0	2.4	0	2.5	0	2.5	0
Hour 22	2.7	0	2.9	0	3.0	0	2.8	0	2.9	0
Hour 23	2.6	0	2.5	0	2.2	0	2.6	0	2.5	0

Run 1 1415-1445 = 3.0 ppm CO
Run 2 1500-1530 = 3.0 ppm CO
Run 3 1545-1615 = 3.2 ppm CO
Run 4 1630-1700 = 3.5 ppm CO
Run 5 1715-1745 = 2.8 ppm CO
Run 6 1800-1830 = 2.5 ppm CO
Run 7 1845-1915 = 2.5 ppm CO
Run 8 1930-2000 = 2.5 ppm CO
Run 9 2015-2045 = 2.7 ppm CO
Run 10 2100-2130 = [illegible] ppm CO
Run 11 2145-[illegible] = 2.6 ppm CO
Run 12 [illegible] = [illegible] ppm CO

DAILY FLOW SUMMARY REPORT

RTO Stack FLOW kcfm FIFTEEN MINUTE AVERAGES
LOUISIANA PACIFIC
Chilco, ID

TODAY'S DATE: 09-20-1994
TIME: 13:59:42

REPORTING PERIOD
DAY: September 16

Period	15 Read.	15 Stat.	30 Read.	30 Stat.	45 Read.	45 Stat.	60 Read.	60 Stat.	Hr. AVG. Read.	Hr. AVG. Stat
Hour 0	145.8	0	147.0	0	147.2	0	146.4	0	146.6	0
Hour 1	143.7	0	146.8	0	152.0	0	146.0	0	147.1	0
Hour 2	141.7	0	140.0	0	140.0	0	141.7	0	140.9	0
Hour 3	142.2	0	144.3	0	142.5	0	152.0	0	145.2	0
Hour 4	150.2	0	141.5	0	139.8	0	140.4	0	143.0	0
Hour 5	140.2	0	138.7	0	138.2	0	138.8	0	139.0	0
Hour 6	145.2	0	144.9	0	141.7	0	143.8	0	143.9	0
Hour 7	144.2	0	142.6	0	141.7	0	137.2	0	141.4	0
Hour 8	141.4	0	141.0	0	141.2	0	141.6	0	141.3	0
Hour 9	143.0	0	143.7	0	0.0	0	148.8	0	108.9	0
Hour 10	150.7	0	148.4	0	153.3	0	158.7	0	152.8	0
Hour 11	153.0	0	152.8	0	153.2	0	158.1	0	154.3	0
Hour 12	159.5	0	150.7	0	157.4	0	158.8	0	156.6	0
Hour 13	160.7	0	156.6	0	161.0	0	157.4	0	158.9	0
Hour 14	154.3	0	155.6	0	153.7	0	158.6	0	155.5	0
Hour 15	157.9	0	156.0	0	157.3	0	152.3	0	155.9	0
Hour 16	159.9	0	153.0	0	154.7	0	156.2	0	155.9	0
Hour 17	160.2	0	154.1	0	155.1	0	157.8	0	156.8	0
Hour 18	157.6	0	157.6	0	154.9	0	153.0	0	155.8	0
Hour 19	154.5	0	155.2	0	152.5	0	152.4	0	153.6	0
Hour 20	154.3	0	148.7	0	148.7	0	149.2	0	150.2	0
Hour 21	150.6	0	148.4	0	147.9	0	149.5	0	149.1	0
Hour 22	152.0	0	150.5	0	147.7	0	148.6	0	149.7	0
Hour 23	148.9	0	147.7	0	147.0	0	145.3	0	147.2	0

Run 1 1415-1445 = 154.7 kcfm
Run 2 1500-1530 = 157.0 kcfm
Run 3 1545-1615 = 156.1 kcfm
Run 4 1630-1700 = 155.5 kcfm
Run 5 1715-1745 = 154.6 kcfm
Run 6 1800-1830 = 157.6 kcfm
Run 7 1845-1915 = 153.8 kcfm
Run 8 1930-2000 = 152.5 kcfm
Run 9 2015-2045 = 148.7 kcfm
Run 10 2100-2130 = 149.5 kcfm
Run 11 2145-2215 = 150.8 kcfm
Run 12 2230-2300 = 148.2 kcfm

DAILY TEMP SUMMARY REPORT

RTO Stack TEMP Deg-F FIFTEEN MINUTE AVERAGES
LOUISIANA PACIFIC
Chilco, ID

ID[redacted]'S DATE: 09-20-1994
[redacted] TIME: 14:00:30

REPORTING PERIOD
DAY: September 16

'e[redacted]od	15 Read.	15 Stat.	30 Read.	30 Stat.	45 Read.	45 Stat.	60 Read.	60 Stat.	Hr. AVG. Read.	Hr. AVG. Stat
Hour 0	180.8	0	180.6	0	178.7	0	178.6	0	179.7	0
Ho[redacted] 1	178.5	0	177.0	0	173.0	0	171.9	0	175.1	0
Ho[redacted] 2	174.9	0	175.5	0	175.5	0	175.4	0	175.4	0
Hour 3	175.1	0	175.5	0	175.8	0	173.7	0	175.0	0
Ho[redacted] 4	171.9	0	174.0	0	174.9	0	175.3	0	174.0	0
Ho[redacted] 5	175.4	0	175.3	0	176.3	0	176.7	0	175.9	0
Hour 6	176.8	0	176.6	0	177.0	0	178.0	0	177.1	0
Ho[redacted] 7	178.2	0	178.1	0	178.4	0	179.1	0	178.4	0
Ho[redacted] 8	179.0	0	179.9	0	180.9	0	182.6	0	180.6	0
Ho[redacted] 9	183.3	0	185.7	0	0.0	0	203.1	0	143.0	0
Hour 10	215.5	0	215.6	0	217.9	0	217.2	0	216.6	0
Ho[redacted] 11	220.4	0	220.2	0	221.7	0	222.2	0	221.1	0
Ho[redacted] 12	224.6	0	229.2	0	229.1	0	229.3	0	228.0	0
Hour 13	229.4	0	230.6	0	230.3	0	221.9	0	228.0	0
Ho[redacted] 14	218.7	0	218.8	0	222.4	0	222.6	0	220.6	0
Ho[redacted] 15	223.2	0	223.5	0	222.7	0	224.5	0	223.5	0
Hour 16	221.8	0	222.3	0	221.8	0	220.2	0	221.5	0
Ho[redacted] 17	220.2	0	220.2	0	220.0	0	219.6	0	220.0	0
Ho[redacted] 18	219.8	0	219.5	0	219.6	0	221.5	0	220.1	0
Ho[redacted] 19	221.1	0	218.6	0	218.4	0	215.7	0	218.4	0
Hour 20	215.7	0	216.7	0	216.1	0	215.6	0	216.0	0
Ho[redacted] 21	214.3	0	214.9	0	214.4	0	214.3	0	214.5	0
Ho[redacted] 22	213.5	0	212.6	0	214.1	0	214.5	0	213.7	0
Hour 23	213.0	0	212.4	0	210.9	0	209.5	0	211.5	0

Run 1 - 1415-1445 = 220.6°F

Run 2 - 1500-1530 = 223.4°F

Run 3 - 1545-1615 = 222.2°F

Run 4 - 1630-1700 = 221.0°F

Run 5 - 1715-1745 = 220.1°F

Run 6 - 1800-1830 = 219.7°F

Run 7 - 1845-1915 = 221.3°F

Run 8 - 1930-2000 = 217.1°F

Run 9 - 2015-2045 = 216.4°F

Run 10 - 2100-2130 = 214.6°F

Run 11 - 2145-2215 = 213.9°F

Run 12 - 2230-2300 = 214.3°F

DAILY OPAC SUMMARY REPORT
RTO Stack OPAC pct THREE MINUTE AVERAGES
LOUISIANA PACIFIC
Chilco, ID

'S DATE: 09-20-1994
TIME: 14:00:54

REPORTING PERIOD
DAY: September 16

r d	3 / 33		6 / 36		9 / 39		12 / 42		15 / 45		18 / 48		21 / 51		24 / 54		27 / 57		30 / 60	
	3.7	0	3.8	0	3.7	0	3.7	0	3.7	0	3.8	0	3.7	0	3.8	0	3.7	0	3.8	0
	3.7	0	3.8	0	3.7	0	3.8	0	3.7	0	3.8	0	3.8	0	3.7	0	3.7	0	3.8	0
1	3.7	0	3.8	0	3.8	0	3.7	0	3.7	0	3.6	0	3.7	0	3.8	0	3.7	0	3.8	0
	3.7	0	3.7	0	3.7	0	3.6	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0
	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0
	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.8	0	3.8	0	3.7	0	3.7	0
	3.7	0	3.7	0	3.8	0	3.7	0	3.7	0	3.8	0	3.7	0	3.8	0	3.8	0	3.7	0
	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.6	0	3.7	0	3.7	0	3.7	0	3.7	0
4	3.7	0	3.7	0	3.7	0	3.8	0	3.6	0	3.7	0	3.7	0	3.7	0	3.8	0	3.8	0
	3.7	0	3.8	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0
	3.7	0	3.7	0	3.8	0	3.9	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0
	3.7	0	3.6	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0
6	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0
	3.7	0	3.7	0	3.6	0	3.7	0	3.6	0	3.7	0	3.6	0	3.7	0	3.7	0	3.8	0
	3.6	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.6	0	3.6	0	3.7	0
	3.7	0	3.7	0	3.7	0	3.7	0	3.6	0	3.7	0	3.7	0	3.7	0	3.6	0	3.7	0
	3.7	0	3.6	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0
	3.8	0	3.7	0	6.9	0	4.1	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0
9	3.7	0	3.7	0	14.0	0	5.0	0	8.6	0	3.8	0	3.7	0	3.7	0	3.8	0	3.7	0
	3.7	0	3.7	0	3.6	0	3.7	0	4.0	0	3.7	0	3.7	0	3.7	0	3.6	0	3.7	0
	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.8	0	3.7	0
	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.8	0
11	3.7	0	3.7	0	3.6	0	3.6	0	3.6	0	3.8	0	3.7	0	3.7	0	3.7	0	3.8	0
	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	4.0	0
	4.2	0	3.7	0	3.8	0	3.8	0	3.7	0	3.8	0	3.8	0	3.8	0	3.7	0	3.7	0
	3.8	0	3.9	0	3.8	0	3.9	0	3.8	0	3.8	0	3.8	0	3.8	0	3.7	0	3.8	0
	3.9	0	3.9	0	3.9	0	3.9	0	3.9	0	3.8	0	3.8	0	3.9	0	3.8	0	3.8	0
	3.8	0	3.8	0	3.8	0	3.8	0	3.9	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0
14	3.8	0	3.8	0	3.9	0	3.7	0	3.8	0	3.8	0	9.1	0	13.9	0	3.8	0	13.7	0
	3.9	0	3.8	0	3.9	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.7	0
	3.8	0	3.7	0	16.8	0	3.8	0	12.9	0	3.8	0	5.4	0	3.8	0	5.2	0	4.9	0
	4.1	0	3.7	0	3.8	0	3.8	0	3.7	0	3.8	0	3.8	0	4.0	0	15.1	0	3.9	0
16	9.0	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0
	3.8	0	5.5	0	4.8	0	4.0	0	9.6	0	3.8	0	3.8	0	3.8	0	3.7	0	3.9	0
	3.8	0	3.8	0	3.8	0	3.8	0	3.7	0	3.8	0	3.8	0	5.9	0	8.0	0	4.6	0
	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0
	3.8	0	13.0	0	3.8	0	6.0	0	3.8	0	3.8	0	3.8	0	3.8	0	3.9	0	3.8	0
	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.7	0	3.8	0	11.1	0	3.8	0	9.6	0
19	3.9	0	3.9	0	3.8	0	3.7	0	3.7	0	3.8	0	3.8	0	3.7	0	3.7	0	3.8	0
	3.8	0	4.7	0	8.7	0	5.1	0	3.8	0	3.8	0	3.8	0	3.8	0	3.8	0	3.6	0
	3.8	0	3.7	0	3.7	0	3.7	0	3.7	0	3.8	0	5.3	0	6.9	0	9.9	0	3.7	0
	3.8	0	3.8	0	3.8	0	3.8	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.8	0
21	3.7	0	5.2	0	3.7	0	9.1	0	3.7	0	3.8	0	3.9	0	11.6	0	37.1	0	71.4	0
	37.5	0	3.6	0	3.6	0	3.7	0	3.7	0	3.6	0	3.8	0	6.8	0	5.4	0	4.6	0
	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.7	0	3.8	0
	3.8	0	4.9	0	4.2	0	5.3	0	3.8	0	3.7	0	3.8	0	3.7	0	3.8	0	3.7	0
	3.9	0	3.6	0	3.6	0	3.7	0	3.7	0	3.7	0	3.6	0	3.6	0	3.7	0	3.8	0
	3.7	0	3.8	0	3.8	0	3.7	0	3.7	0	3.8	0	3.8	0	3.7	0	3.7	0	3.7	0

TAL NUMBER OF MINUTES ABOVE 20 9
MBER OF THREE MINUTE EXCURSIONS 3

09-20-1994 Time: 14:01:46

RTO Stack CO Monthly Calibration Summary
September, 1994
LOUISIANA PACIFIC
Chilco, ID

ZERO READING	ZERO GAS	PERCENT DRIFT	SPAN READING	SPAN GAS	PERCENT DRIFT
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
21.4	0.0	0.0	903.4	902.3	0.0
-0.5	0.0	-1.0	45.2	45.5	-0.5
0.0	0.0	0.0	41.5	45.5	0.0
0.1	0.0	0.0	39.3	44.5	0.0
-0.8	0.0	-1.5	43.4	44.5	-2.2
-0.1	0.0	-0.2	44.4	44.5	-0.2
-0.1	0.0	-0.2	44.5	44.5	-0.1
0.0	0.0	0.1	46.9	45.5	2.8
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0

at 09-20-1994 Time: 14:02:55

RTO Stack OPAC Monthly Calibration Summary
September, 1994
LOUISIANA PACIFIC
Chilco, ID

ZERO READING	ZERO GAS	PERCENT DRIFT	SPAN READING	SPAN GAS	PERCENT DRIFT
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
0.0	0.0	0.0	0.0	14.0	0.0
0.0	1.8	0.0	44.6	45.6	0.0
0.0	3.2	0.0	45.1	46.8	0.0
0.0	0.0	0.0	0.0	-7.2	0.0
-0.0	1.6	-4.0	45.9	46.8	-2.2
-0.0	1.6	-4.0	45.9	-7.2	-2.2
-0.0	1.6	-4.0	45.9	-7.2	-2.2
-0.0	1.6	-3.9	46.1	46.8	-2.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-13.4	-13.5	-1.0	-13.5	-13.5	-10.3
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
3.7	23.8	22.3	-7.4	-5.7	5.3
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0

: 09-20-1994 Time: 14:02:14

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RTO Stack FLOW Monthly Calibration Summary
September, 1994
LOUISIANA PACIFIC
Chilco, ID

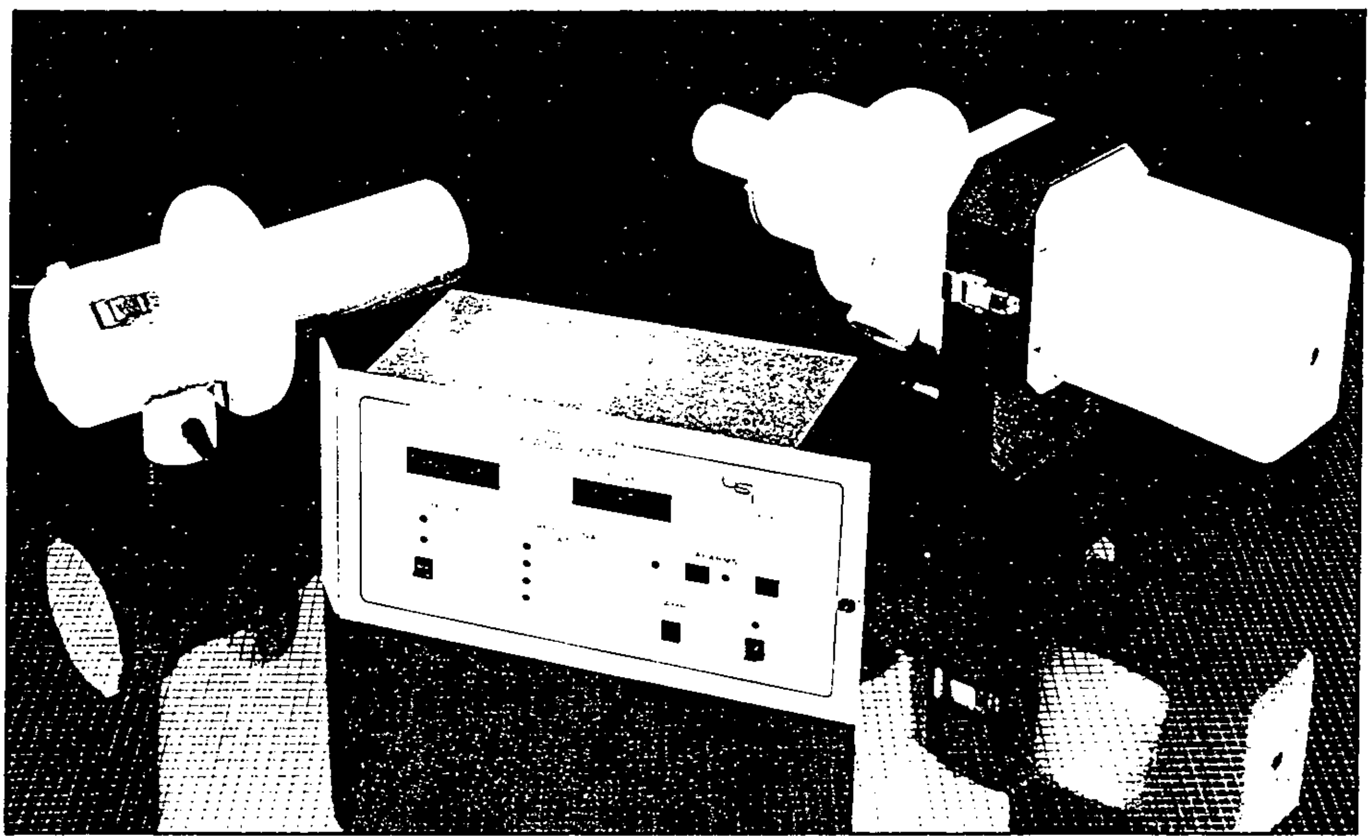
ZERO READING	ZERO GAS	PERCENT DRIFT	SPAN READING	SPAN GAS	PERCENT DRIFT
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
0.0	0.0	0.0	0.0	120.0	0.0
1.0	0.0	0.4	141.2	120.0	8.8
-1.7	0.0	-0.7	151.8	150.0	0.7
0.0	0.0	0.0	0.0	150.0	0.0
5.3	0.0	2.2	151.8	150.0	0.7
0.0	0.0	0.0	150.0	150.0	0.0
-3.5	0.0	-1.5	149.1	150.0	-0.4
-5.3	0.0	-2.2	150.9	150.0	0.4
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
-1.0	-1.0	-1.0	-1.0	-1.0	-1.0

APPENDIX C

Louisiana Pacific Opacity Monitor Data

ADVANCED MICROPROCESSOR BASED COMPLIANCE OPACITY SYSTEM

model 500C



for continuous emission monitoring of opacity

United Sciences Inc.

5310 North Pioneer Road , Gibsonia, PA 15044 412-443-8610

United Sciences Inc.

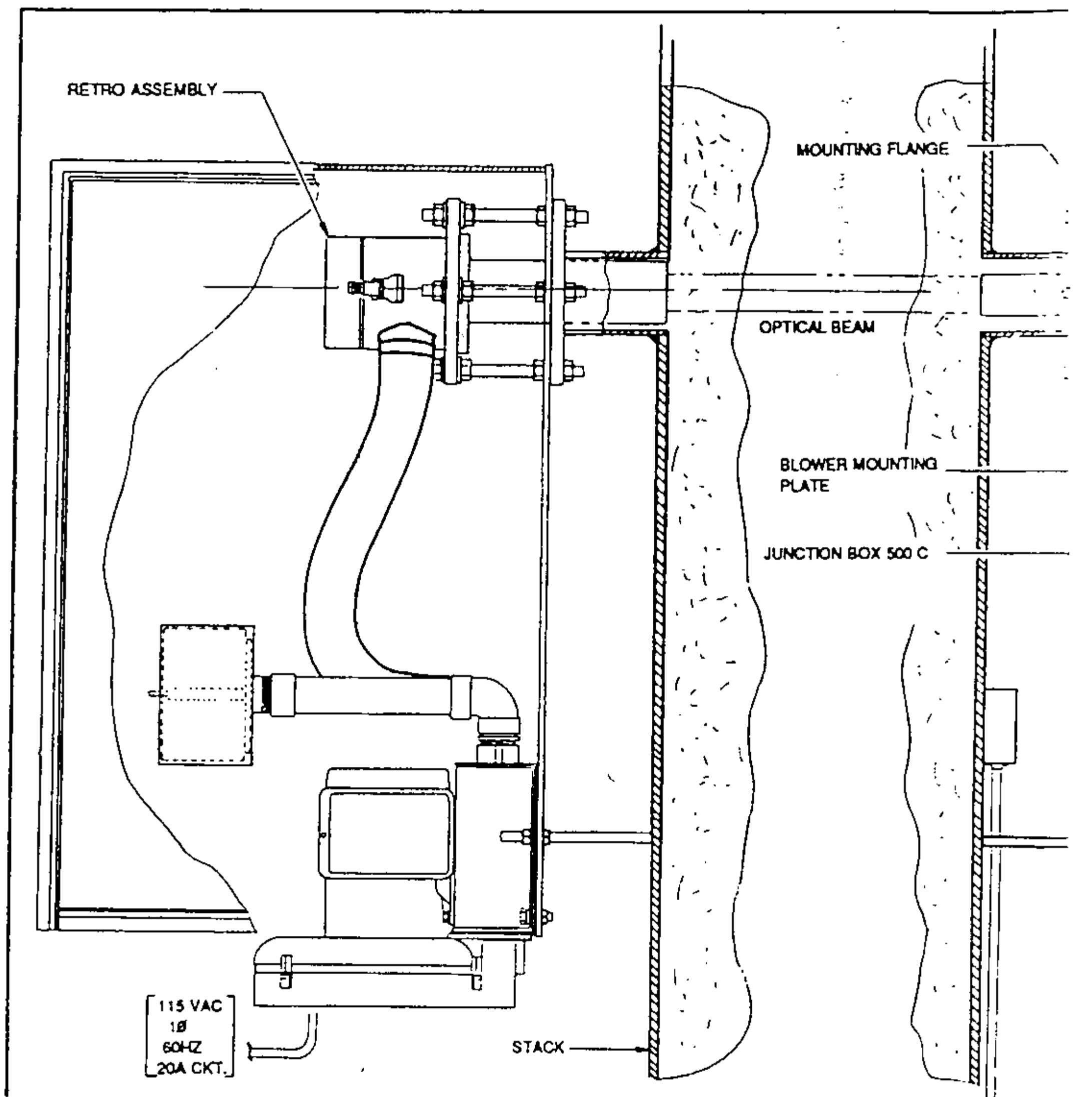
COMPLIANCE OPACITY SYST

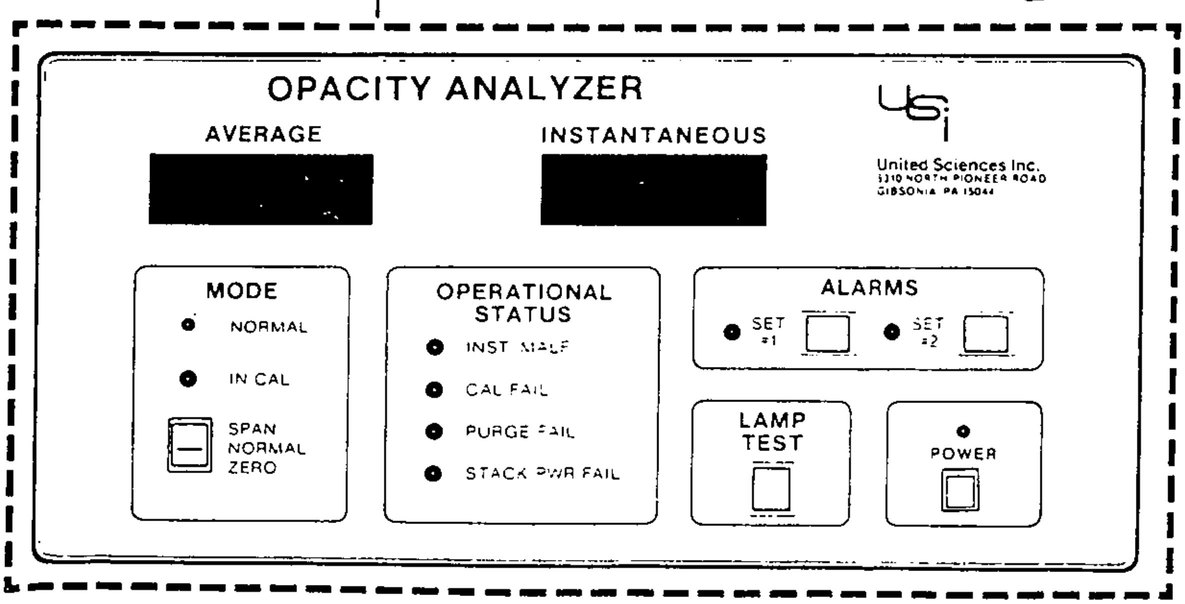
BREAKTHROUGH TECHNOLOGY

United Sciences' Model 500C Compliance Opacity Monitor uses patented advancements in light source and signal processing technology that significantly advances the state of the art!

FEATURES

- Solid State Lamp, 10 year life.
- 5 Year Lamp Warranty.
- ✓ Electronic Lamp Modulation.
- Digital Signal Processor.
- Continuous Calibration.
- ✓ Continuous Dirt Compensation.
- Two Or Four Analog Outputs.
- Two RS-232 Output Ports.
- ✓ Four Programmable Alarms.
- Zero Jig With Filters.
- Fiberglass Purge Shutters.
- ✓ Purge/Power Fail Alarm.
- 200 cfm Purge System.
- Unique One Button Calibration.
- ✓ Long Term Drift ≤0.4% Reading.
- Optional Fiber-Optic Interface.
- Path Lengths To 60 Feet
- ✓ Stack Temperatures to 2000° F.
- Meets 1993 Changes To PS-1.

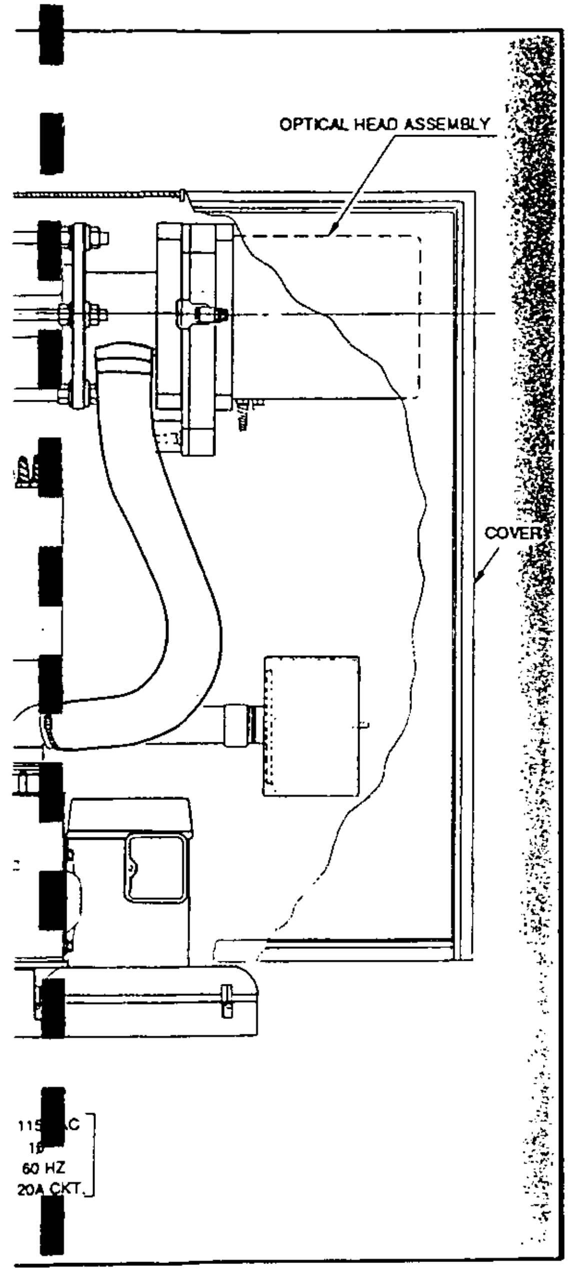




MICRO
REMO

model 500C

New Solid State Lamp, Ultra-Low Drift, Dual Pass Opacity System



:CESSOR
ANEL

SYSTEM DESCRIPTION

Solid State Light Source

A light emitting diode with an expected life of over 100,000 hours replaces the troublesome tungsten filament lamp. The LED does not require optical filters, emits almost no heat, and is electronically modulated.

The optical head has no internal moving parts and is o-ring sealed. The spectral response meets the requirements of 40 CFR 60, Appendix B.

Precision Optical Bench

All optical elements are glass and astigmatically corrected. The optical bench is machined, black anodized aluminum with pinned and screwed fixtures. An eyepiece is provided for alignment viewing at any time.

Continuous Calibration

The 500C opacity monitor measures its span and zero, along with the opacity, once each second. The zero and span readings are averaged for 6 minutes and the system values, including window dirt, are updated at selectable intervals.

Every 24 hours, the system zero, span and dirt compensation may be reported on selected analog outputs. Analog outputs for opacity are available with or without cal data superimposed, and the cal data may also be read from a serial port. The 60 rpm calibration wheel, outside the optical head, is the only moving part in the system, exclusive of the purge blowers.

Calibration Kit

An EPA approved calibration fixture that simulates the clear stack zero of the instrument is supplied with each USI opacity monitor. Calibrated filters are also included.

Digital Signal Processor

The USI Remote Display Panel is a powerful signal processor capable of accepting a variety of analog and digital inputs. Up to four analog outputs, two serial outputs and four SPDT alarm outputs are provided. In addition, the panel displays values, performs calculations, and contains self diagnostics.

The remote panel displays average and instantaneous opacity, plus malfunction alarm indication. Up to two opacity alarms are adjustable from the front panel. Other alarms are normally used for malfunction and/or calibration data output protocol.

Many parameters may be read from the panel, including window dirt, the last cal zero and the last cal span.

Dual Purge System

Two 100 cfm purge blowers are standard with the 500C, which significantly reduce maintenance intervals. Non-corroding, fail-safe fiberglass shutters and differential pressure switches are provided for both the retro-reflector and optical head. The purge air enters the nozzles via an annular opening for uniform dispersion and clean operation. The system recovers automatically from any upset condition such as power loss or purge interruption.

Rugged Construction

USI opacity monitors are constructed of aluminum plate, bar stock and cast aluminum alloy. The machined parts are alodined and finished with acid resistant epoxy paint. Electrical enclosures are NEMA 4X, 304ss.

High quality electronic construction is used throughout. Glass epoxy circuit cards are securely fastened and use gold plated pin and socket connectors. All integrated circuits are on sockets and operational constants are stored in battery back-up RAM. Extensive diagnostic and maintenance aids are included in the firmware and hardware.

The Model 500C Opacity Monitor is covered under one or more of the following US Patents: 4,937,461; 5,077,480; 4,630,482.

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500C COMPLIANCE OPACITY

PRODUCT SPECIFICATIONS

OPACITY MEASUREMENT

Range: 0 to 100% Opacity
Resolution: 0.1%
Spectral Response:
- PEAK: 500 to 600 nm
- MEAN: 500 to 600 nm
- 99% OF ENERGY: 500 to 600 nm

Angle of Projection: Less than 3°
Angle Of View: Less than 3°
Response Time: Less than 10 seconds
System Accuracy
- CALIBRATION ERROR: ≤2.0%
- 24 HOUR DRIFT*:
  - Zero: ≤0.4%
  - Span: ≤0.4%
- 60 DAY DRIFT*:
  - Zero: ≤0.4%
  - Span: ≤0.4%

* Over worst-case combination of line voltage and temperature specification variation.

Calibration
Calibration of the monitor is continuous with a zero, span and media reading once each second. Cal values and window dirt are updated every 6 minutes, may be read on demand, or output every 1, 2, 3, 4, 6, 8, 12, or 24 hours. Dirt Compensation will be output with zero and span data every 24 hours.

Media Conditions
- Temperature: -40 to 2000°F
- Pressure: -10 to +10 inches H_2O
- Moisture: Dry to saturated (non condensing)
- Gaseous Constituents: Not critical
- Standard Path Length: 2 to 30 feet
- Optional Path Length: 30 to 60 feet

Power Requirements: 115/230 VAC ±10%, 50/60 Hz.
Blowers (Direct Drive): Two, ratings for each: 1100 VA full load, 5100 VA inrush. Motors: 1 Hp, TEFC, Class B, with a service factor of 1.15.
Stack Electronics: 50 VA
Remote display panel: 50 VA

Ambient Temperature Limits:
Stack Area: -40° to 150° F (-40 to 66° C)
Remote Panel: 10° to 120° F (-12 to 49° C)

MECHANICAL, SIGNAL OUTPUTS

Retro, Optical Head Construction
Anodized, epoxy painted aluminum, O-ring gasketed enclosures. Optional metallurgy available for nozzles. Includes purge/power fail alarms, fiberglass shutters stack connecting cables and weather covers. Consult factory for application criteria and options.

Process Connection:
Mounting plates furnished for welding to 5 inch schedule 40 pipe (by others) with squeeze rings, seals and stainless steel hardware.

Purge System:
Dual blowers, each rated at 105 CFM @ 5 inches H2O and 70 CFM at 30 inches H2O positive pressure.

Remote Display Panel:
Enclosure: General purpose 19 inch rack mount.
Size: 19 W x 8.75 H x 8 D inches
48.3 W x 22.2 H x 20.3 centimeters
Weight: 11 lbs (5 Kg).
Displays: 0.8 inch (2 cm) LED's for average and instantaneous opacity.
Controls: Pushbuttons for Alarm Set & Lamp Test. Power & Mode (Span, Normal, Zero) Switches.
Status LED's for Malfunction, Cal Fail, Purge Fail, and Stack Power Fail.

Alarms: Four SPDT, two assigned, two variable.
Rating: 1 amp, 24 VDC, 2 amps, 115VAC
Instrument malfunction/power failure alarm.
Calibration data output.

Analog Outputs:
Two standard, two optional, current or voltage. Outputs may be configured for cal data at users option.

Output Parameters: Instantaneous and Average Opacity, with and/or without calibration data.

Serial Output: RS-232C/D
All system parameters may be programmed and read.

Additional Features:
Ability to display all system parameters, including window dirt and diagnostic status.

United Sciences, Inc.
5310 North Pioneer Road, Gibsonia, PA 15044 (412) 443-8610, FAX: (412) 443-4025

The Model 500C Opacity Monitor is covered under one or more of the following US Patents: 4,937,461; 5,077,480; 4,630,482.

TRANSMISSOMETER FACTORY PERFORMANCE
SPECIFICATION TESTS
PER
CODE OF FEDERAL REGULATIONS
TITLE 40, PART 60, APPENDIX B, SPECIFICATION 1

UNITED SCIENCES INC.
MODEL 500C COMPLIANCE OPACITY MONITOR

SERIAL NO: 0993724

TRANSMISSOMETER PERFORMANCE SPECIFICATION TESTS

PER

CODE OF FEDERAL REGULATIONS

TITLE 40, PART 60, APPENDIX B

SPECIFICATION 1

GRASEBY / STI

ID# LOUISIANA PACIFIC CHILCO

Transmissometer Serial No. 0993724

This signed and completed document certifies that the Model 500C Transmissometer has been tested and meets the factory certification tests herein.

Signed

Dean Murray
Please Print Above Signature

Date: 3-16-94

IDENT NO. C93GRG09

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TRANSMISSOMETER FACTORY PERFORMANCE
SPECIFICATION TESTS
PER
CODE OF FEDERAL REGULATIONS
TITLE 40, PART 60, APPENDIX B, SPECIFICATION 1

UNITED SCIENCES INC.
MODEL 500C COMPLIANCE OPACITY MONITOR

SERIAL NO: 0993724

TABLE OF CONTENTS

1.0 INTRODUCTION

This report describes the procedures used and the test results obtained during testing of the United Sciences Inc. (USI) Model 500C Transmissometer.

These tests were conducted in accordance with the Code of Federal Regulations, Title 40, Part 60, Appendix B, Specification 1.

2.0 TEST RESULTS SUMMARY

A summary of test results is listed here in tabular form for quick reference. Discussions of test procedures, actual test data, and calculations will be described later in the appropriate sections of this report.

2.1 DESIGN SPECIFICATIONS

Refer to Manufacturer's Certificate of Conformance with Design Specifications, page 2.

2.2 PERFORMANCE SPECIFICATIONS

2.2.1 CALIBRATION ERROR

Low Filter	0.31	% Opacity
Mid Filter	0.73	% Opacity
High Filter	0.86	% Opacity

2.2.2 RESPONSE TIME . . . . 2.11 seconds

3.0 INSTRUMENT DESCRIPTION

The USI Model 500C transmissometer is a double-pass, two detector analyzer designed to continuously monitor the opacity of effluent in a duct or stack exhausting combustion gases.

The analyzer uses a special solid state light source (Light Emitting Diode) to project a modulated light beam from the optical head assembly through a medium of interest to the passive retroreflector. The retroreflector returns the beam through the medium to the optical head where the beam is refocused onto the "signal" detector. A second "reference" detector is used in the optical head assembly to monitor and control the output of the LED in order to provide long term operational stability regardless of extremes in ambient temperature or aging of optical and electronic components.

United Sciences inc.

5310 NORTH PIONEER ROAD • GIBSONIA, PA 15044 • 412 - 443-8610 • FAX 412 - 443-4025

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MANUFACTURER'S CERTIFICATE OF CONFORMANCE WITH DESIGN SPECIFICATIONS

United Sciences Inc. certifies that the Model 500C transmissometer randomly sampled from the September 1993 production was tested according to Sections 6.1 through 6.4 of the Code of Federal Regulations, Title 40, Part 60, Appendix B, Specification 1 and met all requirements of Section 5 of this specification.

Test results are listed below. These data are valid for Serial Numbers 0993534 through 0993743.

Serial Number Tested - 0993541

5.1.1 Spectral Response

Relative Response	Wavelength
Peak	570nm
Mean	576nm
< 1%	< 400nm
< 1%	> 700nm

5.1.2 Angle of View . . . . ≤ 3.24 Degrees

5.1.3 Angle of Projection
Projection Aperture .141" Diam . . . . ≤ 2.67 Degrees

5.1.4 Optical Alignment . . . . Provided

5.1.5 Simulated Zero and Upscale Calibration . . . . . Provided

5.1.6 Access to External Optics . . . . Provided

5.1.7 Auto Zero Compensation Indicator . . . . Provided

5.1.8 Slotted Tube . . . . Not Applicable

5.1.9 External Calibration Filter Access . . . . Provided

Signed: ______________________

By: Joseph Ziolkowski

Date: September 19, 1993

A calibration wheel, located in the optical head, rotates continuously in front of the projected beam in order to provide simulated zero and upscale calibration values. Signals proportional to the simulated zero, upscale calibration, and the opacity of the effluent are time multiplexed and transmitted via a 0-20 mA current loop to the microprocessor controlled remote display panel.Assessment of these signals by the microprocessor permits the remote display panel to correct the opacity data for dirt accumulation on the optical surfaces and to output the amount of the automatic zero correction to the digital display.

Since the simulated zero, upscale calibration, and actual opacity values are monitored continuously by the microprocessor, the panel can immediately provide alarms to indicate operational malfunctions without waiting for auto calibration cycle evaluation.

These data are analyzed by the remote display panel, and analog outputs are generated in terms of instantaneous and integrated opacity. These outputs may be corrected or uncorrected for stack geometry, depending on the specific user's needs.

A Calibration Kit is provided which may be installed on the Optical Head to check the operation of the analyzer while the stack or duct is in operation. Calibrated Neutral Density Filters may be installed in this fixture to provide audit and calibration information.

4.0 DESIGN SPECIFICATIONS

4.1 SPECTRAL RESPONSE

4.1.1 PROCEDURE

USI obtained curves of the spectral data of the yellow-green LED and the silicon photo diode from their respective manufacturers. The relative response of each curve was determined at 10 nanometer intervals and the product of the response of the two curves calculated. The product data were then normalized and a composite analyzer spectral response curve constructed. Reference Drawing No. 600-0005-01, Figure 1.

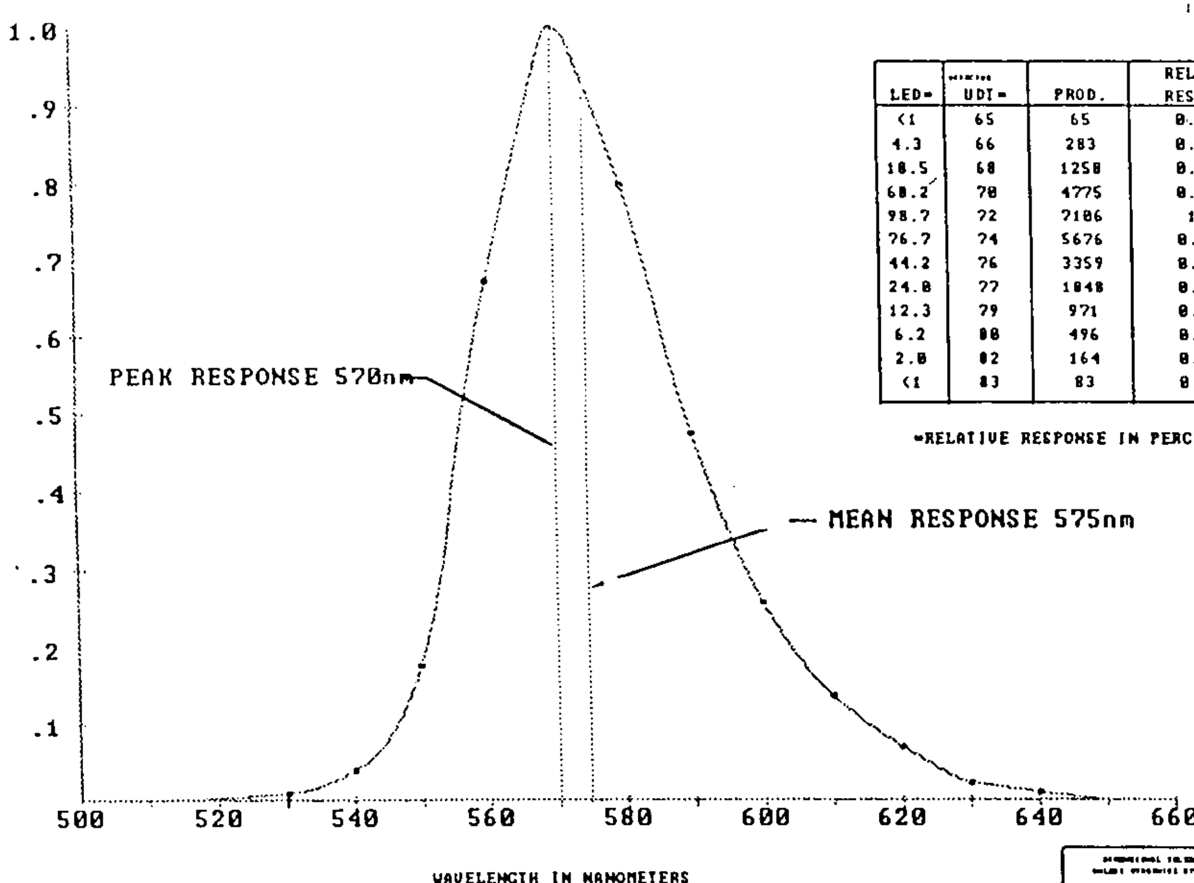
Since the entire output of the LED source falls within the 400 to 700nm range, the use of color correction filters is unnecessary.

4.1.2 RESULTS

The spectral data on the Manufacturer's Certificate of Conformance was obtained from the Analyzer Response Curve, Drawing No. 600-0005-01, and indicate that the analyzer met or exceeded the performance specification.

FIGURE 1

ANALYZER SPECTRAL RESPONSE
UNITED SCIENCES INC. MODEL 500C



LED*	UDI*	PROD.	RELATIVE RESPONSE	(NANOMETERS)
<1	65	65	0.009	530
4.3	66	283	0.039	540
18.5	68	1258	0.177	550
68.2	70	4775	0.672	560
98.7	72	7106	1.0	570
76.7	74	5676	0.799	580
44.2	76	3359	0.473	590
24.0	77	1848	0.260	600
12.3	79	971	0.137	610
6.2	80	496	0.070	620
2.0	82	164	0.023	630
<1	83	83	0.011	640

*RELATIVE RESPONSE IN PERCENT FROM MANU. CURVES

REVISIONS

ZONE	SYM.	DESCRIPTION	DATE	APPD.

USED ON

AUTHORIZATION: EAS; GRG; JET

UNITED SCIENCES INC.

TITLE: ANALYZER SPECTRAL RESPONSE CURVE

MAT'L. | FINISH

SCALE 1-1 | SIZE C | DRAWING NO. 600-0005

4.2 ANGLE OF VIEW

4.2.1 PROCEDURE

USI chose an analyzer, Serial No. 0993541, at random and performed the angle of view test in both the vertical and horizontal directions. A small, 1.3 centimeter, quartz halogen light source was placed on an arc whose radius was 3 meters from the analyzer. The analyzer's response was monitored while the light source was moved until the analyzer's maximum response indicated the viewing centerline. The analyzer's response was then recorded at the centerline and at 5 centimeter intervals along the arc for a total of 30 centimeters on each side (see Figures 2 and 4). These readings were then normalized and the angle of view curves of Figures 3 and 5 constructed.

4.2.2 RESULTS

The angle of view reported on the Manufacturer's *Certificate of Conformance* was obtained from the angle of view curves, Figures 3 and 5, according to the formula:

$$\text{Angle of View in Degrees} = \arctan \frac{D}{300}$$

Where D = Total distance, in centimeters, along the arc during which the analyzer's response was greater than 2.5% of the peak response.

4.3 ANGLE OF PROJECTION

4.3.1 PROCEDURE

USI chose an analyzer, Serial No. 0993541, at random and performed an angle of projection test on the analyzer in both the vertical and the horizontal direction. A small, .25 centimeter, silicon photo diode was placed on an arc whose radius was 3 meters from the analyzer. The analyzer's projection system was focused to the 3 meter range and by measuring the output of the silicon photo diode the centerline of the projected beam was determined.

Measurements of the photo diode's output were recorded at the centerline and at 5 centimeter intervals for 30 centimeters on each side of the centerline (see Figures 6 and 8). These readings were then normalized and the angle of projection curves of Figures 7 and 9 were constructed.

4.3.2 RESULTS

The angle of projection reported on the Manufacturer's Certificate of Conformance was obtained from the angle of projection curves, Figures 7 and 9, according to the formula:

$$\text{Angle of Projection in Degrees} = \arctan \frac{D}{300}$$

Where D = Total distance in centimeters along the arc during which the detector response was greater than 2.5% of the peak response.

FIGURE 2

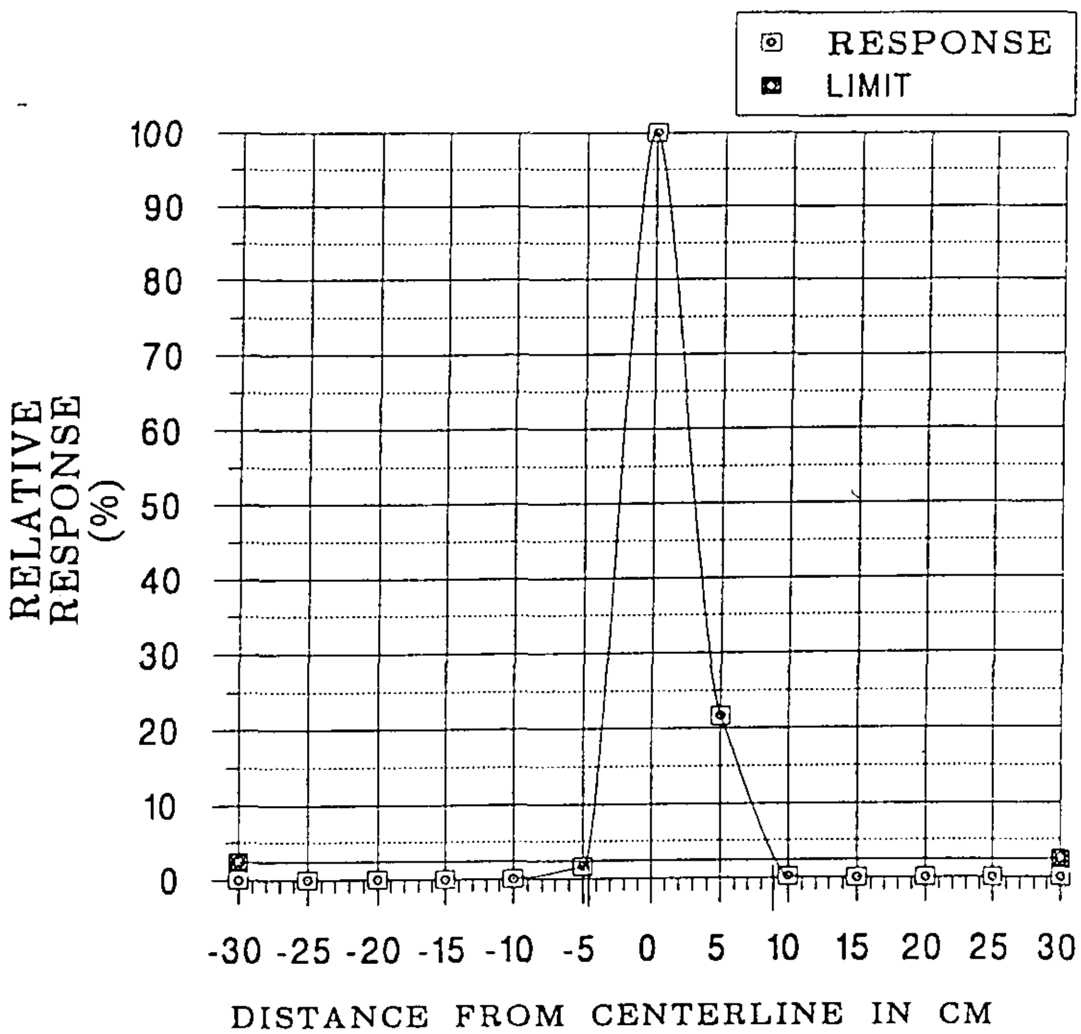
ANGLE OF VIEW TEST

1. VERTICAL/HORIZONTAL: VERTICAL
2. SERIAL NO. TESTED: 0993541
3. FOR ANALYZERS PRODUCED: SEPTEMBER MONTH 1993 YEAR
4. VALID FOR SERIAL NOS.: 0993534 through 0993743
5. LIGHT SOURCE SIZE: 1.3 cm
6. DATE OF TEST: SEPTEMBER 16, 1993
7. TEST PERSONNEL: WILLIAM SMITH and JOSEPH ZIOLKOWSKI
8. RANGE: ANALYZER TO SOURCE: 3 METERS
9. PC BOARD SERIAL NO.: L-08715M-0493
10. TEST POINT USED FOR OUTPUT: TP3

POSITION	READING	RELATIVE RESPONSE
+30 cm	-2.18	0.00%
+25 cm	-2.18	0.00%
+20 cm	-2.18	0.00%
+15 cm	-2.18	0.00%
+10 cm	-2.19	0.19%
+5 cm	-3.32	21.67%
0 cl	-7.44	100.00%
-5 cm	-2.27	1.71%
-10 cm	-2.18	0.00%
-15 cm	-2.18	0.00%
-20 cm	-2.18	0.00%
-25 cm	-2.18	0.00%
-30 cm	-2.18	0.00%

FIGURE 3

ANGLE OF VIEW (vertical)
SERIAL #0993541
Aperture= .141" Angle= 2.58 deg.
Month: Sept. 93
Test Date: 9/16/93



7.

FIGURE 4

ANGLE OF VIEW TEST

1. VERTICAL/HORIZONTAL HORIZONTAL
2. SERIAL NO. TESTED 0993541
3. FOR ANALYZERS PRODUCED SEPTEMBER MONTH 1993 YEAR
4. VALID FOR SERIAL NOS. 0993534 through 0993743
5. LIGHT SOURCE SIZE 1.3 cm
6. DATE OF TEST SEPTEMBER 16, 1993
7. TEST PERSONNEL WILLIAM SMITH and JOSEPH ZIOLKOWSKI
8. RANGE: ANALYZER TO SOURCE 3 METERS
9. PC BOARD SERIAL NO. L-08715M-0493
10. TEST POINT USED FOR OUTPUT TP3

POSITION	READING	RELATIVE RESPONSE
+30 cm	-2.18	0.00%
+25 cm	-2.18	0.00%
+20 cm	-2.18	0.00%
+15 cm	-2.18	0.00%
+10 cm	-2.19	0.21%
+5 cm	-2.50	6.61%
0 cl	-7.02	100.00%
-5 cm	-3.12	19.42%
-10 cm	-2.19	0.21%
-15 cm	-2.19	0.21%
-20 cm	-2.18	0.00%
-25 cm	-2.18	0.00%
-30 cm	-2.18	0.00%

FIGURE 5

ANGLE OF VIEW (horiz.)
Serial #0993541
Aperture= .141" Angle= 3.24 deg.
Month: Sept. 93
Test Date: 9/16/93

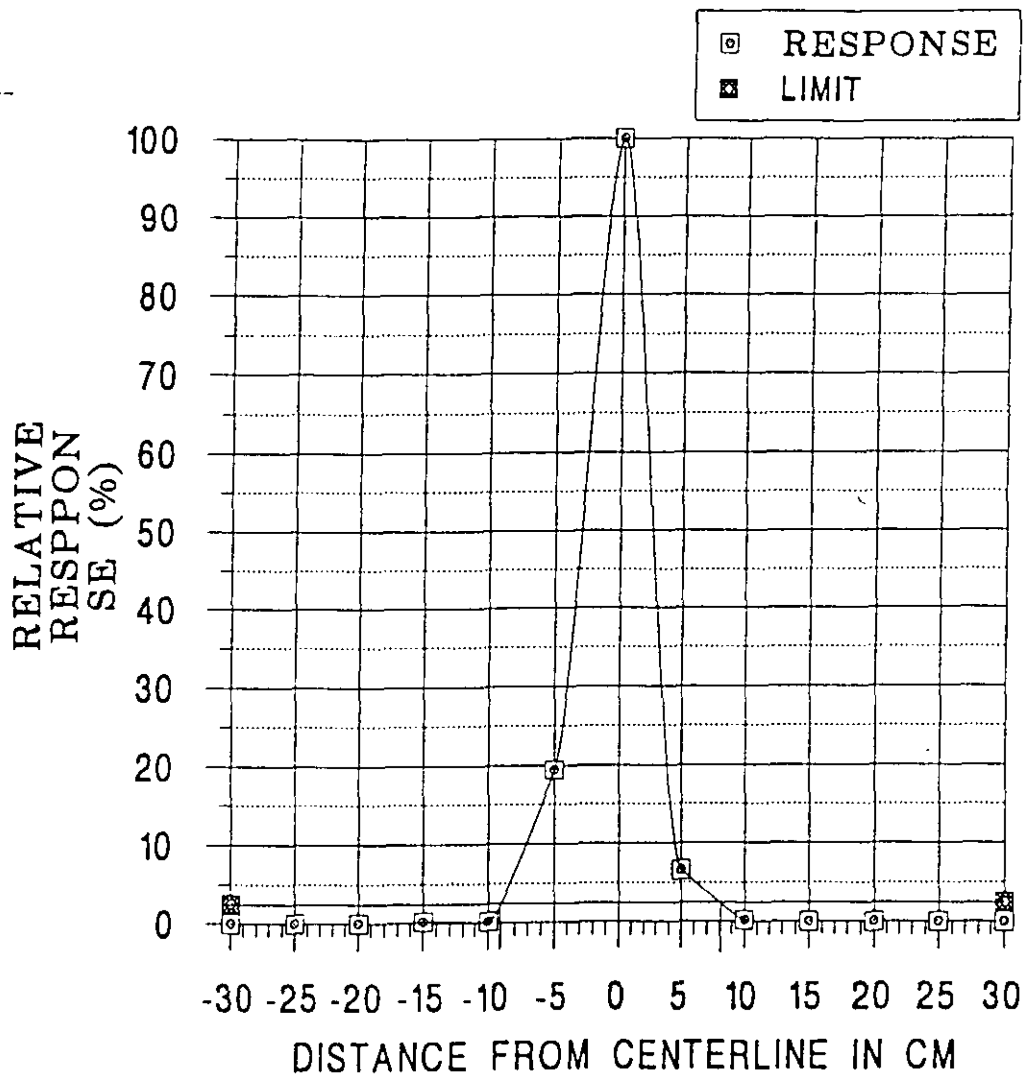


FIGURE 6

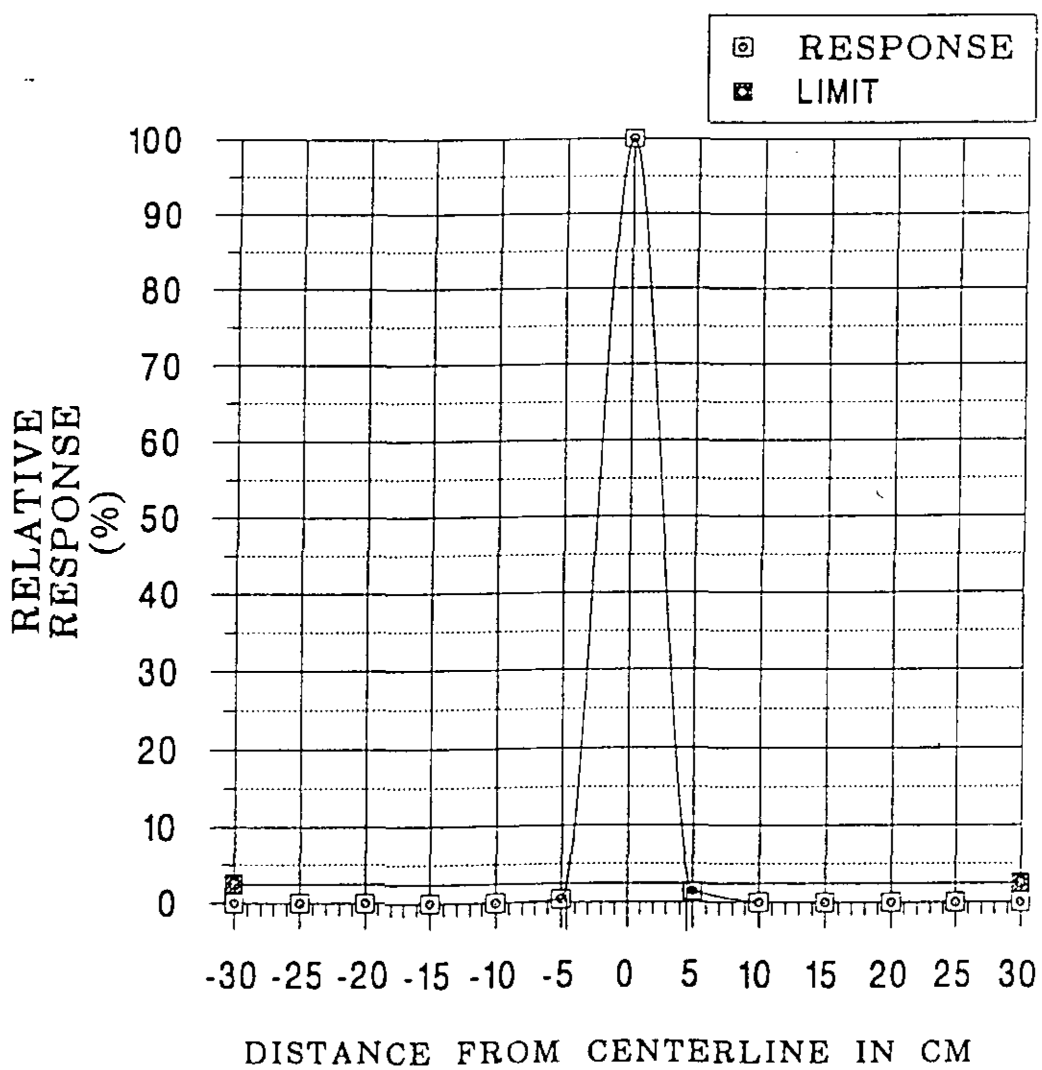
ANGLE OF PROJECTION TEST

1. VERTICAL/HORIZONTAL VERTICAL
2. SERIAL NO. TESTED 0993541
3. FOR ANALYZERS PRODUCED SEPTEMBER MONTH 1993 YEAR
4. VALID FOR SERIAL NOS. 0993534 through 0993743
5. DETECTOR SIZE .25 cm
6. DATE OF TEST SEPTEMBER 16, 1993
7. TEST PERSONNEL WILLIAM SMITH and JOSEPH ZIOLKOWSKI
8. RANGE: ANALYZER TO DETECTOR 3 METERS
9. PROJECTION APERATURE .141 (-09)
10. PC BOARD SERIAL NO. L-08715M-0493
11. TEST POINT USED FOR OUTPUT TP12

POSITION	READING	RELATIVE RESPONSE
+30 cm	-0.11	0.00%
+25 cm	-0.11	0.00%
+20 cm	-0.11	0.00%
+15 cm	-0.11	0.00%
+10 cm	-0.11	0.00%
+5 cm	-0.21	1.40%
0 cl	-7.27	100.0%
-5 cm	-0.14	0.42%
-10 cm	-0.11	0.00%
-15 cm	-0.11	0.00%
-20 cm	-0.11	0.00%
-25 cm	-0.11	0.00%
-30 cm	-0.11	0.00%

FIGURE 7

ANGLE OF PROJECTION (vert.)
Serial # 0993541
Aperture= .141" Angle=1.53 deg.
Month: Sept. 93
Test Date: 9/16/93



7-

FIGURE 8

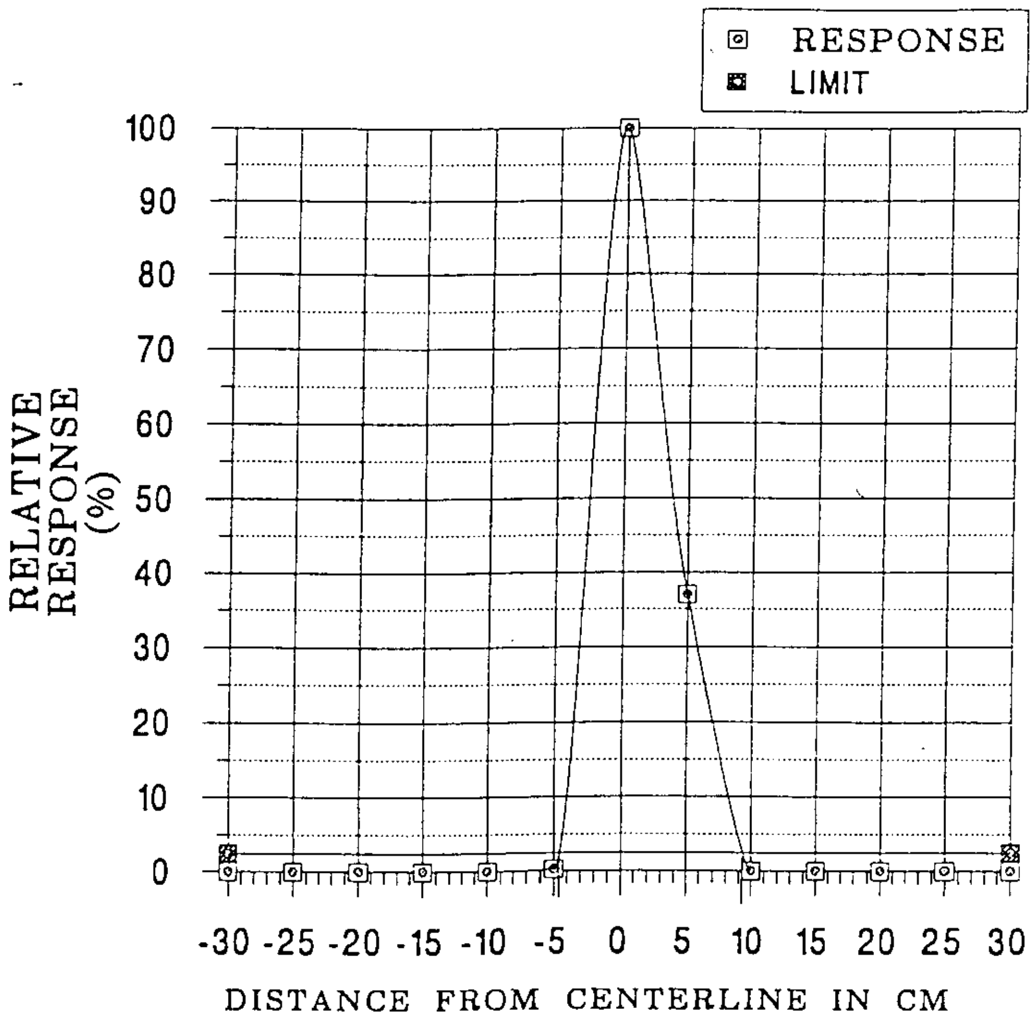
ANGLE OF PROJECTION TEST

1. VERTICAL/HORIZONTAL HORIZONTAL
2. SERIAL NO. TESTED 0993541
3. FOR ANALYZERS PRODUCED SEPTEMBER MONTH 1993 YEAR
4. VALID FOR SERIAL NOS. 0993534 through 0993743
5. DETECTOR SIZE .25 cm
6. DATE OF TEST SEPTEMBER 16, 1993
7. TEST PERSONNEL WILLIAM SMITH and JOSEPH ZIOLKOWSKI
8. RANGE: ANALYZER TO DETECTOR 3 METERS
9. PROJECTION APERATURE .141 (-09)
10. PC BOARD SERIAL NO. L-08715M-0493
11. TEST POINT USED FOR OUTPUT TP12

POSITION	READING	RELATIVE RESPONSE
+30 cm	-0.10	0.00%
+25 cm	-0.10	0.00%
+20 cm	-0.10	0.00%
+15 cm	-0.10	0.00%
+10 cm	-0.10	0.00%
+5 cm	-2.75	36.96%
0 cl	-7.27	100.00%
-5 cm	-0.12	0.28%
-10 cm	-0.10	0.00%
-15 cm	-0.10	0.00%
-20 cm	-0.10	0.00%
-25 cm	-0.10	0.00%
-30 cm	-0.10	0.00%

FIGURE 9

ANGLE OF PROJECTION (horiz)
Serial # 0993541
Aperture= .141" Angle= 2.67 deg
Month: Sept. 93
Test Date: 9/16/93



4.4 OPTICAL ALIGNMENT

4.4.1 PROCEDURE

USI chose an analyzer, Serial No. 0993541, at random from the September 1993 month's production and conducted an optical alignment sight test per Section 6.4 of 40 CFR Part 60, Appendix B, Specification 1. USI considers the optical system misaligned when the circle of the gunsight reticle intersects the edge of the retro image, as viewed from the optical head eyepiece.

4.4.2 RESULTS

The results of this test are shown in Figures 10, 11, and 12 and confirm that the Model 500C tested met or exceeded the Performance Specification. The instrument provided a clear indication when it was misaligned.

4.5 SIMULATED ZERO AND UPSCALE CALIBRATION

USI certifies that the Model 500C meets or exceeds the requirements of this specification and that compliance is inherent in the basic analyzer design details.

4.6 ACCESS TO EXTERNAL OPTICS

USI certifies that the Model 500C meets or exceeds the requirements of this specification and that compliance is inherent in the basic analyzer design details.

4.7 AUTO ZERO COMPENSATION INDICATOR

USI certifies that the Model 500C meets or exceeds the requirements of this specification and that compliance is inherent in the basic analyzer design details.

4.8 EXTERNAL CALIBRATION FILTER ACCESS

USI certifies that the Model 500C meets or exceeds the requirements of this specification and that compliance is inherent in the basic analyzer design details.

5.0 PERFORMANCE SPECIFICATIONS

5.1 CALIBRATION ERROR TEST

5.1.1 PROCEDURE

USI performed a Calibration Error test at the USI laboratory in Gibsonia, Pennsylvania, on the analyzer after the calibration and optical alignments were complete.

FIGURE 10

OPTICAL ALIGNMENT TEST

SERIAL NO. TESTED 0993541

FOR ANALYZERS PRODUCED SEPTEMBER MONTH 1993 YEAR

VALID FOR SERIAL NO. 0993534 through 0993743

DATE OF TEST SEPTEMBER 19, 1993

TEST PERSONNEL JOSEPH ZIOLKOWSKI

TEST DISTANCE 8 METERS

FILTER USED CLEAR

INSTRUMENT PROJECTION APERATURE .125 (-08)

Optical Head

1. OPACITY, PROPER ALIGNMMENT 9.4%

2A. OPACITY, VERTICAL MISALIGNMENT 11.4% ±2.0%

2B. DISTANCE BEAM OFFSET AT 8 METERS 1 1/8"

3A. OPACITY, LATERAL MISALIGNMENT 7.3% ±2.0%

3B. DISTANCE BEAM OFFSET AT 8 METERS 1 1/8"

Retro Reflector

1. OPACITY, PROPER ALIGNMENT 9.4%

2. OPACITY, LATERAL MISALIGNMENT 7.5%

3. DISTANCE OFFSET (APPARENT) INSIGHT IMAGE 1 1/8"

COMMENTS: IN ALL TESTS, THE CIRCLE IN THE GUNSIGHT INTERSECTED THE EDGE OF THE RETRO IMAGE BEFORE THE ±2% OPACITY MOVEMENT WAS INDICATED.

FIGURE 11

PROJECTOR UNIT MISALIGNMENT TEST

SERIAL NO. TESTED ____0993541____

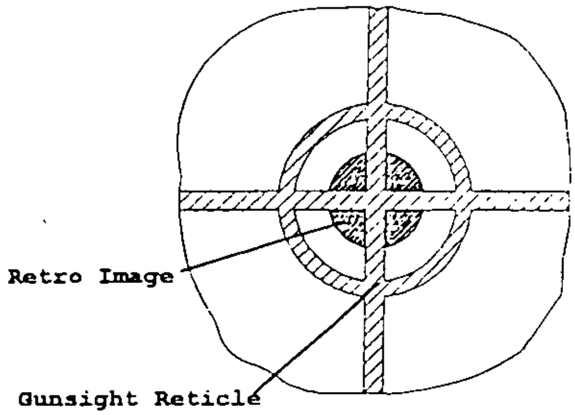
TEST DATE ____SEPTEMBER 19, 1993____

FILTER VALUE ____CLEAR O.D.____

TEST DISTANCE ____8 METERS____

TEST PERSONNEL ____JOSEPH ZIOLKOWSKI____

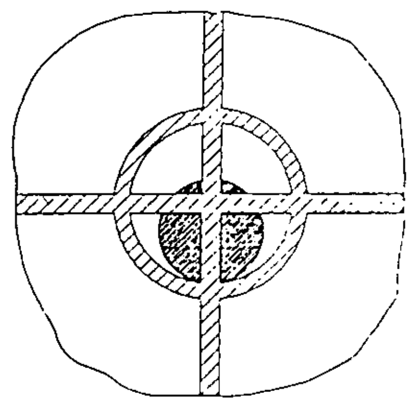
Image as viewed from optical head alignment sight



____9.4____ % OPACITY

VERTICAL MISALIGNMENT:

____11.4____ % OPACITY



HORIZONTAL MISALIGNMENT:

____7.3____ % OPACITY

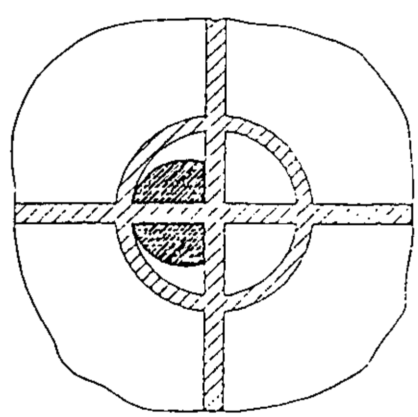


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FIGURE 12

REFLECTOR UNIT
MISALIGNMENT TEST

SERIAL NO. TESTED 0993541

TEST DATE SEPTEMBER 19, 1993

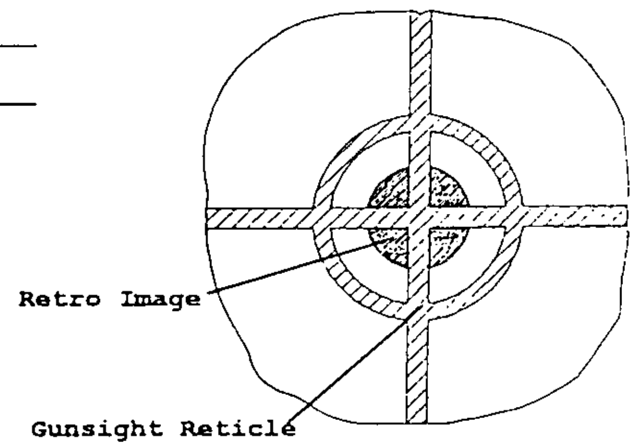
FILTER VALUE CLEAR

TEST DISTANCE 8 METERS

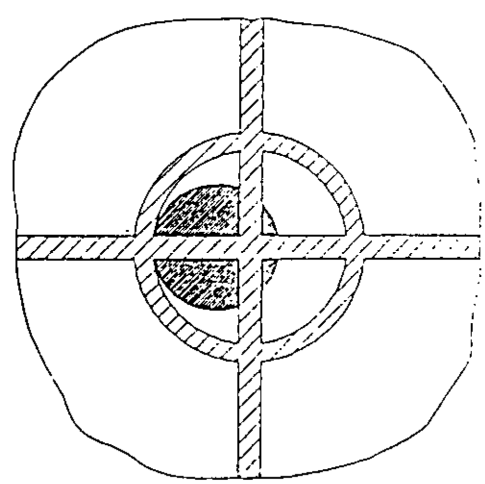
TEST PERSONNEL JOSEPH ZIOLKOWSKI

PROPERLY ALIGNED: 9.4 % OPACITY

Image as viewed from optical head alignment sight



LATERAL MISALIGNMENT: 7.5 % OPACITY



Low, mid, and high value neutral density attenuators were placed in the optical path between the Optical Head and the Retro. The analyzer's response to each attenuator was recorded. Each attenuator was measured five times non-consecutively, and its value was recorded in Figure 13. The test output device was a stripchart recorder, which was connected to the integrated analog output of the Remote Display panel.

5.1.2 RESULTS

The analyzer's response was subtracted from the pathlength adjusted neutral density attenuator value for each data point. The mean, standard deviation, confidence coefficient, and the total drift values were calculated and reported in Figure 13. These data indicate that the analyzer calibration error was less than three percent opacity for each filter and met or exceeded the performance specification.

5.2 RESPONSE TIME TEST

5.2.1 PROCEDURE

A high value attenuator was placed in the optical path and the time required for the analyzer to respond to 95% of the attenuator's value measured. The attenuator was then removed from the path and the time required for the analyzer to return to within 5% of its zero value measured. This procedure was then repeated until five upscale and five downscale times were recorded.

5.2.2 RESULTS

These data were recorded and a mean response time calculated in Figure 14.

5.3 NEUTRAL DENSITY ATTENUATORS

5.3.1 ATTENUATOR SELECTION

The values of the attenuators selected to perform the Calibration Error Test of Section 5.1 above are determined according to Section 7.1.2 of the CFR Title 40, Part 60, Appendix B, PS-1.

Low, mid, and high attenuators are chosen based on the analyzer full scale, and the automatic pathlength compensation (if any), and the availability of standard attenuator values. See Appendix A for the appropriate calculation used.

5.3.2 ATTENUATOR CALIBRATION

All attenuators were calibrated and maintained in accordance with all requirements of Section 7.1.3 of the Code of Federal Regulations Title 40, Part 60, Appendix B, Specification 1.

Certified calibration information is provided in Appendix B.

LERROR.BAS(1.05)

Figure 13

CALIBRATION ERROR TEST

Date: 03/16/94

Customer
GRASEBY / STI - LOUISIANA PACIFIC / CHILCO

Location of Test	GIBSONIA PA
Analyzer Manufacturer	UNITED SCIENCES INC.
Model Number	500C
Serial Number	0990724
Person Conducting Test	DEAN MURRAY
Person's Affiliation	UNITED SCIENCES

THE MONITORING SYSTEM IS NOT PATHLENGTH CORRECTED
Monitor calib. distance 9.479167 Feet

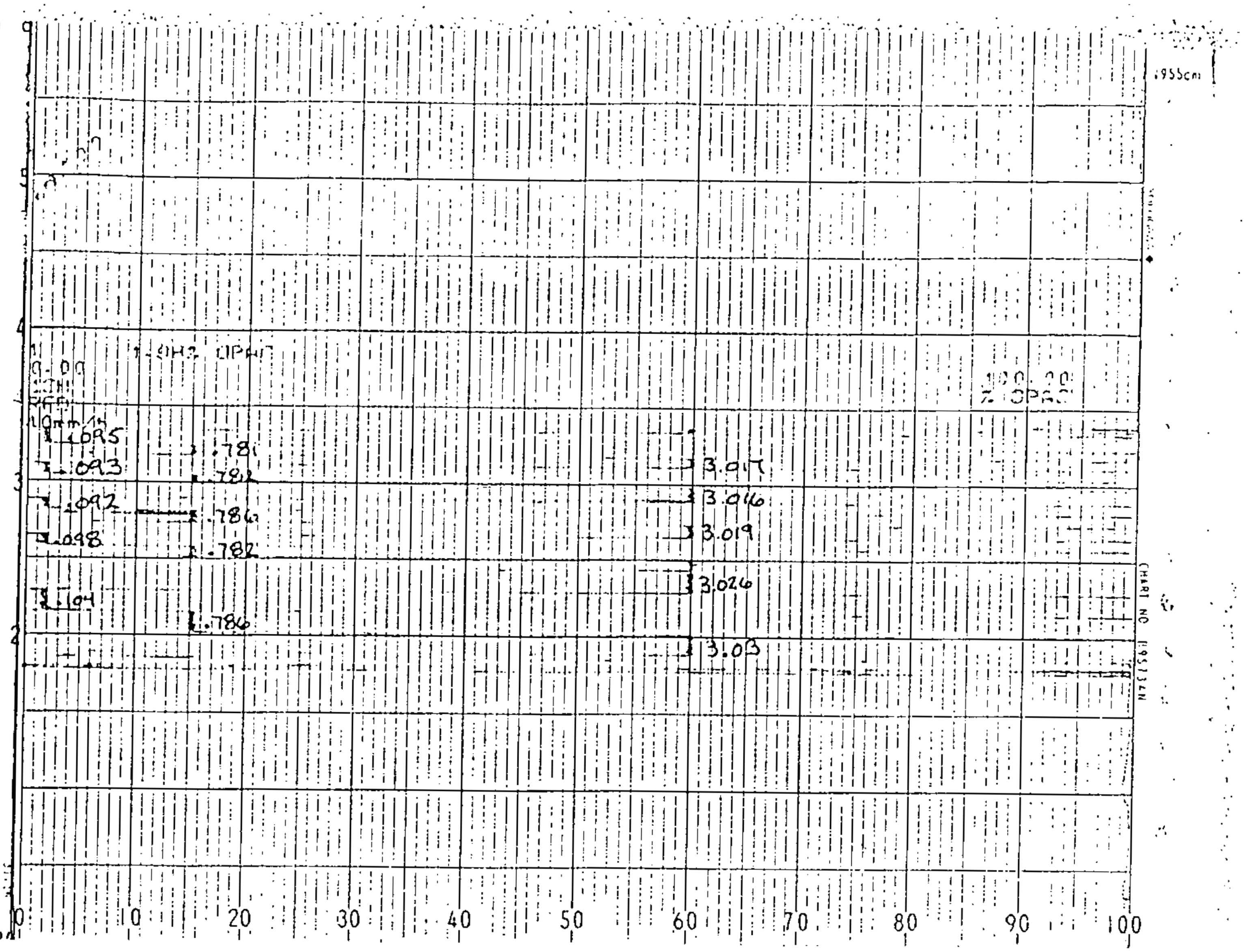
CALIBRATED NEUTRAL DENSITY ATTENUATOR VALUES

Serial Number	Stability Check Date	Certified Value Opacity	Corrected Value Opacity
NBS-026	1-6-94	22.50	22.50
NBS-003	1-6-94	59.80	59.80
NBS-039	1-6-94	85.70	85.70

CUSTOMER GRASEBY / STI
SO # 015694
DATE 9/14/94
☐ NO EXCEPTIONS NOTED
☐ EXCEPTIONS NOTED
☐ RETURNED FOR CORRECTIONS
☐ RECORD COPY
☐ REVISE AND RESUBMIT
☒ INFORMATION ONLY
BY [signature]
UNITED SCIENCES, INC.

CALIBRATION ERROR TEST   S/N: 0993724
CALERROR.BAS(1.04)

RUN NO.	ATTENUATOR VALUE (PATH ADJUSTED)	INSTRUMENT READING	DIFFERENCE READINGS LOW	MID	HI
LOW1	22.50	22.20	-0.30	XXX	XXX
MID1	59.80	60.40	XXX	0.60	XXX
HI1	85.70	85.50	XXX	XXX	-0.20
LOW2	22.50	22.20	-0.30	XXX	XXX
MID2	59.80	60.50	XXX	0.70	XXX
HI2	85.70	86.00	XXX	XXX	0.30
LOW3	22.50	22.30	-0.20	XXX	XXX
MID3	59.80	60.40	XXX	0.60	XXX
HI3	85.70	86.40	XXX	XXX	0.70
LOW4	22.50	22.30	-0.20	XXX	XXX
MID4	59.80	60.50	XXX	0.70	XXX
HI4	85.70	86.40	XXX	XXX	0.70
LOW5	22.50	22.30	-0.20	XXX	XXX
MID5	59.80	60.50	XXX	0.70	XXX
HI5	85.70	86.20	XXX	XXX	0.50
		ARITHMETIC MEAN=	-0.24	0.66	0.40
		CONFIDENCE COEFFICIENT=	0.07	0.07	0.46
		TOTAL ERROR=	0.31	0.73	0.86



CUSTOMER GRASEBY / STI

SO # 015644

DATE 9/14/94

☐ NO EXCEPTIONS NOTED
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FIGURE 14

RESPONSE TIME TEST

Serial Number	0993724
Calibration Distance	9' 5 3/4"
Date of Test	3-14-94
Place of Test	Gibsonia, PA
Test Personnel	Dean Murray
Data Display Device	Fluke Meter
Filter Value Used	89.5%

Upscale	1	2.66	seconds
	2	2.77	seconds
	3	1.57	seconds
	4	2.02	seconds
	5	1.99	seconds
Downscale	1	1.98	seconds
	2	1.63	seconds
	3	1.88	seconds
	4	2.68	seconds
	5	1.95	seconds
AVERAGE RESPONSE		2.113	seconds

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APPENDIX A

EQUATIONS USED

PROCEDURE FOR DETERMINING VALUES AND CONFIDENCE INTERVALS

The mean value or the data set is calculated according to Equation 1.

$$\overline{X} = \frac{1}{n}\sum_{i=1}^{n} X_i \qquad \text{EQUATION 1}$$

Where:

X_1 = Algebraic value of the individual measurements

n = Number of data points

$\overline{X}$ = Mean value of data points

The standard deviation is calculated according to Equation 2.

$$S_d = \sqrt{\frac{\sum_{i=1}^{n} X_i^{2} - \frac{\left(\sum_{i=1}^{n} X_i\right)^2}{n}}{n-1}} \qquad \text{EQUATION 2}$$

Where:

S_d = The standard deviation of the data set

The confidence coefficient is calculated according to Equation 3.

$$CC = t_{0.975}\frac{S_d}{\sqrt{d}} \qquad \text{EQUATION 3}$$

Where:

CC = The confidence coefficient
t_{0975} = t value, see table on following page

The error is calculated according to Equation 4.

$$Error = |\overline{X}| + |CC| \qquad \text{EQUATION 4}$$

VALUES FOR $t_{0.975}$

n	$t_{0.975}$
2	12.706
3	4.303
4	3.182
5	2.776
6	2.571
7	2.447
8	2.365
9	2.306
10	2.262
11	2.228
12	2.201
13	2.179
14	2.160
15	2.145
16	2.131

CONVERSION OF OPACITY VALUES FROM MONITOR PATH LENGTH TO EMISION OUTLET PATH LENGTH

$$OP_e = 1 - [(1 - OP_m)^{STR}] \qquad \text{EQUATION 5}$$

$$OP_m = 1 - [(1 - OP_e)^{1/STR}] \qquad \text{EQUATION 6}$$

Where: OP_e = Opacity at the Emission Outlet (expressed as a decimal).

OP_m = Opacity at the Monitor (expressed as a decimal).

STR = Stack Taper Ratio = $\dfrac{\text{Effluent Pathlength Emission Outlet}}{\text{Effluent Pathlength at the Monitor Location}}$

$$O.D._e = O.D._m \text{ (STR)} \qquad \text{EQUATION 7}$$

$$\frac{O.D._e}{STR} = O.D._m$$

Where: $O.D._e$ = Optical Density at Emission Outlet

$O.D._m$ = Optical Density at the Monitor

STR = See Above

APPENDIX B

CERTIFICATE OF ANALYSIS, NEUTRAL DENSITY FILTERS

DOC #NDFANAL

UNITED SCIENCES INC.

CERTIFIED NEUTRAL DENSITY ATTENUATOR ANALYSIS REPORT

I. PURPOSE

This analysis was conducted in order to determine the CIE Daylight Luminous Transmittance and effective opacity of neutral density attenuators.

II. SPECTRAL TRANSMITTANCE MEASUREMENTS

Spectral transmittance measurements were performed using a laboratory scanning spectrophotometer whose specification meets or exceeds those described in the Code of Federal Regulations Title 40, Part 60, Appendix B, Specification 1, Section 3.4. Transmittance values were determined at 2 nanometer intervals over the range of 350 to 750 nanometers. Two scans are conducted on each attenuator. The second scan is conducted after rotating the attenuator 90 degrees from its original orientation.

The arithmetic mean of the transmittance at each wavelength measured is calculated and these data used to compute the overall transmittance and effective opacity. All attenuator calibration procedures were in accordance with CFR Title 40, Part 60, Appendix B, Specification 1, Section 7.1.3.

III. ACCURACY

The accuracy of the spectrophotemeter is insured using the National Institute of Standards Technology Standard Reference Material 930D to assess its operation method, the NIST traceable calibration is certified to be within ±0.5% transmittance.

IV. STABILITY

In accordance with CFR Title 40, Part 60, Appendix B, Specification 1, Section 7.1.3, these attenuators must be returned to USI for checks of stability every three months in order to maintain valid attenuator certification. These stability checks are performed using a laboratory transmissometer, and any time the attenuator value as measured on the transmissometer varies by ±2% opacity the attenuator is recalibrated.

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United Sciences inc.

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CERTIFICATE OF ANALYSIS
NEUTRAL DENSITY FILTERS

The enclosed calibration attenuators have been calibrated in accordance with Title 40 Code of Federal Regulations Part 60, Appendix B, Specification 1, Section 7.1.3.

These attenuators are certified to have the following opacity values:

Serial Number	Opacity In Percent	Calibration Date	Stability Check Date
NBS001	21.0%	06/28/93	01/06/94
NBS002	30.5%	06/28/93	01/06/94
NBS003	59.8%	06/28/93	01/06/94
NBS004	86.4%	06/28/93	01/06/94
NBS006	77.7%	06/28/93	01/06/94
NBS007	74.9%	06/28/93	01/06/94
NBS008	64.6%	06/28/93	01/06/94
NBS009	35.5%	06/28/93	01/06/94
NBS010	8.7%	06/28/93	01/06/94
NBS011	46.1%	06/28/93	01/06/94
NBS012	77.6%	06/28/93	01/06/94
NBS024	91.7%	06/28/93	01/06/94

SIGNATURE Joseph P. [signature]

DATE January 6, 1994

CUSTOMER United Sciences Inc.
In-house Reference Filters - Set #1
5310 North Pioneer Road
Gibsonia, Pennsylvania 15044-9629

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United Sciences inc.

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CERTIFICATE OF ANALYSIS
NEUTRAL DENSITY FILTERS

The enclosed calibration attenuators have been calibrated in accordance with Title 40 Code of Federal Regulations Part 60, Appendix B, Specification 1, Section 7.1.3.

These attenuators are certified to have the following opacity values:

Serial Number	Opacity In Percent	Calibration Date	Stability Check Date
NBS013	9.5%	01/06/94	01/06/94
NBS014	22.3%	01/06/94	01/06/94
NBS015	37.2%	01/06/94	01/06/94
NBS016	44.4%	01/06/94	01/06/94
NBS018	68.4%	01/06/94	01/06/94
NBS019	75.1%	01/06/94	01/06/94
NBS020	79.9%	01/06/94	01/06/94
NBS021	80.7%	01/06/94	01/06/94
NBS022	84.4%	01/06/94	01/06/94
NBS023	91.4%	01/06/94	01/06/94

SIGNATURE Joseph P. Zurlinden

DATE January 6, 1994

CUSTOMER United Sciences Inc.

In-house Reference Filters - Set #2

5310 North Pioneer Road

Gibsonia, Pennsylvania 15044-9629

United Sciences inc.

5310 NORTH PIONEER ROAD • GIBSONIA, PA 15044 • 412 - 443-8610 • FAX 412 - 443-4025

CERTIFICATE OF ANALYSIS
NEUTRAL DENSITY FILTERS

The enclosed calibration attenuators have been calibrated in accordance with Title 40 Code of Federal Regulations Part 60, Appendix B, Specification 1, Section 7.1.3.

These attenuators are certified to have the following opacity values:

Serial Number	Opacity In Percent	Calibration Date	Stability Check Date
NBS025	9.4%	06/28/93	01/06/94
NBS026	22.5%	06/28/93	01/06/94
NBS029	59.7%	06/28/93	01/06/94

SIGNATURE

DATE January 6, 1994

CUSTOMER United Sciences Inc.
In-house Reference Filters - Set #3
5310 North Pioneer Road
Gibsonia, Pennsylvania 15044-9629

United Sciences inc.

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CERTIFICATE OF ANALYSIS
NEUTRAL DENSITY FILTERS

The enclosed calibration attenuators have been calibrated in accordance with Title 40 Code of Federal Regulations Part 60, Appendix B, Specification 1, Section 7.1.3.

These attenuators are certified to have the following opacity values:

Serial Number	Opacity In Percent	Calibration Date	Stability Check Date
NBS032	37.8%	01/06/94	01/06/94
NBS033	54.0%	01/06/94	01/06/94
NBS034	58.7%	01/06/94	01/06/94
NBS035	68.9%	01/06/94	01/06/94
NBS036	70.5%	01/06/94	01/06/94
NBS037	78.9%	01/06/94	01/06/94
NBS038	81.4%	01/06/94	01/06/94
NBS039	85.7%	01/06/94	01/06/94

SIGNATURE Joseph P. [signature]

DATE January 6, 1994

CUSTOMER United Sciences Inc.

In-house Reference Filters - Set #4

5310 North Pioneer Road

United Sciences inc.

5310 NORTH PIONEER ROAD • GIBSONIA, PA 15044 • 412 - 443-8610 • FAX 412 - 443-4025

CERTIFICATE OF ANALYSIS
NEUTRAL DENSITY FILTERS

The enclosed calibration attenuators have been calibrated in accordance with Title 40 Code of Federal Regulations Part 60, Appendix B, Specification 1, Section 7.1.3.

These attenuators are certified to have the following opacity values:

Serial Number	Opacity In Percent	Calibration Date	Stability Check Date
041	9.1%	11/29/93	01/06/94
042	20.8%	11/29/93	01/06/94
043	59.3%	11/29/93	01/06/94
045	89.9%	11/29/93	01/06/94
046	85.2%	12/22/93	01/06/94

SIGNATURE [signature]

DATE January 6, 1994

CUSTOMER United Sciences Inc.
In-house Reference Filters #5
5310 North Pioneer Road
Gibsonia, PA 15044-9629

United Sciences inc.

5310 NORTH PIONEER ROAD • GIBSONIA, PA 15044 • 412 - 443-8610 • FAX 412 - 443-4025

CERTIFICATE OF ANALYSIS
NEUTRAL DENSITY FILTERS

The enclosed calibration attenuators have been calibrated in accordance with Title 40 Code of Federal Regulations Part 60, Appendix B, Specification 1, Section 7.1.3.

These attenuators are certified to have the following opacity values:

Serial Number	Opacity In Percent	Calibration Date	Stability Check Date
047	8.9%	01/06/94	01/06/94
048	20.7%	01/06/94	01/06/94
049	60.2%	01/06/94	01/06/94
050	86.7%	01/06/94	01/06/94
051	89.5%	01/06/94	01/06/94

SIGNATURE Joseph P. Zielkowski

DATE January 6, 1994

CUSTOMER United Sciences Inc.
In-house Reference Filters #6
5310 North Pioneer Road
Gibsonia, PA 15044-9629

APPENDIX D

Example Calculations and Field Data Sheets

AMTEST
AIR QUALITY INC

Example Calculation of Bias Correction

Client: Louisiana-Pacific Corporation **Location:** [illegible] Idaho

Site Location: RTO Exhaust Stack

Run #: 6

Date: [illegible]

$$C_{gas} = (C - C_o) * (C_{ma}/(C_m - C_o)$$

where:

- C_{gas} = Effluent gas concentration, dry basis, ppm
- C = Average gas concentration indicated by analyzer, dry basis, ppm
- C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm
- C_{ma} = Actual concentration of the upscale calibration gas, ppm
- C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm

= [3.5 ppm - 0.1] * [30.3 /(30.3 - 0.1]

= 3.4 ppm CO (bias corrected)

CONTINUOUS EMISSION MONITORING SYSTEM (CEMS)
RELATIVE ACCURACY TEST AUDIT (RATA)
AM TEST - AIR QUALITY, INC.

Client *Louisiana-Pacific Corporation* Location *RTO Exhaust Con. Test*

Monitor Manufacturer *Thermo Environmental* Model No. *48*

Type of Monitor (SO_2, NO_x, HC, etc.) *carbon monoxide*

Unit of Measurement (%, ppm, wet or dry basis) *ppm dry*

Emission Standard (provide units) *11.65 lb/hr @20*

Measurement Principle (NDIR, chemiluminescent, etc.) *NDIR*

Monitor System Type (extractive, in-situ) ______

Range of Instrument *0-50 ppm* Span Gas Concentration *45 ppm*

RELATIVE ACCURACY TEST

Test No.	Date	Time	Reference Method Value	CEMS Value	Difference X_i	Difference X_i^2
1 (struck through)	9/16/94	1415 1445	3.8	3.0	-0.8	0.64
2	↓	1500 1530	3.6	3.0	-0.6	0.36
3	↓	1545 1615	3.7	3.2	-0.5	0.25
4	↓	1630 1700	3.8	3.5	-0.3	0.09
5	↓	1715 1745	3.3	2.8	-0.5	0.25
6 (struck through)	↓	1800 1830	3.4	2.5	-0.9	0.81
7	↓	1845 1915	3.2	2.5	-0.7	0.49
8 (struck through)	↓	1930 2000	3.4	2.5	-0.9	0.81
9	↓	2015 2045	3.4	2.7	-0.7	0.49
10	↓	2100 2130	2.9	2.5	-0.4	0.16
11	↓	2145 2215	3.1	2.6	-0.5	0.25
12	↓	2230 2300	3.5	2.9	-0.6	0.36
Mean			a 3.39	2.86	b -0.53	
Sum of the Differences						c 2.70
(Sum of the Differences)^2					d 23.04	

Runs 1, 6 and 8 were rejected.

EXAMPLE CALCULATION OF
CONFIDENCE INTERVAL AND RELATIVE ACCURACY
CONTINUOUS EMISSION MONITORING SYSTEM PERFORMANCE EVALUATION
AM TEST - AIR QUALITY, INC.

Client Louisiana-Pacific Corporation Location Chilco, Idaho

Date 9/16/94 Monitor I.D. [illegible] CO Analyzer

Confidence Interval = CI

$t_{.975} = 2.306$

n = 9

Xi = difference

$$\text{Confidence Interval} = \frac{t_{.975}}{n\sqrt{n-1}} * \sqrt{n * (\sum_c X_i^2) - (\sum_d X_i)^2}$$

$$= \frac{2.306}{9\sqrt{9-1}} * \sqrt{9 * (\underline{2.70}) - (\underline{23.04})} = \underline{0.1 \text{ ppm CO}}$$

$$\text{Accuracy (\% basis)} = \frac{|\text{Mean of the Differences}|_b + \text{CI}}{\text{Mean of Reference Method Values}_a} * 100\%$$

$$= \frac{|\underline{-0.53}| + \underline{0.1}}{\underline{3.39}} * 100\% = \underline{18.7}\ \%$$

$$\text{Accuracy (conc. basis)} = |\text{Mean of the Differences}|_b + \text{CI}$$

$$= |\underline{-0.53}| + \underline{0.1} = \underline{0.6 \text{ ppm CO}}$$

EXAMPLE CALCULATION SHEET
EPA METHODS 1, 2, 3A AND 4

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FOR METHOD ______

CLIENT: Louisiana-Pacific Corporation LOCATION: Chilco, Idaho DATE: 9/16/94

RUN #: 6 LAB #: 655 SITE LOCATION: RTO Exhaust Stack

Dry Gas Volume - Equation 5-1

Vm_{std} = 17.647°R/"$Hg_{(constant)}$*volume sampled*Y_{factor}*(P_B + ΔH/13.6)/(460 + T_m)

= 17.647°R/"Hg* 21.898 ft³* 1.000*(27.65"Hg + (1.0 "H_2O/13.6))/(460 + 235° F)

= 19.496 dscf

dscm = 19.496 dscf/35.31 ft³/m³ = 0.552 dscm

Moisture - Equation 5-2 and 5-3

Vw_{std} = 0.04715 ft³/g * 26.4 grams of H_2O collected in impingers = 1.24 scf

B_{ws} = (1.24 scf)/(1.24 scf + 19.496 dscf) = 0.0600

% Moisture = 6.00 % = B_{ws} * 100

Molecular weight - Equation 3-2

M_d = 0.440*(0.8 %CO_2) + 0.320*(19.9 %O_2) + 0.280*(100%-0.8 %CO_2-19.9 %O_2(%CO + %N_2))

= 28.92 g/g-mole (dry)

M_s = M_d * (1-B_{ws}) + 18.0 * B_{ws} = 28.92 g/g-mole * (1 - 0.0600) + 18.0 g/g-mole * 0.0600

= 28.27 g/g-mole (wet) F_o = (20.9-19.9)%O_2/0.8 %CO_2 = 1.250

Stack gas velocity and volumetric flow rate - Equation 2-9 and 2-10

V_s = 85.49 * C_p* $\sqrt{\Delta P * T_s / (M_s * P_s)}$

V_s = 85.49 * 0.84 *√(0.606 * 681.0 °R /(28.27 g/g-mole * 27.61 "Hg))
(221.0° F + 460)° R (27.65 P_B + -0.5 P_s/13.6)

V_s = 52.2 ft/sec (std)

Q_{sd} = 3600 * (1 - B_{ws}) * V_s * A_s * (T_{std}/T_s) * (P_s / P_{std}) / 60 min/hr

Q_{sd} = 3600 * (1 - 0.0600) * 52.2 ft/sec * 49.9 ft² * (528° R/681.0 ° R) * (27.61"Hg / 29.92"Hg) / 60
[illegible] 9/4/94

= 105119.6 dscf/min (dry standard cubic feet per minute)

acfm = 52.2 ft/sec * 49.9 ft²* 60 sec/min

= 156285.8 acfm (actual cubic feet per minute)

Isokinetic variation - Equation 5-8

I = 0.09450 * Vm_{std} * T_s ÷ [P_s * V_s * sample time * A_n *(1 -B_{ws})]

I = 0.09450 * ________ dscf * ______ ° R/[______ "Hg * ______ ft/sec * ______ min * ______ ft² *(1 - ______)]
(____ N_{dia}/12/2)²*Pi

I = N/A %

All of the above numbered equations are from the 40 CFR 60 and assume English units.

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CONTINUOUS EMISSION MONITORING SYSTEM (CEMS)
RELATIVE ACCURACY TEST AUDIT (RATA)
AM TEST - AIR QUALITY, INC.

Client *Louisiana-Pacific Corporation* Location *RTO Exhaust Stack, Chilco, Idaho*

Monitor Manufacturer *United Sciences* Model No. *100*

Type of Monitor (SO_2, NO_x, HC, etc.) *Flow*

Unit of Measurement (%, ppm, wet or dry basis) *Kscfm*

Emission Standard (provide units) ______

Measurement Principle (NDIR, chemiluminescent, etc.) ______

Monitor System Type (extractive, in-situ) ______

Range of Instrument ______ Span Gas Concentration ______

RELATIVE ACCURACY TEST

Test No.	Date	Time	Reference Method Value	CEMS Value	Difference X_i	Difference X_i^2
~~1~~	~~9/16/94~~	~~1415 1445~~	~~161.1~~	~~154.7~~	~~-6.4~~	~~40.96~~
2		1500 1530	154.8	157.0	2.2	4.84
3		1545 1615	161.6	156.1	-5.5	30.25
4		1630 1700	156.1	155.5	-0.6	0.36
~~5~~		~~1715 1745~~	~~160.8~~	~~154.6~~	~~-6.2~~	~~38.44~~
6		1800 1830	156.3	157.6	1.3	1.69
7		1845 1915	153.6	153.8	0.2	0.04
8		1930 2000	155.7	152.5	-3.2	10.24
~~9~~		~~2015 2045~~	~~154.9~~	~~148.7~~	~~-6.2~~	~~38.44~~
10		2100 2130	152.6	149.5	-3.1	9.61
11		2145 2215	152.9	150.8	-2.1	4.41
12	↓	2230 2300	151.9	148.2	-3.7	13.69
Mean			a 155.06	153.44	b -1.61	
Sum of the Differences						c 75.13
(Sum of the Differences)^2					d 210.25	

Runs 1, 5 and 9 were rejected.

EXAMPLE CALCULATION OF
CONFIDENCE INTERVAL AND RELATIVE ACCURACY
CONTINUOUS EMISSION MONITORING SYSTEM PERFORMANCE EVALUATION
AM TEST - AIR QUALITY, INC.

Client Louisiana-Pacific Corporation Location RTO Exhaust Stack Chilco, Idaho

Date 9/16/94 Monitor I.D. United Sciences, Inc. Model 100 Flow Analyzer

Confidence Interval = CI

$t_{.975} = 2.306$

n = 9

Xi = difference

Confidence Interval

$$= \frac{t_{.975}}{n\sqrt{n-1}} * \sqrt{n * (\sum X_i^2)_c - (\sum X_i)^2_d}$$

$$= \frac{2.306}{9\sqrt{9-1}} * \sqrt{9 * (\underline{75.13}) - (\underline{210.25})} = \underline{2.0\ \text{kacf/min}}$$

Accuracy (% basis) $= \dfrac{|\text{Mean of the Differences}|^{b} + \text{CI}}{\text{Mean of Reference Method Values}^{a}} * 100\%$

$$= \frac{|\underline{-1.61}| + \underline{2.0}}{\underline{155.06}} * 100\% = \underline{2.3}\ \%$$

Accuracy (conc. basis) $= |\text{Mean of the Differences}|^{b} + \text{CI}$

$$= |\underline{-1.61}| + \underline{2.0} = \underline{3.6\ \text{kacf/min}}$$

AMTEST
AIR QUALITY, INC

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Example Calculation of Gaseous Carbon Monoxide (CO) Emissions

Client: Louisiana-Pacific Corporation

Location: Chilco, Idaho

Site Location: RTO Exhaust Stack

Run #: 6

Date: 9/16/94

Lab # 6655

Emission Concentration Results

instrument averaged 3.4 ppm carbon monoxide (CO) during the run

$$\_\_\_ \text{ ppm} * \frac{(20.9 - \_\_\_ \% O_2)}{(20.9 - \_\_\_ \% O_2)} = \text{N/A ppm CO @ } \_\_\_ \% O_2$$

$$3.4 \text{ ppm} \cdot \frac{28.01 \text{ g/g-mole}}{22.414 \text{ L/g-mole}} * \frac{273.15\ ^\circ K}{293.15\ ^\circ K} \cdot \frac{1000 \text{ l}}{1 \text{ m}^3} * \frac{1}{10^6 \text{ ppm}} = 0.004 \text{ g/m}^3 \text{ CO}$$

Emission Rate Results

$$0.004 \text{ g/m}^3 * \frac{1 \text{ m}^3}{35.31 \text{ ft}^3} * 10519.6 \frac{\text{dscf}}{\text{min}} * 60 \frac{\text{min}}{\text{hr}} * \frac{1 \text{ lb}}{453.6 \text{ g}} = 1.6 \text{ lb/hr CO}$$

$$1.6 \frac{\text{lb}}{\text{hr}} * 24 \frac{\text{hrs}}{\text{day}} * 365 \frac{\text{days}}{\text{yr}} * \frac{1 \text{ ton}}{2000 \text{ lbs}} = 6.9 \text{ tons/yr CO}$$

STACK SCHEMATIC AND LOCATION OF SAMPLE POINTS

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Client Louisiana Pacific [illegible]

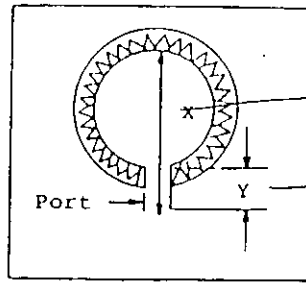
Location ~~[illegible]~~ Chilco, ID

Sampling Location RTO- [illegible]

Inside of far wall to outside of port (distance, X) 102 - South Port; 101 3/4 - W Port; 101.88 [illegible]

Inside of near wall to outside of port (distance, Y) 6.25

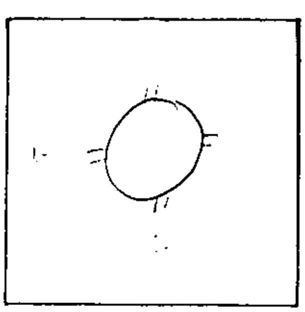
Stack I.D. (distance X - distance Y) 95.63

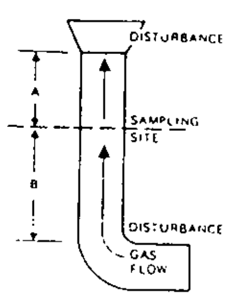


Schematic of Sampling Location

1 Traverse Point #	2 Fractional Percent of Stack I.D.	3 Stack I.D. inches	4 Column 2 x 3	5 Distance Y	6 Traverse Point Location from Outside of Port columns 4 + 5
1	.032	95.63	3.1	6.25	9.3
2	.105		10		16.3
3	.194		18.6		24.8
4	.323		30.9		37.1
5	.677		[illegible]		71
6	.806		77.1		[illegible]
7	.895		85.6		[illegible]
8	.968		92.6		[illegible]
9					
10					
11					
12					

CROSS SECTION

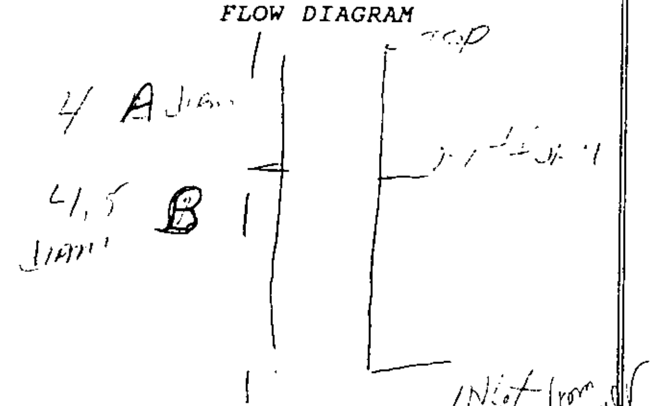




Distance A = 4 diameters downstream

Distance B = 4.5 diameters upstream

STACK, CONTROL DEVICE AND PROCESS FLOW DIAGRAM



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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Page ___ of ___

Client [illegible]
Location [illegible]
Sample Site [illegible]

Stack Diameter [illegible] 95.63
Date 9/13/57
Operators [illegible]
Run I.D. 1 & 2

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	<.01 / 15
Leak Test Vacuum	[illegible] / 20
✓ Pitots, Pre Leak Ck	
___ Pitots, Post Leak Ck	
___ Gas Sampling System	
___ Integrated Bag	
___ Thermocouples @ ___ °F	

QA FORMS COMPLETED

Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # ______ Box # 0-1

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	654.1	627.5	26.6
#2 Imp.	635.7	634.7	1
#3 Imp.	548.6	547.3	1.3
#4 Imp.			
#5 Imp.			
#6 S.G.	771.8	765.9	5.9
Total H_2O Volume			34.8 ✓ g

Start Time 14:15
Stop Time 15:30
Barometric Pressure "Hg [illegible]
Static Pres "H_2O -.5"
Production Rate ______

SAMPLING PARAMETERS

% Moisture 6.8
Meter Temp. 89.1
Stack Temp. ______
Δ H@ ______ Y 1.000
Meter Box ID [illegible]
Pitot # [illegible] Side # [illegible]
Thermocouple ID [illegible]
Flow Meas. Device [illegible]
Cp [illegible]
K Factor ______

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^ P " H_2O	Stack Temp °F	
North port	0	68.802	1.0	89	88		75				
	15	75.001			89	88		74				
	30/0	81.019		90	89		74				
	15	—		90	89		78				
	30	94.084	↓	90	89		77				
	[illegible]		$\sqrt{\Delta H}$	89.1 ✓ T_m			~~74.4~~		$(\Delta P)^2$	T_s	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Page ___ of ___

Client [illegible]
Location Chilco, ID
Sample Site PTO-out[illegible]

Stack Diameter 95.63
Date 9/16/94
Operators [illegible]
Run I.D. [illegible] -1

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Start Time 14:15
Stop Time 14:45
Barometric Pressure "Hg 27.68
Static Pres "H_2O -.5"
Production Rate ___

Filter # ___ Box # ___

EQUIPMENT CHECKS

Initial/Final
Leak Rate cfm ___/___
Leak Test Vacuum ___/___
✓ Pitots, Pre Leak Ck
___ Pitots, Post Leak Ck
___ Gas Sampling System
___ Integrated Bag
___ Thermocouples @ ___ °F

28.94 MW dry
28.20 MW wet

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.			
#2 Imp.			
#3 Imp.			
#4 Imp.			
#5 Imp.			
#6 S.G.			

Total H_2O Volume ___ g

SAMPLING PARAMETERS

% Moisture 6.8
Meter Temp. ___
Stack Temp. ___
ΔH@ ___ Y [illegible]
Meter Box ID ___
Pitot # P10B Side # A
Thermocouple ID [illegible]
Flow Meas. Device [illegible]
Cp .84
K Factor ___

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (ΔH) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading Δ P " H_2O	Stack Temp °F	
3-1									.76	210	
2									.90	216	
3									.84	228	
4									.62	222	
5									.64	219	
6									.56	222	
7									.54	223	
8									.50	224	
4-1									.64	223	
2									.68	224	
3									.74	219	
4									.62	221	
5									.66	225	
6									.64	230	
7									.52	229	
8									.50	225	
							161,036	ACFM		CO_2	0.9%
							[illegible] 102	[illegible]		O_2	19.9%
							[illegible] 275	[illegible]		CO	3.8 ppm

ΔH ___ T_m ___ 53.8 $(\sqrt{\Delta p})^2$ 222.5 ✓ T_s

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Page ___ of ___

Client *Louisiana Pacific*
ocation *Chilco - ID*
ample Site *PTO outlet*

Stack Diameter *95.63"*
ate *9/16/94*
perators *Newman/Albertson*
Run I.D. *2*

EQUIPMENT CHECKS

Initial/Final
eak Rate cfm *✓* / ___
eak Test Vacuum ___ / ___
___ Pitots, Pre Leak Ck
___ Pitots, Post Leak Ck
___ Gas Sampling System
___ Integrated Bag
___ Thermocouples @ ___ °F
28.94 in dry
28.20 in wet

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # ___ Box # ___

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.			
#2 Imp.			
#3 Imp.			
#4 Imp.			
#5 Imp.			
#6 S.G.			

Total H_2O Volume ___ g

Start Time *15^00*
Stop Time *15:30*
Barometric Pressure "Hg *27.68*
Static Pres "H_2O *-0.5*
Production Rate ___

SAMPLING PARAMETERS

% Moisture *6.8*
Meter Temp. ___
Stack Temp. ___
△H@ ___ Y *1.000*
Meter Box ID ___
Pitot # *P10A* Side # *A*
Thermocouple ID *[illegible]*
Flow Meas. Device *[illegible]*
Cp *0.834*
K Factor ___

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^P " H_2O	Stack Temp °F	
W-1									0.56	224	
2									0.68	221	
3									0.74	219	
4									0.60	221	
5									0.58	223	
6									0.58	226	
7									0.56	229	
8									0.44	226	
S-1									0.62	222	
2									0.80	219	
3									0.62	222	
4									0.73	225	
5									0.55	229	
6									0.50	225	
7									0.54	220	
8									0.46	218	
							154,846	ACFm		CO_2	0.9%
							110,819	SCFm		O_2	19.9%
							103,284	SDCFm		CO	3.6 ppm
			△H	Tm				51.7 fps	$(\Delta p)^2$	221.6 ✓ Ts	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Client Louisiana Pacific
Location Chilco ID
Sample Site RTO outlet

Stack Diameter ~~9~~ 95.63
Date 9/16/94
Operators Albertson/Newman
Run I.D. 3/4

EQUIPMENT CHECKS

Initial/Final
Leak Rate cfm <.01 / .20
Leak Test Vacuum <.01 / 20
_____ Pitots, Pre Leak Ck
_____ Pitots, Post Leak Ck
_____ Gas Sampling System
_____ Integrated Bag
_____ Thermocouples @ ___ °F
MW dry = 28.94
wet 27.84

QA FORMS COMPLETED
Stack Schematic ✓
Sample Train ___
Pitot Tube Insp. ✓
Magnehelic Cal. ✓
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # _______ Box # 0-2

	Final Wt. gram	Initial Wt. gram		Net Wt. gram
#1 Imp.	659.9	639.6	=	20.3
#2 Imp.	646.0	642.9	=	3.1
#3 Imp.	532.0	531.6	=	0.4
#4 Imp.			=	
#5 Imp.			=	
#6 S.G.	805.7	800.9	=	4.8

Total H_2O Volume 28.6 g

Start Time 15:45
Stop Time 16:15 / 16:30 / 17:00
Barometric
Pressure "Hg 27.63
Static Pres "H_2O -0.5
Production Rate ______

SAMPLING PARAMETERS

% Moisture 6.1
Meter Temp. 90.2
Stack Temp. ______
△ H@ ______ Y 1.000
Meter Box ID ______
Pitot # ______ Side # ______
Thermocouple ID ______
Flow Meas. Device ______
Cp ______
K Factor ______

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^ P " H_2O	Stack Temp °F	
N[illegible]	0	94.348	1.0	89	90		58				
[illegible]	18	101.305	↓	90	90		67				
	30	106.006	↓	91	90		67				
16:30	15	—	↓	91	90		67				
	30	117.694	↓	91	90		70				
17:00											
		23.346 ✓	___ △ H	90.2 ✓ Tm			[illegible]		___ (△ p)²	___ Ts	

METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

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Client Louisiana Pacific
Location Chilco ID
Sample Site PTO - stack

Stack Diameter 75.63
Date 9/16/92
Operators Albertson/Newman
Run I.D. 3

EQUIPMENT CHECKS

Initial/Final
Leak Rate cfm —— / ____
Leak Test Vacuum ____ / ____
____ Pitots, Pre Leak Ck
____ Pitots, Post Leak Ck
____ Gas Sampling System
____ Integrated Bag
____ Thermocouples @ ____ °F

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # ______ Box # ______

	Final Wt. gram		Initial Wt. gram		Net Wt. gram
#1 Imp.		-		=	
#2 Imp.		-		=	
#3 Imp.		-		=	
#4 Imp.		-		=	
#5 Imp.		-		=	
#6 S.G.		-		=	

Total H_2O Volume ______ g

Start Time 15:45
Stop Time 16:15
Barometric Pressure "Hg ______
Static Pres "H_2O -0.5"
Production Rate ______

SAMPLING PARAMETERS

% Moisture 6.1
Meter Temp. ______
Stack Temp. ______
Δ H@ ______ Y 0.996 1.000
Meter Box ID ______
Pitot # 10A Side # A
Thermocouple ID 10'
Flow Meas. Device ______
Cp .84
K Factor ______

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (ΔH) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading Δ P " H_2O	Stack Temp °F	
S-1									0.75	216	
2									0.76	216	
3									0.85	218	
4									0.72	222	
5									0.52	225	
6									0.55	226	
7									0.62	229	
8									0.48	231	
W-1									0.62	202	
2									0.80	214	
3									0.70	221	
4									0.62	224	
5									0.60	231	
6									0.62	230	
7									0.58	229	
8									0.60	223	
											CO_2 0.0%
							161,550	ACFM			O_2 20.1%
							115,501	SCFM			CO 3.7 ppm
							108,455	DSCFM			
			Δ H	Tm				54.0 fps $(\Delta p)^2$		222.3 Ts	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Client *Louisiana Pacific*
Location *Chilco - ID*
Sample Site *RTO - Stack*

Stack Diameter *95.63"*
Date *9/16/94*
Operators *Atherton/Newman*
Run I.D. *4*

EQUIPMENT CHECKS

Initial/Final
Leak Rate cfm ______/______
Leak Test Vacuum ______/______
_____ Pitots, Pre Leak Ck
_____ Pitots, Post Leak Ck
_____ Gas Sampling System
_____ Integrated Bag
_____ Thermocouples @ ____ °F

28.96 mw dry
27.86 mw wet

QA FORMS COMPLETED

Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # ______ Box # ______

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	-	=	
#2 Imp.	-	=	
#3 Imp.	-	=	
#4 Imp.	-	=	
#5 Imp.	-	=	
#6 S.G.	-	=	

Total H_2O Volume ______ g

Start Time *16:30*
Stop Time *17:00*
Barometric Pressure "Hg *27.68*
Static Pres "H_2O *-0.5*
Production Rate ______

SAMPLING PARAMETERS

% Moisture *6.1*
Meter Temp. ______
Stack Temp. ______
Δ H@ ______ Y ~~.996~~ *1.000*
Meter Box ID ______
Pitot # *10A* Side # *A*
Thermocouple ID *10' w 5/8 SS*
Flow Meas. Device ______
Cp *.84*
K Factor ______

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (ΔH) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading Δ P " H_2O	Stack Temp °F	
W-1									0.50	210	
2									0.75	224	
3									0.75	228	
4									0.58	227	
5									0.60	222	
6									0.62	221	
7									0.52	224	
8									0.44	224	
S-1									0.75	207	
2									0.88	222	
3									0.78	229	
4									0.58	225	
5									0.50	225	
6									0.52	229	
7									0.52	230	
8									0.46	228	
							155,995	ACFM			
							111,346	SCFM			CO_2 0.8%
							104,559	SDCFM			O_2 20.1%
											CO 3.8 ppm
			Δ H	T_m					*52.1 fps* $(\Delta P)^{1/2}$	*223.4* T_s	

METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Page ___ of ___

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Client Louisiana-Pacific
Location Chilco, ID
Sample Site RTO outlet Stack
Stack Diameter 95.62
Date 9/16/94
Operators DWP, DN
Run I.D. 5/6
Test 3

EQUIPMENT CHECKS

Initial/Final
Leak Rate cfm 0.001 / .20
Leak Test Vacuum 0.001 / 20
___ Pitots, Pre Leak Ck
___ Pitots, Post Leak Ck
___ Gas Sampling System
___ Integrated Bag
___ Thermocouples @ ___ °F

28.94 dry
28.28 mw wet

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # ___ Box # ___

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	675.8	654.1	21.7
#2 Imp.	635.4	635.7	-0.3
#3 Imp.	549.2	548.6	0.6
#4 Imp.			
#5 Imp.			
#6 S.G.	776.2	771.8	4.4

Total H_2O Volume 26.4 g

Start Time 1705/17:4_
Stop Time 1930-193_
Barometric Pressure "Hg 27.68
Static Pres "H_2O ___
Production Rate ___

SAMPLING PARAMETERS

% Moisture 6.0
Meter Temp. 89.5
Stack Temp. ___
△ H@ ___ Y 1.000
Meter Box ID ___
Pitot # ___ Side # ___
Thermocouple ID ___
Flow Meas. Device ___
Cp ___
K Factor ___

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^ P " H_2O	Stack Temp °F
North	0	117.856	1.0	90	91		76			
run 5	15	122.941	↓	90	91		76			
	30/0	128.620		90	91		76			
	15	134.135		89	89		76			
	30/0	139.754		87	87		76			
09/18:30										
	21.898		△ H	89.5 Tm					(Δ P)^2	Ts

METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

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Client Louisiana Pacific
Location Chilco - (ID)
Sample Site RTO - stack
Stack Diameter 95.63
Date 9/16/94
Operators Albers / Neuman
Run I.D. 5

EQUIPMENT CHECKS

Initial/Final
Leak Rate cfm ______/______
Leak Test Vacuum ______/______
_____ Pitots, Pre Leak Ck
_____ Pitots, Post Leak Ck
_____ Gas Sampling System
_____ Integrated Bag
_____ Thermocouples @ ___ °F

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # _______ Box # _______

	Final Wt. gram	Initial Wt. gram		Net Wt. gram
#1 Imp.		-	=	
#2 Imp.		-	=	
#3 Imp.		-	=	
#4 Imp.		-	=	
#5 Imp.		-	=	
#6 S.G.		-	=	

Total H_2O Volume ________ g

Start Time 17:15
Stop Time 17:45
Barometric Pressure "Hg 27.65
Static Pres "H_2O -0.5
Production Rate ________

SAMPLING PARAMETERS

% Moisture 6.0
Meter Temp. ________
Stack Temp. ________
Δ H@ ________ Y .966 1.000
Meter Box ID ________
Pitot # 10A Side # A
Thermocouple ID ________
Flow Meas. Device ________
Cp .84
K Factor ________

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^P " H_2O	Stack Temp °F	
5-1									0.68	214	
2									0.86	216	
3									0.78	222	
4									0.60	226	
5									0.56	228	
6									0.55	231	
7									0.50	232	
8									0.48	230	
6-1									0.68	217	
2									0.75	226	
3									0.72	225	
4									0.65	223	
5									0.58	225	
6									0.68	226	
7									0.62	225	
8									.58	230	
							160,638	ACFm		CO_2	0.8%
							114,400	SCFm		O_2	20.0%
							107,544	SDCFm		CO	3.3 ppm
		______ Δ H		______ Tm				53.7 fps $(\Delta P)^{1/2}$		224.9 ✓ Ts	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Client Louisiana Pacific
Location Chilco-ID
Sample Site Pro-Stack Outlet

Stack Diameter 95.63
Date 9/16/54
Operators Ables/Neumeyer
Run I.D. Ø-6

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Start Time 1800
Stop Time 1830
Barometric Pressure "Hg 27.65
Static Pres "H_2O -0.5
Production Rate ___

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	___/___
Leak Test Vacuum	___/___
✓ Pitots, Pre Leak Ck	
✓ Pitots, Post Leak Ck	
___ Gas Sampling System	
___ Integrated Bag	
___ Thermocouples @ ___ °F	

Filter # ___ Box # ___

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	-		=
#2 Imp.	-		=
#3 Imp.	-		=
#4 Imp.	-		=
#5 Imp.	-		=
#6 S.G.	-		=

Total H_2O Volume ___ g

SAMPLING PARAMETERS

% Moisture 6.0
Meter Temp. ___
Stack Temp. ___
Δ H@ ___ Y 1.000
Meter Box ID ___
Pitot # P10A Side # A
Thermocouple ID 10'... 5/...
Flow Meas. Device Mag Gau
Cp .84
K Factor ___

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (ΔH) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading Δ P " H_2O	Stack Temp °F	
W-1									0.48	215	
2									0.72	217	
3									0.68	226	
4									0.58	225	
5									0.58	220	
6									0.62	220	
7									0.62	222	
8									0.60	224	
S-1									0.64	210	
2									0.80	222	
3									0.80	225	
4									0.60	227	
5									0.54	220	
6									0.59	219	
7									0.50	221	
8									0.46	223	
							156,208	ACFM			CO: 0.3%
							111,775	SCFM			O_2 19.9%
							105,068	SDCFM			? 34 ppm
			ΔH	Tm			52.2 fps		$(\Delta p)^{1/2}$	221 °F T_s	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Page ___ of ___

Client [illegible]
Location [illegible]
Sample Site RTO outlet Stack
Stack Diameter 95.63
Date 9/16/99
Operators Albertson, Newman
Run I.D. 7/B
Run #4

EQUIPMENT CHECKS

Initial/Final
Leak Rate cfm <.008 / 20
Leak Test Vacuum <.008 / 20
_____ Pitots, Pre Leak Ck
_____ Pitots, Post Leak Ck
_____ Gas Sampling System
_____ Integrated Bag
_____ Thermocouples @ ___ °F

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # _______ Box # _______

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	653.5	659.9	-6.4
#2 Imp.	668.6	646.0	22.6
#3 Imp.	536.1	532.0	4.1
#4 Imp.			
#5 Imp.			
#6 S.G.	809.9	805.7	4.2

Total H_2O Volume 24.5 g

Start Time R7 18:45
Stop Time 1915 1330
Barometric 2000
Pressure "Hg [illegible]
Static Pres "H_2O -0.5
Production Rate ______

SAMPLING PARAMETERS

% Moisture 5.6
Meter Temp. 83.1
Stack Temp. ______
ΔH@ ______ Y 1.000
Meter Box ID ______
Pitot # 10A Side # A
Thermocouple ID 10'
Flow Meas. Device ______
Cp .84
K Factor ______

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^ P " H_2O	Stack Temp °F	
3:45	0	140,040	1.0	86	86		75				
	15	145,475	↓	86	85		72				
19	30/0	150,619		83	84		70				
7:30	15	159,325		80	87		63				
6	30	161,179	↓	80	80						
		[illegible]	ΔH	83.1 Tm					(Δ p)^2	Ts	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Client Louisiana Pacific

Location Chilco - ID

Sample Site PTO - Stack

Stack Diameter 95.63

Date 9/16/94

Operators Wheeler/Newman

Run I.D. 7

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	___ / ___
Leak Test Vacuum	___ / ___

✓ Pitots, Pre Leak Ck

✓ Pitots, Post Leak Ck

___ Gas Sampling System

___ Integrated Bag

___ Thermocouples @ ___ °F

QA FORMS COMPLETED

Stack Schematic ___

Sample Train ___

Pitot Tube Insp. ___

Magnehelic Cal. ___

Temp. Probe Cal. ___

Gas Meter Calib. ___

Filter # ___ Box # ___

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	-	=	
#2 Imp.	-	=	
#3 Imp.	-	=	
#4 Imp.	-	=	
#5 Imp.	-	=	
#6 S.G.	-	=	

Total H_2O Volume ___ g

Start Time 18:45

Stop Time 19:15

Barometric Pressure "Hg 27.65

Static Pres "H_2O -0.50

Production Rate ___

SAMPLING PARAMETERS

% Moisture 5.6

Meter Temp. ___

Stack Temp. ___

Δ H@ ___ Y 1.000

Meter Box ID ___

Pitot # 10A Side # 14

Thermocouple ID 101

Flow Meas. Device ___

Cp .84

K Factor ___

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^ P " H_2O	Stack Temp °F	
S-1									.70	216	
2									.80	224	
3									.72	226	
4									.65	221	
5									0.56	219	
6									0.48	220	
7									0.46	222	
8									0.42	222	
1									0.58	209	
2									0.72	221	
3									0.58	227	
4									0.58	221	
5									0.62	219	
6									0.58	221	
7									0.56	223	
8									0.45	223	
							153,574	ACFm		CO_2	0.8%
							109,910	SCFm		O_2	20.0%
							103,755	SDCFm		CO	3.2 ppm

Δ H ___ Tm ___ [illegible] $(\Delta p)^{1/2}$ ___ 220.9 Ts

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Client Louisiana Pacific
Location Chilco ID
Sample Site PTO-Stack

Stack Diameter 95.63
Date 9/16/94
Operators Atherton/Newman
Run I.D. 8

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	___/___
Leak Test Vacuum	___/___

___ Pitots, Pre Leak Ck
___ Pitots, Post Leak Ck
___ Gas Sampling System
___ Integrated Bag
___ Thermocouples @ ___ °F

QA FORMS COMPLETED

Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # ______ Box # ______

	Final Wt. gram		Initial Wt. gram		Net Wt. gram
#1 Imp.		-		=	
#2 Imp.		-		=	
#3 Imp.		-		=	
#4 Imp.		-		=	
#5 Imp.		-		=	
#6 S.G.		-		=	

Total H_2O Volume ______ g

Start Time 1930
Stop Time 2000
Barometric Pressure "Hg 27.65
Static Pres "H_2O -0.5
Production Rate ______

SAMPLING PARAMETERS

% Moisture ______
Meter Temp. ______
Stack Temp. ______
$\Delta H@$ ______ Y 1.000
Meter Box ID ______
Pitot # 10A Side # A
Thermocouple ID 10' 5/855
Flow Meas. Device 1
Cp .84
K Factor ______

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^ P " H_2O	Stack Temp °F	
W-1									0.70	210	
2									0.66	217	
3									0.60	219	
4									0.62	221	
5									0.52	225	
6									0.58	228	
7									0.60	227	
8									0.50	224	
S-1									0.72	214	
2									0.72	220	
3									0.58	216	
4									0.68	217	
5									0.48	220	
6									0.55	222	
7									0.48	223	
8									0.48	226	
							155,817	ACFM		CO_2	0.8%
							111,567	SCFM		O_2	20.0%
							[illegible]	SDCFM		CO	3.4 ppm
			ΔH	T_m				52.1 fps $(\Delta p)^2$		220.6 T_s	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Page ___ of ___

Client Louisiana Pacific
Location Chilco, ID
Sample Site R70' Outlet Stack
Stack Diameter 95.65
Date 7/16/94
Operators DMA + [illegible]
Run I.D. 9/10
Test 5

EQUIPMENT CHECKS

Initial/Final
Leak Rate cfm <.005 / 20
Leak Test Vacuum <.005 / 20
___ Pitots, Pre Leak Ck
___ Pitots, Post Leak Ck
___ Gas Sampling System
___ Integrated Bag
___ Thermocouples @ ___ °F

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # ___ Box # ___

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	686.3	675.8	10.5
#2 Imp	644.8	635.4	9.4
#3 Imp.	549.7	549.2	0.5
#4 Imp.			
#5 Imp.			
#6 S.G.	782.1	776.2	5.9

Total H_2O Volume 26.3 ✓ g

Start Time 20:15
Stop Time 2130
Barometric Pressure "Hg 27.65
Static Pres "H_2O -0.5
Production Rate ___

SAMPLING PARAMETERS

% Moisture 5.9
Meter Temp. 76.4
Stack Temp. ___
ΔH@ ___ Y 1.000
Meter Box ID ___
Pitot # ___ Side # ___
Thermocouple ID ___
Flow Meas. Device ___
Cp ___
K Factor ___

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^ P " H_2O	Stack Temp °F	
North port	0	161.568	1.0	78	78		69				
East S	18	167.451	↓	78	78		69				
	30/0	171.891		78	78		69				
	15	176.331		74	74		68				
[illegible]	30	182.501	↓	74	74		68				
	20.933 ✓		ΔH	76.4 ✓ Tm					$(\Delta p)^2$	T_s	

21:30

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Page ___ of ___

Client Louisiana Pacific
Location Chiles -ID
Sample Site PTO stack

Stack Diameter 9.23
Date 1/16/04
Operators [illegible]
Run I.D. 9

EQUIPMENT CHECKS

Initial/Final
Leak Rate cfm ___/___
Leak Test Vacuum ___/___
✓ Pitots, Pre Leak Ck
___ Pitots, Post Leak Ck
___ Gas Sampling System
___ Integrated Bag
___ Thermocouples @ ___ °F

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # ___ Box # ___

	Final Wt. gram	Initial Wt. gram		Net Wt. gram
#1 Imp.		-	=	
#2 Imp.		-	=	
#3 Imp.		-	=	
#4 Imp.		-	=	
#5 Imp.		-	=	
#6 S.G.		-	=	

Total H_2O Volume ___ g

Start Time 20:15
Stop Time 20:45
Barometric Pressure "Hg 27.65
Static Pres "H_2O -9.5
Production Rate ___

SAMPLING PARAMETERS

% Moisture 5.9
Meter Temp. ___
Stack Temp. ___
ΔH@ ___ Y 1.000
Meter Box ID ___
Pitot # 10A Side # A
Thermocouple ID 10'
Flow Meas. Device ___
Cp. .84
K Factor ___

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (ΔH) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading Δ P " H_2O	Stack Temp °F	
- 1									0.66	213	
2									0.76	216	
3									0.66	219	
4									0.68	221	
5									0.52	225	
6									0.48	226	
7									0.48	225	
8									0.50	219	
- 1									0.62	213	
2									0.75	215	
3									0.72	216	
4									0.60	219	
5									0.56	219	
6									0.58	223	
7									0.60	224	
8									0.44	223	
							154,229	ACFM			
							110,956	SCFM		CO_2	0.92
							[illegible]	[illegible]		O_2	19.8%
										CO	3.4 ppm
			ΔH	Tm				51.7	$(\Delta P)^2$	219.8 ✓ T_s	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Page ___ of ___

Client Louisiana Pacific
Location Chilco - ID
Sample Site [illegible] Stack

Stack Diameter [illegible]
Date 9/16/97
Operators [illegible]
Run I.D. 10

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Start Time 2100
Stop Time 2130
Barometric
Pressure "Hg 27.65
Static Pres "H_2O -0.5
Production Rate ___

EQUIPMENT CHECKS

Initial/Final
Leak Rate cfm ___/___
Leak Test Vacuum ___/___
✓ Pitots, Pre Leak Ck
✓ Pitots, Post Leak Ck
___ Gas Sampling System
___ Integrated Bag
___ Thermocouples @ ___ °F

Filter # ___ Box # ___

	Final Wt. gram	Initial Wt. gram		Net Wt. gram
#1 Imp.		-	=	
#2 Imp.		-	=	
#3 Imp.		-	=	
#4 Imp.		-	=	
#5 Imp.		-	=	
#6 S.G.		-	=	

Total H_2O Volume ___ g

SAMPLING PARAMETERS

% Moisture 5.9
Meter Temp. ___
Stack Temp. ___
Δ H@ ___ Y 1.000
Meter Box ID ___
Pitot # 10A Side # A
Thermocouple ID [illegible]
Flow Meas. Device Mag. [illegible]
Cp .84
K Factor ___

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^ P " H_2O	Stack Temp °F	
U-1									0.62	210	
2									0.58	213	
3									.76	213	
4									0.55	217	
5									0.50	219	
6									0.58	228	
7									0.56	224	
8									0.52	224	
S-1									.56	205	
2									0.62	216	
3									0.74	221	
4									0.62	218	
5									0.52	215	
6									0.55	215	
7									0.50	218	
8									0.42	218	
							152,469	ACFM		CO_2	0.9%
							109,805	SCFM		O_2	19.8%
							103,336	SDCFM		CO	29 ppm
			Δ H	Tm				50.9	$(\Delta P)^{\frac{1}{2}}$	216.9 Ts	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Client Louisiana Pacific
Location Chilco, ID
Sample Site RTO outlet Stack
Stack Diameter 95.62
Date 3/12/98
Operators DM DN
Run I.D. 3 (6) C 11/12

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	<.009 / .20
Leak Test Vacuum	<.002 / 10

____ Pitots, Pre Leak Ck
____ Pitots, Post Leak Ck
____ Gas Sampling System
____ Integrated Bag
____ Thermocouples @ ___ °F

QA FORMS COMPLETED

Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # ______ Box # ______

	Final Wt. gram	Initial Wt. gram		Net Wt. gram
#1 Imp.	573.1	653.5	=	-80.4
#2 Imp.	768.5	668.6	=	99.9
#3 Imp.	536.3	536.1	=	0.2
#4 Imp.			=	
#5 Imp.			=	
#6 S.G.	817.0	809.9	=	7.1

Total H_2O Volume 26.8 g

Start Time 21 45
Stop Time 22 15 2200
Barometric Pressure "Hg 29.65
Static Pres "H_2O -0.5
Production Rate ______

SAMPLING PARAMETERS

% Moisture ______
Meter Temp. ______
Stack Temp. ______
△H@ ______ Y 1.000
Meter Box ID ______
Pitot # ___ Side # ___
Thermocouple ID ______
Flow Meas. Device ______
Cp ______
K Factor ______

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^ P " H_2O	Stack Temp °F	
	0	182.871	1.0	73	72		68				
"	15	187.795	↓	73	72		65				
	30/0	192.684		72	71		66				
	15	—		70	69		69				
12	30	202.898	↓								
		20.027✓	△H	71.5✓ Tm					$(\triangle P)^2$	Ts	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Page ___ of ___

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Client Louisiana Pacific
Location Chilco - ID
Sample Site PTO - Stack

Stack Diameter 95.63
Date 9/14/94
Operators DMA/DAN
Run I.D. 11

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	___/___
Leak Test Vacuum	___/___
___ Pitots, Pre Leak Ck	
___ Pitots, Post Leak Ck	
___ Gas Sampling System	
___ Integrated Bag	
___ Thermocouples @ ___ °F	

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Filter # ______ Box # ______

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	-	=	
#2 Imp.	-	=	
#3 Imp.	-	=	
#4 Imp.	-	=	
#5 Imp.	-	=	
#6 S.G.	-	=	

Total H_2O Volume ______ g

Start Time 21:45
Stop Time 22:15
Barometric Pressure "Hg 27.65
Static Pres "H_2O -.50
Production Rate ______

SAMPLING PARAMETERS

% Moisture ______
Meter Temp. ______
Stack Temp. ______
Δ H@ ______ Y 1.000
Meter Box ID ______
Pitot # 10A Side # A
Thermocouple ID 10'
Flow Meas. Device ______
Cp .84
K Factor ______

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (^H) "H_2O Actual	Gas Meter Temp °F In	Gas Meter Temp °F Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading ^ P " H_2O	Stack Temp °F	
S-1									0.62	212	
2									0.76	215	
3									0.72	221	
4									0.60	224	
5									0.48	222	
6									0.52	219	
7									0.50	216	
8									0.44	214	
?-1									0.58	200	
2									0.78	206	
3									0.70	213	
4									0.54	217	
5									0.56	219	
6									0.58	224	
7									0.56	224	
8									0.46	222	
										CO_2	0.8%
										O_2	20.0%
										CO	3.1 ppm
			Δ H	Tm					(Δ p)^½	216.8 ✓ Ts	

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METHOD 4 AND AIRFLOW SAMPLING DATA SHEET

Client Louisiana Pacific
Location Chilco-ID
Sample Site PTO - Stack

Stack Diameter 95.63
Date 3/16/94
Operators DMP / DAN
Run I.D. 12

QA FORMS COMPLETED
Stack Schematic ___
Sample Train ___
Pitot Tube Insp. ___
Magnehelic Cal. ___
Temp. Probe Cal. ___
Gas Meter Calib. ___

Start Time 2220
Stop Time 2300
Barometric Pressure "Hg 27.65
Static Pres "H_2O -0.5
Production Rate ___

Filter # ___ Box # ___

EQUIPMENT CHECKS

	Initial/Final
Leak Rate cfm	/
Leak Test Vacuum	/

___ Pitots, Pre Leak Ck
___ Pitots, Post Leak Ck
___ Gas Sampling System
___ Integrated Bag
___ Thermocouples @ ___ °F

	Final Wt. gram	Initial Wt. gram	Net Wt. gram
#1 Imp.	-	=	
#2 Imp.	-	=	
#3 Imp.	-	=	
#4 Imp.	-	=	
#5 Imp.	-	=	
#6 S.G.	-	=	

Total H_2O Volume ___ g

SAMPLING PARAMETERS

% Moisture ___
Meter Temp. ___
Stack Temp. ___
△ H@ ___ Y 1.000
Meter Box ID ___
Pitot # 10A Side # A
Thermocouple ID 10'
Flow Meas. Device ___
Cp .84
K Factor ___

Sample Point	Elap Time Min.	Dry Gas Meter Reading Cu.Ft.	Orifice Setting (△H) "H_2O Actual	Gas Meter Temp °F In	Out	Pump. Vac. Gauge " Hg	Imp. Exit Temp °F	Sample Point	Pitot Reading △P " H_2O	Stack Temp °F	
W-1									0.48	218	
2									0.72	213	
3									0.64	215	
4									0.56	217	
5									[illegible]	218	
6									0.60	221	
7									0.54	224	
8									0.45	223	
S-1									0.66	214	
2									0.66	217	
3									0.80	217	
4									0.64	216	
5									0.44	218	
6									0.58	218	
7									0.52	221	
8									0.45	221	
										CO_2	0.9%
										O_2	19.9%
										CO	3.5 ppm
		△H		Tm					(△P)½	218.5 T.	

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AMTEST AIR QUALITY, INC.

SAMPLE TRAIN INFORMATION

Fill out one sheet per site and per test type.

CLIENT: ~~Fvcc~~ Louisiana Pacific

LOCATION: Chicco, Idaho

SITE: RTO Outlet

TEST TEAM: DMA, DAN DATE(S): ______

RUN #'S: 1-12 TYPE: M4

Probe/Filter Temperature: ✓ 248+25 F ______ 320 F ______ Other

Impinger Temperature: ✓ <68 F ______ Other

THIMBLE: ______ yes ✓ no NOZZLE TYPE: ______ quartz ______ steel ✓ none

PROBE LINER: ______ quartz ______ glass ✓ steel ______ teflon

PROBE TYPE: ✓ regular ______ water-cooled

FRONT-HALF FILTER: ____ yes ____ no SIZE (mm): ____ 90 ____ 110 ____ 125 ____ other ____

FRONT-HALF FILTER MEDIA: ______ quartz fiber ______ glass fiber ______ teflon

SUPPORT: ______ steel ______ glass frit ______ teflon GASKET: ______ silicon ______ teflon

BACK-HALF FILTER: ____ yes ✓ no

BACK-HALF FILTER MEDIA: ____ quartz fiber ____ glass fiber ____ telfon ____ tared ____ untared

NOTE: Show the back-half filter location with an arrow on the table below.

CONTENTS	Initial Volume (mL)	Clean-up Solution Used	Bottle Type	Comments
Nozzle/Probe Rinse				
Filter				
#1 D.I	100	Weigh		
#2 D.I	100	↓		
#3 M.T.	-	↓		
#4 S.G.	-	↓		
#5				
#6				
#7				

IF THIS INFORMATION IS NOT ACCURATE FOR ALL RUNS, NOTE ALL EXCEPTIONS.

______

Louisiana-Pacific Corp.
CO RATA Run 1
September 16, 1994

TIME	CO ppm	CO2 %	O2 %
14:15	3.95	0.94	19.89
14:16	4.4	0.84	19.86
14:18	3.75	1	19.76
14:19	4.25	0.86	19.81
14:21	4	1.11	19.66
14:22	4.05	1.04	19.65
14:24	4.1	1.05	19.8
14:25	3.95	1.05	19.65
14:27	4.4	1.13	19.6
14:28	3.4	0.89	19.74
14:30	4.6	1.04	19.74
14:31	3.8	1	19.69
14:33	3.9	0.91	19.76
14:34	3.1	0.9	19.84
14:36	3.7	0.95	19.71
14:37	3.35	0.84	19.81
14:39	3.9	1.08	19.8
14:40	3.85	1.03	19.84
14:42	3.45	1.03	19.89
14:43	3.25	0.81	19.84
14:45	3.6	0.88	19.8

	CO ppm	CO2 %	O2 %
AVG	3.85	0.97	19.77

Louisiana-Pacific Corp.
CO RATA Run 2
September 16, 1994

TIME	CO ppm	CO2 %	O2 %				
15:00	4.1	0.9	19.73				
15:01	3.8	1	19.74				
15:03	3.85	0.98	19.73				
15:04	4.1	0.86	19.74				
15:06	3.85	0.89	19.74				
15:07	4.25	0.98	19.78				
15:09	3.35	0.98	19.74				
15:10	4.4	0.81	19.76				
15:12	3.55	1.03	19.78				
15:13	3.95	0.98	19.75				
15:15	3.45	0.88	19.83				
15:16	4.5	0.94	19.78				
15:18	3.55	0.94	19.85				
15:19	3.6	0.98	19.76				
15:21	3.55	1.06	19.76				
15:22	3.75	1	19.71				
15:24	3.55	0.99	19.81				
15:25	3.5	1.09	19.75				
15:27	4	1.06	19.7				
15:28	3.8	1.03	19.73		CO ppm	CO2 %	O2 %
15:30	3.9	0.99	19.69	AVG	3.83	0.97	19.76

Louisiana-Pacific Corp.
CO RATA Run 3
September 16, 1994

TIME	CO ppm	CO2 %	O2 %		CO ppm	CO2 %	O2 %
15:45	4.4	0.83	19.73				
15:46	3.6	0.94	19.88				
15:48	3.9	0.91	19.8				
15:49	3.5	0.89	19.86				
15:51	3.9	0.89	19.84				
15:52	3.9	0.81	19.96				
15:54	3.85	0.89	19.81				
15:55	3.75	0.88	19.95				
15:57	3.6	0.83	19.9				
15:58	4.05	0.8	19.93				
16:00	3.6	0.71	19.98				
16:01	4.45	0.84	19.89				
16:03	3.65	0.8	19.98				
16:04	4.15	0.84	19.84				
16:06	3.5	0.83	19.94				
16:07	4.05	0.84	19.85				
16:09	3.85	0.96	19.85				
16:10	4.05	0.75	19.89				
16:12	3.9	0.91	19.85				
16:13	3.8	0.93	19.85				
16:15	4.25	1	19.85	AVG	3.89	0.86	19.88

AMTEST AIR QUALITY, INC

SAMPLING SYSTEM BIAS CHECK

Am Test-Air Quality, Inc.

CLIENT: Louisiana Pacific Corp
LOCATION: Chilco, ID
SITE LOCATION: RTO outlet Stack
DATE: 9/16/94

RUN # 1 CONDITION:

START: 14:15 STOP: 14:45 — All calibration thru probe

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Wet	Dry
Carbon Dioxide (CO2)	%	0.1	0.1	6.0	5.8	5.99	0-25		✓
Oxygen (O2)	%	0.1	0.1	15.0	15.0	15.05	0-25		✓
Carbon Monoxide (CO)	ppm	0.1	0.1	30.2	30.2	30.3	0-100		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

RUN # 2 CONDITION:

START: 15:00 STOP: 15:30

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Wet	Dry
Carbon Dioxide (CO2)	%	0.1	0.1	5.9	6.1	5.99	0-25		✓
Oxygen (O2)	%	0.1	0.0	15.0	14.9	15.05	0-25		✓
Carbon Monoxide (CO)	ppm	0.1	0.3	30.2	30.3	30.3	0-100		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

RUN # 3 CONDITION:

START: 15:45 STOP: 16:15

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Wet	Dry
Carbon Dioxide (CO2)	%	0.1	0.1	6.1	6.0	5.99	0-25		✓
Oxygen (O2)	%	0.0	0.1	14.9	14.9	15.05	0-25		✓
Carbon Monoxide (CO)	ppm	0.3	0.1	30.3	30.0	30.3	0-100		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

[jaa\c\excel\biaschk]

Louisiana-Pacific Corp.
CO RATA Run 4
September 16, 1994

TIME	CO ppm	CO2 %	O2 %		CO ppm	CO2 %	O2 %
16:30	4	0.9	19.96				
16:31	4.6	0.91	19.84				
16:33	4.05	0.81	19.98				
16:34	4.7	0.88	19.9				
16:36	4.3	1.03	19.93				
16:37	4.65	0.85	19.93				
16:39	4.45	0.85	19.91				
16:41	3.95	0.91	19.96				
16:42	4.5	0.75	19.96				
16:44	3.9	0.75	19.95				
16:45	4.55	0.76	19.95				
16:47	3.55	0.79	19.91				
16:49	3.75	0.7	19.94				
16:50	3.45	1.01	19.96				
16:52	4.15	0.89	19.91				
16:53	3.5	0.76	19.99				
16:55	3.5	0.94	19.96				
16:56	3.8	0.84	19.98				
16:58	3.5	0.95	19.89				
17:00	3.75	0.78	19.98	AVG	4.03	0.85	19.94

Louisiana-Pacific Corp.
CO RATA Run 5
September 16, 1994

TIME	CO ppm	CO2 %	O2 %
17:15	3.3	0.94	19.86
17:16	3.95	0.86	19.76
17:18	3.2	0.81	19.9
17:19	3.3	0.89	19.9
17:21	3.3	0.88	19.95
17:22	3.6	0.88	19.94
17:24	3.25	0.83	19.93
17:25	3	1.01	19.83
17:27	3.4	0.98	19.86
17:28	3.25	0.8	19.91
17:30	3.55	0.98	19.89
17:31	3.25	0.91	19.9
17:33	3.95	0.93	19.81
17:34	3.15	0.9	19.85
17:36	4.05	0.81	19.86
17:37	3.2	0.91	19.86
17:39	3.8	0.96	19.84
17:40	3.4	0.96	19.86
17:42	3.75	1.03	19.79
17:43	3.65	0.96	19.85
17:45	3.25	0.95	19.76

	CO ppm	CO2 %	O2 %
AVG	3.45	0.91	19.86

Louisiana-Pacific Corp.
CO RATA Run 6
September 16, 1994

TIME	CO ppm	CO2 %	O2 %				
18:00	3.25	0.98	19.79				
18:01	4.1	0.94	19.76				
18:03	3.2	0.91	19.84				
18:04	4.25	0.99	19.84				
18:06	3.25	0.86	19.85				
18:07	3.7	0.94	19.85				
18:09	3.55	1	19.86				
18:10	3.25	0.99	19.81				
18:12	3.95	0.99	19.9				
18:13	3.3	0.76	19.91				
18:15	3.95	0.8	19.91				
18:16	3.2	0.85	19.81				
18:18	4.25	0.96	19.83				
18:19	3.25	0.86	19.88				
18:21	3.85	0.93	19.75				
18:22	3.25	0.86	19.86				
18:24	3.35	0.89	19.79				
18:25	3.35	0.98	19.81				
18:27	3.55	0.81	19.85				
18:28	2.95	0.79	19.94		CO ppm	CO2 %	O2 %
18:30	3.15	0.83	19.88	AVG	3.52	0.90	19.84

SAMPLING SYSTEM BIAS CHECK

Am Test-Air Quality, Inc.

AMTEST AIR QUALITY, INC

143

CLIENT: Louisiana Pacific Corp

LOCATION: Chilco ID

SITE LOCATION: [illegible]

DATE: [illegible]

RUN # 4 CONDITION:

START: 16:30 [illegible]
STOP: 17:00 [illegible]

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Check One Wet	Check One Dry
Carbon Dioxide (CO2)	%	0.1	0.1	6.0	5.9	[illegible]	0-25		✓
Oxygen (O2)	%	0.1	0.1	[illegible]	15.0	[illegible]	0-25		✓
Carbon Monoxide (CO)	ppm	0.1	0.3	30.0	30.5	30.2	0-100		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

RUN # 5 CONDITION:

START: 1715
STOP: 1745

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Check One Wet	Check One Dry
Carbon Dioxide (CO2)	%	0.1	0.1	5.9	6.1	5.99	0-25		✓
Oxygen (O2)	%	0.1	0.1	15.0	15.0	15.05	0-25		✓
Carbon Monoxide (CO)	ppm	0.3	0.1	30.5	30.5	30.2	0-100		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

RUN # 6 CONDITION:

START: 1800
STOP: 1830

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Check One Wet	Check One Dry
Carbon Dioxide (CO2)	%	0.1	0.1	6.0	6.1	5.99	0-25		✓
Oxygen (O2)	%	0.1	0.1	15.0	15.0	15.05	0-25		✓
Carbon Monoxide (CO)	ppm	0.1	0.1	30.5	30.0	30.2	0-100		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

Louisiana-Pacific Corp.
CO RATA Run 7
September 16, 1994

TIME	CO ppm	CO2 %	O2 %		CO ppm	CO2 %	O2 %
18:45	3.95	0.98	19.83				
18:46	3.15	0.94	19.85				
18:48	3.95	0.99	19.79				
18:49	3.35	0.9	19.89				
18:51	3.4	0.95	19.88				
18:52	3.2	0.95	19.89				
18:54	3.25	0.95	19.89				
18:55	3.15	0.84	19.9				
18:57	3.3	0.8	19.89				
18:58	3.45	0.86	19.88				
19:00	3.2	0.93	19.91				
19:01	3.5	0.94	19.91				
19:03	2.75	0.85	19.94				
19:04	3.15	0.79	19.99				
19:06	2.9	0.84	19.9				
19:07	4.1	0.91	19.93				
19:09	3.25	0.84	19.96				
19:10	4.15	0.89	19.9				
19:12	3.6	0.9	19.98				
19:13	3.8	0.79	19.93				
19:15	3.7	0.84	19.96	AVG	3.44	0.89	19.90

Louisiana-Pacific Corp.
CO RATA Run 8
September 16, 1994

TIME	CO ppm	CO2 %	O2 %		CO ppm	CO2 %	O2 %
19:30	3.65	0.74	19.89				
19:31	3.25	0.96	19.89				
19:33	3.75	0.93	19.86				
19:34	3.15	0.95	19.9				
19:36	3.9	0.94	19.89				
19:37	3.1	1.03	19.88				
19:39	4.15	0.96	19.86				
19:40	3.2	0.89	19.91				
19:42	3.75	0.93	19.88				
19:43	3.35	0.94	19.9				
19:45	3.45	0.78	19.93				
19:46	3.8	0.88	19.96				
19:48	3.3	0.9	19.95				
19:49	4.1	0.73	20.03				
19:51	3.25	0.83	19.98				
19:52	4.05	0.81	19.99				
19:54	3.4	0.83	19.98				
19:55	5.05	0.86	19.98				
19:57	3.5	0.88	20.03				
19:58	3.95	0.79	20				
20:00	3.35	0.83	19.96	AVG	3.64	0.88	19.94

Louisiana-Pacific Corp.
CO RATA Run 9
September 16, 1994

TIME	CO ppm	CO2 %	O2 %		CO ppm	CO2 %	O2 %
20:15	3.35	0.9	19.81				
20:16	3.55	1.03	19.85				
20:18	3.05	0.96	19.94				
20:19	3.5	0.86	19.88				
20:21	3.3	0.94	19.95				
20:22	3.4	0.94	19.91				
20:24	3.35	1.04	19.88				
20:25	3.3	1.09	19.85				
20:27	3.65	0.88	19.89				
20:28	3.55	0.94	19.88				
20:30	3.9	0.91	19.83				
20:31	3.45	0.93	19.84				
20:33	4.2	0.96	19.84				
20:34	3.45	1.11	19.83				
20:36	4.3	1.04	19.8				
20:37	3.65	1.05	19.78				
20:39	4.5	1.21	19.73				
20:40	3.55	1.04	19.84				
20:42	4.45	1.11	19.63				
20:43	3.95	1.08	19.75				
20:45	4.1	0.98	19.86	AVG	3.69	1.00	19.84

AMTEST
AIR QUALITY, INC.

SAMPLING SYSTEM BIAS CHECK

Am Test-Air Quality, Inc.

CLIENT: Louisiana Pacific Corp
LOCATION: Chilco [illegible]
SITE LOCATION: RTO Outlet [illegible]
DATE: 7/16/94

RUN # 7 CONDITION:

START: 1845
STOP: 1915

All calibrations [illegible]

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Check One: Wet	Check One: Dry
Carbon Dioxide (CO2)	%	0.1	0.1	6.1	5.9	5.99	0-25		✓
Oxygen (O2)	%	0.1	-0.1	[illegible]	15.0	15.05	0-25		✓
Carbon Monoxide (CO)	ppm	0.1	0.3	[illegible]	30.5	30.3	0-100		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

RUN # 8 CONDITION:

START: 1930
STOP: 2000

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Check One: Wet	Check One: Dry
Carbon Dioxide (CO2)	%	0.1	0.1	5.9	5.9	5.99	0-25		✓
Oxygen (O2)	%	-0.1	0.1	15.0	15.0	15.05	0-25		✓
Carbon Monoxide (CO)	ppm	0.3	0.2	30.5	30.2	30.3	0-100		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

RUN # 9 CONDITION:

START: 2015
STOP: 2045

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Check One: Wet	Check One: Dry
Carbon Dioxide (CO2)	%	0.1	0.2	5.9	6.0	5.99	[illegible]		✓
Oxygen (O2)	%	0.1	0.1	15.0	15.1	15.05	[illegible]		✓
Carbon Monoxide (CO)	ppm	0.2	0.5	30.3	30.4	30.3	[illegible]		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

[jaa\c\excel\biaschk]

Louisiana-Pacific Corp.
CO RATA Run 10
September 16, 1994

TIME	CO ppm	CO2 %	O2 %				
21:00	3.65	0.98	19.76				
21:01	3.05	0.91	19.83				
21:03	3.6	1.1	19.73				
21:04	3.05	0.83	19.83				
21:06	3.05	1.03	19.84				
21:07	3.1	0.93	19.73				
21:09	3.1	0.9	19.8				
21:10	3.15	0.91	19.86				
21:12	3.25	0.88	19.83				
21:13	3.75	0.98	19.83				
21:15	3.3	0.96	19.84				
21:16	3.65	1.11	19.8				
21:18	2.95	1.1	19.81				
21:19	3.35	1.03	19.85				
21:21	2.65	0.91	19.98				
21:22	3.35	1.03	19.85				
21:24	2.85	0.93	19.93				
21:25	3.85	1	19.89				
21:27	3.05	0.94	19.93				
21:28	4	0.81	19.9		CO ppm	CO2 %	O2 %
21:30	3.65	0.86	19.38	AVG	3.30	0.96	19.82

Louisiana-Pacific Corp.
CO RATA Run 11
September 16, 1994

TIME	CO ppm	CO2 %	O2 %				
21:45	3.2	0.98	19.89				
21:46	4	0.91	19.81				
21:48	3.1	0.9	19.9				
21:49	3.9	1	19.85				
21:51	3.2	0.91	19.83				
21:52	3.7	0.89	19.85				
21:54	2.95	0.89	19.84				
21:55	3.35	0.98	19.78				
21:57	3.2	0.98	19.85				
21:58	3.15	0.95	19.85				
22:00	3.2	0.98	19.9				
22:01	3.15	0.96	19.84				
22:03	3.2	0.74	19.95				
22:04	3.25	0.94	19.93				
22:06	3.4	0.88	19.91				
22:07	3.3	0.89	19.99				
22:09	4	0.96	19.89				
22:10	3.35	0.85	19.9				
22:12	4.3	0.98	19.86				
22:13	3.4	0.86	19.9		CO ppm	CO2 %	O2 %
22:15	4.25	0.95	19.91	AVG	3.45	0.92	19.88

Louisiana-Pacific Corp.
CO RATA Run 12
September 16, 1994

TIME	CO ppm	CO2 %	O2 %				
22:30	4.5	1.11	19.64				
22:31	3.95	1.14	19.55				
22:33	4.9	1.05	19.79				
22:34	3.85	0.96	19.66				
22:36	4.75	1.09	19.6				
22:37	3.8	1.15	19.68				
22:39	4.55	0.98	19.66				
22:40	3.75	1.16	19.68				
22:42	4.1	1.14	19.69				
22:43	3.6	0.95	19.79				
22:45	4.1	1.15	19.68				
22:46	3.65	1.11	19.78				
22:48	3.85	1.09	19.81				
22:49	3.6	1.03	19.84				
22:51	3.35	1.11	19.8				
22:52	3.7	1.01	19.88				
22:54	3.35	1	19.89				
22:55	3.45	0.9	19.91				
22:57	3.45	0.79	20.01				
22:58	3.75	0.93	19.98		CO ppm	CO2 %	O2 %
23:00	3.55	0.78	19.96	AVG	3.88	1.03	19.78

SAMPLING SYSTEM BIAS CHECK

Am Test-Air Quality, Inc.

AMTEST AIR QUALITY, INC.

151

CLIENT: Louisiana - Pacific Corp

LOCATION: Chilco ID

SITE LOCATION: RTO O. Air Stack

DATE: 9/16/94

RUN # 10　　CONDITION:

START: 2100　Cal thru probe

STOP: 2130

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Check One: Wet	Check One: Dry
Carbon Dioxide (CO2)	%	0.2	0.1	6.0	6.1	5.99	0-25		✓
Oxygen (O2)	%	0.1	0.1	15.1	15.0	15.05	0-25		✓
Carbon Monoxide (CO)	ppm	0.5	0.4	30.4	30.5	30.3	0-100		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

RUN # 11　　CONDITION:

START: 2145

STOP: 2215

Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Check One: Wet	Check One: Dry
Carbon Dioxide (CO2)	%	0.1	0.2	6.1	5.9	5.99	[illegible]		✓
Oxygen (O2)	%	[illegible]	0.0	15.0	15.0	15.05	[illegible]		✓
Carbon Monoxide (CO)	ppm	[illegible]	0.4	30.5	30.4	30.3	[illegible]		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

✓

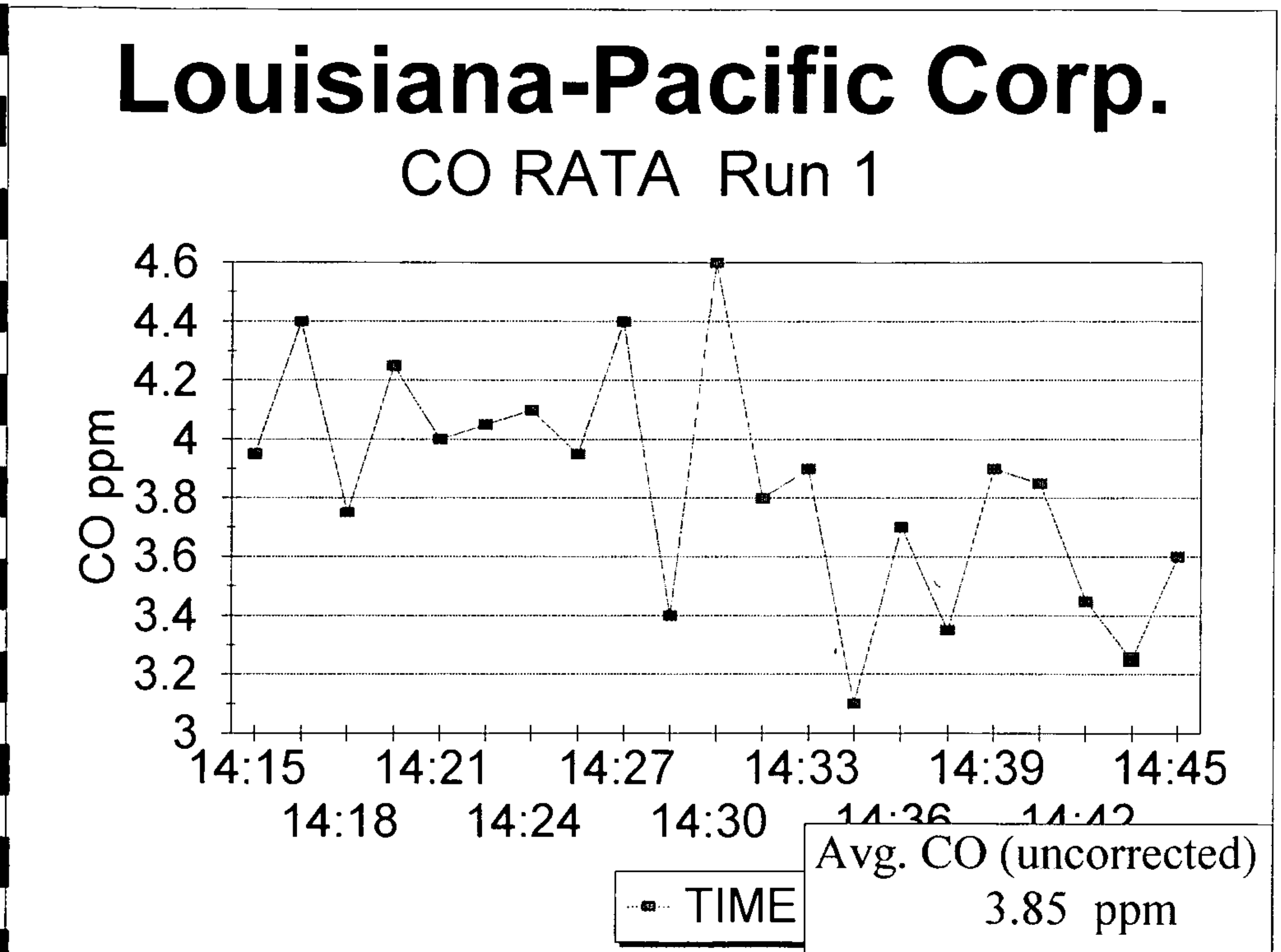
RUN # 12　　CONDITION:

START: 2230

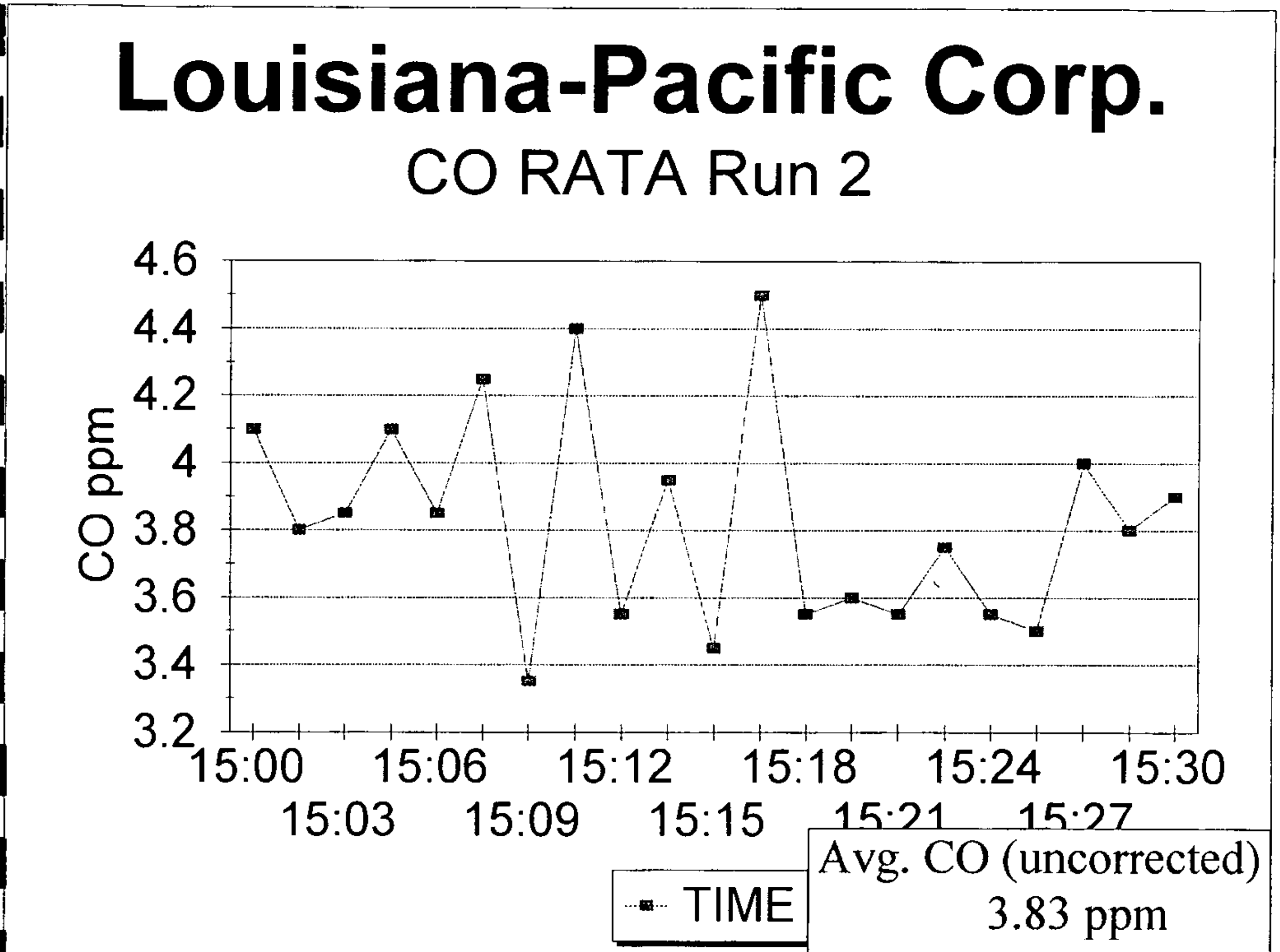
STOP: 2300

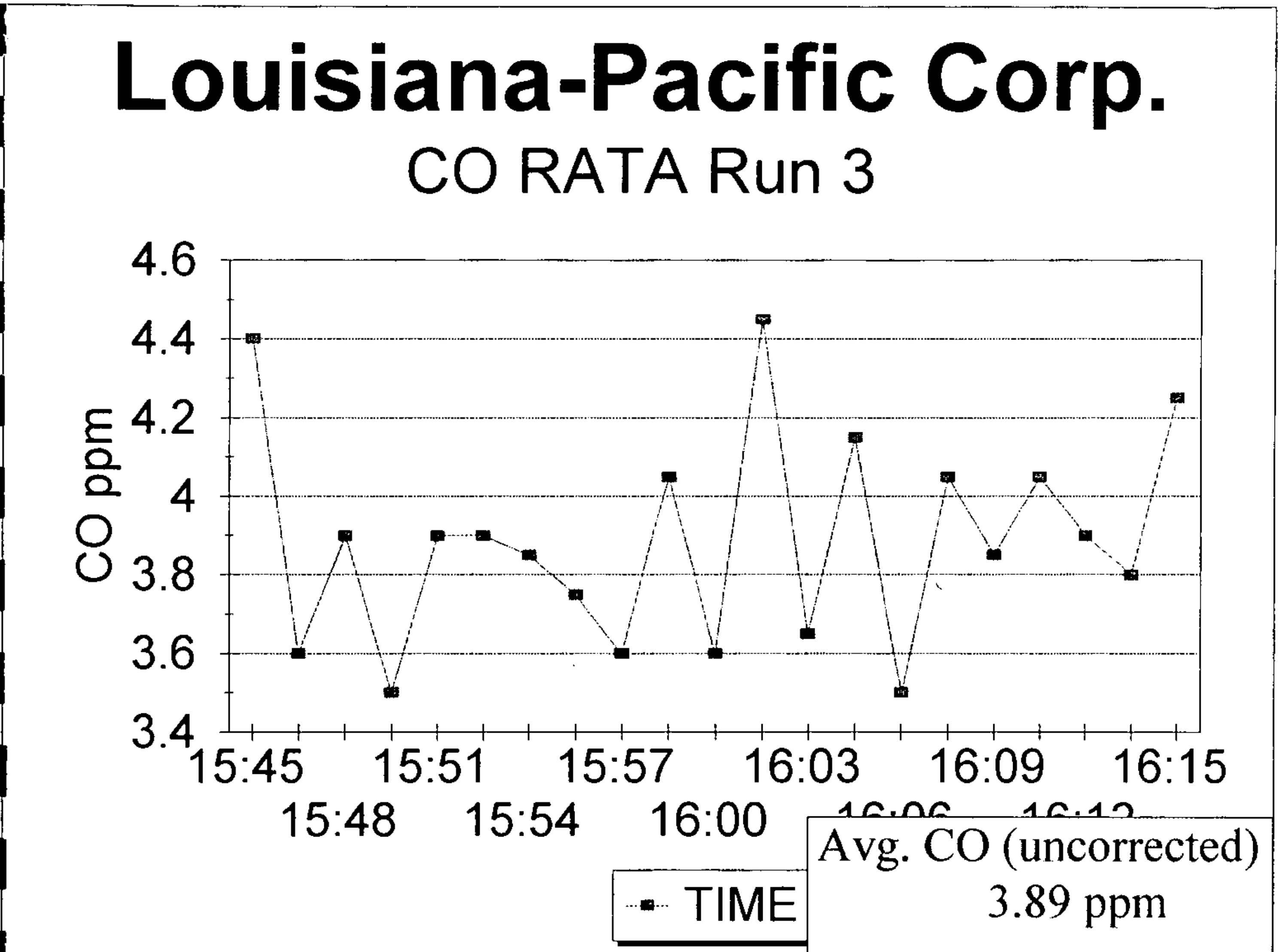
Parameter	Unit	Initial Zero Check	Final Zero Check	Initial Span Check	Final Span Check	Upscale Cal Gas Value	Analyzer Range	Check One: Wet	Check One: Dry
Carbon Dioxide (CO2)	%	0.2	0.1	5.9	5.9	5.99	0-25		✓
Oxygen (O2)	%	0.0	0.1	15.0	15.0	15.05	0-25		✓
Carbon Monoxide (CO)	ppm	0.4	0.4	30.4	30.3	30.3	0-100		✓
Sulfur Dioxide (SO2)	ppm								
Nitrogen Oxides (NOx)	ppm								
Total Reduced Sulfur (TRS as SO2)	ppm								
Non-Methane Hydrocarbons (NMHC)	ppm								
Total Hydrocarbons (THC)	ppm								

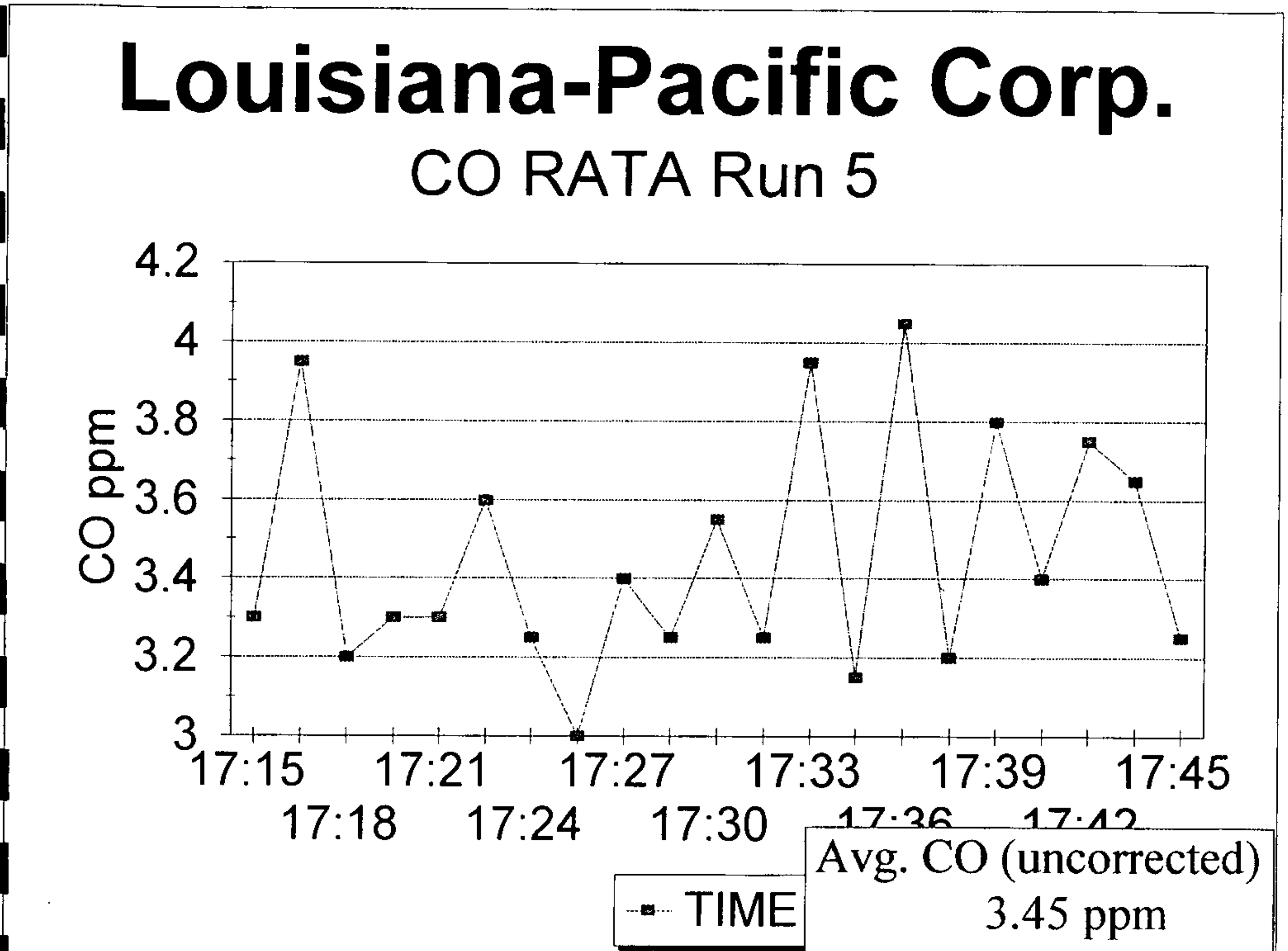
✓



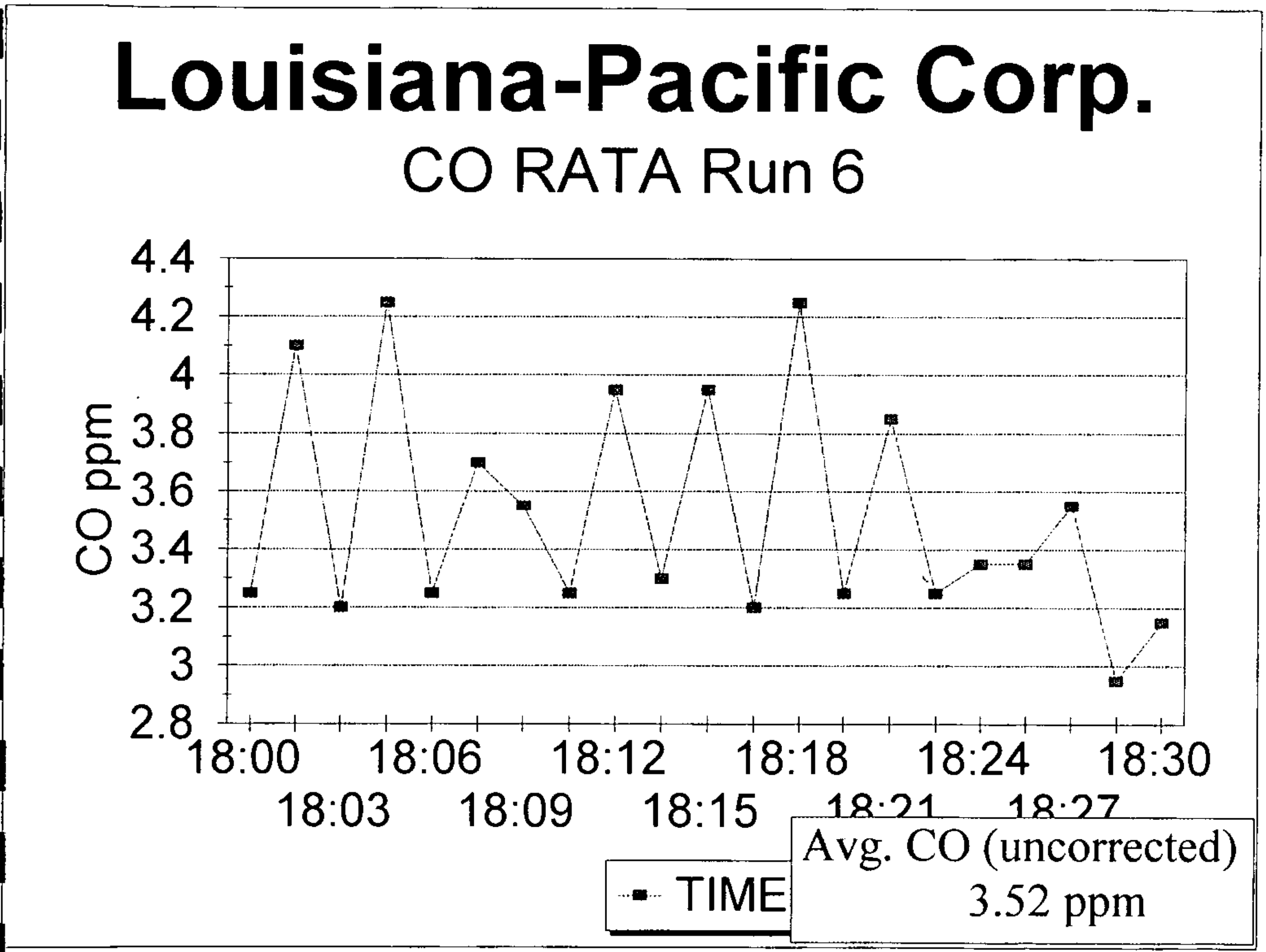
Louisiana-Pacific Corp.
CO RATA Run 1
CO ppm
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
14:15
14:18
14:21
14:24
14:27
14:30
14:33
14:39
14:45
TIME
Avg. CO (uncorrected)
3.85 ppm


Louisiana-Pacific Corp.
CO RATA Run 2
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
CO ppm
15:00
15:03
15:06
15:09
15:12
15:15
15:18
15:24
15:30
TIME
Avg. CO (uncorrected)
3.83 ppm

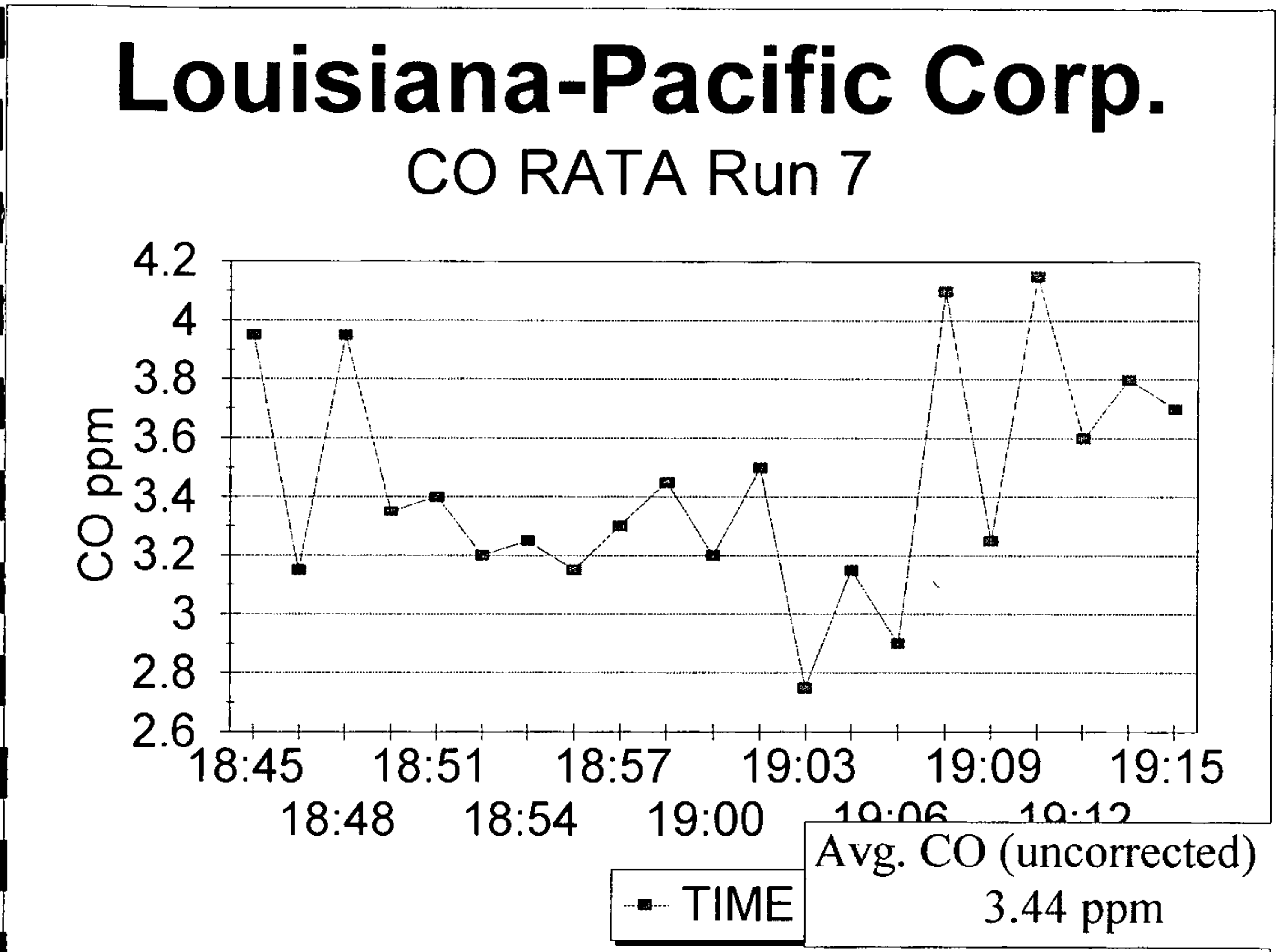

Louisiana-Pacific Corp.
CO RATA Run 3
CO ppm
4.6
4.4
4.2
4
3.8
3.6
3.4
15:45
15:51
15:57
16:03
16:09
16:15
15:48
15:54
16:00
TIME
Avg. CO (uncorrected)
3.89 ppm



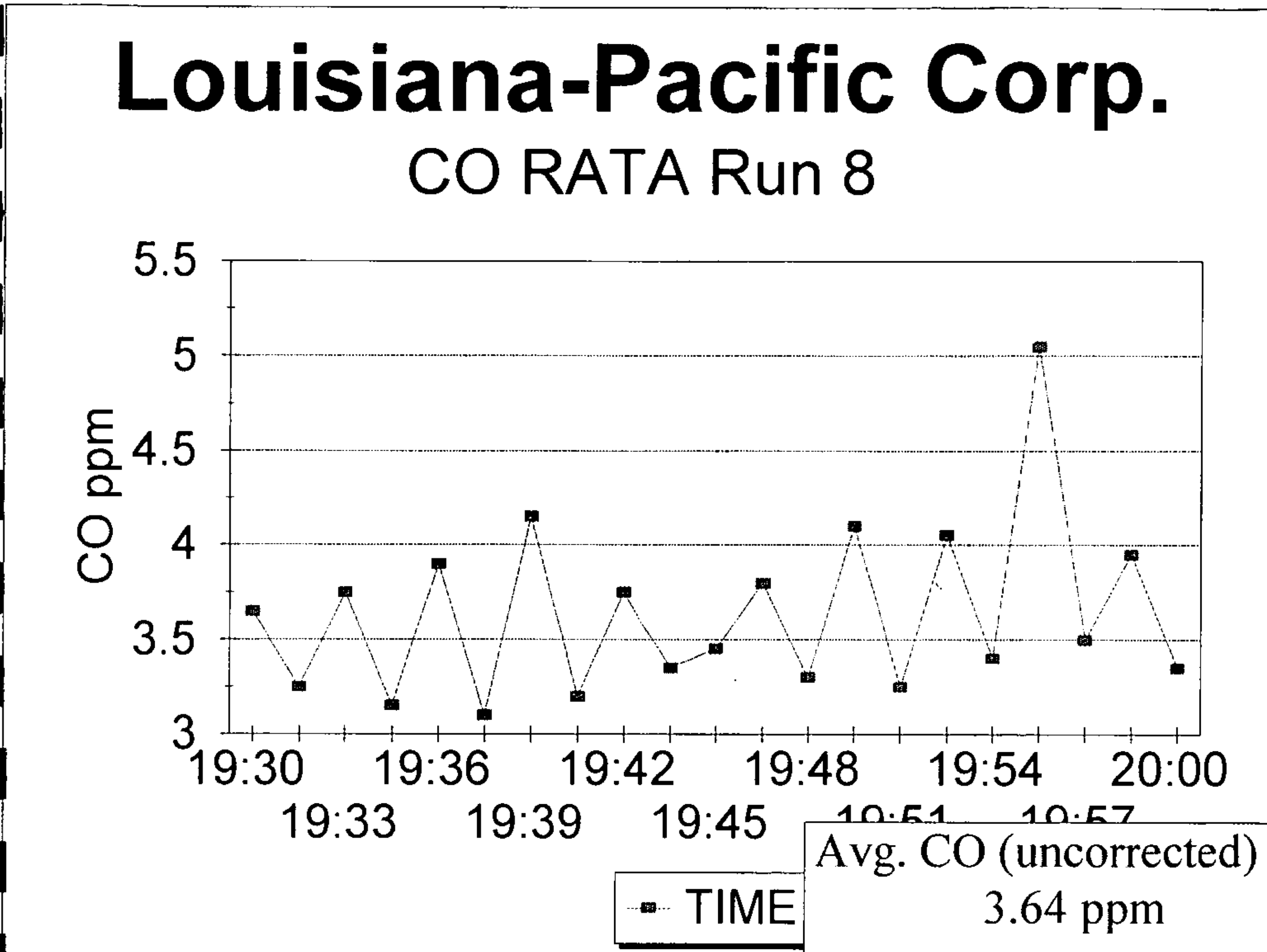
Louisiana-Pacific Corp.
CO RATA Run 5
CO ppm
4.2
4
3.8
3.6
3.4
3.2
3
17:15
17:18
17:21
17:24
17:27
17:30
17:33
17:39
17:45
TIME
Avg. CO (uncorrected)
3.45 ppm



Louisiana-Pacific Corp.
CO RATA Run 6
CO ppm
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
18:00
18:03
18:06
18:09
18:12
18:15
18:18
18:24
18:30
TIME
Avg. CO (uncorrected)
3.52 ppm

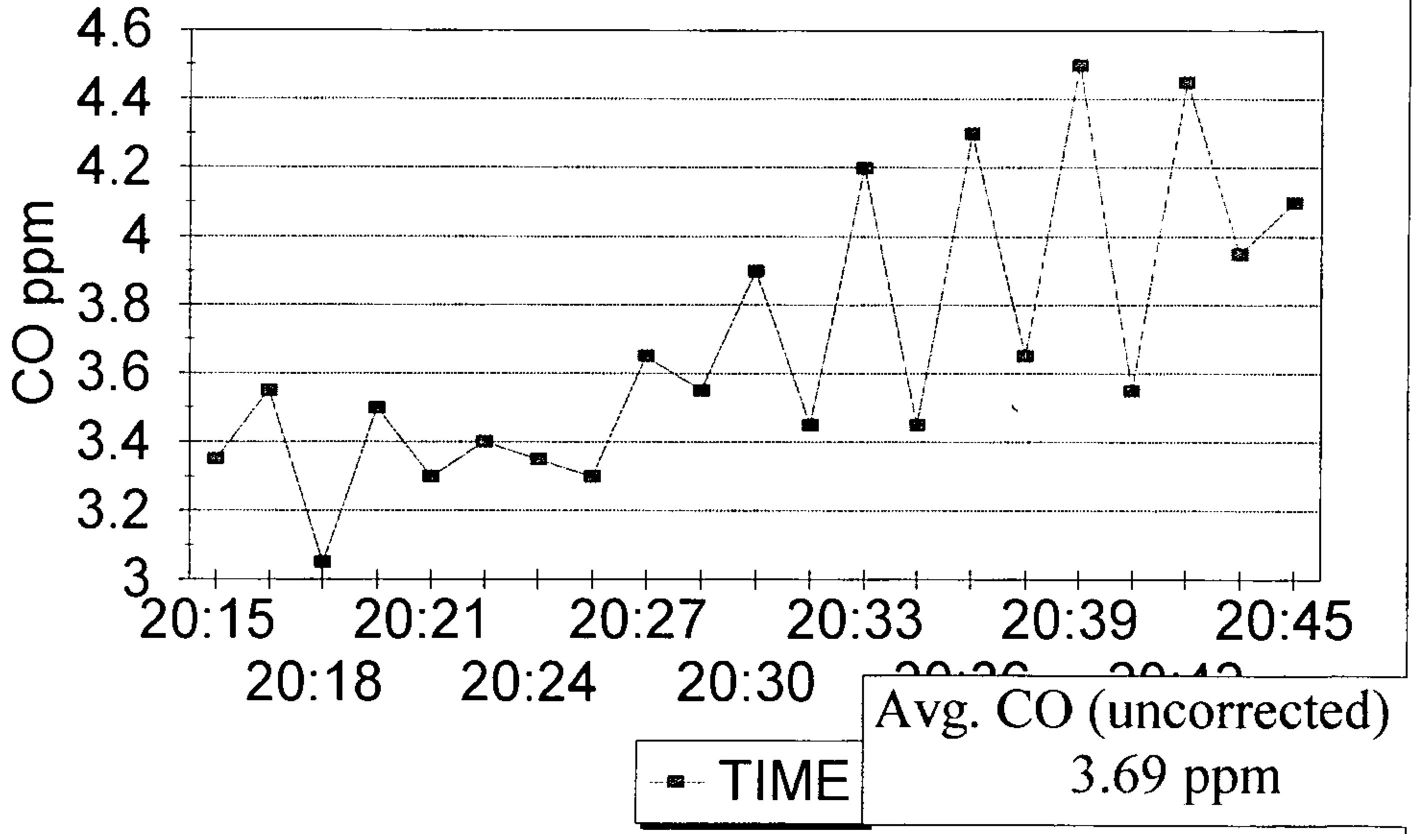


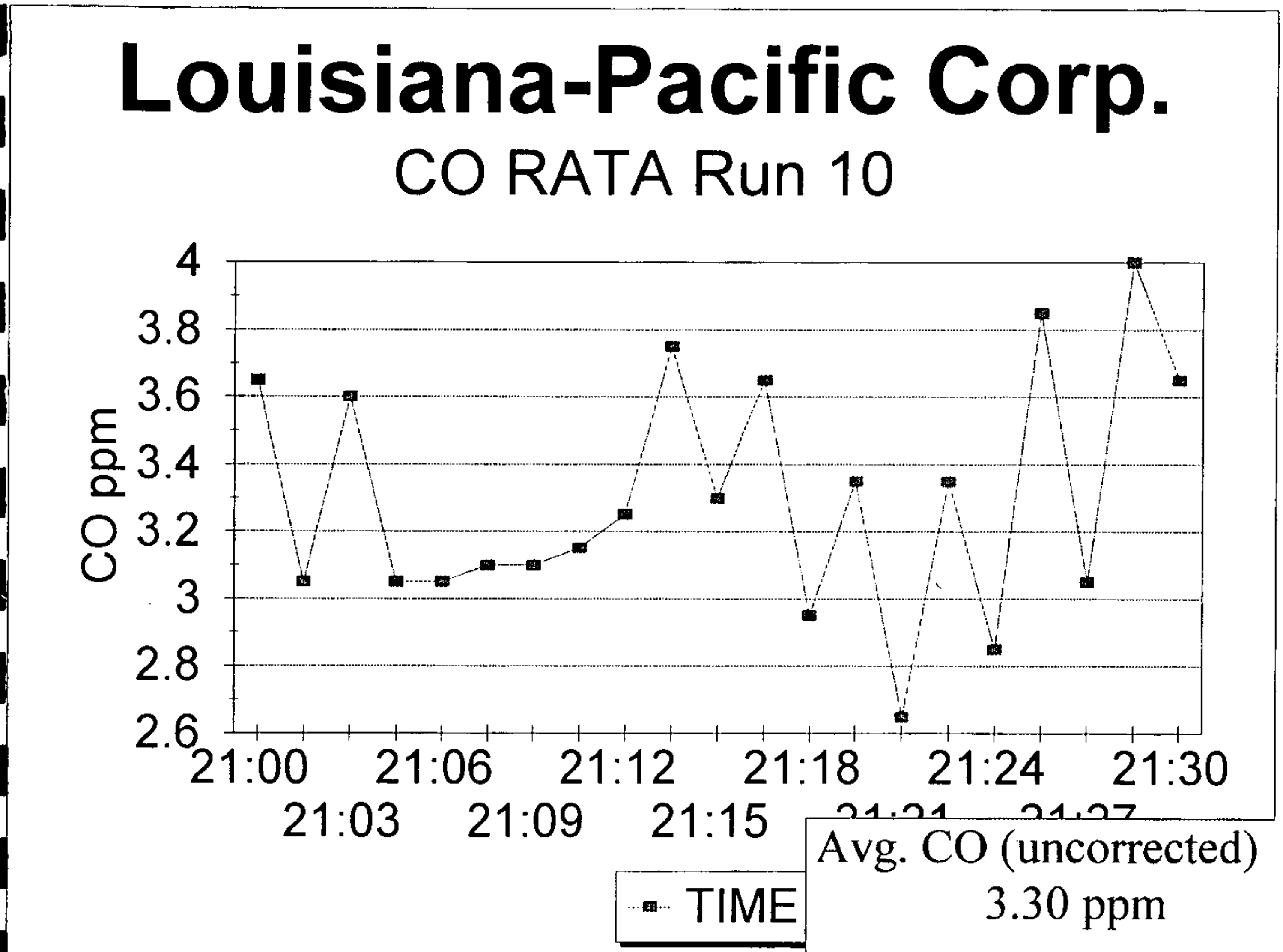
Louisiana-Pacific Corp.
CO RATA Run 7
CO ppm
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
18:45
18:48
18:51
18:54
18:57
19:00
19:03
19:09
19:15
TIME
Avg. CO (uncorrected)
3.44 ppm

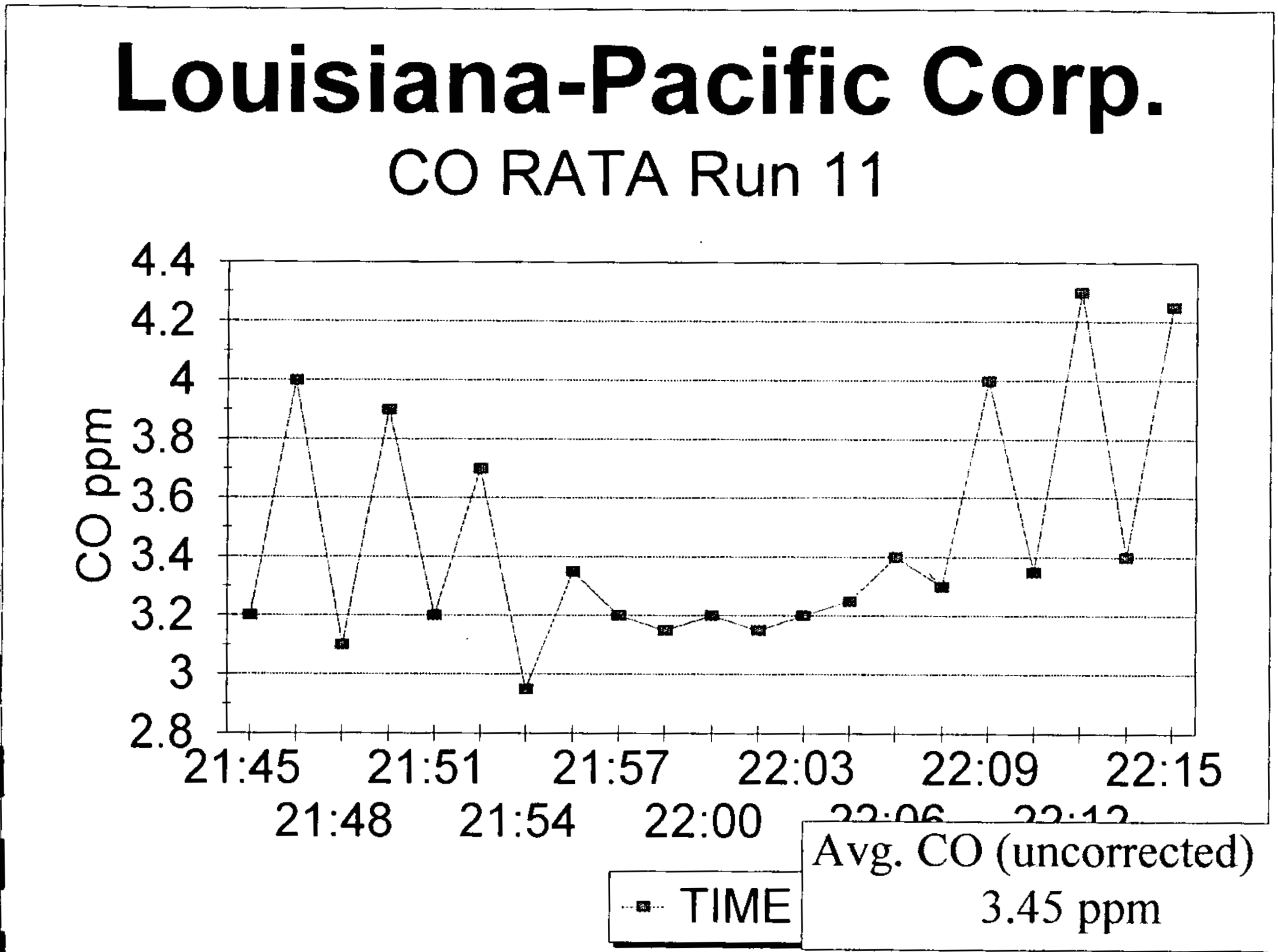

Louisiana-Pacific Corp.
CO RATA Run 8
CO ppm
5.5
5
4.5
4
3.5
3
19:30
19:33
19:36
19:39
19:42
19:45
19:48
19:54
20:00
TIME
Avg. CO (uncorrected)
3.64 ppm

Louisiana-Pacific Corp.

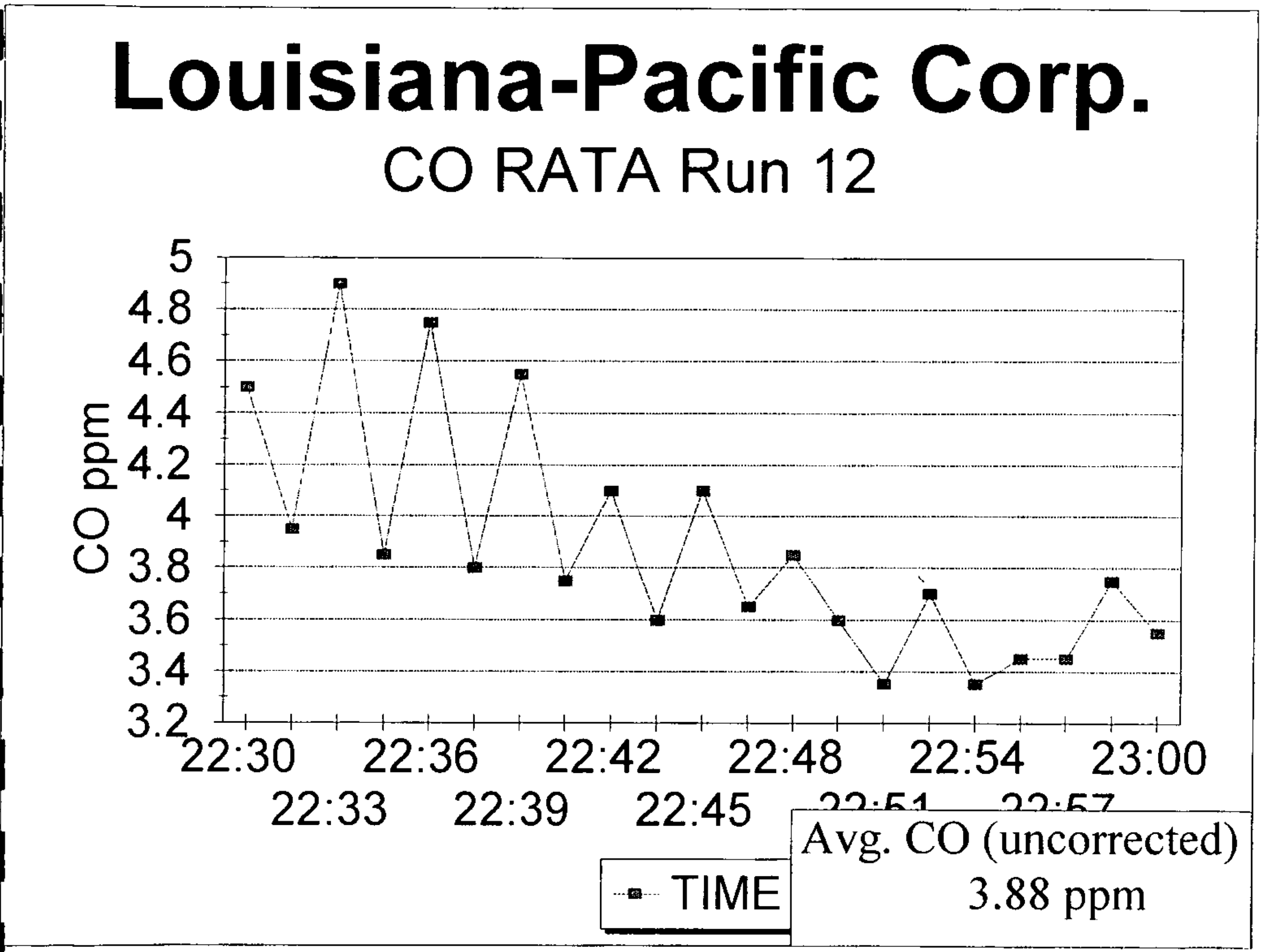
CO RATA Run 9




Louisiana-Pacific Corp.
CO RATA Run 10
CO ppm
4
3.8
3.6
3.4
3.2
3
2.8
2.6
21:00
21:03
21:06
21:09
21:12
21:15
21:18
21:24
21:30
TIME
Avg. CO (uncorrected)
3.30 ppm



Louisiana-Pacific Corp.
CO RATA Run 11
CO ppm
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
21:45
21:48
21:51
21:54
21:57
22:00
22:03
22:09
22:15
TIME
Avg. CO (uncorrected)
3.45 ppm


Louisiana-Pacific Corp.
CO RATA Run 12
CO ppm
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
22:30
22:33
22:36
22:39
22:42
22:45
22:48
22:54
23:00
TIME
Avg. CO (uncorrected)
3.88 ppm

AMTEST
AIR QUALITY, INC.

CONTINUOUS ANALYZERS CHECKLIST

Oxygen (O_2)

Infrared Industries Model 2200 O_2 Analyzer ______
Servomex Model 1420B O_2 Analyzer ______ ✓
Western Research Model 721ATM Analyzer with *Servomex 1155 O_2 Transducer* ______

Carbon Dioxide (CO_2)

Infrared Industries Model 702D CO_2 Analyzer ______
Automated Custom Systems Model 3300 CO_2 Analyzer ______
Servomex Model 1410B Infrared CO_2 Analyzer ______ ✓

Carbon Monoxide (CO)

Automated Custom Systems Model 3300 CO Analyzer ______
Thermo Environmental Instruments Model 48 CO Analyzer ______ ✓

Sulfur Dioxide (SO_2)

Monitor Labs Model 8850 SO_2 Analyzer ______
Sampling Technologies, Inc./Am Test SO_2 Dilution Module ______
Western Research Model 721AT SO_2 Analyzer ______
Western Research Model 721ATM SO_2 Analyzer ______

Nitrogen Oxides (NO_x)

Monitor Labs Model 8840 NO_x Analyzer ______
Monitor Labs Model 8730 NO_x Dilution Module ______
Thermo Environmental Instruments Model 10S NO_x Analyzer ______
Thermo Environmental Instruments Model 42H NO_x Analyzer ______

Hydrocarbons (HC)

Byron Model 301 HC Analyzer ______
Infrared Industries Model 702D HC Analyzer ______
Infrared Industries Model 703 HC Analyzer ______
Compur Flame Ionization Detector (FID) THC Analyzer ______
Thermo Environmental Instruments Model 51 THC Analyzer ______

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GAS CYLINDER CHECKLIST

ATAQ#		CYLINDER #	GAS CONCENTRATIONS	EXP. DATE
			Carbon Dioxide, Oxygen	
140	____	CC-19319	6.03% O_2	2/97
			Carbon Dioxide, Oxygen	
05	____	LL-10577	9.95% O_2, 11.8% CO_2	---
131	____	CC-14228	19.96% CO_2	6/95
			Carbon Dioxide, Oxygen, Carbon Monoxide	
133	____	CC-125	296 ppm CO, 6.05% CO_2, 15.02% O_2	---
132	____	CC-48487	297 ppm CO, 5.99% CO_2, 15.07% O_2	---
13 **AK**	____	CC-44522	300 ppm CO, 6.00% CO_2, 15.0% O_2	---
146	____	CC-12009	302 ppm CO, 6.00% CO_2, 15.03% O_2	---
150	✓	CC-12024	303 ppm CO, 5.99% CO_2, 15.05% O_2	---
148	____	CC-12087	593 ppm CO, 11.92% CO_2, 9.97% O_2	---
147	____	CC-14137	594 ppm CO, 11.94% CO_2, 9.98% O_2	---
121	____	CC-7284	597 ppm CO, 11.99% CO_2, 10.00% O_2	---
112	____	CC-14485	597 ppm CO, 12.00% CO_2, 9.99% O_2	---
128	____	CC-15362	598 ppm CO, 12.01% CO_2, 10.03% O_2	---
12 **AK**	____	CC-37055	600 ppm CO, 11.99% CO_2, 10.0% O_2	---
144	____	CC-6825	604 ppm CO, 11.98% CO_2, 10.00% O_2	---
91	____	CC-58965	1798 ppm CO, 24.03% CO_2, 5.00% O_2	---
			Sulfur Dioxide, Oxygen	
86 **AK**	____	CC-61393	49.0 ppm SO_2, 15.0% O_2	11/93
87 **AK**	____	CC-61497	89.0 ppm SO_2, 15.0% O_2	5/95
98	____	CC-5966	148 ppm SO_2, 5.04% O_2	8/95
130	____	CC-14717	992.9 ppm SO_2	6/95
			Sulfur Dioxide, Nitrogen Oxides	
50	____	CC-97571	22.5 ppm SO_2, 22.0 ppm NO_x	7/93
58 **AK**	____	CC-38345	46.84 ppm SO_2, 47.86 ppm NO_x	8/94
155	____	CC-20494	50.3 ppm SO_2, 51.8 ppm NO_x	7/96
160	____	CC-26785	50.4 ppm SO_2, 52.0 ppm NO_x	7/96
135	____	CC-10646	50.6 ppm SO_2, 49.2 ppm NO_x	4/94
107	____	CC-10652	50.7 ppm SO_2, 49.0 ppm NO_x	4/94
60 **AK**	____	CC-56402	83.15 ppm SO_2, 86.65 ppm NO_x	8/94
152	____	CC-7020	86.4 ppm SO_2, 89.9 ppm NO_x	8/96
153	____	CC-26792	89.9 ppm SO_2, 93.9 ppm NO_x	7/96
106	____	CC-10816	90.9 ppm SO_2, 88.8 ppm NO_x	4/94
134	____	CC-10634	90.9 ppm SO_2, 89.1 ppm NO_x	4/94

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GAS CYLINDER CHECKLIST

ATAQ#		CYLINDER #	GAS CONCENTRATIONS	EXP. DATE
			Sulfur Dioxide, Nitrogen Oxides (continued)	
143	____	CC-6781	92.5 ppm SO_2, 92.6 ppm NO_x	5/96
159	____	CC-20482	183.1 ppm SO_2, 195.6 ppm NO_x	7/96
118	____	CC-4623	212 ppm SO_2, 236 ppm NO_x	10/95
61 **AK**	____	150-635	220.1 ppm SO_2, 227.7 ppm NO_x	7/94
92	____	CC-5812	460 ppm SO_2, 470 ppm NO_x	7/95
76	____	CC-3712	514.5 ppm SO_2, 512.5 ppm NO_x	12/94
115	____	CC-4486	865 ppm SO_2, 893 ppm NO_x	10/95
77	____	CC-3735	932.1 ppm SO_2, 912.7 ppm NO_x	12/94
			Nitrogen Oxides	
139	____	CC-14913	4.86 ppm NO_x	3/96
142	____	CC-82961	10.6 ppm NO_x	3/96
93	____	CC-97675	13.1 ppm NO_x	7/95
90	____	CC-107849	24.2 ppm NO_x	5/95
88	____	CC-1560	49.3 ppm NO_x	5/95
89	____	CC-1600	82.3 ppm NO_x	5/95
141	____	CC-18322	114.9 ppm NO_x	3/96
62 **AK**	____	CC-37048	466.1 ppm NO_x	8/94
59 **AK**	____	CC-44500	977.6 ppm NO_x	8/94
125	____	CC-14479	3011 ppm NO_x	6/95
			Carbon Monoxide	
39	____	CC-6293	29.4 ppm CO	---
94	✓	CC-16544	30.3 ppm CO	7/96
46	✓	CC-72592	58.4 ppm CO	---
110	____	CC-14269	63.7 ppm CO	6/95
71	____	CC-64521	905 ppm CO	---
84	____	CC-90717	912 ppm CO	6/96
126	____	CC-1607	9080 ppm CO (0.908%)	6/95
			Carbon Monoxide, Oxygen	
26 **AK**	____	CC-87523	121 ppm CO, 10.1% O_2	---
138	____	CC-17765	11.8 ppm CO, 14.2% O_2	---
			Carbon Monoxide, Carbon Dioxide	
128 **AK**	____	CC-61491	84.0 ppm CO, 9.86% CO_2	---

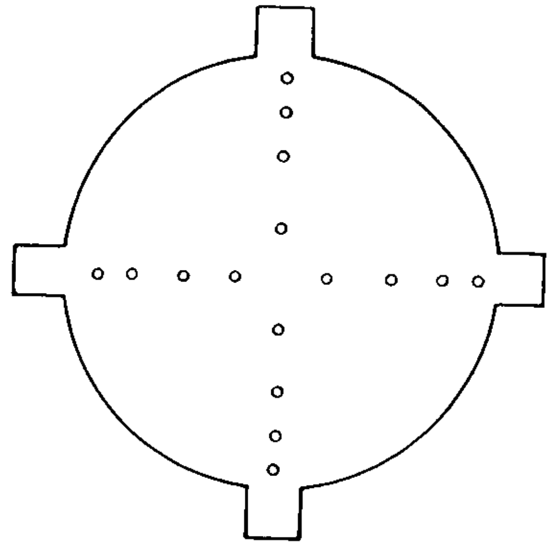
Rev 8/26/94

GAS CYLINDER CHECKLIST

ATAQ#		CYLINDER #	GAS CONCENTRATIONS	EXP. DATE
			Sulfur Dioxide, Nitrogen Oxides, Carbon Monoxide	
99	____	CC-6875	109 ppm SO_2, 276 ppm NO_x, 274 ppm CO	8/95
			Methane, Propane	
163	____	CC-66450	8.17 ppm Propane	7/97
156	____	CC-26790	25.4 ppm Propane	7/97
154	____	CC-26845	25.5 ppm Propane	7/97
111	____	CC-14274	29.7 ppm Propane	5/95
145	____	CC-59497	31.8 ppm Propane	9/96
104	____	CC-59457	31.8 ppm Propane	9/96
161	____	CC-26826	45.3 ppm Propane	7/97
162	____	CC-26835	45.6 ppm Propane	7/97
57	____	CC-18250	50.0 ppm Propane	---
102	____	CC-19253	50.4 ppm Propane	9/96
149	____	CC-17649	72.9 ppm Propane, 73.7 ppm Methane	
105	____	CC-93822	90.2 ppm Propane	9/96
158	____	CC-26828	90.9 ppm Propane	7/97
157	____	CC-26883	91.1 ppm Propane	7/97
129	____	CC-48931	179.9 ppm Propane	6/95
113	____	CC-15033	4999 ppm Propane	6/95
124	____	CC-91743	3.07% Propane	---
19	____	CC-69475	5.00% Propane	---
24	____	CC-77479	9.00% Propane	---
			Hydrogen Sulfide, Oxygen	
123	____	CC-9147	16.0 ppm H_2S (10.4 ppm), 4.02% O_2	---
136	____	SG9127100	24.7 ppm H_2S	---
122	____	CC-9073	27.9 ppm H_2S (25.1 ppm), 4.03% O_2	---
151	____	CC-16610	51.3 ppm H_2S	6/95
68	____	CC-44407	83.0 ppm H_2S (balance Methane)	---
127	____	CC-38805	89.0 ppm H_2S (balance Propane)	---
			Special Use Gases	
53	____	CC-39354	52.8 ppm NH_3	---

APPENDIX E

Miscellaneous Supporting Information



CROSS SECTIONAL AREA

Traverse Point	Distance (inches)
1	3.1
2	10.0
3	18.6
4	30.9
5	64.7
6	77.1
7	85.6
8	92.6

STACK DIMENSIONS

95.63 inch diameter circular stack

4 ports at 90 degrees

A = 4 diameters downstream

B = 4.5 diameters upstream

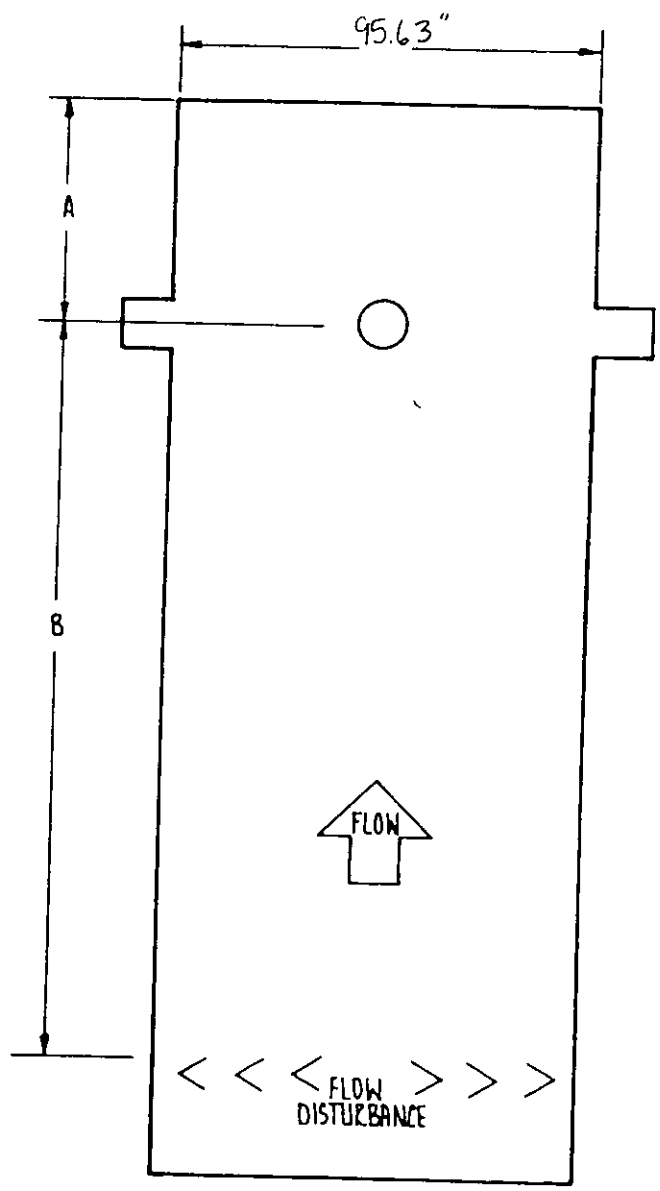


Figure 1. Location of sampling ports and traverse points

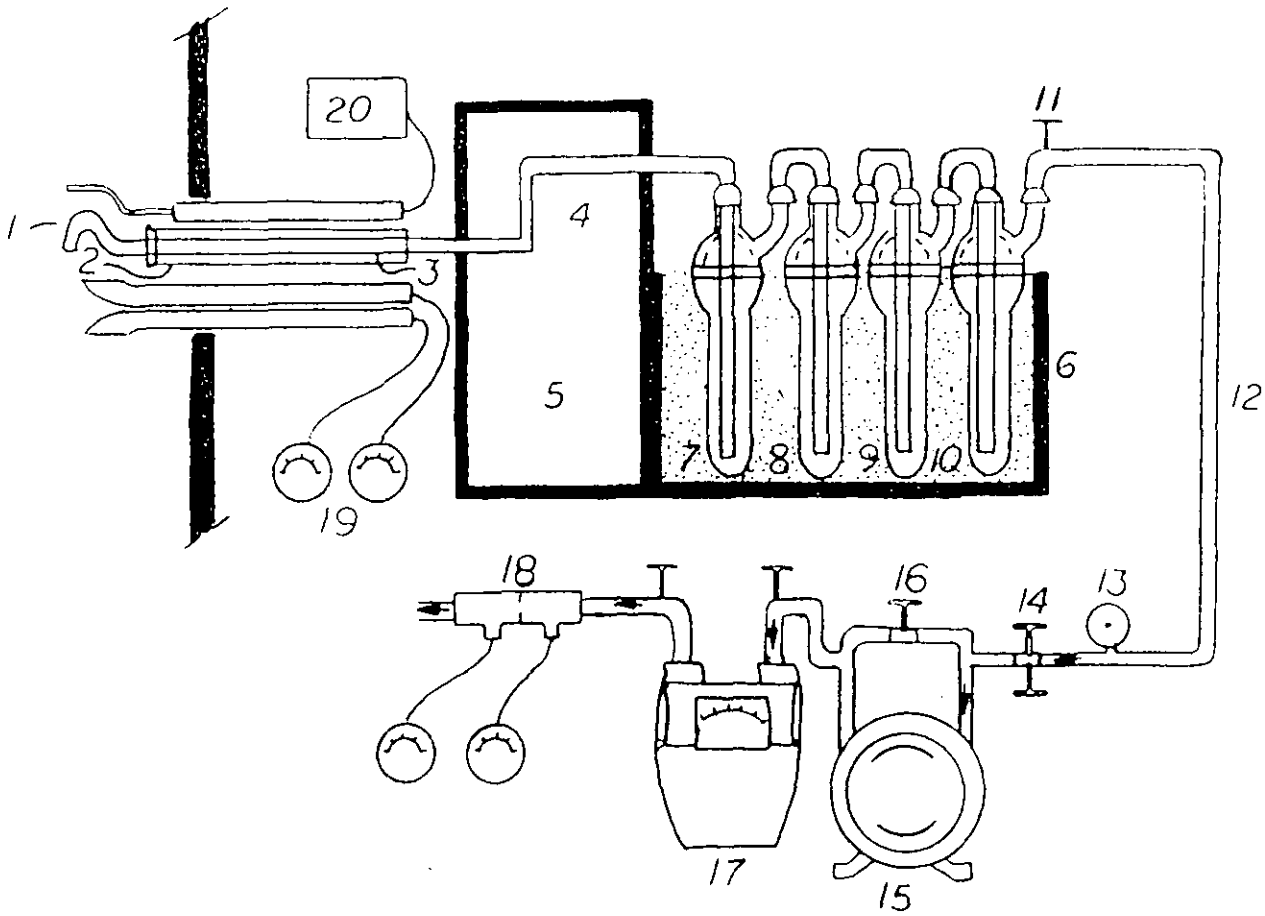


Figure . EPA Method 4 Moisture Sample Train.

1. Sampling nozzle
2. Sampling probe sheath
3. Heated sample probe liner
4. Connective glassware
5. Heated compartment
6. Impinger case - contains ice during sampling
7. First impinger containing 100 ml H_2O
8. Modified Greenburg-Smith impinger containing 100 ml H_2O
9. Third impinger - empty
10. Fourth impinger containing indicating silica gel desiccant
11. Impinger exit gas temperature sensor
12. Umbilical cord - vacuum line
13. Vacuum gauge
14. Fine and coarse adjustment valves
15. Leak free pump
16. By-pass valve
17. Dry gas meter with inlet and outlet temperature sensors
18. Orifice meter with magnehelic gauges
19. S-type pitot tube with magnehelic gauges
20. Fluke multi-channel digital thermocouple indicator

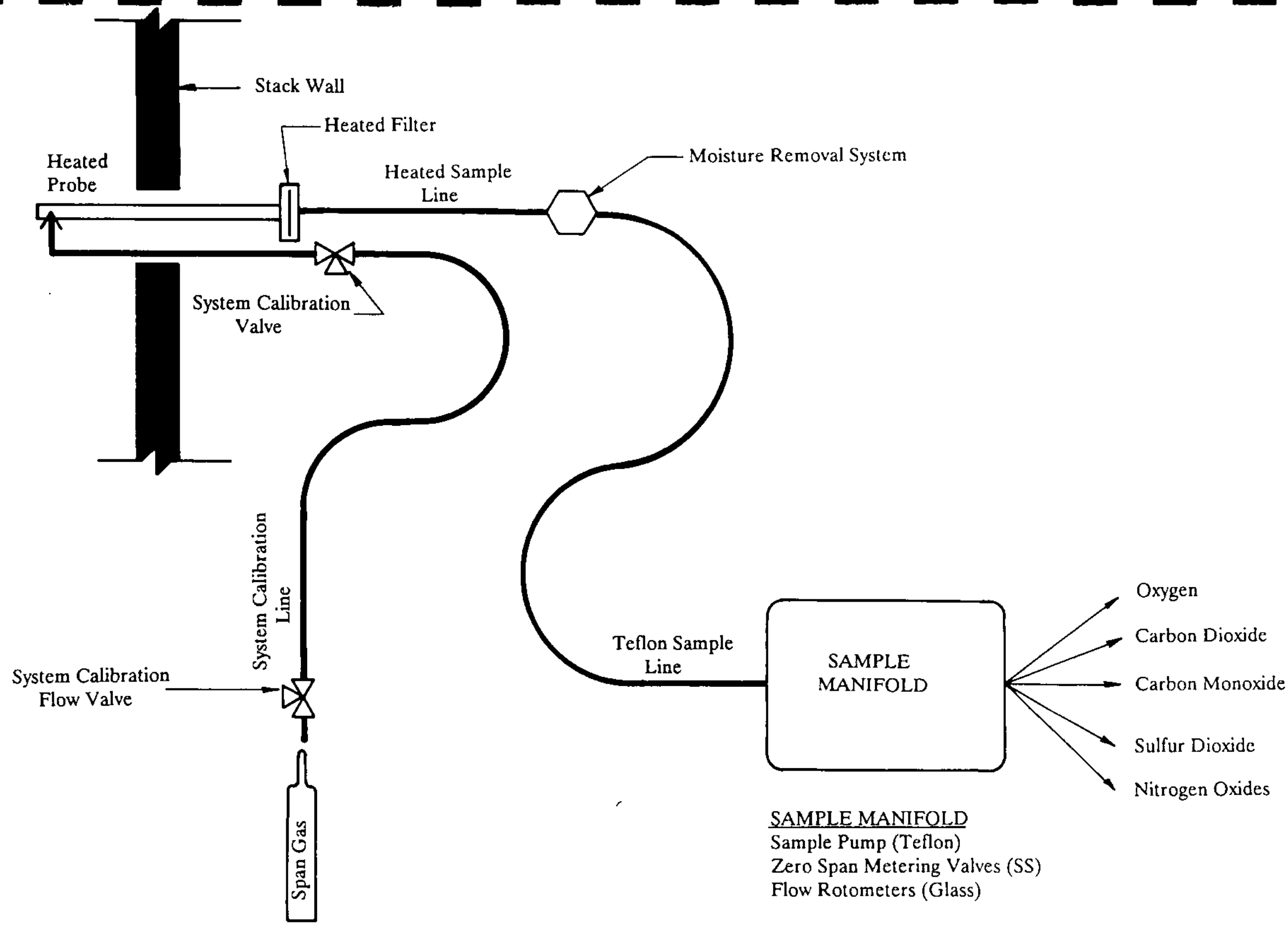


Figure . EPA Method 3A, 6C, 7E and 10 Sample Train

METHOD 1 - LOCATION OF TRAVERSE POINTS

Circular Stacks

TRAVERSE POINT	DISTANCE, % of diameter
1	4.4
2	14.7
3	29.5
4	70.5
5	85.3
6	95.6

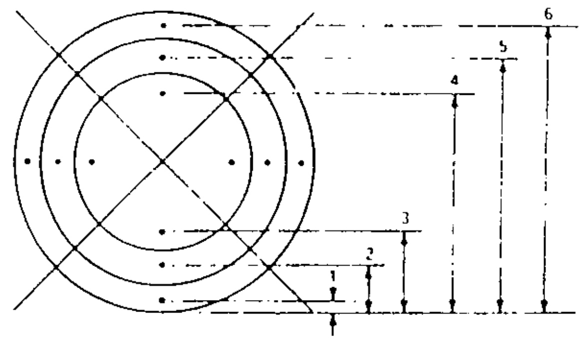


Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points indicated.

TABLE 1-2. LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

(Percent of stack diameter from inside wall to traverse point)

Traverse point number on a diameter	Number of traverse points on a diameter—											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	65.4	80.6
18									98.6	93.3	88.4	83.9

Rectangular Stacks

For a rectangular cross section, an equivalent diameter (D_e) shall be calculated from the following equation, to determine the upstream and downstream distances:

$$D_e = \frac{2LW}{(L+W)}$$

where L=length and W=width.

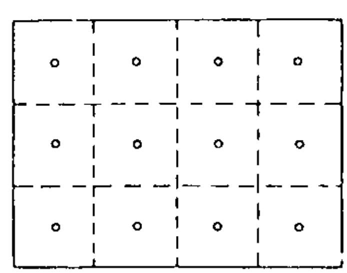


Figure 1-4. Example showing rectangular stack cross section divided into 12 equal areas, with a traverse point at centroid of each area.

METHOD 1 - MINIMUM NUMBER OF TRAVERSE POINTS

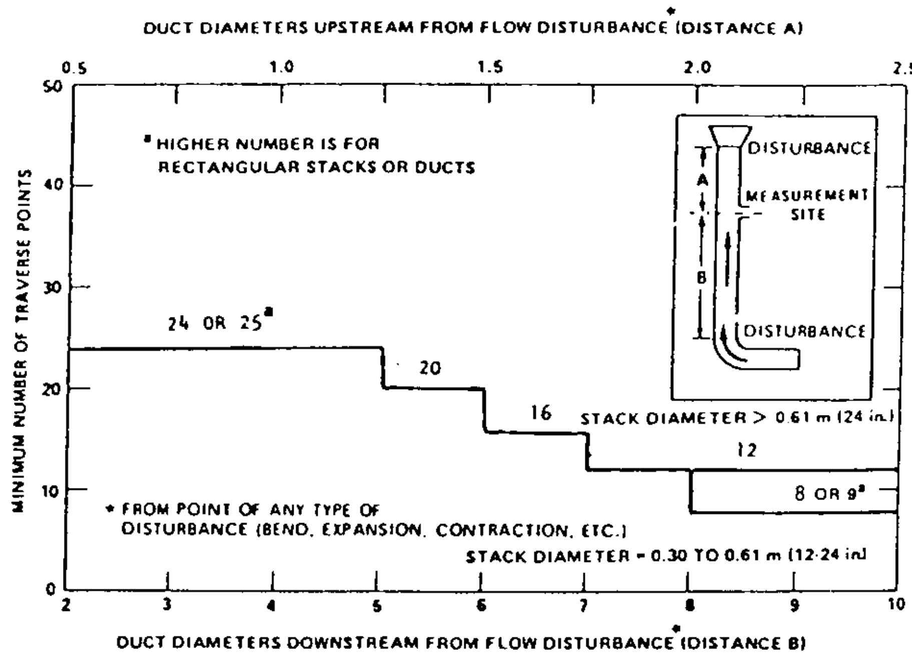


Figure 1-1. Minimum number of traverse points for particulate traverses.

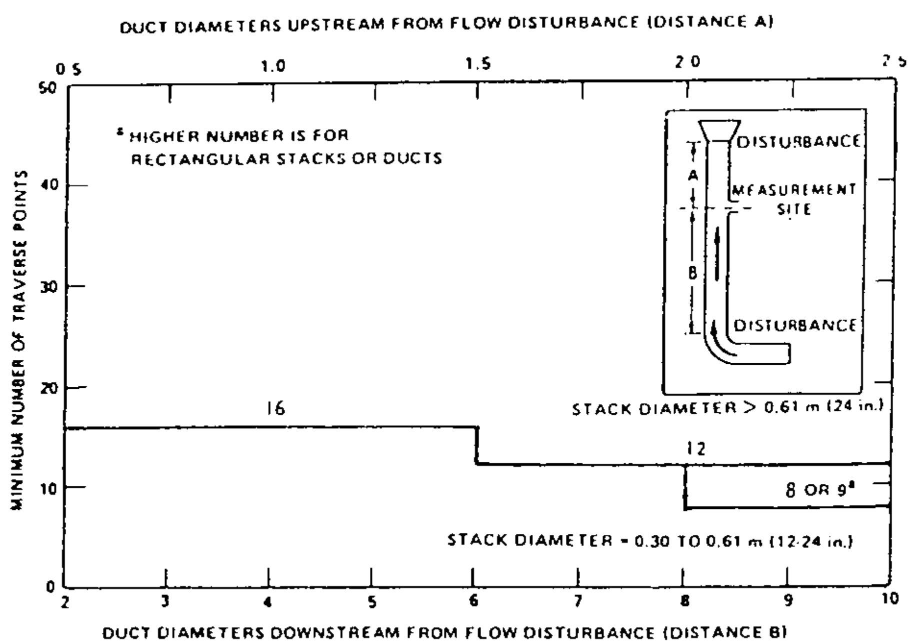


Figure 1-2. Minimum number of traverse points for velocity (nonparticulate) traverses.

METHOD 2 - STACK GAS VELOCITY AND VOLUMETRIC FLOW CALCULATIONS

5.1 Nomenclature.

A = Cross-sectional area of stack, m^2 (ft^2).
B_{ws} = Water vapor in the gas stream (from Method 5 or Reference Method 4), proportion by volume.
C_p = Pitot tube coefficient, dimensionless.
K_p = Pitot tube constant.

$$34.97 \frac{m}{sec} \left[\frac{(g/g\text{-mole})(mm\ Hg)}{(°K)(mm\ H_2O)} \right]^{1/2}$$

for the metric system and

$$85.49 \frac{ft}{sec} \left[\frac{(lb/lb\text{-mole})(in.\ Hg)}{(°R)(in.\ H_2O)} \right]^{1/2}$$

for the English system.

M_d = Molecular weight of stack gas, dry basis (see Section 3.6) g/g-mole (lb/lb-mole).
M_s = Molecular weight of stack gas, wet basis, g/g-mole (lb/lb-mole).
$= M_d\ (1 - B_{ws}) + 18.0\ B_{ws}$

Eq. 2-5

P_{bar} = Barometric pressure at measurement site, mm Hg (in. Hg).
P_g = Stack static pressure, mm Hg (in. Hg).
P_s = Absolute stack gas pressure, mm Hg (in. Hg).
$= P_{bar} + P_g$ Eq. 2-6

Eq. 2-6

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscm/hr (dscf/hr).
t_s = Stack temperature, °C (°F).
T_s = Absolute stack temperature, °K, (°R).
$= 273 + t_s$ for metric.

Eq. 2-7

$= 460 + t_s$ for English.

Eq. 2-8

T_{std} = Standard absolute temperature, 293 °K (528° R).
v_s = Average stack gas velocity, m/sec (ft/sec).
Δ_p = Velocity head of stack gas, mm H_2O (in. H_2O).
3,600 = Conversion factor, sec/hr.
18.0 = Molecular weight of water, g/g-mole (lb/lb-mole).

5.2 Average Stack Gas Velocity.

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{T_{s(avg)}}{P_s M_s}}$$

Equation 2-9

5.3 Average Stack Gas Dry Volumetric Flow Rate.

$$Q_{sd} = 3{,}600(1 - B_{ws}) v_s A \left(\frac{T_{std}}{T_{s\ (avg)}} \right) \left(\frac{P_s}{P_{std}} \right)$$

Eq. 2-10

METHOD 3 - MOLECULAR WEIGHT AND EXCESS AIR CALCULATIONS

6.1 Nomenclature.

M_d = Dry molecular weight, g/g-mole (lb/lb-mole).
%EA = Percent excess air.
$\%CO_2$ = Percent CO_2 by volume (dry basis).
$\%O_2$ = Percent O_2 by volume (dry basis).
%CO = Percent CO by volume (dry basis).
$\%N_2$ = Percent N_2 by volume (dry basis).
0.264 = Ratio of O_2 to N_2 in air, v/v.
0.280 = Molecular weight of N_2 or CO, divided by 100.
0.320 = Molecular weight of O_2 divided by 100.
0.440 = Molecular weight of CO_2 divided by 100.

6.2 Percent Excess Air. Calculate the percent excess air (if applicable), by substituting the appropriate values of percent O_2, CO, and N_2 (obtained from Section 4.1.3 or 4.2.4) into Equation 3-1.

% EA =

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

Eq. 3-1

NOTE: The equation above assumes that ambient air is used as the source of O_2 and that the fuel does not contain appreciable amounts of N_2 (as do coke oven or blast furnace gases). For those cases when appreciable amounts of N_2 are present (coal, oil, and natural gas do not contain appreciable amounts of N_2) or when oxygen enrichment is used, alternate methods, subject to approval of the Administrator, are required.

6.3 Dry Molecular Weight. Use Equation 3-2 to calculate the dry molecular weight of the stack gas

$$M_d = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(\%N_2 + \%CO)$$

Eq. 3-2

METHOD 4 - STACK GAS MOISTURE CALCULATIONS

2.3.1 Nomenclature.

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

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_m = Absolute pressure (for this method, same as barometric pressure) at the dry gas meter, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R = Ideal gas constant, 0.06236 (mm Hg) (m³)/(g-mole) (°K) for metric units and 21.85 (in. Hg) (ft³)/(lb-mole) (°R) for English units.

T_m = Absolute temperature at meter, °K (°R).

T_{std} = Standard absolute temperature, 293° K (528°R).

V_m = Dry gas volume measured by dry gas meter, dcm (dcf).

ΔV_m = Incremental dry gas volume measured by dry gas meter at each traverse point, dcm (dcf).

$V_{m(std)}$ = Dry gas volume measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

$V_{wc(std)}$ = Volume of water vapor condensed corrected to standard conditions, scm (scf).

$V_{wsg(std)}$ = Volume of water vapor collected in silica gel corrected to standard conditions, scm (scf).

V_f = Final volume of condenser water, ml.

V_i = Initial volume, if any, of condenser water, ml.

W_f = Final weight of silica gel or silica gel plus impinger, g.

W_i = Initial weight of silica gel or silica gel plus impinger, g.

Y = Dry gas meter calibration factor.

ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).

2.3.2 Volume of Water Vapor Condensed.

$$V_{wc(std)} = \frac{(V_f - V_i)\rho_w R T_{std}}{P_{std} M_w}$$

$$= K_1 (V_f - V_i)$$

Eq. 4-1

K_1 = 0.001333 m³/ml for metric units
= 0.04707 ft³/ml for English units

2.3.3 Volume of Water Vapor Collected in Silica Gel.

$$V_{wsg(std)} = \frac{(W_f - W_i) R T_{std}}{P_{std} M_w}$$

$$= K_2 (W_f - W_i)$$

Eq. 4-2

Where:
K_2 = 0.001335 m³/g for metric units
= 0.04715 ft³/g for English units

2.3.4 Sample Gas Volume.

$$V_{m(std)} = V_m Y \frac{(P_m)(T_{std})}{(P_{std})(T_m)}$$

$$= K_3 Y \frac{V_m P_m}{T_m}$$

Eq. 4-3

Where:
K_3 = 0.3858 °K/mm Hg for metric units
= 17.64 °R/in. Hg for English units

NOTE: If the post-test leak rate (Section 2.2.6) exceeds the allowable rate, correct the value of V_m in Equation 4-3, as described in Section 6.3 of Method 5.

2.3.5 Moisture Content.

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

Eq. 4-4

NOTE: In saturated or moisture droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one using a value based upon the saturated conditions (see Section 1.2), and another based upon the results of the impinger analysis. The lower of these two values of B_{ws} shall be considered correct.

AMTEST
AIR QUALITY, INC.

DRY GAS METER CALIBRATION
AM TEST - AIR QUALITY, INC.

FILE NAME: CALMASTER\TEMPBOX
METER BOX #: TEMPBOX
CALIBRATION DATE: 9/13/94
METHOD OF CALIB.: STANDARD DRY GAS METER (Method 5 Section 7.1)

TOTAL TIME min	DELTA H "H2O	METER VOL V1 cf	METER VOL V2 cf	TEMP IN deg F	TEMP OUT deg F	BARO. PRES. "Hg	STD DGM V1	STD DGM V2	ST.DGM TEMP IN deg F	ST.DGM TEMP OUT deg F	ST.DGM Yds FACTOR	Y FACTOR	DELTA H@
16.9	1.00	44.942	53.728	75	71	29.57	816.300	825.300	71	71	0.997	1.0236	2.015
10.3	1.00	54.409	59.784	77	73	29.57	826.000	831.500	71	71	0.997	1.0248	1.998
11.2	1.00	60.370	66.235	78	74	29.57	832.100	838.100	72	72	0.997	1.0251	1.994
AVERAGE												1.024	2.002

TYPE S PITOT TUBE INSPECTION DATA FORM

Date 12-28-93 Pitot Tube # P10A

Client Louisiana-Pacific Corporation

Location Chilco, Idaho

Site(s) RTO Exhaust Stack

Test Date(s) 9/16/94

Pitot tube assembly level? ✓ yes ____ no

Pitot tube openings damaged? ____ yes (explain below) ✓ no

α_1 = 4.0 ° (<10°), α_2 = 3.0 ° (<10°), β_1 = 1.5 ° (<5°),

β_2 = 2.0 ° (<5°)

γ = 1.0 °, θ = 1.0 °, A = .870 cm (in.)

$z = A \sin \gamma$ = 0.0152 cm (in.); <0.32 cm (<1/8 in.),

$w = A \sin \theta$ = 0.0152 cm (in.); <.08 cm (<1/32 in.)

P_A .435 cm (in.) P_b .435 cm (in.)

D_t = 0.311 cm (in.)

Comments:

Calibration required? ____ yes* ✓ no

*If yes, tag and take out of service until repaired.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 8/23/94 Thermocouple Indicator: BLUE Mag Box

Ambient Temperature 71 °F Barometric Pressure 29.80 in Hg

THERMOCOUPLE # OR REFERENCE	REFERENCE THERMOMETER TEMPERATURE °F	THERMOCOUPLE TEMPERATURE °F	TEMPERATURE DIFFERENCE °F	%
T10A				
ICE BATH	33	32	1.0	0.20
	32.5	31	1.5	0.30
	33	31	2.0	0.41
BOILING WATER	206	206	0.0	0.0
	207	207	0.0	0.0
	207.5	208	0.5	0.07
BOILING OIL	379.5	379	0.5	0.06
	383	382	1.0	0.12
	388	387	1.0	0.12

$$\frac{(\text{ref temp, °F} + 460) - (\text{test therm. temp, °F} + 460)}{(\text{ref temp, °F} + 460)} \cdot 100 \leq 1.5\%$$

SECTION 1. DESCRIPTION

1.1 General

The Servomex 1400B series of gas analysers comprises two base units, the 1410B analyser using dual wavelength, single beam infrared technique and the 1420B/1421B oxygen analysers using paramagnetic technology. This manual describes the 1420B oxygen analyser.

The 1400B series may be fitted into a twin unit 19" rack mounted case, a bench top case or a single unit case for flush panel mounting.

The 1420B has voltage and current outputs, multiple ranges, oxygen level alarms, flow alarm and remote range indication.

A version of the analyser is available for oxygen purity measurements.

Included with the analyser are the following accessories:

Fuses	2531-0526
Filters	2377-3608
'D' connectors	2535-7127 (plug)
	2535-7374 (socket)
'D' connector hoods	2535-7088
Manual	01420001B
IEC Power connector	2533-1437

A 3 1/2 digit green LED indicates the oxygen content to 0.1% resolution.

WARNING

This analyser is not suitable for use in hazardous areas or for measuring flammable sample gases.

1.2 Principles of Operation

The 1420B oxygen analyser measures the paramagnetic susceptibility of the sample gas by means of a magneto-dynamic type measuring cell.

Oxygen is virtually unique in being a paramagnetic gas, this means that it is attracted into a magnetic field. In the Servomex measuring cell the oxygen concentration is detected by means of a dumb-bell mounted on a torque suspension in a strong, non-linear magnetic field. The higher the concentration of oxygen the greater this dumb-bell is deflected from its rest position. This deflection is detected by an optical system and twin photo-cells connected to an amplifier. Around the dumb-bell is a coil of wire. A current is passed through this coil to return the dumb-bell to its original position. The current is measured and is proportional to the oxygen concentration.

1.3 Sampling System

The sampling system of the analyser includes a combination filter/automatic flow control device, designed to keep a constant flow of sample gas through the measuring cell for varying input pressures and to prevent the entrance of particulate matter into the measuring cell. Excess flow is vented to the by-pass.

An optional back pressure regulator is available for high oxygen concentrations to reduce the errors which would occur due to changes in barometric pressure.

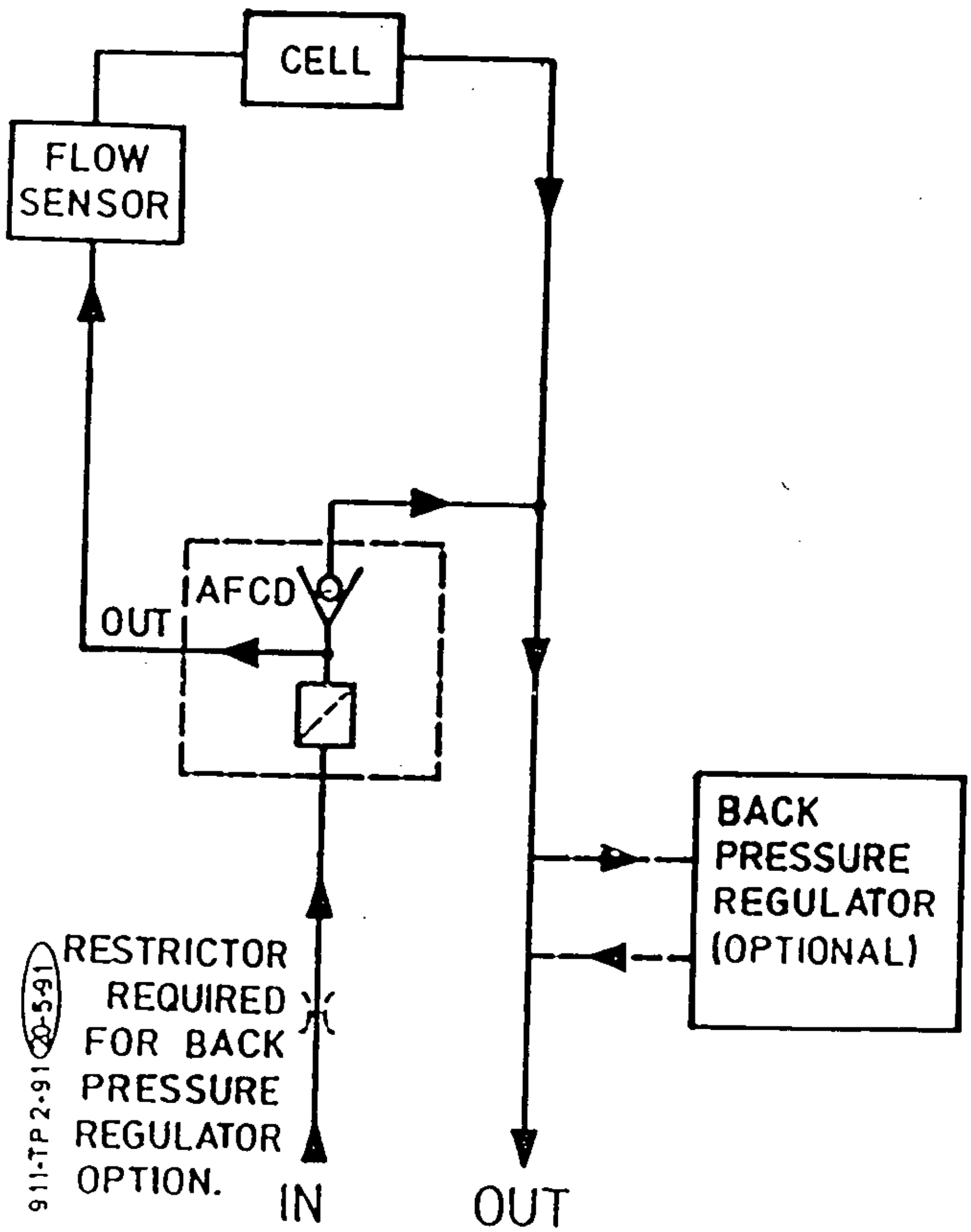


Figure 1.1 Schematic of Sampling System

1.4 Use With Toxic or Flammable Gases

1.4.1 Toxic Gases

If the analyser is used with sample gases which may be toxic, asphyxiant or otherwise harmful to health then adequate precautions should be taken to ensure safe installation and operation.

These precautions could, for example, include ensuring good quality sample piping to reduce the possibility of leaks, regular leak checking of the analyser and sample piping, minimum sample pressure, adequate ventilation of enclosed spaces and the possibility of monitoring for toxic levels.

The analyser vent should be piped to a well ventilated area.

1.4.2 Flammable Gases

WARNING

This analyser is not suitable for use in hazardous areas or for measuring flammable sample gases.

Consult Servomex for details of analysers which may be more suitable for measuring sample gases which can be toxic or flammable.

1.5 Specification

Performance Specification (typical)

Repeatability:	Better than ±0.1% O_2 under constant conditions (measured at the IV electrical output).
Temperature coefficient:	±0.005% O_2 ±0.04% of reading(on display) per °C change from calibration temperature.
Response Time:	Less than 15 seconds to 90%. At point when flow alarm is triggered the response time will be approximately 50 seconds

<u>Outputs</u>

Display:	3 1/2 digit LED reading 0.0 to 100.0% oxygen with overrange capability.
Output:	4-20mA (isolated), maximum load 600 ohms. Isolation 110V ac. 0-1V (unisolated), minimum load 1000 ohms for range selected.

<u>Alarm outputs:</u>

Oxygen level:	2 oxygen level alarms, SPCO relay contacts rated at 1A/110V AC or 1A/28V DC, non-inductive. Can be configured to high or low. Independent of range.
Flow fail:	SPCO relay contacts rated at 1A/110V AC or 1A 28V DC, non-inductive.
Local alarm:	Red LED lamps flash when alarm active.

<u>Sample requirements</u>

Condition:	Clean, dry gas with dew point 5°C below ambient temperature.
Inlet pressure: (Standard)	3.5 to 70kPa (0.5 to 10psig). Inlet pressure changes within this range will change the reading by less than 0.1% O_2.
(With back-pressure regulator)	17kPa to 35kPa (2.5 to 5 psig). Pressure values will be increased by 1 psig for every 2000ft(10Pa per 1000m) altitude above sea level.
Flowrate:	1 to 6 litres/minute approximately depending on sample pressure. Version with back pressure regulator: 1 - 2 litres/min
Filtering:	0.6 micron replaceable filter integral to the automatic flow control device.
Materials exposed to the sample:	Stainless steel, Pyrex glass, brass, platinum, epoxy resin, Viton, nylon, neoprene, polypropylene and glass fibre filter.
Gas connection:	6.4mm (1/4") OD tube.

<u>Physical Characteristics</u>

Case:	Steel and aluminium finished in epoxy powder paint.
Case classification:	IP 20 (IEC 529) when fitted into the Servomex 1400 series 19 inch case.

Dimensions	See Figure 2 1
Weight:	5Kg (11lb) approximately

Electrical

AC Supply:	88 to 264V, 47 to 440Hz.
Power required:	50VA.

Environmental Limits

Operating ambient temperature:	0 to +45°C (32 to 113°F) 0 to 40°C (32 to 104°F), when fitted in bench top case.
Storage temperature range:	-20 to +70°C (-4 to 158°F)
Relative humidity:	0-85%, non-condensing.
Sunlight:	Protect from direct sunlight which may cause the interior of the analyser to overheat.
Vibration:	Protect the analyser from excessive vibration.
EMC:	Complies with EN 50022(1987) CLASS A for conducted interference and radiated electric field.

1.6 Product Identification

A label is fitted to the rear panel giving the model and serial numbers. It is of the form 1420/B701/NNNN where NNNN is the serial number

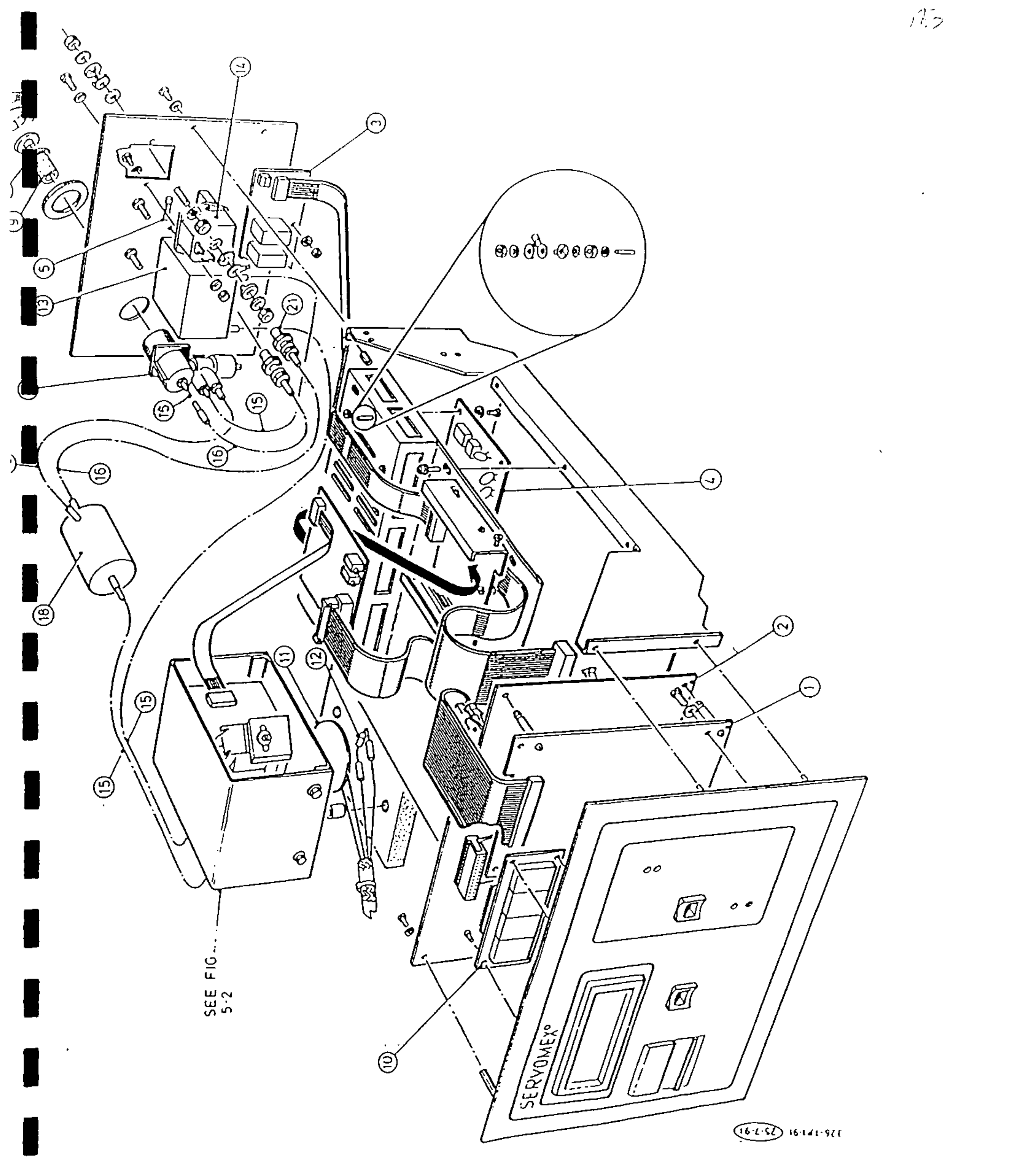


Figure 5.1 Exploded View 1420B Oxygen Analyser

Servomex

1410B
Infrared Analyser
Instruction Manual

Ref : 01410/001B/0
Order as part No. 01410001B

BSI REGISTERED FIRM
NATIONAL ACCREDITATION OF CERTIFICATION BODIES

Certificate No.________Q5166
ISO 9001 (1987)
EN 29001 (1987)

CUSTOMISED CIRCUIT VARIABLES

The 1400 display pcb (01410902/0) on this instrument is fitted with ~~standard~~/special resistor values and switch settings, as follows :-

Resistors		Special Switch 1 Settings	
R8	~~8K0/~~	1/1	ON
R9	9K0	1/2	ON
R10	~~1K0/~~	1/3	OFF
R11	500R	1/4	ON
R12	500R	1/5	ON
R13	500R	1/6	ON
R14	500R	1/7	ON
R15	500R	1/8	ON

Standard Switch 1 settings are listed on Page 18 of the manual.

Section 1. Description and Specification.

1.1 General

This manual describes the Servomex 1410 infra-red gas analyser.

The 1410 is supplied for packaging into a 19 inch rack , 4U high, case. A suitable case is available from Servomex, part number 00022905.

If the 1410 is not fitted into a suitable protective case by Servomex (eg. when the 1410 is supplied as an OEM chassis) it is then the responsibility of the user to ensure that suitable precautions are taken so that the level of protection is adequate for the intended environment.

A 3 1/2 digit LED display indicates the gas concentration

The analyser has built-in alarms for flow failure, instrument fault and high concentration level. These alarms have indicating LED's on the front panel. An alarm relay is fitted inside the unit and can be selected by the user to operate on any one of these alarm conditions.

A switch on the analyser's front panel selects the measurement range. Pins on the rear of the analyser allow connection of a remote range change switch which, if connected, overrides the front panel switch.

> **WARNING**
>
> This analyser is not suitable for use in hazardous areas or for measuring hazardous gas mixtures

1.2 Specification

Principle:	Infra-red. Single beam dual wavelength.
Accuracy:	Subject to available standards or gas mixtures. Typically better than +/- 2% FSD.
Linearity:	Better than +/- 1% FSD.
Repeatability:	Better than +/- 1% FSD
Zero drift:	Less than 2% FSD per week
Effect of sample cell contamination:	Less than 1% FSD for 50% cell window obscuration, due to broad band contamination.
Temperature coefficient:	Zero - less than 0.2% FSD per deg C Span - less than 0.4% of reading per deg C

Sample pressure coefficient:	Less than 0.15% of reading per mbar
Response time:	Typically 30 seconds to 90%.
Electrical output:	0 to 1V, isolated, min load 1K and 4 to 20mA, isolated, max load impedance 500R. Note that the current and voltage outputs are not isolated from each other.
Operating ambient temperature:	0 to 40 deg C (32 to 104 deg F).
Relative humidity:	5 to 85% non-condensing.
Storage temperature:	-20 to +70 deg C (-4 to 158 deg F).
Storage relative humidity:	80% RH maximum.
AC supply;	120 or 240V AC, +/-10%, 45/65Hz. Max load 30VA.

Alarms

Instrument/level/ flow alarm:	This alarm can be configured to operate in different ways:- 1. As a concentration alarm only 2. As an instrument fault alarm only 3. As a flow alarm 4 sets of changeover relay contacts rated at 3A/120V, 1A/240V AC or 1A/28V DC. Relay de-energises on alarm or power failure. See section 2.3.1 for details of how to configure these alarms.
Additional Gas Concentration Alarm:	Change over relay contacts rated at 1A/28V AC or DC . Relay de-energises on high concentration or power fail.

Sample Requirements

Pressure:	0.9 to 1.1 bar absolute.
Flowrate:	Typically 100ml/min to 1 litre/min.
Materials in contact with the sample:	Stainless steel, Viton, sapphire/CaF2, UPVC, as standard.
Gas connection:	6.4mm (1/4in) OD tube, suitable for push-on tubing or 1/4 inch compression fittings.

Section 4. Principles Of Operation And Product Description

4.1 Description Of The 1410

The 1410 analyser comprises two major assemblies:-

1. 12X1 infrared bench (see appendices A-D)
2. Front panel assembly (see figure 4.1)

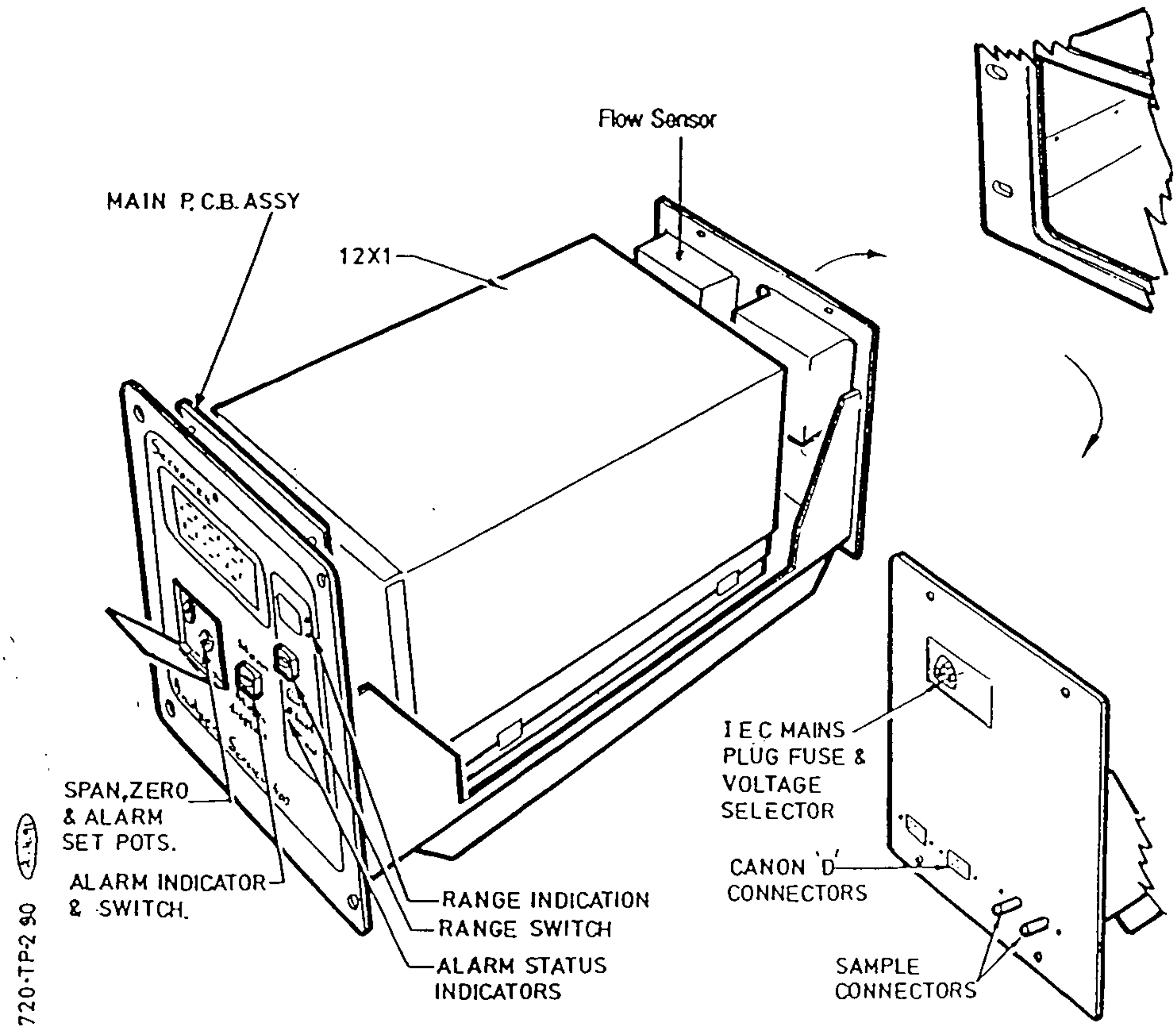


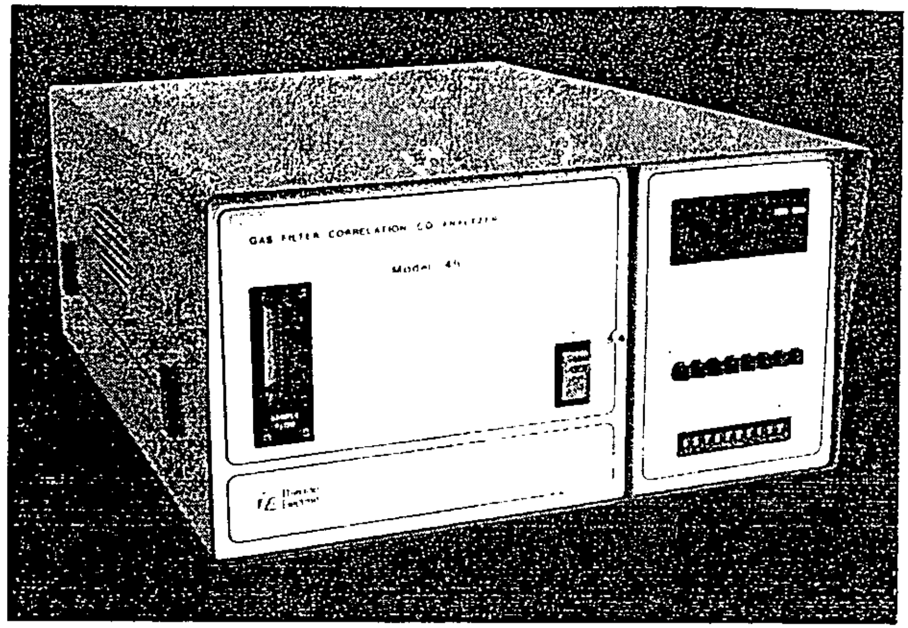
Figure 4.1 General Construction

TE Thermo Environmental Instruments Inc

Gas Filter Correlation CO Analyzer

Model 48

For Continuous Ambient Air Monitoring



Thermo Electron's Microprocessor Based Model 48 Ambient CO Analyzer provides unequaled ease of operation, reliability, precision and specificity. The unique Gas Filter Correlation principle of operation offers the significant advantages of unequaled specificity and sensitivity and increased resistance to shock and vibration.

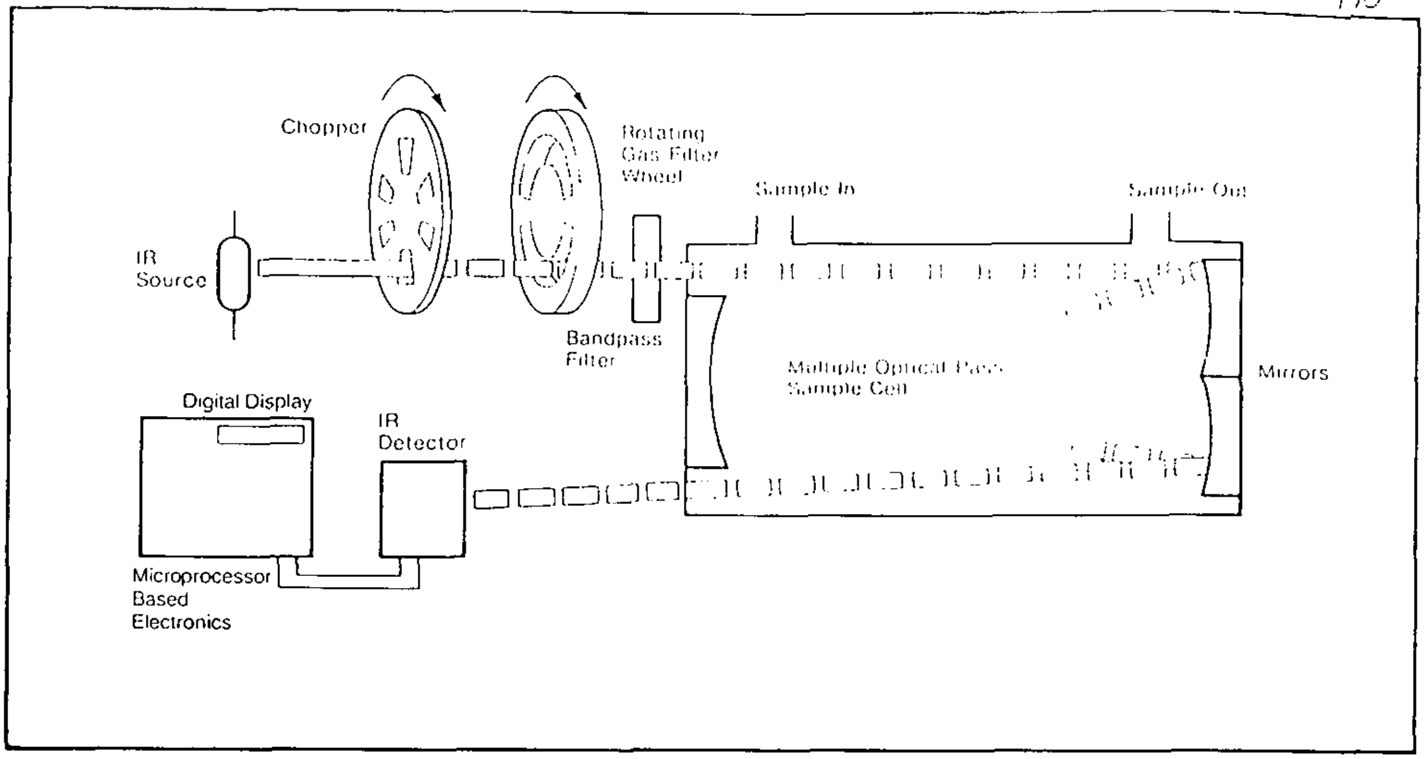
Key Features

- Microprocessor Based
- Automatic pressure and temperature correction
- Dual fully independent outputs standard
- Hourly average output standard
- Lower ranges, wide dynamic range (suitable for both ambient and source)
- Highly specific to CO
- Long term zero and span stability
- Vibration and shock resistant
- Powerful diagnostics made possible by microprocessor
- Linear through all ranges
- Unaffected by changes in flow
- Self-aligning optics
- U.S.A.—EPA reference method RFCA-0981-054, range 0-50ppm time constant — 30 seconds

Model 48 Specifications

Ranges	0-1, 0-2, 0-5, 0-10, 0-20, 0-50*, 0-100, 0-200, 0-500, 0-1000ppm
Zero Noise	0.05 ppm RMS — With time constant = 30 seconds
Minimum Detectable Limit	0.10 ppm
Zero Drift, 24 Hours	± 0.2 ppm
Span Drift, 24 hours	± 1% Full Scale
Rise/Fall Times (0-95%) (at 1 lpm flow, 30 second integration time)	1 minute
Precision	± 0.1 ppm
Linearity	± 1%
Flow Rate	1 lpm standard
Rejection Ratio	Negligible interference from water and CO
Operating Temperature	Performance specifications maintained over the range 15-35 °C (may be operated safely over the range 5-45 °C)
Power Requirements	100 Watts, 105-125 VAC, 60Hz, 220-240VAC, 50Hz
Physical Dimensions	17" wide × 8¾" high × 23" deep
Weight	45 lbs
Dual Outputs (standard)	Selectable to 0-10mV, 0-100mV, 0-1V, 0-5V, 0-10V, digital display, 1 hour integrated value. Other outputs available upon request (4-20ma, IEEE488)

* See Federal Register ... February 18, 1975 ... [illegible]



Principle of Operation

The basic components of a Gas Correlation System are illustrated in the above diagram. Radiation from an infrared source is chopped and then passed through a gas filter which alternates between CO and N_2 due to Rotation of the filter wheel. The radiation then passes through a narrow bandpass filter and a multiple optical pass sample cell where absorption by the sample gas occurs. The IR radiation exits the sample cell and falls on a solid state IR detector.

The CO gas filter acts to produce a reference beam which cannot be further affected by CO in the sample chamber. The N_2 side of the filter wheel is transparent to IR radiation and therefore produces a measure beam which *can* be absorbed by CO. The chopped detector signal is modulated by the alternation between the two gas filters with an amplitude proportional to the concentration of CO in the sample chamber. Other gases do not cause modulation of the detector signal since they absorb the reference and measure beams equally. Thus, the Gas Filter Correlation System responds solely to CO.

Options

48-001 — Particulate Filter

48-002 — Rack Mounts

48-003 — Remote activation of zero and span solenoids.

TE Thermo Environmental Instruments Inc.

8 West Forge Parkway
Franklin, MA 02038

(508) 520-0430
Telex: 200205 THEMO UR

FAX: (508) 520-1460

A11

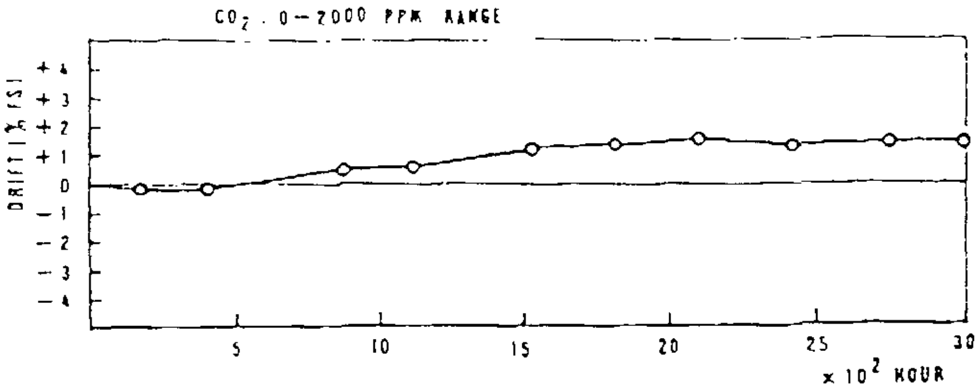
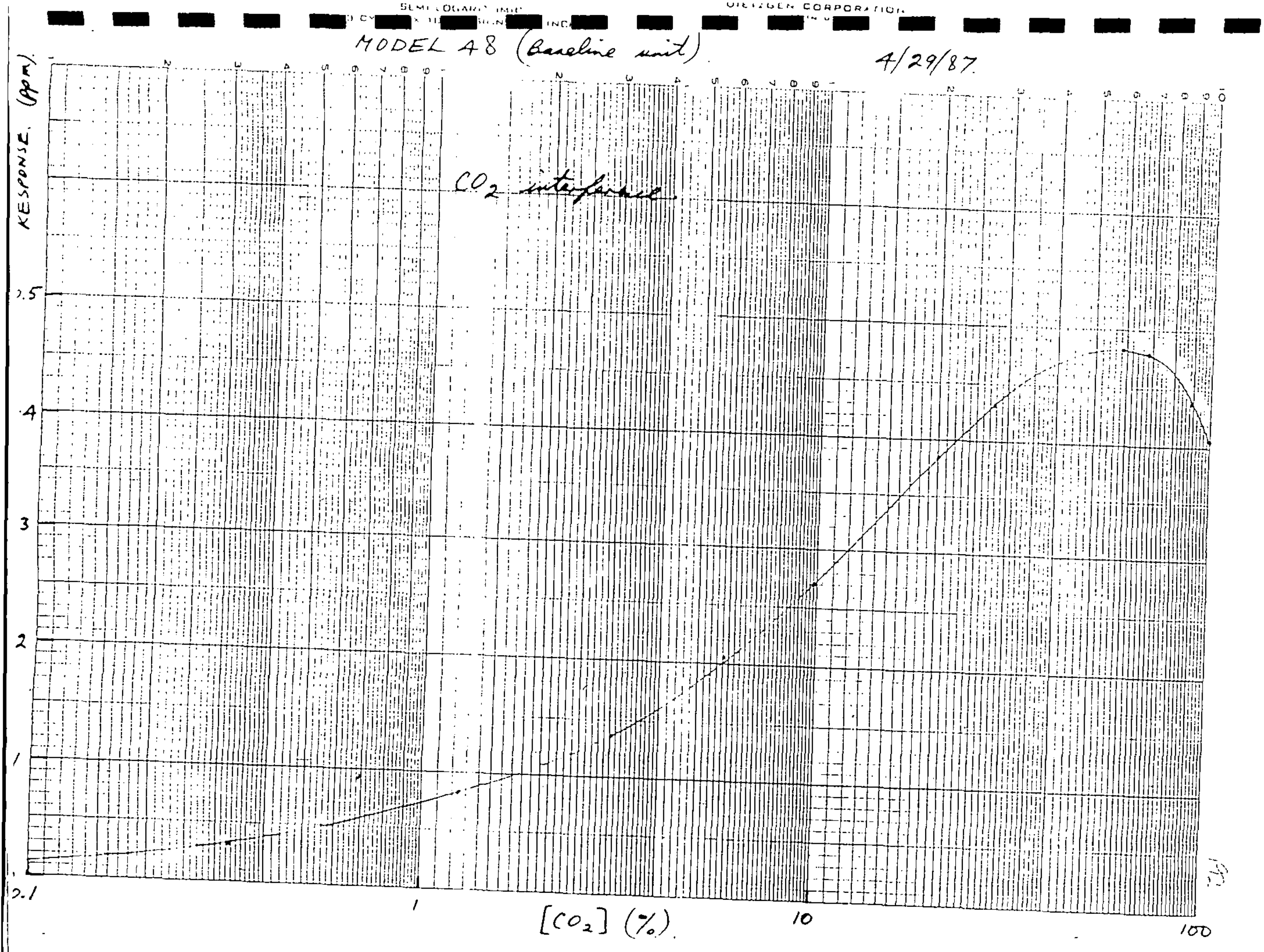


FIGURE 9 ZERO DRIFT

INTERFERENT COMP. / RANGE	CO 1000 PPM	CO_2 20%	SO_2 1000 PPM	H_2O 25°C SAT.
CO : 0 — 1000 PPM	———	0.02 %FS	≃ 0	— 0.5 %FS
CO_2 : 0 — 400 PPM	0.12 %FS	———	≃ 0	— 0.5 %FS

TABLE 1 . INTERFERENCE



MODEL A8 (Baseline unit)
4/29/87
CO2 interference
RESPONSE (ppm)
.5
.4
.3
.2
.1
0.1
1
10
100
[CO2] (%)

630214

AIRCO Special Gases

An operating unit of The BOC Group, Inc

Union Landing & River Roads
P.O. Drawer No. 272
Riverton
New Jersey 08077
Telephone: Marketing; 609-829-7878
Prod. & Admin.; 609-829-7914
International; 609-829-7917

ANALYTICAL REPORT

To: General Welding Supply
3623 E. Marginal Way So.
Seattle, WA 98134

Date Reported: 06-15-94
Test Number: 44979
Fill Date: 06-09-94

Material Submitted: 300ppm CO,6%CO2,15%O2/N2

Specification Number: N/A

Method of Analysis: Non-Dispersive Infrared Analyzer, Percent Oxygen Analyzer

Result of Investigation: Cylinder No. CC-12024

Component	Specification	Concentration
*Carbon Monoxide	300 ppm	303 ppm
**Carbon Dioxide	6%	5.99%
**Oxygen	15%	15.05%
Nitrogen	Balance	Balance

Primary Standard Analytical Accuracy * +/- 2.0% Relative
** +/- 0.02% Absolute

By ______________________________
Authorized Signature

AIRCO

Airco Special Gases
2009 Bellaire Avenue
Royal Oak
Michigan 48067

Telephone: 313-399-8020
Fax: 313-399-2912

CERTIFICATE OF ANALYSIS - EPA PROTOCOL GAS MIXTURE

CUSTOMER: General Welding Supply

CYLINDER #: CC16544 CERTIFICATION DATE: 7-9-93
CYLINDER PRESSURE: 1650psig EXPIRATION DATE: 7-9-96
LABORATORY: Royal Oak, MI REFERENCE: 566402

MIXTURE COMPONENT	NOMINAL CONCENTRATION	NIST SRM NO.	NIST SRM SERIAL#	NIST SRM CONC.
CO	30ppm	1678c	CAL6694	45.2ppm

BALANCE GAS: Nitrogen

GAS ANALYZER:
MAKE: Beckman MODEL: 867 SERIAL#: 0100300
PRINCIPLE: Non-dispersive infrared
LAST MULTIPOINT CALIBRATION DATE: 6-14-93

R=REFERENCE STANDARD Z=ZERO GAS S=SAMPLE GAS

1ST ANALYSIS: DATE 7-2-93 ANALYST MK

1) Z -00.1	R 95.2	S 63.8	CONC (1) 30.3ppm
2) R 95.1	Z -00.1	S 64.0	CONC (2) 30.4ppm
3) R 95.3	S 63.8	Z 00.0	CONC (3) 30.3ppm

AVE CONC 30.3ppm CO

2ND ANALYSIS: DATE 7-9-93 ANALYST MK

1) Z 00.0	R 97.2	S 65.3	CONC (1) 30.4ppm
2) R 97.2	Z 00.1	S 65.3	CONC (2) 30.4ppm
3) R 97.3	S 65.4	Z 00.1	CONC (3) 30.4ppm

AVE CONC 30.4ppm CO

THIS CALIBRATION STANDARD HAS BEEN CERTIFIED VERSUS EPA TRACE-ABILITY PROTOCOL NO. 1, PROCEDURE G1, AND ANALYSES PERFORMED PER SECTION 3.0.4.

CERTIFIED CONCENTRATION: 30.3ppm carbon monoxide in nitrogen

APPROVED BY Michael E. Kelley
LABORATORY MANAGER

AIRCO Special Gases
An operating unit of The BOC Group Inc

Union Landing & River Roads
P.O. Drawer No. 272
Riverton
New Jersey 08077
Telephone: Marketing: 609-829-7878
Prod. & Admin.: 609-829-7914
International: 609-829-7917

531921

ANALYTICAL REPORT

To: Kris A. Hansen Co.
Div. A.M. Test Air Quality
30545 S.E. 84th St.
Preston, WA 98050

Date Reported: 01-07-93
Test Number: 25467
Fill Date: 01-06-93

Material Submitted: 60ppm Carbon Monoxide/, Nitrogen

Specification Number: N/A

Method of Analysis: Non-Dispersive Infrared Analyzer

Result of Investigation: Cylinder No. CC-72592

Component	Specification	Concentration
Carbon Monoxide	60 ppm	58.4 ppm
Nitrogen	Balance	Balance

NIST TRACEABLE TO SRM #1678C

By ______________
Authorized Signature

AMTEST
AIR QUALITY, INC

RESUME OF
KRIS A. HANSEN

PRESIDENT
AM TEST-AIR QUALITY, INC.
AM TEST ALASKA

EDUCATION

- B.S., Chemistry, Central Washington University, 1973
- Coursework and 2.5 years research completed towards M.S., Chemistry, Central Washington University
- Several workshops, courses and conferences annually, including a Continuous Emission Monitoring System (CEMS) Workshop, taught by Dr. James Jahnke in October 1992, an Advanced Emission Measurement Workshop in July 1993, a Title III MACT Workshop in 1994, a Title V Operating Permits Workshop in 1994 and Enhanced Monitoring Workshops in 1993 and 1994.

PROFESSIONAL MEMBERSHIPS

- Air and Waste Management Association (AWMA)
- Pacific Northwest International Section of AWMA (PNWIS)
- Source Evaluation Society (SES)

PROFESSIONAL EXPERIENCE

Am Test-Air Quality, Inc. was formed under the direction of Mr. Hansen in 1982. This company conducts full-service source testing activities. Mr. Hansen keeps current on recent developments in EPA methodology and has developed sampling and analysis techniques for many sources for which EPA guidelines are not available. He has worked at numerous types of industrial facilities, including oil and gas refineries, gas, oil and coal-fired power plants, nuclear plants, aluminum plants, wood products industries, smelters, incinerators, and other industrial sources throughout the United States and internationally. Mr. Hansen manages an experienced field testing and laboratory analysis staff. Mr. Hansen manages all phases of project development, including cost estimation, scheduling, sample collection, analysis and report preparation. He also manages all other aspects of the business, including business development and personnel issues.

Prior to joining Am Test, Inc., Mr. Hansen's professional experience included 4.5 years as the Manager of Laboratory services and a Project Leader for an environmental consulting firm which specialized in air quality studies, and 2 years as a laboratory instructor while attending graduate school at Central Washington University, where his research emphasis was in gas chemistry. Mr. Hansen has 18 years of professional experience.

Mr. Hansen has assisted in the instruction of the EPA 450 "Source Sampling for Particulate Pollutants" and the EPA 468 "Source Sampling and Analysis of Gaseous Pollutants" courses offered yearly by the EPA in cooperation with the University of Washington. Students are represented by industry and governmental agency personnel from across the U.S. and other nations. Mr. Hansen was the recipient of the 1987 PNWIS/APCA "Hardhat Award" which was presented in recognition of his contributions to the advancement of source sampling technology in the Pacific Northwest.

AMTEST
AIR QUALITY, INC

RESUME OF
ANGELA F. BLAISDELL

VICE PRESIDENT/SR. TECHNICAL WRITER

EDUCATION

- B.S., Marine Resources, Western Washington University, Bellingham, Washington, 1980
- Minors in Chemistry and Biology
- Several workshops, courses and conferences annually, including a Continuous Emission Monitoring System (CEMS) Workshop, taught by Dr. James Jahnke in October 1992 and April 1993, a Title V Operating Permits Workshop in May 1993, an Advanced Emission Measurement Workshop in July 1993, a Title III MACT Workshop in 1994 and Enhanced Monitoring Workshops in 1993 and 1994.

PROFESSIONAL MEMBERSHIPS

- Air and Waste Management Association (A&WMA)
- Pacific Northwest International Section of A&WMA (PNWIS)
- Source Evaluation Society (SES)

PROFESSIONAL EXPERIENCE

Ms. Blaisdell has worked with Am Test-Air Quality, Inc. for the past 10 years and has had 14 years of professional experience in the field of air quality. She helps manage all aspects of source test projects, including initial client contact, scope of work preparation, scheduling, pre-test coordination, implementation of quality assurance programs for field sampling, analysis, data reduction, final data review and report preparation and review. She reviews current literature for each test method and incorporates the methodology into our testing and reporting protocol. Ms. Blaisdell recently assisted in the instruction of the EPA-APTI 464L "Continuous Emission Monitoring" course, the EPA 450 "Source Sampling for Particulate Pollutants" course and the EPA 502 Course "Hazardous Waste Incineration" offered by the EPA's Air Pollution Training Institute in cooperation with the University of Washington. She was the General Chair of the 1994 PNWIS Spring Specialty Conference on Enhanced Monitoring, and was a speaker at the 1990 and 1991 PNWIS annual meetings on the subject of continuous emission monitoring systems (CEMS). Angela is the current Treasurer and past secretary/treasurer for the Pacific Northwest International Section (PNWIS) of the Air and Waste Management Association (A&WMA) and is the past Chair for the Puget Sound Chapter of PNWIS. Ms. Blaisdell was the recipient of the 1991 PNWIS/A&WMA "Labcoat Award" which is presented each year to an individual to recognize his contribution to the advancement of source sampling methodology in the Pacific Northwest.

Prior to joining Am Test, Ms. Blaisdell acted as a Project Leader and Office Manager for an environmental engineering consulting firm in the Seattle area for 2 years. Experience with that firm involved sample collection, analysis and report preparation for source and ambient air, water and industrial hygiene studies. Ms. Blaisdell also worked on various research projects in the Chemistry department while attending Western Washington University.

RESUME OF
DOUGLAS M. ALBERTSON

SENIOR AIR QUALITY SPECIALIST

EDUCATION

- B.A., Bioscience, California State University at Stanislaus, 1971
- Professional training courses and specialty conferences

PROFESSIONAL MEMBERSHIPS

- Air and Waste Management Association (AWMA)
- Pacific Northwest International Section of AWMA (PNWIS)

PROFESSIONAL EXPERIENCE

Mr. Albertson has worked with Am Test-Air Quality Inc. for the past year. He has over 20 years experience in environmental research, including process modification, equipment design, permitting, analytical testing, and plant start-up. Mr. Albertson manages Am Test-Air Quality's Coeur d'Alene, Idaho office. He has had extensive experience in all aspects of source testing, project management and technical review of emission reports.

From 1972 to 1982, Mr. Albertson was the co-founder of Chemecology Corporation, an analytical laboratory which specialized in all facets of environmental testing. He was responsible for the identification and solution of environmental problems on combustion sources fired with coal, crude oil, natural gas and a wide variety of biomass. Mr. Albertson organized research projects and managed data collection teams throughout the United States, Europe and Japan.

From 1983 to 1993, Mr. Albertson was employed by Energy Products, Inc. of Coeur d'Alene, Idaho, as an Environmental and Special Projects Manager. His responsibilities included development of equipment and procedures to analyze and minimize emissions from full scale combustors and gasifiers fired with conventional and experimental fuels. In this position, Mr. Albertson derived full scale operating conditions and process flow for full scale facilities based on mass/energy balance from pilot research, developed emissions factors and projections to be used for environmental permit operations, and provided technical support for marketing, sales and engineering staff. He designed, built and operated a continuous emission monitoring system (CEMS) for monitoring process emissions. Mr. Albertson authored over 30 research reports in fluid bed combustion and gasification. In the 10 years Mr. Albertson was employed at EPI, several of his reports were published in national publications. A sample of Mr. Albertson's technical papers follows:

"Emissions From Fluid Bed Combustion of High Ash Cotton Stalks", IGT Conference, New Orleans, Louisiana, February 1988.

"Design Characteristics of a 12 MW AFB Power Station Firing Agricultural Wastes", American Society of Mechanical Engineers, San Francisco, California, April 1989.

"Modifications to Fluid Bed Boiler Design Based on NO_x Reduction Experience", American Society of Mechanical Engineers, Dallas, Texas, October 1989

AMTEST
AIR QUALITY, INC

RESUME OF DAVID A. NEWMAN

PROJECT ENGINEER

EDUCATION

- B.S., Environmental Health, Department of Public Health and Community Medicine, University of Washington, Seattle, Washington, 1976
- M.S., Environmental Engineering and Science Division, Dept. of Civil Engineering, University of Washington, 1980
- Certified Industrial Hygienist (CIH)
- Professional training courses and specialty conferences

PROFESSIONAL MEMBERSHIPS

- Air and Waste Management Association
- American Industrial Hygiene Association (national and local)
- American Conference of Governmental Industrial Hygienists

PROFESSIONAL EXPERIENCE

Mr. Newman is a consulting Project Engineer for Am Test-Air Quality, Inc. and performs field sampling on a project basis as required. He has 19 years of professional experience in source testing and industrial hygiene. He is a Certified Industrial Hygienist (CIH) and the owner of his own IH consulting firm in Seattle. Mr. Newman was an engineering staff member of a multi-county air pollution control agency where his duties included review and analysis of air pollution control equipment in regard to federal, state and local requirements, inspection and source testing of local industries for compliance with air pollution regulations. He is also experienced with EIS review, air pollution dispersion modeling and emissions inventories.

Prior to his regulatory position, Mr. Newman acted as a Project Manager/Leader for 3 years with a consulting engineering firm specializing in air pollution and industrial hygiene. He coordinated and supervised projects involving field sample collection, laboratory analysis, data reduction and report preparation. He is experienced with EPA reference Methods 1-26, particle sizing using cascade impactors, NIOSH sampling procedures and OSHA requirements.

Mr. Newman participates as an instructor of continuing education courses, including various Occupational Health and Safety courses offered through the University of Washington. Mr. Newman has also completed a variety of EPA Air Pollution Training Institute courses which compliment his background and expertise. He also assists in the instruction of EPA 450 and 468 Source Sampling Short Courses for particulate and gaseous pollutants which are offered each year by the EPA in cooperation with the University of Washington.

AMTEST
AIR QUALITY, INC

RESUME OF
AMY M. BROTHERTON

TECHNICAL WRITER

EDUCATION

- B.A., English, University of California, Santa Barbara, California, 1991

PROFESSIONAL EXPERIENCE

Ms. Brotherton began her employment with Am Test-Air Quality, Inc. in April 1992. She performs technical writing of reports and word processing of proposals, test plans, and reports for the Senior Technical Writers to review. She performs data processing of field and laboratory analysis data using computerized data reduction programs, and performs by-hand calculations to verify computer program integrity. She also develops new computerized data reduction programs for field and laboratory analysis data and reviews other staff members data for accuracy.

Prior to her employment at Am Test, Ms. Brotherton worked for a medical claims processing company as an assistant to the medical-legal staff. In this position, she determined payment for worker's compensation claims, performed quality assurance review, and provided medical-legal training to company officers.

AMTEST
AIR QUALITY, INC

RESUME OF
CASSIE B. HEATON

PROJECT ENGINEER/CHEMIST

EDUCATION

- B.A. in Chemistry, BSc in Chemical Engineering
  University of Colorado, Boulder, Colorado, 1990
- Engineer-in-Training; State of Colorado
- EPA 450 "Source Sampling for Particulate Pollutants Course", August 1992.

PROFESSIONAL EXPERIENCE

Ms. Heaton began her employment with Am Test-Air Quality, Inc. in January 1992. She performs technical writing of reports and word processing of proposals, test plans, and reports for the Senior Technical Writers to review. She performs data processing of field and laboratory analysis data using computerized data reduction programs, and performs by-hand calculations to verify computer program integrity. She also develops new computerized data reduction programs for field and laboratory analysis data and reviews other staff members data for accuracy.

Ms. Heaton is also experienced preparing and packing sampling equipment for mobilization to the test sites, and in assisting the Project Leaders to collect samples. She has assisted in handling and setting up the equipment at each sample site, running the control box and recording data, sample recovery, in-field analysis, data reduction, and demobilization.

In the laboratory, Ms. Heaton is experienced with gravimetric analysis of particulate matter samples and particle size distribution samples, wet chemical titrametric analysis and glassware preparation for organics and metals testing. She assists in preparation and analysis of samples for quantifying sulfur oxides, nitrogen oxides, hydrogen sulfide, toxic metals (including hexavalent chromium), semi-volatile compounds (including dioxins and furans), and volatile organic compounds.

AMTEST AIR QUALITY, INC.

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Preston, WA 98050
Office: (206) 222-7746
FAX (206) 222-7849

AM TEST-AIR QUALITY, INC.
CAPABILITIES

Am Test-Air Quality, Inc. is an independent company providing comprehensive air pollution testing services to industry and government. Am Test, Inc.'s Air Quality Division was developed in 1982 by Mr. Kris A. Hansen. On January 1, 1991, the Air Quality Division incorporated as a separate company named Am Test-Air Quality, Inc. Am Test-Air Quality's main office and laboratory facility is located in Preston, Washington. The Preston office employs a staff of 20 qualified, experienced engineers, chemists and scientists. In January 1993, Am Test-Air Quality, Inc. opened a branch office, Am Test Alaska in Anchorage, Alaska in order to better serve our many Alaskan clients. One aspect of the testing services provided by Am Test-Air Quality, Inc., which we feel is unsurpassed by other testing firms, is the quality and experience of our personnel. We utilize highly experienced, motivated personnel on all projects. We believe that the success of a project is dependent on the use of state-of-the-art equipment and experienced, knowledgeable personnel. We have performed source testing projects of all different sizes and difficulty levels. Typically, we dispatch test teams of one to ten individuals. On all projects, our attention to detail remains extremely high.

Am Test-Air Quality, Inc. performs source testing projects at all types of facilities throughout the United States and Canada. Some of the types of facilities tested include:

- Oil and Gas Refineries
- Pulp and Paper Mills
- Gas, Oil, Wood, Coal and Nuclear-Fired Power Plants
- Chemical Plants
- Aluminum Reduction Facilities
- Wood Products Industries
- Smelters
- Cement Kilns
- Hazardous Waste Incinerators
- Municipal and Medical Waste Combustors
- Landfill Gas Flares
- Wastewater and Sewage Treatment Facilities
- Coating and Finishing Facilities
- Manufacturers
- Superfund Clean-Up Sites
- Asphalt Plants

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Examples of the types of projects Am Test-Air Quality, Inc. becomes involved in include:

- Regulatory compliance with NSPS, MACT, BIF requirements
- Continuous emission monitoring system (CEMS) certifications
- Enhanced monitor certifications (CEMS, CRMS, CPMS)
- Emission inventories for MACT, NESHAP, SARA Title III and SIP determinations
- Air pollution control equipment warranty/guarantee/design testing
- Combustion or control device optimization
- Air toxics studies for hazardous air pollutants (HAPs)
- Particle size distribution studies (PM_{10})
- Soil remediation unit evaluations
- Vapor recovery system efficiency evaluations
- Destruction/capture efficiency studies
- Ammonia slip evaluations
- Pilot plant or engineering-scale trial burns
- Hands-on stack sampling training workshops
- Industry-agency liaison

AMTEST AIR QUALITY, INC

MANUAL EMISSIONS TESTING SERVICES

Am Test-Air Quality, Inc. performs all recognized EPA source test methods for many types of industries. We also perform NIOSH methods, BIF Regulation methods, SW-846 methods, toxic organic (TO) methods and are experienced at developing test methods for specialized applications where published methods do not exist. Am Test personnel keep current on new method development by attending training courses and utilizing the EMTIC bulletin board system (BBS). A partial list of pollutants measured using manual test methods follows:

- Particulate Matter
- Particle Size Distribution
- Sulfur Oxides
- Nitrogen Oxides
- Opacity Measurement
- Carbon Monoxide and Fixed Gases
- Hydrogen Sulfide
- Multi-Metals
  - Hexavalent Chromium
  - ICP Metals
  - Low-Level Mercury
- Particulate and Gaseous Fluoride
- Total Reduced Sulfur Compounds
- Volatile Organic Compounds
  - 8240 list of VOCs
  - Alcohols and Acetates
  - BTEX
  - Formaldehyde/Aldehydes
- Semi-Volatile Organic Compounds
  - Dioxin and Furan Isomers
  - PAHs
  - BNAs
  - PCBs
  - Pesticides and Herbicides
- Acid Gases
  - Hydrochloric Acid
  - Hydrofluoric Acid
  - Nitric Acid
  - Sulfuric Acid
- Chlorine, Chlorine Dioxide and Chloroform
- Ammonia and Urea
- Radionucleides
- Hazardous Air Pollutants (HAPs)

AMTEST
AIR QUALITY, INC

CONTINUOUS EMISSION MONITORING SYSTEMS AND INSTRUMENTAL TESTING SERVICES

Am Test-Air Quality, Inc. has two (2) complete continuous emission monitor (CEM) instrument vans and a separate set of instruments which can be shipped to remote locations. We maintain an inventory of approximately 80 EPA Protocol 1 (or best available grade) certified calibration gas mixtures to tailor calibrations gases to each source. Each mobile laboratory is equipped with:

- O_2, CO_2, SO_2, NO_x, and CO analyzers
- Total hydrocarbon (THC) and non-methane hydrocarbon (NMHC) analyzers
- PC-based data acquisition systems for collecting and reducing data to provide on-site results
- Cylinder racks for calibration gases
- Heated or unheated Teflon sample transport lines
- Sample extraction systems, including sample probes, fine particulate filters, moisture removal systems, and Teflon lined sample pumps
- Laboratory bench space which can be equipped with analytical balances, wet chemical analysis equipment and instrumental methods, including gas chromatography

Am Test-Air Quality, Inc.'s mobile laboratories are used to perform New Source Performance Standards (NSPS) testing and to conduct continuous emission monitoring system (CEMS) performance specification testing and audits. We provide a variety of CEMS services, including:

- Performance Specification Tests (PST)
- Relative Accuracy Test Audits (RATA)
- Relative Accuracy Audits (RAA)
- Cylinder Gas Audits (CGA)
- Quality Assurance Plans (QAP)

In addition, Am Test-Air Quality, Inc.'s senior level staff are extremely knowledgeable in the field of CEMS and can assist in monitor selection, calibration gas selection, stratification testing to locate CEMS probes, sampling system troubleshooting, and act as a liaison with the regulatory agency.

AMTEST

AM TEST LABORATORY

AmTest, Inc. is a full service analytical testing laboratory located in Redmond, Washington. It was organized to provide the highest caliber laboratory testing of environmental and industrial samples. Experienced environmental chemists and microbiologists have the best available equipment at their disposal. Experienced personnel, top-notch instrumentation, and a personal interest in your testing requirements assures:

- **Quick turnaround time for sample analysis**
- **Maximum quality control on projects**
- **Direct dialogue with the analytical staff**
- **Reasonable rates**

AmTest's laboratory is departmentalized into the following disciplines:

AIR QUALITY	**Source and Ambient Testing**
ENVIRONMENTAL	**Water, Wastes, Tissue, Vegetation**
INDUSTRIAL	**Food, Materials Testing, Industrial Hygiene, Special Projects**
OIL AND FUELS	**Lubricating Oil, Fuel Analysis, Hydraulics, Contamination Analysis**
TRACE ORGANICS	**PCB's, Pesticides, Hazardous Wastes, Priority Pollutants**
MICROBIOLOGY	**Water, Wells, Food, Product Evaluation**

AmTest's laboratory utilizes the following instrumentation:

Finnigan Incos 50 GC/MS	Atomic Absorption Spectrometer-Flame
Jarrell Ash ICP Plasma Emission Spectrometer	Atomic Absorption Spectrometer-Graphite Furnace
Gas Chromatographs: FID, EC, TC, N_2, P	Atomic Absorption Spectrometer-Hydride Generation
Jarrell Ash Arc, Spark Emission Spectrometer	UV/Visible Spectrometer
Xertex TOX Analyzer	Infrared Spectrometer
Source Test Equipment-EPA Approved	High Performance Liquid Chromatograph

AmTest is one laboratory in a group of laboratories serving the West. Other facilities include:

AmTest, Inc., Portland, Oregon
AmTest of Arizona, Phoenix, Arizona
Can Test Ltd., Vancouver, B.C.
Loring Laboratories, Calgary, Alberta
Metropolitan Clinical Laboratories, Ltd., Vancouver, B.C.

Phone Mr. Shawn Moore, General Manager or Mr. Mark Fugiel, Technical Director, at (206)885-1664 for more details or a price quotation.