Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section:	11.3
Reference:	36
Title:	Source Emissions Testing, Marseilles Brick, Marseilles, Illinois, Fugro Midwest, Inc., St. Ann, MO, October 13, 1994.

FUGRO MIDWEST, INC.

FUGRO McClelland

SOURCE EMISSIONS TESTING
MARSEILLES BRICK
MARSEILLES, ILLINOIS

MARSEILLES BRICK VENTURE, LTD.

5/20/97

Brian

The August 29, 1994 and August 30, 1994 Emission Tests were performed with the kiln on a 15 car/day production rate

FAX TRANSMISSION

MARSEILLES BRICK
1401 BROADWAY ST.
MARSEILLES, IL 61341
(815)795-6922
FAX: (815)795-6869

To: Brian Shrager
First Midwest Research
Fax #: (919) 677-0065

Date: 5/1/97

Pages: , including this cover sheet.

From: Jock Laird

Subject: Stack Emission Tests

COMMENTS:

Dear Brian

The following is copied from our Stack Test Report on Tests done 5/10/94 & 5/11/94. I do not have that information on the August test where I can get to it as readily. I will get it for you and fax to you some time next week.

Thanks

Jock Laird

[redacted]

MARSEILLES BRICK

VENTURE LIMITED PARTNERSHIP

**********FAX COVER SHEET**********

DATE: 5/25/94

TO: Robt Felle
Fugro McClelland

FROM: Jock Laird

TOTAL # OF PAGES, INCLUDING COVER: 3

MESSAGE: Dear Bob
Following is a Brief description of our Drying & Firing process. The test were set up for a 80% Shale 20% Fireclay mix. If you have any questions about this information please give me a call.

Regards
Jock

MAIN OFFICE 1401 Broadway P.O. Box 306 • Marseilles, IL 61341 • 815/795-6922 • [redacted]

Description of Drying & Firing Procedure

Marseilles Brick has two independent Dryer tunnels approximately 200 ft. in length that hold 14 kiln cars each. Waste heat from the cooling section of the kiln is supplied to each dryer by a fan through a duct/plenum system. The heat to each dryer is boosted to 325°F by two natural gas burners, 442M BTU/hr and 432M BTU/hr respectively, located in the air supply duct. Moist warm air is exhausted to the atmosphere by a fan at the entrance end of each dryer tunnel. Dryer #1 and Dryer #2 are independent of each other except for the common waste heat supply from the kiln.

The tunnel kiln used by Marseilles Brick to fire its brick is a 498 ft. metal jacketed natural gas fired kiln designed by Ceric. The kiln holds a total of 36 kiln cars with 20 in the pre-heat and furnace section and 16 in the cooling section. The pre-heat section is divided into 6 zones with a total of 32 gas fired side burners. The furnace section is divided into 7 zones with 19 natural gas fired top burners in each zone for a total of 133 top fired burners. The cooling section has a rapid cool zone (2 car lengths long) where the brick are cooled from 1930°F to approximately 1300°F by injecting ambient air directly on the brick. The balance of the cooling section is used to cool the brick to approximately 100°F before exiting the kiln.

Waste heat is removed from the cooling section close to the exit to supply heated air to the dryers. The kiln exhaust fan is located near the entrance end of the pre-heat and exhausts the products of combustion to the atmosphere through a 40' high brick chimney.

MATERIAL BEING TESTED

80% Shale, 20% Fireclay
Size: Modular
Weight: Wet - 4.6 lbs., Dry - 4.1 lbs., Fired - 3.8 lbs.
Units per car: 10,080
Production rate 12 cars per day

Date: May 10, Time 12:00 p.m.
Position of cars in kiln
16 cars 80% Shale, 20% Fireclay in pre-heat & furnace section
20 cars 10% Shale, 90% Fireclay 4 in furnace & 16 in cooling

Position of cars in Dryers
Dryer #1
14 cars 80% Shale, 20% Fireclay
Dryer #2
14 cars 80% Shale, 20% Fireclay

Date: May 11, Time 7:00 a.m.
Position of cars in kiln
23 cars 80% Shale, 20% Fireclay in pre-heat, furnace & cooling
13 cars 10% Shale, 90% Fireclay in cooling section

Position of cars in Dryers
Dryer #1
14 cars 80% Shale, 20% Fireclay
Dryer #2
14 cars 80% Shale, 20% Fireclay

Date: May 11, Time 12:00 p.m.
Position of cars in kiln
25 cars 80% Shale, 20% Fireclay in pre-heat, furnace & cooling
11 cars 10% Shale, 90% Fireclay in cooling section

Position of cars in Dryers
Dryer #1
14 cars 80% Shale, 20% Fireclay
Dryer #2
14 cars 80% Shale, 20% Fireclay

Total fuel consumption during Test #1 (Dryer #1 exhaust)

May 10 - 14,200 cubic feet per hour

Total fuel consumption during Test #2 (Dryer #2 exhaust)

May 11 - 13,100 cubic feet per hour

Total fuel consumption during Test #3 (kiln exhaust)

May 11 - 13,100 cubic feet per hour

FUGRO MIDWEST, INC.

SOURCE EMISSIONS TESTING
MARSEILLES BRICK
MARSEILLES, ILLINOIS

MARSEILLES BRICK VENTURE, LTD.

FUGRO MIDWEST, INC.

9921 St. Charles Rock Road
St. Ann (St. Louis), Missouri 63074
Tel: (314) 428-8880
Fax: (314) 428-8719

October 13, 1994
Report 0894-8885-2

Mr. Charles Laird
Marseilles Brick Venture, Ltd.
P.O. Box 306
1401 Broadway
Marseilles, Illinois 61341

Source Emissions Testing
Marseilles Brick
Marseilles, Illinois

Dear Mr. Laird:

Fugro Midwest, Inc. (Fugro) is pleased to provide you with this report on the results of the air emissions tests conducted at the Marseilles Brick facility located in Marseilles, Illinois. Testing was conducted on August 29, 1994 on the outlet of the kiln, and on August 30, 1994 on the outlet of the number one and number two dryer stacks.

This report describes the testing methodologies and summarizes the results of the emissions testing.

Fugro appreciates this opportunity to provide service to Marseilles Brick, and we look forward to working with you on future projects. Please call us if you have any questions concerning this report.

Sincerely,

FUGRO MIDWEST, INC.

Robert F. Folle
Air Quality Scientist

Christopher N. Dawdy/nm
Christopher N. Dawdy
Vice President
Manager, Air Quality Group

RFF:CND:nm

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1.0 INTRODUCTION

Fugro Midwest, Inc. (Fugro) was contracted by Marseilles Brick Venture, Ltd. to conduct source emissions testing at their facility located in Marseilles, Illinois. Marseilles Brick has two independent dryer tunnels approximately 200 ft. in length that hold 14 kiln cars each. Waste heat from the cooling section of the kiln is supplied to each dryer by a fan through a duct/plenum system. The heat to each dryer is boosted to 325°F by two natural gas burners, 442M BTU/hr. and 432M BTU/hr. respectively, located in the air supply duct. Moist warm air is exhausted to the atmosphere by a fan at the entrance end of each dryer tunnel. Dryer #1 and dryer #2 are independent of each other except for the common waste heat supply from the kiln.

The tunnel kiln used by Marseilles Brick to fire its brick is a 498 ft. metal jacketed natural gas fired kiln designed by Ceric. The kiln holds a total of 36 kiln cars with 20 in the pre-heat and furnace section and 16 in the cooling section. The pre-heat section is divided into 6 zones with a total of 32 gas fired side burners. The furnace section is divided into 7 zones with 19 natural gas fired top burners in each zone for a total of 133 top fired burners. The cooling section has a rapid cool zone (2 car lengths long) where the brick is cooled from 1930°F to approximately 1300°F by injecting ambient air directly on the brick. The balance of the cooling section is used to cool the brick to approximately 100°F before existing the kiln.

Waste heat is removed from the cooling section close to the exit to supply heated air to the dryers. The kiln exhaust fan is located near the entrance end of the pre-heat and exhausts the products of combustion to the atmosphere through a 40 ft high brick chimney.

Source emissions testing was conducted to determine mass emission rates of particulate, sulfur trioxide, sulfur dioxide, carbon monoxide, nitrogen oxide, and volatile organics. Three 1-hour test runs were conducted on each of the two dryer units and the kiln while firing bricks with a 17% shale/83% fireclay composition.

The emissions testing was conducted following the procedures outlined in 40 CFR Part 60, Appendix A, using USEPA Methods 1, 2, 3, 4, 5, and 6 to determine sampling point locations, volumetric flow rates, molecular weight, moisture concentrations, total particulate matter, and sulfur dioxide/sulfur trioxide, respectively. Additionally, USEPA Method 7E was used to determine nitrogen oxide (NO_x) emissions, USEPA Method 10 was used to determine carbon monoxide emissions, and USEPA Method 25A was used to determine total volatile organic emissions.

This report presents the results of the emissions testing. Copies of the field data sheets, laboratory analysis, equipment calibration records, calibration gas certifications, and example calculations are included in the appendices of this report.

2.0 SUMMARY OF TEST RESULTS

Fugro conducted source emissions testing at the Marseilles Brick facility located in Marseilles, Illinois, on August 29 and August 30, 1994 to quantify emission rates from three sources. An air emissions summary is presented in Table 2-1 for total particulate matter, NO_x, CO, and total hydrocarbon (THC) emissions. Table 2-2 presents the SO_2 and SO_3 results. The emissions were determined by averaging the results of three 1-hour test runs conducted on the exhaust of each unit. The testing was conducted during the use of a 17% shale/83% fire clay mixture and the north (#1) and south (#2) dryer, and the kiln stacks were tested.

Complete test results for total particulate matter, SO_2, and SO_3 are presented in Tables 6-1 through 6-9. Example calculations for Test Run No. 1 for total particulate matter are presented in Appendix F.

The continuous emissions monitoring results for total hydrocarbons (THC), NO_x, and carbon monoxide (CO) are presented in Section 6.0, Tables 6-10 through 6-15.

3.0 PURPOSE OF TESTING

Fugro conducted air emissions testing at the facility located in Marseilles, Illinois for the purpose of determining mass emission rates of particulate matter, sulfur trioxide, sulfur dioxide, carbon monoxide, nitrogen oxide and volatile organics. These emissions rates will be used to evaluate the potential emissions associated with the brick manufacturing operation. The testing was conducted as required by 35 Ill. Adm. Code 201.282(a) in association with Permit #89010009.

4.0 ACTIVITIES DURING THE TESTING

Messrs. Robert Folle, Todd Staley, and Dan Cusac of Fugro conducted the emissions testing. Mr. Charles Laird of Marseilles Brick scheduled the testing and coordinated the testing effort. Mr. Mark Martin and John Krolak of the Illinois EPA were present and observed the testing. Resumes of the test crew are presented in Appendix A.

5.0 TEST METHODS AND PROCEDURES

Fugro utilized USEPA Test Methods 1, 2, 3, 4, 5, and 6 as outlined in 40 CFR Part 60, Appendix A, to determine traverse point locations, stack gas velocity, volumetric flow rates, molecular weight, moisture, total particulate matter emissions and sulfur emissions, respectively. Additionally, Methods 7E, 10, and 25A were used to determine nitrogen oxide, carbon monoxide, and total hydrocarbon emissions.

Table 2-1
Emissions Summary
Marseilles Brick Venture Ltd.
Marseilles, Illinois

Source	Run	Parameter				
			Particulate	NO_x	CO	THC
Dryer #1	1	gr/dscf	0.0039	-	-	-
		lb/hr	0.645	0	0.46	0.21
		ppm	-	0	5.5	1.55
	2	gr/dscf	.0010	-	-	-
		lb/hr	0.1641	0	1.20	0
		ppm	-	0	14.6	0
	3	gr/dscf	.0026	-	-	-
		lb/hr	0.4483	0	0.46	0
		ppm	-	0	5.4	0
	Avg.	gr/dscf	.0025	-	-	-
		lb/hr	0.4190	0	0.71	0.52
		ppm	-	0	8.5	0.068
Dryer #2	1	gr/dscf	.0017	-	-	-
		lb/hr	0.2663	0	0.396	0
		ppm	-	0	4.7	0
	2	gr/dscf	.0017	-	-	-
		lb/hr	0.2640	0	0.246	0
		ppm	-	0	3.0	0
	3	gr/dscf	.0012	-	-	-
		lb/hr	0.1890	0	0.430	0
		ppm	-	0	5.0	0
	Avg.	gr/dscf	0.0016	-	-	-
		lb/hr	.2397	0	0.357	0
		ppm	-	0	4.23	0
Kiln	1	gr/dscf	.1427	-	-	-
		lb/hr	21.58	2.02	9.78	0.92
		ppm	-	16.38	130.10	7.8
	2	gr/dscf	0.0759	-	-	-
		lb/hr	11.36	1.92	9.41	0.72
		ppm	-	15.63	125.98	6.1
	3	gr/dscf	.0907	-	-	-
		lb/hr	14.33	0.93	10.64	0.76
		ppm	-	7.250	136.82	6.2
	Avg.	gr/dscf	0.1031	-	-	-
		lb/hr	15.75	1.62	9.94	0.798
		ppm	-	13.1	130.97	6.7

Table 2-2
Emissions Summary
Marseilles Brick Venture Ltd.
Marseilles, Illinois

Source	Run	Parameter		
			SO_2	SO_3
Dryer #1	1	mg	ND	0.18
		lb/hr	ND	0.0094
	2	mg	ND	0.25
		lb/hr	ND	0.0124
	3	mg	ND	10.67
		lb/hr	ND	0.556
	Avg.	mg	ND	3.70
		lb/hr	ND	0.193
Dryer #2	1	mg	ND	6.25
		lb/hr	ND	0.314
	2	mg	ND	3.31
		lb/hr	ND	0.165
	3	mg	1.60	2.33
		lb/hr	0.0796	0.116
	Avg.	mg	0.53	3.96
		lb/hr	0.0265	0.198
Kiln	1	mg	3,347	34.33
		lb/hr	119.89	1.26
	2	mg	3,411	44.14
		lb/hr	119.54	1.58
	3	mg	3,555	79.69
		lb/hr	127.36	2.95
	Avg.	mg	3,437.67	52.72
		lb/hr	122.26	1.93

ND = Non-detected

5.1 Field Procedures and Equipment (EPA Method 5 and 6)

5.1.1 Sampling Equipment and Procedures

The sampling equipment consists of the following:

1. Pitot Assembly
   a. Nozzle – Glass with a sharp, tapered leading edge.
   b. Probe – Stainless steel sheath with a 5/8-in. OD glass liner wrapped with nichrome wire; rheostat controlled and capable of maintaining a temperature of 248 degrees F +/- 25 degrees F.
   c. Pitot – Type "S" constructed and attached to probe according to specifications outlined in the "code of Federal Regulations, Chapter I, Title 40 Part 60, Appendix A, Method 2."
   d. Fyrite probe – Stainless steel 1/4-in. tubing attached to pitot tube in an interference-free arrangement.
   e. Thermocouple – Type "K" attached to the pitot tube such that the tip has no contact with the metal and does not interfere with the pitot tube face openings.

2. Filter Holder – Borosilicate glass with a glass fritted filter support and silicone rubber sealing gasket.

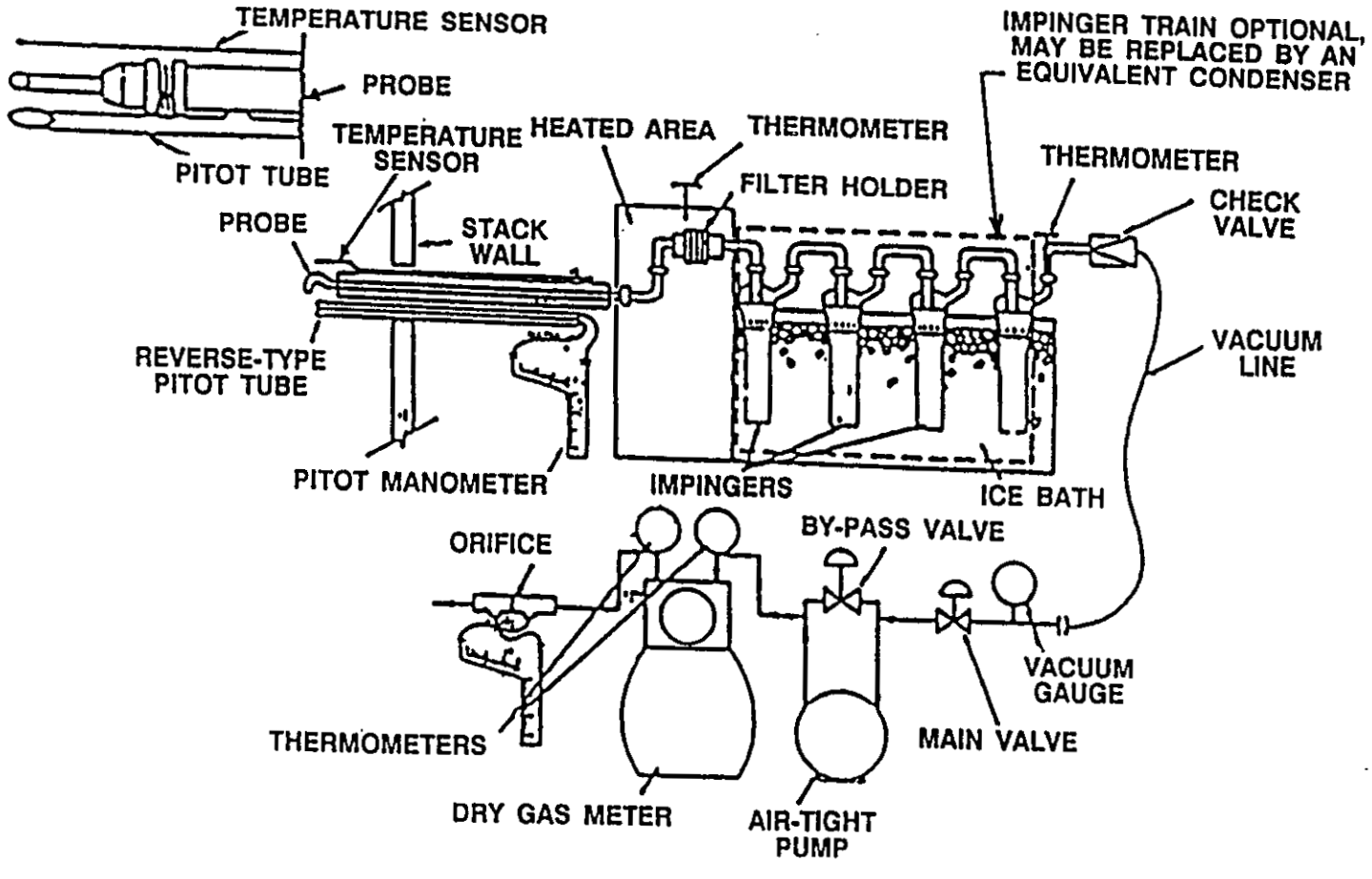
3. Filter Heating Assembly – Controlled heating element in aluminum module attached to end of probe; capable of maintaining 248 degrees F +/- 25 degrees F.

4. Impingers – Four glass impingers connected in series with glass ball joint fittings and placed in an ice bath. The first, third, and fourth impingers were of the modified Greenburg-Smith design. The second impinger was of the Greenburg-Smith design with a standard tip. Final gas exit temperature was measured to within +/- 5 degrees F with a thermometer immersed in the gas stream.

5. Control Box – Module containing the vacuum gauge, leak-free pump, thermometer capable of measuring temperature to within +/- 5 degrees F, dry gas meter with a minimum of 2% accuracy, valves and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

6. Nomograph – To determine isokinetic sampling rate.

A schematic of the particulate sampling train is shown in Figure 5-1.



SOURCE: ENVIRONMENT REPORTER

Figure 5-1
PARTICULATE SAMPLING TRAIN
EPA METHOD 5

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Prior to leaving the laboratory, glass fiber filters were numbered for identification purposes, heated for 2 hours at 220 degrees F, desiccated for 2 hours, and preweighed to the nearest 0.1 mg.

Upon arrival at the sampling site, the control box was leak-checked from the pump to the orifice at 5 to 7 in. of water.

The sampling train was prepared in the following manner: 100 ml of 80% isopropanol in the first impinger, 100 ml of 3% hydrogen peroxide was added to each of the next two impingers. The fourth impinger was left empty and the fifth impinger contained 250 grams of silica gel.

After assembling the train with the pitot tube, as shown on the schematic, the system was leak-checked by plugging the inlet to the probe nozzle and pulling a 15-in. mercury vacuum. A leakage rate not to exceed 0.02 cfm is considered acceptable. The pitot tube system was also leak-checked at 2 to 3 in. of water, and any leaks found were corrected.

The probe nozzle size and moisture content were derived from a preliminary velocity and temperature traverse measurement. Sampling points within the duct were selected in accordance with EPA Method 1 (40 CFR 60, Appendix A). The sampling probe was attached and the heater was adjusted to provide a gas temperature of approximately 248 degrees F, +/- 25 degrees F.

The filter heating system was turned on, and ice was placed around the impingers. After a suitable warmup period, the nozzle was placed at the first traverse point with the flow adjusted to isokinetic conditions. Using calculated sampling points and sampling times, the probe was repositioned to the next traverse point, and isokinetic sampling was re-established. This was accomplished for each point along the traverse until the run was completed. Readings were taken at each traverse point and at the calculated time interval. At the conclusion of each run, the pump was turned off and the final readings were recorded. A final leak check of the sampling system was performed, as previously described at the highest vacuum encountered during the test run. A leak check of the pitot system was also repeated.

5.1.2 Sample Recovery

The volume of liquid in the first four impingers was measured and recorded on the field data sheet. The probe nozzle, and all sample-exposed surfaces were washed with reagent-grade acetone and put into a clean sample bottle marked "prefilter." A brush was used to loosen any adhering particulate matter, and subsequent washings were put into the "prefilter" container. The filter was carefully removed from the fritted teflon support and placed in its original container. Any filter material that adhered to the filter support surfaces was carefully removed and added to the filter container. The silica gel was removed from the fifth impinger and transferred to its original container. A sample of the acetone used in washing the probe was saved as a blank for laboratory analysis. The liquid from the first four impingers was collected and labeled for shipment to the laboratory.

5.1.3 Analytical Procedures

The filter and any loose particulate matter were transferred from the filter container to a clean, tared glass weighing dish. The filter was placed in a desiccator for 24 hours and weighed to a constant weight. The original weight of the filter was deducted, and the weight gain recorded to the nearest 0.1 mg.

The "prefilter" wash and blank acetone solutions were transferred to individual clean, tared beakers, then evaporated to dryness and desiccated to a constant weight. The weight gain of the prefilter" was adjusted for the blank and recorded to the nearest 0.1 gram.

The impinger catch was shipped to Triangle Laboratory of North Carolina, for sulfur titrations. The analytical data sheets for particulate and SO_2/SO_3 analyses are presented in Appendix B.

5.2 Oxygen (O_2) and Carbon Dioxide (CO_2) Sampling

As required by EPA Method 3 (40 CFR 60, Appendix A), Oxygen and carbon dioxide samples were collected an analyzed. The collected sample was analyzed using a Horiba CMA-331A continuous gas analyzer. Oxygen and carbon dioxide concentrations were determined in percent of stack gas and stack gas molecular weight was then calculated.

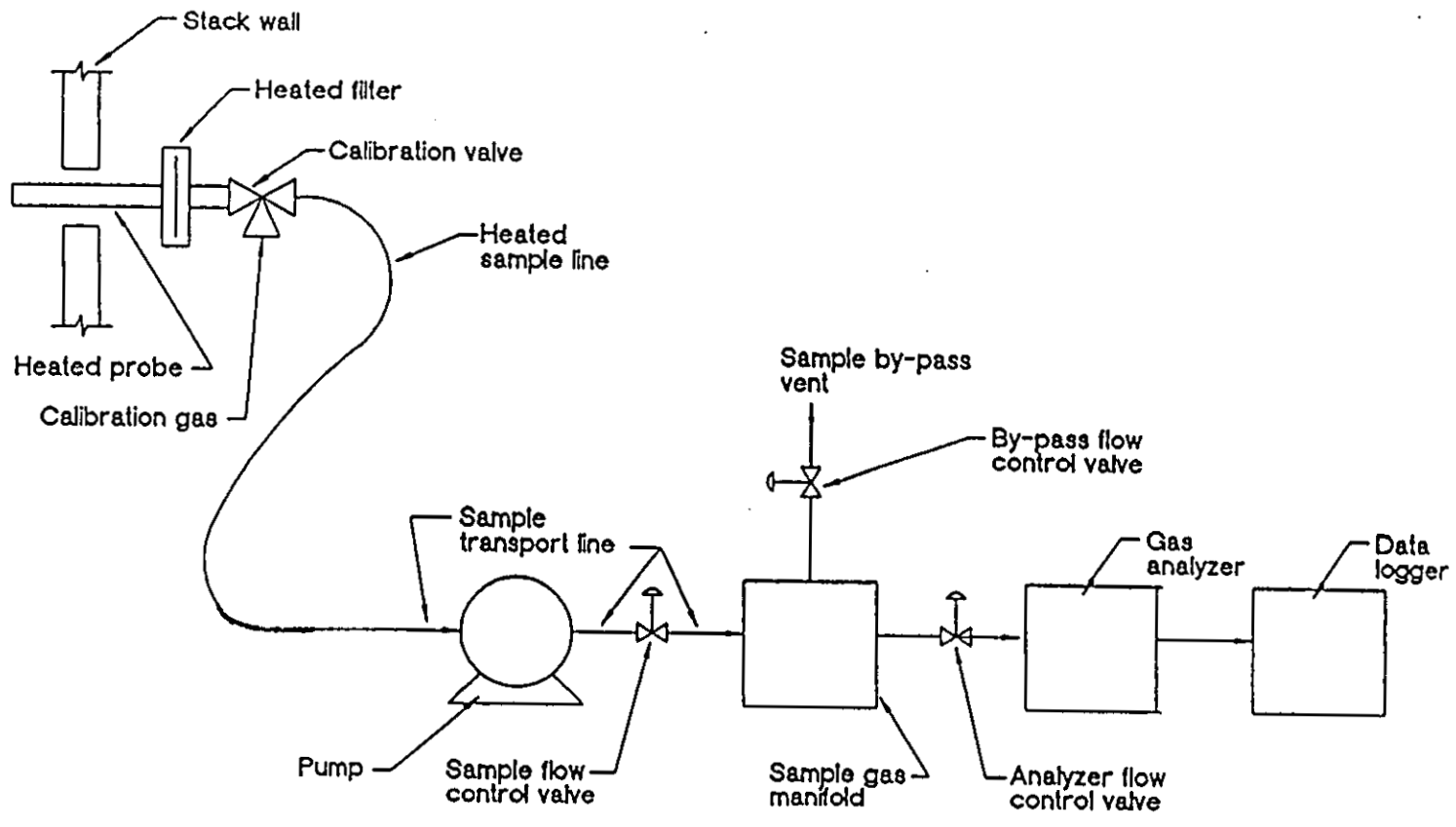
Table 5-1 presents the equipment specifications of the continuous emissions monitors and Figure 5-2 presents a schematic of the analyzer system.

TABLE 5-1

CONTINUOUS EMISSIONS MONITORING
(CEM) SYSTEM
OXYGEN (O2) AND CARBON DIOXIDE (CO2)

CEM SYSTEM SPECIFICATIONS

PARAMETER:	O2	CO2
ANALYZER	HORIBA	HORIBA
MODEL	CMA-331A	CMA-331A
TYPE	PARAMAGNETIC	NDIR
RANGE	0-25 %	0-20 %
REPEATABILITY	+/- .5% Full scale (FS)	+/- .5% Full scale (FS)
DRIFT (ZERO) DRIFT (SPAN)	+/- 1% FS/per week +/- 2% FS per week	+/- 1% FS/per week +/- 2% FS per week
RESPONSE TIME	90% FS < 1 MINUTE	90% FS < 1 MINUTE
ACCURACY	+/- 1% FS	+/- 1% FS
INPUT POWER	110-115 V.A.C./60 HZ.	110-115 V.A.C./60 HZ.



SOURCE: ENVIRONMENT REPORTER

Figure 5-2

OXYGEN (O_2) AND CARBON DIOXIDE (CO_2) MONITORING SYSTEM

FUGRO McClelland

5.2.1 Sampling Equipment and Procedures for Carbon Dioxide (CO_2) and Oxygen (O_2) Sampling - EPA Method 3A

The gas sample was continuously drawn form the stack with a Thomas Industries Model 107 diaphragm pump. The Gas flowed form the stack through Teflon tubing to a glass condenser where the majority of the water vapor was removed. From the condenser, the gas flow rate was reduced by a valve before entering the pump. The gas was then pumped through the analyzer at a constant flow rate and pressure (Figure 5-2). The analyzer was calibrated with known concentrations of certified N_2 for zero span and certified concentrations of gas for upscale span calibrations. The analyzer was calibrated before and after each test run. Photocopies of the actual concentration readings recorded on the data logger/chart recorder are presented in Appendix E. Protocol-1 calibration gas certificates are presented in Appendix G.

Tables 6-1 through 6-9 present the O_2 and CO_2 results.

5.2.2 Sampling Procedures

The sampling procedure consists of the following leak check and sampling techniques. Prior to sampling, the vase was leak-checked to 2 to 4 in. of water. The inlet to the condenser was plugged, and a vacuum of 10 in. of Hg was created. The outlet of the pump was then plugged and the pump was turned off. The vacuum was observed for 30 seconds to determine any leakage. The vacuum must hold steady for at least 30 seconds for the leak test to be acceptable. The sample line was then purged with stack gas and the bag was connected. Sampling was conducted at an appropriate constant rate at the same traverse points and for the same length of time as the other testing parameters were tested. At the conclusion of the run, the pump was turned off and the bag sealed.

5.2.3 Analytical Procedures

The percentage of effluent gas which was O_2 and CO_2 were measured directly. Nitrogen and CO content were determined by subtracting the sum of CO_2 and O_2 percent from 100 percent.

The dry molecular weight was calculated using the following equation:

$$M_d = 0.440 \times \%CO_2 + 0.320 \times \%0_2 + 0.280 \times (\%N_2 + \%CO)$$

The molecular weight results for each test run are included in Tables 6-1 through 6-9.

5.3 Sampling and calibration procedures continuous monitoring of gaseous pollutants

An initial analyzer calibration error test was performed for zero and upscale span calibrations on the analyzer to determine the difference between the gas concentrations exhibited by the gas analyzer and the known concentrations of the calibration gas, when the calibration gas is introduced directly to the analyzer's input (+/- 2% of span for each concentration is acceptable).

A sampling system bias test was performed on the analyzer system. Zero and calibration gases were introduced to the outlet of the sampling probe, and the difference between the bias readings and the initial analyzer calibration error readings (known gas concentrations introduced directly into the analyzer's input) were recorded (bias). Bias system limits for each concentration is +/- 5% of span. Sampling was performed simultaneously. Sampling was started at the first measurement point, as determined by Method 1, after twice the system response time (time it takes for calibration gas to travel up to the probe and back down to the analyzers input) had elapsed. System response time was 2 minutes and 36 seconds. Zero and calibration drift (span) tests were performed immediately preceding and following the test run before any adjustments to the measurement system (+/- 3% of span). All test runs were found to be within the system specifications and all zero and upscale calibrations were within the sampling system bias specifications.

5.4 Oxides of Nitrogen (NO_x) Sampling - EPA Method 7E

Nitrogen oxide (NO_x) was measured following the procedures set forth in Method 7E of 40 CFR 60, Appendix A. The NO_x analysis was performed with a TECO, Model 10AR, chemiluminescence NO_x analyzer manufactured by Thermo Environmental Instruments, Inc. The TECO 10AR blends the gas sample with O_3 in a reaction chamber. The resulting chemiluminescence is monitored through an optical filter by a high-sensitivity photomultiplier positioned at one end of the chamber. The filer/photomultiplier combination responds to light in a narrow-wave length band unique to the reaction of NO and O_3. The output from the photomultiplier is linearly proportional tot he NO concentration. To measure No_x concentrations, the NO_x in the sample gas is converted to NO through a converter. The chemiluminescent response in the reaction chamber to the converter effluent is linearly proportional to the NO_x concentration entering the converter.

The electrical responses from the TECO 10AR were recorded on an Omega 5500 data logger. This data was digitized into 60-minute averages. The gas sample in the stack was drawn from the stack port with a Thomas Industries Model 107 diaphragm pump. The sample gas flow from the stack flowed through Teflon tubing to a glass condenser (ice bath) where the water vapor was removed. Form the condenser, the gas flow was reduced by a valve before entering the pump. The gas sample was then pumped through the analyzer at a constant flow rate and pressure (Figure 5-3). Photocopies of the actual concentration readings recorded on the data logger recorder are presented in Appendix E.

The nitrogen oxide analyzer was calibrated using a three-point calibration consisting of a zero gas, and two additional test concentrations of nitrogen oxide (NO) consisting of 86.7 parts per million (ppm) and 151 ppm of NO. The NO_x analyzer was calibrated before an dafter the NO_x tests. the certifications for the calibration gases used during the test are presented in Appendix G.

5.5 *Sampling Equipment and Procedures for Carbon Monoxide (CO) Sampling* - EPA Method 10.

CO concentrations in the stack gas were monitored with a Horiba 331 CO Analyzer. This instrument utilizes gas filter correlation for CO measurement.

The gas sample was continuously drawn form the stack with a Thomas Industries Model 107 diaphragm pump. The gas flowed from the stack through Teflon tubing to a glass condenser where the majority of the water vapor was removed. From the condenser, the gas flow rate was reduced by a valve before entering the pump. The gas was then pumped through the analyzer at a constant flow rate and pressure (Figure 5-3). The CO analyzer was calibrated with known concentrations of certified N_2 for zero span and certified concentrations of CO for upscale span calibrations. The analyzer was calibrated before and after each test run. Photocopies of the actual CO concentration readings recorded on a data logger/chart recorder are presented in Appendix E. Protocol-1 calibration gas certificates are presented in Appendix G.

5.6 Sampling Equipment and Procedures for Total Hydrocarbon (THC) Determination EPA Method 25A

Total hydrocarbon concentrations (as propane) in the stack gas were continuously extracted and analyzed with a J.U. M. Model VE-7 heated total hydrocarbon analyzer. The analyzer utilizes a hydrogen flame ionization detector (FID) in a heated oven (190°C) to prevent the loss of high molecular weight hydrocarbons.

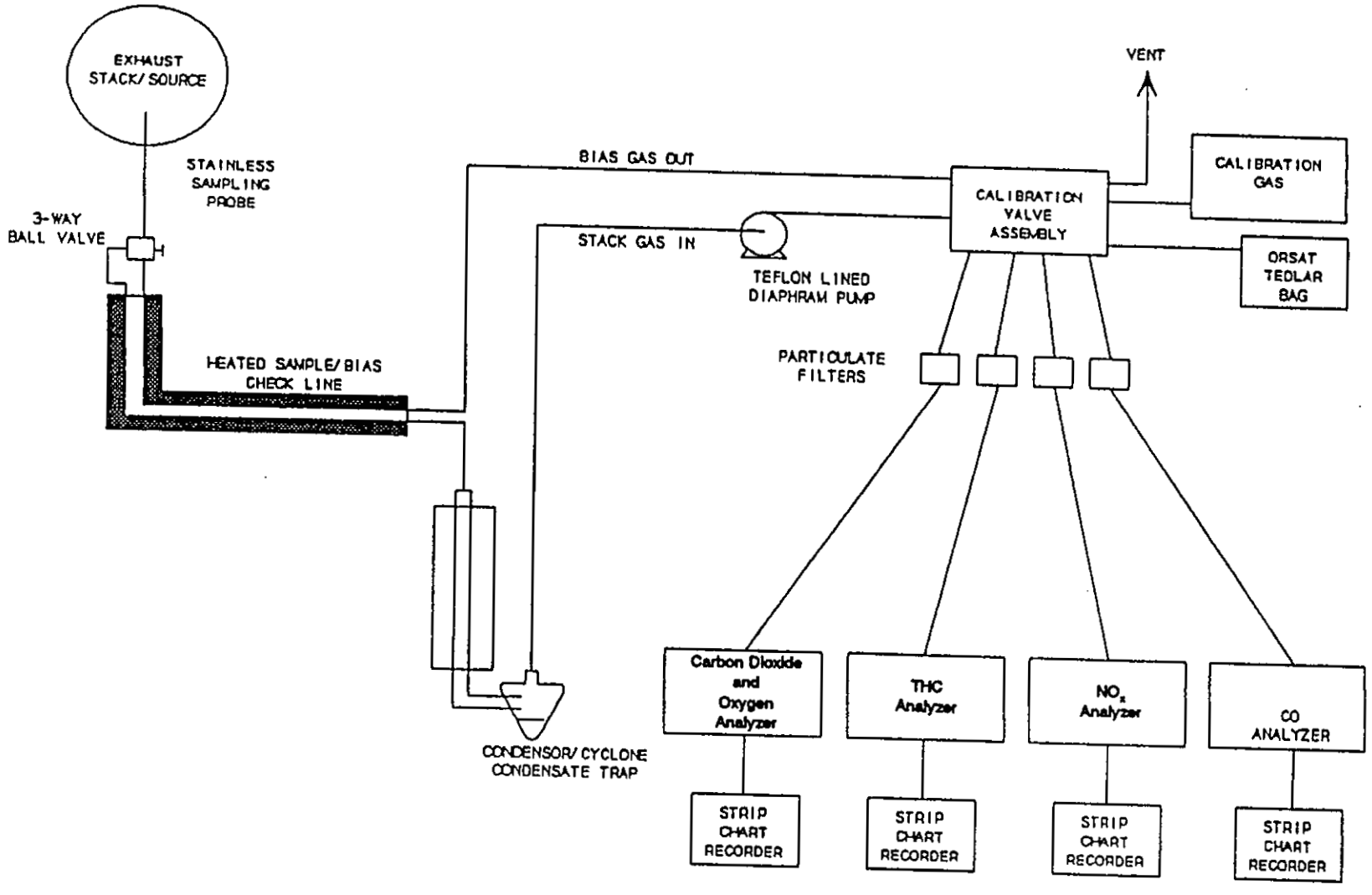


Figure 5-3
Continuous Emission Monitoring System

FUGRO ◘ McClelland

Stack gas was continuously extracted from the source through heated teflon sample lines (250°F) connected to suitable stainless steel sampling probes. The stack gas was introduced directly into the heated total hydrocarbon analyzer at a constant flow rate and pressure. The total hydrocarbon analyzer was calibrated before and after each of the tests with known concentrations of USEPA Protocol-1 propane calibration gases for upscale span calibrations and drift checks and zero gas for zero calibrations.

The total hydrocarbon analyzer's responses (as propane) were continuously recorded on an Omega Model 5500 data logger. Figure 5-4 illustrates a schematic diagram of the total hydrocarbon sampling train. Copies of the data logger records are presented in Appendix E. Calibration gas certifications for the USEPA Protocol-1 calibration gases are presented in Appendix G.

6.0 EMISSION RESULTS

The emissions results of the testing are presented in Tables 6-1 through 6-9. Example calculations for test run number 1, conducted on the kiln outlet on August 29, 1994, for total particulate matter are presented in Appendix F.

Tables 6-10 through 6-15 presents the emissions for NO_x, total hydrocarbons (THC), and carbon monoxide (CO) as measured utilizing the continuous emission monitors. There were no NO_x emissions detected on the north dryer No. 1 and no total hydrocarbon or NO_x emissions detected on the south dryer No. 2.

TABLE 6-1

PARTICULATE MATTER EMISSION SUMMARY.

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: KILN

PARTICULATE MATTER SUMMARY				
Run Number	1	2	3	AVERAGE
Date of Run		AUGUST 29, 1994		
Starting Time (hours)	1048	1250	1451	
Ending Time (hours)	1154	1355	1556	
Net Time of Run (minutes)	60	60	60	
Number of Points	21	21	21	
Barometric Pressure (in. Hg)	30.24	30.24	30.24	
Static Pressure (in. H2O)	-0.15	-0.15	-0.15	
Stack Pressure (in. Hg)	30.23	30.23	30.23	30.23
Average Delta H (in. H2O)	4.1381	4.1286	4.3762	4.21
Average Delta P (in,H2o)	0.3652	0.3567	0.3781	0.37
Meter Pressure (in. Hg)	30.54	30.54	30.56	30.55
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.002	1.002	1.002	
Stack Length (in.)	41	41	41	
Stack Width (in.)	41	41	41	
Stack Cross Sectional Area (ft2)	11.673611	11.673611	11.673611	11.67361
Nozzle Diameter (inches)	0.370	0.370	0.370	
Nozzle Area (ft2)	0.00074667	0.0007467	0.000746674	0.000747
Meter Temperature (F)	92.667	89.952	97.952	93.524
Stack Temperature (F)	437.429	436.286	434.762	436.159
Ending DGM Volume(ACF)	321.647	397.72	479.652	
Beginning DGM Volume (ACF)	257.989	333.035	413.778	
Volume of Dry Gas Sample (acf)	63.6580	64.6850	65.8740	64.7390
Dry, Std. Gas Sample Volume (dscf)	62.2097	63.524	63.802	63.1785
Condensate Collected (mL)	81.10	79.30	60.20	73.53
Moisture Concentration (%)	5.78	5.55	4.25	5.19
Carbon Dioxide Concentration (%)	2.218	2.230	2.270	2.239
Oxygen Concentration (%)	16.730	18.300	19.385	18.138
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	81.052	79.470	78.345	79.622
Molecular Weight, Dry (lb/lb-mole)	29.0241	29.0888	29.1386	29.0838
Molecular Weight, Wet (lb/lb-mole)	28.3867	28.4734	28.6649	28.5083
SQRT Delta P Avg., Pitot (in. H2O)	0.598272	0.593871	0.611407	0.601183
Avg. Velocity, Stack Gas (ft/sec)	43.9364	43.5190	44.6161	44.0238
Actual Flow Rate (acfm)	30773.768	30481.418	31249.863	30835.016
Dry, Std. Vol. Flow Rate (dscfm)	17234.991	17135.054	17838.682	17402.909
% Isokinetic	94.11	96.66	93.25	94.67
Total Filter Catch (mg)	413.30	263.00	268.20	314.83
Total Wash Catch (mg)	175.50	55.20	119.10	116.60
Total Catch (mg)	588.80	318.20	387.30	431.43
Particulate Conc. (grams/dscf)	0.0092	0.0049	0.0059	0.0067
Particulate Conc. (grains/dscf)	0.1427	0.0759	0.0907	0.1031
Particulate Concentration (lb/dscf)	2.09E-05	1.10E-05	1.34E-05	1.51E-05
Particulate Emission Rate (lb/hr)	21.5814	11.3556	14.3264	15.7545

TABLE 6-2

SULFUR DIOXIDE EMISSION RESULTS
SO2

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: KILN

SO2 EMISSIONS SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run		AUGUST 29, 1994		
Starting Time (hours)	1048	1250	1451	
Ending Time (hours)	1154	1355	1556	
Net Time of Run (minutes)	60	60	60	
Number of Points	21	21	21	
Barometric Pressure (in. Hg)	30.24	30.24	30.24	
Static Pressure (in. H2O)	-0.15	-0.15	-0.15	
Stack Pressure (in. Hg)	30.23	30.23	30.23	30.23
Average Delta H (in. H2O)	4.1381	4.1286	4.3762	4.21
Average Delta P (in,H2o)	0.3652	0.3567	0.3781	0.37
Meter Pressure (in. Hg)	30.54	30.54	30.56	30.55
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.002	1.002	1.002	
Stack Length (in.)	41	41	41	
Stack Width (in.)	41	41	41	
Stack Cross Sectional Area (ft2)	11.673611	11.673611	11.673611	11.67361
Nozzle Diameter (inches)	0.370	0.370	0.370	
Nozzle Area (ft2)	0.00074667	0.0007467	0.000746674	0.000747
Meter Temperature (F)	92.667	89.952	97.952	93.524
Stack Temperature (F)	437.429	436.286	434.762	436.159
Ending DGM Volume(ACF)	321.647	397.72	479.652	
Beginning DGM Volume (ACF)	257.989	333.035	413.778	
Volume of Dry Gas Sample (acf)	63.6580	64.6850	65.8740	64.7390
Dry, Std. Gas Sample Volume (dscf)	62.2097	63.524	63.802	63.1785
Condensate Collected (mL)	81.10	79.30	60.20	73.53
Moisture Concentration (%)	5.78	5.55	4.25	5.19
Carbon Dioxide Concentration (%)	2.218	2.230	2.270	2.239
Oxygen Concentration (%)	16.730	18.300	19.385	18.138
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	81.052	79.470	78.345	79.622
Molecular Weight, Dry (lb/lb-mole)	29.0241	29.0888	29.1386	29.0838
Molecular Weight, Wet (lb/lb-mole)	28.3867	28.4734	28.6649	28.5083
SQRT Delta P Avg., Pitot (in. H2O)	0.598272	0.593871	0.611407	0.601183
Avg. Velocity, Stack Gas (ft/sec)	43.9364	43.5190	44.6161	44.0238
Actual Flow Rate (acfm)	30773.768	30481.418	31249.863	30835.016
Dry, Std. Vol. Flow Rate (dscfm)	17234.991	17135.054	17838.682	17402.909
% Isokinetic	94.11	96.66	93.25	94.67
SO2				
Total Catch (mg) SO2	3347.00	3411.00	3555.00	3437.67
SO2 Conc. (grams/dscf)	0.0526	0.0527	0.0540	0.0531
SO2 Conc. (grains/dscf)	0.8113	0.8137	0.8327	0.8192
SO2 Concentration (lb/dscf)	1.16E-04	1.16E-04	1.19E-04	1.17E-04
SO2 Emission Rate (lb/hr)	119.8874	119.5428	127.3644	122.2649

TABLE 6-3

SULFUR TRIOXIDE EMISSION SUMMARY.
SO3

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: KILN

SO3 SUMMARY				
Run Number	1	2	3	AVERAGE
Date of Run		AUGUST 29, 1994		
Starting Time (hours)	1048	1250	1451	
Ending Time (hours)	1154	1355	1556	
Net Time of Run (minutes)	60	60	60	
Number of Points	21	21	21	
Barometric Pressure (in. Hg)	30.24	30.24	30.24	
Static Pressure (in. H2O)	-0.15	-0.15	-0.15	
Stack Pressure (in. Hg)	30.23	30.23	30.23	30.23
Average Delta H (in. H2O)	4.1381	4.1286	4.3762	4.21
Average Delta P (in,H2o)	0.3652	0.3567	0.3781	0.37
Meter Pressure (in. Hg)	30.54	30.54	30.56	30.55
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.002	1.002	1.002	
Stack Length (in.)	41	41	41	
Stack Width (in.)	41	41	41	
Stack Cross Sectional Area (ft2)	11.673611	11.673611	11.673611	11.67361
Nozzle Diameter (inches)	0.370	0.370	0.370	
Nozzle Area (ft2)	0.00074667	0.0007467	0.000746674	0.000747
Meter Temperature (F)	92.667	89.952	97.952	93.524
Stack Temperature (F)	437.429	436.286	434.762	436.159
Ending DGM Volume(ACF)	321.647	397.72	479.652	
Beginning DGM Volume (ACF)	257.989	333.035	413.778	
Volume of Dry Gas Sample (acf)	63.6580	64.6850	65.8740	64.7390
Dry, Std. Gas Sample Volume (dscf)	62.2097	63.524	63.802	63.1785
Condensate Collected (mL)	81.10	79.30	60.20	73.53
Moisture Concentration (%)	5.78	5.55	4.25	5.19
Carbon Dioxide Concentration (%)	2.218	2.230	2.270	2.239
Oxygen Concentration (%)	16.730	18.300	19.385	18.138
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	81.052	79.470	78.345	79.622
Molecular Weight, Dry (lb/lb-mole)	29.0241	29.0888	29.1386	29.0838
Molecular Weight, Wet (lb/lb-mole)	28.3867	28.4734	28.6649	28.5083
SQRT Delta P Avg., Pitot (in. H2O)	0.598272	0.593871	0.611407	0.601183
Avg. Velocity, Stack Gas (ft/sec)	43.9364	43.5190	44.6161	44.0238
Actual Flow Rate (acfm)	30773.768	30481.418	31249.863	30835.016
Dry, Std. Vol. Flow Rate (dscfm)	17234.991	17135.054	17838.682	17402.909
% Isokinetic	94.11	96.66	93.25	94.67
Total Catch (mg) SO3	34.33	44.14	79.69	52.720
SO3 Conc. (grams/dscf)	0.0005	0.0007	0.0012	0.0008
SO3 Conc. (grains/dscf)	0.0083	0.0105	0.0187	0.0125
SO3 Concentration (lb/dscf)	1.22E-06	1.53E-06	2.75E-06	1.83E-06
SO3 Emission Rate (lb/hr)	1.2583	1.5752	2.9478	1.9271

TABLE 6-4

PARTICULATE MATTER EMISSION SUMMARY.

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: DRYER STACK #1

PARTICULATE MATTER SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run		AUGUST 30, 1994		
Starting Time (hours)	937	1133	1311	
Ending Time (hours)	1040	1236	1417	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.12	30.12	30.12	
Static Pressure (in. H2O)	-0.12	-0.12	-0.12	
Stack Pressure (in. Hg)	30.11	30.11	30.11	30.11
Average Delta H (in. H2O)	2.4458	2.4388	2.6500	2.51
Average Delta P (in,H2o)	0.3363	0.3233	0.3463	0.34
Meter Pressure (in. Hg)	30.30	30.30	30.31	30.30
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.002	1.002	1.002	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.044662	11.044662	11.044662	11.04466
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000491
Meter Temperature (F)	72.417	77.417	78.375	76.069
Stack Temperature (F)	113.417	103.500	102.250	106.389
Ending DGM Volume(ACF)	537.987	598.745	659.159	
Beginning DGM Volume (ACF)	489.166	548.537	608.88	
Volume of Dry Gas Sample (acf)	48.8210	50.2080	50.2790	49.7693
Dry, Std. Gas Sample Volume (dscf)	49.1286	50.053	50.061	49.7475
Condensate Collected (mL)	72.00	89.00	87.70	82.90
Moisture Concentration (%)	6.45	7.72	7.62	7.26
Carbon Dioxide Concentration (%)	0.320	0.220	0.400	0.313
Oxygen Concentration (%)	20.300	20.420	20.450	20.390
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.380	79.360	79.150	79.297
Molecular Weight, Dry (lb/lb-mole)	28.8632	28.8520	28.8820	28.8657
Molecular Weight, Wet (lb/lb-mole)	28.1622	28.0139	28.0530	28.0764
SQRT Delta P Avg., Pitot (in. H2O)	0.569051	0.555836	0.581913	0.568934
Avg. Velocity, Stack Gas (ft/sec)	33.6035	32.6240	34.0929	33.4401
Actual Flow Rate (acfm)	22268.334	21619.287	22592.676	22160.099
Dry, Std. Vol. Flow Rate (dscfm)	19303.906	18812.170	19725.345	19280.473
% Isokinetic	95.49	99.83	95.23	96.85
Total Filter Catch (mg)	1.40	0.80	0.00	0.73
Total Wash Catch (mg)	11.00	2.50	8.60	7.37
Total Catch (mg)	12.40	3.30	8.60	8.10
Particulate Conc. (grams/dscf)	0.0003	0.0001	0.0002	0.0002
Particulate Conc. (grains/dscf)	0.0039	0.0010	0.0026	0.0025
Particulate Concentration (lb/dscf)	5.57E-07	1.45E-07	3.79E-07	3.60E-07
Particulate Emission Rate (lb/hr)	0.6446	0.1641	0.4483	0.4190

TABLE 6-5

SULFUR DIOXIDE EMISSION SUMMARY.
SO2

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: DRYER STACK #1

SO2 EMISSION SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run		AUGUST 30, 1994		
Starting Time (hours)	937	1133	1311	
Ending Time (hours)	1040	1236	1417	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.12	30.12	30.12	
Static Pressure (in. H2O)	-0.12	-0.12	-0.12	
Stack Pressure (in. Hg)	30.11	30.11	30.11	30.11
Average Delta H (in. H2O)	2.4458	2.4388	2.6500	2.51
Average Delta P (in,H2o)	0.3363	0.3233	0.3463	0.34
Meter Pressure (in. Hg)	30.30	30.30	30.31	30.30
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.002	1.002	1.002	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.044662	11.044662	11.044662	11.04466
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000491
Meter Temperature (F)	72.417	77.417	78.375	76.069
Stack Temperature (F)	113.417	103.500	102.250	106.389
Ending DGM Volume(ACF)	537.987	598.745	659.159	
Beginning DGM Volume (ACF)	489.166	548.537	608.88	
Volume of Dry Gas Sample (acf)	48.8210	50.2080	50.2790	49.7693
Dry, Std. Gas Sample Volume (dscf)	49.1286	50.053	50.061	49.7475
Condensate Collected (mL)	72.00	89.00	87.70	82.90
Moisture Concentration (%)	6.45	7.72	7.62	7.26
Carbon Dioxide Concentration (%)	0.320	0.220	0.400	0.313
Oxygen Concentration (%)	20.300	20.420	20.450	20.390
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.380	79.360	79.150	79.297
Molecular Weight, Dry (lb/lb-mole)	28.8632	28.8520	28.8820	28.8657
Molecular Weight, Wet (lb/lb-mole)	28.1622	28.0139	28.0530	28.0764
SQRT Delta P Avg., Pitot (in. H2O)	0.569051	0.555836	0.581913	0.568934
Avg. Velocity, Stack Gas (ft/sec)	33.6035	32.6240	34.0929	33.4401
Actual Flow Rate (acfm)	22268.334	21619.287	22592.676	22160.099
Dry, Std. Vol. Flow Rate (dscfm)	19303.906	18812.170	19725.345	19280.473
% Isokinetic	95.49	99.83	95.23	96.85
Total Catch (mg) SO2	N/D	N/D	N/D	0.00
SO2 Conc. (grams/dscf)	N/D	N/D	N/D	0.0000
SO2 Conc. (grains/dscf)	N/D	N/D	N/D	0.0000
SO2 Concentration (lb/dscf)	N/D	N/D	N/D	0.00E+00
SO2 Emission Rate (lb/hr)	N/D	N/D	N/D	0.0000

N/D = NON-DETECT

TABLE 6-6

SULFUR TRIOXIDE EMISSION SUMMARY.
SO3

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: DRYER STACK #1

SO3 EMISSION SUMMARY				
Run Number	1	2	3	AVERAGE
Date of Run		AUGUST 30, 1994		
Starting Time (hours)	937	1133	1311	
Ending Time (hours)	1040	1236	1417	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.12	30.12	30.12	
Static Pressure (in. H2O)	-0.12	-0.12	-0.12	
Stack Pressure (in. Hg)	30.11	30.11	30.11	30.11
Average Delta H (in. H2O)	2.4458	2.4388	2.6500	2.51
Average Delta P (in,H2o)	0.3363	0.3233	0.3463	0.34
Meter Pressure (in. Hg)	30.30	30.30	30.31	30.30
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.002	1.002	1.002	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.044662	11.044662	11.044662	11.04466
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000491
Meter Temperature (F)	72.417	77.417	78.375	76.069
Stack Temperature (F)	113.417	103.500	102.250	106.389
Ending DGM Volume(ACF)	537.987	598.745	659.159	
Beginning DGM Volume (ACF)	489.166	548.537	608.88	
Volume of Dry Gas Sample (acf)	48.8210	50.2080	50.2790	49.7693
Dry, Std. Gas Sample Volume (dscf)	49.1286	50.053	50.061	49.7475
Condensate Collected (mL)	72.00	89.00	87.70	82.90
Moisture Concentration (%)	6.45	7.72	7.62	7.26
Carbon Dioxide Concentration (%)	0.320	0.220	0.400	0.313
Oxygen Concentration (%)	20.300	20.420	20.450	20.390
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.380	79.360	79.150	79.297
Molecular Weight, Dry (lb/lb-mole)	28.8632	28.8520	28.8820	28.8657
Molecular Weight, Wet (lb/lb-mole)	28.1622	28.0139	28.0530	28.0764
SQRT Delta P Avg., Pitot (in. H2O)	0.569051	0.555836	0.581913	0.568934
Avg. Velocity, Stack Gas (ft/sec)	33.6035	32.6240	34.0929	33.4401
Actual Flow Rate (acfm)	22268.334	21619.287	22592.676	22160.099
Dry, Std. Vol. Flow Rate (dscfm)	19303.906	18812.170	19725.345	19280.473
% Isokinetic	95.49	99.83	95.23	96.85
Total Catch (mg) SO3	0.18	0.25	10.67	3.70
SO3 Conc. (grams/dscf)	0.0000	0.0000	0.0002	0.0001
SO3 Conc. (grains/dscf)	0.0001	0.0001	0.0033	0.0011
SO3 Concentration (lb/dscf)	8.08E-09	1.10E-08	4.70E-07	1.63E-07
SO3 Emission Rate (lb/hr)	0.0094	0.0124	0.5562	0.1927

TABLE 6-7

PARTICULATE MATTER EMISSION SUMMARY.

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: DRYER STACK #2

PARTICULATE MATTER SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run		AUGUST 30, 1994		
Starting Time (hours)	1520	1733	1856	
Ending Time (hours)	1623	1838	1958	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.06	30.06	30.06	
Static Pressure (in. H2O)	-0.22	-0.22	-0.22	
Stack Pressure (in. Hg)	30.04	30.04	30.04	30.04
Average Delta H (in. H2O)	2.3029	2.2613	2.2383	2.27
Average Delta P (in,H2o)	0.2992	0.2917	0.2850	0.29
Meter Pressure (in. Hg)	30.23	30.23	30.22	30.23
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.002	1.002	1.002	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.044662	11.044662	11.044662	11.04466
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000491
Meter Temperature (F)	75.500	79.750	83.625	79.625
Stack Temperature (F)	103.583	102.667	104.500	103.583
Ending DGM Volume(ACF)	714.134	774.13	832.62	
Beginning DGM Volume (ACF)	667.141	726.747	785.615	
Volume of Dry Gas Sample (acf)	46.9930	47.3830	47.0050	47.1270
Dry, Std. Gas Sample Volume (dscf)	46.9073	46.919	46.211	46.6792
Condensate Collected (mL)	96.50	89.70	88.20	91.47
Moisture Concentration (%)	8.83	8.26	8.24	8.44
Carbon Dioxide Concentration (%)	0.300	0.400	0.300	0.333
Oxygen Concentration (%)	20.380	20.430	20.300	20.370
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.320	79.170	79.400	79.297
Molecular Weight, Dry (lb/lb-mole)	28.8632	28.8812	28.8600	28.8681
Molecular Weight, Wet (lb/lb-mole)	27.9041	27.9829	27.9648	27.9506
SQRT Delta P Avg., Pitot (in. H2O)	0.532303	0.524855	0.516691	0.524616
Avg. Velocity, Stack Gas (ft/sec)	31.3416	30.8344	30.4141	30.8633
Actual Flow Rate (acfm)	20769.412	20433.348	20154.774	20452.511
Dry, Std. Vol. Flow Rate (dscfm)	17813.572	17664.152	17369.102	17615.609
% Isokinetic	98.80	99.67	99.83	99.43
Total Filter Catch (mg)	0.40	1.50	0.10	0.67
Total Wash Catch (mg)	4.90	3.80	3.70	4.13
Total Catch (mg)	5.30	5.30	3.80	4.80
Particulate Conc. (grams/dscf)	0.0001	0.0001	0.0001	0.0001
Particulate Conc. (grains/dscf)	0.0017	0.0017	0.0012	0.0016
Particulate Concentration (lb/dscf)	2.49E-07	2.49E-07	1.81E-07	2.27E-07
Particulate Emission Rate (lb/hr)	0.2663	0.2640	0.1890	0.2397

TABLE 6-8

SULFUR DIOXIDE EMISSION SUMMARY.
SO2

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: DRYER STACK #2

SO2 EMISSION SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run		AUGUST 30, 1994		
Starting Time (hours)	1520	1733	1856	
Ending Time (hours)	1623	1838	1958	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.06	30.06	30.06	
Static Pressure (in. H2O)	-0.22	-0.22	-0.22	
Stack Pressure (in. Hg)	30.04	30.04	30.04	30.04
Average Delta H (in. H2O)	2.3029	2.2613	2.2383	2.27
Average Delta P (in,H2o)	0.2992	0.2917	0.2850	0.29
Meter Pressure (in. Hg)	30.23	30.23	30.22	30.23
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.002	1.002	1.002	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.044662	11.044662	11.044662	11.04466
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000491
Meter Temperature (F)	75.500	79.750	83.625	79.625
Stack Temperature (F)	103.583	102.667	104.500	103.583
Ending DGM Volume(ACF)	714.134	774.13	832.62	
Beginning DGM Volume (ACF)	667.141	726.747	785.615	
Volume of Dry Gas Sample (acf)	46.9930	47.3830	47.0050	47.1270
Dry, Std. Gas Sample Volume (dscf)	46.9073	46.919	46.211	46.6792
Condensate Collected (mL)	96.50	89.70	88.20	91.47
Moisture Concentration (%)	8.83	8.26	8.24	8.44
Carbon Dioxide Concentration (%)	0.300	0.400	0.300	0.333
Oxygen Concentration (%)	20.380	20.430	20.300	20.370
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.320	79.170	79.400	79.297
Molecular Weight, Dry (lb/lb-mole)	28.8632	28.8812	28.8600	28.8681
Molecular Weight, Wet (lb/lb-mole)	27.9041	27.9829	27.9648	27.9506
SQRT Delta P Avg., Pitot (in. H2O)	0.532303	0.524855	0.516691	0.524616
Avg. Velocity, Stack Gas (ft/sec)	31.3416	30.8344	30.4141	30.8633
Actual Flow Rate (acfm)	20769.412	20433.348	20154.774	20452.511
Dry, Std. Vol. Flow Rate (dscfm)	17813.572	17664.152	17369.102	17615.609
% Isokinetic	98.80	99.67	99.83	99.43
Total Catch (mg) SO2	N/D	N/D	1.60	0.53
SO2 Conc. (grams/dscf)	N/D	N/D	0.0000	0.0000
SO2 Conc. (grains/dscf)	N/D	N/D	0.0005	0.0002
SO2 Concentration (lb/dscf)	N/D	N/D	7.63E-08	2.54E-08
SO2 Emission Rate (lb/hr)	N/D	N/D	0.0796	0.0265

N/D = NON-DETECT

TABLE 6-9

SULFUR TRIOXIDE EMISSION SUMMARY.
SO3

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: DRYER STACK #2

SO3 EMISSION SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run		AUGUST 30, 1994		
Starting Time (hours)	1520	1733	1856	
Ending Time (hours)	1623	1838	1958	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.06	30.06	30.06	
Static Pressure (in. H2O)	-0.22	-0.22	-0.22	
Stack Pressure (in. Hg)	30.04	30.04	30.04	30.04
Average Delta H (in. H2O)	2.3029	2.2613	2.2383	2.27
Average Delta P (in,H2o)	0.2992	0.2917	0.2850	0.29
Meter Pressure (in. Hg)	30.23	30.23	30.22	30.23
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.002	1.002	1.002	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.044662	11.044662	11.044662	11.04466
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000491
Meter Temperature (F)	75.500	79.750	83.625	79.625
Stack Temperature (F)	103.583	102.667	104.500	103.583
Ending DGM Volume(ACF)	714.134	774.13	832.62	
Beginning DGM Volume (ACF)	667.141	726.747	785.615	
Volume of Dry Gas Sample (acf)	46.9930	47.3830	47.0050	47.1270
Dry, Std. Gas Sample Volume (dscf)	46.9073	46.919	46.211	46.6792
Condensate Collected (mL)	96.50	89.70	88.20	91.47
Moisture Concentration (%)	8.83	8.26	8.24	8.44
Carbon Dioxide Concentration (%)	0.300	0.400	0.300	0.333
Oxygen Concentration (%)	20.380	20.430	20.300	20.370
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.320	79.170	79.400	79.297
Molecular Weight, Dry (lb/lb-mole)	28.8632	28.8812	28.8600	28.8681
Molecular Weight, Wet (lb/lb-mole)	27.9041	27.9829	27.9648	27.9506
SQRT Delta P Avg., Pitot (in. H2O)	0.532303	0.524855	0.516691	0.524616
Avg. Velocity, Stack Gas (ft/sec)	31.3416	30.8344	30.4141	30.8633
Actual Flow Rate (acfm)	20769.412	20433.348	20154.774	20452.511
Dry, Std. Vol. Flow Rate (dscfm)	17813.572	17664.152	17369.102	17615.609
% Isokinetic	98.80	99.67	99.83	99.43
Total Catch (mg) SO3	6.25	3.31	2.33	3.96
SO3 Conc. (grams/dscf)	0.0001	0.0001	0.0000	0.0001
SO3 Conc. (grains/dscf)	0.0021	0.0011	0.0008	0.0013
SO3 Concentration (lb/dscf)	2.94E-07	1.56E-07	1.11E-07	1.87E-07
SO3 Emission Rate (lb/hr)	0.3140	0.1649	0.1159	0.1982

TABLE 6-10

KILN OUTLET
EMISSION RATE CALCULATION
TOTAL HYDROCARBONS (THC)

En - TOTAL HYDROCARBONS (THC) Emission Rate; lb/hr
Qsd - *Volumetric Flow Rate of Stack Gas, Corrected to Dry,* Standard Conditions; DSCF/min.
Mw - Molecular Weight of TOTAL HYDROCARBONS (THC); 44.0 g/gmole
Cn - Concentration of TOTAL HYDROCARBONS (THC); Dry Basis
K1 - Conversion Factor; Part Per Million
K2 - *Conversion Factor; 385.3 g/gmole-lb/ft3*
k3 - Conversion Factor; 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA
KILN OUTLET

RUN 1:	Cn =	7.800	Qsd =	17234.991
RUN 2:	Cn =	6.100	Qsd =	17135.054
RUN 3:	Cn =	6.200	Qsd =	17838.682
AVERAGE:	=	**6.700**		**17402.91**

TOTAL HYDROCARBONS (THC) Emission
CALCULATIONS:
KILN OUTLET

RUN 1: 7.8 * 44 * 17234.99 * 60
(385.3 E6)
= **0.921108** LB/HR

RUN 2: 6.1 * 44 * 17135.05 * 60
(385.3 E6)
= **0.716177** LB/HR

RUN 3: 6.2 * 44 * 17838.68 * 60
(385.3 E6)
= **0.757808** LB/HR

AVERAGE: = **0.798364** LB/HR

TABLE 6-11

KILN OUTLET
EMISSION RATE CALCULATION
OXIDES OF NITROGEN (NOx)

En - OXIDES OF NITROGEN (NOx) Emission Rate; lb/hr
Qsd - Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions; DSCF/min.
Mw - Molecular Weight of OXIDES OF NITROGEN (NOx)0 46.0 g/gmole
Cn - Concentration of OXIDES OF NITROGEN (NOx); Dry Basis
K1 - Conversion Factor; Part Per Million
K2 - Conversion Factor; 385.3 g/gmole-lb/ft3
k3 - Conversion Factor; 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA
KILN OUTLET

RUN 1:	Cn =	16.3830	Qsd =	17234.99
RUN 2:	Cn =	15.6300	Qsd =	17135.05
RUN 3:	Cn =	7.2500	Qsd =	17838.68
AVERAGE:	=	**13.088**		**17402.91**

OXIDES OF NITROGEN (NOx) Emission CALCULATIONS:
KILN OUTLET

RUN 1: 16.383 * 46 * 17234.99 * 60 / (385.3 E6) = **2.022621** LB/HR

RUN 2: 15.63 * 46 * 17135.05 * 60 / (385.3 E6) = **1.918468** LB/HR

RUN 3: 7.25 * 46 * 17838.68 * 60 / (385.3 E6) = **0.926426** LB/HR

AVERAGE: = **1.622505** LB/HR

TABLE 6-12

KILN OUTLET
EMISSION RATE CALCULATION
CARBON MONOXIDE (CO)

En - Carbon monoxide Emission Rate; lb/hr
Qsd - Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions; DSCF/min.
Mw - Molecular Weight of Carbon Monoxide; 28.0 g/gmole
Cn - Concentration of Carbon Monoxide; Dry Basis
K1 - Conversion Factor; Part Per Million
K2 - Conversion Factor; 385.3 g/gmole-lb/ft3
k3 - Conversion Factor; 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA
KILN OUTLET AUGUST 29, 1994

RUN 1:	Cn =	130.10	Qsd =	17234.99
RUN 2:	Cn =	125.98	Qsd =	17135.05
RUN 3:	Cn =	136.82	Qsd =	17838.68
AVE:		130.97		17402.91

Carbon Monoxide (CO) Emissions
CALCULATIONS:
KILN OUTLET

RUN 1:

$$\frac{130.1 * 28 * 17234.99 * 60}{(385.3\ E6)} = \mathbf{9.776843}\ LB/HR$$

RUN 2:

$$\frac{125.98 * 28 * 17135.05 * 60}{(385.3\ E6)} = \mathbf{9.412335}\ LB/HR$$

RUN 3:

$$\frac{136.816 * 28 * 17838.68 * 60}{(385.3\ E6)} = \mathbf{10.64167}\ LB/HR$$

AVERAGE **9.943617** LB/HR

TABLE 6-13

DRYER STACK 1 (NORTH)
EMISSION RATE CALCULATION
TOTAL HYDROCARBONS (THC)

En - TOTAL HYDROCARBONS (THC) Emission Rate; lb/hr
Qsd - Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions; DSCF/min.
Mw - Molecular Weight of TOTAL HYDROCARBONS (THC); 44.0 g/gmole
Cn - Concentration of TOTAL HYDROCARBONS (THC); Dry Basis
K1 - Conversion Factor; Part Per Million
K2 - Conversion Factor; 385.3 g/gmole-lb/ft3
k3 - Conversion Factor; 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA
DRYER STACK 1 (NORTH)

RUN 1:	Cn =	1.550	Qsd =	19303.906
RUN 2:	Cn =	0.000	Qsd =	18812.170
RUN 3:	Cn =	0.000	Qsd =	19725.345
AVERAGE:	=	**0.517**		**19280.47**

TOTAL HYDROCARBONS (THC) Emission
CALCULATIONS:
DRYER 1 (NORTH)

RUN 1:

$$\frac{1.55 * 44 * 19303.91 * 60}{(385.3\ E6)} = \mathbf{0.205013}\ LB/HR$$

RUN 2:

$$\frac{0 * 44 * 18812.17 * 60}{(385.3\ E6)} = \mathbf{0}\ LB/HR$$

RUN 3:

$$\frac{0 * 44 * 19725.35 * 60}{(385.3\ E6)} = \mathbf{0}\ LB/HR$$

AVERAGE: = **0.068338 LB/HR**

TABLE 6-14

DRYER 1 (NORTH)
EMISSION RATE CALCULATION
CARBON MONOXIDE (CO)

En - Carbon monoxide Emission Rate; lb/hr
Qsd - Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions; DSCF/min.
Mw - Molecular Weight of Carbon Monoxide; 28.0 g/gmole
Cn - Concentration of Carbon Monoxide; Dry Basis
K1 - Conversion Factor; Part Per Million
K2 - Conversion Factor; 385.3 g/gmole-lb/ft3
k3 - Conversion Factor; 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA
DRYER 1 (NORTH) AUGUST 30, 1994

RUN 1:	Cn =	5.50	Qsd =	19303.91
RUN 2:	Cn =	14.6	Qsd =	18812.17
RUN 3:	Cn =	5.40	Qsd =	19725.35
AVE:		8.50		19280.47

Carbon Monoxide (CO) Emissions
CALCULATIONS:
DRYER 1 (NORTH)

RUN 1:

$$\frac{5.5 * 28 * 19303.91 * 60}{(385.3\ E6)} = \mathbf{0.462933}\ LB/HR$$

RUN 2:

$$\frac{14.6 * 28 * 18812.17 * 60}{(385.3\ E6)} = \mathbf{1.197573}\ LB/HR$$

RUN 3:

$$\frac{5.4 * 28 * 19725.35 * 60}{(385.3\ E6)} = \mathbf{0.464439}\ LB/HR$$

AVERAGE **0.708315** LB/HR

TABLE 6-15

DRYER STACK 2 (SOUTH)
EMISSION RATE CALCULATION
CARBON MONOXIDE (CO)

En - Carbon monoxide Emission Rate; lb/hr
Qsd - Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions; DSCF/min.
Mw - Molecular Weight of Carbon Monoxide; 28.0 g/gmole
Cn - Concentration of Carbon Monoxide; Dry Basis
K1 - Conversion Factor; Part Per Million
K2 - Conversion Factor; 385.3 g/gmole-lb/ft3
k3 - Conversion Factor; 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*K2}$$

TEST DATA
DRYER STACK 2 (SOUTH)

RUN 1:	Cn =	4.70	Qsd =	17813.57 19303.91
RUN 2:	Cn =	3.00	Qsd =	17664.15 18812.17
RUN 3:	Cn =	5.00	Qsd =	17369.10 19725.35
AVE:		4.23		17615.61 19280.47

North Stack Flow Rates. Correct rates shown in red.

Carbon Monoxide (CO) Emissions
CALCULATIONS:
DRYER STACK 2 (SOUTH)

RUN 1: $\frac{4.7 * 28 * 19303.91 * 60}{(385.3\ E6)}$ = 0.365 **0.395597** LB/HR

RUN 2: $\frac{3 * 28 * 18812.17 * 60}{(385.3\ E6)}$ = 0.231 **0.246077** LB/HR

RUN 3: $\frac{5 * 28 * 19725.35 * 60}{(385.3\ E6)}$ = 0.379 **0.430036** LB/HR

AVERAGE 0.325 **0.357237** LB/HR

APPENDIX A

Resumes

RESUME

Robert F. Folle
Air Quality Scientist

EDUCATION:

MBA, Business Management, Golden Gate University, San Francisco, California, 1979
BA, Business Administration, St. Leo College, St. Leo, Florida, 1977

QUALIFICATIONS:

Certified EPA Method 9 visual opacity observer, 40 CFR, Part 52, Appendix F, Air Pollution Control Board, St. Louis, MO, April 1993; Certified AHERA Asbestos Inspector #7ME0409920031R; Certified AHERA Asbestos Mgr. Planner #7ME040992003MPR; Certification of Completion, 40 Hr. Course in Hazardous Materials/Waste Site Investigation, 1989; Certification of Completion, Supervisors Course in Hazardous Materials/Waste Site Operations, 1990; Certification of Completion, Air Dispersion Modeling, 1990; Certification of Completion, Air Dispersion Modeling Laboratory, 1990.

EXPERIENCE:

Over 4 years experience in the performance and management of a diversified range of air quality projects. Performed as field team leader, project manager or group leader on over 200 source emissions projects involving the collection and analysis of air quality data for engineering design, permitting and compliance.

Project manager for numerous air dispersion modeling projects involving the use of the USEPA industrial source complex (ISC) short-term (ISCST) and long-term (ISCLT), complex-1 and screen models.

Extensive experience as field team leader and project manager for continuous emission monitoring system (CEMS) performance specification certification testing including CEMS relative accuracy (RA) certifications.

Participated and managed numerous projects involving asbestos sampling and asbestos air monitoring for facility and transactional environmental audits.

PROFESSIONAL AFFILIATIONS:

Member of the Air and Waste Management Association
Source Evaluation Society

RESUME

J. Todd Staley

Senior Environmental Technician

EDUCATION:

Community College of the Air Force
1983 - 1992 - Management and Construction Technology

QUALIFICATIONS:

Certified EPA Method 9 visual opacity observer
OSHA Hazardous Waste Operations and Emergency Response
RCRA Compliance & Hazardous Waste Management

EXPERIENCE:

Over nine years experience as an environmental technician. Responsible for ensuring compliance and providing technical assistance on waste disposal, UST remediation and air quality projects. Currently assigned to the Air Quality Group engaged in all technical aspects of Source Emissions testing. Participated in several source tests including projects at petroleum refineries, hazardous waste incinerators, chemical production facilities, explosive manufacturers and chemical transfer facilities.

Mr. Staley has served as an Air Quality Technician on several source emission testing projects and Continuous Emission Monitoring System (CEM) specification certifications.

He has provided technical support on several USEPA Method 5 projects including collection and analysis of Air Quality data for a major explosives plant in Missouri.

At a chemical production facility in West Virginia, he assisted in a USEPA Boiler and Industrial Furnace (BIF) project, providing Continuous Emission Monitoring (CEM) specification certifications on two CO and O_2 systems. Certifications included span drift and CEMS relative accuracy tests. (RA)

Mr. Staley is presently providing on-going monitoring services for two benzene transfer facilities in Illinois and Missouri. He is responsible for leak detection monitoring of all components at both facilities on a routine basis.

PROFESSIONAL AFFILIATIONS:

Air and Waste Management Association
Source Evaluation Society

RESUME

Daniel M. Cusac
Air Quality Technician

EDUCATION: Illinois Central College, 1989-1993, Metals Technology

QUALIFICATIONS: Certified EPA Method 9-Visual Plume Observer
OSHA Hazardous Waste Operations and Emergency Response

EXPERIENCE:

Assigned to the Air Quality Division serving as a technician on several Source Emissions Testing projects. Provided technical support for Air Quality projects at petroleum refineries, waste incinerators, chemical production facilities and chemical transfer facilities.

While assigned to the Air Quality Group, Mr. Cusac has provided technical support on several source emission testing projects and Continuous Emission Monitoring (CEM) system certifications.

He has served as an Air Quality Technician on a wide variety of tests utilizing USEPA Methods 1, 2, 3, 4, 5, 9, and 12 for the collection and analysis of total particulate matter, visible opacity and lead.

Mr. Cusac has also performed multi-metals emission testing utilizing USEPA (Draft) Method 0012 at major industrial facilities. He has been involved in the collection and recovery of samples utilizing the procedures outlined in the draft method.

He has participated in conducting Continuous Emission Monitoring (CEM) system performance specification and relative accuracy testing following the guidelines published in the Boilers and Industrial Furnace (BIF) regulation.

PROFESSIONAL AFFILIATIONS: Air and Waste Management Association
Source Evaluation Society

APPENDIX B

Laboratory Analysis

Fugro - McClelland

Lab Name: Triangle Laboratories of RTP, Inc.
TLRTP Project Number: 29512
Date Analyzed: October 3, 1994

Client Project: Marseilles Brick
Date Received: September 9, 1994
Analysis Method: 40 CFR 60 App. A, Method 8

FIELD SAMPLES:

Client Sample I.D. Number:	TLI I.D. Number:	Total Sample Volume, mL:		Aliquot Volume, mL:	Normality BaCl2, meq/mL:	Sample Titrant Volume used, mL:	Blank Titrant Volume, mL:	Sample Results in milligrams:
Run 1 K. Exht SO3	87-194-1	250	*	10	0.010	2.9	0.1	34.33
Run 1 K. Exht SO2	87-194-2	1000	*	2	0.010	21	0.1	3347
Run 2 K. Exht SO3	87-194-3	250	•	10	0.010	3.7	0.1	44.14
Run 2 K. Exht SO2	87-194-4	1000	*	2	0.010	21.4	0.1	3411
Run 3 K. Exht SO3	87-194-5	250	*	10	0.010	6.6	0.1	79.69
Run 3 K. Exht SO2	87-194-6	1000	*	2	0.010	22.3	0.1	3555
Run 1 N. Dryer SO3	87-194-7	250		100	0.010	0.25	0.1	0.18
Run 1 N. Dryer SO2	87-194-8	1000		10	0.010	0.1	0.1	ND
Run 2 N. Dryer SO3	87-194-9	250		100	0.010	0.3	0.1	0.25
Run 2 N. Dryer SO2	87-194-10	1000		10	0.010	0.1	0.1	ND
Run 3 N. Dryer SO3	87-194-11	250		100	0.010	8.8	0.1	10.67
Run 3 N. Dryer SO2	87-194-12	1000		10	0.010	0.1	0.1	ND
Run 1 S. Dryer SO3	87-194-13	250		100	0.010	5.2	0.1	6.25
Run 1 S. Dryer SO2	87-194-14	1000		10	0.010	0.1	0.1	ND
Run 2 S. Dryer SO3	87-194-15	250		100	0.010	2.8	0.1	3.31
Run 2 S. Dryer SO2	87-194-16	1000		10	0.010	0.1	0.1	ND
Run 3 S. Dryer SO3	87-194-17	250		100	0.010	2	0.1	2.33
Run 3 S. Dryer SO2	87-194-18	1000		10	0.010	0.15	0.1	1.60
80% IPA Blank	87-194-19	250		100	0.010	0.0	---	
3% H2O2 Blank	87-194-20	250		10	0.010	0.1	0.1	
Lab IPA Blank	---	100		100	0.010	0.1	—	

AUDIT SAMPLES:

Dry Gas Volume used, DSCM: 2.1E-02 mg/DSCM

Audit Vial # 1194	100	20	0.010	1.6	0.1	114.39

COMMENTS:

The true value of the audit used for this project was known (114.4 mg/DSCM), and the titration yielded a value within 5% of this value.

• A smaller aliquot was used for these samples due to high concentrations found during initial screening.

Triangle Laboratories of RTP, Inc.
801 Capitola Drive • Durham, NC 27713
Tele.: 919-544-5729 • Fax: 919-544-5491

Printed: 05:52 PM on 05-Oct-94

PARTICULATE LABORATORY ANALYSIS

Project Name: Marseilles Brick

Project Number: 0894-8805-2

Source: North Dryer

Date Sampled: 8-30-94

Date Analyzed: 9-7-94

Analyzed By: RTT

Run No. 1	Run No. 2	Run No. 3	Run No.
Beaker No. 94-140	Beaker No. 94-141	Beaker No. 94-142	Beaker No.
Beaker Vol 100 ml ml	Beaker Vol 100 ml ml	Beaker Vol 100 ml ml	Beaker Vol ml
Final Wt 63.9945 g	Final Wt 62.5166 g	Final Wt 60.8190 g	Final Wt g
Tare Wt 63.9832 g	Tare Wt 62.5138 g	Tare Wt 60.8101 g	Tare Wt g
Wt Gain 11.3 mg	Wt Gain 2.8 mg	Wt Gain 8.9 mg	Wt Gain mg
Blk Corr 0.3 mg	Blk Corr 0.3 mg	Blk Corr 0.3 mg	Blk Corr mg
Net Wt 11.0 mg	Net Wt 2.5 mg	Net Wt 8.6 mg	Net Wt mg
Filter No. 940126	Filter No. 940127	Filter No. 940128	Filter No.
Final Wt 0.3421 g	Final Wt 0.3428 g	Final Wt 0.3406 g	Final Wt g
Tare Wt 0.3407 g	Tare Wt 0.3420 g	Tare Wt 0.3406 g	Tare Wt g
Wt Gain 1.4 mg	Wt Gain 0.8 mg	Wt Gain 0 mg	Wt Gain mg
Blk Gain 0.0 mg	Blk Gain 0.0 mg	Blk Gain 0 mg	Blk Gain mg
Net Wt 1.4 mg	Net Wt 0.8 mg	Net Wt 0 mg	Net Wt mg
TOTAL PARTICULATE WTS	TOTAL PARTICULATE WTS	TOTAL PARTICULATE WTS	TOTAL PARTICULATE WTS
Filter 1.4 mg	Filter 0.8 mg	Filter 0.0 mg	Filter mg
Wash 11.0 mg	Wash 2.5 mg	Wash 8.6 mg	Wash mg
Total 12.4 mg	Total 3.3 mg	Total 8.6 mg	Total mg

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PARTICULATE LABORATORY ANALYSIS

Project Name: Marseilles Brick

Project Number: 0844-8885-2

Source: South Dryer

Date Sampled: 8-30-94

Date Analyzed: 9-7-94

Analyzed By: RFF

Run No. 1	Run No. 2	Run No. 3	Run No.
Beaker No. 94-143	Beaker No. 94-144	Beaker No. 94-145	Beaker No.
Beaker Vol 100 ml ml	Beaker Vol 100 ml ml	Beaker Vol 100 ml ml	Beaker Vol ml
Final Wt 63.4989 g	Final Wt 63.7469 g	Final Wt 62.4608 g	Final Wt g
Tare Wt 63.4937 g	Tare Wt 63.7428 g	Tare Wt 62.4568 g	Tare Wt g
Wt Gain 5.2 mg	Wt Gain 4.1 mg	Wt Gain 4.0 mg	Wt Gain mg
Blk Corr 0.3 mg	Blk Corr 0.3 mg	Blk Corr 0.3 mg	Blk Corr mg
Net Wt 4.9 mg	Net Wt 3.8 mg	Net Wt 3.7 mg	Net Wt mg
Filter No. 940129	Filter No. 940130	Filter No. 940131	Filter No.
Final Wt 0.3425 g	Final Wt 0.3427 g	Final Wt 0.3420 g	Final Wt g
Tare Wt 0.3421 g	Tare Wt 0.3412 g	Tare Wt 0.3419 g	Tare Wt g
Wt Gain 0.4 mg	Wt Gain 1.5 mg	Wt Gain 0.1 mg	Wt Gain mg
Blk Gain 0.0 mg	Blk Gain 0.0 mg	Blk Gain 0.0 mg	Blk Gain mg
Net Wt 0.4 mg	Net Wt 1.5 mg	Net Wt 0.1 mg	Net Wt mg
TOTAL PARTICULATE WTS	TOTAL PARTICULATE WTS	TOTAL PARTICULATE WTS	TOTAL PARTICULATE WTS
Filter 0.4 mg	Filter 1.5 mg	Filter 0.1 mg	Filter mg
Wash 4.9 mg	Wash 3.8 mg	Wash 3.7 mg	Wash mg
Total 5.3 mg	Total 5.3 mg	Total 3.8 mg	Total mg

FUGRO McClelland

PARTICULATE LABORATORY ANALYSIS

Project Name: Marseilles Brick

Date Sampled: 8 29-94

Project Number: 0894-8885-2

Date Analyzed: 9-1-94

Source: KILN EXHAUST

Analyzed By: STS

Run No. 1	Run No. 2	Run No. 3	Run No. BLANK
Beaker No. 94-137	Beaker No. 94-138	Beaker No. 94-139	Beaker No. 94-100
Beaker Vol 100 ml ml	Beaker Vol 100 ml ml	Beaker Vol 100 ml ml	Beaker Vol 100 ml ml
Final Wt 62.7382 g	Final Wt 64.1636 g	Final Wt 64.4449 g	Final Wt 61.0087 g
Tare Wt 62.5624 g	Tare Wt 64.1081 g	Tare Wt 64.3255 g	Tare Wt 61.0084 g
Wt Gain 175.8 mg	Wt Gain 55.5 mg	Wt Gain 119.4 mg	Wt Gain 0.30 mg
Blk Corr 0.3 mg	Blk Corr 0.3 mg	Blk Corr 0.3 mg	Blk Corr 0.30 mg
Net Wt 175.5 mg	Net Wt 55.2 mg	Net Wt 119.1 mg	Net Wt 0.30 mg
Filter No. 940123	Filter No. 940124	Filter No. 940125	Filter No. 940140 (BLANK)
Final Wt 0.7561 g	Final Wt 0.6057 g	Final Wt 0.6077 g	Final Wt 0.3410 g
Tare Wt 0.3428 g	Tare Wt 0.3427 g	Tare Wt 0.3395 g	Tare Wt 0.3410 g
Wt Gain 413.3 mg	Wt Gain 263.0 mg	Wt Gain 268.2 mg	Wt Gain 0 mg
Blk Gain 0 mg	Blk Gain 0 mg	Blk Gain 0 mg	Blk Gain 0 mg
Net Wt 413.3 mg	Net Wt 263.0 mg	Net Wt 268.2 mg	Net Wt 0 mg
TOTAL PARTICULATE WTS	TOTAL PARTICULATE WTS	TOTAL PARTICULATE WTS	TOTAL PARTICULATE WTS
Filter 413.3 mg	Filter 263.0 mg	Filter 268.2 mg	Filter 0.0 mg
Wash 175.5 mg	Wash 55.2 mg	Wash 119.1 mg	Wash 0.3 mg
Total 588.80 mg	Total 318.20 mg	Total 387.30 mg	Total 0.3 mg

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APPENDIX C

Field Data Sheets

PLANT Marseilles Brick

CITY, STATE Marseilles IL

STACK Kiln Exhaust

PROJECT 0894-8885

TEST SERIES NO.

DATE 8-29-94

VELOCITY TRAVERSE DATA

Run No.

Page ____ of ____

	Clock Time Cyclonic	Port # and Point	Stack Temp. °F	Δp in. H_2O	$\sqrt{\Delta p}$
1	0		435	.34	
2	0		440	.40	
3	0		443	.40	
4	0		445	.30	
5	0		445	.26	
6	0		445	.22	
7	0		445	.18	
8	0		444	.47	
9	0		447	.55	
10	0		449	.52	
11	0		450	.50	
12	0		451	.39	
13	0		452	.36	
14	0		453	.34	
15	0		447	.36	
16	0		452	.38	
17	0		455	.46	
18	0		457	.47	
19	0		458	.50	
20	0		459	.51	
21	0		460	.42	
22					
23					
24					
25					
AVERAGES			449	.40	.6324

PITOT TUBE

Number ____

Coefficient (C_p) ____

Calibration Date ____

PRESSURES

Barometric 30.24 in. Hg

Static -.15 in. H_2O

Stack (P_s) ____ in. Hg

CALCULATIONS

Stack Area (A) ____ ft^2

Water Vapor Conc. 5 %

Dry Gas Fraction (DGF)

DGF = 1 − (%H_2O/100) = ____

Carbon Dioxide Conc. 2.2 %

Oxygen Concentration 16.7 %

Molecular Weight, Wet (M_s) ____

RMS p = $(\overline{\sqrt{\Delta p}})^2$ ____ $\overline{\sqrt{\Delta p}}$ = ____

Stack Temp. ____ °F + 460 = (T_s) ____ °R

Stack Gas Velocity (V_s)

$V_s = (\sqrt{(T_s/(P_s M_s))})(\overline{\sqrt{\Delta p}})\, C_p\, 85.49$

V_s = ____ feet/second

Actual Volumetric Flowrate (Q_a)

$Q_a = 3600\, V_s\, A$

Q_a = ____ acf/hour

$Q_a/60$ = ____ acf/min.

Dry, Standard Volumetric Flowrate (Q_s)

$Q_s = 17.64\, Q_a\, DGF\, P_s / T_s$

Q_s = ____ dscf/hour

$Q_s/60$ = ____ dscf/min.

Signature ____

.298

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11.67

Company Marseilles Brick Project 0894-8885

Test Location Marseilles IL Date 8-29-94

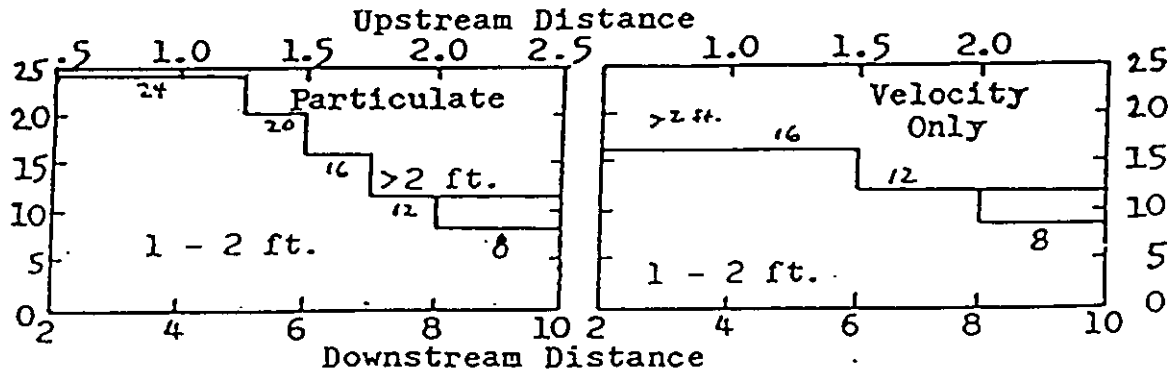
Traverse Point Determination -- Rectangular Duct

Size of Duct 3.417 ft x 3.417 ft Equivalent Diameter ____ ft
(2LW/L+W)

Distance upstream from disturbance ____ ft ____ diameters

Distance downstream from disturbance ____ ft ____ diameters

Minimum Number of Traverse Points



Minimum number of traverse points 21

Matrix layout 3 ports x 7 traverse points

Distance between traverse points 5.86' ft
(Depth of duct / Points at one port)

Distance from stack wall to first point 2.93 ft
(Distance between points / 2)

Port Extension Length 20 inches

Point	Distances From Stack Wall (inches)	End of Port
1	2.93	22.9
2	8.78	28.8
3	14.64	34.6
4	20.5	40.5
5	26.36	46.36
6	32.21	52.21
7	38.07	58.07

Cross Section

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Company Marseles Brick Project 0894-8885

Test Location Marseilles IL Date 8-30-94

Traverse Point Determination — Circular Stacks

Stack Inside Diameter 3.75 feet

Is diameter greater than 12 inches? Yes / No

Distance Upstream from Disturbance ____ ft ____ diameters

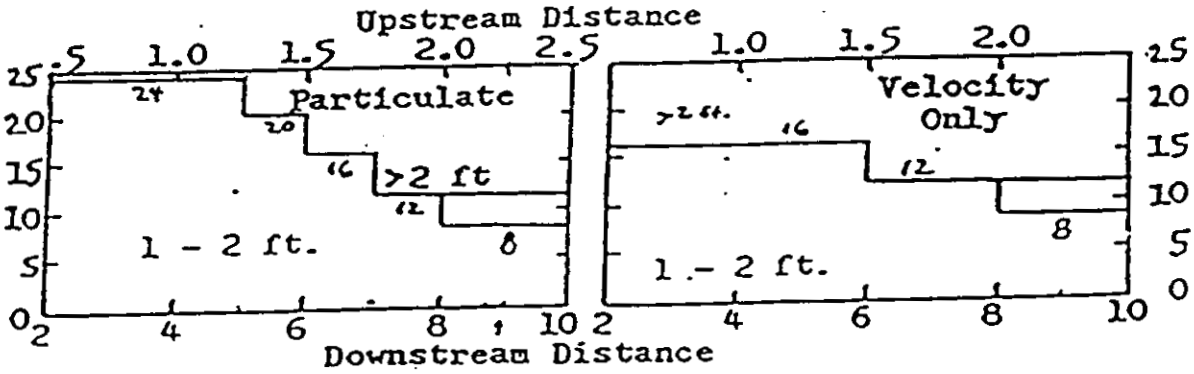
Distance Downstream from Disturbance ____ ft ____ diameters

Are the ports greater than two diameters downstream and one-half diameter upstream from disturbances? Yes / No

Number of Traverse Points Required (as shown in 40CFR60, Appendix A, Method 1) 24 points

Number of Traverse Points per Diameter ~~24~~ 12

Minimum Number of Traverse Points



Port Extension Length 6 inches

Point No.	% of ID From Wall	Distance To Inside Wall	Distance To Outside Port Edge
1	2.1	0.94	6.94
2	6.7	3.0	9.0
3	11.8	5.3	11.3
4	17.7	8.0	14.0
5	25.0	11.25	17.25
6	35.6	16.0	22.0
7	64.4	29.0	32.0
8	75.0	33.7	39.7
9	82.3	37.0	43.0
10	88.2	39.7	45.7
11	93.3	42.0	48.0
12	97.9	44.0	50.0

PLANT Marseilles Brick

CITY, STATE Marseilles IL

STACK North Dryer

PROJECT 0894-8885

TEST SERIES NO. —

DATE 8-30-94

VELOCITY TRAVERSE DATA

Run No. _____

Page ____ of ____

	Clock Time	Port # and Point	Stack Temp. °F	Δp in. H_2O	$\sqrt{\Delta p}$
1	0		108	.71	
2	0		114	.65	
3	0		115	.55	
4	0		116	.35	
5	0		116	.27	
6	0		117	.15	
7	0		117	.14	
8	0		117	.20	
9	0		117	.21	
10	0		117	.11	
11	0		118	.21	
12	0		118	.21	
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
AVERAGES			116	.313	0.5595

PITOT TUBE

Number _____

Coefficient (C_p) .84

Calibration Date _____

PRESSURES

Barometric 30.12 in. Hg

Static -.12 in. H_2O

Stack (P_s) _____ in. Hg

CALCULATIONS

Stack Area (A) _____ ft^2

Water Vapor Conc. 5 %

Dry Gas Fraction (DGF)

DGF = 1 − (%H_2O/100) = _____

Carbon Dioxide Conc. _____ %

Oxygen Concentration _____ %

Molecular Weight, Wet (M_s) _____

RMS p = $(\overline{\sqrt{\Delta p}})^2$ _____ $\overline{\sqrt{\Delta p}}$ = _____

Stack Temp. _____ °F + 460 = (T_s) _____ °R

Stack Gas Velocity (V_s)

$V_s = [\sqrt{(T_s/(P_s M_s))}][\overline{\sqrt{\Delta p}}]\, C_p\, 85.49$

V_s = _____ feet/second

Actual Volumetric Flowrate (Q_a)

$Q_a = 3600\, V_s\, A$

Q_a = _____ acf/hour

$Q_a/60$ = _____ acf/min.

Dry, Standard Volumetric Flowrate (Q_s)

$Q_s = 17.64\, Q_a\, DGF\, P_s / T_s$

Q_s = _____ dscf/hour

$Q_s/60$ = _____ dscf/min.

Signature _____

FUGRO McClelland

FUGRO

Page of

Client: Marseilles Brick	Hot Box No.: STL2	Barometric Pressure: 30.24	
Location: Marseilles IL	Cold Box No.: STL2	Stack Diameter, in: 11.674	
Source I.D.: Kiln Exaust	Console No.: STL2	Nozzle Diameter, in: .37	
Project No.: 0891-8885	Pitot No.:	Filter No.: 940123	
Date: 8-29-94	Pitot Coefficient: .84	Ambient Temp.: 75	
Run Number: 1	DGMC Factor: 1.002	Static Pressure: -.15	
Operator: STJ	Meter ΔH@: 1.887	K Factor: 11.35	

91.49

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc.	Orifice Pressure Differential (H2O) Actual Reqd	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
1 (1)W	0	257.989	.30	0.5477	3.405	3.4	449	251	250	64	85	3
2	2.86	260.670	.41	0.6403	4.6535	4.6	453	250	250	55	86	5
3	5.72	263.990	.35	0.5916	3.9725	4.0	418	250	250	61	88	5
4	8.58	267.120	.30	0.5477	3.405	3.4	425	250	251	60	88	5
5	11.44	269.610	.25	0.5000	2.8375	2.8	433	250	250	60	90	4
6	14.3	272.420	.21	0.4582	2.3835	2.4	433	250	250	60	90	4
7	17.16	274.970	.15	0.3873	1.7025	1.7	435	250	250	61	90	4
8 (2)	20.02	276.83	.45	0.6708	5.105	5.1	446	250	251	60	91	5
9	22.88	279.590	.51	0.7141	5.7885	5.8	451	250	250	60	92	6
10	25.74	283.620	.50	0.7071	5.675	5.6	455	251	251	59	93	5
11	28.6	286.950	.30	0.5477	3.405	3.4	458	250	250	59	94	5
12	31.46	290.500	.35	0.5916	3.9725	4.0	385	250	250	58	95	5
13	34.32	293.640	.35	0.5916	3.9725	4.0	419	250	251	59	96	5
14	37.18	297.400	.25	0.5000	2.8375	2.8	425	250	251	60	94	5
15 (3)	40.04	298.707	.35	0.5916	3.9725	4.0	428	250	250	61	94	5
16	42.9	301.570	.40	0.6324	4.540	4.5	436	250	251	62	95	5
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	100	100	0
Second Impinger	140	100	40
Third Impinger	110	100	10
Silica Gel		250	31.1
	81.1	Total Condensate	

28.3475

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	16.73	2.218		
2	16.73	2.218		
3	16.73	2.218		
Avg				

COMMENTS:

Start 1048

Stop 1154

Pretest Leak Check @ 10 "Hg for 0.00 CFM

Postest Leak Check @ 10 "Hg for 0.000 CFM

Point and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H) (H2O)		Orifice Pressure Differential (H) (H2O)		Stack Gas Temperature (°F)	Sample Train Temperatures (°F)				Vacuum (Hg)
			ΔP	VAR	Calc	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter	
17	45.76	303.470	.40	0.6321	4.540	4.5	443	250	250	62	96	5
18	48.62	307.990	.45	0.6708	5.1075	5.1	445	250	250	62	96	4
19	51.48	311.600	.51	0.7141	5.7885	5.8	448	250	250	63	97	6
20	54.34	315.000	.46	0.6782	5.221	5.2	452	251	250	64	98	6
21	57.2	318.480	.42	0.6480	4.767	4.8	457	250	250	64		
	60.06	321.647										
Total/Avg			.364			4.13	437				92	

FUGRO

Client: Marseilles Brick	Hot Box No.: STL2	Barometric Pressure: 30.24
Location: Marseilles IL	Cold Box No.: STL2	Stack Diameter, in: 11.674
Source I.D.: Kiln Exaust	Console No.: STL2	Nozzle Diameter, in: .37
Project No.: 0894-8885	Pitot No.:	Filter No.: 940124
Date: 8-29-94	Pitot Coefficient: .84	Ambient Temp.: 81
Run Number: 2	DGMC Factor: 1.002	Static Pressure: -.15
Operator: JTS	Meter ΔH@: 1.887	K Factor: 11.52

41.14

Port end Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Orifice Pressure Differential (H2O) ΔH@		Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (in Hg)
				Calc	Actual						
1 (1)E	0	333.035	.32	0.5657	3.6864	3.7	437	250	251	60	90	2
2	2.7	335.820	.41	0.6403	4.7252	4.7	451	251	250	52	90	2
3	5.7	339.300	.35	0.5916	4.032	4.0	455	250	250	52	91	2
4	8.6	342.321	.43	0.6557	4.9536	4.9	423	250	251	53	92	2
5	11.4	345.410	.47	0.6856	5.444	5.4	414	250	250	53	92	2
6	14.3	349.016	.45	0.6708	5.184	5.2	424	250	250	52	93	2
7	17.2	352.610	.35	0.5916	4.032	4.0	428	250	251	52	94	2
8 (2)	20.0	355.700	.40	0.6324	4.608	4.6	434	251	251	50	94	2
9	22.9	357.521	.40	0.6324	4.608	4.6	435	251	250	51	95	2
10	25.7	361.600	.51	0.7141	5.8752	5.9	443	250	250	54	95	4
11	28.6	365.520	.42	0.6481	4.8384	4.8	448	251	250	52	95	4
12	31.5	369.120	.40	0.6324	4.608	4.6	452	250	250	54	96	4
13	34.3	372.760	.25	0.7071	3.3408	3.3	455	250	250	54	96	4
14	37.2	376.000	.35	0.5916	4.032	4.0	460	250	250	56	97	3
15 (3)	40.0	378.582	.25	0.7071	3.3408	3.3	411	250	251	57	97	3
16	42.9	380.840	.30	0.5477	3.456	3.4	420	250	250	58		
Total/Avg.											

	Final Weights	Initial Weights	Weight Gained
First Impinger	100	100	—
Second Impinger	140	100	40
Third Impinger	112	100	12
Silica Gel		250	27.3
	79.3	Total Condensate	

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	18.3	2.33		
2	18.3	2.33		
3	18.3	2.33		
AVG				

COMMENTS:
Start 1250
Stop 1355

Pretest Leak Check @ 15 "Hg for 0.002 CFM

Postest Leak Check @ 15 "Hg for 0.002 CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O)		Orifice Pressure Differential (H_2O)		Stack Gas Temperature (°F)	Sample Train Temperatures (°F)				Vacuum (Hg)
			ΔP	√ΔP	Calc.	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter	
17	45.8	383.940	.30	2.5477	3.456	3.4	427	250	250	61	95	3
18	48.6	386.620	.25	0.5000	2.880	2.8	430	250	251	61	96	3
19	51.5	389.320	.30	0.5477	3.456	3.4	435	250	251	62	96	3
20	54.3	391.200	.32	0.5657	3.6864	3.7	439	250	251	63	97	3
21	57.2	395.800	.26	0.5099	2.9952	3.0	441	251	251	64	98	3
	60.0	397.720										
Total/Avg.			3.56			4.13	436					

Portland Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O)		Orifice Pressure Differential (H2O)		Stack Gas Temperature (°F)	Sample Train Temperatures (°F)				Vacuum (Hg)
			ΔP	√ΔP	Calc	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter	
17	45.8	383.940	.30	0.5477	3.456	3.4	427	250	250	61	95	3
18	48.6	386.620	.25	0.5000	2.880	2.8	430	250	251	61	96	3
19	51.5	389.320	.30	0.5477	3.456	3.4	435	250	251	62	96	3
20	54.3	391.200	.32	0.5657	3.6864	3.7	439	250	251	63	97	3
21	57.2	395.800	.26	0.5099	2.9952	3.0	441	251	251	64	98	3
	60.0	397.720										
Total/Avg			.3.56			4.13	436					

FUGRO

Client: Marseilles Rock	Hot Box No.: STC2	Barometric Pressure: 30.24
Location: Marseilles IL	Cold Box No.: STC2	Stack Diameter, in: 41
Source I.D.: Kiln Exaust	Console No.: STC2	Nozzle Diameter, in: .37
Project No.: 0894-8885	Pitot No.:	Filter No.: 940125
Date: 8-29-94	Pitot Coefficient: .84	Ambient Temp.: 85
Run Number: 3	DGMC Factor: 1.002	Static Pressure: -.15
Operator: JTS	Meter ΔH@: 1.887	K Factor: 11.65

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc.	Orifice Pressure Differential (H2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
1 (1)W	0	413.778	.30	0.5477	3.456	3.4	423	250	251	52	95	2
2	2.7	416.240	.35	0.5916	4.032	4.0	446	250	250	52	95	2
3	5.7	419.690	.35	0.5916	4.032	4.0	447	250	250	52	95	2
4	8.6	421.930	.42	0.6481	4.8384	4.8	449	250	250	53	96	2
5	11.4	426.300	.47	0.6856	5.4755	5.5	453	250	250	53	96	2
6	14.3	429.721	.42	0.6481	4.8384	4.8	455	250	251	54	96	2
7	17.2	432.410	.25	0.5000	2.9125	2.9	400	250	250	55	96	2
8 (2)	20.0	435.142	.45	0.6708	5.2425	5.2	420	250	250	58	97	2
9	22.9	438.310	.51	0.7141	5.9415	5.9	426	250	250	57	97	4
10	25.7	442.200	.47	0.6856	5.4755	5.5	432	250	250	59	97	3
11	28.6	445.000	.40	0.6324	4.660	4.7	434	250	251	59	98	3
12	31.5	448.830	.40	0.6324	4.660	4.7	439	250	250	60	98	3
13	34.3	452.160	.35	0.5916	4.032	4.0	443	250	251	60	98	3
14	37.2	455.420	.20	0.4472	2.3360	2.3	445	250	250	61	99	3
15 (3)	40.0	458.264	.30	0.5477	3.456	3.4	449	251	250	60	99	3
16	42.9	459.990	.34	0.5831	3.961	4.0	429	251	250	62	99	3
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	100	100	0
Second Impinger	142	100	42
Third Impinger	110	100	10
Silica Gel	258.2	250	8.2
	60.2	Total Condensate	

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	19.38	2.27		
2	19.38	2.27		
3	19.38	2.27		
AVG				

COMMENTS:
Start 1451
Stop 1556

Pretest Leak Check @ 15 "Hg for 0.000 CFM

Postest Leak Check @ 10 "Hg for 0.000 CFM

Portland Traverse Point No.	Sample Time (min)	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc	Orifice Pressure Differential (H2O) Actual	Stack Gas Temperature (°R)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
17	45.8	464.120	.45	0.6708	5.2425	5.2	418	250	250	62	100	3
18	48.6	466.200	.36	0.6000	4.1940	4.2	423	250	251	63	101	3
19	51.5	470.350	.30	0.5477	3.495	3.5	428	250	250	64	101	3
20	54.3	474.100	.40	0.6324	4.66	4.7	434	250	251	65	102	3
21	57.2	476.220	.45	0.6708	5.2425	5.2	437	250	250	65	102	3
	60.0	479.652										
Total/Avg												

FUGRO

Client: Marseilles Brick	Hot Box No.: STL2	Barometric Pressure: 30.12
Location: Marseilles IL	Cold Box No.: STL2	Stack Diameter, in: 45
Source I.D.: NORTH DRYER	Console No.: STL2	Nozzle Diameter, in: .30
Project No.: 0894-8885	Pitot No.:	Filter No.: 940126
Date: 8-30-94	Pitot Coefficient: .84	Ambient Temp.: 65
Run Number: 1	DGMC Factor: 1.002	Static Pressure: -.12
Operator: JTS	Meter ΔH@: 1.887	K Factor: 7.27

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc.	Orifice Pressure Differential (H2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
1 (E)	0	489.166	.67	0.8185	4.8709	4.9	110	250	250	62	66	5
2	2.5	493.020	.56	0.7483	4.0712	4.1	112	250	249	52	66	5
3	5.0	495.020	.50	0.7071	3.635	3.6	113	250	248	52	66	5
4	7.5	497.120	.37	0.6083	2.6899	2.7	113	250	250	56	66	5
5	10.0	499.320	.31	0.5568	2.2537	2.2	113	250	250	60	66	3
6	12.5	501.390	.20	0.4472	1.454	1.4	114	250	250	61	67	2
7	15.0	502.900	.15	0.3880	1.0905	1.1	114	250	250	61	67	2
8	17.5	504.370	.25	0.5000	1.8175	1.8	114	250	250	60	70	2
9	20.0	506.300	.40	0.6324	2.908	2.9	114	250	250	60	72	2
10	22.5	508.220	.40	0.6324	2.908	2.9	114	250	253	60	74	2
11 *	25.0	510.220	.41	0.6403	3.0176	3.0	114	250	250	61	75	2
12	27.5	512.820	.40	0.6324	2.908	2.9	114	251	250	61	77	2
13 (N)	30.0	514.757	.32	0.5657	2.3552	2.3	109	250	248	61	77	2
14	32.5	516.7	.32	0.5657	2.3552	2.3	111	251	249	62	75	2
15	35.0	518.900	.33	0.5844	2.4288	2.4	111	250	248	63	74	2
16	37.5	520.750	.42	0.6481	3.0912	3.1	113	250	250	63	74	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	100	100	0
Second Impinger	140	100	40
Third Impinger	110	100	10
Silica Gel	272.0	250	22.0
	72.0	Total Condensate	

28.0923

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.3	0.32		
2	20.3	0.32		
3	20.3	0.32		
AVG				

COMMENTS:

Start 0937

Stop 1040

* Change K-Factor 7.36

Pretest Leak Check @ 15 "Hg for 0.000 CFM

Postest Leak Check @ 15 "Hg for 0.000 CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc	Orifice Pressure Differential (H2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
17	40.0	523.310	.47	06856	3.4592	3.4	114	250	251	62	72	4
18	42.5	525.300	.32	0.5657	2.3552	2.3	115	250	250	62	73	1
19	45.0	527.420	.20	0.4472	1.472	1.5	115	250	251	63	74	3
20	47.5	529.400	.15	0.3873	1.104	1.1	115	250	250	64	76	2
21	50.0	530.620	.15	0.3873	1.104	1.1	115	250	251	62	77	2
22	52.5	532.010	.24	0.4899	1.7664	1.8	115	250	250	62	77	2
23	55.0	533.820	.25	0.5000	1.890	1.8	115	250	250	62	78	2
24	57.5	535.700	.28	0.5291	2.0608	2.1	115	250	250	63	79	2
	60.0	537.987										
Total/Avg			.336			2.47	114				74	

FUGRO

Client: Marseilles Brick	Hot Box No.: STL 2	Barometric Pressure: 30.12
Location: Marseilles IL	Cold Box No.: STL 2	Stack Diameter, in: 45
Source I.D.: NORTH DRYER	Console No.: STL 2	Nozzle Diameter, in: .30
Project No.: 0844-8885	Pitot No.:	Filter No.: 940128
Date: 8-30-94	Pitot Coefficient: .84	Ambient Temp.: 63
Run Number: 2	DGMC Factor: 1.022	Static Pressure: -.12
Operator: JS	Meter ΔH@: 1.887	K Factor: 7.58

Port and Traverse Point No.	Sample Time (min)	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc.	Orifice Pressure Differential (H2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
1 (N)	0	548.537	.37	0.6083	2.8046	2.8	112	250	250	62	75	2
2	2.5	550.780	.39	0.6245	2.9562	2.9	112	250	249	46	76	2
3	5.0	553.300	.43	0.6557	3.2591	3.2	105	250	250	45	76	2
4	7.5	555.920	.47	0.6856	3.5626	3.6	103	250	251	45	76	2
5	10.0	557.900	.47	0.6856	3.5626	3.6	102	250	250	48	76	2
6	12.5	560.102	.30	0.5477	2.274	2.3	102	250	250	49	77	2
7	15.0	562.400	.15	0.3873	1.137	1.1	103	250	251	49	77	2
8	17.5	564.990	.15	0.3873	1.137	1.1	103	250	250	50	78	2
9	20.0	566.320	.22	0.4690	1.6676	1.7	103	250	251	52	78	2
10	22.5	567.990	.22	0.4690	1.6676	1.7	102	250	250	54	77	2
11	25.0	569.480	.25	0.5000	1.895	1.9	102	250	250	54	77	2
12	27.5	571.920	.27	0.5196	2.0466	2.0	102	250	250	56	78	2
13 (E)	30.0	573.445	.65	0.8062	4.927	4.9	103	250	251	57	78	2
14	32.5	576.780	.54	0.7348	4.032	4.1	102	250	250	58	79	2
15	35.0	579.420	.45	0.6708	3.411	3.4	103	251	250	59	78	2
16	37.5	581.720	.44	0.6633	3.3352	3.3	103	250	250	60	78	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	100	100	0
Second Impinger	142	100	42
Third Impinger	118	100	18
Silica Gel	279	250	29
	89	Total Condensate	

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.42	0.00		
2	20.42	0.00		
3	20.42	0.00		
AVG				

COMMENTS:

Start 1133

Stop 1236

Pretest Leak Check @ 15 "Hg for 0.000 CFM

Postest Leak Check @ 15 "Hg for 0.000 CFM

Portland Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc.	Orifice Pressure Differential (H2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
17	40.0	583.620	.35	0.5916	2.653	2.6	103	251	250	62	77	2
18	42.5	585.920	.20	0.4472	1.516	1.5	103	250	251	62	78	2
19	45.0	588.120	.18	0.4243	1.3644	1.4	103	250	250	63	78	2
20	47.5	589.720	.20	0.4472	1.516	1.5	103	251	251	63	78	2
21	50.0	591.230	.25	0.5000	1.895	1.9	103	251	250	64	78	2
22	52.5	593.100	.35	0.5916	2.653	2.6	103	251	250	64	79	2
23	55.0	595.000	.35	0.5916	2.653	2.6	103	251	250	64	78	2
24	57.5	597.720	.11	0.3317	0.8338	0.83	101	250	251	64	78	2
	60.0	598.745										
Total/Avg.			.323			2.438	103				77	

FUGRO

Client: Marseilles Brick	Hot Box No.: STL2	Barometric Pressure: 30.12
Location: Marseilles Brick	Cold Box No.: STL2	Stack Diameter, in: 45
Source I.D.: North Dryer	Console No.: Silc	Nozzle Diameter, in: .30
Project No.: 0894-8885	Pitot No.:	Filter No.: 940128
Date: 8-30-94	Pitot Coefficient: .84	Ambient Temp.: 72
Run Number: 3	DGMC Factor: 1.002	Static Pressure: -.12
Operator: STS	Meter ΔH@: 1.887	K Factor: 7.66

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc	Orifice Pressure Differential (H2O) Actual Found	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
1 (E)	0	608.880	.63	0.7937	4.8258	4.8	100	250	251	61	76	2
2	2.5	611.580	.45	0.6708	3.447	3.4	100	250	250	52	76	2
3	5.0	613.448	.47	0.6857	3.6002	3.6	101	250	250	51	77	2
4	7.5	615.620	.40	0.6324	3.064	3.1	99	250	250	52	78	2
5	10.0	617.850	.30	0.5477	2.298	2.2	98	250	251	52	77	2
6	12.5	619.240	.30	0.5477	2.298	2.3	103	250	251	53	77	2
7	15.0	622.620	.32	0.5657	2.4512	2.4	103	250	251	54	78	2
8	17.5	624.250	.27	0.5196	2.0682	2.1	103	250	251	55	78	2
9	20.0	627.240	.25	0.5000	1.915	1.9	103	250	250	56	78	2
10	22.5	628.250	.27	0.5196	2.4517	2.4	103	250	251	57	78	2
11	25.0	630.421	.37	0.6083	2.8342	2.8	104	251	250	58	79	2
12	27.5	632.207	.37	0.6083	2.8342	2.8	103	251	250	59	79	2
13	30.0	634.528	.34	0.5831	2.6044	2.6	99	250	250	60	78	2
14	32.5	636.770	.37	0.6083	2.8342	2.8	102	250	251	60	78	2
15	35.0	639.340	.38	0.6164	2.9108	2.9	102	250	250	60	79	2
16	37.5	641.120	.43	0.6557	3.2938	3.3	103	250	250	60	80	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	100	100	0
Second Impinger	143	100	43
Third Impinger	119	100	19
Silica Gel	275.7	250	25.7
	87.7	Total Condensate	

28.2196

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.45	.40		
2	20.45	.40		
3	20.45	.40		
AVG				

COMMENTS:

Start 1311

Stop 1417

Pretest Leak Check @ 12 "Hg for 0.000 CFM

Posttest Leak Check @ "Hg for CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O)		Orifice Pressure Differential (H2O)		Stack Gas Temperature (°F)	Sample Train Temperatures (°F)				Vacuum (" Hg)
			ΔP	√ΔP	Calc.	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter	
17	40.0	643.240	.45	0.6708	3.447	3.4	103	250	250	62	80	2
18	42.5	646.100	.47	0.6855	3.6002	3.6	103	251	250	62	80	2
19	45.0	648.250	.32	0.5657	2.4512	2.4	103	250	250	60	80	2
20	47.5	650.640	.30	0.5477	2.298	2.3	104	250	250	61	80	2
21	50.0	652.630	.15	0.3873	1.149	1.1	104	250	250	60	77	2
22	52.5	654.270	.19	0.4359	1.4554	1.4	104	251	248	60	78	2
23	55.0	655.720	.25	0.5000	1.915	1.9	104	250	251	59	79	2
24	57.5	657.400	.26	0.5099	1.9916	2.0	104	251	250	60	78	2
	60.0	659.159										
Total/Avg.			.346			2.65	103				78	

FUGRO

Client: Marseilles Brick	Hot Box No.: STL2	Barometric Pressure: 30.12
Location: Marseilles Brick	Cold Box No.: STL2	Stack Diameter, in: 45
Source I.D.: North Dryer	Console No.: S/L C	Nozzle Diameter, in: .30
Project No.: 0894-8005	Pitot No.:	Filter No.: 9/0128
Date: 8-30-94	Pitot Coefficient: .84	Ambient Temp.: 72
Run Number: 3	DGMC Factor: 1.002	Static Pressure: -.12
Operator: STS	Meter ΔH@: 1.887	K Factor: 7.66

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	√ΔP	Orifice Pressure Differential (H2O) Calc.	Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
1 (E)	0	608.880	.63	0.7937	4.8258	4.8	100	250	251	61	76	2
2	2.5	611.580	.45	0.6708	3.447	3.4	100	250	250	52	76	2
3	5.0	613.448	.47	0.6857	3.6002	3.6	101	250	250	51	77	2
4	7.5	615.620	.40	0.6324	3.064	3.1	99	250	250	52	78	2
5	10.0	617.850	.30	0.5477	2.298	2.3	98	250	251	52	77	2
6	12.5	619.240	.30	0.5477	2.298	2.3	103	250	251	53	77	2
7	15.0	622.620	.32	0.5657	2.4512	2.4	103	250	251	54	78	2
8	17.5	624.250	.27	0.5196	2.0682	2.1	103	250	251	55	78	2
9	20.0	627.240	.25	0.5000	1.915	1.9	103	250	250	56	78	2
10	22.5	628.250	.27	0.5196	2.4577	2.4	103	250	251	57	78	2
11	25.0	630.421	.37	0.6083	2.8342	2.8	104	251	250	58	79	2
12	27.5	632.207	.37	0.6083	2.8342	2.8	103	251	250	59	79	2
13	30.0	634.528	.34	0.5831	2.6044	2.6	99	250	250	60	78	2
14	32.5	636.770	.37	0.6083	2.8342	2.8	102	250	251	60	78	2
15	35.0	639.340	.38	0.6164	2.9108	2.9	102	250	250	60	79	2
16	37.5	641.120	.43	0.6557	3.2938	3.3	103	250	250	60	80	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	100	100	0
Second Impinger	143	100	43
Third Impinger	119	100	19
Silica Gel	275.7	250	25.7
	87.7	Total Condensate	

28.2196

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.45	.40		
2	20.45	.40		
3	20.45	.40		
AVG				

COMMENTS:

Start 1311

Stop 1417

Pretest Leak Check @ 12 "Hg for 0.000 CFM

Posttest Leak Check @ "Hg for CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O)		Orifice Pressure Differential (H2O)		Stack Gas Temperature (°F)	Sample Train Temperatures (°F)				Vacuum (Hg)
			ΔP	V_{AR}	Calc.	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter	
17	40.0	583.620	.35	0.5916	2.653	2.6	103	251	250	62	77	2
18	42.5	585.920	.20	0.4472	1.516	1.5	103	250	251	62	78	2
19	45.0	588.120	.18	0.4243	1.3644	1.4	103	250	250	63	78	2
20	47.5	589.720	.20	0.4472	1.516	1.5	103	251	251	63	78	2
21	50.0	591.230	.25	0.5000	1.895	1.9	103	251	250	64	78	2
22	52.5	593.100	.35	0.5916	2.653	2.6	103	251	250	64	79	2
23	55.0	595.000	.35	0.5916	2.653	2.6	103	251	250	64	78	2
24	57.5	597.720	.11	0.3317	0.8338	0.83	101	250	251	64	78	2
	60.0	598.745										
Total/Avg.			3.23			2.438	103				77	

FUGRO

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Client: Marseilles Brick	Hot Box No.: STL2	Barometric Pressure: 30.06
Location: Marseilles IL	Cold Box No.: STL2	Stack Diameter, in: 45
Source I.D.: South Dryer	Console No.: STL2	Nozzle Diameter, in: .30
Project No.: 0894-8885	Pitot No.:	Filter No.: 940129
Date: 8-30-94	Pitot Coefficient: .84	Ambient Temp.: 70
Run Number: 1	DGMC Factor: 1.002	Static Pressure: -.22
Operator: JTS	Meter ΔH@: 1.887	K Factor: 7.73

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP		Orifice Pressure Differential (H2O) Calc.	Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Pump Vacuum (Hg)
1 (N)	0	668.141	.45	0.6708	3.4785	3.5	99	250	252	61	73	3
2	2.5	669.990	.45	0.6708	3.4785	3.5	101	250	250	52	73	3
3	5.0	672.250	.41	0.6708	3.1693	3.2	102	250	250	50	73	3
4	7.5	674.120	.32	0.5657	2.4736	2.5	103	251	249	51	74	3
5	10.0	676.521	.32	0.5657	2.4736	2.5	103	251	250	52	74	3
6	12.5	678.040	.28	0.5291	2.1644	2.2	103	251	249	53	74	3
7	15.0	680.420	.12	0.3464	0.9276	0.93	104	250	250	54	74	3
8	17.5	682.120	.39	0.6245	3.0147	3.0	104	251	248	55	74	3
9	20.0	684.230	.51	0.7141	3.9423	3.9	104	251	250	56	74	3
10	22.5	686.350	.51	0.7141	3.9423	3.9	104	250	250	57	74	3
11	25.0	689.430	.55	0.7416	4.2515	4.2	104	250	250	58	74	3
12	27.5	692.020	.50	0.7071	3.865	3.9	103	250	250	59	74	3
13 *	30.0	695.000	.26	0.5099	1.9942	2.0	102	250	250	59	74	3
14	32.5	696.850	.28	0.8291	2.1476	2.1	104	250	250	59	74	2
15	35.0	698.370	.21	0.4582	1.6107	1.6	104	250	250	60	75	2
16	37.5	700.650	.24	0.4899	1.8408	1.8	105	250	250	60	77	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	100	100	0
Second Impinger	145	100	45
Third Impinger	128	100	28
Silica Gel	273.5	250	23.5
	96.5	Total Condensate	

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.38	.30		
2	20.38	.30		
3	20.38	.30		
AVG				

COMMENTS:

Start 1520

Stop 1623

* Change K-Factor - 7.67

Pretest Leak Check @ 15 "Hg for 0.000 CFM

Postest Leak Check @ 15 "Hg for 0.000 CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc.	Orifice Pressure Differential (H2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
17	40.0	702.420	.18	0.4243	1.3806	1.4	105	250	250	59	77	2
18	42.5	703.920	.14	0.3742	1.0738	1.1	105	251	250	60	78	2
19	45.0	705.120	.12	0.3464	0.9204	.92	102	251	250	59	78	2
20	47.5	707.020	.12	0.3464	0.9201	.92	105	250	250	60	79	2
21	50.0	708.020	.16	0.4000	1.2272	1.2	105	250	250	60	79	2
22	52.5	709.120	.21	0.4582	1.6107	1.6	105	250	250	60	78	2
23	55.0	710.620	.24	0.4899	1.8408	1.8	105	250	250	61	79	2
24	57.5	713.120	.21	0.4582	1.6107	1.6	105	250	250	61	79	2
	60.0	714.134										
Total/Avg			.294			2.302						

FUGRO

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Client: Marsallos Brick	Hot Box No.: STC 2	Barometric Pressure: 30.06
Location: Marsallos IL	Cold Box No.: STC 2	Stack Diameter, in: 45
Source I.D.: South Dryer	Console No.: STC 2	Nozzle Diameter, in: .30
Project No.: 0894-8885	Pitot No.:	Filter No.: 940130
Date: 8-30-94	Pitot Coefficient: .84	Ambient Temp.: 72
Run Number: 2	DGMC Factor: 1.002	Static Pressure: -.22
Operator: JTS	Meter ΔH@: 1.887	K Factor: 7.74

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP		Orifice Pressure Differential (H2O) Calc	Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
				√ΔP								
1 (E)	0	726.747	.31	0.5568	2.3994	2.4	104	250	250	63	78	3
2	2.5	729.050	.30	0.5477	2.322	2.3	100	251	251	50	74	3
3	5.0	730.900	.25	0.5000	1.935	1.9	100	251	250	51	75	3
4	7.5	732.520	.21	0.4582	1.6254	1.6	101	251	250	52	76	3
5	10.0	734.720	.15	0.3873	1.161	1.2	101	251	251	53	77	3
6	12.5	735.990	.12	0.3464	0.9288	.93	102	251	250	54	77	3
7	15.0	737.250	.12	0.3464	0.9288	.93	102	251	251	55	78	3
8	17.5	738.720	.12	0.3464	0.9288	.93	102	250	250	55	78	3
9	20.0	740.120	.15	0.3873	1.161	1.2	102	250	251	56	79	3
10	22.5	741.420	.25	0.5000	1.935	1.9	100	250	250	56	79	2
11	25.0	743.200	.28	0.5291	2.1672	2.2	103	251	250	57	80	2
12	27.5	745.280	.28	0.5291	2.1672	2.2	103	250	250	57	80	2
13	30.0	747.164	.39	0.6245	3.0186	3.0	103	250	250	56	79	2
14	32.5	749.550	.37	0.5477	2.8638	2.9	103	249	250	57	80	2
15	35.0	751.020	.40	0.6324	3.096	3.1	103	250	250	58	81	2
16	37.5	753.920	.30	0.5477	2.322	2.3	103	250	250	59	80	
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	100	100	0
Second Impinger	144	100	44
Third Impinger	122	100	22
Silica Gel	273.7	250	23.7
	87.7	Total Condensate	

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.43	0.4		
2	"	"		
3	"	"		
AVG				

COMMENTS:
Start 1733
Stop 1838

Pretest Leak Check @ 15 "Hg for 0.000 CFM

Postest Leak Check @ 15 "Hg for 0.000 CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc.	Orifice Pressure Differential (H2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
17	41.0	756.820	.11	0.3317	0.8514	0.85	104	250	250	59	81	2
18	42.5	758.320	.12	0.3464	0.9288	0.93	104	247	251	59	82	2
19	45.0	759.500	.37	0.6083	2.8638	2.9	104	250	250	59	82	2
20	47.5	761.520	.43	0.6557	3.3282	3.3	104	250	250	60	83	2
21	50.0	763.020	.46	0.6782	3.5604	3.6	104	250	250	60	84	2
22	52.5	766.421	.50	0.7071	3.870	3.9	104	250	251	60	85	2
23	55.0	769.900	.50	0.7071	3.870	3.9	104	250	250	61	84	2
24	57.5	771.420	.51	0.7141	3.974	3.9	104	251	250	61	82	2
	60.0	774.130										
Total/Avg.												

FUGRO

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Client: Marseilles Brick	Hot Box No.: STL3	Barometric Pressure: 30.06
Location: Marseilles IL	Cold Box No.: STL3	Stack Diameter, in: 45
Source I.D.: South Dryer	Console No.: STL3	Nozzle Diameter, in: .30
Project No.: 0841-8885	Pitot No.:	Filter No.: 94015
Date: 8-30-94	Pitot Coefficient: .84	Ambient Temp.: 72
Run Number: 3	DGMC Factor: 1.002	Static Pressure: -.22
Operator: JTS	Meter ΔH@: 1.887	K Factor: 7.80

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc.	Orifice Pressure Differential (H2O) Actual	Stack Gas Temperature (°F)	Probe	Sample Train Temperatures (°F) Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
	0	785.615	.41	0.6403	3.198	3.2	102	250	251	52	82	2
	2.5	787.251	.41	0.6403	3.198	3.2	102	250	250	53	83	2
	5.0	790.300	.38	0.664	2.964	3.0	103	250	250	54	83	3
	7.5	793.250	.38	0.6164	2.964	3.0	104	250	251	55	84	3
	10.0	795.320	.15	0.3873	1.170	1.2	104	250	250	56	85	3
	12.5	796.990	.13	0.3605	1.014	1.0	104	250	251	56	84	3
	15.0	798.720	.11	0.3317	0.858	0.86	104	251	250	57	84	3
	17.5	799.620	.49	0.7000	3.822	3.8	105	251	251	57	83	3
	20.0	802.320	.47	0.6324	3.666	3.7	105	251	251	58	84	3
	22.5	805.021	.51	0.7141	3.978	4.0	105	250	250	59	84	3
	25.0	807.030	.56	0.7483	4.368	4.4	105	250	250	60	85	3
	27.5	810.720	.53	0.7280	4.134	4.1	105	250	251	60	84	3
	30.0	812.853	.25	0.5000	1.95	2.0	105	250	250	61	85	3
	32.5	814.520	.20	0.4472	1.56	1.6	105	251	251	60	84	3
	35.0	816.270	.20	0.4472	1.56	1.6	105	251	251	60	82	3
	37.0	818.510	.15	0.3873	1.17	1.2	105	251	252	60	82	3
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	~~147~~ 0	100	0
Second Impinger	~~121~~ 147	100	47
Third Impinger	121	100	21
Silica Gel	270.2	250 gr	20.2
	98.2	Total Condensate	

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.3	0.3		
2	20.3	0.3		
3	20.3	0.3		
Avg				

COMMENTS:
Start 1856
Stop 1958

Pretest Leak Check @ 15 "Hg for 0.000 CFM

Postest Leak Check @ 15 "Hg for 0.000 CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O)		Orifice Pressure Differential (H_2O)		Stack Gas Temperature (°F)	Sample Train Temperatures (°F)				Vacuum (Hg)
			ΔP	√ΔP	Calc.	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter	
17	40.0	820.120	.15	0.3873	1.17	1.2	105	250	250	59	82	3
16	42.5	822.721	.11	0.3317	0.858	.86	105	250	251	59	82	3
19	45.0	823.210	.15	0.3873	1.17	1.2	105	250	251	60	83	3
20	47.5	824.500	.20	0.4472	1.56	1.6	105	249	250	61	84	3
21	50.0	825.520	.21	0.4582	1.638	1.6	105	250	250	60	84	3
22	52.5	827.320	.21	0.4582	1.638	1.6	105	251	250	61	85	3
23	55.0	828.920	.24	0.4899	1.872	1.9	105	250	249	62	85	3
24	57.5	830.950	.24	0.4899	1.872	1.9	105	250	250	61	84	2
	60.0	832.620										
Total/Avg.												

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-29-94

SOURCE KILN RUN # 1A

	TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (~~ppm~~ dry)	O2 % (~~ppm~~ dry)	VOC (ppm dry)	OTHER (ppm dry)
1	1048	12	131	500	2.2	16.6	7	
2	1049	15	134	500	2.0	17.1	7	
3	1050	10	133	500	2.1	16.8	7	
4	1051	~~10~~ 15	133	505	1.8	17.3	7	
5	1052	10	136	410	1.9	16.8	9	
6	1053	4	78	490	0.8	19.1	9	
7	1054	17	154	495	1.8	17.7	7	
8	1055	22	127	490	2.6	16.2	7	
9	1056	14	122	495	2.3	16.4	7	
10	1057	15	125	500	2.3	16.6	7	
11	1058	22	125	500	2.5	16.3	7	
12	1059	17	124	505	2.4	16.3	7	
13	1100	15	124	505	2.4	16.2	7	
14	1101	20	128	505	2.1	16.9	7	
15	1102	18	124	505	2.6	16.0	7	
16	1103	17	127	510	2.1	16.7	7	
17	1104	22	124	510	2.9	15.6	7	
18	1105	20	128	515	2.1	16.7	7	
19	1106	16	126	520	2.5	16.2	7	
20	1107	24	129	520	2.5	16.2	7	
21	1108	18	124	525	2.4	16.1	7	
22	1109	14	120	525	2.3	16.0	7	Port
23	1112	22	131	525	2.3	16.5	7	Change
24	1113	20	135	525	2.4	16.7	7	
25	1114	22	131	525	2.3	16.5	7	
26	1115	25	135	530	2.4	16.4	7	
27	1116	17	135	535	2.0	16.9	7	
28	1117	30	137	530	2.3	16.8	7	
29	1118	23	136	540	1.9	17.2	7	
30	1119	21	136	535	2.6	16.3	7	
AVERAGE								

continued on Run # 1B

1 minute averages

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-29-94

SOURCE KILN RUN # 1B

	TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (dry)	O2 % (dry)	VOC (ppm dry)	OTHER (ppm dry)
1	1120	18	138	535	2.0	17.0	7	
2	1121	13	138	535	2.2	16.9	7	
3	1122	10	138	535	2.1	17.0	7	
4	1123	20	141	530	2.2	17.1	7	
5	1124	7	139	440	1.4	17.6	8	
6	1125	5	86	515	0.6	19.4	7	
7	1126	17	144	515	1.9	17.8	7	
8	1127	13	128	515	2.5	16.4	7	
9	1128	12	126	515	2.3	16.5	7	
10	1129	10	126	515	2.3	16.5	7	
11	1130	25	130	520	2.5	16.5	7	
12	1131	15	130	520	2.1	16.8	7	
13	1132	15	130	520	2.5	16.5	7	Bart
14	1134	17	128	520	2.7	16.2	7	Change
15	1135	14	129	525	2.2	16.5	7	
16	1136	15	130	535	2.4	16.5	7	
17	1137	18	133	540	2.3	16.7	6	
18	1138	13	129	535	2.5	16.2	6	
19	1139	16	133	535	2.3	16.9	6	
20	1140	17	131	530	2.3	16.5	6	
21	1141	22	135	535	2.4	16.7	6	
22	1142	12	133	535	2.2	16.9	6	
23	1143	15	134	540	2.4	16.5	6	
24	1144	14	134	540	2.4	16.6	6	
25	1145	13	135	540	2.2	16.8	6	
26	1146	23	136	545	2.2	16.9	6	
27	1147	13	133	545	2.3	16.7	6	
28	1148	15	136	545	2.2	16.7	6	
29	1149	17	136	550	2.2	16.8	6	
30	1150	12	135	545	2.2	16.8	6	
AVERAGE		16.383	130.100	518.750	2.213	16.733	7.8	

1 minute averages

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-29-94

SOURCE Kiln RUN # 2A

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (ppm dry)	O2 % (ppm dry)	VOC (ppm dry)	OTHER (ppm dry)
1 1250	20	131	520	2.1	17.9	7	
2 1251	13	130	530	2.3	18.1	7	
3 1252	25	132	540	2.1	18.7	6	
4 1253	11	130	550	1.9	18.7	6	
5 1254	12	127	550	2.1	18.1	6	
6 1255	13	134	560	1.7	19.0	6	
7 1256	14	131	555	2.5	18.0	7	
8 1257	22	133	555	2.2	18.7	7	
9 1258	14	130	555	2.3	18.2	7	
10 1259	18	133	560	2.2	18.6	6	
11 1300	10	127	470	1.4	18.9	7	
12 1301	5	82	545	0.7	20.8	9	
13 1302	18	132	550	1.8	19.4	7	
14 1303	23	126	550	2.6	18.1	6	
15 1304	14	121	555	2.3	17.9	6	
16 1305	21	124	560	2.7	17.8	6	
17 1306	14	118	555	2.5	17.5	6	
18 1307	27	124	555	2.6	18.0	6	
19 1308	14	123	555	2.1	18.4	6	
20 1309	17	124	560	2.7	17.9	6	
21 1312	16	126	560	2.2	18.5	6	Port Change
22 1313	15	125	550	2.5	17.9	6	
23 1314	18	127	555	2.4	18.2	6	
24 1315	16	125	550	2.5	17.8	6	
25 1316	18	126	550	2.4	18.2	6	
26 1317	14	125	545	2.4	18.1	6	
27 1318	13	126	545	2.2	18.1	6	
28 1319	23	128	540	2.3	18.3	6	
29 1320	15	127	540	2.3	18.3	6	
30 1321	14	127	540	2.2	18.3	6	
AVERAGE							

→ continued on Run # 2B

1 minute averages

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-29-94

SOURCE KiLN RUN # 2B

	TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (dry)	O2 % (dry)	VOC (ppm dry)	OTHER (ppm dry)
1	1322	20	129	535	2.3	18.3	6	
2	1323	15	130	530	2.2	18.5	6	
3	1324	15	131	535	2.0	18.8	6	
4	1325	16	129	530	2.4	18.0	6.	
5	1326	15	131	535	2.1	18.7	6	
6	1327	14	131	530	2.1	18.5	6	
7	1328	15	132	525	2.3	18.4	6	
8	1329	13	132	525	1.8	19.1	6	
9	1330	12	133	525	2.1	18.6	6	
10	1331	18	132	530	2.1	18.6	6	
11	1332	6	128	445	1.3	19.0	8	Port
12	1333	14	152	515	2.0	19.4	6	Change
13	1335	16	118	515	2.4	17.9	6	
14	1336	14	118	515	2.4	17.9	6	
15	1337	16	119	515	2.4	18.0	6	
16	1338	18	120	520	2.6	17.8	6	
17	1339	15	117	520	2.4	17.8	6	
18	1340	16	119	525	2.5	17.9	6	
19	1341	15	124	530	2.2	18.5	6	
20	1342	13	124	535	2.4	18.3	6	
21	1343	15	122	530	2.5	17.7	6	
22	1344	15	123	535	2.3	18.1	6	
23	1345	17	123	535	2.4	17.9	6	
24	1346	13	122	540	2.3	17.9	6	
25	1347	17	126	545	2.2	18.5	6	
26	1348	14	122	545	2.5	17.8	6	
27	1349	18	125	550	2.4	18.1	6	
28	1350	14	123	550	2.4	17.8	6	
29	1351	19	125	550	2.4	18.0	6	
30	1352	13	124	555	2.2	18.0	6	
AVERAGE		15.63	125.98	531.96	2.23	18.303	6.1	

1 minute Averages

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-29-94

SOURCE KILN RUN # 3A

	TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (ppm dry)	O2 % (ppm dry)	VOC (ppm dry)	OTHER (ppm dry)
1	1451	11	139	425	2.5	17.2	6	
2	1452	9	139	445	2.5	16.9	6	
3	1453	8	142	455	2.4	16.8	6	
4	1454	6	140	465	2.5	16.8	6	
5	1455	8	141	470	2.5	16.8	6	
6	1456	8	141	480	2.4	17.3	6	
7	1457	9	144	480	2.4	17.4	6	
8	1458	8	143	485	2.4	16.8	6	
9	1459	12	142	485	2.5	16.8	6	
10	1500	5	142	495	2.4	17.3	6	
11	1501	5	146	495	2.3	17.5	6	
12	1502	7	145	495	2.2	17.3	6	
13	1503	7	146	495	2.2	17.1	6	
14	1504	5	147	495	2.1	17.3	6	
15	1505	5	146	495	2.2	17.2	6	
16	1506	9	147	490	2.1	17.1	6	
17	1507	6	148	490	2.1	17.4	6	
18	1508	3	110	440	1.9	18.6	8	
19	1509	2	98	470	1.6	19.1	6	
20	1510	10	150	470	1.6	17.7	6	
21	1511	8	137	470	1.8	17.0	6	Port
22	1514	8	132	470	2.4	16.7	6	change
23	1515	8	135	475	2.4	16.4	6	
24	1516	8	133	470	2.5	16.1	6	
25	1517	6	132	470	2.5	16.2	6	
26	1518	8	135	475	2.5	16.6	6	
27	1519	6	135	475	2.5	16.4	6	
28	1520	8	138	480	2.4	17.0	6	
29	1521	9	137	480	2.4	16.4	6	
30	1522	5	133	480	2.5	16.2	6	
AVERAGE								

Continued on Run #3B

1 minute average

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-29-94

SOURCE Kiln RUN # 3B

	TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (~~ppm~~ dry)	O2 % (~~ppm~~ dry)	VOC (ppm dry)	OTHER (ppm dry)
1	1523	9	139	480	2.4	16.8	6	
2	1524	10	138	485	2.4	16.9	6	
3	1525	7	137	480	2.4	16.3	6	
4	1526	6	137	480	2.5	16.4	6	
5	1527	5	138	480	2.4	16.6	6	
6	1528	7	139	485	2.3	16.8	6	
7	1529	6	141	485	2.3	16.5	6	
8	1530	5	141	485	2.3	16.6	6	
9	1531	5	141	490	2.3	16.9	6	
10	1532	10	141	490	2.3	16.6	6	
11	1533	6	140	490	2.3	16.7	6	
12	1534	5	141	485	2.2	16.8	6	Port
13	1537	4	142	485	2.2	16.7	6	change
14	1538	4	143	480	2.1	17.0	6	
15	1539	12	147	480	2.0	16.9	6	
16	1540	3	129	410	2.2	17.1	8	
17	1541	1	85	460	1.6	18.7	7	
18	1542	10	151	460	1.5	17.5	6	
19	1543	11	134	460	1.9	16.2	6	
20	1544	7	130	460	2.1	16.2	6	
21	1545	6	132	460	2.3	16.4	6	
22	1546	8	133	460	2.3	16.4	6	
23	1547	8	131	460	2.3	16.3	6	
24	1548	9	133	460	2.4	16.3	6	
25	1549	8	134	460	2.4	16.2	6	
26	1550	10	135	465	2.4	16.0	6	
27	1551	7	133	470	2.4	16.2	6	
28	1552	12	136	490	2.4	16.1	6	
29	1553	8	132	470	2.5	15.7	6	
30	1554	7	133	465	2.5	16.0	6	
AVERAGE		7.25	136.816	473.58	2.27	19.385	6.2	

CO2 and O2 concentrations are in (%)

1 minute averages

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-30-94

SOURCE Dryer 1 (North) RUN # 1

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (~~ppm~~ dry)	O2 % (~~ppm~~ dry)	VOC (ppm dry)	OTHER (ppm dry)
1 0937	0	3	0	0.4	20.1	1	
2	0	3	0	.4	20.1	1	
3	0	4	0	.4	20.1	0	
4	0	4	0	.4	20.1	0	
5	0	5	0	.4	20.1	0	
6	0	5	0	.3	20.2	0	
7	0	5	0	.3	20.2	0	
8	0	3	0	.3	20.3	0	
9	0	3	0	.3	20.4	0	
10	0	4	0	.3	20.5	0	
11	0	5	0	.3	20.5	0	
12	0	6	0	.3	20.6	0	
13	0	6	0	.3	20.5	0	
14	0	7	0	.3	20.4	0	
15	0	7	0	.3	20.4	2	
16	0	8	0	.3	20.3	2	
17	0	8	0	.3	20.3	1	
18	0	9	0	.3	20.3	1	
19	0	9	0	.3	20.2	5	
20 1040	0	9	0	0.3	20.2	18	
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	0	5.50	0	0.32	20.332	1.550	

3 minute averages

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-30-94

SOURCE Dryer 1 (North) RUN # 2

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (~~ppm~~ dry)	O2 % (~~ppm~~ dry)	VOC (ppm dry)	OTHER (ppm dry)
1 1133	0	14	0	0.2	20.4	0	
2	0	14	0	.2	20.4	0	
3	0	16	0	.2	20.4	0	
4	0	15	0	.2	20.4	0	
5	0	16	0	.2	20.4	0	
6	0	15	0	.2	20.4	0	
7	0	15	0	.2	20.4	0	
8	0	14	0	.2	20.4	0	
9	0	14	0	.2	20.4	0	
10	0	14	0	.2	20.4	0	
11	0	15	0	.2	20.4	0	
12	0	15	0	.2	20.4	0	
13	0	15	0	.2	20.4	0	
14	0	15	0	.2	20.4	0	
15	0	15	0	.2	20.4	0	
16	0	15	0	.3	20.4	0	
17	0	15	0	.3	20.5	0	
18	0	15	0	.3	20.5	0	
19	0	15	0	0.3	20.5	0	
20 1236	0	15	0	0.3	20.5	0	
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	0	14.60	0	0.22	20.42	0	

3 minute averages

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-30-94

SOURCE Dryer 1 (North) RUN # 3

	TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (~~ppm~~ dry)	O2 % (~~ppm~~ dry)	VOC (ppm dry)	OTHER (ppm dry)
1	1311	0	4	0	0.4	20.4	0	—
2		0	4	0	.4	20.4	0	
3		0	4	0	.4	20.4	0	
4		0	4	0	.4	20.4	0	
5		0	4	0	.4	20.4	0	
6		0	4	0	.4	20.4	0	
7		0	4	0	.4	20.4	0	
8		0	4	0	.4	20.5	0	
9		0	5	0	.4	20.5	0	
10		0	5	0	.4	20.5	0	
11		0	5	0	.4	20.5	0	
12		0	5	0	.4	20.5	0	
13		0	5	0	.4	20.5	0	
14		0	5	0	.4	20.4	0	
15		0	5	0	.4	20.4	0	
16		0	7	0	.4	20.4	0	
17		0	8	0	.4	20.4	0	
18		0	8	0	.4	20.5	0	
19		0	9	0	.4	20.5	0	
20	1426	0	9	0	0.4	20.5	0	
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
AVERAGE		0	5.40	0	0.24	20.43	0	

3 minute averages

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-30-94

SOURCE Dryer 2 (south) RUN # 1

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (~~ppm~~ dry)	O2 % (~~ppm~~ dry)	VOC (ppm dry)	OTHER (ppm dry)
1 1520	0	4	0	0.3	20.2	0	
2	0	4	0	0.3	20.2	0	
3	0	4	0	.3	20.2	0	
4	0	4	0	.3	20.2	0	
5	0	4	0	.3	20.2	0	
6	0	4	0	.3	20.2	0	
7	0	5	0	.3	20.2	0	
8	0	5	0	.3	20.2	0	
9	0	5	0	.3	20.5	0	
10	0	5	0	.3	20.5	0	
11	0	5	0	.3	20.5	0	
12	0	5	0	.3	20.5	0	
13	0	5	0	.3	20.5	0	
14	0	5	0	.3	20.5	0	
15	0	5	0	.3	20.5	0	
16	0	5	0	.3	20.5	0	
17	0	5	0	.3	20.5	0	
18	0	5	0	.3	20.5	0	
19	0	5	0	.3	20.5	0	
20 1624	0	5	0	0.3	20.5	0	
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	0	4.70	0	0.3	20.380	0	

3 minute Averages

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-30-94

SOURCE Dryer 2 (south) RUN # 2

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 % (~~ppm~~ dry)	O2 % (~~ppm~~ dry)	VOC (ppm dry)	OTHER (ppm dry)
1 1733	0	3	0	0.4	20.4	0	
2	0	3	0	.4	20.4	0	
3	0	3	0	.4	20.4	0	
4	0	3	0	.4	20.4	0	
5	0	3	0	.4	20.4	0	
6	0	3	0	.4	20.4	0	
7	0	3	0	.4	20.4	0	
8	0	3	0	.4	20.4	0	
9	0	3	0	.4	20.4	0	
10	0	3	0	.4	20.4	0	
11	0	3	0	.4	20.4	0	
12	0	3	0	.4	20.4	0	
13	0	3	0	.4	20.4	0	
14	0	3	0	.4	20.4	0	
15	0	3	0	.4	20.5	0	
16	0	3	0	.4	20.5	0	
17	0	3	0	.4	20.5	0	
18	0	3	0	.4	20.5	0	
19	0	3	0	.4	20.5	0	
20 1836	0	3	0	0.4	20.5	0	
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	0	3	0	0.4	20.430	0	

3 minute average

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT Marseilles Brick DATE 8-30-94

SOURCE Dryer 2 (south) RUN # 3

TIME	NOX (ppm-dry)	CO (ppm-dry)	SO2 (ppm-dry)	CO2 % (~~ppm~~ dry)	O2 % (~~ppm~~ dry)	VOC (ppm-dry)	OTHER (ppm-dry)
1 1856	0	4	0	0.4	20.3	0	
2	0	4	0	.4	20.3	0	
3	0	4	0	.4	20.3	0	
4	0	4	0	.4	20.3	0	
5	0	4	0	.4	20.3	0	
6	0	4	0	.3	20.3	0	
7	0	4	0	.3	20.3	0	
8	0	4	0	.3	20.3	0	
9	0	5	0	.3	20.3	0	
10	0	5	0	.3	20.3	0	
11	0	5	0	.3	20.3	0	
12	0	5	0	.3	20.3	0	
13	0	6	0	.3	20.3	0	
14	0	6	0	.3	20.3	0	
15	0	6	0	.3	20.3	0	
16	0	6	0	.3	20.3	0	
17	0	6	0	.3	20.3	0	
18	0	6	0	.3	20.3	0	
19	0	6	0	0.4	20.3	0	
20 1959	0	6	0	0.4	20.3	0	
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	0	5.0	0	0.335	20.3	0	

3 minute averages

NOTES:

APPENDIX D

Equipment Calibration Records

FUGRO McClelland

Dry Gas Meter and Orifice Calibration

Dry Gas Meter or Console Number STL 2 Date 8-25-94

Barometric Pressure(not corrected to sea level pressure), P_b = 30.19 in. Hg

ΔH	Dry Gas Meter						Wet Test Meter						Time		Y	$\Delta H_@$
	Volume, cu.ft.			Temp.		Press	Volume, cu.ft.			Temp.						
	Final	Init.	Δ V_d	°F	°R T_d	in.Hg P_m	Final	Init.	Δ V_w	°C	°F	°R T_w	' & "	min. θ		
.5	207.505	197.501	10.004	80	540	30.23	30.452	20.265	10.187		69	529		25.1	1.038	1.652
1.0	217.508	207.505	10.003	81	541	30.26	40.475	30.452	10.023		20	530		18.2	1.020	1.798
1.5	227.558	217.508	10.050	82	542	30.30	50.384	40.475	9.909		20	530		15.0	1.005	1.871
2.0	237.558	227.558	10.000	83	543	30.34	60.122	50.384	9.738		69	529		13.1	0.995	1.959
2.5	247.558	237.558	10.000	83	543	30.37	69.748	60.122	9.626		69	529		11.7	0.982	1.999
3.0	257.560	247.558	10.002	84	544	30.41	79.275	69.748	9.527		69	529		10.7	0.972	2.044
														Average	1.002	1.887

Signature [signature]

$P_m = (\Delta H \div 13.6) + P_b$

°F = (°C x 9 ÷ 5) + 32

°R = °F + 460

$$Y = \frac{V_w P_b T_d}{V_d P_m T_w}$$

$$\Delta H_@ = \left(\frac{T_w \theta}{V_w}\right)^2 \frac{0.0317 \Delta H}{P_b T_d}$$

Y is the ratio of accuracy of the wet test meter to the dry gas meter and its tolerance limits are ±0.02 from 1.00.

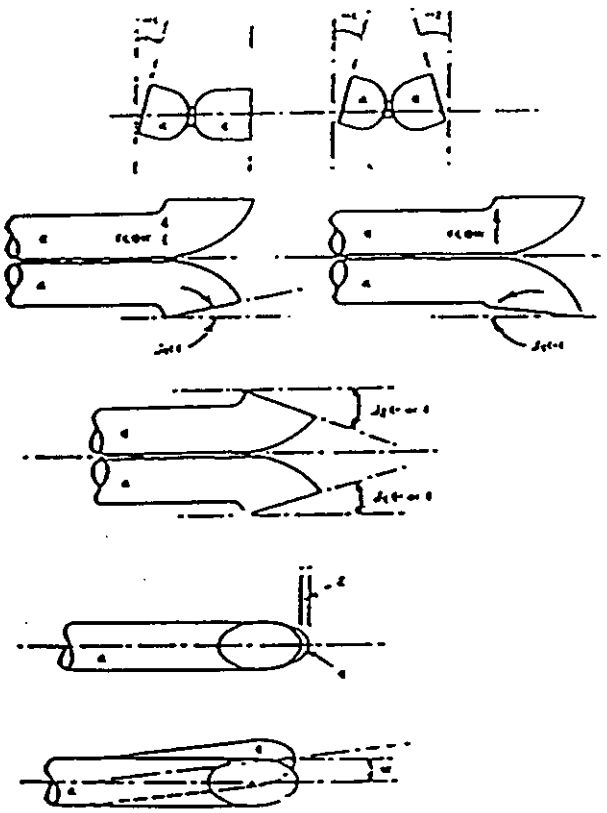
$\Delta H_@$ is the orifice differential pressure which gives an air flow rate of 0.75 cfm at 70°F and 29.92 inches of mercury. It had tolerance limits of ±0.20 in. H_2O from 1.84.

FUGRO McClelland

TYPE S PITOT TUBE CALIBRATION

PITOT TUBE 5-1SS

DATE 4-11-94

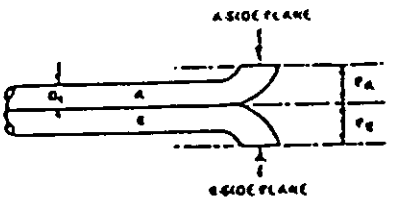


Are a_1 and a_2 < 10°? Yes No

Are B_1 and B_2 < 5°? Yes No

Is Z < 1/8 inch? Yes No

Is W < 1/32 inch? Yes No



External tube diameter (D_t) .3705

Is D_t between 3/16 and 3/8 in.? Yes No

Base-to-opening plane distances:

P_A .401

P_B .401

Does $P_A = P_b$? Yes No

Is $1.05\ D_t \leq P \leq 1.50\ D_t$?

.397 ≤ .401 ≤ .568 Yes No

When pitot tube is part of an assembly:

Is the thermocouple 2 inches behind the pitot tube opening? Yes No

Does the pitot tube extend 3 inches beyond the compression fitting on the nozzle? Yes No

Is the distance between the nozzle and the pitot tube more than 3/4 inch when a ½ inch nozzle is in place? Yes No

If any answer is no, the pitot tube must be calibrated in a wind tunnel against a standard type pitot tube.

If all answers are yes, the pitot tube may be assigned a baseline coefficient of 0.84.

Assigned Baseline Coefficient 0.84

Signature: [illegible]

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 1-6-94 Thermocouple number 5-1

Ambient temperature 23.0 °C Barometric pressure 29.74 in. Hg

Calibrator D.M.C Reference: mercury-in-glass Fisher Scientific #15-041A

other _____

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
100°C	Water	100°C	97.78	0.006
0°C	Ice Water	0.000°C	0.000°C	0.000
—	Oil	219.44°C	219.44°C	0.000

[a]Type of calibration system used.

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

METHOD 5: PROBE NOZZLE FIELD CALIBRATION DATA

FUGRO McClelland

Nozzle Identification Number: STL 3-10	
Client: Marseilles Brick	Project No.: 0894-8885-2
Source: KILN	Date: 8-29-94
Analyst: RFF	Micrometer:
Scale:	Tolerence:

CALIBRATION DATA

Trial Number	Run	Run	Run	Run
1	0.368			
2	0.370			
3	0.370			
4	0.372			
5	0.370			
6				
7				
8				
9				
10				
AVERAGE	0.370			

Comments:

METHOD 5: PROBE NOZZLE FIELD CALIBRATION DATA

FUGRO McClelland

Nozzle Identification Number: STL 3-4	
Client: Marseilles Brick	Project No.: 0894-8885-2
Source: Dryer Stack	Date: 8-30-94
Analyst:	Micrometer:
Scale:	Tolerence:

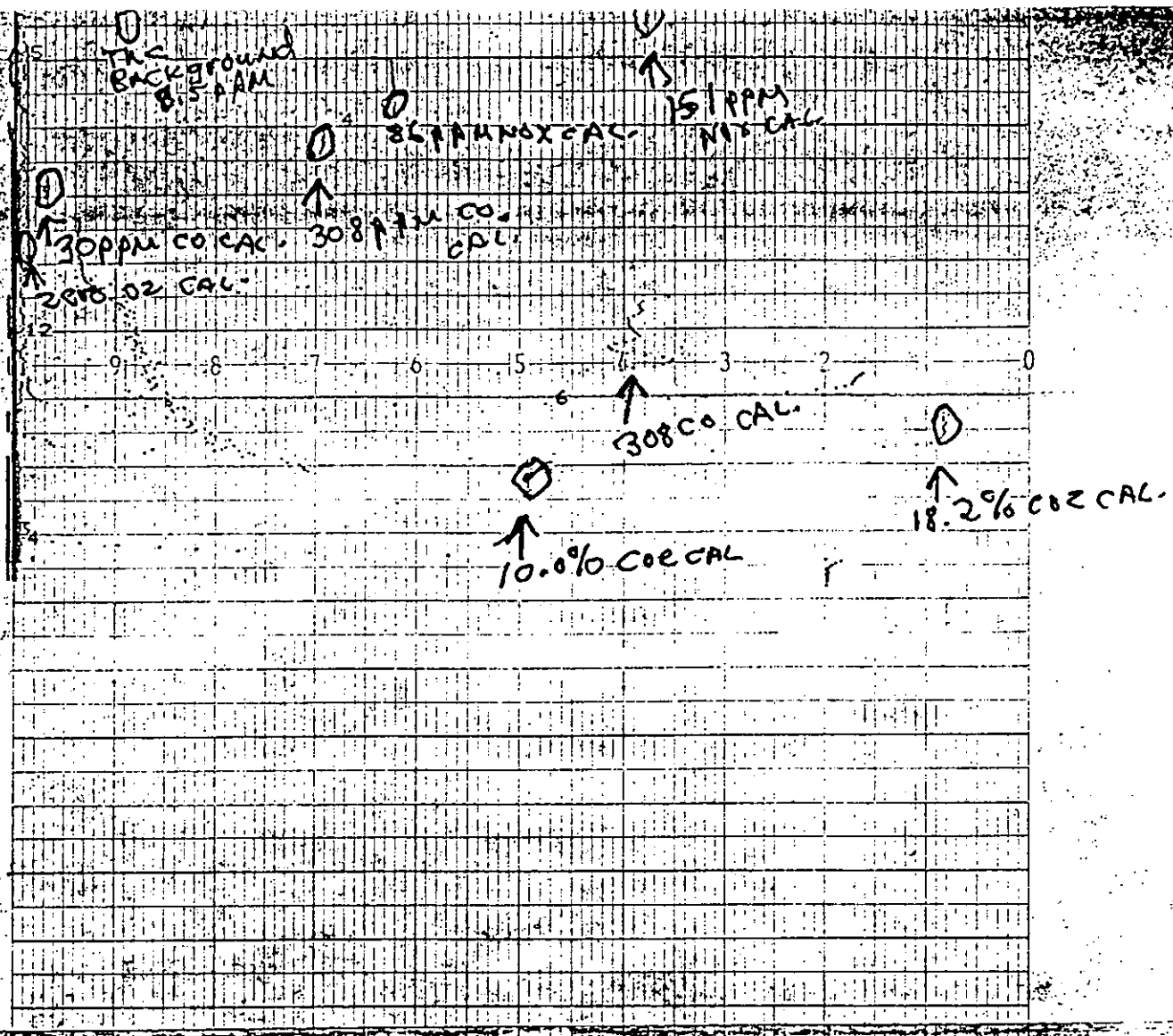
CALIBRATION DATA

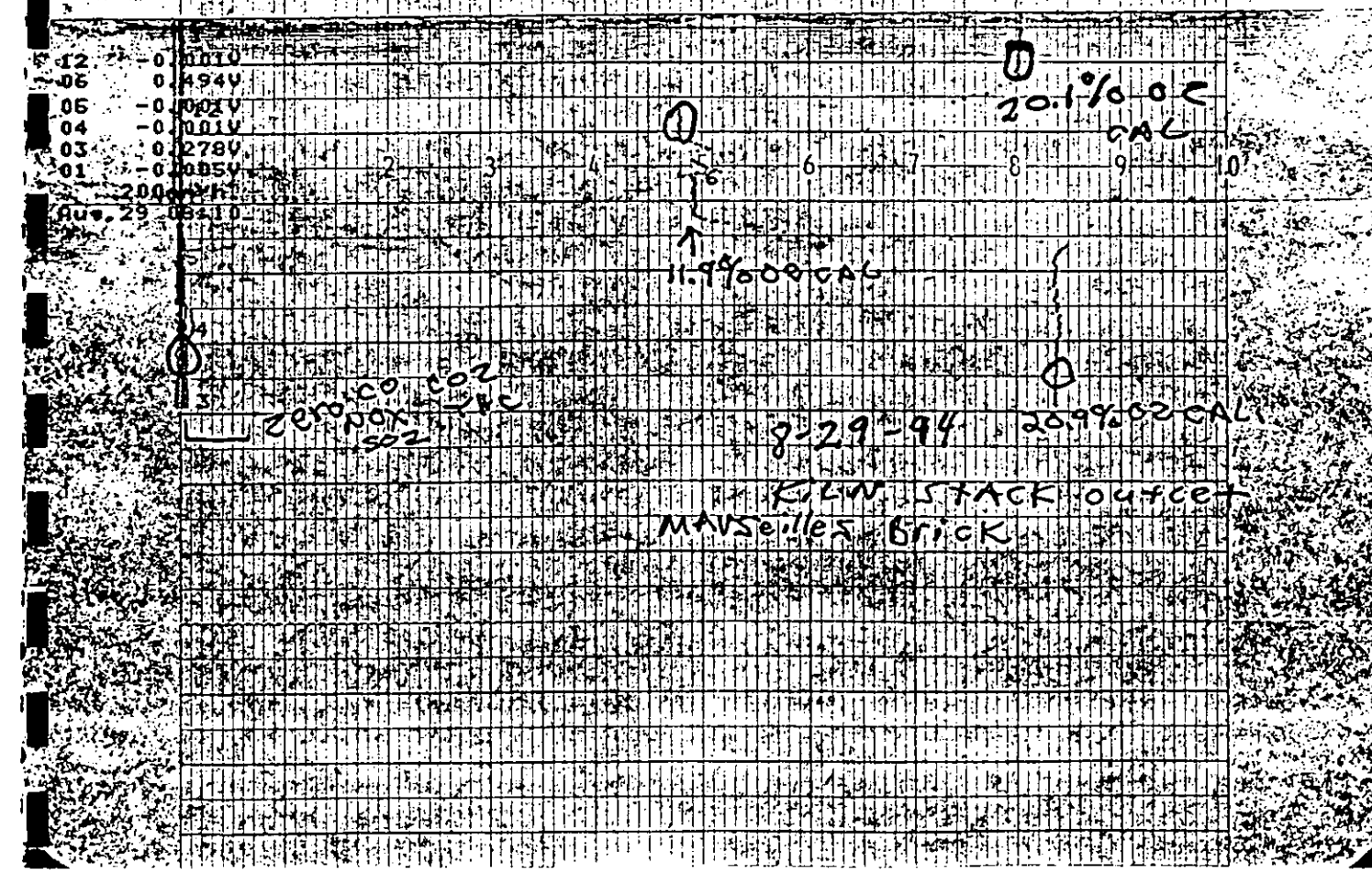
Trial Number	Run	Run	Run	Run
1	0.300			
2	0.299			
3	0.300			
4	0.300			
5	0.301			
6				
7				
8				
9				
10				
AVERAGE	0.300			

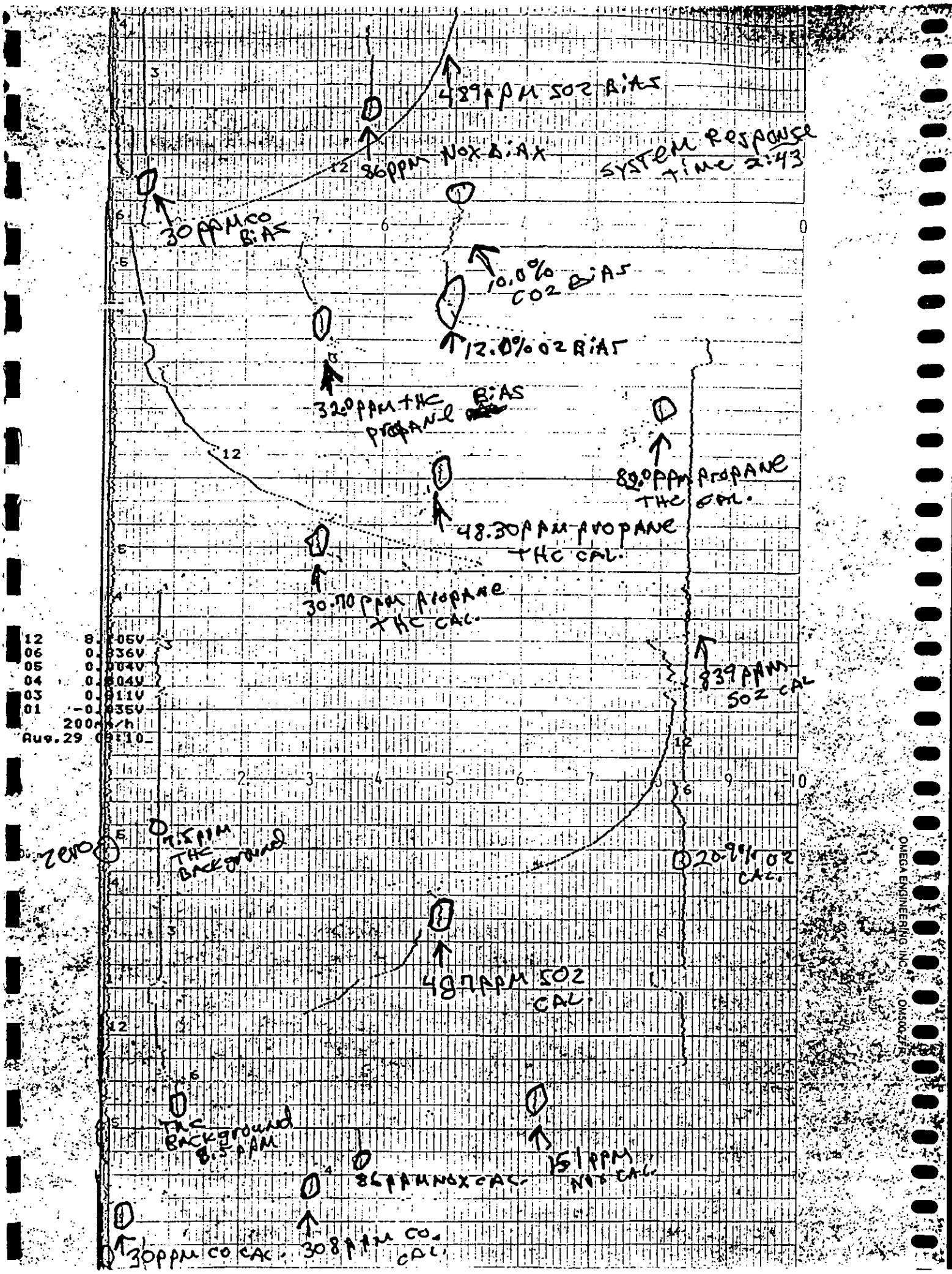
Comments:

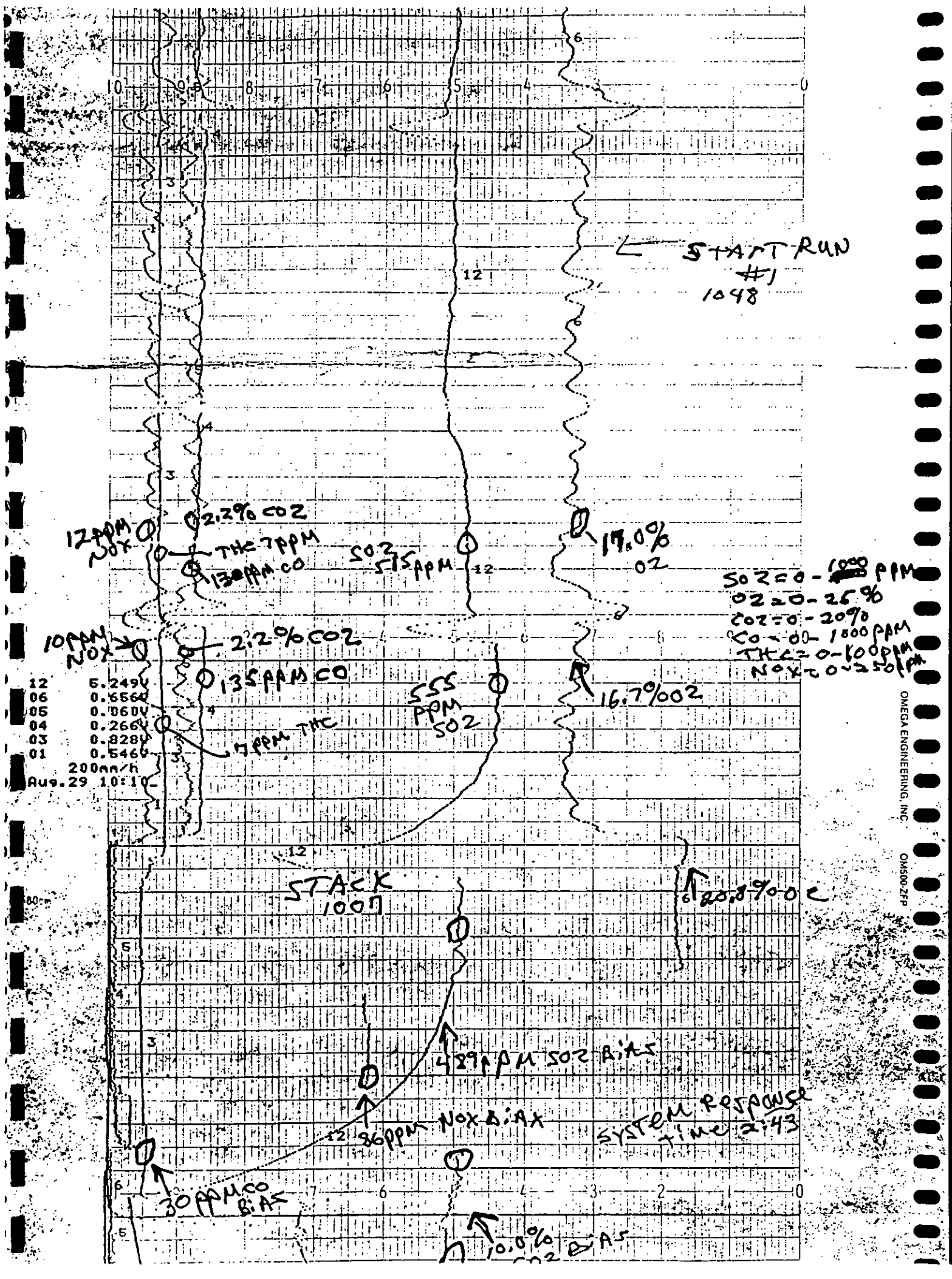
APPENDIX E

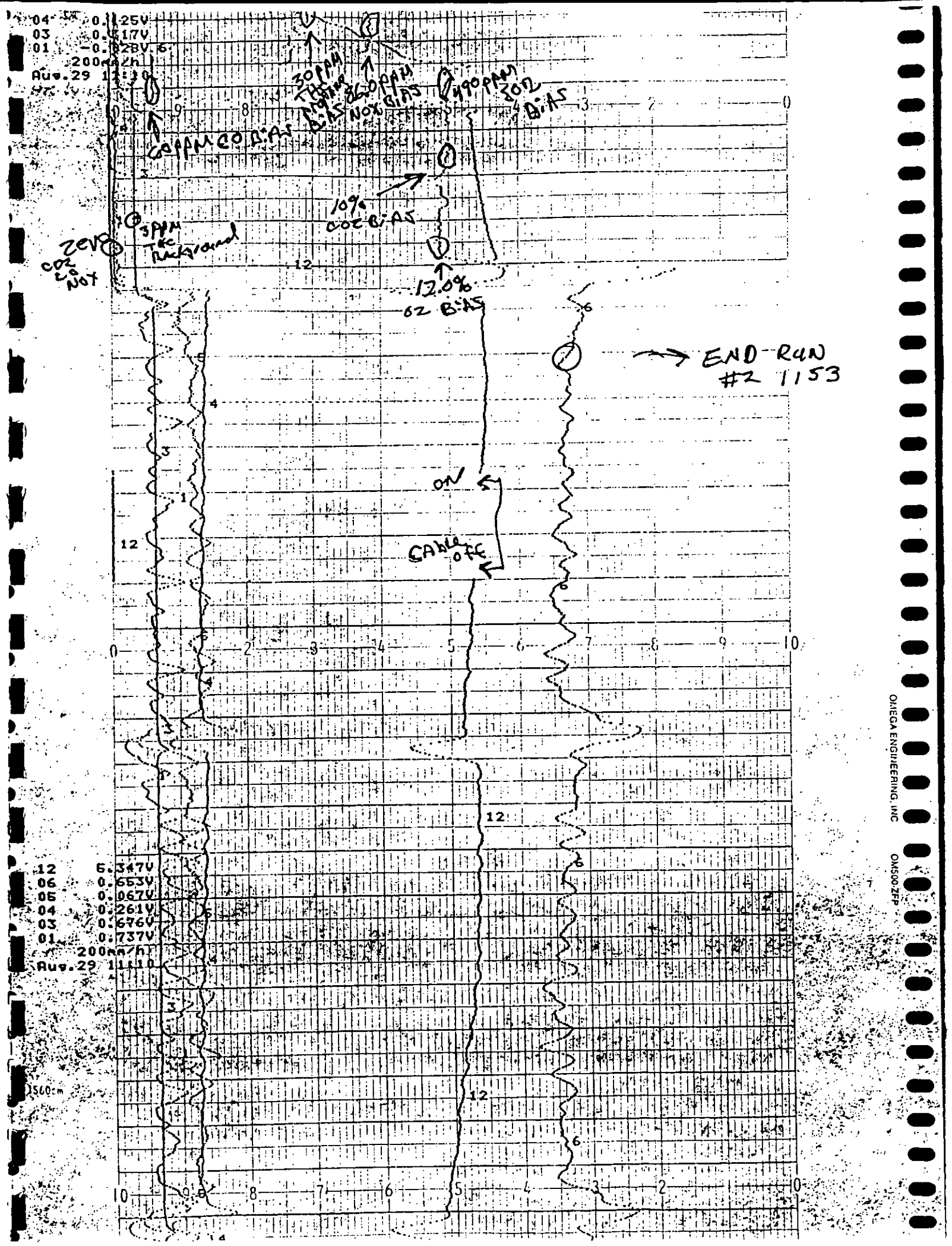
Data Logger Strip Chart Recordings

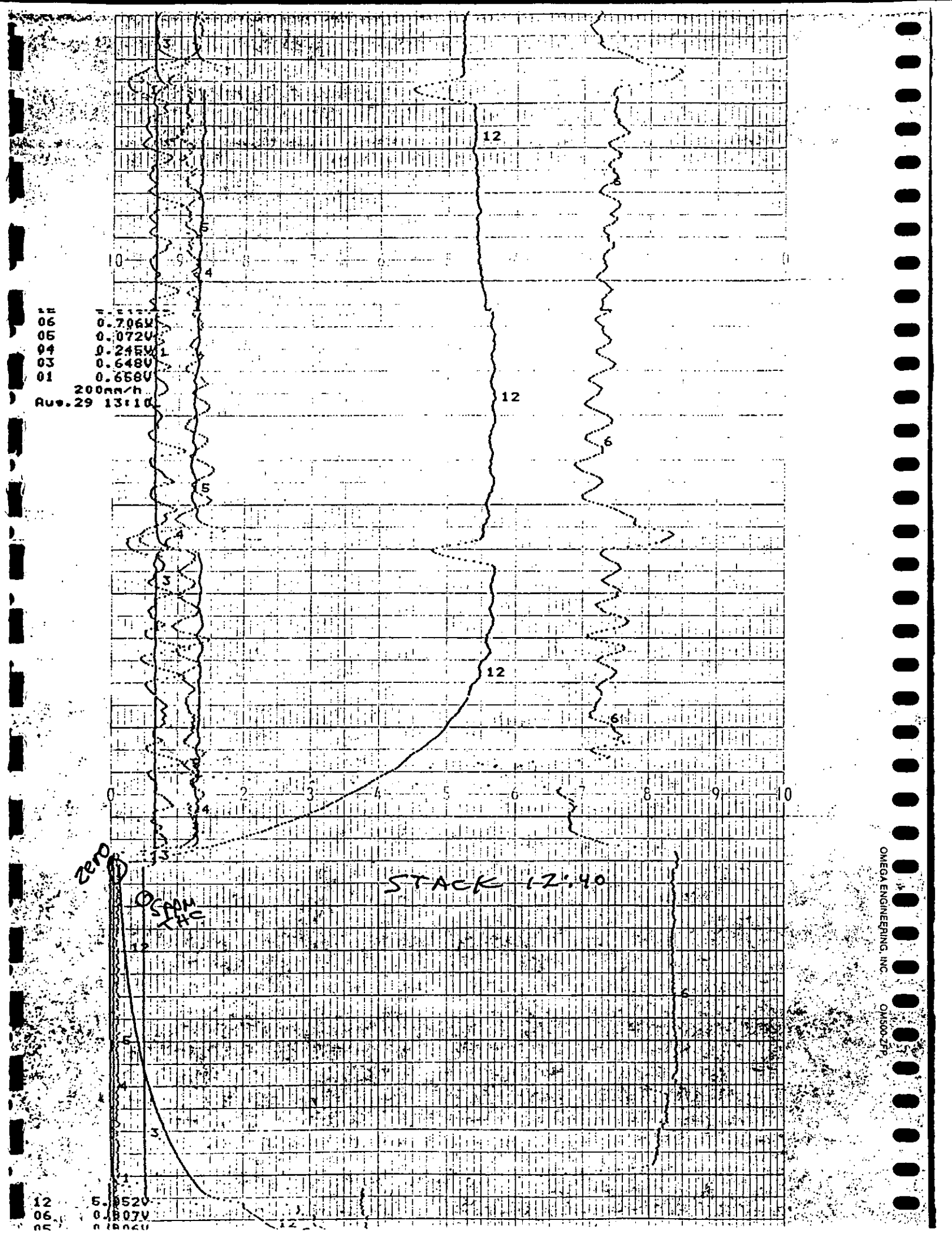

THC Background 8.5 PPM
86 PPM NOX CAL
151 PPM NOX CAL
30 PPM CO CAL
308 PPM CO CAL
zero O2 CAL
308 CO CAL
18.2% CO2 CAL
10.0% CO2 CAL


12 -0.001V
06 0.494V
05 -0.001V
04 -0.001V
03 0.278V
01 -0.005V
200 mV/h
Aug. 29 08:10
20.1% O2 CAL
11.9% CO2 CAL
zero CO CO2 NOX THC SO2
20.9% O2 CAL
8-29-94
KILN STACK outlet
MARSeilles Brick

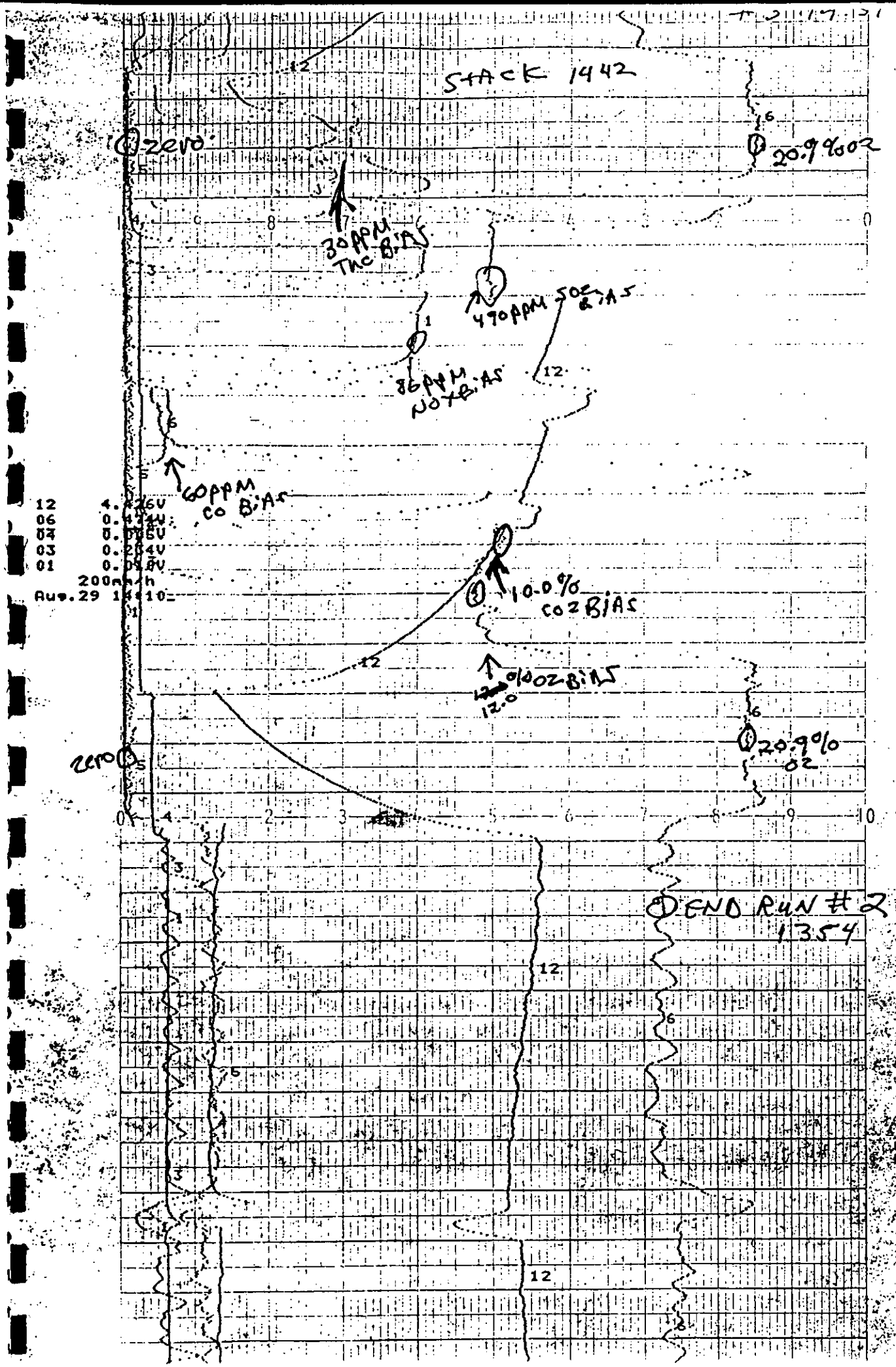

489 PPM SO2 BIAS
86 PPM NOX BIAX
SYSTEM RESPONSE TIME 2:43
30 PPM CO BIAS
10.0% CO2 BIAS
12.0% O2 BIAS
32.0 PPM THC PROPANE BIAS
82.0 PPM PROPANE THC CAL.
48.30 PPM PROPANE THC CAL.
30.70 PPM PROPANE THC CAL.
839 PPM SO2 CAL
12 8.[illegible]05V
06 0.[illegible]36V
05 0.[illegible]04V
04 0.[illegible]04V
03 0.[illegible]11V
01 -0.[illegible]35V
200mm/h
Aug.29 09:10
zero
7.5 PPM THC BACKGROUND
20.9% O2 CAL.
487 PPM SO2 CAL.
THC BACKGROUND 8.5 PPM
151 PPM NOX CAL.
86 PPM NOX CAL.
30 PPM CO CAL.
308 PPM CO. CAL.
OMEGA ENGINEERING INC. OM500ZFR


START RUN #1 1048
12 PPM NOX
2.2% CO2
THC 7PPM
130PPM CO
SO2 555 PPM
17.0% O2
SO2 = 0 - 1000 PPM
O2 = 0 - 25%
CO2 = 0 - 20%
CO = 0 - 1000 PPM
THC = 0 - 100 PPM
NOX = 0 - 250 PPM
10PPM NOX
2.2% CO2
135PPM CO
555 PPM SO2
16.7% O2
7PPM THC
12 5.249V
06 0.656V
05 0.060V
04 0.266V
03 0.828V
01 0.546V
200mm/h
Aug.29 10:10
STACK 100ft
20.8% O2
489PPM SO2 BIAS
86PPM NOX BIAS
SYSTEM RESPONSE TIME 2:43
30PPM CO BIAS
10.0% CO2 BIAS
OMEGA ENGINEERING, INC.
OM500-ZFP

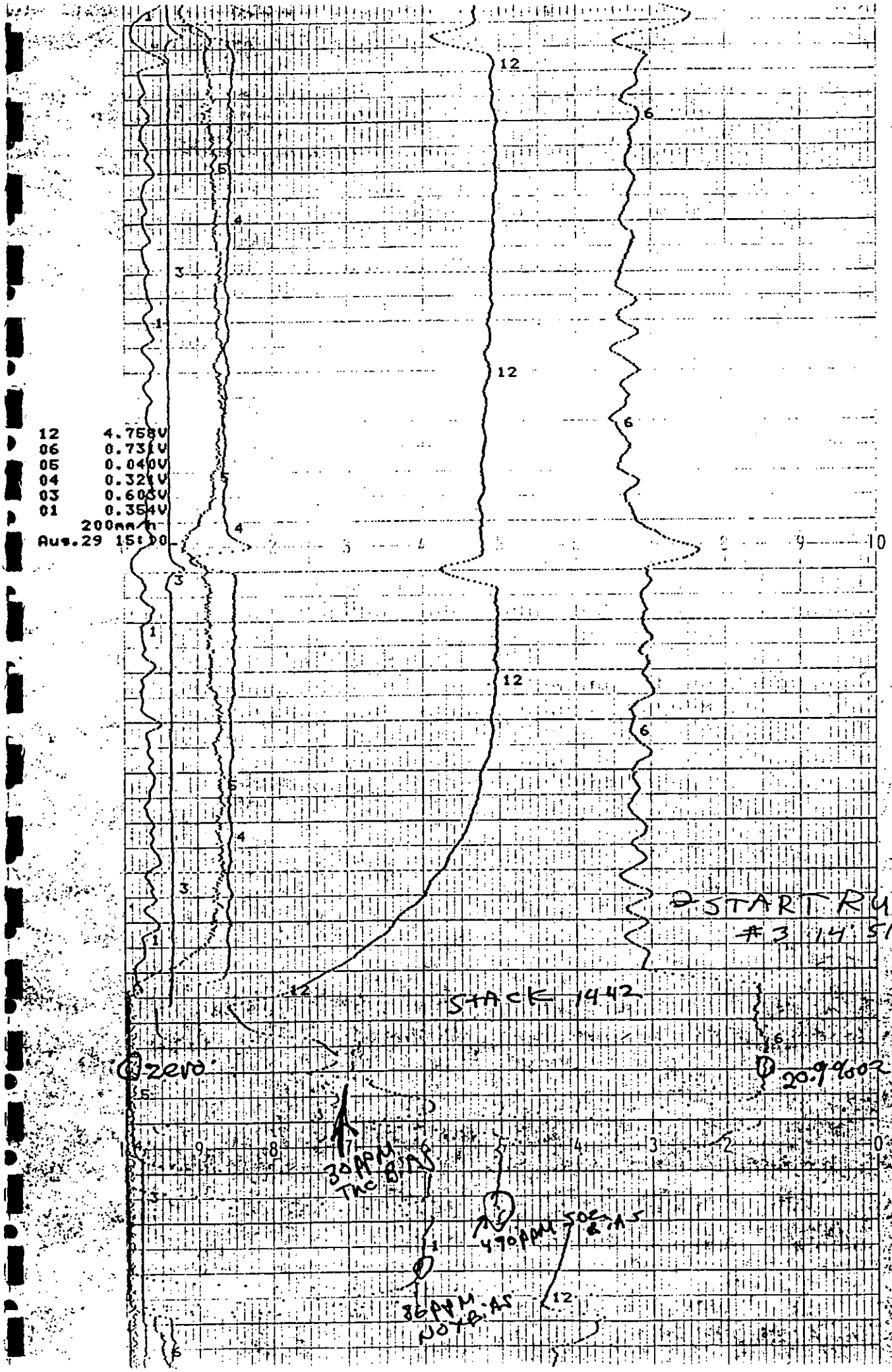

04 0.125V
03 0.517V
01 -0.028V
200mA/h
Aug.29 11:30
30PPM THC BIAS
360PPM NOX BIAS
490PPM SO2 BIAS
60PPM CO BIAS
10% CO2 BIAS
3PPM THC BACKGROUND
ZERO CO2 & NOX
12.0% O2 BIAS
END RUN #2 1153
ON
CABLE OFF
12 6.347V
06 0.653V
05 0.067V
04 0.261V
03 0.676V
01 0.737V
200mA/h
Aug.29 11:10
OMEGA ENGINEERING, INC
OM500.ZFP



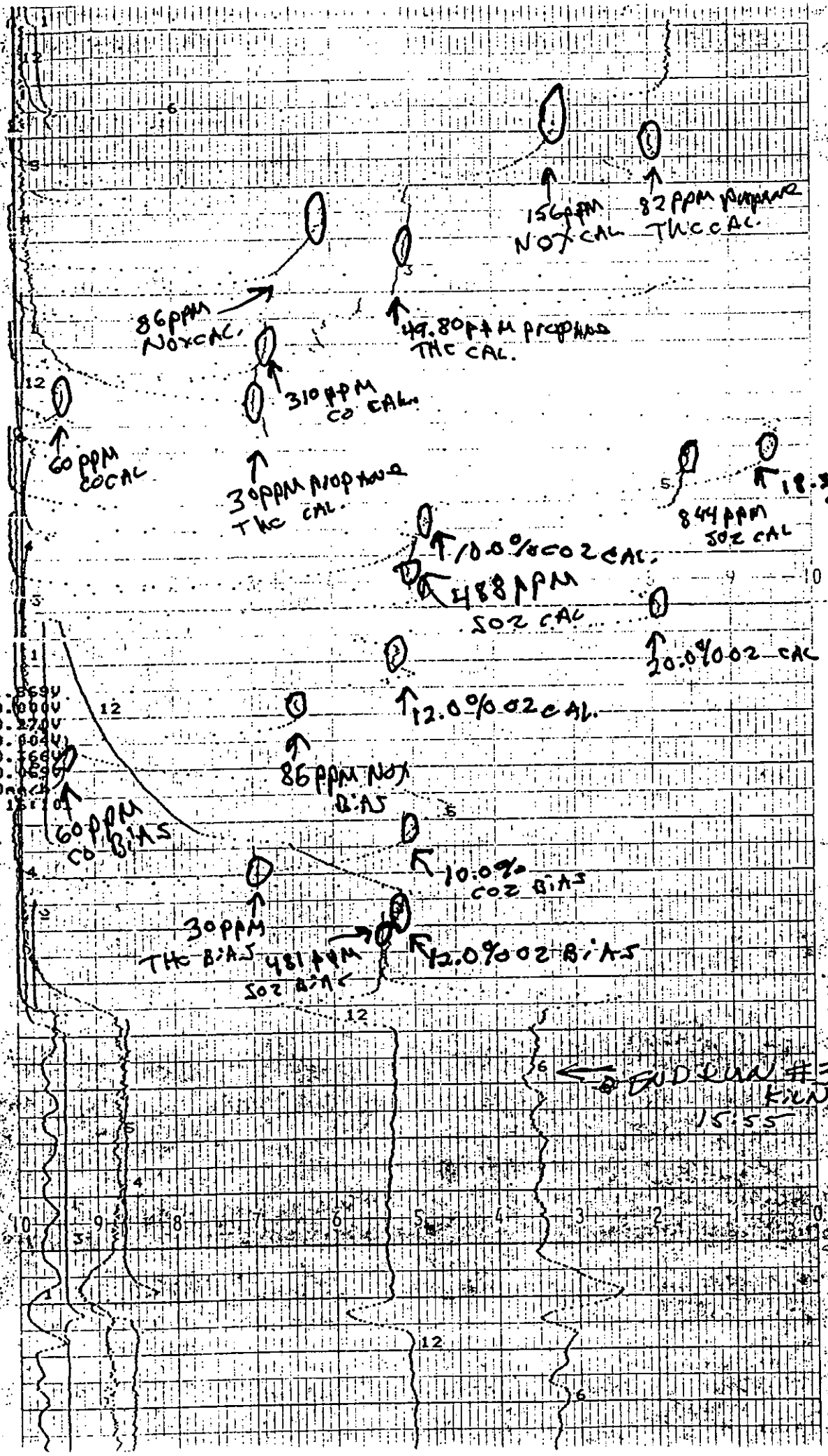
OMEGA ENGINEERING, INC.
OM500-7FP



OMEGA ENGINEERING INC. OM506-ZFP

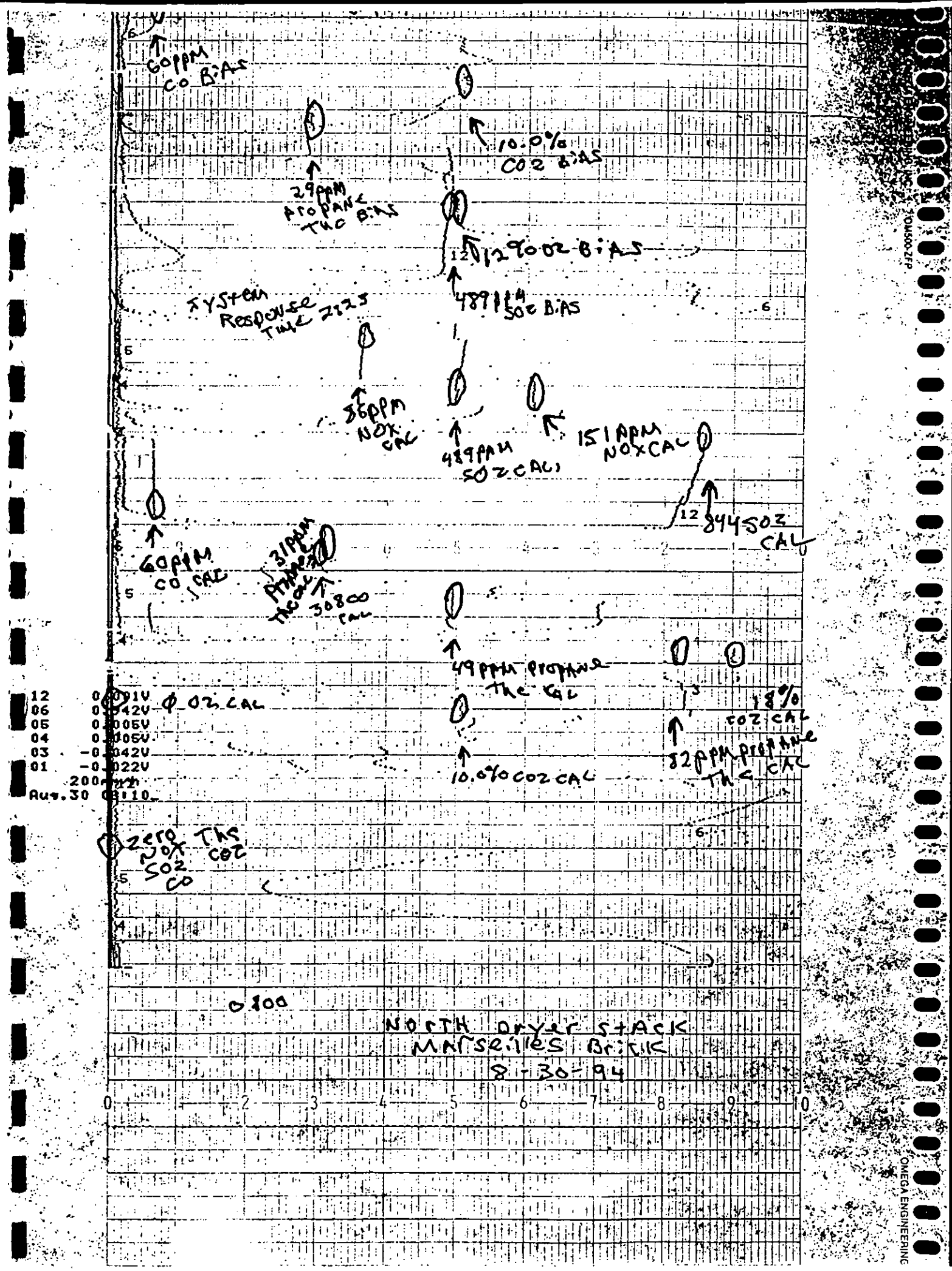


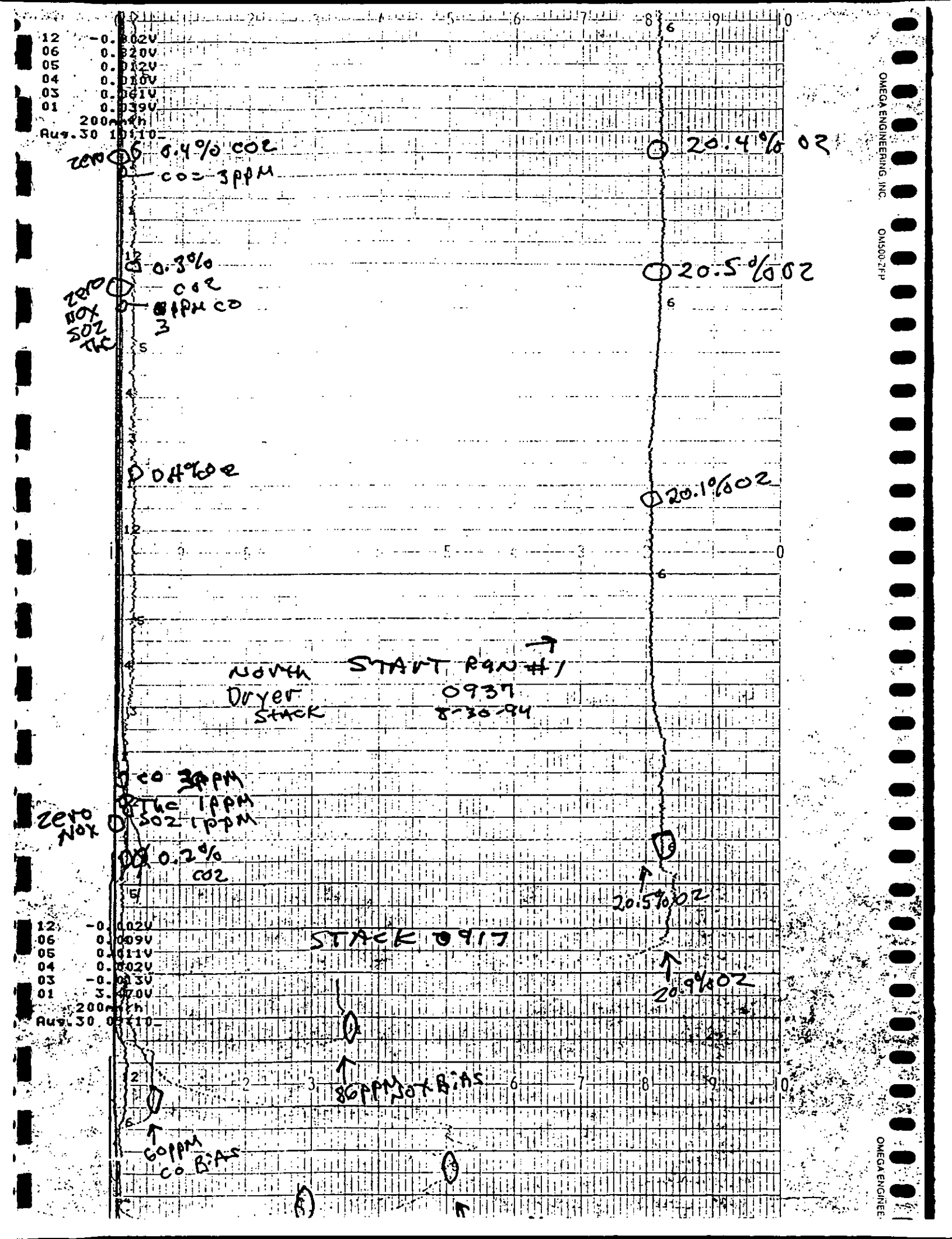
OMEGA ENGINEERING, INC OM500-ZFP

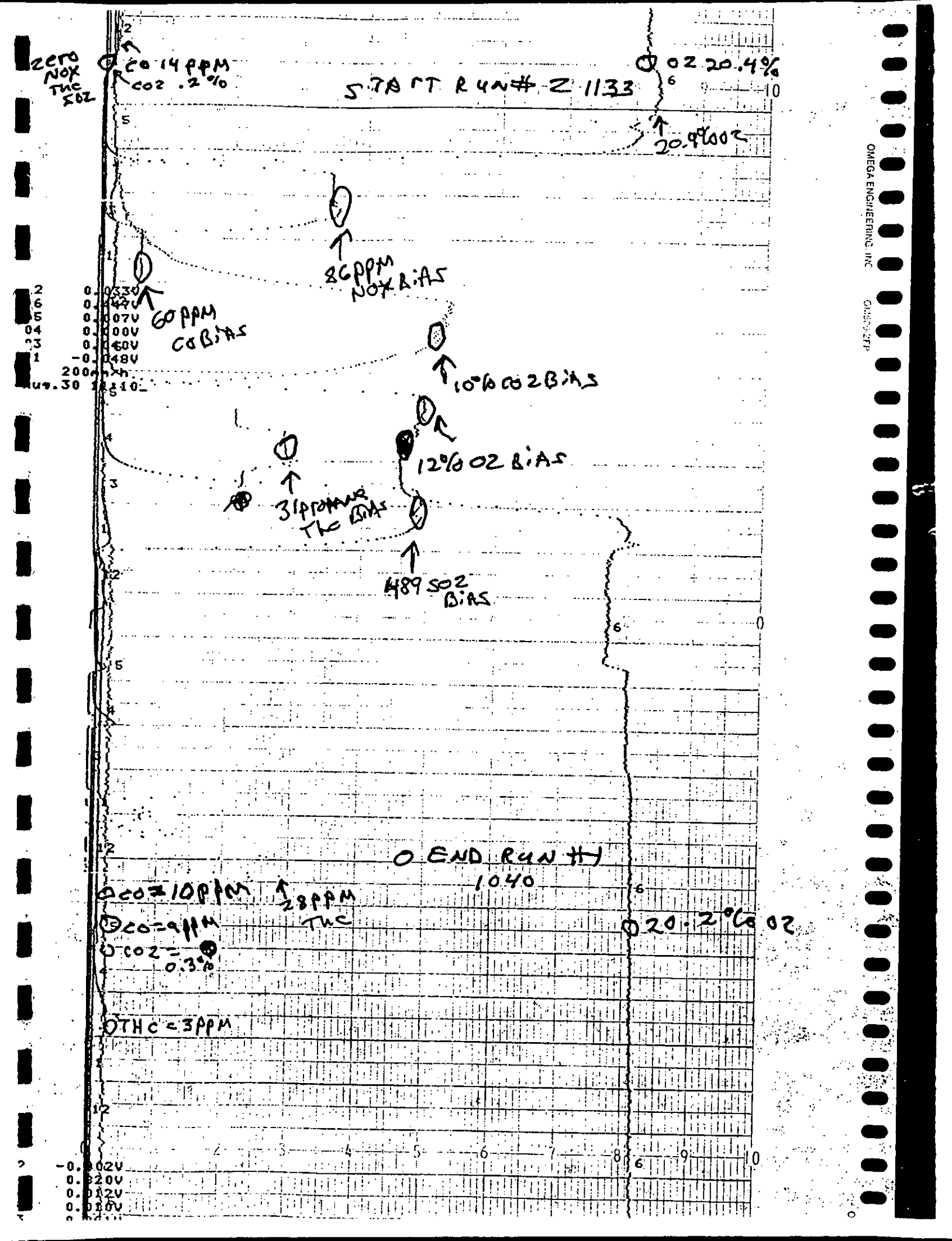


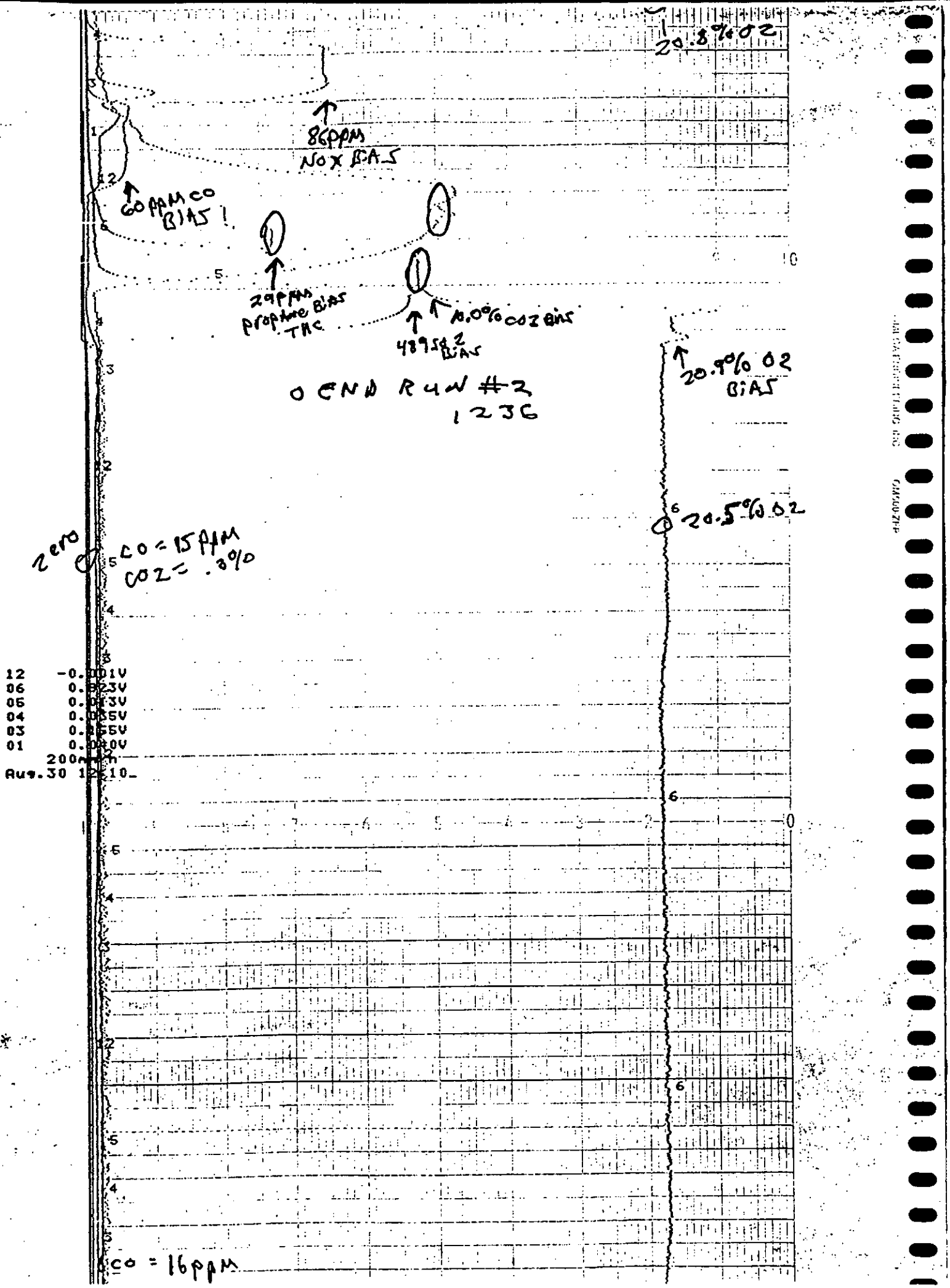
OMEGA ENGINEERING, INC.

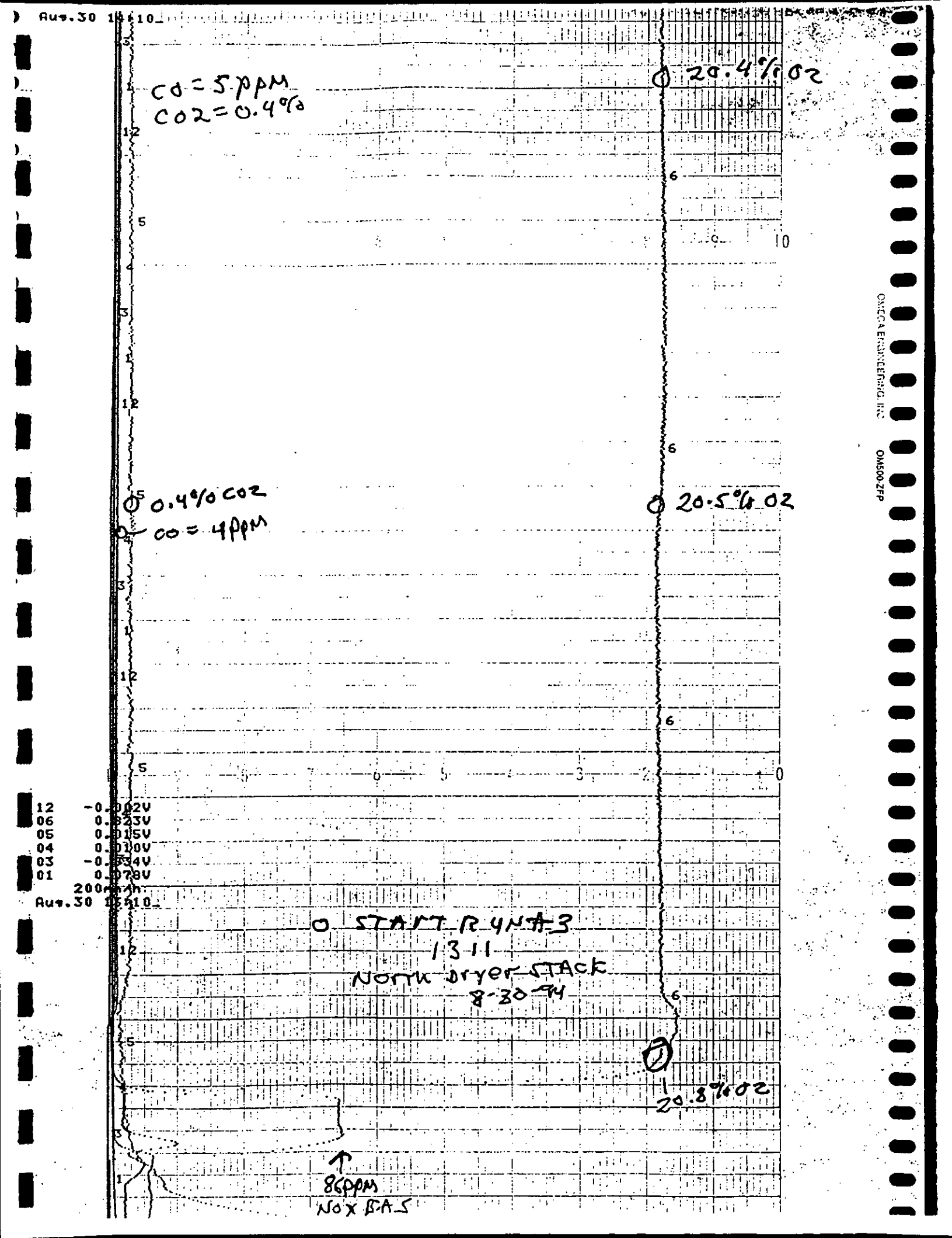
OM500-ZFP

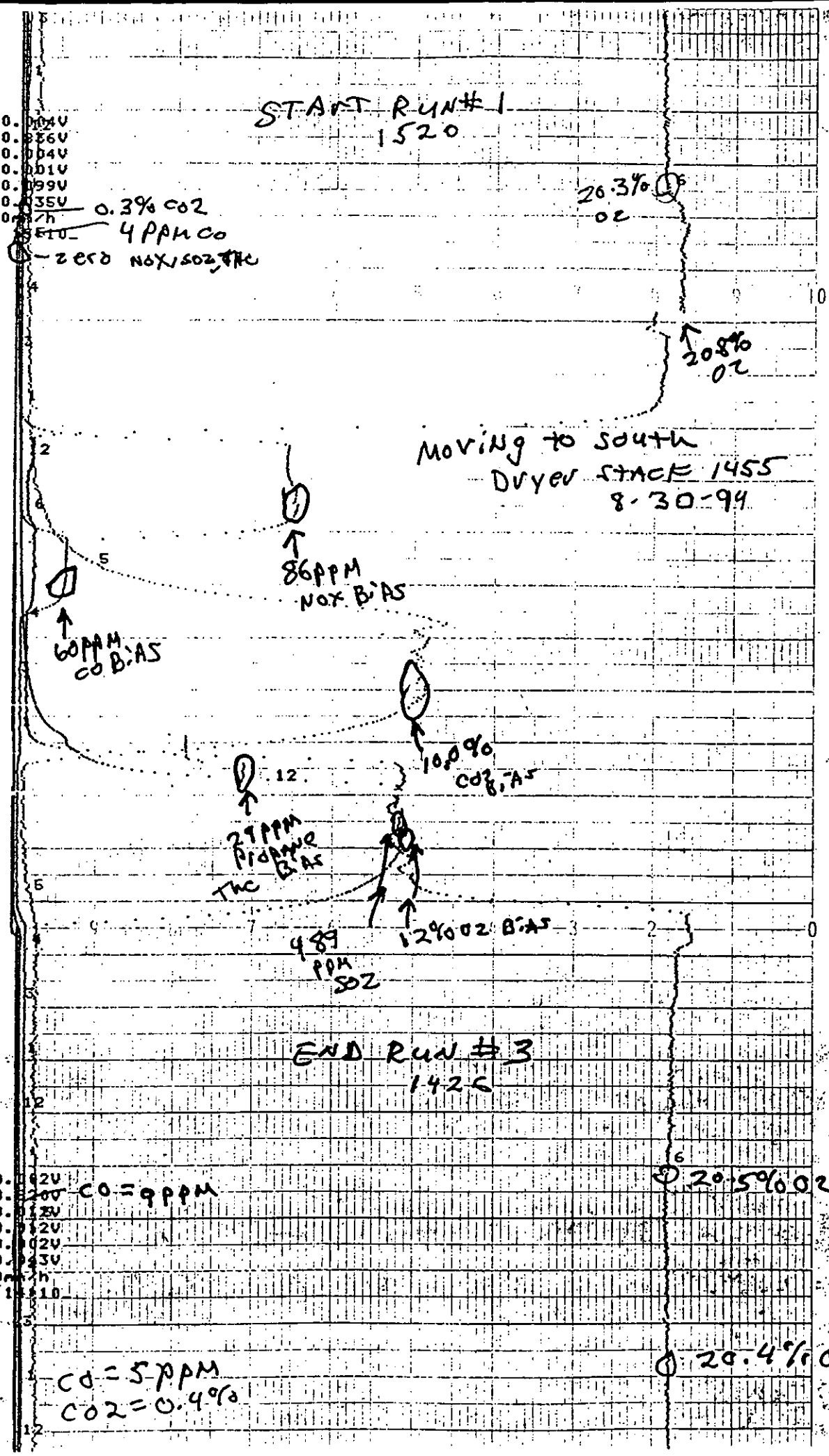

60PPM CO BIAS
10.0% CO2 BIAS
29PPM PROPANE THC BIAS
12 90 O2 BIAS
489PPM SO2 BIAS
SYSTEM RESPONSE TIME 2:25
86PPM NOX CAL
489PPM SO2 CAL
151PPM NOX CAL
844 SO2 CAL
60PPM CO CAL
31PPM PROPANE THC CAL
30800 CAL
49PPM PROPANE THC CAL
18% CO2 CAL
82PPM PROPANE THC CAL
10.0% CO2 CAL
12 0.001V
06 0.042V
05 0.005V
04 0.005V
03 -0.042V
01 -0.022V
200
Aug.30 08:10
ϕ O2 CAL
zero NOX SO2 CO THC CO2
0800
NORTH DRYER STACK
MARSEILLES BRICK
8-30-94
OMEGA ENGINEERING


12 -0.002V
06 0.320V
05 0.012V
04 0.010V
03 0.061V
01 0.039V
200mV/h
Aug.30 10:10
zero
0.4% CO2
CO = 3ppM
20.4% O2
0.3% CO2
zero
NOX
SO2
THC
3 ppM CO
20.5% O2
0.4% CO2
20.1% O2
NORTH
Dryer
STACK
START RUN #1
0937
8-30-94
CO 3ppM
THC 1ppM
SO2 1ppM
zero
NOX
0.2% CO2
20.5% O2
12 -0.002V
06 0.009V
05 0.011V
04 0.002V
03 -0.013V
01 3.470V
200mV/h
Aug.30 09:10
STACK 0917
20.9% O2
86ppM NOX BIAS
60ppM CO BIAS
OMEGA ENGINEERING, INC.
OM500-ZFP
OMEGA ENGINEE

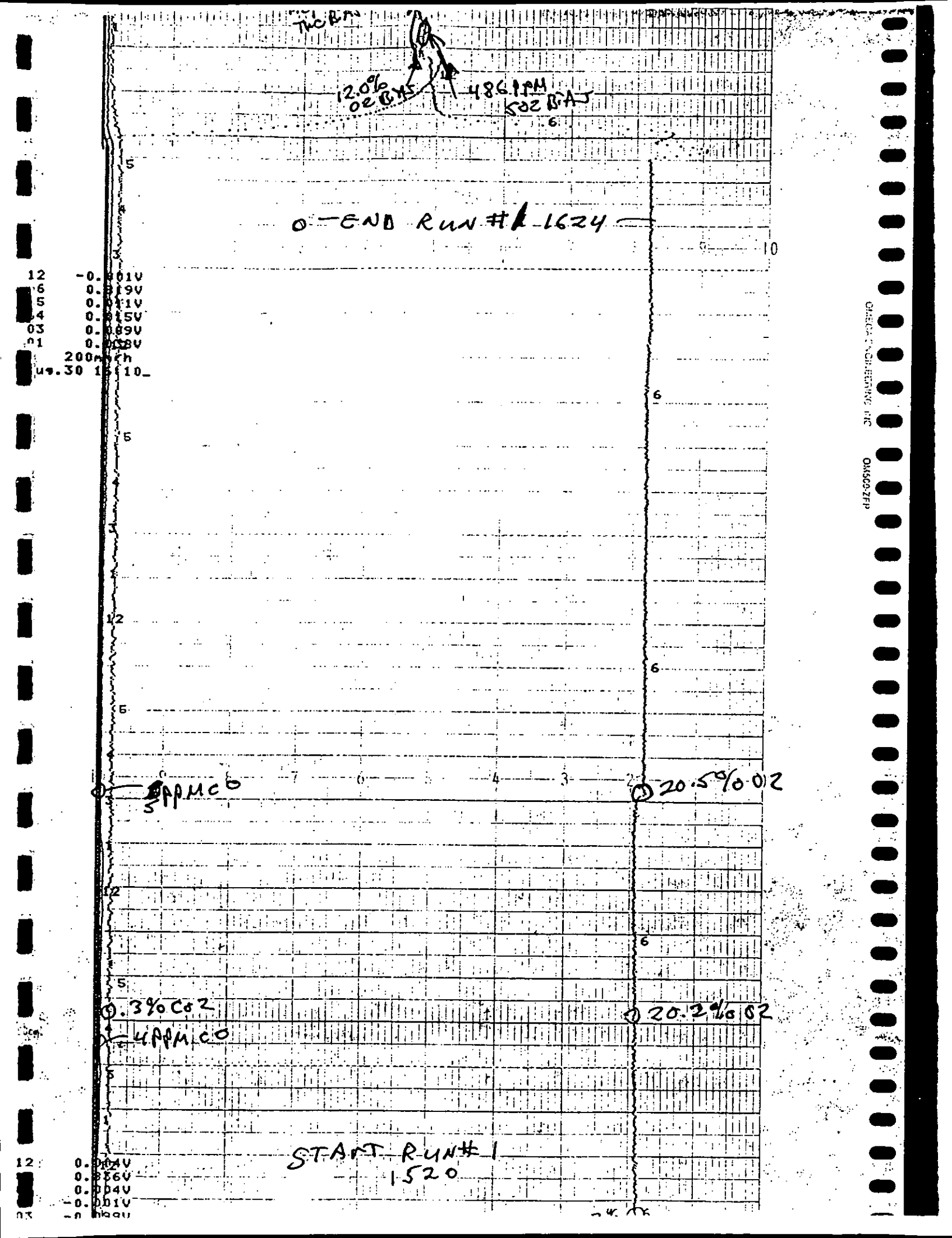

ZERO NOX THC SO2
CO 14 PPM
CO2 .2%
START RUN # Z 1133
O2 20.4%
20.9% O2
86 PPM NOX BIAS
60 PPM CO BIAS
10% CO2 BIAS
12% O2 BIAS
31 PPM THC BIAS
489 SO2 BIAS
END RUN #1
1040
CO = 10 PPM
28 PPM THC
CO = 9 PPM
CO2 = 0.3%
THC = 3 PPM
20.2% O2
OMEGA ENGINEERING, INC


20.8% O2
86ppm NOx BIAS
60ppm CO BIAS!
29ppm propane BIAS THC
10.0% CO2 BIAS
489 SO2 BIAS
20.9% O2 BIAS
O END RUN #2
1236
20.5% O2
zero
CO = 15 ppm
CO2 = .3%
12 -0.001V
06 0.823V
05 0.013V
04 0.035V
03 0.155V
01 0.010V
200mm
Aug.30 12:10
CO = 16ppm

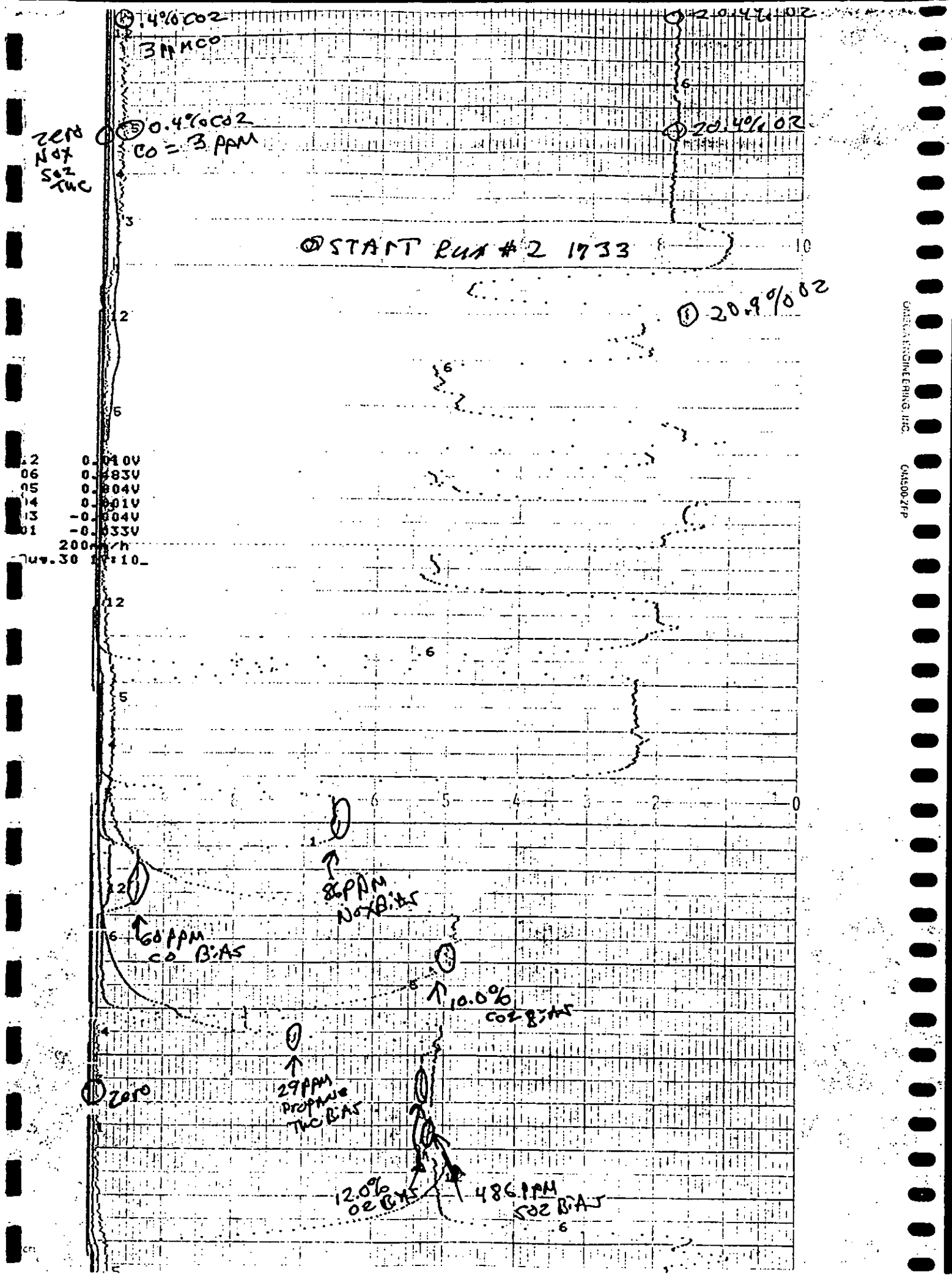

Aug.30
CO = 5 ppm
CO2 = 0.4%
20.4% O2
0.4% CO2
CO = 4 ppm
20.5% O2
12 -0.002V
06 0.023V
05 0.015V
04 0.010V
03 -0.034V
01 0.078V
START RUN #3
1311
North dryer STACK
8-30-94
20.8% O2
86 ppm
NOx GAS
OMEGA ENGINEERING INC
OM500-ZFP



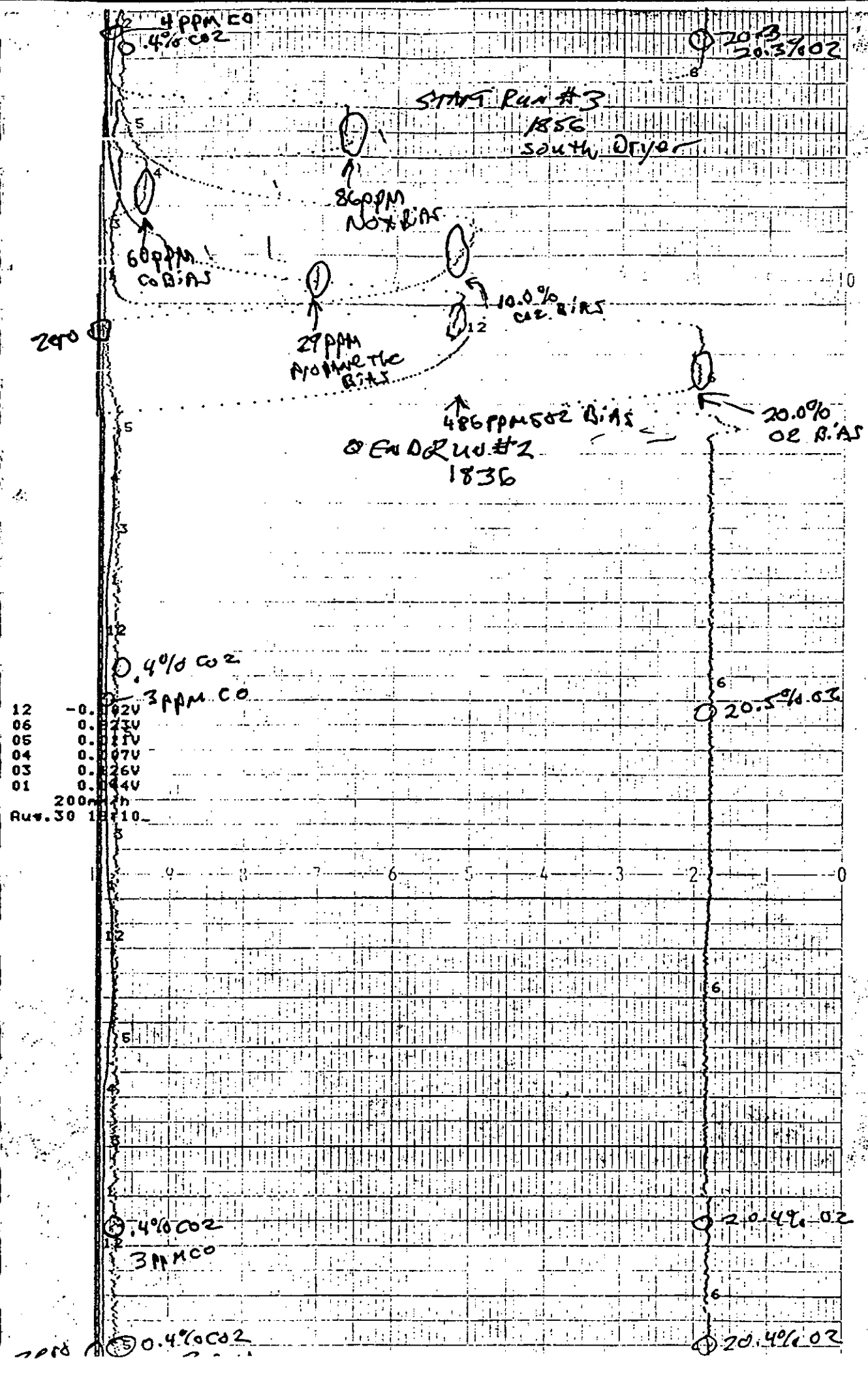
OMEGA ENGINEERING, INC
OM500-ZFP

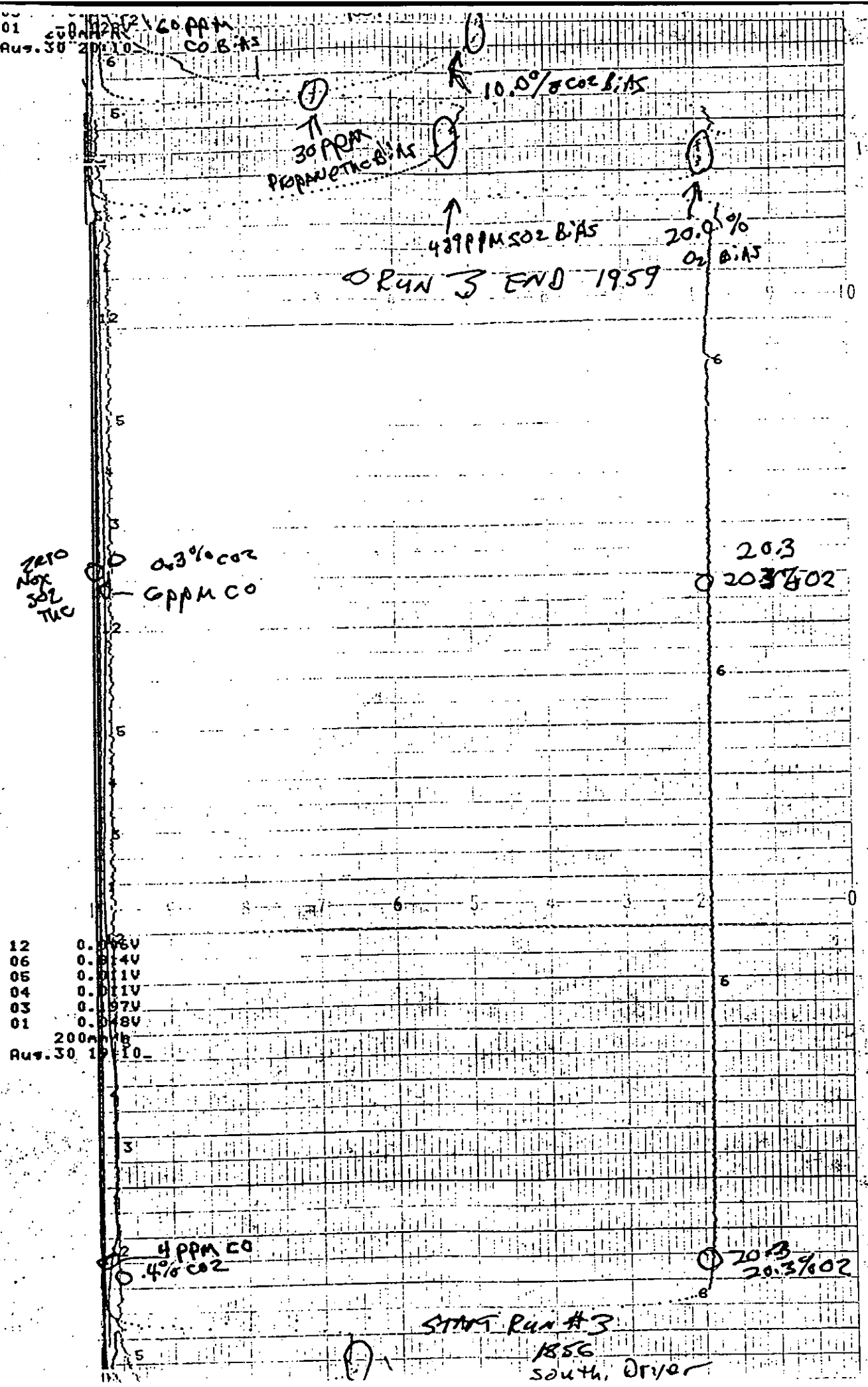


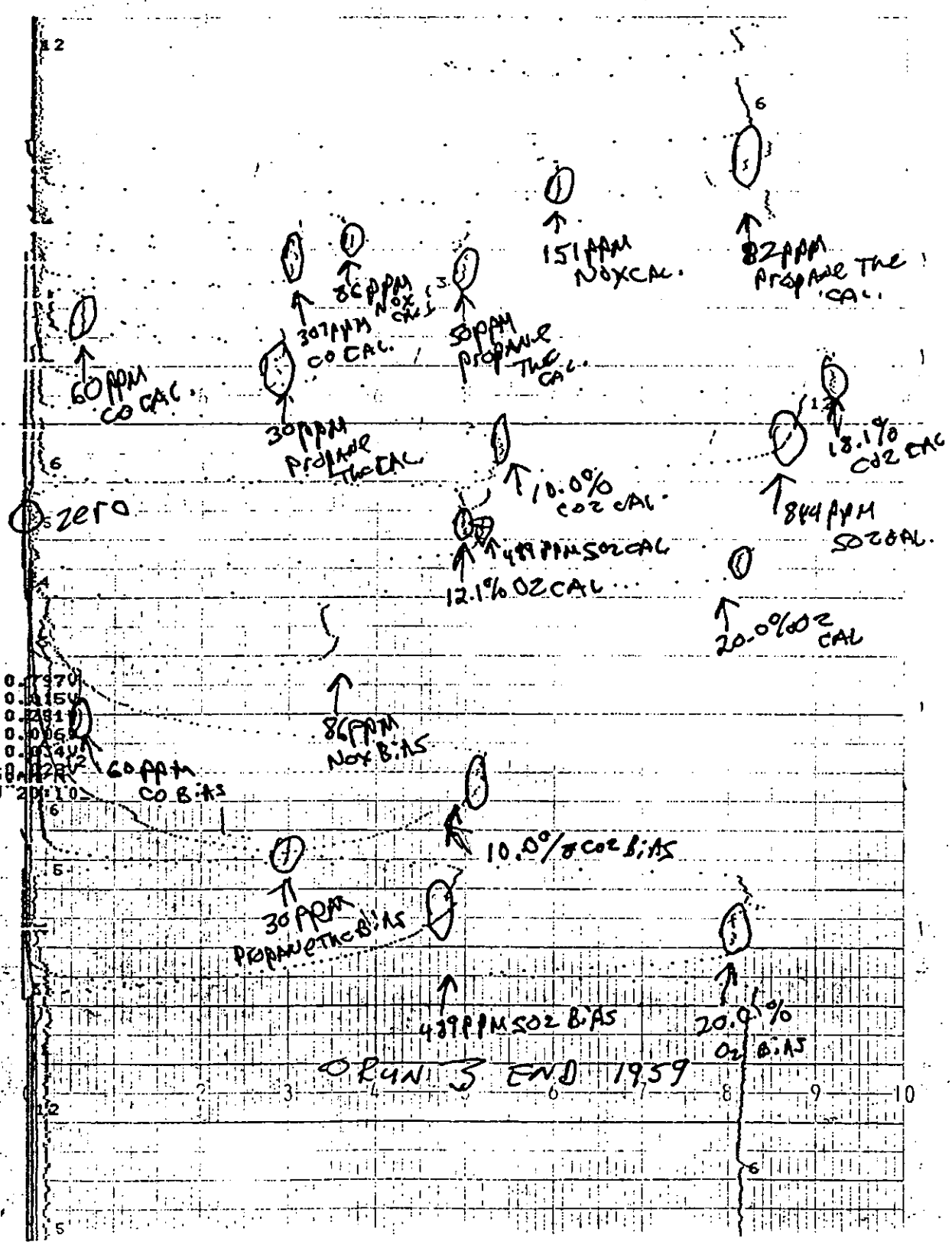
12.0% O2 BYS
486 PPM SO2 BIAS
END RUN #1 1624
12 -0.001V
6 0.819V
5 0.011V
4 0.015V
03 0.089V
01 0.038V
200mmh
ug.30 15:10
5 PPM CO
20.5% O2
.3% CO2
4 PPM CO
20.2% O2
START RUN #1
1520
12 0.004V
0.836V
0.004V
-0.001V



.4% CO2
3 PPM CO
0.4% CO2
CO = 3 PPM
zero
NOx
SO2
THC
20.4% O2
20.4% O2
START Run #2 1733
20.9% O2
.2 0.010V
06 0.483V
05 0.004V
14 0.001V
13 -0.004V
01 -0.033V
200mm/h
Aug.30 17:10
86 PPM
NOx BIAS
60 PPM
CO BIAS
10.0%
CO2 BIAS
29 PPM
PROPANE
THC BIAS
zero
12.0%
O2 BIAS
486 PPM
SO2 BIAS
OMEGA ENGINEERING, INC.
OM500-ZFP


4 PPM CO
.4% CO2
20.3
20.3% O2
START Run #3
1856
South Dryer
86 PPM
NOx BIAS
60 PPM
CO BIAS
10.0%
CO2 BIAS
29 PPM
Propane Tic
BIAS
486 PPM SO2 BIAS
20.0%
O2 BIAS
END Run #2
1836
.4% CO2
3 PPM CO
20.5% O2
.4% CO2
3 PPM CO
20.4% O2
0.4% CO2
20.4% O2
12 -0.002V
06 0.023V
05 0.011V
04 0.007V
03 0.026V
01 0.044V
200mm/h
Aug.30 18:10


01
Aug.30 20:10
60 PPM CO BIAS
10.0% CO2 BIAS
30 PPM PROPANE BIAS
439 PPM SO2 BIAS
20.0% O2 BIAS
RUN 3 END 1959
ZERO NOX SO2 THC
0.3% CO2
6 PPM CO
20.3
20.3% O2
12 0.096V
06 0.014V
05 0.011V
04 0.011V
03 0.197V
01 0.048V
200 mV
Aug.30 19:10
4 PPM CO
.4% CO2
20.3
20.3% O2
START Run #3
1856
South, Dryer



OMEGA ENGINEERING, INC.

APPENDIX F

Example Calculations

MOISTURE CONTENT DETERMINATION
EPA Method 4 Calculations
TEST RUN #1
KILN

Parameter	Definition	Unit
Pm	- Absolute Meter Pressure	in. Hg.
Po	- *Average Meter Orifice Differential Pressure*	in. H2O
Pstd	- Absolute Standard Barometric Pressure {29.92}	in. Hg.
Pb	- Absolute Barometric Pressure	in. Hg.
k	- Standard Volume H2O Vapor/Unit Weight Liquid Constant = 0.04715 cu. ft./g	ft./g
Tm(F)	- *Average Meter Temperature Degrees F:*	degrees (F)
Tm	- Average Meter Temperature Degrees R:	degrees (R)
Tstd	- Absolute Standard Temperature (528 R)	degrees (R)
Y	- Dry Gas Meter Correction Factor	dimensionless
Vlcg	- Total condensate Collected	grams/ml H2O
Vm	- Metered Dry Sample Gas Volume	dcf
Vmstd	- Volume of Water Vapor Collected at Standard Conditions (528 R, 1 atmosphere)	scf
Bws	- Moisture Content (mole fraction)	mole fraction
Bwd	- Moisture Content (% Volume)	% volume

TEST DATA
RUN # 1

Pb	30.24	Y	1.002
Vm	63.658	Tm(F)	92.666667
Vlcg	81.10	Tm	552.66667
Tstd	528.00	Po	4.138
Pstd	29.92	k	0.04715

MOISTURE DETERMINATION CALCULATIONS:

1. Meter Pressure:

Pm = (Po/13.6)+Pb

Pm =	4.138095238	divided by	13.6	+	30.24	
				=	30.5443	in. Hg.

2. Standard Meter Volume:

$$Vmstd = \frac{17.64 * Vm * Y * Pm}{Tm}$$

Vmstd =

$$\frac{17.64 * 63.658 * 1.002 * 30.5443}{552.6666667} = 62.1850 \text{ dscf}$$

3. Meter Temperature:

Tm=Tm(F)+460

Tm =	92.66666667	+	460	=	552.6666667	Deg. (R)

4. Standard Water Volume:

Vwstd = k*Vlcg

Vwstd =	0.04715	*	81.1	=	3.823865	scf

5a. *Moisture Content:*

$$Bws = \frac{Vwstd}{Vwstd+Vmstd}$$

$$Bws = \frac{3.823865}{3.823865 + 62.1850} = 0.0579 \text{ mole frac.}$$

5b. Bwd = Bws*100

Bwd =	0.057929548	*	100	=	5.7930	% H2O

5c. Dry Gas Fraction:

Fdg = 1-Bws

Fdg =	1	-	0.0579	=	0.9421	FDG

VELOCITY AND VOLUMETRIC FLOWRATE DETERMINATION
EPA METHOD 2 CALCULATIONS
TEST RUN #1
KILN

Parameter	Definition		Units
Cp	- Pitot Tube Coefficient		dimensionless
Vs	- Gas Stream Velocity		ft./second
Qsd	- Volumetric Flow Rate at Standard Condition,Dry Basis		dscfm
Qact	- Actual Volumetric Flow Rate, Wet Basis		acfm
Bws	- Moisture Content		mole fraction
Dp	- Average Square Root of Velocity Head		in. H2O
Pb	- Absolute Barometric Pressure		in. Hg.
Kp	- Constant=89.49(ft)(lb/lb-mol)(in.Hg^0.5)/(s)(R)		in.H2O
Ts	- Absolute Stack Gas Temperature (R)		Degrees (R)
Ms	- Sample Gas Molecular Weight, Wet Basis		lb/lb-mole
Sp	- Static Pressure of Gas Stream		in. H2O
Abs	- Absolute Standard Temperature	528	degrees R
Sl	- Stack Length		in.
Sw	- Stack Width		in.
Csa	- Stack Cross-sectional Area		ft2
Ps	- Absolute Stack Gas Pressure		in. Hg.
Sm	- Conversion Factor	60	sec/min
Pi	- Constant Ratio	3.1415927	dimensionless
Dn	- Nozzle Diameter		in.
An	- Nozzle Area		ft.2
Tstd	- Absolute Standard Temperature (528) (R		degrees R

TEST DATA
TEST RUN #1

Ms	28.3867	Cp	0.84
Bws	0.0579	Pb	30.24
Sp	-0.15	Ts	897.43
Sl	41.00	Dp	0.5983
Sw	41		
Tstd	528.00	Dn	0.3700

VELOCITY AND VOLUMETRIC FLOWRATE CALCULATIONS:

1. Stack Pressure:

Ps = Pb+(Sp/13.6)

Ps=	30.24	+	-0.15	/	13.6		
				=	30.2290	in. Hg.	

2. Velocity of Stack Gas:

Vs=85.49	*Cp*Dp*[(	SQRT[(Ts)/(Ps*Ms)]		29.9571	29.2934	
Vs=85.49*	0.502548772	*	1.022658579			
				=	43.9364	ft./sec.

3. Stack Cross-sectional Area:

Csa =	(L*W)/144					
Csa=	(L*W)/144 =	41	*	41	/ 144 =	
					11.67361111	ft.2

4a. Volumetric Flowrate, Wet Basis:

Qact =	(Vs*Csa)*60					
Qact=	43.9364	*	700.4167			
				=	30773.7677	acfm

4b. Volumetric Flowrate at Standard Conditions, Dry Basis:

$$Qsd = \frac{(Qact)(1-Bws)}{(Ts)(29.92)} \frac{(Tstd)(Ps)}{} =$$

Qsd =	30773.76769	*	0.942070452	*	15960.89647
	26851.06286				

Qsd	=	17232.9589	dscfm

MOLECULAR WEIGHT DETERMINATION
EPA METHOD 3 CALCULATIONS
TEST RUN # 1
KILN

Parameter	Definition	Units
Md	- Sample Gas Molecular Weight, Dry Basis	lb/lb-mole
Ms	- Sample Gas Molecular Weight, Wet Basis	lb/lb-mole
Bws	- Moisture Content	mole fraction
%O2	- Oxygen (O2) Concentration, Dry Basis	% volume
%CO2	- Carbon Dioxide (CO2) Concentration, Dry Basis	% volume
%CO	- Carbon Monoxide (CO) Concentration, Dry Basis	% volume
%N2	- Nitrogen (N2) Concentration, Dry Basis (gas balance)	% volume
0.32	- Molecular Weight of Oxygen (O2) divided by 100	lb/lb-mole
0.44	- Molecular Weight of Carbon Dioxide (CO2) / by 100	lb/lb-mole
0.28	- Molecular Weight of Carbon Monoxide (CO) / by 100	lb/lb-mole
0.28	- Molecular Weight of Nitrogen (N2) divided by 100	lb/lb-mole
18.00	- Molecular Weight of Water	lb/lb-mole

TEST DATA
TEST RUN #1

Bws	0.0579	%N2	81.052
%O2	16.73		
%CO2	2.218		
%CO	0		

1. MOLECULAR WEIGHT, DRY:

Md = 0.44*%CO2+0.32*%O2+0.28*%N2+%CO

0.97592 + 5.3536 + 22.69456 + 0

Md = 29.0241 lb/lb-mole

2. MOLECULAR WEIGHT, WET:

Ms = Md*(1-Bws)+18.00*Bws

29.02408 * 0.942070452 + 1.042731861

Ms = 28.3855 lb/lb-mole

PARTICULATE MATTER EMISSION DETERMINATION
EPA METHOD 5 CALCULATIONS
TEST RUN # 1
KILN

Parameter	Definition	Units
Fdg	- (1-Bws)	fraction
I	- Percent of Isokinetic Sampling	%
Ts	- Absolute Average Stack Gas Temperature	degrees R
Vmstd	- Volume of Stack Gas Sampled, Corrected to Dry, Standard Conditions	dscf
Vs	- Stack Gas Velocity	ft./second
T	- Sample Time Interval	minutes
An	- Cross-Sectional Area of Sampling Nozzle	ft.2
Ps	- Absolute Stack Gas Pressure	in. Hg
Dn	- Sampling Nozzle Diameter	inches
Pi	- Constant (3.141592654)	dimensionless
K2	- Conversion Factor (144)	in.2/ft.2
K3	- Conversion Factor (0.002669)	in. Hg-ft.3/ml-R
K4	- Conversion Factor (17.64)	deg.R/in. Hg
1.67	- Conversion Factor	%-sec/min

TEST DATA
TEST RUN #1
KILN

Bws	0.0579		
Vs	43.9364	Ts	897.43
Vlcg	81.1000	Ps	30.2290
K3	0.0027	T	60
K4	0.0945	Dn	0.3700
Fdg	0.9421	Vmstd	62.1850

1. Nozzle Area:

An=(Dn/24)^2*Pi

An= 0.000237674 * 3.1415927

An = = 0.00074667 ft.2

2. I = ISOKINETICS (%):

$$\frac{0.0945*Ts*Vmstd}{Ps*Vs*An*T*Fdg}$$

An*T*Fdg = 0.042205152

$$\frac{0.0945 * 897.4285714 * 62.185022}{30.22897 * 43.93637266 * 0.0422052}$$

= 94.08 % I

PARTICULATE MATTER EMISSION DETERMINATION
EPA METHOD 5 CALCULATIONS
TEST RUN # 1
KILN

Parameter	Definition	Units
Pc	- Total Particulate Catch	mg
Pg	- Total Particulate Catch (mg/1000)	grams
Vmstd	- Volume of Stack Gas Sampled, Corrected to Dry, Standard Conditions	dscf
Cs	- Concentration of Particulate in Stack Gas, Corrected to Dry, Standard Conditions (grams/dscf)	gm/dscf
Cg	- Concentration of Particulate Matter (grains)	gr/dscf
Pcs	- Concentration of Particulate (lb/hour)	lb/hour
K3	- Conversion Factor (15.43)	gr/gm
Qsd	- Stack Gas Volumetric Flow Rate, Corrected to Dry, Standard Conditions	dscf/min
K2	- Conversion Factor (0.002205)	lb/gm
K1	- Conversion Factor (0.001)	gm/mg
K4	- Conversion Factor (60)	min/hour
Pe	- Particulate Matter Emission Rate	lb/hour

TEST DATA
TEST RUN #1
KILN

Pc	588.8	K4	60.00
Pg	0.5888	Qsd	17232.959
Vmstd	62.1850	K1	0.001000
K2	0.002205	K3	15.43

AUGUST 29, 1994
KILN STACK
PARTICULATE MATTER EMISSIONS CALCULATIONS:

1a. Total Particulate Catch :

Cs = Pg/Vmstd

0.5888 / 62.1850224

Cs = 0.0095 grams/dscf

1b. Cg = K3*Cs

15.43 * 0.009468518

Cg = 0.1461 grains/dscf

1c. Pcs = K2*Cs

0.002205 * 0.009468518

Pcs = 0.00002088 lb/dscf

1d. Pe = K4 * Pcs * Qsd

60 * 0.000020878 * 17232.95892

Pe = 21.5875 lbs/hour Total Particulate Emissions.

APPENDIX G

Calibration Gas Certifications

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
FURGO MCCLELLAND
CHRIS DAWDY
9921 ST CHARLES ROCK RD
ST ANN MO 63074

Assay Laboratory
Scott Specialty Gases, Inc.
1290 Combermere
Troy, MI 48083

Purchase Order H145-2
Scott Project # 547552

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

Cylinder Number ALM020958
Cylinder Pressure 1900 psig
Certification Date 2-18-93
Previous Certification Dates None
Expiration Date 8-18-94

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	82.11 ppm	±1% NIST Directly Traceable

Balance Gas: *Nitrogen*

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
SRM 2643A	10-14-95	SX-20305	99.12 ppm Propane in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Prop: Beckman/400/1002059	1-25-93	Flame Ionization Detector

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Propane	Date: 2-18-93 Response Units: mv Z1=0.00 R1=99.10 T1=82.10 R2=99.10 Z2=0.00 T2=82.10 Z3=0.00 T3=82.10 R3=99.10 Avg. Conc. of Cust. Cyl. 82.11 ppm		Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$ r=0.99999 SRM 2643A Constants: A=-0.03442105 B=1.000549 C=0 D=0 E=0
			Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$
			Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$

Special Notes

Analyst Tim Sanderson

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer	Assay Laboratory	
FURGO MCCLELLAND	Scott Specialty Gases, Inc.	Purchase Order H145-2
CHRIS DAWDY	1290 Combermere	Scott Project # 547552
9921 ST CHARLES ROCK RD	Troy, MI 48083	
ST ANN MO 63074		

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

Cylinder Number	ALM030297	**Certification Date**	2-18-93	**Expiration Date**	8-18-94
Cylinder Pressure	1900 psig	**Previous Certification Dates**	None		

ANALYZED CYLINDER

Components	*Certified Concentration*	*Analytical Uncertainty**
Propane	**49.59 ppm**	**±1% NIST Directly Traceable**

Balance Gas: Nitrogen

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
SRM 2643A	10-14-95	SX-20305	99.12 ppm Propane in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Prop: Beckman/400/1002059	1-25-93	Flame Ionization Detector

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Propane	Date: 2-18-93 Response Units: mv Z1=0.00 R1=99.10 T1=49.60 R2=99.10 Z2=0.00 T2=49.60 Z3=0.00 T3=49.60 R3=99.10 Avg. Conc. of Cust. Cyl. 49.59 ppm		Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$ r=0.99999 SRM 2643A Constants: A=-0.03442105 B=1.000549 C=0 D=0 E=0
			Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$
			Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$

Special Notes

Analyst Tim Sanderson

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
FURGO MCCLELLAND
CHRIS DAWDY
9921 ST CHARLES ROCK RD
ST ANN MO 63074

Assay Laboratory
Scott Specialty Gases, Inc.
1290 Combermere
Troy, MI 48083

Purchase Order H145-2
Scott Project # 547552

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

Cylinder Number ALM030957
Cylinder Pressure 1900 psig
Certification Date 2-18-93
Previous Certification Dates None
Expiration Date 8-18-94

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	30.68 ppm	±1% NIST Directly Traceable

Balance Gas: Nitrogen

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
SRM 2643A	10-14-95	SX-20305	99.12 ppm Propane in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Prop: Beckman/400/1002059	1-25-93	Flame Ionization Detector

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Propane	Date: 2-18-93 Response Units: mv Z1=0.00 R1=99.10 T1=30.70 R2=99.10 Z2=0.00 T2=30.70 Z3=0.00 T3=30.70 R3=99.10 Avg. Conc. of Cust. Cyl. 30.68 ppm		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.99999 SRM 2643A Constants: A=-0.03442105 B=1.000549 C=0 D=0 E=0
			Concentration=A+Bx+Cx^2+Dx^3+Ex^4
			Concentration=A+Bx+Cx^2+Dx^3+Ex^4

Special Notes

Analyst Tim Sanderson

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALEMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER N/A

REFERENCE STANDARD

COMPONENT		NIST SRM NO.	CYLINDER NO.	CONCENTRATION
NITRIC OXIDE	GMIS	vs 1685b	SA 5692	237 ppm

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT NITRIC OXIDE GMIS ANALYZER MAKE-MODEL-S/N Beckman 951A S/N 0101354

ANALYTICAL PRINCIPLE Chemiluminescence LAST CALIBRATION DATE 03/03/93

FIRST ANALYSIS DATE 04/16/93 SECOND ANALYSIS DATE 04/23/93

Z 0	R 931	C 964	CONC. 245 ppm	Z 0	R 932	C 966	CONC. 246 ppm
R 932	Z 0	C 964	CONC. 245 ppm	R 933	Z 0	C 969	CONC. 246 ppm
Z 0	C 964	R 931	CONC. 245 ppm	Z 0	C 968	R 933	CONC. 246 ppm
U/M mV		MEAN TEST ASSAY	245 ppm	U/M mV		MEAN TEST ASSAY	246 ppm

THIS CYLINDER NO. SA 6137
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 04/23/93
EXPIRATION DATE 10/23/94

CERTIFIED CONCENTRATION

NITRIC OXIDE	246 ppm
NITROGEN	BALANCE
NOx	248 ppm

ANALYZED BY Maria E. Ruchon MARIA E. RUCHON

CERTIFIED BY KWAN T. YOUNG

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 102293-1

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
SULFUR DIOXIDE GMIS	vs. 1662a	SA 6240	1002 ppm

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT SULFUR DIOXIDE GMIS ANALYZER MAKE-MODEL-S/N Siemens Ultramat 5E S/N C1-009

ANALYTICAL PRINCIPLE NDIR LAST CALIBRATION DATE 08/17/93

FIRST ANALYSIS DATE 11/08/93 SECOND ANALYSIS DATE 11/15/93

Z 0	R 1002	C 845	CONC. 845 ppm	Z 0	R 1004	C 846	CONC. 844 ppm
R 1002	Z 0	C 844	CONC. 844 ppm	R 1004	Z 0	C 847	CONC. 845 ppm
Z 0	C 844	R 1002	CONC. 844 ppm	Z 0	C 846	R 1004	CONC. 844 ppm
U/M ppm		MEAN TEST ASSAY	844 ppm	U/M ppm		MEAN TEST ASSAY	844 ppm

THIS CYLINDER NO. SA 8427
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 11/15/93
EXPIRATION DATE 11/15/96 TERM 36 MONTHS

CERTIFIED CONCENTRATION

SULFUR DIOXIDE	844 ppm
NITROGEN	BALANCE

ANALYZED BY Kelly Gallagher KELLY GALLAGHER

CERTIFIED BY Maria Rochon MARIA ROCHON

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALEMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 031993-4

REFERENCE STANDARD

COMPONENT		NIST SRM NO.	CYLINDER NO.	CONCENTRATION
NITRIC OXIDE	GMIS	vs 1684b	SA 1395	85.2 ppm

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT NITRIC OXIDE GMIS ANALYZER MAKE-MODEL-S/N Beckman 951A S/N 0101354

ANALYTICAL PRINCIPLE Chemiluminescence LAST CALIBRATION DATE 03/03/93

FIRST ANALYSIS DATE 01/21/93 SECOND ANALYSIS DATE 03/24/93

Z 0	R 967	C 822	CONC.	86.7 ppm	Z 0	R 862	C 870	CONC.	86.0 ppm
R 967	Z 0	C 822	CONC.	86.7 ppm	R 860	Z 0	C 869	CONC.	86.1 ppm
Z 0	C 822	R 967	CONC.	86.7 ppm	Z 0	C 869	R 860	CONC.	86.1 ppm
U/M mV		MEAN TEST ASSAY		86.7 ppm	U/M mV		MEAN TEST ASSAY		86.1 ppm

CHRONOLOGY: First Analysis vs GMIS SA 3057, 102 ppm NO/N2

THIS CYLINDER NO. SGAL 1074
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 03/24/93
EXPIRATION DATE 09/24/94

CERTIFIED CONCENTRATION

NITRIC OXIDE	86.4 ppm
NITROGEN	BALANCE
NOx	88.7 ppm

ANALYZED BY MARIA E. ROCHON

CERTIFIED BY KWAN T. YOUNG

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FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 102293-1

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
SULFUR DIOXIDE GMIS	vs. 1662a	SA 6240	1002 ppm

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT SULFUR DIOXIDE GMIS ANALYZER MAKE-MODEL-S/N Siemens Ultramat 5E S/N C1-009

ANALYTICAL PRINCIPLE NDIR LAST CALIBRATION DATE 08/17/93

FIRST ANALYSIS DATE 11/08/93 SECOND ANALYSIS DATE 11/15/93

Z 0	R 1002	C 845	CONC. 845 ppm	Z 0	R 1004	C 846	CONC. 844 ppm
R 1002	Z 0	C 844	CONC. 844 ppm	R 1004	Z 0	C 847	CONC. 845 ppm
Z 0	C 844	R 1002	CONC. 844 ppm	Z 0	C 846	R 1004	CONC. 844 ppm
U/M ppm		MEAN TEST ASSAY	844 ppm	U/M ppm		MEAN TEST ASSAY	844 ppm

THIS CYLINDER NO. SA 8427
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 11/15/93
EXPIRATION DATE 11/15/96 TERM 36 MONTHS

CERTIFIED CONCENTRATION

SULFUR DIOXIDE	844 ppm
NITROGEN	BALANCE

ANALYZED BY KELLY GALLAGHER

CERTIFIED BY MARIA ROCHON

3

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FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

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CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 102293-1

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
SULFUR DIOXIDE GMIS	vs 1662a	SA 3104	480 ppm

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT SULFUR DIOXIDE GMIS ANALYZER MAKE-MODEL-S/N Siemens Ultramat 5E S/N C1-009

ANALYTICAL PRINCIPLE NDIR LAST CALIBRATION DATE 08/17/93

FIRST ANALYSIS DATE 11/08/93 SECOND ANALYSIS DATE 11/15/93

Z 0	R 480	C 489	CONC. 489 ppm	Z 0	R 480	C 489	CONC. 489 ppm
R 481	Z 0	C 488	CONC. 487 ppm	R 480	Z 0	C 489	CONC. 489 ppm
Z 0	C 488	R 481	CONC. 487 ppm	Z 0	C 488	R 480	CONC. 488 ppm
U/M ppm		MEAN TEST ASSAY	488 ppm	U/M ppm		MEAN TEST ASSAY	489 ppm

THIS CYLINDER NO. SA 6036
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 11/15/93
EXPIRATION DATE 11/15/95 TERM 24 MONTHS

CERTIFIED CONCENTRATION

SULFUR DIOXIDE	489 ppm
NITROGEN	BALANCE

ANALYZED BY Kelly Gallagher KELLY GALLAGHER

CERTIFIED BY Maria Rochon MARIA ROCHON

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 022194-1

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
CARBON DIOXIDE GMIS	vs 1675b	438008	14.04 %

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT CARBON DIOXIDE GMIS ANALYZER MAKE-MODEL-S/N Siemens Ultramat 5E S/N A12-730

ANALYTICAL PRINCIPLE NDIR LAST CALIBRATION DATE 03/04/94

FIRST ANALYSIS DATE 03/17/94 SECOND ANALYSIS DATE

Z 0.00	R 14.04	C 10.00	CONC. 10.00 %	Z	R	C	CONC.
R 14.04	Z 0.00	C 10.00	CONC. 10.00 %	R	Z	C	CONC.
Z 0.00	C 10.00	R 14.04	CONC. 10.00 %	Z	C	R	CONC.
U/M %		MEAN TEST ASSAY	10.00 %	U/M %		MEAN TEST ASSAY	

THIS CYLINDER NO. CC 58016
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 03/17/94
EXPIRATION DATE 03/17/97 TERM 36 MONTHS

CERTIFIED CONCENTRATION

CARBON DIOXIDE	10.00 %
NITROGEN	BALANCE

ANALYZED BY MARIO S. ROCHON

CERTIFIED BY TY TRIPLETT

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 102293-1

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
CARBON DIOXIDE	2745	SX-20341	15.75 %

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT CARBON DIOXIDE ANALYZER MAKE-MODEL-S/N Siemens Ultramat 5E S/N A12-730

ANALYTICAL PRINCIPLE NDIR LAST CALIBRATION DATE 09/03/93

FIRST ANALYSIS DATE 11/10/93 SECOND ANALYSIS DATE

Z 0.00	R 15.74	C 18.12	CONC. 18.13 %	Z	R	C	CONC.
R 15.76	Z 0.00	C 18.12	CONC. 18.11 %	R	Z	C	CONC.
Z 0.00	C 18.11	R 15.75	CONC. 18.11 %	Z	C	R	CONC.
U/M %		MEAN TEST ASSAY	18.12 %	U/M %		MEAN TEST ASSAY	

THIS CYLINDER NO. SA 8767
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 11/10/93
EXPIRATION DATE 11/10/96 TERM 36 MONTHS

CERTIFIED CONCENTRATION

CARBON DIOXIDE	18.12 %
NITROGEN	BALANCE

ANALYZED BY MARIA ROCHON

CERTIFIED BY DAVID LEON

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 102293-1

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
CARBON MONOXIDE GMIS	vs 1680b	55251	452 ppm

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT CARBON MONOXIDE GMIS ANALYZER MAKE-MODEL-S/N Siemens Ultramat 5E S/N A12-729

ANALYTICAL PRINCIPLE NDIR LAST CALIBRATION DATE 09/02/93

FIRST ANALYSIS DATE 11/8/93 SECOND ANALYSIS DATE 11/15/93

Z 0	R 452	C 309	CONC. 309 ppm	Z 0	R 452	C 309	CONC. 309 ppm
R 452	Z 0	C 309	CONC. 309 ppm	R 452	Z 0	C 309	CONC. 309 ppm
Z 0	C 309	R 452	CONC. 309 ppm	Z 0	C 309	R 452	CONC. 309 ppm
U/M ppm		MEAN TEST ASSAY	309 ppm	U/M ppm		MEAN TEST ASSAY	309 ppm

THIS CYLINDER NO. SA 8631
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 1650 PSIG
CERTIFICATION DATE 11/15/93
EXPIRATION DATE 11/15/96 TERM 36 MONTHS

CERTIFIED CONCENTRATION

CARBON MONOXIDE	309 ppm
NITROGEN	BALANCE

ANALYZED BY Maria E. Rochon MARIA E. ROCHON

CERTIFIED BY DAVID LEON

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer

FUGRO MCCLELLAND
MR. TODD SATLEY
9921 ST CHARLES ROCK RD
ST ANN MO 63074

Assay Laboratory
Scott Specialty Gases, Inc.
1290 Combermere
Troy, MI 48083

Purchase Order H145
Scott Project # 549824

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol I Procedure # G1, Section Number 3.0.4

Cylinder Number	ALM022588	**Certification Date**	4-19-93	**General Exp. Date**	4-19-96
Cylinder Pressure	1900 psig	**Previous Certification Dates**	None	**Acid Rain Exp. Date**	10-19-94

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Monoxide	60.08 ppm	±1% NIST Directly Traceable

Balance Gas: NITROGEN

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM 1679	12-20-94	AAL1355	96.67 ppm CO in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO: Horiba/OPE 144E/560172153	4-6-93	Non-Dispersive Infrared

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Carbon Monoxide	Date: 4-12-93 Response Units: mv Z1=0.00 R1=170.0 T1=106.4 R2=170.0 Z2=0.00 T2=106.4 Z3=0.00 T3=106.4 R3=170.0 Avg. Conc. of Cust. Cyl. 60.13 ppm	Date: 4-19-93 Response Units: mv Z1=0.00 R1=170.0 T1=106.2 R2=170.0 Z2=0.00 T2=106.2 Z3=0.00 T3=106.2 R3=170.0 Avg. Conc. of Cust. Cyl. 60.02 ppm	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.99999 CRM 1679 Constants: A=-0.02233189 B=0.5597086 C=0.000053352 D=0 E=0
			Concentration=A+Bx+Cx^2+Dx^3+Ex^4
			Concentration=A+Bx+Cx^2+Dx^3+Ex^4

Special Notes
If this product is used for Acid Rain Rule Compliance, the *Acid Rain Expiration Date* noted above applies per 40 CFR Part 75, Appendix H. Otherwise, the *General Expiration Date* applies.

Analyst Frank P. Doran

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer

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MR. TODD SATLEY
9921 ST CHARLES ROCK RD
ST ANN MO 63074

Assay Laboratory
Scott Specialty Gases, Inc.
1290 Combermere
Troy, MI 48083

Purchase Order H145
Scott Project # 549824

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure # G1, Section Number 3.0.4

Cylinder Number	ALM016785	**Certification Date**	4-19-93	**General Exp. Date**	4-19-96
Cylinder Pressure	1900 psig	**Previous Certification Dates**	None	**Acid Rain Exp. Date**	10-19-94

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Monoxide	30.47 ppm	±1% NIST Directly Traceable

Balance Gas: NITROGEN

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM 1679	12-20-94	AAL1355	96.67 ppm CO in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO: Horiba/OPE 144E/560172153	4-6-93	Non-Dispersive Infrared

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Carbon Monoxide	Date: 4-12-93 Response Units: mv Z1=0.00 R1=170.0 T1=54.20 R2=170.0 Z2=0.00 T2=54.20 Z3=0.00 T3=54.20 R3=170.0 Avg. Conc. of Cust. Cyl. 30.47 ppm	Date: 4-19-93 Response Units: mv Z1=0.00 R1=170.0 T1=54.20 R2=170.0 Z2=0.00 T2=54.20 Z3=0.00 T3=54.20 R3=170.0 Avg. Conc. of Cust. Cyl. 30.47 ppm	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.99999 CRM 1679 Constants: A=-0.02233189 B=0.5597086 C=0.000053352 D=0 E=0
			Concentration=A+Bx+Cx^2+Dx^3+Ex^4
			Concentration=A+Bx+Cx^2+Dx^3+Ex^4

Special Notes
If this product is used for Acid Rain Rule Compliance, the *Acid Rain Expiration Date* noted above applies per 40 CFR Part 75, Appendix H. Otherwise, the *General Expiration Date* applies.

Analyst Frank P. Doran

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALEMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS8U

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 022293-3

REFERENCE STANDARD

COMPONENT		NIST SRM NO.	CYLINDER NO.	CONCENTRATION
OXYGEN	GMIS	vs 2629a	632487	21.00 %

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT OXYGEN GMIS ANALYZER MAKE-MODEL-S/N Siemens Oxymat 5E S/N A12-839

ANALYTICAL PRINCIPLE Paramagnetic LAST CALIBRATION DATE 12/08/92

FIRST ANALYSIS DATE 03/01/93 SECOND ANALYSIS DATE

Z 0.00	R 21.00	C 20.05	CONC. 20.05 %	Z	R	C	CONC.
R 21.00	Z 0.00	C 20.00	CONC. 20.00 %	R	Z	C	CONC.
Z 0.00	C 20.05	R 21.00	CONC. 20.05 %	Z	C	R	CONC.
U/M %		MEAN TEST ASSAY	20.03 %	U/M %		MEAN TEST ASSAY	

THIS CYLINDER NO. SA-6957
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 03/01/93
EXPIRATION DATE 09/01/94

CERTIFIED CONCENTRATION

OXYGEN	20.03 %
NITROGEN	BALANCE

ANALYZED BY Maria E. Rochon
MARIA E. ROCHON

CERTIFIED BY
KWAN T. YOUNG

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALEMEDA STREET • LOS ANGELES, CALIFORNIA 90058

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Z 0.00	C 20.05	R 21.00	CONC. 20.05 %	Z	C	R	CONC.
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