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/

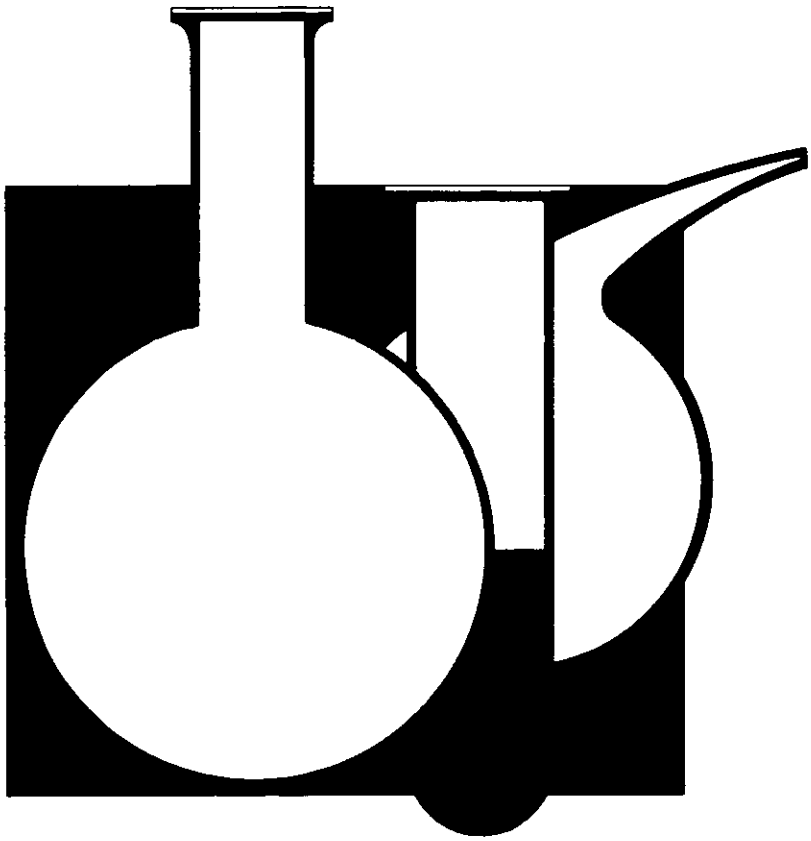
The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section:	11.3
Reference:	10
Title:	Flue Gas Characterization Studies Conducted On The 30B Kiln And Dryer Stacks In Atlanta, GA For General Shale Corporation, Guardian Systems, Inc., Leeds, AL, March 1993.

AP-42 Section 11.3
Reference 10

GUARDIAN SYSTEMS INC.

P.O. Box 190
Leeds, Alabama 35094
205/699-6647



Test Report

FLUE GAS CHARACTERIZATION STUDIES

CONDUCTED ON THE

30B KILN & DRYER STACKS

IN

ATLANTA, GEORGIA

FOR

GENERAL SHALE CORPORATION

ON

MARCH 9, 1993

APPROVED BY _____

Tom Lotz
Director, Field Services

GUARDIAN SYSTEMS inc

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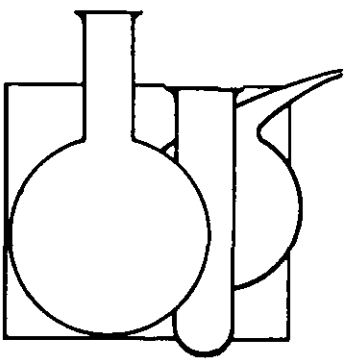
Introduction



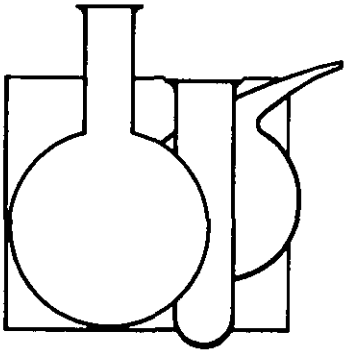
I. INTRODUCTION AND PROCESS DESCRIPTION

On March 9, 1993, Guardian Systems, Inc., conducted an emission sampling program on the kiln exhaust and dryer exhaust stacks of Chattahoochee Brick Company located in Atlanta, Georgia for General Shale Corporation. The purpose of this program was to provide baseline emission data while the brick kiln was operating normally while burning coal.

Sulfur dioxide, nitrogen oxides, carbon monoxide, & VOC as carbon emissions, volumetric flow, gas temperature, gas composition, moisture content of gas stream were measured. These tests were conducted in accordance with the rules and regulations expressed in the Code of Federal Regulations, Title 40, Section 60, Reference Methods 1-4, 6c, 7e, 10, & 25a as amended.

Mr. Dave McNees represented General Shale Corporation. Mr. Tom Lotz, Mr. Mike Caudle, and Mr. Tommy Lotz, Jr. of Guardian Systems, Inc., conducted these tests.

Test Results



II. SUMMARY OF TEST RESULTS

Table 1 is a summary of the test results of the Kiln Exhaust and the Dryer Exhaust.

Test #	Kiln	Dryer	Composite
SO_2, PPM v/v	98.76	0.0	
NO_x, PPM v/v	37.31	0.0	
CO, PPM v/v	130.14	0.0	
VOC as Carbon, PPM v/v	3.85	4.03	
SO_2, Tons/Yr	56.65	0.0	**56.6**
NO_x, Tons/Yr	15.37	0.0	**15.4**
CO, Tons/Yr	32.64	0.0	**32.6**
VOC as Carbon, Tons/Yr	0.41	1.37	**1.8**

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30B

Summarized Air Test Results for Chattahoochee Brick Co

Run Number	1	2	Composite
Date	3-9-93	3-9-93	9-11-92
Location	Kiln	Dryer	Kiln + Dryer
Time	0917-1047	1455-1625	0917-1625
Stack Gas Temperature, F	242	94	
Moisture Content, % v/v	4.23	3.20	
Oxygen Content, % v/v	15.80	19.80	
Carbon Dioxide Content, % v/v	3.60	0.00	
Sulfur Dioxide Content, PPM v/v	98.76	0.00	
Nitrogen Oxides Content, PPM v/v	37.31	0	
Carbon Monoxide Content, PPM v/v	130.14	0.00	
VOC as Carbon, PPM v/v	3.85	4.03	
Stack Gas Velocity Feet per Second	68.83	38.06	
Volumetric Flow Actual Cubic Feet per Minute	17,660	44,837	
Volumetric Flow Dry Std Cubic Feet per Minute	13,128	41,571	
Sulfur Dioxide, #/hr	12.93	0.00	12.93
Tons/Yr	56.65	0.00	56.6
Nitrogen Oxides, #/hr	3.51	0.00	3.51
Tons/Yr	15.37	0.00	15.4

Table 1

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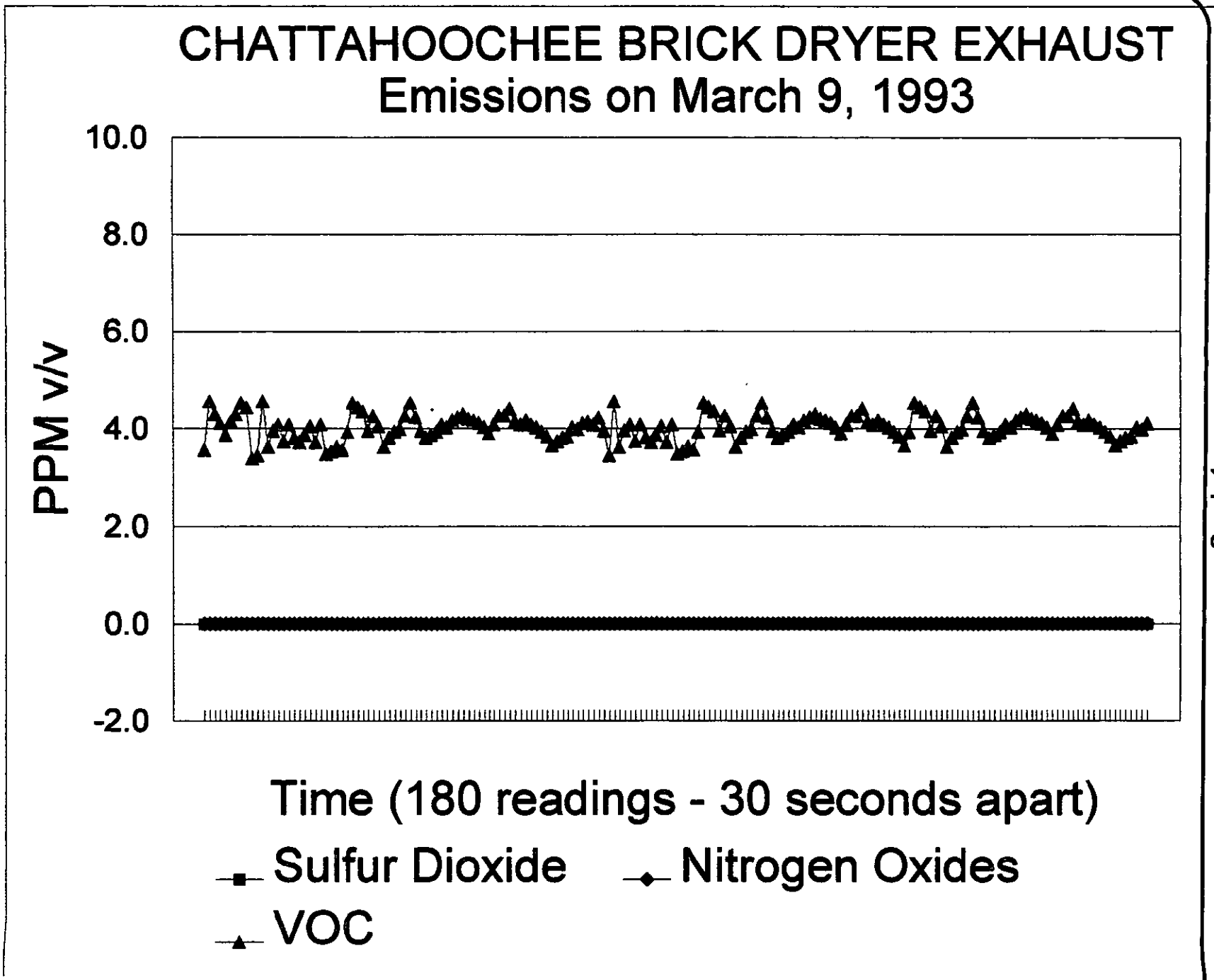
Run Number	1	2	Composite
Date	3-9-93	3-9-93	9-11-92
Location	Kiln	Dryer	Kiln + Dryer
Time	0917-1047	1455-1625	0917-1625
Carbon Monoxide, #/hr	7.45	0.00	7.45
Tons/Yr	32.64	0.00	32.6
VOC as Carbon, #/hr	0.094	0.313	0.407
Tons/Yr	0.414	1.371	1.8

Table 1-Continued



Graph 1

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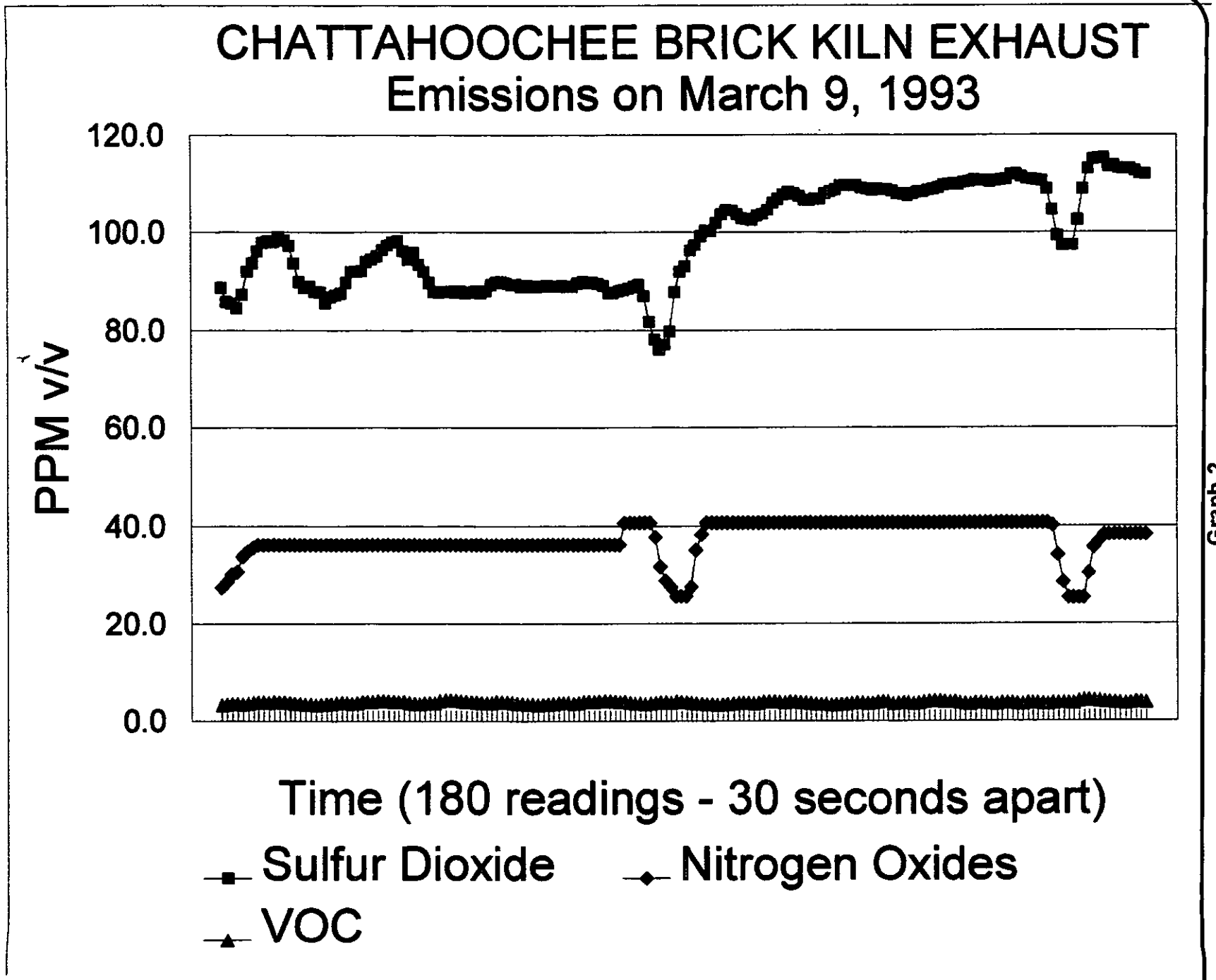

Graph 2

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Computer Input Parameters for Chattahoochee Brick Co

Run Number	1	2	Composite
Date	3-9-93	3-9-93	9-11-92
Location	Kiln	Dryer	Kiln + Dryer
Time	0917-1047	1455-1625	0917-1625
Barometric Pressure, in Hg	30.07	30.07	30.07
Static Pressure, in H2O	11.00	-0.02	
Run Time, minutes	30.00		
Meter Volume, CF	21.112	0.000	
Meter Correction factor, MCF	1.0685		
Meter Volume (Corrected)	22.558		
Stack Temperature, F	242	94	
Meter Temperature, F	65		
Meter Pressure, in H2O	1.750		
Sqr Velocity Pressure	1.008	0.616	
Ml of Water Collected	21.5		
% Oxygen	15.80	19.80	
% Carbon Dioxide	3.60	0.00	
Sulfur Dioxide, PPM v/v	98.76	0.00	
Nitrogen Oxides, PPM v/v	37.31	0.00	

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30B

Computer Input Parameters for Chattahoochee Brick Co

Run Number	1	2	Composite
Date	3-9-93	3-9-93	9-11-92
Location	Kiln	Dryer	Kiln + Dryer
Time	0917-1047	1455-1625	0917-1625
Carbon Monoxide, PPM v/v	130.14	0.00	
VOC as Carbon, PPM v/v	3.85	4.03	
Stack Area, Sq ft	4.276	19.635	
Pitot Correction Factor	0.898	0.898	
Hours per Year	8,760	8,760	

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30 B

Computed Air Test Results for Chattahooche Brick Co

Run Number	1	2	Composite
Date	3-9-93	3-9-93	9-11-92
Location	Kiln	Dryer	Kiln + Dryer
Time	0917-1047	1455-1625	0917-1625
1. Stack Pressure			
Inches Hg	30.88	30.07	
Millimeters Hg	784.32	763.74	
2. Meter Pressure			
Inches Hg	30.20		
Millimeters Hg	767.05		
3. Meter Volume			
Dry Std Cubic Feet	22.898		
Dry Std Cubic Meters	0.648		
4. Water Volume			
Std Cubic Feet	1.012		
Std Cubic Meters	0.029		
5. Moisture Content, %	4.23	3.20	
6. Molecular Weight Dry	29.21	28.79	
7. Molecular Weight Wet	28.73	28.45	
8. Stack Velocity			
Feet per Second	68.83	38.06	
Meters per Second	20.98	11.60	
9. Volumetric Flow			
Actual Cubic Ft per minute	17,660	44,837	
Actual Cubic M per second	8.34	21.16	

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30B

Computed Air Test Results for Chattahoochee Brick Co

Run Number	1	2	Composite
Date	3-9-93	3-9-93	9-11-92
Location	Kiln	Dryer	Kiln + Dryer
Time	0917-1047	1455-1625	0917-1625
10. Volumetric Flow			
Dry Std Cubic Ft per minute	13,128	41,571	
Dry Std Cubic M per second	6.20	19.62	
15a. SO2 Mass Rate			
Pounds per Hour, #/hr	12.93	0.00	12.93
15b. NOx Mass Rate			
Pounds per Hour, #/hr	3.51	0.00	3.51
15c. CO Mass Rate			
Pounds per Hour, #/hr	7.45	0.00	7.45
15d. VOC Mass Rate			
Pounds per Hour, #/hr	0.094	0.313	0.407

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SO2

Data Logger Reading for Chattahoochee Brick Kiln Exhaust

Level	Vendor	Tag Conc. PPM	Carrier Gas	Container Type	Cylinder ID#	Date of Expiration
Mid	Scott Special Gases	93.6	Nitrogen	Stainless	ALM 008182	5-6-93
High	Scott Special Gases	190.1	Nitrogen	Stainless	ALM 010156	4-30-93

Response Time Determinations based on 95% of step change in gas concentration

Gas Conc	Time, sec
0 to 93.6	300
93.6 to 0	300
Avg time	300.00 sec
2 times response =	**600.00 sec**

Analyzer Calibration Data

Cylinder Value ppm	Analyzer Calibration Value ppm	Absolute Difference	Analyzer Calibration Error, %
0.00	-0.69	0.69	0.35%
93.60	90.15	3.45	1.72%
190.10	192.12	2.02	1.01%
		Allowable Value	**2.00%**

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Run #1
3-9-93

Data Logger Reading for Chattahoochee Brick Kiln Exhaust

Reading	Date Time	Uncorrected PPM Reading As SO2	Corrected PPM Reading As SO2
1	03/09/93 09:16:59	87.1	88.73
2	03/09/93 09:17:29	84.4	85.87
3	03/09/93 09:17:59	84.1	85.55
4	03/09/93 09:18:29	83.2	84.60
5	03/09/93 09:18:59	85.8	87.35
6	03/09/93 09:19:29	90.2	92.01
7	03/09/93 09:19:59	91.8	93.70
8	03/09/93 09:20:29	94.1	96.13
9	03/09/93 09:20:59	95.8	97.93
10	03/09/93 09:21:29	96.1	98.25
11	03/09/93 09:21:59	96.0	98.14
12	03/09/93 09:22:29	96.9	99.10
13	03/09/93 09:22:59	96.2	98.36
14	03/09/93 09:23:29	95.2	97.30
15	03/09/93 09:23:59	91.8	93.70
16	03/09/93 09:24:29	88.2	89.89
17	03/09/93 09:24:59	87.1	88.73
18	03/09/93 09:25:29	87.3	88.94
19	03/09/93 09:25:59	86.3	87.88
20	03/09/93 09:26:29	86.2	87.77
21	03/09/93 09:26:59	84.2	85.66
22	03/09/93 09:27:29	85.3	86.82
23	03/09/93 09:27:59	85.6	87.14
24	03/09/93 09:28:29	86.0	87.56
25	03/09/93 09:28:59	88.1	89.79
26	03/09/93 09:29:29	90.2	92.01
27	03/09/93 09:29:59	90.2	92.01
28	03/09/93 09:30:29	90.3	92.11
29	03/09/93 09:30:59	92.1	94.02
30	03/09/93 09:31:29	92.6	94.55
31	03/09/93 09:31:59	93.2	95.18
32	03/09/93 09:32:29	94.4	96.45
33	03/09/93 09:32:59	95.3	97.40
34	03/09/93 09:33:29	95.9	98.04
35	03/09/93 09:33:59	96.1	98.25
36	03/09/93 09:34:29	94.2	96.24
37	03/09/93 09:34:59	92.5	94.44

38	03/09/93 09:35:29	93.9	95.92
39	03/09/93 09:35:59	91.6	93.49
40	03/09/93 09:36:29	90.2	92.01
41	03/09/93 09:36:59	88.1	89.79
42	03/09/93 09:37:29	86.3	87.88
43	03/09/93 09:37:59	86.2	87.77
44	03/09/93 09:38:29	86.3	87.88
45	03/09/93 09:38:59	86.4	87.99
46	03/09/93 09:39:29	86.2	87.77
47	03/09/93 09:39:59	86.5	88.09
48	03/09/93 09:40:29	86.1	87.67
49	03/09/93 09:40:59	86.2	87.77
50	03/09/93 09:41:29	86.5	88.09
51	03/09/93 09:41:59	86.1	87.67
52	03/09/93 09:42:29	86.5	88.09
53	03/09/93 09:42:59	87.6	89.26
54	03/09/93 09:43:29	88.1	89.79
55	03/09/93 09:43:59	88.2	89.89
56	03/09/93 09:44:30	88.0	89.68
57	03/09/93 09:44:59	87.6	89.26
58	03/09/93 09:45:29	87.7	89.36
59	03/09/93 09:45:59	87.2	88.83
60	03/09/93 09:46:29	87.5	89.15
61	03/09/93 09:46:59	87.3	88.94
62	03/09/93 09:47:29	87.4	89.04
63	03/09/93 09:47:59	87.3	88.94
64	03/09/93 09:48:29	87.5	89.15
65	03/09/93 09:48:59	87.4	89.04
66	03/09/93 09:49:29	87.3	88.94
67	03/09/93 09:49:59	87.5	89.15
68	03/09/93 09:50:29	87.3	88.94
69	03/09/93 09:50:59	87.3	88.94
70	03/09/93 09:51:29	87.9	89.57
71	03/09/93 09:51:59	88.2	89.89
72	03/09/93 09:52:29	88.1	89.79
73	03/09/93 09:52:59	88.1	89.79
74	03/09/93 09:53:29	87.8	89.47
75	03/09/93 09:53:59	87.5	89.15
76	03/09/93 09:54:29	86.1	87.67
77	03/09/93 09:54:59	86.1	87.67
78	03/09/93 09:55:29	86.5	88.09
79	03/09/93 09:55:59	86.6	88.20
80	03/09/93 09:56:29	87.0	88.62
81	03/09/93 09:56:59	87.2	88.83
82	03/09/93 09:57:29	87.6	89.26
83	03/09/93 09:57:59	85.5	87.03
84	03/09/93 09:58:29	80.5	81.74
85	03/09/93 09:59:00	77.1	78.15
86	03/09/93 09:59:29	75.2	76.13

87	03/09/93 09:59:59	76.1	77.09
88	03/09/93 10:00:29	78.6	79.73
89	03/09/93 10:00:59	86.2	87.77
90	03/09/93 10:01:30	90.2	92.01
91	03/09/93 10:01:59	91.2	93.07
92	03/09/93 10:02:29	94.3	96.35
93	03/09/93 10:02:59	95.3	97.40
94	03/09/93 10:03:29	97.1	99.31
95	03/09/93 10:03:59	98.1	100.37
96	03/09/93 10:04:29	98.0	100.26
97	03/09/93 10:04:59	99.5	101.85
98	03/09/93 10:05:29	101.2	103.65
99	03/09/93 10:05:59	102.1	104.60
100	03/09/93 10:06:29	102.0	104.49
101	03/09/93 10:06:59	101.2	103.65
102	03/09/93 10:07:29	100.5	102.91
103	03/09/93 10:07:59	100.3	102.69
104	03/09/93 10:08:30	100.1	102.48
105	03/09/93 10:08:59	101.0	103.44
106	03/09/93 10:09:29	101.3	103.75
107	03/09/93 10:09:59	102.1	104.60
108	03/09/93 10:10:29	103.5	106.08
109	03/09/93 10:10:59	104.2	106.82
110	03/09/93 10:11:29	105.1	107.77
111	03/09/93 10:11:59	105.6	108.30
112	03/09/93 10:12:29	105.2	107.88
113	03/09/93 10:12:59	104.8	107.46
114	03/09/93 10:13:29	104.1	106.72
115	03/09/93 10:13:59	104.0	106.61
116	03/09/93 10:14:29	104.3	106.93
117	03/09/93 10:14:59	104.2	106.82
118	03/09/93 10:15:29	105.3	107.99
119	03/09/93 10:15:59	105.7	108.41
120	03/09/93 10:16:29	106.1	108.83
121	03/09/93 10:16:59	106.8	109.57
122	03/09/93 10:17:29	106.9	109.68
123	03/09/93 10:17:59	106.8	109.57
124	03/09/93 10:18:29	106.8	109.57
125	03/09/93 10:18:59	106.4	109.15
126	03/09/93 10:19:29	106.2	108.94
127	03/09/93 10:19:59	106.0	108.73
128	03/09/93 10:20:29	106.2	108.94
129	03/09/93 10:20:59	106.1	108.83
130	03/09/93 10:21:29	106.1	108.83
131	03/09/93 10:21:59	105.8	108.51
132	03/09/93 10:22:29	105.3	107.99
133	03/09/93 10:22:59	105.2	107.88
134	03/09/93 10:23:29	105.0	107.67
135	03/09/93 10:23:59	105.3	107.99

136	03/09/93 10:24:29	105.6	108.30
137	03/09/93 10:24:59	105.7	108.41
138	03/09/93 10:25:29	106.0	108.73
139	03/09/93 10:25:59	106.2	108.94
140	03/09/93 10:26:29	106.5	109.26
141	03/09/93 10:26:59	107.0	109.78
142	03/09/93 10:27:29	107.1	109.89
143	03/09/93 10:27:59	107.2	110.00
144	03/09/93 10:28:29	107.1	109.89
145	03/09/93 10:28:59	107.5	110.31
146	03/09/93 10:29:29	107.7	110.53
147	03/09/93 10:29:59	107.9	110.74
148	03/09/93 10:30:29	107.8	110.63
149	03/09/93 10:30:59	107.8	110.63
150	03/09/93 10:31:29	107.6	110.42
151	03/09/93 10:31:59	107.8	110.63
152	03/09/93 10:32:29	107.9	110.74
153	03/09/93 10:32:59	108.1	110.95
154	03/09/93 10:33:29	109.0	111.90
155	03/09/93 10:33:59	109.1	112.01
156	03/09/93 10:34:29	108.6	111.48
157	03/09/93 10:34:59	108.2	111.05
158	03/09/93 10:35:29	108.1	110.95
159	03/09/93 10:35:59	107.9	110.74
160	03/09/93 10:36:29	107.8	110.63
161	03/09/93 10:36:59	106.2	108.94
162	03/09/93 10:37:29	102.1	104.60
163	03/09/93 10:37:59	97.2	99.41
164	03/09/93 10:38:29	95.2	97.30
165	03/09/93 10:38:59	95.3	97.40
166	03/09/93 10:39:29	95.3	97.40
167	03/09/93 10:39:59	100.1	102.48
168	03/09/93 10:40:29	106.2	108.94
169	03/09/93 10:40:59	110.1	113.06
170	03/09/93 10:41:29	112.0	115.08
171	03/09/93 10:41:59	112.1	115.18
172	03/09/93 10:42:29	112.2	115.29
173	03/09/93 10:42:59	110.6	113.59
174	03/09/93 10:43:29	110.8	113.81
175	03/09/93 10:43:59	110.2	113.17
176	03/09/93 10:44:29	110.1	113.06
177	03/09/93 10:44:59	110.1	113.06
178	03/09/93 10:45:29	109.8	112.75
179	03/09/93 10:45:59	109.2	112.11
180	03/09/93 10:46:29	109.1	112.01
	Average	96.58	98.76

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System Calibration Bias and Drift Data

Analyzer Calib Value ppm	Initial Value ppm	Final Value ppm	Initial S S Bias Error, %	Final S S Bias Error, %	0 Drift Error, %	Cal Drift Error, %
-0.69	1.83	4.67	1.26%	2.68%	1.42%	
90.15	89.70	93.71	-0.23%	1.78%		2.01%
	Allowable Values		5.00%	5.00%	3.00%	3.00%
Span Value	200 ppm		**Gas Concentration, ppm**			**98.76**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

NOx

Data Logger Reading for Chattahoochee Brick Kiln Exhaust

Level	Vendor	Tag Conc. PPM	Carrier Gas	Container Type	Cylinder ID#	Date of Expiration
Mid	Scott Special Gases	125.4	Nitrogen	Stainless	ALM 010156	4-30-93
High	Scott Special Gases	240.0	Nitrogen	Stainless	AAL9551	1-1-94

Response Time Determinations based on 95% of step change in gas concentration

Gas Conc	Time, sec
0 to 125.4	120
125.4 to 0	120
Avg time	120.00 sec
2 times response =	**240.00 sec**

Analyzer Calibration Data

Cylinder Value ppm	Analyzer Calibration Value ppm	Absolute Difference	Analyzer Calibration Error, %
0.00	0.04	0.04	0.02%
125.40	123.18	2.22	0.89%
240.00	239.99	0.01	0.00%
		Allowable Value	**2.00%**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Run #1
3-9-93

Data Logger Reading for Chattahoochee Brick Kiln Exhaust

Reading	Date	Time	Uncorrected PPM Reading As NOx	Corrected PPM Reading As NOx
1	03/09/93	09:16:59	25.20	27.44
2	03/09/93	09:17:29	26.30	28.60
3	03/09/93	09:17:59	27.80	30.18
4	03/09/93	09:18:29	28.30	30.71
5	03/09/93	09:18:59	31.20	33.77
6	03/09/93	09:19:29	32.20	34.82
7	03/09/93	09:19:59	33.00	35.67
8	03/09/93	09:20:29	33.50	36.19
9	03/09/93	09:20:59	33.50	36.19
10	03/09/93	09:21:29	33.50	36.19
11	03/09/93	09:21:59	33.50	36.19
12	03/09/93	09:22:29	33.50	36.19
13	03/09/93	09:22:59	33.50	36.19
14	03/09/93	09:23:29	33.50	36.19
15	03/09/93	09:23:59	33.50	36.19
16	03/09/93	09:24:29	33.50	36.19
17	03/09/93	09:24:59	33.50	36.19
18	03/09/93	09:25:29	33.50	36.19
19	03/09/93	09:25:59	33.50	36.19
20	03/09/93	09:26:29	33.50	36.19
21	03/09/93	09:26:59	33.50	36.19
22	03/09/93	09:27:29	33.50	36.19
23	03/09/93	09:27:59	33.50	36.19
24	03/09/93	09:28:29	33.50	36.19
25	03/09/93	09:28:59	33.50	36.19
26	03/09/93	09:29:29	33.50	36.19
27	03/09/93	09:29:59	33.50	36.19
28	03/09/93	09:30:29	33.50	36.19
29	03/09/93	09:30:59	33.50	36.19
30	03/09/93	09:31:29	33.50	36.19
31	03/09/93	09:31:59	33.50	36.19
32	03/09/93	09:32:29	33.50	36.19
33	03/09/93	09:32:59	33.50	36.19
34	03/09/93	09:33:29	33.50	36.19
35	03/09/93	09:33:59	33.50	36.19
36	03/09/93	09:34:29	33.50	36.19
37	03/09/93	09:34:59	33.50	36.19

38	03/09/93 09:35:29	33.50	36.19
39	03/09/93 09:35:59	33.50	36.19
40	03/09/93 09:36:29	33.50	36.19
41	03/09/93 09:36:59	33.50	36.19
42	03/09/93 09:37:29	33.50	36.19
43	03/09/93 09:37:59	33.50	36.19
44	03/09/93 09:38:29	33.50	36.19
45	03/09/93 09:38:59	33.50	36.19
46	03/09/93 09:39:29	33.50	36.19
47	03/09/93 09:39:59	33.50	36.19
48	03/09/93 09:40:29	33.50	36.19
49	03/09/93 09:40:59	33.50	36.19
50	03/09/93 09:41:29	33.50	36.19
51	03/09/93 09:41:59	33.50	36.19
52	03/09/93 09:42:29	33.50	36.19
53	03/09/93 09:42:59	33.50	36.19
54	03/09/93 09:43:29	33.50	36.19
55	03/09/93 09:43:59	33.50	36.19
56	03/09/93 09:44:30	33.50	36.19
57	03/09/93 09:44:59	33.50	36.19
58	03/09/93 09:45:29	33.50	36.19
59	03/09/93 09:45:59	33.50	36.19
60	03/09/93 09:46:29	33.50	36.19
61	03/09/93 09:46:59	33.50	36.19
62	03/09/93 09:47:29	33.50	36.19
63	03/09/93 09:47:59	33.50	36.19
64	03/09/93 09:48:29	33.50	36.19
65	03/09/93 09:48:59	33.50	36.19
66	03/09/93 09:49:29	33.50	36.19
67	03/09/93 09:49:59	33.50	36.19
68	03/09/93 09:50:29	33.50	36.19
69	03/09/93 09:50:59	33.50	36.19
70	03/09/93 09:51:29	33.50	36.19
71	03/09/93 09:51:59	33.50	36.19
72	03/09/93 09:52:29	33.50	36.19
73	03/09/93 09:52:59	33.50	36.19
74	03/09/93 09:53:29	33.50	36.19
75	03/09/93 09:53:59	33.50	36.19
76	03/09/93 09:54:29	33.50	36.19
77	03/09/93 09:54:59	33.50	36.19
78	03/09/93 09:55:29	33.50	36.19
79	03/09/93 09:55:59	37.75	40.67
80	03/09/93 09:56:29	37.75	40.67
81	03/09/93 09:56:59	37.75	40.67
82	03/09/93 09:57:29	37.75	40.67
83	03/09/93 09:57:59	37.75	40.67
84	03/09/93 09:58:29	37.75	40.67
85	03/09/93 09:59:00	35.00	37.77
86	03/09/93 09:59:29	29.25	31.71

87	03/09/93 09:59:59	26.50	28.81
88	03/09/93 10:00:29	25.25	27.50
89	03/09/93 10:00:59	23.50	25.65
90	03/09/93 10:01:30	23.50	25.65
91	03/09/93 10:01:59	23.50	25.65
92	03/09/93 10:02:29	25.25	27.50
93	03/09/93 10:02:59	32.50	35.14
94	03/09/93 10:03:29	35.50	38.30
95	03/09/93 10:03:59	37.75	40.67
96	03/09/93 10:04:29	37.75	40.67
97	03/09/93 10:04:59	37.75	40.67
98	03/09/93 10:05:29	37.75	40.67
99	03/09/93 10:05:59	37.75	40.67
100	03/09/93 10:06:29	37.75	40.67
101	03/09/93 10:06:59	37.75	40.67
102	03/09/93 10:07:29	37.75	40.67
103	03/09/93 10:07:59	37.75	40.67
104	03/09/93 10:08:30	37.75	40.67
105	03/09/93 10:08:59	37.75	40.67
106	03/09/93 10:09:29	37.75	40.67
107	03/09/93 10:09:59	37.75	40.67
108	03/09/93 10:10:29	37.75	40.67
109	03/09/93 10:10:59	37.75	40.67
110	03/09/93 10:11:29	37.75	40.67
111	03/09/93 10:11:59	37.75	40.67
112	03/09/93 10:12:29	37.75	40.67
113	03/09/93 10:12:59	37.75	40.67
114	03/09/93 10:13:29	37.75	40.67
115	03/09/93 10:13:59	37.75	40.67
116	03/09/93 10:14:29	37.75	40.67
117	03/09/93 10:14:59	37.75	40.67
118	03/09/93 10:15:29	37.75	40.67
119	03/09/93 10:15:59	37.75	40.67
120	03/09/93 10:16:29	37.75	40.67
121	03/09/93 10:16:59	37.75	40.67
122	03/09/93 10:17:29	37.75	40.67
123	03/09/93 10:17:59	37.75	40.67
124	03/09/93 10:18:29	37.75	40.67
125	03/09/93 10:18:59	37.75	40.67
126	03/09/93 10:19:29	37.75	40.67
127	03/09/93 10:19:59	37.75	40.67
128	03/09/93 10:20:29	37.75	40.67
129	03/09/93 10:20:59	37.75	40.67
130	03/09/93 10:21:29	37.75	40.67
131	03/09/93 10:21:59	37.75	40.67
132	03/09/93 10:22:29	37.75	40.67
133	03/09/93 10:22:59	37.75	40.67
134	03/09/93 10:23:29	37.75	40.67
135	03/09/93 10:23:59	37.75	40.67

136	03/09/93 10:24:29	37.75	40.67
137	03/09/93 10:24:59	37.75	40.67
138	03/09/93 10:25:29	37.75	40.67
139	03/09/93 10:25:59	37.75	40.67
140	03/09/93 10:26:29	37.75	40.67
141	03/09/93 10:26:59	37.75	40.67
142	03/09/93 10:27:29	37.75	40.67
143	03/09/93 10:27:59	37.75	40.67
144	03/09/93 10:28:29	37.75	40.67
145	03/09/93 10:28:59	37.75	40.67
146	03/09/93 10:29:29	37.75	40.67
147	03/09/93 10:29:59	37.75	40.67
148	03/09/93 10:30:29	37.75	40.67
149	03/09/93 10:30:59	37.75	40.67
150	03/09/93 10:31:29	37.75	40.67
151	03/09/93 10:31:59	37.75	40.67
152	03/09/93 10:32:29	37.75	40.67
153	03/09/93 10:32:59	37.75	40.67
154	03/09/93 10:33:29	37.75	40.67
155	03/09/93 10:33:59	37.75	40.67
156	03/09/93 10:34:29	37.75	40.67
157	03/09/93 10:34:59	37.75	40.67
158	03/09/93 10:35:29	37.75	40.67
159	03/09/93 10:35:59	37.75	40.67
160	03/09/93 10:36:29	37.75	40.67
161	03/09/93 10:36:59	37.75	40.67
162	03/09/93 10:37:29	37.25	40.15
163	03/09/93 10:37:59	31.5	34.08
164	03/09/93 10:38:29	26.25	28.55
165	03/09/93 10:38:59	23.25	25.39
166	03/09/93 10:39:29	23.25	25.39
167	03/09/93 10:39:59	23.25	25.39
168	03/09/93 10:40:29	23.25	25.39
169	03/09/93 10:40:59	28.00	30.39
170	03/09/93 10:41:29	33.00	35.67
171	03/09/93 10:41:59	34.25	36.98
172	03/09/93 10:42:29	35.50	38.30
173	03/09/93 10:42:59	35.50	38.30
174	03/09/93 10:43:29	35.50	38.30
175	03/09/93 10:43:59	35.50	38.30
176	03/09/93 10:44:29	35.50	38.30
177	03/09/93 10:44:59	35.50	38.30
178	03/09/93 10:45:29	35.50	38.30
179	03/09/93 10:45:59	35.50	38.30
180	03/09/93 10:46:29	35.50	38.30
	Average	34.56	37.31

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System Calibration Bias and Drift Data

Analyzer Calib Value ppm	Initial Value ppm	Final Value ppm	Initial S S Bias Error, %	Final S S Bias Error, %	0 Drift Error, %	Cal Drift Error, %
0.04	-0.77	-0.89	-0.32%	-0.37%	-0.05%	
123.18	118.23	118.00	-1.98%	-2.07%		-0.09%
	Allowable Values		5.00%	5.00%	3.00%	3.00%
Span Value	250 ppm		**Gas Concentration, ppm**			**37.31**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Bag Sample for Chattahoochee Brick Kiln Exhaust

Level	Vendor	Tag Conc. PPM	Carrier Gas	Container Type	Cylinder ID#	Date of Expiration
Low	AIRCO	296.0	Nitrogen	Steel	CC-49196	None
Mid	AIRCO	613.0		Steel	CC-3513	None
High	AIRCO	867.0	Nitrogen	Steel	CC-14636	None

Response Time Determinations based on 95% of 867 from 0

Start Time, sec	Stop Time, sec
0	85
0	86
Avg time	85.50 sec

2 time response = 171.00 sec

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Run #1
3-9-93

Bag Sample for Chattahoochee Brick Kiln Exhaust
With silica gel & ascarite

Reading	Chart Rd	Multipler	PPM Reading As CO
1	13.5	10.0	135
2	13.5	10.0	135
3	13.5	10.0	135
Average			**135.0**
% CO2 from orsat		**3.6**	

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Analyzer Calibration Data

Cylinder Value ppm	Analyzer Calib Value ppm	Absolute Difference	Analyzer Calib Error, %
0.0	5.00	5.00	0.50%
296.0	300.00	4.00	0.40%
613.0	605.00	8.00	0.80%
867.0	870.00	3.00	0.30%
		Allowable Value	2.00%

Analyzer Calib Value ppm	Initial Value ppm	Final Value ppm	Initial S S Bias Error, %	Final S S Bias Error, %	0 Drift Error, %	Cal Drift Error, %
5.00	5.00	5.00	0.00%	0.00%	0.00%	
870.00	870.00	870.00	0.00%	0.00%		0.00%
	Allowable Values		5.00%	5.00%	3.00%	3.00%

Span Value 1000 ppm **Gas Concentration, ppm** **130.14**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

VOC

Data Logger Reading for Chattahoochee Brick Kiln Exhaust

Level	Vendor	Tag Conc. PPM	Carrier Gas	Container Type	Cylinder ID#	Date of Expiration
Low	Scott Special Gases	24.94	Nitrogen	Stainless	AAL-3924	5-2-93
Mid	Scott Special Gases	54.99	Nitrogen	Stainless	AAL-13169	5-2-93
High	Scott Special Gases	85.29	Nitrogen	Stainless	ALM-010501	7-21-93

Response Time Determinations based on 95% of step change in gas concentration

Gas Conc		Time, sec
0 to 85.29		38
0 to 85.29		38
0 to 85.29		37
	Avg time	37.67 sec
2 times response =		**75.33 sec**

Analyzer Calibration Data

Cylinder Value ppm	Analyzer Calibration Value ppm	Absolute Difference	Analyzer Calibration Error, %
0.00	0.02	0.02	0.02%
24.94	25.20	0.26	0.26%
54.99	58.00	3.01	3.01%
85.29	85.20	0.09	0.09%
		Allowable Value	**5.00%**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Run #1
3-9-93

Data Logger Reading for Chattahoochee Brick Kiln Exhaust

Reading	Date Time	Uncorrected PPM Reading VOC as Propane	Corrected PPM Reading VOC as Carbon
1	03/09/93 09:16:59	1.12	3.36
2	03/09/93 09:17:29	1.18	3.54
3	03/09/93 09:17:59	1.21	3.63
4	03/09/93 09:18:29	1.23	3.69
5	03/09/93 09:18:59	1.19	3.57
6	03/09/93 09:19:29	1.24	3.72
7	03/09/93 09:19:59	1.28	3.84
8	03/09/93 09:20:29	1.31	3.93
9	03/09/93 09:20:59	1.32	3.96
10	03/09/93 09:21:29	1.29	3.87
11	03/09/93 09:21:59	1.36	4.08
12	03/09/93 09:22:29	1.33	3.99
13	03/09/93 09:22:59	1.30	3.90
14	03/09/93 09:23:29	1.27	3.81
15	03/09/93 09:23:59	1.24	3.72
16	03/09/93 09:24:29	1.20	3.60
17	03/09/93 09:24:59	1.19	3.57
18	03/09/93 09:25:29	1.17	3.51
19	03/09/93 09:25:59	1.12	3.36
20	03/09/93 09:26:29	1.15	3.45
21	03/09/93 09:26:59	1.19	3.57
22	03/09/93 09:27:29	1.21	3.63
23	03/09/93 09:27:59	1.25	3.75
24	03/09/93 09:28:29	1.27	3.81
25	03/09/93 09:28:59	1.28	3.84
26	03/09/93 09:29:29	1.23	3.69
27	03/09/93 09:29:59	1.26	3.78
28	03/09/93 09:30:29	1.33	3.99
29	03/09/93 09:30:59	1.37	4.11
30	03/09/93 09:31:29	1.35	4.05
31	03/09/93 09:31:59	1.39	4.17
32	03/09/93 09:32:29	1.41	4.23
33	03/09/93 09:32:59	1.39	4.17
34	03/09/93 09:33:29	1.36	4.08
35	03/09/93 09:33:59	1.34	4.02
36	03/09/93 09:34:29	1.35	4.05
37	03/09/93 09:34:59	1.28	3.84

38	03/09/93 09:35:29	1.22	3.66
39	03/09/93 09:35:59	1.21	3.63
40	03/09/93 09:36:29	1.29	3.87
41	03/09/93 09:36:59	1.28	3.84
42	03/09/93 09:37:29	1.26	3.78
43	03/09/93 09:37:59	1.41	4.23
44	03/09/93 09:38:29	1.47	4.41
45	03/09/93 09:38:59	1.45	4.35
46	03/09/93 09:39:29	1.44	4.32
47	03/09/93 09:39:59	1.42	4.26
48	03/09/93 09:40:29	1.37	4.11
49	03/09/93 09:40:59	1.34	4.02
50	03/09/93 09:41:29	1.31	3.93
51	03/09/93 09:41:59	1.28	3.84
52	03/09/93 09:42:29	1.26	3.78
53	03/09/93 09:42:59	1.29	3.87
54	03/09/93 09:43:29	1.36	4.08
55	03/09/93 09:43:59	1.33	3.99
56	03/09/93 09:44:30	1.30	3.90
57	03/09/93 09:44:59	1.27	3.81
58	03/09/93 09:45:29	1.24	3.72
59	03/09/93 09:45:59	1.20	3.60
60	03/09/93 09:46:29	1.19	3.57
61	03/09/93 09:46:59	1.17	3.51
62	03/09/93 09:47:29	1.12	3.36
63	03/09/93 09:47:59	1.15	3.45
64	03/09/93 09:48:29	1.19	3.57
65	03/09/93 09:48:59	1.21	3.63
66	03/09/93 09:49:29	1.25	3.75
67	03/09/93 09:49:59	1.27	3.81
68	03/09/93 09:50:29	1.28	3.84
69	03/09/93 09:50:59	1.23	3.69
70	03/09/93 09:51:29	1.26	3.78
71	03/09/93 09:51:59	1.33	3.99
72	03/09/93 09:52:29	1.37	4.11
73	03/09/93 09:52:59	1.35	4.05
74	03/09/93 09:53:29	1.39	4.17
75	03/09/93 09:53:59	1.41	4.23
76	03/09/93 09:54:29	1.39	4.17
77	03/09/93 09:54:59	1.36	4.08
78	03/09/93 09:55:29	1.34	4.02
79	03/09/93 09:55:59	1.35	4.05
80	03/09/93 09:56:29	1.28	3.84
81	03/09/93 09:56:59	1.22	3.66
82	03/09/93 09:57:29	1.23	3.69
83	03/09/93 09:57:59	1.19	3.57
84	03/09/93 09:58:29	1.24	3.72
85	03/09/93 09:59:00	1.28	3.84
86	03/09/93 09:59:29	1.31	3.93

87	03/09/93 09:59:59	1.32	3.96
88	03/09/93 10:00:29	1.29	3.87
89	03/09/93 10:00:59	1.36	4.08
90	03/09/93 10:01:30	1.33	3.99
91	03/09/93 10:01:59	1.30	3.90
92	03/09/93 10:02:29	1.27	3.81
93	03/09/93 10:02:59	1.24	3.72
94	03/09/93 10:03:29	1.20	3.60
95	03/09/93 10:03:59	1.19	3.57
96	03/09/93 10:04:29	1.17	3.51
97	03/09/93 10:04:59	1.12	3.36
98	03/09/93 10:05:29	1.15	3.45
99	03/09/93 10:05:59	1.19	3.57
100	03/09/93 10:06:29	1.21	3.63
101	03/09/93 10:06:59	1.25	3.75
102	03/09/93 10:07:29	1.27	3.81
103	03/09/93 10:07:59	1.28	3.84
104	03/09/93 10:08:30	1.23	3.69
105	03/09/93 10:08:59	1.26	3.78
106	03/09/93 10:09:29	1.33	3.99
107	03/09/93 10:09:59	1.37	4.11
108	03/09/93 10:10:29	1.35	4.05
109	03/09/93 10:10:59	1.32	3.96
110	03/09/93 10:11:29	1.29	3.87
111	03/09/93 10:11:59	1.36	4.08
112	03/09/93 10:12:29	1.33	3.99
113	03/09/93 10:12:59	1.30	3.90
114	03/09/93 10:13:29	1.27	3.81
115	03/09/93 10:13:59	1.24	3.72
116	03/09/93 10:14:29	1.20	3.60
117	03/09/93 10:14:59	1.19	3.57
118	03/09/93 10:15:29	1.17	3.51
119	03/09/93 10:15:59	1.12	3.36
120	03/09/93 10:16:29	1.15	3.45
121	03/09/93 10:16:59	1.19	3.57
122	03/09/93 10:17:29	1.21	3.63
123	03/09/93 10:17:59	1.25	3.75
124	03/09/93 10:18:29	1.27	3.81
125	03/09/93 10:18:59	1.28	3.84
126	03/09/93 10:19:29	1.23	3.69
127	03/09/93 10:19:59	1.26	3.78
128	03/09/93 10:20:29	1.33	3.99
129	03/09/93 10:20:59	1.37	4.11
130	03/09/93 10:21:29	1.35	4.05
131	03/09/93 10:21:59	1.21	3.63
132	03/09/93 10:22:29	1.25	3.75
133	03/09/93 10:22:59	1.27	3.81
134	03/09/93 10:23:29	1.28	3.84
135	03/09/93 10:23:59	1.23	3.69

136	03/09/93 10:24:29	1.26	3.78
137	03/09/93 10:24:59	1.33	3.99
138	03/09/93 10:25:29	1.39	4.17
139	03/09/93 10:25:59	1.41	4.23
140	03/09/93 10:26:29	1.39	4.17
141	03/09/93 10:26:59	1.36	4.08
142	03/09/93 10:27:29	1.34	4.02
143	03/09/93 10:27:59	1.35	4.05
144	03/09/93 10:28:29	1.28	3.84
145	03/09/93 10:28:59	1.22	3.66
146	03/09/93 10:29:29	1.21	3.63
147	03/09/93 10:29:59	1.29	3.87
148	03/09/93 10:30:29	1.28	3.84
149	03/09/93 10:30:59	1.28	3.84
150	03/09/93 10:31:29	1.22	3.66
151	03/09/93 10:31:59	1.21	3.63
152	03/09/93 10:32:29	1.29	3.87
153	03/09/93 10:32:59	1.28	3.84
154	03/09/93 10:33:29	1.28	3.84
155	03/09/93 10:33:59	1.22	3.66
156	03/09/93 10:34:29	1.21	3.63
157	03/09/93 10:34:59	1.29	3.87
158	03/09/93 10:35:29	1.28	3.84
159	03/09/93 10:35:59	1.28	3.84
160	03/09/93 10:36:29	1.22	3.66
161	03/09/93 10:36:59	1.21	3.63
162	03/09/93 10:37:29	1.29	3.87
163	03/09/93 10:37:59	1.28	3.84
164	03/09/93 10:38:29	1.28	3.84
165	03/09/93 10:38:59	1.27	3.81
166	03/09/93 10:39:29	1.26	3.78
167	03/09/93 10:39:59	1.41	4.23
168	03/09/93 10:40:29	1.47	4.41
169	03/09/93 10:40:59	1.45	4.35
170	03/09/93 10:41:29	1.44	4.32
171	03/09/93 10:41:59	1.42	4.26
172	03/09/93 10:42:29	1.37	4.11
173	03/09/93 10:42:59	1.34	4.02
174	03/09/93 10:43:29	1.31	3.93
175	03/09/93 10:43:59	1.28	3.84
176	03/09/93 10:44:29	1.26	3.78
177	03/09/93 10:44:59	1.29	3.87
178	03/09/93 10:45:29	1.36	4.08
179	03/09/93 10:45:59	1.33	3.99
180	03/09/93 10:46:29	1.30	3.90
	Average	**1.28**	**3.85**

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System Calibration Bias and Drift Data

Analyzer Calib Value ppm	Initial Value ppm	Final Value ppm		0 Drift Error, %	Cal Drift Error, %
0.02	0.02	0.05		0.03%	
58.00	50.00	50.50			0.50%
	Allowable Values			3.00%	3.00%
Span Value	100 ppm		**Gas Concentration, ppm as carbon**		**3.85**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

SO2

Data Logger Reading for Chattahoochee Brick Dryer Exhaust

Level	Vendor	Tag Conc. PPM	Carrier Gas	Container Type	Cylinder ID#	Date of Expiration
Mid	Scott Special Gases	93.6	Nitrogen	Stainless	ALM 008182	5-6-93
High	Scott Special Gases	190.1	Nitrogen	Stainless	ALM 010156	4-30-93

Response Time Determinations based on 95% of step change in gas concentration

Gas Conc	Time, sec
0 to 190.1	286
190.1 to 0	292
Avg time	289.00 sec
2 times response =	**578.00 sec**

Analyzer Calibration Data

Cylinder Value ppm	Analyzer Calibration Value ppm	Absolute Difference	Analyzer Calibration Error, %
0.00	1.00	1.00	0.50%
93.60	91.90	1.70	0.85%
190.10	191.40	1.30	0.65%
		Allowable Value	**2.00%**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Run #1
3-9-93

Data Logger Reading for Chattahoochee Brick Dryer Exhaust

Reading	Date	Time	Uncorrected PPM Reading As SO2	Corrected PPM Reading As SO2
1	03/09/93	14:54:52	-1.20	-0.00
2	03/09/93	14:55:22	-1.20	-0.00
3	03/09/93	14:55:52	-1.20	-0.00
4	03/09/93	14:56:22	-1.20	-0.00
5	03/09/93	14:56:52	-1.20	-0.00
6	03/09/93	14:57:22	-1.20	-0.00
7	03/09/93	14:57:52	-1.20	-0.00
8	03/09/93	14:58:22	-1.20	-0.00
9	03/09/93	14:58:52	-1.20	-0.00
10	03/09/93	14:59:22	-1.20	-0.00
11	03/09/93	14:59:52	-1.20	-0.00
12	03/09/93	15:00:22	-1.20	-0.00
13	03/09/93	15:00:52	-1.20	-0.00
14	03/09/93	15:01:23	-1.20	-0.00
15	03/09/93	15:01:52	-1.20	-0.00
16	03/09/93	15:02:22	-1.20	-0.00
17	03/09/93	15:02:52	-1.20	-0.00
18	03/09/93	15:03:22	-1.20	-0.00
19	03/09/93	15:03:52	-1.20	-0.00
20	03/09/93	15:04:22	-1.20	-0.00
21	03/09/93	15:04:52	-1.20	-0.00
22	03/09/93	15:05:22	-1.20	-0.00
23	03/09/93	15:05:52	-1.20	-0.00
24	03/09/93	15:06:22	-1.20	-0.00
25	03/09/93	15:06:52	-1.20	-0.00
26	03/09/93	15:07:22	-1.20	-0.00
27	03/09/93	15:07:52	-1.20	-0.00
28	03/09/93	15:08:22	-1.20	-0.00
29	03/09/93	15:08:52	-1.20	-0.00
30	03/09/93	15:09:23	-1.20	-0.00
31	03/09/93	15:09:52	-1.20	-0.00
32	03/09/93	15:10:22	-1.20	-0.00
33	03/09/93	15:10:52	-1.20	-0.00
34	03/09/93	15:11:22	-1.20	-0.00
35	03/09/93	15:11:52	-1.20	-0.00
36	03/09/93	15:12:22	-1.20	-0.00
37	03/09/93	15:12:52	-1.20	-0.00

38	03/09/93 15:13:22	-1.20	-0.00
39	03/09/93 15:13:52	-1.20	-0.00
40	03/09/93 15:14:22	-1.20	-0.00
41	03/09/93 15:14:52	-1.20	-0.00
42	03/09/93 15:15:22	-1.20	-0.00
43	03/09/93 15:15:52	-1.20	-0.00
44	03/09/93 15:16:22	-1.20	-0.00
45	03/09/93 15:16:52	-1.20	-0.00
46	03/09/93 15:17:22	-1.20	-0.00
47	03/09/93 15:17:52	-1.20	-0.00
48	03/09/93 15:18:22	-1.20	-0.00
49	03/09/93 15:18:52	-1.20	-0.00
50	03/09/93 15:19:22	-1.20	-0.00
51	03/09/93 15:19:52	-1.20	-0.00
52	03/09/93 15:20:22	-1.20	-0.00
53	03/09/93 15:20:52	-1.20	-0.00
54	03/09/93 15:21:22	-1.20	-0.00
55	03/09/93 15:21:52	-1.20	-0.00
56	03/09/93 15:22:22	-1.20	-0.00
57	03/09/93 15:22:52	-1.20	-0.00
58	03/09/93 15:23:22	-1.20	-0.00
59	03/09/93 15:23:52	-1.20	-0.00
60	03/09/93 15:24:22	-1.20	-0.00
61	03/09/93 15:24:52	-1.20	-0.00
62	03/09/93 15:25:22	-1.20	-0.00
63	03/09/93 15:25:52	-1.20	-0.00
64	03/09/93 15:26:22	-1.20	-0.00
65	03/09/93 15:26:52	-1.20	-0.00
66	03/09/93 15:27:22	-1.20	-0.00
67	03/09/93 15:27:52	-1.20	-0.00
68	03/09/93 15:28:22	-1.20	-0.00
69	03/09/93 15:28:52	-1.20	-0.00
70	03/09/93 15:29:22	-1.20	-0.00
71	03/09/93 15:29:52	-1.20	-0.00
72	03/09/93 15:30:22	-1.20	-0.00
73	03/09/93 15:30:52	-1.20	-0.00
74	03/09/93 15:31:22	-1.20	-0.00
75	03/09/93 15:31:52	-1.20	-0.00
76	03/09/93 15:32:22	-1.20	-0.00
77	03/09/93 15:32:52	-1.20	-0.00
78	03/09/93 15:33:22	-1.20	-0.00
79	03/09/93 15:33:52	-1.20	-0.00
80	03/09/93 15:34:22	-1.20	-0.00
81	03/09/93 15:34:52	-1.20	-0.00
82	03/09/93 15:35:22	-1.20	-0.00
83	03/09/93 15:35:52	-1.20	-0.00
84	03/09/93 15:36:22	-1.20	-0.00
85	03/09/93 15:36:52	-1.20	-0.00
86	03/09/93 15:37:22	-1.20	-0.00

87	03/09/93 15:37:52	-1.20	-0.00
88	03/09/93 15:38:22	-1.20	-0.00
89	03/09/93 15:38:52	-1.20	-0.00
90	03/09/93 15:39:22	-1.20	-0.00
91	03/09/93 15:39:52	-1.20	-0.00
92	03/09/93 15:40:22	-1.20	-0.00
93	03/09/93 15:40:52	-1.20	-0.00
94	03/09/93 15:41:22	-1.20	-0.00
95	03/09/93 15:41:52	-1.20	-0.00
96	03/09/93 15:42:22	-1.20	-0.00
97	03/09/93 15:42:52	-1.20	-0.00
98	03/09/93 15:43:22	-1.20	-0.00
99	03/09/93 15:43:52	-1.20	-0.00
100	03/09/93 15:44:22	-1.20	-0.00
101	03/09/93 15:44:52	-1.20	-0.00
102	03/09/93 15:45:22	-1.20	-0.00
103	03/09/93 15:45:52	-1.20	-0.00
104	03/09/93 15:46:22	-1.20	-0.00
105	03/09/93 15:46:52	-1.20	-0.00
106	03/09/93 15:47:22	-1.20	-0.00
107	03/09/93 15:47:52	-1.20	-0.00
108	03/09/93 15:48:22	-1.20	-0.00
109	03/09/93 15:48:52	-1.20	-0.00
110	03/09/93 15:49:23	-1.20	-0.00
111	03/09/93 15:49:52	-1.20	-0.00
112	03/09/93 15:50:22	-1.20	-0.00
113	03/09/93 15:50:52	-1.20	-0.00
114	03/09/93 15:51:22	-1.20	-0.00
115	03/09/93 15:51:53	-1.20	-0.00
116	03/09/93 15:52:22	-1.20	-0.00
117	03/09/93 15:52:52	-1.20	-0.00
118	03/09/93 15:53:22	-1.20	-0.00
119	03/09/93 15:53:52	-1.20	-0.00
120	03/09/93 15:54:22	-1.20	-0.00
121	03/09/93 15:54:52	-1.20	-0.00
122	03/09/93 15:55:22	-1.20	-0.00
123	03/09/93 15:55:52	-1.20	-0.00
124	03/09/93 15:56:22	-1.20	-0.00
125	03/09/93 15:56:53	-1.20	-0.00
126	03/09/93 15:57:22	-1.20	-0.00
127	03/09/93 15:57:52	-1.20	-0.00
128	03/09/93 15:58:22	-1.20	-0.00
129	03/09/93 15:58:52	-1.20	-0.00
130	03/09/93 15:59:22	-1.20	-0.00
131	03/09/93 15:59:52	-1.20	-0.00
132	03/09/93 16:00:22	-1.20	-0.00
133	03/09/93 16:00:52	-1.20	-0.00
134	03/09/93 16:01:22	-1.20	-0.00
135	03/09/93 16:01:52	-1.20	-0.00

136	03/09/93 16:02:22	-1.20	-0.00
137	03/09/93 16:02:52	-1.20	-0.00
138	03/09/93 16:03:22	-1.20	-0.00
139	03/09/93 16:03:52	-1.20	-0.00
140	03/09/93 16:04:22	-1.20	-0.00
141	03/09/93 16:04:52	-1.20	-0.00
142	03/09/93 16:05:22	-1.20	-0.00
143	03/09/93 16:05:52	-1.20	-0.00
144	03/09/93 16:06:22	-1.20	-0.00
145	03/09/93 16:06:52	-1.20	-0.00
146	03/09/93 16:07:22	-1.20	-0.00
147	03/09/93 16:07:52	-1.20	-0.00
148	03/09/93 16:08:22	-1.20	-0.00
149	03/09/93 16:08:52	-1.20	-0.00
150	03/09/93 16:09:22	-1.20	-0.00
151	03/09/93 16:09:52	-1.20	-0.00
152	03/09/93 16:10:22	-1.20	-0.00
153	03/09/93 16:10:52	-1.20	-0.00
154	03/09/93 16:11:22	-1.20	-0.00
155	03/09/93 16:11:52	-1.20	-0.00
156	03/09/93 16:12:22	-1.20	-0.00
157	03/09/93 16:12:52	-1.20	-0.00
158	03/09/93 16:13:22	-1.20	-0.00
159	03/09/93 16:13:52	-1.20	-0.00
160	03/09/93 16:14:22	-1.20	-0.00
161	03/09/93 16:14:52	-1.20	-0.00
162	03/09/93 16:15:22	-1.20	-0.00
163	03/09/93 16:15:52	-1.20	-0.00
164	03/09/93 16:16:22	-1.20	-0.00
165	03/09/93 16:16:52	-1.20	-0.00
166	03/09/93 16:17:22	-1.20	-0.00
167	03/09/93 16:17:52	-1.20	-0.00
168	03/09/93 16:18:22	-1.20	-0.00
169	03/09/93 16:18:52	-1.20	-0.00
170	03/09/93 16:19:22	-1.20	-0.00
171	03/09/93 16:19:52	-1.20	-0.00
172	03/09/93 16:20:22	-1.20	-0.00
173	03/09/93 16:20:52	-1.20	-0.00
174	03/09/93 16:21:22	-1.20	-0.00
175	03/09/93 16:21:52	-1.20	-0.00
176	03/09/93 16:22:22	-1.20	-0.00
177	03/09/93 16:22:52	-1.20	-0.00
178	03/09/93 16:23:22	-1.20	-0.00
179	03/09/93 16:23:52	-1.20	-0.00
180	03/09/93 16:24:22	-1.20	-0.00
	Average	-1.20	-0.00

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System Calibration Bias and Drift Data

Analyzer Calib Value ppm	Initial Value ppm	Final Value ppm	Initial S S Bias Error, %	Final S S Bias Error, %	0 Drift Error, %	Cal Drift Error, %
1.00	0.42	-2.81	-0.29%	-1.91%	-1.62%	
191.40	184.92	182.42	-3.24%	-4.49%		-1.25%
	Allowable Values		5.00%	5.00%	3.00%	3.00%
Span Value	200 ppm		**Gas Concentration, ppm**			**-0.00**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

NOx

Data Logger Reading for Chattahoochee Brick Dryer Exhaust

Level	Vendor	Tag Conc. PPM	Carrier Gas	Container Type	Cylinder ID#	Date of Expiration
Mid	Scott Special Gases	125.4	Nitrogen	Stainless	ALM 010156	4-30-93
High	Scott Special Gases	240.0	Nitrogen	Stainless	AAL9551	1-1-94

Response Time Determinations based on 95% of step change in gas concentration

Gas Conc		Time, sec
0 to 125.4		132
125.4 to 0		136
	Avg time	134.00 sec
2 times response =		**268.00 sec**

Analyzer Calibration Data

Cylinder Value ppm	Analyzer Calibration Value ppm	Absolute Difference	Analyzer Calibration Error, %
0.00	0.79	0.79	0.32%
95.20	95.50	0.30	0.12%
125.40	125.06	0.34	0.14%
		Allowable Value	**2.00%**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Run #1
3-9-93

Data Logger Reading for Chattahoochee Brick Dryer Exhaust

Reading	Date Time	Uncorrected PPM Reading As NOx	Corrected PPM Reading As NOx
1	03/09/93 14:54:52	-0.45	0.00
2	03/09/93 14:55:22	-0.45	0.00
3	03/09/93 14:55:52	-0.45	0.00
4	03/09/93 14:56:22	-0.45	0.00
5	03/09/93 14:56:52	-0.45	0.00
6	03/09/93 14:57:22	-0.45	0.00
7	03/09/93 14:57:52	-0.45	0.00
8	03/09/93 14:58:22	-0.45	0.00
9	03/09/93 14:58:52	-0.45	0.00
10	03/09/93 14:59:22	-0.45	0.00
11	03/09/93 14:59:52	-0.45	0.00
12	03/09/93 15:00:22	-0.45	0.00
13	03/09/93 15:00:52	-0.45	0.00
14	03/09/93 15:01:23	-0.45	0.00
15	03/09/93 15:01:52	-0.45	0.00
16	03/09/93 15:02:22	-0.45	0.00
17	03/09/93 15:02:52	-0.45	0.00
18	03/09/93 15:03:22	-0.45	0.00
19	03/09/93 15:03:52	-0.45	0.00
20	03/09/93 15:04:22	-0.45	0.00
21	03/09/93 15:04:52	-0.45	0.00
22	03/09/93 15:05:22	-0.45	0.00
23	03/09/93 15:05:52	-0.45	0.00
24	03/09/93 15:06:22	-0.45	0.00
25	03/09/93 15:06:52	-0.45	0.00
26	03/09/93 15:07:22	-0.45	0.00
27	03/09/93 15:07:52	-0.45	0.00
28	03/09/93 15:08:22	-0.45	0.00
29	03/09/93 15:08:52	-0.45	0.00
30	03/09/93 15:09:23	-0.45	0.00
31	03/09/93 15:09:52	-0.45	0.00
32	03/09/93 15:10:22	-0.45	0.00
33	03/09/93 15:10:52	-0.45	0.00
34	03/09/93 15:11:22	-0.45	0.00
35	03/09/93 15:11:52	-0.45	0.00
36	03/09/93 15:12:22	-0.45	0.00
37	03/09/93 15:12:52	-0.45	0.00

38	03/09/93 15:13:22	-0.45	0.00
39	03/09/93 15:13:52	-0.45	0.00
40	03/09/93 15:14:22	-0.45	0.00
41	03/09/93 15:14:52	-0.45	0.00
42	03/09/93 15:15:22	-0.45	0.00
43	03/09/93 15:15:52	-0.45	0.00
44	03/09/93 15:16:22	-0.45	0.00
45	03/09/93 15:16:52	-0.45	0.00
46	03/09/93 15:17:22	-0.45	0.00
47	03/09/93 15:17:52	-0.45	0.00
48	03/09/93 15:18:22	-0.45	0.00
49	03/09/93 15:18:52	-0.45	0.00
50	03/09/93 15:19:22	-0.45	0.00
51	03/09/93 15:19:52	-0.45	0.00
52	03/09/93 15:20:22	-0.45	0.00
53	03/09/93 15:20:52	-0.45	0.00
54	03/09/93 15:21:22	-0.45	0.00
55	03/09/93 15:21:52	-0.45	0.00
56	03/09/93 15:22:22	-0.45	0.00
57	03/09/93 15:22:52	-0.45	0.00
58	03/09/93 15:23:22	-0.45	0.00
59	03/09/93 15:23:52	-0.45	0.00
60	03/09/93 15:24:22	-0.45	0.00
61	03/09/93 15:24:52	-0.45	0.00
62	03/09/93 15:25:22	-0.45	0.00
63	03/09/93 15:25:52	-0.45	0.00
64	03/09/93 15:26:22	-0.45	0.00
65	03/09/93 15:26:52	-0.45	0.00
66	03/09/93 15:27:22	-0.45	0.00
67	03/09/93 15:27:52	-0.45	0.00
68	03/09/93 15:28:22	-0.45	0.00
69	03/09/93 15:28:52	-0.45	0.00
70	03/09/93 15:29:22	-0.45	0.00
71	03/09/93 15:29:52	-0.45	0.00
72	03/09/93 15:30:22	-0.45	0.00
73	03/09/93 15:30:52	-0.45	0.00
74	03/09/93 15:31:22	-0.45	0.00
75	03/09/93 15:31:52	-0.45	0.00
76	03/09/93 15:32:22	-0.45	0.00
77	03/09/93 15:32:52	-0.45	0.00
78	03/09/93 15:33:22	-0.45	0.00
79	03/09/93 15:33:52	-0.45	0.00
80	03/09/93 15:34:22	-0.45	0.00
81	03/09/93 15:34:52	-0.45	0.00
82	03/09/93 15:35:22	-0.45	0.00
83	03/09/93 15:35:52	-0.45	0.00
84	03/09/93 15:36:22	-0.45	0.00
85	03/09/93 15:36:52	-0.45	0.00
86	03/09/93 15:37:22	-0.45	0.00

87	03/09/93 15:37:52	-0.45	0.00
88	03/09/93 15:38:22	-0.45	0.00
89	03/09/93 15:38:52	-0.45	0.00
90	03/09/93 15:39:22	-0.45	0.00
91	03/09/93 15:39:52	-0.45	0.00
92	03/09/93 15:40:22	-0.45	0.00
93	03/09/93 15:40:52	-0.45	0.00
94	03/09/93 15:41:22	-0.45	0.00
95	03/09/93 15:41:52	-0.45	0.00
96	03/09/93 15:42:22	-0.45	0.00
97	03/09/93 15:42:52	-0.45	0.00
98	03/09/93 15:43:22	-0.45	0.00
99	03/09/93 15:43:52	-0.45	0.00
100	03/09/93 15:44:22	-0.45	0.00
101	03/09/93 15:44:52	-0.45	0.00
102	03/09/93 15:45:22	-0.45	0.00
103	03/09/93 15:45:52	-0.45	0.00
104	03/09/93 15:46:22	-0.45	0.00
105	03/09/93 15:46:52	-0.45	0.00
106	03/09/93 15:47:22	-0.45	0.00
107	03/09/93 15:47:52	-0.45	0.00
108	03/09/93 15:48:22	-0.45	0.00
109	03/09/93 15:48:52	-0.45	0.00
110	03/09/93 15:49:23	-0.45	0.00
111	03/09/93 15:49:52	-0.45	0.00
112	03/09/93 15:50:22	-0.45	0.00
113	03/09/93 15:50:52	-0.45	0.00
114	03/09/93 15:51:22	-0.45	0.00
115	03/09/93 15:51:53	-0.45	0.00
116	03/09/93 15:52:22	-0.45	0.00
117	03/09/93 15:52:52	-0.45	0.00
118	03/09/93 15:53:22	-0.45	0.00
119	03/09/93 15:53:52	-0.45	0.00
120	03/09/93 15:54:22	-0.45	0.00
121	03/09/93 15:54:52	-0.45	0.00
122	03/09/93 15:55:22	-0.45	0.00
123	03/09/93 15:55:52	-0.45	0.00
124	03/09/93 15:56:22	-0.45	0.00
125	03/09/93 15:56:53	-0.45	0.00
126	03/09/93 15:57:22	-0.45	0.00
127	03/09/93 15:57:52	-0.45	0.00
128	03/09/93 15:58:22	-0.45	0.00
129	03/09/93 15:58:52	-0.45	0.00
130	03/09/93 15:59:22	-0.45	0.00
131	03/09/93 15:59:52	-0.45	0.00
132	03/09/93 16:00:22	-0.45	0.00
133	03/09/93 16:00:52	-0.45	0.00
134	03/09/93 16:01:22	-0.45	0.00
135	03/09/93 16:01:52	-0.45	0.00

136	03/09/93 16:02:22	-0.45	0.00
137	03/09/93 16:02:52	-0.45	0.00
138	03/09/93 16:03:22	-0.45	0.00
139	03/09/93 16:03:52	-0.45	0.00
140	03/09/93 16:04:22	-0.45	0.00
141	03/09/93 16:04:52	-0.45	0.00
142	03/09/93 16:05:22	-0.45	0.00
143	03/09/93 16:05:52	-0.45	0.00
144	03/09/93 16:06:22	-0.45	0.00
145	03/09/93 16:06:52	-0.45	0.00
146	03/09/93 16:07:22	-0.45	0.00
147	03/09/93 16:07:52	-0.45	0.00
148	03/09/93 16:08:22	-0.45	0.00
149	03/09/93 16:08:52	-0.45	0.00
150	03/09/93 16:09:22	-0.45	0.00
151	03/09/93 16:09:52	-0.45	0.00
152	03/09/93 16:10:22	-0.45	0.00
153	03/09/93 16:10:52	-0.45	0.00
154	03/09/93 16:11:22	-0.45	0.00
155	03/09/93 16:11:52	-0.45	0.00
156	03/09/93 16:12:22	-0.45	0.00
157	03/09/93 16:12:52	-0.45	0.00
158	03/09/93 16:13:22	-0.45	0.00
159	03/09/93 16:13:52	-0.45	0.00
160	03/09/93 16:14:22	-0.45	0.00
161	03/09/93 16:14:52	-0.45	0.00
162	03/09/93 16:15:22	-0.45	0.00
163	03/09/93 16:15:52	-0.45	0.00
164	03/09/93 16:16:22	-0.45	0.00
165	03/09/93 16:16:52	-0.45	0.00
166	03/09/93 16:17:22	-0.45	0.00
167	03/09/93 16:17:52	-0.45	0.00
168	03/09/93 16:18:22	-0.45	0.00
169	03/09/93 16:18:52	-0.45	0.00
170	03/09/93 16:19:22	-0.45	0.00
171	03/09/93 16:19:52	-0.45	0.00
172	03/09/93 16:20:22	-0.45	0.00
173	03/09/93 16:20:52	-0.45	0.00
174	03/09/93 16:21:22	-0.45	0.00
175	03/09/93 16:21:52	-0.45	0.00
176	03/09/93 16:22:22	-0.45	0.00
177	03/09/93 16:22:52	-0.45	0.00
178	03/09/93 16:23:22	-0.45	0.00
179	03/09/93 16:23:52	-0.45	0.00
180	03/09/93 16:24:22	-0.45	0.00
	Average	-0.45	0.00

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System Calibration Bias and Drift Data

Analyzer Calib Value ppm	Initial Value ppm	Final Value ppm	Initial S S Bias Error, %	Final S S Bias Error, %	0 Drift Error, %	Cal Drift Error, %
0.79	-0.59	-0.32	-0.55%	-0.44%	0.11%	
125.06	121.15	121.33	-1.56%	-1.49%		0.07%
	Allowable Values		5.00%	5.00%	3.00%	3.00%
Span Value	250 ppm		**Gas Concentration, ppm**			**0.00**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Bag Sample for Chattahoochee Brick Dryer Exhaust

Level	Vendor	Tag Conc. PPM	Carrier Gas	Container Type	Cylinder ID#	Date of Expiration
Low	AIRCO	296.0	Nitrogen	Steel	CC-49196	None
Mid	AIRCO	613.0		Steel	CC-3513	None
High	AIRCO	867.0	Nitrogen	Steel	CC-14636	None

Response Time Determinations based on 95% of 867 from 0

Start Time, sec	Stop Time, sec
0	85
0	86
Avg time	85.50 sec

2 time response = 171.00 sec

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Run #1
3-9-93

Bag Sample for Chattahoochee Brick Dryer Exhaust
With silica gel & ascarite

Reading	Chart Rd	Multipler	PPM Reading As CO
1	0	10.0	0
2	0	10.0	0
3	0	10.0	0
Average			**0.0**

% CO2 from orsat **0**

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Analyzer Calibration Data

Cylinder Value ppm	Analyzer Calib Value ppm	Absolute Difference	Analyzer Calib Error, %
0.0	5.00	5.00	0.50%
296.0	300.00	4.00	0.40%
613.0	605.00	8.00	0.80%
867.0	870.00	3.00	0.30%
		Allowable Value	2.00%

Analyzer Calib Value ppm	Initial Value ppm	Final Value ppm	Initial S S Bias Error, %	Final S S Bias Error, %	0 Drift Error, %	Cal Drift Error, %
5.00	5.00	5.00	0.00%	0.00%	0.00%	
870.00	870.00	870.00	0.00%	0.00%		0.00%
	Allowable Values		5.00%	5.00%	3.00%	3.00%

Span Value 1000 ppm **Gas Concentration, ppm** **0.00**

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

VOC

Data Logger Reading for Chattahoochee Brick Dryer Exhaust

Level	Vendor	Tag Conc. PPM	Carrier Gas	Container Type	Cylinder ID#	Date of Expiration
Low	Scott Special Gases	24.94	Nitrogen	Stainless	AAL-3924	5-2-93
Mid	Scott Special Gases	54.99	Nitrogen	Stainless	AAL-13169	5-2-93
High	Scott Special Gases	85.29	Nitrogen	Stainless	ALM-010501	7-21-93

Response Time Determinations based on 95% of step change in gas concentration

Gas Conc	Time, sec
0 to 85.29	42
0 to 85.29	43
0 to 85.29	42
Avg time	42.33 sec
2 times response =	**84.67 sec**

Analyzer Calibration Data

Cylinder Value ppm	Analyzer Calibration Value ppm	Absolute Difference	Analyzer Calibration Error, %
0.00	0.01	0.01	0.01%
24.94	24.30	0.64	0.64%
54.99	55.20	0.21	0.21%
85.29	85.40	0.11	0.11%
		Allowable Value	**5.00%**

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P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Run #1
3-9-93

Data Logger Reading for Chattahoochee Brick Dryer Exhaust

Reading	Date	Time	Uncorrected PPM Reading VOC as Propane	Corrected PPM Reading VOC as Carbon
1	03/09/93	14:54:52	1.19	3.57
2	03/09/93	14:55:22	1.52	4.56
3	03/09/93	14:55:52	1.43	4.29
4	03/09/93	14:56:22	1.37	4.11
5	03/09/93	14:56:52	1.29	3.87
6	03/09/93	14:57:22	1.38	4.14
7	03/09/93	14:57:52	1.43	4.29
8	03/09/93	14:58:22	1.51	4.53
9	03/09/93	14:58:52	1.48	4.44
10	03/09/93	14:59:22	1.13	3.39
11	03/09/93	14:59:52	1.15	3.45
12	03/09/93	15:00:22	1.52	4.56
13	03/09/93	15:00:52	1.21	3.63
14	03/09/93	15:01:23	1.32	3.96
15	03/09/93	15:01:52	1.36	4.08
16	03/09/93	15:02:22	1.25	3.75
17	03/09/93	15:02:52	1.36	4.08
18	03/09/93	15:03:22	1.27	3.81
19	03/09/93	15:03:52	1.24	3.72
20	03/09/93	15:04:22	1.29	3.87
21	03/09/93	15:04:52	1.35	4.05
22	03/09/93	15:05:22	1.24	3.72
23	03/09/93	15:05:52	1.36	4.08
24	03/09/93	15:06:22	1.16	3.48
25	03/09/93	15:06:52	1.18	3.54
26	03/09/93	15:07:22	1.21	3.63
27	03/09/93	15:07:52	1.19	3.57
28	03/09/93	15:08:22	1.31	3.93
29	03/09/93	15:08:52	1.51	4.53
30	03/09/93	15:09:23	1.48	4.44
31	03/09/93	15:09:52	1.45	4.35
32	03/09/93	15:10:22	1.32	3.96
33	03/09/93	15:10:52	1.42	4.26
34	03/09/93	15:11:22	1.35	4.05
35	03/09/93	15:11:52	1.21	3.63
36	03/09/93	15:12:22	1.27	3.81
37	03/09/93	15:12:52	1.31	3.93

38	03/09/93 15:13:22	1.33	3.99
39	03/09/93 15:13:52	1.42	4.26
40	03/09/93 15:14:22	1.51	4.53
41	03/09/93 15:14:52	1.41	4.23
42	03/09/93 15:15:22	1.32	3.96
43	03/09/93 15:15:52	1.27	3.81
44	03/09/93 15:16:22	1.29	3.87
45	03/09/93 15:16:52	1.31	3.93
46	03/09/93 15:17:22	1.36	4.08
47	03/09/93 15:17:52	1.34	4.02
48	03/09/93 15:18:22	1.39	4.17
49	03/09/93 15:18:52	1.41	4.23
50	03/09/93 15:19:22	1.43	4.29
51	03/09/93 15:19:52	1.40	4.20
52	03/09/93 15:20:22	1.39	4.17
53	03/09/93 15:20:52	1.37	4.11
54	03/09/93 15:21:22	1.34	4.02
55	03/09/93 15:21:52	1.30	3.90
56	03/09/93 15:22:22	1.36	4.08
57	03/09/93 15:22:52	1.42	4.26
58	03/09/93 15:23:22	1.42	4.26
59	03/09/93 15:23:52	1.47	4.41
60	03/09/93 15:24:22	1.38	4.14
61	03/09/93 15:24:52	1.36	4.08
62	03/09/93 15:25:22	1.39	4.17
63	03/09/93 15:25:52	1.36	4.08
64	03/09/93 15:26:22	1.34	4.02
65	03/09/93 15:26:52	1.31	3.93
66	03/09/93 15:27:22	1.28	3.84
67	03/09/93 15:27:52	1.22	3.66
68	03/09/93 15:28:22	1.25	3.75
69	03/09/93 15:28:52	1.27	3.81
70	03/09/93 15:29:22	1.28	3.84
71	03/09/93 15:29:52	1.34	4.02
72	03/09/93 15:30:22	1.33	3.99
73	03/09/93 15:30:52	1.37	4.11
74	03/09/93 15:31:22	1.38	4.14
75	03/09/93 15:31:52	1.36	4.08
76	03/09/93 15:32:22	1.41	4.23
77	03/09/93 15:32:52	1.32	3.96
78	03/09/93 15:33:22	1.15	3.45
79	03/09/93 15:33:52	1.52	4.56
80	03/09/93 15:34:22	1.21	3.63
81	03/09/93 15:34:52	1.32	3.96
82	03/09/93 15:35:22	1.36	4.08
83	03/09/93 15:35:52	1.25	3.75
84	03/09/93 15:36:22	1.36	4.08
85	03/09/93 15:36:52	1.27	3.81
86	03/09/93 15:37:22	1.24	3.72

87	03/09/93 15:37:52	1.29	3.87
88	03/09/93 15:38:22	1.35	4.05
89	03/09/93 15:38:52	1.24	3.72
90	03/09/93 15:39:22	1.36	4.08
91	03/09/93 15:39:52	1.16	3.48
92	03/09/93 15:40:22	1.18	3.54
93	03/09/93 15:40:52	1.21	3.63
94	03/09/93 15:41:22	1.19	3.57
95	03/09/93 15:41:52	1.31	3.93
96	03/09/93 15:42:22	1.51	4.53
97	03/09/93 15:42:52	1.48	4.44
98	03/09/93 15:43:22	1.45	4.35
99	03/09/93 15:43:52	1.32	3.96
100	03/09/93 15:44:22	1.42	4.26
101	03/09/93 15:44:52	1.35	4.05
102	03/09/93 15:45:22	1.21	3.63
103	03/09/93 15:45:52	1.27	3.81
104	03/09/93 15:46:22	1.31	3.93
105	03/09/93 15:46:52	1.33	3.99
106	03/09/93 15:47:22	1.42	4.26
107	03/09/93 15:47:52	1.51	4.53
108	03/09/93 15:48:22	1.41	4.23
109	03/09/93 15:48:52	1.32	3.96
110	03/09/93 15:49:23	1.27	3.81
111	03/09/93 15:49:52	1.29	3.87
112	03/09/93 15:50:22	1.31	3.93
113	03/09/93 15:50:52	1.36	4.08
114	03/09/93 15:51:22	1.34	4.02
115	03/09/93 15:51:53	1.39	4.17
116	03/09/93 15:52:22	1.41	4.23
117	03/09/93 15:52:52	1.43	4.29
118	03/09/93 15:53:22	1.40	4.20
119	03/09/93 15:53:52	1.39	4.17
120	03/09/93 15:54:22	1.37	4.11
121	03/09/93 15:54:52	1.34	4.02
122	03/09/93 15:55:22	1.30	3.90
123	03/09/93 15:55:52	1.36	4.08
124	03/09/93 15:56:22	1.42	4.26
125	03/09/93 15:56:53	1.42	4.26
126	03/09/93 15:57:22	1.47	4.41
127	03/09/93 15:57:52	1.38	4.14
128	03/09/93 15:58:22	1.36	4.08
129	03/09/93 15:58:52	1.39	4.17
130	03/09/93 15:59:22	1.36	4.08
131	03/09/93 15:59:52	1.34	4.02
132	03/09/93 16:00:22	1.31	3.93
133	03/09/93 16:00:52	1.28	3.84
134	03/09/93 16:01:22	1.22	3.66
135	03/09/93 16:01:52	1.31	3.93

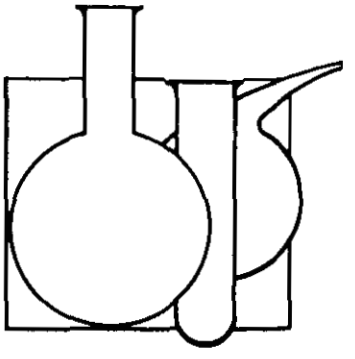
136	03/09/93 16:02:22	1.51	4.53
137	03/09/93 16:02:52	1.48	4.44
138	03/09/93 16:03:22	1.45	4.35
139	03/09/93 16:03:52	1.32	3.96
140	03/09/93 16:04:22	1.42	4.26
141	03/09/93 16:04:52	1.35	4.05
142	03/09/93 16:05:22	1.21	3.63
143	03/09/93 16:05:52	1.27	3.81
144	03/09/93 16:06:22	1.31	3.93
145	03/09/93 16:06:52	1.33	3.99
146	03/09/93 16:07:22	1.42	4.26
147	03/09/93 16:07:52	1.51	4.53
148	03/09/93 16:08:22	1.41	4.23
149	03/09/93 16:08:52	1.32	3.96
150	03/09/93 16:09:22	1.27	3.81
151	03/09/93 16:09:52	1.29	3.87
152	03/09/93 16:10:22	1.31	3.93
153	03/09/93 16:10:52	1.36	4.08
154	03/09/93 16:11:22	1.34	4.02
155	03/09/93 16:11:52	1.39	4.17
156	03/09/93 16:12:22	1.41	4.23
157	03/09/93 16:12:52	1.43	4.29
158	03/09/93 16:13:22	1.40	4.20
159	03/09/93 16:13:52	1.39	4.17
160	03/09/93 16:14:22	1.37	4.11
161	03/09/93 16:14:52	1.34	4.02
162	03/09/93 16:15:22	1.30	3.90
163	03/09/93 16:15:52	1.36	4.08
164	03/09/93 16:16:22	1.42	4.26
165	03/09/93 16:16:52	1.42	4.26
166	03/09/93 16:17:22	1.47	4.41
167	03/09/93 16:17:52	1.38	4.14
168	03/09/93 16:18:22	1.36	4.08
169	03/09/93 16:18:52	1.39	4.17
170	03/09/93 16:19:22	1.36	4.08
171	03/09/93 16:19:52	1.34	4.02
172	03/09/93 16:20:22	1.31	3.93
173	03/09/93 16:20:52	1.28	3.84
174	03/09/93 16:21:22	1.22	3.66
175	03/09/93 16:21:52	1.25	3.75
176	03/09/93 16:22:22	1.27	3.81
177	03/09/93 16:22:52	1.28	3.84
178	03/09/93 16:23:22	1.34	4.02
179	03/09/93 16:23:52	1.33	3.99
180	03/09/93 16:24:22	1.37	4.11
	Average	**1.34**	**4.03**

++++++++++ ++++++++++ +++++++++++++++ ++++++++++ ++++++++++ ++++++++++ ++++++++++

System Calibration Bias and Drift Data

Analyzer Calib Value ppm	Initial Value ppm	Final Value ppm		0 Drift Error, %	Cal Drift Error, %
0.01	0.01	-0.02		-0.03%	
55.20	55.20	52.61			-2.59%
	Allowable Values			3.00%	3.00%
Span Value	100 ppm		**Gas Concentration, ppm as carbon**		**4.03**

Sampling & Analytical Procedures



III. SAMPLING AND ANALYTICAL PROCEDURES

General

All sampling and analytical procedures used on this source were conducted in strict adherence with the Code of Federal Regulations, Title 40, Part 60, Appendix A, Methods 1-4, 6c, 7e, 10, & 25a as amended. The sampling equipment used in these tests was manufactured by Research Appliance Corporation and was properly calibrated before these tests (See **Calibrations**). The sulfur dioxide emissions were measured with a nondispersive ultraviolet (UV) analyzer, the nitrogen oxides emissions were measured with a chemiluminescent analyzer, and the carbon monoxide emissions were measured with a nondispersive infrared (NDIR) analyzer and the VOC emissions were measured with a flame ionization analyzer (FIA).

METHOD 1

"To aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source, a measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. A traverse point is then located within each of these equal areas. This method is applicable to flowing gas streams in ducts, stacks, and flues. The method cannot be used when: (1) flow is cyclonic or swirling, (2) a stack is smaller than about 0.30 meter (12 in.) in diameter, or 0.071 m^2 (113 $in.^2$) in cross-sectional area, or (3) the measurement site is less than two stack or duct diameters downstream or less than a half diameter upstream from a flow disturbance.

Sampling or velocity measurement is performed at a site located at least eight stack or duct diameters downstream and two diameters upstream from any flow disturbance such as a bend, expansion, or contraction in the stack, or from a visible flame. If necessary, an alternative location may be selected, at a position at least two stack or duct diameters downstream and a half diameter upstream from any flow disturbance.

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

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

where L = length and W = width."[1]

This method was used to figure out the number of sampling points and the required sampling matrix. The dimension of the sample locations (see **Figures 1 & 2**) suggested that 24 points would be required to sample these sources. We sampled 24 points for velocity on the kiln exhaust and 12 points on the dryer exhaust (only one port was accessible). Verification of absence of cyclonic flow was not determined because cyclonic flow did not seem to exist from either stack exhaust

METHOD 2

"The average gas velocity in a stack is determined from the gas density and from measurement of the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube. This method is applicable for measurement of the average velocity of a gas stream and for quantifying gas flow. This procedure is not applicable at measurement sites that fail to meet the criteria of Method 1. Also, the method cannot be used for direct measurement in cyclonic or swirling gas streams. When unacceptable conditions exist, alternative procedures, subject to the approval of the Administrator, U.S. Environmental Protection Agency, must be employed to make accurate flow rate determinations; examples of such alternative procedures are: (1) to install straightening vanes; (2) to calculate the total volumetric flow rate stoichiometrically, or (3) to move to another measurement site at which the flow is acceptable.

Specifications for the apparatus are given below. Any other apparatus that has been demonstrated (subject to approval of the Administrator) to be capable of meeting the specifications will be considered acceptable. Pitot tube made of metal tubing (e.g., stainless steel). It is recommended that the external tubing diameter be between 0.48

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[1]Method 1 - Sample and Velocity Traverses for Stationary Sources, Code of Federal Regulations, Title 40, Section 60, Appendix A, July 1, 1991.

and 0.95 cm (3/16 and 3/8 inch). There shall be an equal distance from the base of each leg of the pitot tube to its face-opening plane; it is recommended that this distance be between 1.05 and 1.50 times the external tubing diameter. The Type S pitot tube shall have a known coefficient. An inclined manometer or equivalent device. Most sampling trains are equipped with a 10-in. (water column) inclined-vertical manometer, having 0.01-in. H_2O divisions on the 0- to l-in. inclined scale, and 0.1-in. H_20 divisions on the l- to 10-in. vertical scale. This type of manometer (or other gauge of equivalent sensitivity) is satisfactory for the measurement of Δp values as low as 1.3 mm (0.05 in.) H_20. However, a differential pressure gauge of greater sensitivity shall be used (subject to the approval of the Administrator), if any of the following is found to be true: (1) the arithmetic average of all Δp readings at the traverse points in the stack is less than 1.3 mm (0.05 in.) H_20; (2) for traverses of 12 or more points, more than 10 percent of the individual Δp readings are below 1.3 mm (0.05 in.) H_20; (3) for traverses of fewer than 12 points, more than one Δp reading is below 1.3 mm (0.05 in.) H_20. [2]

Velocity readings were taken with a properly calibrated S type pitot tube and a 0-10.0 inch inclined-vertical manometer; which had 0.01 inch H_2O divisions on the 0 to 1 inch inclined scale, and 0.1 inch H_2O divisions on the 1 to 10 inch vertical scale.

METHOD 3

"This method is applicable for determining carbon dioxide (CO_2) and oxygen (O_2) concentrations and dry molecular weight of a sample from a gas stream of a fossil-fuel combustion process. The method may also be applicable to other processes where it has been determined that compounds other than $C0_2$, 0_2, carbon monoxide (C0), and nitrogen (N_2) are not present in concentrations sufficient to affect the results. A gas sample is extracted from a stack by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent $C0_2$, percent 0_2, and if necessary, for percent

[2]Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube), Code of Federal Regulations, Title 40, Section 60, Appendix A, July 1, 1991.

CO. For dry molecular weight determination, either an Orsat or a Fyrite analyzer may be used for the analysis."[3]

Gas composition for CO_2, O_2, and N_2 by difference was performed using the integrated sample technique during each test. The individual gas bags (Tedlar) were leak checked the previous night by pressuring each bag to 4 inches H_2O and allowed to stand overnight. All gas bags used in this test were leak free. The integrated gas samples were taken utilizing the sampling train shown in **Figure 3**. Just prior to sampling, a vacuum of 10 inches of mercury was placed across the system and the vacuum remained stable for 0.5 minutes. The samples were taken at a constant rate (see **Data Sheets**).

After completion of the sampling, the sampling train was again leak checked at 10 inches of mercury vacuum, and no leaks were noted for 0.5 minutes. Each gas sample was analyzed with a Burrell Orsat Gas Analyzer (0-50% scale with 0.1% divisions) within eight (8) hours after it was taken. Each analysis was repeated until the results of any three analyzes differed by no more than (1) 0.3% by volume when the CO_2 was greater than 4.0% by volume of 0.2% by volume when the CO_2 was less than 4.0% by volume; (2) 0.3% by volume when the O_2 was less than 15.0% by volume of 0.2% by volume when the O_2 was less than 15.0% by volume. The orsat was leak checked before and after each series of samples were analyzed for 4 minutes and the meniscus in the burette did not change by more than 0.2 ml or the liquid level in each pipette did not fall below the bottom of the capillary tubing (see **Data Sheets**).

METHOD 4

"A gas sample is extracted at a constant rate from the source; moisture is removed from the sample stream and determined either volumetrically or gravimetrically. This method is applicable for determining the moisture content of stack gas.

Two procedures are given. The first is a reference method, for accurate determinations of moisture content (such as are needed to calculate emission data). The second is an approximation method, which provides estimates of percent moisture to aid

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[3]Method 3 - Gas Analysis for the Determination of Dry Molecular Weight, Code of Federal Regulations, Title 40, Section 60, Appendix A, July 1, 1991.

in setting isokinetic sampling rates prior to a pollutant emission measurement run. The approximation method described herein is only a suggested approach; alternative means for approximating the moisture content, e.g., drying tubes, wet bulb-dry bulb techniques, condensation techniques, stoichiometric calculations, previous experience, etc., are also acceptable.

The reference method is often conducted simultaneously with a pollutant emission measurement run; when it is, calculation of percent isokinetic, pollutant emission rate, etc., for the run shall be based upon the results of the reference method or its equivalent; these calculations shall not be based upon the results of the approximation method, unless the approximation method is shown, to the satisfaction of the Administrator, U.S. Environmental Protection Agency, to be capable of yielding results within I percent H_2O of the reference method.

The reference method may yield questionable results when applied to saturated gas streams or to streams that contain water droplets. Therefore, when these conditions exist or are suspected, a second determination of the moisture content shall be made simultaneously with the reference method, as follows: Assume that the gas stream is saturated. Attach a temperature sensor [capable of measuring to within 1^0C (2^0F)] to the reference method probe. Measure the stack gas temperature at each traverse point during the reference method traverse; calculate the average stack gas temperature. Next, determine the moisture percentage, either by: (I) using a psychometric chart and making appropriate corrections if stack pressure is different from that of the chart, or (2) using saturation vapor pressure tables."[4]

The moisture content of the stack gases for the kiln exhaust was determined by weighing the amount of water collected in the impingers and the increase in weight of the silica gel. These weights were combined to give the total amount of water collected. Wet bulb-dry bulb was used for the dryer exhaust.

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[4]Method 4 - Determination of Moisture Content in Stack Gases, Code of Federal Regulations, Title 40, Section 60, Appendix A, July 1, 1991.

METHOD 6C

"This method is applicable to the determination of sulfur dioxide (SO_2) concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. A gas sample is continuously extracted from a stack, and a portion of the sample is conveyed to an instrumental analyzer for determination of SO_2 gas concentration using an ultraviolet (UV), nondispersive infrared (NDIR), or fluorescence analyzer. Performance specifications and test procedures are provided to ensure reliable data.

The analytical range is determined by the instrumental design. For this method, a portion of the analytical range is selected by choosing the span of the monitoring system. The span of the monitoring system shall be selected such that the pollutant gas concentration equivalent to the emission standard is not less than 30 percent of the span. If at any time during a run the measured gas concentration exceeds the span, the run shall be considered invalid.

The minimum detectable limit depends on the analytical range, span, and signal-to-noise ratio of the measurement system. For a well designed system, the minimum detectable limit should be less than 2 percent of the span.

Span. The upper limit of the gas concentration measurement range displayed on the data recorder.

Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

Analyzer Calibration Error. The difference between the gas concentration exhibited by the gas analyzer and the known concentration of the calibration gas when the calibration gas is introduced directly to the analyzer.

Sampling System Bias. The difference between the gas concentrations exhibited by the measurement system when a known concentration gas is introduced at the outlet of the sampling probe and when the same gas is introduced directly to the analyzer.

Zero Drift. The difference in the measurement system output reading from the initial calibration response at the zero concentration level after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

Calibration Drift. The difference in the measurement system output reading from the initial calibration response at a mid-range calibration value after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

Response Time. The amount of time required for the measurement system to display 95 percent of a step change in gas concentration on the data recorder.

Interference Check. A method for detecting analytical interferences and excessive biases through direct comparison of gas concentrations provided by the measurement system and by a modified Method 6 procedure. For this check, the modified Method 6 samples are acquired at the sample by-pass discharge vent."[5]

General

The sampling train consisted of a sample probe, heated sampling line, calibration valve assembly, a condenser to remove condensate from the sample gas while maintaining minimal contact between any condensate and the sample gas, particulate filter, sample pump, sample flow rate control, sample gas manifold, SO_2 analyzer (Anarad AR-440 serial # 4278), a strip chart recorder (Cole Parmer model # 1201-000 serial # 7342) and a Fluke Data Logger (2625a/5454653). See **Figure 4**.

The following measurement system performance specifications were complied with during these tests:

1. Analyzer Calibration Error - Less than ± 2% of the span for the zero, mid-range, and high-range calibration gases.
2. Sampling System Bias - Less than ± 5% of the span for the zero, and mid- or high-range calibration gases.
3. Zero Drift - Less than ± 3% of the span over the period of each run.
4. Calibration Drift - Less than ± 3% of the span over the period of each run.

Measurement System Preparation

The system was assembled by following the manufacturer's written instruction for preparing and preconditioning the gas analyzer and the other system components.

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[5]Method 6C - Determination of Sulfur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure), Code of Federal Regulations, Title 40, Section 60, Appendix A, July 1, 1991.

Various calibration gases were then introduced and all necessary adjustments were made to calibrate the analyzer and the data recorder.

Then an analyzer calibration error check was conducted by introducing calibration gases to the measurement system at the back of the analyzer and all measurements were less than ± 2% of the span for any of the calibration gases. Next the sampling system bias check was conducted by introducing calibration gases at the calibration valve installed at the outlet of the sampling probe. A zero, mid-range, and high-range gas were introduced. During this check, the system was operated at the normal sampling rate, and no adjustments to the measurement system other than those necessary to achieve proper calibration gas flow rates to the analyzer was done. The response time was determined during this check. All measurements were less than ± 5% of the span for either the zero or upscale calibration gas.

Emission Test Procedure

The probe was positioned at the sampling location and sampling began at the same rate as used during the system calibration drift test. A constant sampling rate was maintained during the entire run. The sampling time per run was 90 minutes plus twice the system response time. Immediately following each run, the sampling system bias check was redone without making any adjustments to the measurement system. All values were within acceptable limits. The average of the initial and final bias check values were used to calculate the gas concentration for the run.

Method 7E

"This method is applicable to the determination of nitrogen oxides (NO_X) concentrations in emissions from stationary sources only when specified within the regulations. A sample is continuously extracted from the effluent stream; a portion of the sample stream is conveyed to an instrumental chemiluminescent analyzer for determination of NO_X concentration. Performance specifications and test procedures are provided to ensure reliable data. Range and sensitivity is the same as in Method 6C. The Sample Interface, Gas Analyzer, and Data Recorder are the same as in Method 6C. A NO_2 to NO Converter is a device that converts the nitrogen dioxide (NO_2) in the sample

gas to nitrogen oxide (NO). The Span, Calibration Gas, Analyzer Calibration Error, Sampling System Bias, Zero Drift, Calibration Drift, and Response Time are the same as in Method 6C."[6]

General

The sampling train consisted of a sample probe, heated sampling line, calibration valve assembly, a refrigerator-type condenser to remove condensate from the sample gas while maintaining minimal contact between any condensate and the sample gas, particulate filter, sample pump, sample flow rate control, sample gas manifold, NO_x analyzer (Beckman 921A NO/NO_x Analyzer serial # 0100084), a strip chart recorder (Cole Palmer model # 1201-0000 serial # 234255) and a Fluke Data Logger (2625a/5454653). See **Figure 5**.

Upon receipt of the NO_x Analyzer an interference response test was conducted using 500 ppm CO, 200 ppm SO_2, 10.5% CO_2, and 20.7% O_2. These gases were introduced as a gas mixture to the analyzer and the total interference response was less than 2% of the span value of 249 ppm NO_x.

Before field use the NO_2 to NO conversion efficiency was determined by adding gas from the mid-level NO in N_2 (505 ppm) to a clean, evacuated, leak-tight Tedlar bag. This gas was diluted approximately 1:1 with 20.9 % O_2, purified air. The bag was immediately attached to the calibration valve assembly and sampling begun, recording the NO_x response for 30 minutes. The NO_2 to NO conversion was 100% as the instrument response was stable at the highest peak value observed and did not decrease more than 2.0% of the highest peak value.

The following measurement system performance specifications were complied with during these tests:

1. Analyzer Calibration Error - Less than $\pm$ 2% of the span for the zero, mid-range, and high-range calibration gases.

2. Sampling System Bias - Less than $\pm$ 5% of the span for the zero, and mid- or high-range calibration gases.

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[6]Method 7e - Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure), Code of Federal Regulations, Title 40, Section 60, Appendix A, July 1, 1991.

3. Zero Drift - Less than ± 3% of the span over the period of each run.
4. Calibration Drift - Less than ± 3% of the span over the period of eachrun.

Measurement System Preparation

The system was assembled by following the manufacturer's written instruction for preparing and preconditioning the gas analyzer and the other system components. Various calibration gases were then introduced and all necessary adjustments were made to calibrate the analyzer and the data recorder.

Then an analyzer calibration error check was conducted by introducing calibration gases to the measurement system at the back of the analyzer and all measurements were less than ± 2% of the span for any of the calibration gases. Next the sampling system bias check was conducted by introducing calibration gases at the calibration valve installed at the outlet of the sampling probe. A zero, mid-range, and high-range gas was introduced. During this check, the system was operated at the normal sampling rate, and no adjustments to the measurement system other than those necessary to achieve proper calibration gas flow rates to the analyzer were done. The response time was determined during this check. All measurements were less than ± 5% of the span for either the zero or upscale calibration gas.

Emission Test Procedure

The probe was positioned at the sampling location and sampling began at the same rate as used during the system calibration drift test. A constant sampling rate was maintained during the entire run. The sampling time per run was 90 minutes plus twice the system response time. Immediately following each run, the sampling system bias check was redone without making any adjustments to the measurement system. All values were within acceptable limits. The average of the initial and final bias check values were used to calculate the gas concentration for the run.

METHOD 10

"An integrated or continuous gas sample is extracted from a sampling point and analyzed for carbon monoxide (CO) content using a Luft-type nondispersive infrared analyzer (NDIR) or equivalent. This method is applicable for the determination of carbon monoxide emissions from stationary sources only when specified by the test procedures for determining compliance with new source performance standards. The test procedure will indicate whether a continuous or an integrated sample is to be used. Minimum detectable concentration is 20 ppm for a 0- to 1000-ppm span.

Any substance having a strong absorption of infrared energy will interfere to some extent. For example, discrimination ratios for water (H_2O) and carbon dioxide (CO_2) are 3.5 percent H_2O per 7 ppm CO and 10 percent CO_2 per 10 ppm CO, respectively, for devices measuring in the 1500- to 3000-ppm range. For devices measuring in the 0- to 100-ppm range, interference ratios can be as high as 3.5 percent H_2O per 25 ppm CO and 10 percent CO_2 per 50 ppm CO. The use of silica gel and ascarite traps will alleviate the major interference problems. The measured gas volume must be corrected if these traps are used.

For continuous sampling, set up the equipment as shown in Figure 10-1 making sure all connections are leak free. Place the probe in the stack at a sampling point, and purge the sampling line. Connect the analyzer, and begin drawing sample into the analyzer. Allow 5 minutes for the system to stabilize, then record the analyzer reading as required by the test procedure. (See Sections 7.2 and 8). CO_2 content of the gas may be determined by using the Method 3 integrated sampling procedure, or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

For integrated sampling, evacuate the flexible bag. Set up the equipment as shown in Figure 10-2 with the bag disconnected. Place the probe in the stack, and purge the sampling line. Connect the bag, making sure that all connections are leak free. Sample at a rate proportional to the stack velocity. CO_2 content of the gas may be determined by using the Method 3 integrated sample procedures, or by weighing the

ascarite CO_2 concentration from the gas volume sampled and the weight gain of the tube."[7]

General

The sampling train consisted of a sample probe, heated sampling line, calibration valve assembly, a condenser to remove condensate from the sample gas while maintaining minimal contact between any condensate and the sample gas, particulate filter, sample pump, sample flow rate control, sample gas manifold, a Luft-type nondispersive infrared analyzer (Rosemount 880-2000943) a Cole Palmer strip chart recorder (1201-000/9322) and a Fluke Data Logger (2625a/5454653). See **Figure 6**. .

Measurement System Preparation

The system was assembled by following the manufacturer's written instruction for preparing and preconditioning the gas analyzer and the other system components. Various calibration gases were then introduced and all necessary adjustments were made to calibrate the analyzer and the data recorder.

Then an analyzer calibration error check was conducted by introducing calibration gases to the measurement system at the back of the analyzer and all measurements were less than ± 2% of the span for any of the calibration gases. Next the sampling system bias check was conducted by introducing calibration gases at the calibration valve installed at the outlet of the sampling probe. A zero, mid-range, and high-range gas were introduced. During this check, the system was operated at the normal sampling rate, and no adjustments to the measurement system other than those necessary to achieve proper calibration gas flow rates to the analyzer was done. The response time was determined during this check. All measurements were less than ± 5% of the span for either the zero or upscale calibration gas.

Emission Test Procedure

The bag samples were positioned at the sampling inlet and sampling began at the same rate as used during the system calibration drift test. A constant sampling rate was

[7]Method 10 - Determination of Carbon Monoxide Emissions from Stationary Sources, Code of Federal Regulations, Title 40, Section 60, Appendix A, July 1, 1991.

maintained during the entire run. The sampling time per run was approximately 5 minutes. Once the value stabilized, three reading every 30 seconds. Immediately following each run, the sampling system bias check was redone without making any adjustments to the measurement system. All values were within acceptable limits.

METHOD 25a

The sampling train consisted of a sample probe, heated sampling line, calibration valve assembly, particulate filter, sample pump, sample flow rate control, FIA analyzer (Ratfish RS-55CA serial # 0119692), and data logger (Fluke model # 2625a serial # 5454653). A strip chart recorder was not used because the voltage output from the Ratfish was 10 volts and all strip charts would only handle 5 volts. See **Figure 7**.

The following measurement system performance specifications were complied with during these tests:

1. Zero Drift - Less than ± 3% of the span.
2. Calibration Drift - Less than ± 3% of the span.
3. Calibration Error - Less than ± 5% of the calibration gas value.

Measurement System Preparation

The system was assembled by following the manufacturer's written instruction for preparing and preconditioning the gas analyzer and the other system components. The zero and high-level calibration gases were introduced at the calibration valve assembly, and adjustments were made to set the analyzer and the data recorder at the appropriate level. The response time was determined during this check. Then the low-range and mid-range gas were introduced. During this check, the system was operated at the normal sampling rate, and no adjustments to the measurement system other than those necessary to achieve proper calibration gas flow rates to the analyzer was done. All measurements were less than ± 5% of the respective calibration gas value.

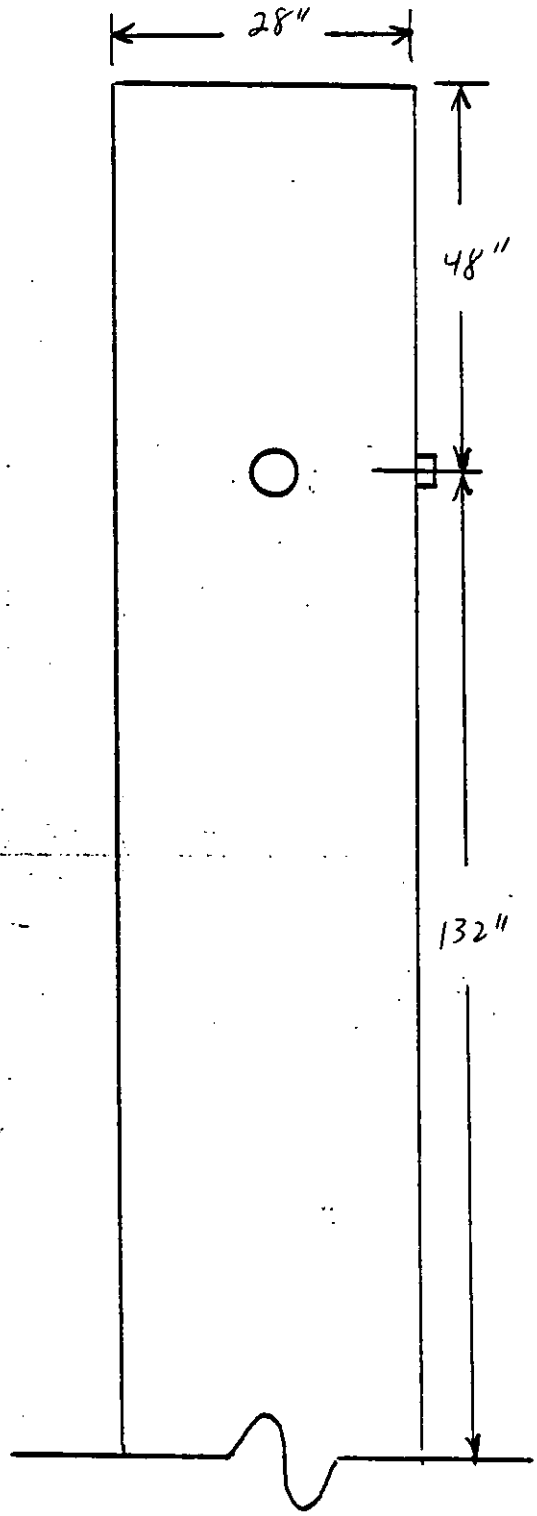
Emission Test Procedure

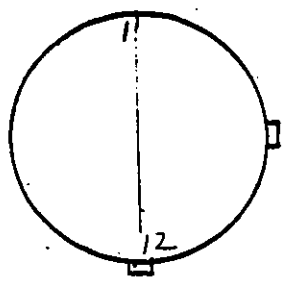
The probe was positioned at the sampling location and sampling began at the same rate as used during the system calibration drift test. A constant sampling rate was

maintained during the entire run. The sampling time per run was 90 minutes plus twice the system response time. Immediately following each run, the zero gas and the mid-level calibration gas were introduced to determine the drift values. This check was accomplished without making any adjustments to the measurement system. All values were within acceptable limits.

STACK BREECHING AND SAMPLE POINT LOCATION

30B KILN EXHAUST



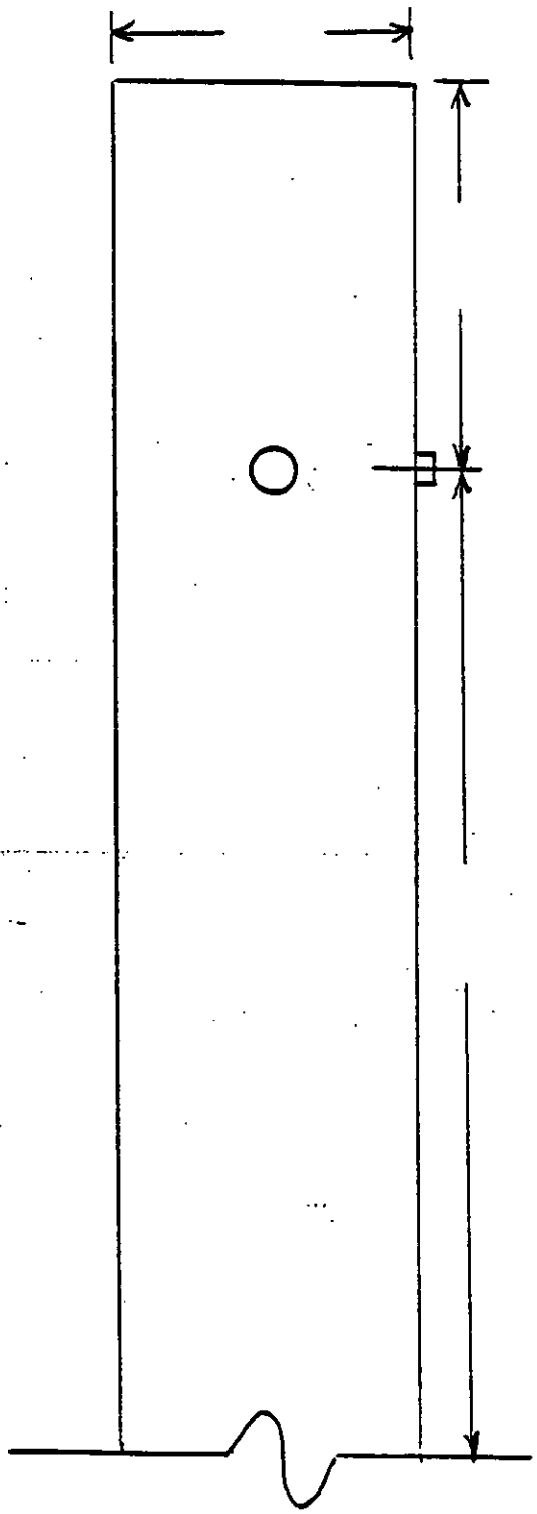


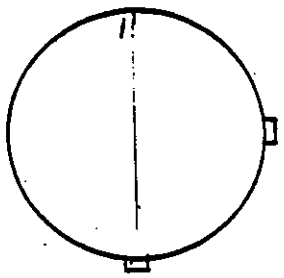
Point #	Distance to wall (in)
1	27.4
2	26.1
3	24.7
4	23.0
5	21.0
6	18.0
7	10.0
8	7.0
9	5.0
10	3.3
11	1.9
12	0.6

Figure 1

STACK BREECHING AND SAMPLE POINT LOCATION

30B DRYER EXHAUST





Point #	Distance to wall (in)
1	58.7
2	56.0
3	52.9
4	49.4
5	45.0
6	38.7
7	21.3
8	15.0
9	10.6
10	7.1
11	4.0
12	1.3

Figure 2

Integrated Sampling Train

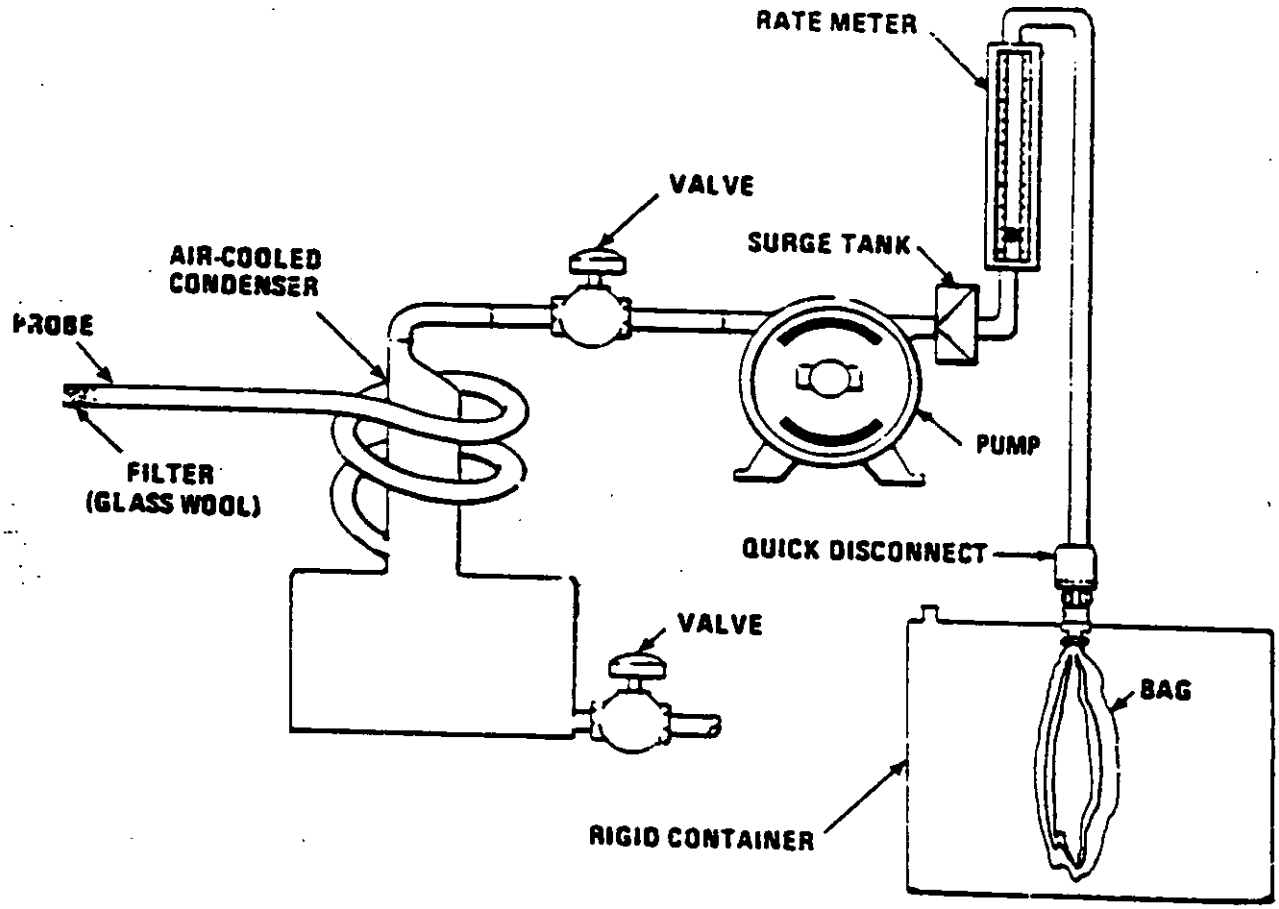
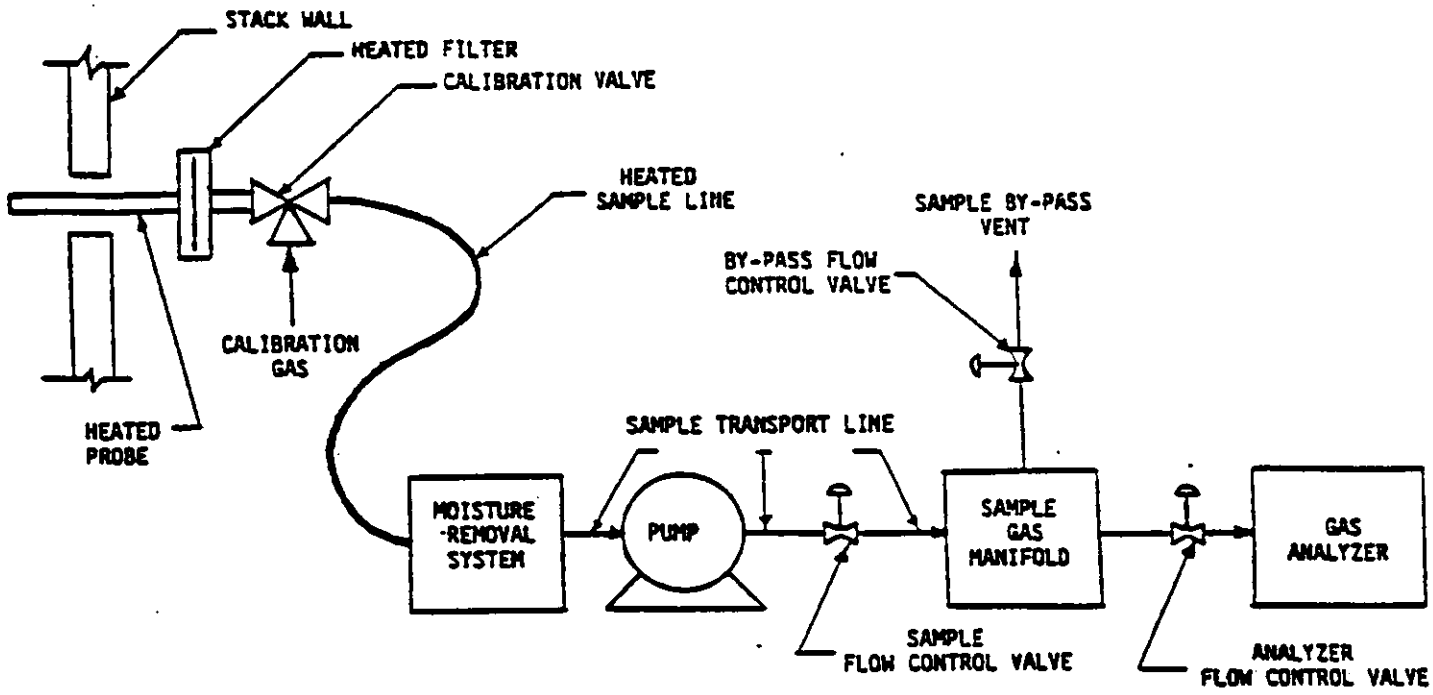
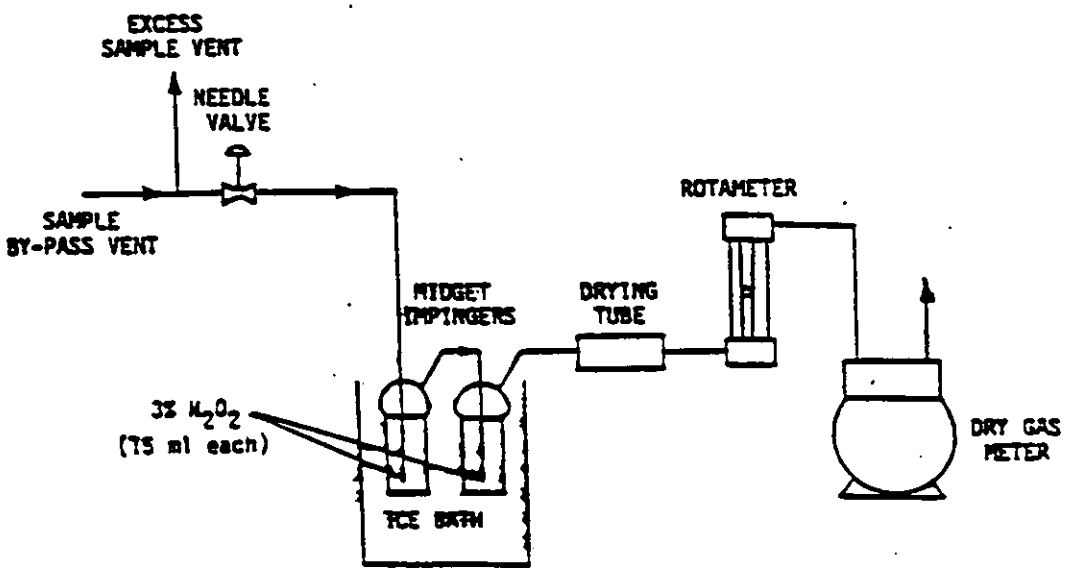


Figure 3

SO_2 SAMPLING TRAIN

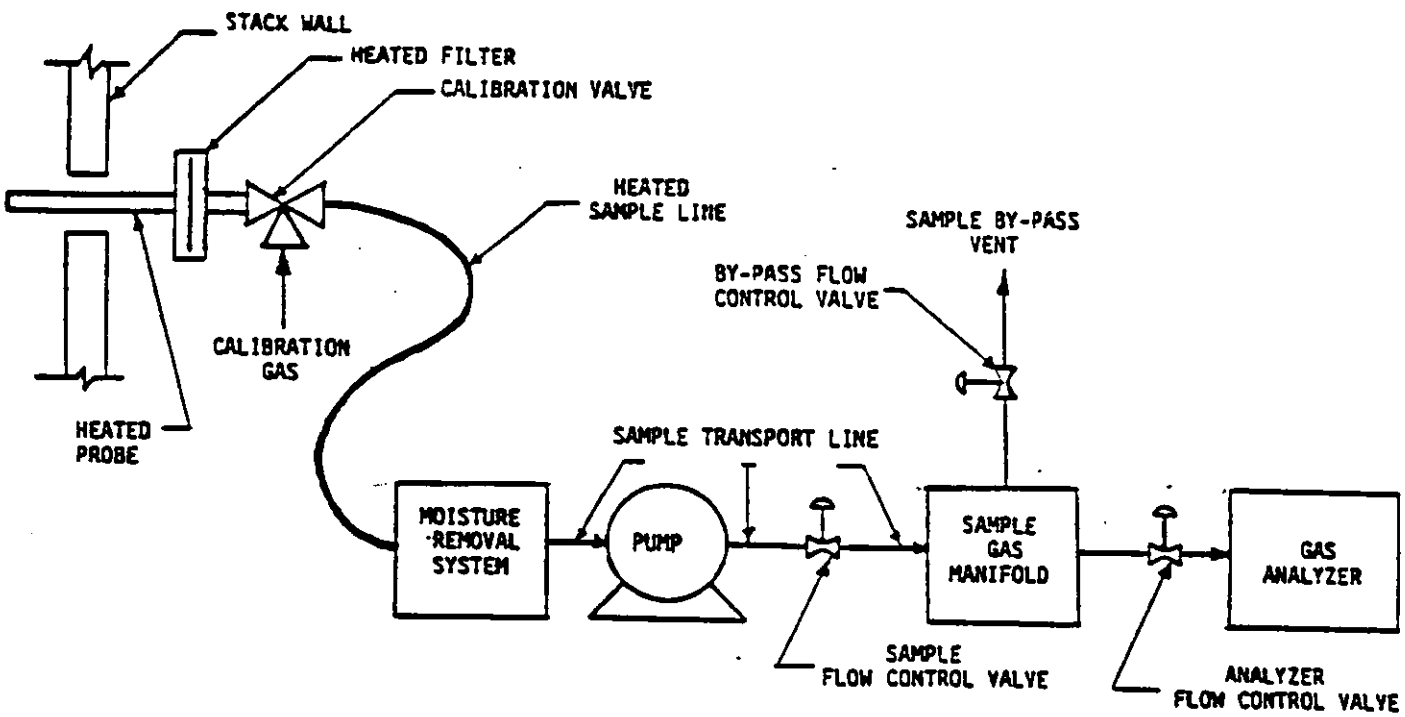


Measurement system schematic.



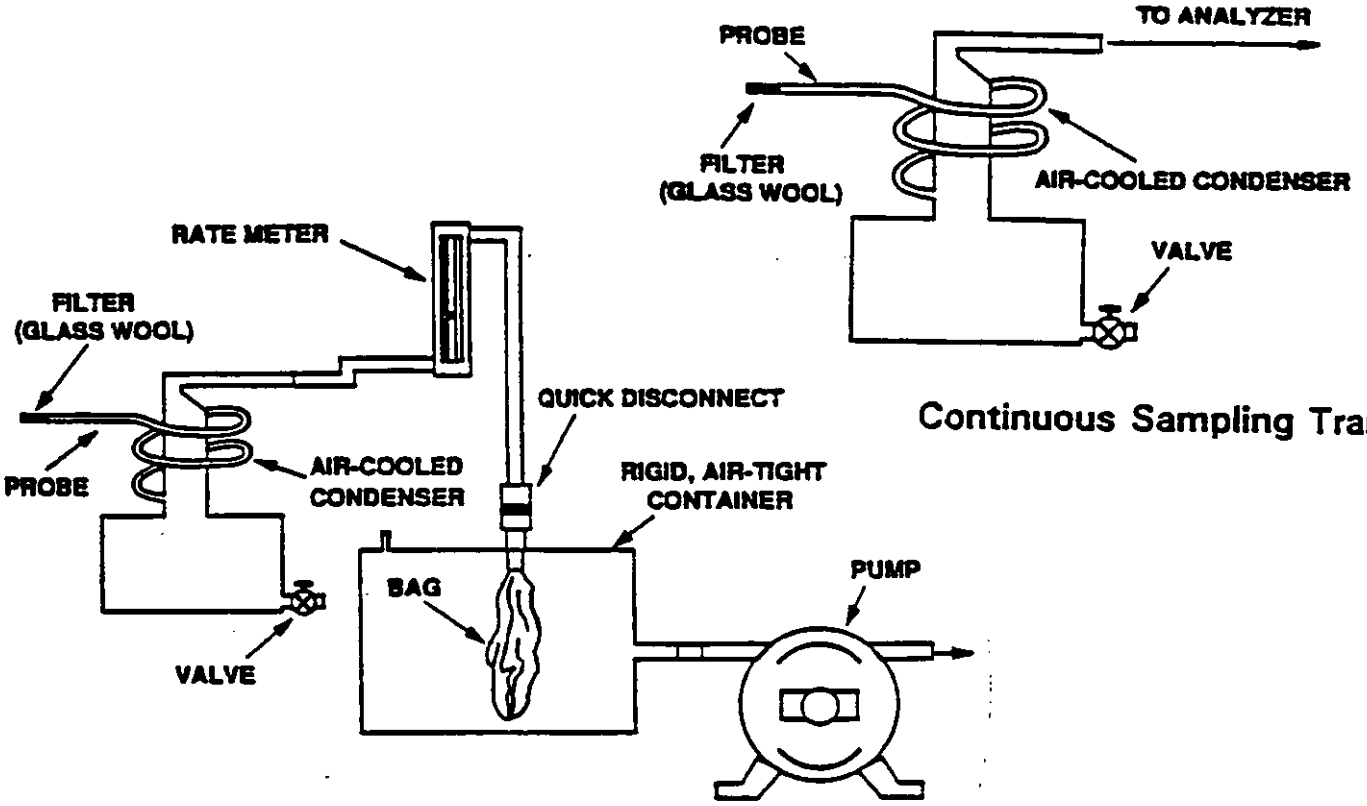
Interference check sampling train.

Figure 4



Measurement system schematic.

Figure 5



Continuous Sampling Train

Integrated Gas--Sampling Train

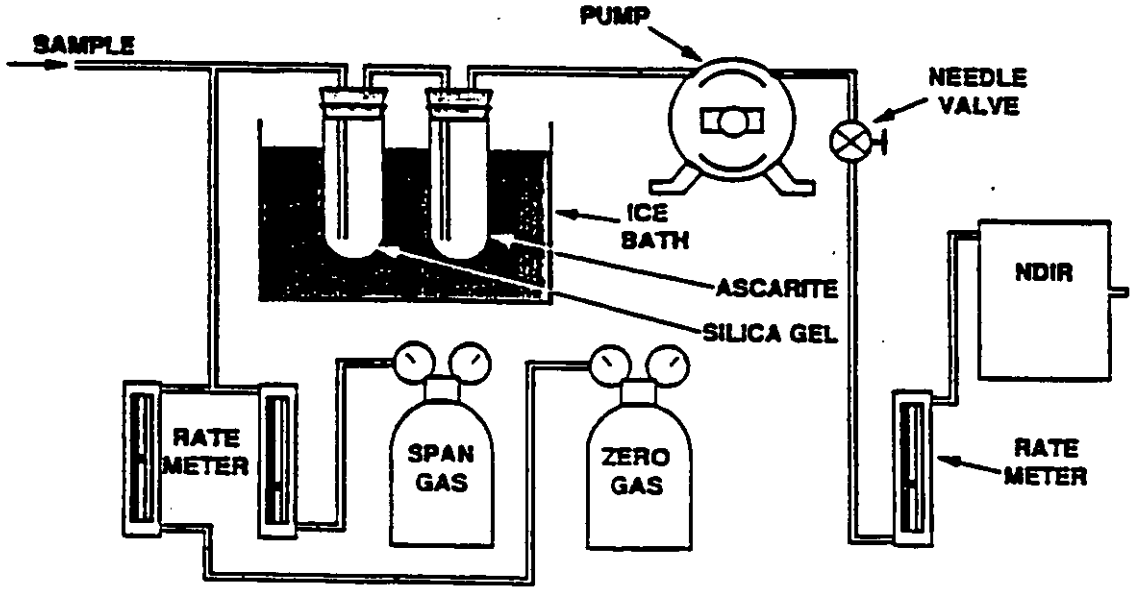
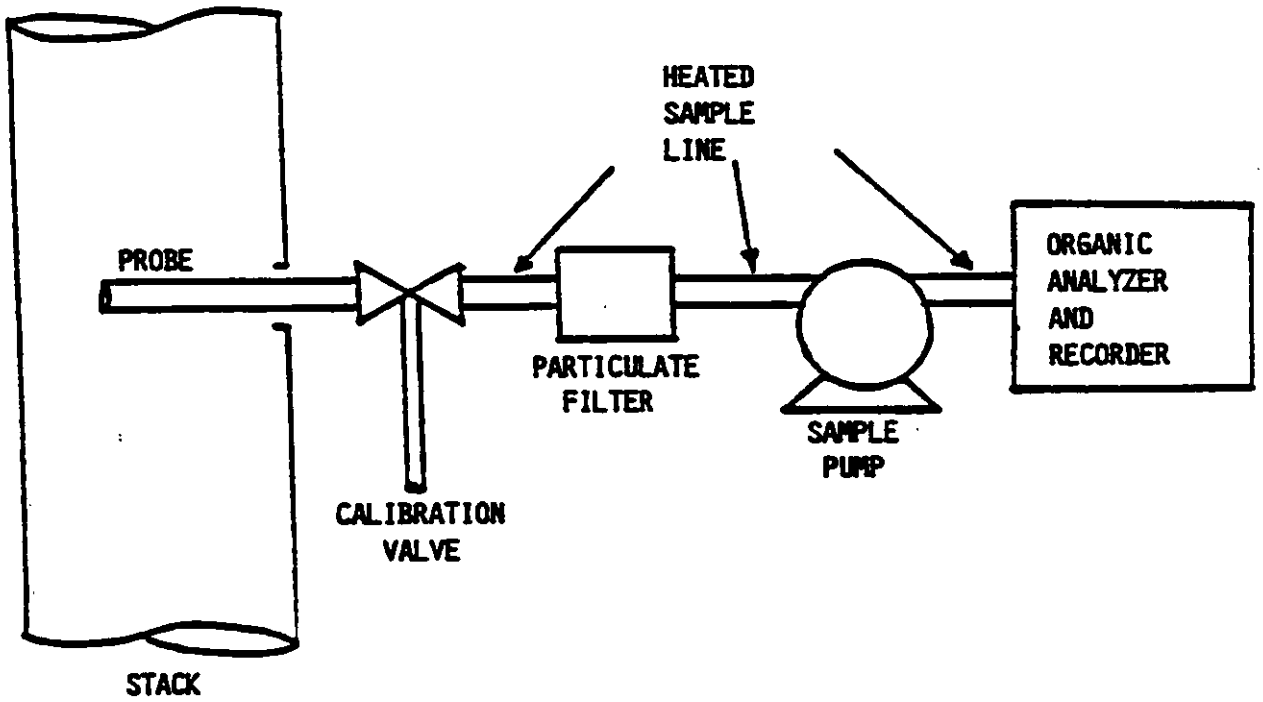


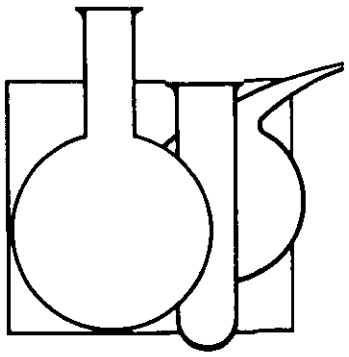
Figure 6 Analytical Equipment



Organic Concentration Measurement System

Figure 7

Field Data



NOMENCLATURE

ACF - Actual Cubic Feet

ACFM - Actual Cubic Feet per minute

ACM - Actual Cubic Meters

ACMS - Actual Cubic Meters per second

An - Cross sectional area of nozzle, (ft^2)

As - Area of Stack, (ft^2)

Bws - Water vapor in the gas stream, proportion by volume (dimensionless)

C_a- Acetone blank residue concentration, mg/g

c_a - Particulate Concentration, ACF

CFM - Cubic feet per minute

C_p - Pitot tube coefficient, (dimensionless)

c_s- Particulate Concentration, grains/DSCF

Cso_2- Concentration of sulfur dioxide (dry basis) corrected to standard conditions, lb/DSCF

C_{12} - Particulate concentration (c_s adjusted to 12% excess air), grains/DSCF

C_{50} - Particulate concentration (c_s adjusted to 50% excess air), grains/DSCF

DSCF - Dry Standard Cubic Feet

DSCFM - Dry Standard Cubic Feet per minute

DSCM - Dry Standard Cubic Meters

DSCMS - Dry Standard Cubic Meters per second

EA - Excess Air, %

I - Isokinetic Sampling, %

NOMENCLATURE - continued

Km - Orifice Correction Factor, (dimensionless)

Kp - Pitot tube constant, 85.49 $\frac{(lb/lb\text{-}mole)(in.Hg)}{(^{0}R)\ (in.\ H_2O)}$ 1/2

La - Maximum acceptable leakage rate for either a pretest leak check or for a leak check following a component change; equal to 0.02 CFM or 4 percent of the average sampling rate, whichever is less.

Li - Individual leakage rate observed during the leak check conducted prior to the "i^{th}" component change
(i = 1,2,3,...n), CFM.

Lp - Leakage rate observed during the post test leak check, ft^3/min. (cfm).

Ma - Mass of residue of acetone after evaporation, mg.

Md - Molecular weight of stack gas; dry basis, lb/lb-mole.

Mn - Total amount of particulate matter collected, mg.

Ms - Molecular weight of stack gas; wet basis, lb/lb-mole.

Mw - Molecular weight of water, 18.0g/g-mole(18.01lb/lb-mole)

ΔP - Velocity head of stack gas, in. H_2O

Pa - Density of acetone, mg/ml

Pbar - Barometric pressure at the sampling site, in. Hg

Pg - Stack static pressure, in. H_2O

Pm - Meter pressure, in. Hg

PMR - Particulate Mass Rate, lbs per hour

Ps - Absolute stack pressure, in. Hg

Pstd - Standard absolute pressure, 29.92 in. Hg

Pw - Density of water, 0.9982 g/ml (0.002201 lb/ml)

Qa - Volumetric flow rate, ACFM

NOMENCLATURE - continued

Qs - Volumetric flow rate, DSCFM

R - Ideal gas constant, 0.06236 mm Hg - $m^3/^0K$-g-mole (21.85 in. Hg-$ft^3/^0R$-lb -mole)

SCF - Standard Cubic Foot

ta - Ambient Temperature, ^0F

tm - Average Temperature of meter, ^0F

t_s - Average Temperature of stack, ^0F

tstd - Standard Temperature, 68^0F

NOTE: Capital "T" denotes degrees Rankine

Va - Volume of acetone blank, ml

Vaw - Volume of acetone used in wash, ml

Vlc - Total volume of liquid collected in condenser and silica gel, ml

Vm - Volume of gas sample, as measured by the dry gas meter, ACF

Vmc - Volume of gas sample, corrected for leak, ACF

Vm(std) - Volume of gas sample measured by the dry gas meter, corrected to standard conditions, DSCF

Vn - Volume collected at stack conditions through nozzle,ACF

Vs - Average stack gas velocity, ft/sec.

Vw(std) - Volume of water in the gas sample, corrected to standard conditions, SCF

Wa - Weight of residue in acetone wash, mg

Y - Dry gas meter calibration factor, (dimensionless)

ΔH - Average pressure differential across the calibrated orifice, in. H_2O

NOMENCLATURE - continued

ΔH_a - Value of H measured for a specific orifice when operated under the following conditions: 0.75 cfm of dry air (M.W. = 29) at 68^0F, 29.92 in. Hg.

$\sqrt{\Delta P}$ - Average of the square roots of the velocity pressure, in. H_2O

θ - Total Sampling time, min.

$\theta 1$ - Sampling time interval from the beginning of a run until the first component change, minutes.

θi - Sampling time interval between two successive component changes, beginning with the interval between the first and second changes, minutes.

θp - Sampling time interval from the final (n^{th}) component change until the end of the sampling run, minutes.

$\%CO_2$, $\%O_2$, $\%N_2$, %CO - Number percent (%) by volume (dry basis) of each compound in the stack gas.

EQUATIONS

1.

$$P_s = P_{b_{s_r}} + \frac{P_g}{13.6}$$

2.

$$P_m = P_{b_{s_r}} + \frac{\overline{\Delta H}}{13.6}$$

3.

$$V_m(std) = V_m Y \left(\frac{Tstd}{Tm}\right) \left(\frac{P_m}{Pstd}\right)$$

4.

$$V_w(std) = 0.04707\, V_{l_c}$$

5.

$$B_{w_s} = \frac{V_w(std)}{V_m(std) + V_w(std)}$$

6.

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

7.

$$M_s = M_d(1 - B_{w_s}) + 18\,(B_{w_s})$$

EQUATIONS - Continued

8.

$$v_s = K_p C_p (\sqrt{\Delta p})\ avg. \sqrt{\frac{T_s}{M_s P_s}}$$

9.

$$Q_a = (v_s)\ (A_s)\ (60)$$

10.

$$Q_s = Q_a (1 - B_{w_s})\ (\frac{528}{T_s})\ (\frac{P_s}{29.92})$$

11.

$$c_s = [0.0154\ (Mn/Vmstd)]$$

12.

$$EA = [\frac{\%O_2 - 0.5\%CO}{0.264\%N_2 - (\%O_2 - 0.5\%CO)}]100$$

13.

$$c_{5_0} = c_s / 1 - [\frac{(1.5)\ (\%O_2) - 0.133\ (\%N_2) - 0.75\ (\%CO)}{21}]$$

14.

$$c_{1_2} = c_s \frac{12}{\%CO_2}$$

EQUATIONS - Continued

15.

$$PMR=(c_s)\ (Q_s)\ (\frac{60}{7000})$$

16.

$$V_n=\frac{T_s}{P_s}\left[(0.002669)\ (V_{1_c})+\frac{V_m}{T_m}(P_m)\right]$$

17.

$$C_a=(0.0154)\ (M_n)\ /V_n$$

18.

$$I=\frac{100V_n}{60v_s\theta An}$$

19.

$$V_{m_c}=V_m-(L_p-L_a)\,\theta$$

20.

$$W_a=CaVawP_a$$

NOMENCLATURE FOR SULFUR DIOXIDE

C_{gas} = Effluent gas concentration, dry basis, ppm

C = Average gas concentration indicated by gas analyzer, dry basis, ppm

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

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

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

SO_2 PPH = Sulfur dioxide mass rate in pounds per hour

EQUATIONS FOR SO_2

$$C_{gas} = (C - C_0) \times (C_{ma}) / (C_m - C_0)$$

$$SO_2 \text{ PPH} = C_{gas} \times 64.06/24.056 \times 6.2427703E^{-08} \times \text{DSCFM} \times 60$$

NOMENCLATURE FOR NITROGEN OXIDES

C_{gas} = Effluent gas concentration, dry basis, ppm

C = Average gas concentration indicated by gas analyzer, dry basis , ppm

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

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

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

EQUATIONS FOR NO_x

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

Conversion factors

NO_x #/DSCF = C_{gas} x 46/24.056 x 6.2427703E-08

NO_x #/hr = NO_x #/DSCF x DSCFM x 60

NO_x #/MBTU = NO_x #/DSCF x F-Factor x (20.9/(20.9-%O_2))

NOMENCLATURE FOR CARBON MONOXIDE

$C_{CO\ stack}$ = Concentration of CO in stack, ppm by volume (dry basis)

$C_{CO\ NDIR}$ = Concentration of CO measured by NDIR analyzer, ppm by volume (dry basis)

C_{COpph} = Carbon Monoxide mass rate in pounds per hour

F_{co2} = Volume fraction of CO2 in sample, i.e., percent CO2 from Orsat analysis divided by 100.

EQUATIONS FOR CARBON MONOXIDE

$$C_{CO\ stack} = C_{CO\ NDIR} \cdot (1 - F_{co2})$$

$$C_{COpph} = C_{CO\ stack} \times 28/24.056 \times 6.2427703E^{-08} \times DSCFM \times 60$$

NOMENCLATURE FOR HYDROCARBONS

C_{meas} = Organic concentration as measured, ppmv

C_c = Organic concentration as carbon, ppmv

C_{pph} = Organic oncentration as carbon, #/hr

K = Carbon equivalent correction factor

K = 2 for ethane

K = 3 for propane

K = 4 for butane

EQUATIONS FOR HYDROCARBONS

$C_c = K * C_{meas}$

$C_{pph} = C_c \times 12/24.056 \times 6.2427703E^{-08} \times DSCFM \times 60$

HAND EQUATIONS

Run # Kiln

1. $P_s = P_{bar} + (P_g/13.6) = (30.07) + (\ 11\ )/13.6 =$ 30.879

2. $P_m = P_{bar} + (\Delta H/13.6) = (30.07) + (1.75)/13.6 =$ 30.199

3. $V_{m(std)} = V_m\ Y\ (T_{std}/T_m)(P_m/P_{std})$
   $= (21.112)(1.0685)(528/525)(30.199/29.92) =$ 22.8984
   651460

4. $V_{w(std)} = 0.04707\ V_{lc} = 0.04707(21.5) =$ 1.0120

5. $B_{ws} = V_{w(std)}/(V_{m(std)} + V_{w(std)}) = (1.0120)/(22.8984 + 1.0120) =$ .0423

6. $M_d = 0.44\ \%CO_2 + 0.32\ \%O_2 + 0.28(\%N_2 + \%CO) =$
   $.44(3.6) + .32(15.8) + .28(80.6) =$ 29.21

7. $M_s = M_d\ (1-B_{ws}) + 18(B_{ws}) = (29.21)(1-.0423) + 18(.0423) =$ 28.7358
   .9577

8. $v_s = K_p C_p\ (\sqrt{\Delta p})\ \sqrt{(T_s/(M_s P_s))}$
   $= 85.49(1.008)(.898)\ \sqrt{(702/(28.7358)(30.879))} =$ 68.830
   242+460

   $\frac{(1.016+1.000)}{2} = 1.008$ $\frac{236+248}{2} = 242$

9. $Q_a = v_s\ A_s\ (60) = (68.830)(4.276066)(60) =$ 17,659
   $(25/24)^2\ 43.1416 = 4.276066$

10. $Q_s = Q_a(1-B_{ws})(528/T_s)(P_s/29.92)$
    $= (17659)(1-.0423)(528/702)(30.879/29.92) =$ 13,128
    .9577

11. $c_s = 0.0154(M_n/V_{m(std)}) = 0.0154(\quad / \quad) =$

15. $PMR = c_s Q_s(60/7000) = (\quad)(\quad)(60/7000) =$

HAND EQUATIONS - Continued

16. $V_n = T_s/P_s \times \{(0.002669)V_{lc} + V_m Y\ P_m/T_m\}$
$= (\quad / \quad)\ \{(0.002669)(\quad) + (\quad)(\quad)(\quad)/(\quad)\} \quad =$

18. $I = V_n(100)/\{(60)ev_sA_n\} = 100(\quad)/\{60(\quad)(\quad)(\quad)\} \quad =$

SO2

$$C_{gas} = \frac{\left(96.58 - \frac{1.83+4.67}{2}\right)(93.6)}{\left(\frac{89.7+93.7}{2}\right) - \left(\frac{1.83+4.67}{2}\right)} = \frac{8735.688}{88.45} = 98.76$$

$$SO_2\ ppm = \frac{(98.76)(64.06)}{24.056}(6.2427703E^{-05})(13128)(60) = 12.93$$

NOx

$$C_{gas} = \frac{\left(34.56 - \frac{(-.77-.89)}{2}\right)(125.4)}{\frac{118.23+118}{2} - \left(\frac{-.79-.87}{2}\right)} = \frac{4439.16}{118.955} = 37.32$$

$$\#/hr = \frac{(37.32)(46)}{24.056}(6.2427703E^{-05})(13128)(60) = 3.51$$

CO

$$C_c = 135(1-.036) = 135(.964) = 130.14$$

$$\#/hr = \frac{(130.14)(28)}{24.056}(6.2427703E^{-05})(13128)(60) = 7.45$$

VOC

$$C_c = 1.28 \times 3 = 3.85$$

$$\#/hr = \frac{(3.85)(12)}{24.056}(6.2427703E^{-05})(13128)(60) = .094$$

GUARDIAN SYSTEMS, INC.

P. O. Box 190
Leeds, AL 35094
205/699-6647

PLANT Chutahuchee Brick Co.

DATE 3-9-93

LOCATION 30 B Kiln Exhaust

STACK I.D.

BAROMETRIC PRESSURE, in. Hg 30.07

STACK PRESSURE, in. H_2O +11

PERCENT O_2 14.1

PERCENT CO_2 4.1

PITOT CORRECTION FACTOR .898

OPERATORS Lotz Jr, Cundie

Omega III

PRELIMINARY VELOCITY TRAVERSE

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), F
1 0.4	1.1	238
2 1.9	1.2	239
3 3.3	1.1	238
4 5.0	1.1	239
5 7.0	1.1	239
6 10.0	1.1	239
7 18.0	1.1	239
8 21.0	.95	239
9 23.0	.92	238
10 24.7	.87	238
11 26.1	.81	195
12 27.4	.84	190
		284
AVERAGE	1.016	239

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.1	239
2	1.1	241
3	1.0	242
4	1.1	243
5	1.1	243
6	1.0	242
7	1.1	244
8	1.0	243
9	.93	244
10	.89	244
11	.89	244
12	.84	244
		248
AVERAGE	1.000	243

FIELD DATA SHEET

GUARDIAN SYSTEMS INC.
BOX 190
LEEDS, ALABAMA 35094

PLANT Chattanooga Brick Co. RUN # 1
LOCATION 3B Kiln Exhaust DATE 3-9-93
BARO. PRES. 30.07 TIME 7:23

	TIME MIN	TIME DUR	METER VOL FT 3	STACK TEMP °F	METER TEMP °F IN	METER TEMP °F OUT	METER TEMP °F AVG	IMP TEMP °F	BOX TEMP °F	METER PRESSURE "H2O	VELOCITY PRESSURE "H2O	VACUUM PRESSURE "Hg
			983.235	239	54	54	54	37		1.75	.98	—
		30.00	1004.347	238	70	64	67	80		1.75	.95	—
		30	21.112	244			65					
				239			61			1.75	.982	

STATIC PRESSURE "H2O +11

PROBE TIP SIZE
BEFORE AFTER

#4 WATER
ml. 17.0
gram 4.5
Total 21.5

OPERATOR
Lotz JR

Sample Box No.
Meter Box No. 100
Meter ΔH@ 1.75
Pitot, CP .898
Temp. Device
Probe No.
Probe Liner
Probe Htr. Set
Ambient Temp.
% O_2 16 / 16
% CO_2 4 / 4

NOTES
Orifice ✓
Pitot ✓ 6.5 / 55.3
Meter ✓

G-1

INTEGRATED BAG SAMPLING FIELD DATA

Run Number 1 Page # ____ of ____ pages

Date 3-9-90 Plant Chattahoochee Brick Plant

Sampling Location 303 Kiln Exhaust

Barometric Pressure 30.07 Ambient Temperature °F 68

Stack Temperature °F ____ Operator ____

Sample bag leak checked ✓ Sample train leak checked ✓

Time	Traverse Point	Flow Rate, L/m	% Dev.	Fyrite	
				$\%O_2$	CO_2
		400 cc/m			

GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Molecular Weight Determination

Test No: 1

Plant: Chattahoochee Brick Date: 3-9-93

Sample Location: Kiln Sampling Time: 0917-1047

Type: Integrated Method: Orsat Ambient Temp: 70

Run Number Gas	1 Actual	1 Net	2 Actual	2 Net	3 Actual	3 Net	Avg	Mol Wt
CO2	3.6	3.6	3.6	3.6	3.6	3.6	**3.60**	1.58
O2	19.4	15.8	19.4	15.8	19.4	15.8	**15.80**	5.06
CO	19.4	0.0	19.4	0.0	19.4	0.0	**0.00**	0.00
N2		80.6		80.6		80.6	80.60	22.57
							TOTAL	**29.21**

Fo = 1.417

OPERATOR: _____

METHOD 6C FIELD DATA

Facility: Chattanooga Brick Co

Sampling Location: 30 B Kiln Stack

Date(s) of tests : 3-5-93

Analyzer Manufacturer: Anarad Inc

Analyzer Model #/Serial #: AR-400 / 4278

Recorder Manufacturer: Cole Parmer / Fluke Hydra Data Logger

Recorder Model #/Serial#: 1201-0000 / 734L / 2625A / SN 5454653

Anticipated SO_2 Concentration (ppm): ~200

Calibration Gases

Level	0%	40-60%	80-100%	
Vendor	Airco	Scott	Scott	
Conc(ppm)	0	~~190.1~~ 93.6	190.1	
Carrier gas	N_2	→	→	
Container Type	Steel	SS	→	
Cylinder ID #	—	AL M0081F2	ALM 010156	
Date of Certificate	—	11-6-92	10-30-92	
Cylinder Pres. (psi)	2000	1350	1650	

Signature: [signature]

Method 6C
Analyzer Calibration Data

Facility: Chattahoochee Brick Co Runs: All

Operator: Lotz Span: 200

Date : 7-9-93 Flow Setting: 2 lb

Range of Gas	Zero	Mid	High	
Cylinder Value ppm	0	93.6	190.1	
Analyzer calibration response, ppm	~~0014~~ 84620 - 0.69	84554 ~~90~~.15	843 40 192.12	
Absolute Difference	.69	5.45	1.12	
% of Span	0.34%	1.72%	0.56%	

All values must be less than 2% of span.

Signature of Operator: [signature]

Method 6C
System Calibration Bias and Drift Data

channel 1

Customer: Chattahoochee Brick Run #: All

Location: 30B Kiln Exhaust Operator: LOTZ Span: 200

Date: 3-9-93 Time: 9:17-10:47 30 Flow Setting: 2.0 l/m

RT 300 RT 300

Range	Zero	Upscale	
Analyzer Calibration Response, ppm	-.69	90.15	192.12
Initial System Calibration Response, ppm	858.22 1.83	91047 89.7	90451 172.83
Initial System Cal. Bias, %	1.76%	0.78%	9.64
Final System Calibration Response, ppm	1104 4.67	1119:30 93.71	
Final System Cal. Bias, %	2.68%	2.38%	
Drift, %	1.42%	2.00%	

System Cal. Bias, % = (System Calibration Response - Analyzer Calibration Response)/Span x 100

Drift, % = (Final System Calibration Response - Initial System Calibration Response)/Span x 100

Maximum allowable System Calibration Bias is ± 5%.

Maximum allowable Drift is ± 3%.

Signature: [signature]

METHOD 7E FIELD DATA

Facility: Chattahoochee Brick CO

Sampling Location: 30 B Kiln Exhaust

Date(s) of tests : 3-9-93

Analyzer Manufacturer: Beckman NO/NOx

Analyzer Model #/Serial #: 951A / 0100084

Recorder Manufacturer: Cole Palm / Fluke Hypra

Recorder Model #/Serial#: 1201-0000/234955 / 2625A/ 5454653

Anticipated NO_x Concentration (ppm): < 250

Calibration Gases

Level	0%	40-60%	80-100%	
Vendor	Airgas	Scott	Scott	
Conc(ppm)	0	~~126.3~~ 125.4	240	
Carrier gas	N2	N2		
Container Type	Steel	SS		
Cylinder ID #	—	~~ACM 027265~~ ACM 01086	~~AAL~~ AAL9551	
Date of Certificate	—	~~12-3-91~~ 10-30-92	7-1-92	
Cylinder Pres. (psi)	2000	1350	1000	

Signature: [signature]

Method 7E
Analyzer Calibration Data

Facility: Chattahoochee Brick Co. Runs: 1

Operator: LOTZ Span: 250

Date : 3-9-93 Flow Setting: 2 lb.

Range of Gas	Zero	Mid	High	
Cylinder Value ppm	0	125.4	240	
Analyzer calibration response, ppm	826 45 .04	83146 123.18	829 - 235.59	
Absolute Difference	.04	2.62	.01	
% of Span	.016 %	1.0 %	.004 %	

All values must be less than 2% of span.

Signature of Operator: [signature]

Method 7E
System Calibration Bias and Drift Data

channel 2

Customer: Chattahoochee Brick Run #: NA

Location: 303 Kiln Exhaust Operator: Lotz Span: 250

Date: 3-9-93 Time: 918 - 1048 730 Flow Setting: 2-8 lpm

Response Time (Sec) Span Gas 120 Zero Gas 120

Range	Zero	Upscale	
Analyzer Calibration Response, ppm	.04	123.18	
Initial System Calibration Response, ppm	855 46 -.77	902 45 118.23	
Initial System Cal. Bias, %	-0.32%	-1.58%	
Final System Calibration Response, ppm	1053 30 -0.89	1109 118.0	
Final System Cal. Bias, %	-0.37%	-2.07%	
Drift, %	0.02	0.04	

System Cal. Bias, % = (System Calibration Response - Analyzer Calibration Response)/Span x 100

Drift, % = (Final System Calibration Response - Initial System Calibration Response)/Span x 100

Maximum allowable System Calibration Bias is ± 5%.

Maximum allowable Drift is ± 3%.

Signature: _____

METHOD 10 FIELD DATA

Facility: Chattahoochee Brick Co.

Sampling Location: Kiln & Dryer Stacks

Date(s) of tests : 3-9-93

Analyzer Manufacturer: Rosemount

Analyzer Model #/Serial #: 880 / 2000543

Recorder Manufacturer: Cole Parmer / Fluke Hydra

Recorder Model #/Serial#: 1201-0000 / 9322 / 2625A / 5454653

Anticipated CO Concentration (ppm): <1000

Calibration Gases

Level	0%	30%	60%	Span
Vendor	Airco	→	→	→
Conc(ppm)	0	296	613	867
Carrier gas	N_2	→	→	→
Container Type	Steel	→	→	→
Cylinder ID #		CC 49196	CC 3513	CC 14636
Date of Certificate	→	→	→	→
Cylinder Pres. (psi)	1950	1500	1650	1700

Signature: [signature]

Method 10
Analyzer Calibration Data

Facility: Chattanooga Brick Kiln + Dryer Runs: Kiln + Dryer

Operator: LJT Span: 1000

Date : 3-9-93 Roto Setting: 800

Range of Gas	Zero	30%	60%	Span
Cylinder Value ppm	0	296.0	613.0	867.0
Analyzer calibration response, ppm	5	300.0	605.0	870.0
Absolute Difference	5	4	8	3
% of Span	.5	.4	.8	.3

All values must be less than 2% of span.

Signature of Operator: LJT

Method 10
System Calibration Bias and Drift Data

Facility: Chittenden Brick Run #: Kl + Dry

Operator: CDT2 Span: 1000

Date: 3-5-93 Time: Roto Setting: 800

Range	Zero	Upscale	
Analyzer Calibration Response, ppm	5	870	
Initial System Calibration Response, ppm	5	870	
Initial System Cal. Bias, %	0	0	
Final System Calibration Response, ppm	5	870	
Final System Cal. Bias, %	0	870	
Drift, %	0	0	

System Cal. Bias, % = (System Calibration Response - Analyzer Calibration Response)/Span x 100

Drift, % = (Final System Calibration Response - Initial System Calibration Response)/Span x 100

Maximum allowable System Calibration Bias is ± 5%.

Maximum allowable Drift is ± 10% of Span.

Signature: [signature]

METHOD 25a FIELD DATA

Facility: Chattahoochee Brick

Sampling Location: 30B Kiln Exhaust

Date(s) of tests : 3/9/93

Analyzer Manufacturer: Ratfisch

Analyzer Model #/Serial #: RS55CA / 0119692

Recorder Manufacturer: Fluke Hydra

Recorder Model #/Serial#: 5454653

Anticipated VOC Concentration (ppm): 0-10

Calibration Gases

Level	0%	25-35%	45-55%	80-90%
Vendor	AIRCO	Scott	→	→
Conc(ppm)	0	24.94	54.99	85.29
Carrier gas	N_2			
Container Type	St.	AL	AL	AL
Cylinder ID #	AM08587A	AAL-3924	AAL13169	ALM-010501
Date of Certificate		2-4-93	7-21-92	12-8-92
Cylinder Pres. (psi)	950			

Signature: M. Caudle

Method 25a
Calibration Data

channel 5

Facility: Chattahoochee Runs: 1-

Operator: M. Caudle Span: 0-100

Date : 3/9/93 Roto Setting: 200 mbar

Range of Gas	Zero	25-35%	45-55%	80-90%
Cylinder Value ppm	0	24.9	55.0	85.3
Calibration Response, ppm	0829 0.02	0833 25.2	0831 58.0	0830 85.2
Absolute Difference	0.02	0.3	3.0	0.1
% of Span	0 %	0.3%	3%	0.1%

All values must be less than 5% of span.

Response Time Test (from zero to high level gas)

Test #	Time (seconds)
1	38
2	38
3	37

Response to Instrument 85.2
System bias Response 83.0

Signature of Operator: M. Caudle

Method 25a
System Calibration Drift and Zero Drift Data

Facility: Chattahoochee Brick 30B Kiln Exhaust Run #: ALL

Operator: M. Caudle Span: 0-100

Date: 2/9/93 Time: 0917 - 1047.5 Roto Setting: 200 mbar

Range	Zero	Mid-level	
Initial System Calibration Response, ppm	0.02	50.0	
Final System Calibration Response, ppm	105430 0.05	1058:30 50.5	
Calibration Drift, %		+0.5	
Zero Drift, %	-0.03		

Calibration Drift , % = (Final System Calibration Response - Initial System Calibration Response)/Span x 100

Zero Drift, % = (Final System Calibration Response - Initial System Calibration Response)/Span x 100

Maximum allowable Calibration Drift is ± 3% of span.

Maximum allowable Zero Drift is ± 3% of span.

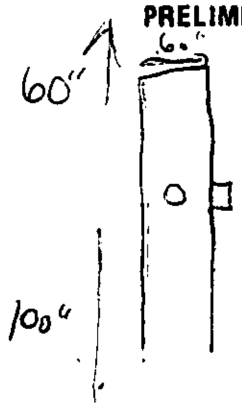
Signature: M. Caudle

GUARDIAN SYSTEMS, INC.

P. O. Box 190
Leeds, AL 35094
205/699-6847

PRELIMINARY VELOCITY TRAVERSE

PLANT Chattahoochee Brick Co.
DATE 3-9-93
LOCATION 30 B Dryer ~~Stack~~ Exhaust
STACK I.D.
BAROMETRIC PRESSURE, in. Hg 30.07
STACK PRESSURE, in. H_2O -.02
PERCENT O_2 21 / 21
PERCENT CO_2 0 / 0
PITOT CORRECTION FACTOR .898
OPERATORS Lutz, Candle



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	100 Box STACK TEMPERATURE (T_s), F
1. 1.3	.55	88
2 4.0	.53	88
3 7.1	.46	88
4 10.6	.33	88
5 15.0	.22	88
6 21.3	.15	89
7 38.7	.40	89
8 45.0	.43	89
9 49.4	.43	91
10 52.9	.41	89
11 56.0	.39	89
12 58.7	.35	89
		(94)
AVERAGE	.0616	89

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

CS-100
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GUARDIAN * SYSTEMS * INCORPORATED

P.O. BOX 190
LEEDS, AL 35094
205-699-6647

Molecular Weight Determination

Test No: 2

Plant: Chattahoochee Brick Date: 3-9-93

Sample Location: Dryer Sampling Time: 1455-1625

Type: Integrated Method: Orsat Ambient Temp: 70

Run Number Gas	1 Actual	1 Net	2 Actual	2 Net	3 Actual	3 Net	Avg	Mol Wt
CO2	0.0	0.0	0.0	0.0	0.0	0.0	**0.00**	0.00
O2	19.8	19.8	19.8	19.8	19.8	19.8	**19.80**	6.34
CO	19.8	0.0	19.8	0.0	19.8	0.0	**0.00**	0.00
N2		80.2		80.2		80.2	80.20	22.46
							TOTAL	**28.79**

OPERATOR: _____

METHOD 6C FIELD DATA

Facility: Chattahoochee Bird

Sampling Location: Dryer Stack 303

Date(s) of tests : 3-9-93

Analyzer Manufacturer: Anmad, Inc.

Analyzer Model #/Serial #: AR-440 / 4278

Recorder Manufacturer: Cole Parmer / Fluke Hydra Data Logger

Recorder Model #/Serial#: 1201-0000/ 7342 / 2625A/ 5454653

Anticipated SO_2 Concentration (ppm): <200

Calibration Gases

Level	0%	40-60%	80-100%	
Vendor	Airco	Scott →	→	
Conc(ppm)	0	93.6	190.1	
Carrier gas	N_2 →	→	→	
Container Type	Steel	SS →	→	
Cylinder ID #	—	ACM 008182	ACM 010152	
Date of Certificate	—	11-6-92	10-30-92	
Cylinder Pres. (psi)	2000	1350	1650	

Signature: [signature]

Method 6C
Analyzer Calibration Data

Facility: 208 Dryer exhaust Runs: ALL

Operator: M Cardle Span: 200

Date : 3-9-93 Flow Setting: 2.0 lpm

Range of Gas	Zero	Mid	High	
Cylinder Value ppm	0	93.6	190.1	
Analyzer calibration response, ppm	1.00	91.9	191.4	
Absolute Difference	1.0	1.7	1.3	
% of Span	~~0.00~~ 0.50%	0.85	0.65	

All values must be less than 2% of span.

Signature of Operator: M. Cardle

Method 6C
System Calibration Bias and Drift Data

Customer: Chattahoochee Brick 30B Dryer Exhaust Run #: ALC

Location: _____ Operator: M. Caudle Span: 200

Date: 3/9/93 Time: 1455 - 1625 30 Flow Setting: 2 lpm

RT 7 min 46 sec RT 9 Min 52 sec

Range	Zero	Upscale	
Analyzer Calibration Response, ppm	1.0	191.4	
Initial System Calibration Response, ppm	0.42	1447.30 184.92	
Initial System Cal. Bias, %	0.29	3.24	
Final System Calibration Response, ppm	1630 30 -2.81	1645 30 182.42	
Final System Cal. Bias, %	1.91	4.49	
Drift, %	1.62	1.25	

System Cal. Bias, % = (System Calibration Response - Analyzer Calibration Response)/Span x 100

Drift, % = (Final System Calibration Response - Initial System Calibration Response)/Span x 100

Maximum allowable System Calibration Bias is ± 5%.

Maximum allowable Drift is ± 3%.

Signature: M. Caudle

METHOD 7E FIELD DATA

Facility: Chattahoochee Brick Co.

Sampling Location: 30B Kiln Stack

Date(s) of tests : 3-9-93

Analyzer Manufacturer: Beckman NO/NO_x

Analyzer Model #/Serial #: 951A / 0100084

Recorder Manufacturer: Cole Palmer / Fluke Hydra

Recorder Model #/Serial#: 1201-0000 / 234 255 / 2625A / 545465D

Anticipated NO_x Concentration (ppm): < 250

Calibration Gases

Level	0%	40-60%	80-100%	
Vendor	AIRCO	SCOTT →	→	
Conc(ppm)	0	95.2	125.4	
Carrier gas	N_2	—	—	
Container Type	Steel	SS	—	
Cylinder ID #	—		AAM 010156	
Date of Certificate	—	10-30-92	7-1-92	
Cylinder Pres. (psi)	2000	1350	1000	

Signature: [signature]

Method 7E
Analyzer Calibration Data

Facility: 30B Dryer Exhaust Runs: [illegible]

Operator: LS72 Span: 250

Date : 3-9-93 Flow Setting: 2.0 l/m

Range of Gas	Zero	Mid	High	
Cylinder Value ppm	0	95.2	125.8	
Analyzer calibration response, ppm	.79	95.5	125.06	
Absolute Difference	~~[illegible]~~ .79	.3	.74	
% of Span	0.31 %	.12 %	.30%	

All values must be less than 2% of span.

Signature of Operator: [signature]

G-5

Method 7E
System Calibration Bias and Drift Data

Customer: Chattahoochee Brick Co. Run #: ALL

Location: 30B Dryer Stack Operator: LOTZ Span: 250

Date: 3-9-93 Time: 1455-1625 30 Flow Setting: 2.0

RT 2 min 12 sec RT 2 min 16 sec

Range	Zero	Upscale	
Analyzer Calibration Response, ppm	.79	125.06	
Initial System Calibration Response, ppm	1431 -0.59	1435 30 121.15	
Initial System Cal. Bias, %	0.55%	1.56%	
Final System Calibration Response, ppm	1631 -0.32	1637 121.33	
Final System Cal. Bias, %	0.44	1.49	
Drift, %	0.11	0.07	

System Cal. Bias, % = (System Calibration Response - Analyzer Calibration Response)/Span x 100

Drift, % = (Final System Calibration Response - Initial System Calibration Response)/Span x 100

Maximum allowable System Calibration Bias is ± 5%.

Maximum allowable Drift is ± 3%.

Signature: M. Caudle

METHOD 25a FIELD DATA

Facility: Chattahoochee Brick

Sampling Location: 30B Kiln Exhaust

Date(s) of tests : 3/9/93

Analyzer Manufacturer: Ratfisch

Analyzer Model #/Serial #: RS55CA / 0119692

Recorder Manufacturer: Fluke Hydra

Recorder Model #/Serial#: 5454653

Anticipated VOC Concentration (ppm): 0-10

Calibration Gases

Level	0%	25-35%	45-55%	80-90%
Vendor	AIRCO	Scott	→	→
Conc(ppm)	0	24.94	54.99	85.29
Carrier gas	N_2			
Container Type	st.	AL	AL	AL
Cylinder ID #	AH08587A	AAL-3924	AAL 13169	ALM-010501
Date of Certificate		2-4-93	7-21-92	12-8-92
Cylinder Pres. (psi)	950			

Signature: M. Caudle

Method 25a
Calibration Data

Facility: Chattahoochee Brick 30 B Dryer Exhaust Runs: ALL

Operator: M. Candle Span: 100

Date : 3/9/93 Roto Setting: 200 rubber

Range of Gas	Zero	25-35%	45-55%	80-90%
Cylinder Value ppm	0	24.9	55.0	85.3
Calibration Response, ppm	0.01	24.3	55.2	85.4
Absolute Difference	+0.01	-0.6	+0.2	+0.1
% of Span	0.01	0.6	0.2	0.1

All values must be less than 5% of span.

Response Time Test (from zero to high level gas)

Test #	Time (seconds)
1	42
2	43
3	42

Cal. Response - 0 55.2
System bias 0.02 54.9

Signature of Operator: M. Candle

Method 25a
System Calibration Drift and Zero Drift Data

Facility: Chattahoochee Brick 30B Dryer Exhaust Run #: ALL

Operator: M. Caudle Span: 100

Date: 3/9/93 Time: 1455 - 1625 30 ~~Rate~~ Setting: 200 mbar

Range	Zero	Mid-level	
Initial System Calibration Response, ppm	0.01	55.20	
Final System Calibration Response, ppm	1629 -0.02	1634 30 52.61	
Calibration Drift, %		2.59	
Zero Drift, %	0.03		

Calibration Drift , % = (Final System Calibration Response - Initial System Calibration Response)/Span x 100

Zero Drift, % = (Final System Calibration Response - Initial System Calibration Response)/Span x 100

Maximum allowable Calibration Drift is ± 3% of span.

Maximum allowable Zero Drift is ± 3% of span.

Signature: M. Caudle

FLUKE HYDRA DATA LOGGER INFORMATION FOR CHATTAHOOCHEE BRICK CO

TIME	SO2 PPM	NOx PPM	CO PPM	VOC PPM
03/09/93 09:16:59	87.1	25.20		1.12
03/09/93 09:17:29	84.4	26.30		1.18
03/09/93 09:17:59	84.1	27.80		1.21
03/09/93 09:18:29	83.2	28.30		1.23
03/09/93 09:18:59	85.8	31.20		1.19
03/09/93 09:19:29	90.2	32.20		1.24
03/09/93 09:19:59	91.8	33.00		1.28
03/09/93 09:20:29	94.1	33.50		1.31
03/09/93 09:20:59	95.8	33.50		1.32
03/09/93 09:21:29	96.1	33.50		1.29
03/09/93 09:21:59	96.0	33.50		1.36
03/09/93 09:22:29	96.9	33.50		1.33
03/09/93 09:22:59	96.2	33.50		1.30
03/09/93 09:23:29	95.2	33.50		1.27
03/09/93 09:23:59	91.8	33.50		1.24
03/09/93 09:24:29	88.2	33.50		1.20
03/09/93 09:24:59	87.1	33.50		1.19
03/09/93 09:25:29	87.3	33.50		1.17
03/09/93 09:25:59	86.3	33.50		1.12
03/09/93 09:26:29	86.2	33.50		1.15
03/09/93 09:26:59	84.2	33.50		1.19
03/09/93 09:27:29	85.3	33.50		1.21
03/09/93 09:27:59	85.6	33.50		1.25
03/09/93 09:28:29	86.0	33.50		1.27
03/09/93 09:28:59	88.1	33.50		1.28
03/09/93 09:29:29	90.2	33.50		1.23
03/09/93 09:29:59	90.2	33.50		1.26
03/09/93 09:30:29	90.3	33.50		1.33
03/09/93 09:30:59	92.1	33.50		1.37
03/09/93 09:31:29	92.6	33.50		1.35
03/09/93 09:31:59	93.2	33.50		1.39
03/09/93 09:32:29	94.4	33.50		1.41
03/09/93 09:32:59	95.3	33.50		1.39
03/09/93 09:33:29	95.9	33.50		1.36
03/09/93 09:33:59	96.1	33.50		1.34
03/09/93 09:34:29	94.2	33.50		1.35
03/09/93 09:34:59	92.5	33.50		1.28
03/09/93 09:35:29	93.6	33.50		1.22
03/09/93 09:35:59	91.6	33.50		1.21
03/09/93 09:36:29	90.2	33.50		1.29
03/09/93 09:36:59	88.1	33.50		1.28
03/09/93 09:37:29	86.3	33.50		1.26
03/09/93 09:37:59	86.2	33.50		1.41
03/09/93 09:38:29	86.3	33.50		1.47
03/09/93 09:38:59	86.4	33.50		1.45
03/09/93 09:39:29	86.2	33.50		1.44
03/09/93 09:39:59	86.5	33.50		1.42
03/09/93 09:40:29	86.1	33.50		1.37
03/09/93 09:40:59	86.2	33.50		1.34
03/09/93 09:41:29	86.5	33.50		1.31
03/09/93 09:41:59	86.1	33.50		1.28

FLUKE HYDRA DATA LOGGER INFORMATION FOR CHATTAHOOCHEE BRICK CO

03/09/93 09:42:29	86.5	33.50	1.26
03/09/93 09:42:59	87.6	33.50	1.29
03/09/93 09:43:29	88.1	33.50	1.36
03/09/93 09:43:59	88.2	33.50	1.33
03/09/93 09:44:30	88.0	33.50	1.30
03/09/93 09:44:59	87.6	33.50	1.27
03/09/93 09:45:29	87.7	33.50	1.24
03/09/93 09:45:59	87.2	33.50	1.20
03/09/93 09:46:29	87.5	33.50	1.19
03/09/93 09:46:59	87.3	33.50	1.17
03/09/93 09:47:29	87.4	33.50	1.12
03/09/93 09:47:59	87.3	33.50	1.15
03/09/93 09:48:29	87.5	33.50	1.19
03/09/93 09:48:59	87.4	33.50	1.21
03/09/93 09:49:29	87.3	33.50	1.25
03/09/93 09:49:59	87.5	33.50	1.27
03/09/93 09:50:29	87.3	33.50	1.28
03/09/93 09:50:59	87.3	33.50	1.23
03/09/93 09:51:29	87.9	33.50	1.26
03/09/93 09:51:59	88.2	33.50	1.33
03/09/93 09:52:29	88.1	33.50	1.37
03/09/93 09:52:59	88.1	33.50	1.35
03/09/93 09:53:29	87.8	33.50	1.39
03/09/93 09:53:59	87.5	33.50	1.41
03/09/93 09:54:29	86.1	33.50	1.39
03/09/93 09:54:59	86.1	33.50	1.36
03/09/93 09:55:29	86.5	33.50	1.34
03/09/93 09:55:59	86.6	37.75	1.35
03/09/93 09:56:29	87.0	37.75	1.28
03/09/93 09:56:59	87.2	37.75	1.22
03/09/93 09:57:29	87.6	37.75	1.23
03/09/93 09:57:59	85.5	37.75	1.19
03/09/93 09:58:29	80.5	37.75	1.24
03/09/93 09:59:00	77.1	35.00	1.28
03/09/93 09:59:29	75.2	29.25	1.31
03/09/93 09:59:59	76.1	26.50	1.32
03/09/93 10:00:29	78.6	25.25	1.29
03/09/93 10:00:59	86.2	23.50	1.36
03/09/93 10:01:30	90.2	23.50	1.33
03/09/93 10:01:59	91.2	23.50	1.30
03/09/93 10:02:29	94.3	25.25	1.27
03/09/93 10:02:59	95.3	32.50	1.24
03/09/93 10:03:29	97.1	35.50	1.20
03/09/93 10:03:59	98.1	37.75	1.19
03/09/93 10:04:29	98.0	37.75	1.17
03/09/93 10:04:59	99.5	37.75	1.12
03/09/93 10:05:29	101.2	37.75	1.15
03/09/93 10:05:59	102.1	37.75	1.19
03/09/93 10:06:29	102.0	37.75	1.21
03/09/93 10:06:59	101.2	37.75	1.25
03/09/93 10:07:29	100.5	37.75	1.27
03/09/93 10:07:59	100.3	37.75	1.28
03/09/93 10:08:30	100.1	37.75	1.23

FLUKE HYDRA DATA LOGGER INFORMATION FOR CHATTAHOOCHEE BRICK CO

03/09/93 10:08:59	101.0	37.75	1.26
03/09/93 10:09:29	101.3	37.75	1.33
03/09/93 10:09:59	102.1	37.75	1.37
03/09/93 10:10:29	103.5	37.75	1.35
03/09/93 10:10:59	104.2	37.75	1.32
03/09/93 10:11:29	105.1	37.75	1.29
03/09/93 10:11:59	105.6	37.75	1.36
03/09/93 10:12:29	105.2	37.75	1.33
03/09/93 10:12:59	104.8	37.75	1.30
03/09/93 10:13:29	104.1	37.75	1.27
03/09/93 10:13:59	104.0	37.75	1.24
03/09/93 10:14:29	104.3	37.75	1.20
03/09/93 10:14:59	104.2	37.75	1.19
03/09/93 10:15:29	105.3	37.75	1.17
03/09/93 10:15:59	105.7	37.75	1.12
03/09/93 10:16:29	106.1	37.75	1.15
03/09/93 10:16:59	106.8	37.75	1.19
03/09/93 10:17:29	106.9	37.75	1.21
03/09/93 10:17:59	106.8	37.75	1.25
03/09/93 10:18:29	106.8	37.75	1.27
03/09/93 10:18:59	106.4	37.75	1.28
03/09/93 10:19:29	106.2	37.75	1.23
03/09/93 10:19:59	106.0	37.75	1.26
03/09/93 10:20:29	106.2	37.75	1.33
03/09/93 10:20:59	106.1	37.75	1.37
03/09/93 10:21:29	106.1	37.75	1.35
03/09/93 10:21:59	105.8	37.75	1.21
03/09/93 10:22:29	105.3	37.75	1.25
03/09/93 10:22:59	105.2	37.75	1.27
03/09/93 10:23:29	105.0	37.75	1.28
03/09/93 10:23:59	105.3	37.75	1.23
03/09/93 10:24:29	105.6	37.75	1.26
03/09/93 10:24:59	105.7	37.75	1.33
03/09/93 10:25:29	106.0	37.75	1.39
03/09/93 10:25:59	106.2	37.75	1.41
03/09/93 10:26:29	106.5	37.75	1.39
03/09/93 10:26:59	107.0	37.75	1.36
03/09/93 10:27:29	107.1	37.75	1.34
03/09/93 10:27:59	107.2	37.75	1.35
03/09/93 10:28:29	107.1	37.75	1.28
03/09/93 10:28:59	107.5	37.75	1.22
03/09/93 10:29:29	107.7	37.75	1.21
03/09/93 10:29:59	107.9	37.75	1.29
03/09/93 10:30:29	107.8	37.75	1.28
03/09/93 10:30:59	107.8	37.75	1.28
03/09/93 10:31:29	107.6	37.75	1.22
03/09/93 10:31:59	107.8	37.75	1.21
03/09/93 10:32:29	107.9	37.75	1.29
03/09/93 10:32:59	108.1	37.75	1.28
03/09/93 10:33:29	109.0	37.75	1.28
03/09/93 10:33:59	109.1	37.75	1.22
03/09/93 10:34:29	108.6	37.75	1.21
03/09/93 10:34:59	108.2	37.75	1.29

FLUKE HYDRA DATA LOGGER INFORMATION FOR CHATTAHOOCHEE BRICK CO

03/09/93 10:35:29	108.1	37.75	1.28
03/09/93 10:35:59	107.9	37.75	1.28
03/09/93 10:36:29	107.8	37.75	1.22
03/09/93 10:36:59	106.2	37.75	1.21
03/09/93 10:37:29	102.1	37.25	1.29
03/09/93 10:37:59	97.2	31.5	1.28
03/09/93 10:38:29	95.2	26.25	1.28
03/09/93 10:38:59	95.3	23.25	1.27
03/09/93 10:39:29	95.3	23.25	1.26
03/09/93 10:39:59	100.1	23.25	1.41
03/09/93 10:40:29	106.2	23.25	1.47
03/09/93 10:40:59	110.1	28.00	1.45
03/09/93 10:41:29	112.0	33.00	1.44
03/09/93 10:41:59	112.1	34.25	1.42
03/09/93 10:42:29	112.2	35.50	1.37
03/09/93 10:42:59	110.6	35.50	1.34
03/09/93 10:43:29	110.8	35.50	1.31
03/09/93 10:43:59	110.2	35.50	1.28
03/09/93 10:44:29	110.1	35.50	1.26
03/09/93 10:44:59	110.1	35.50	1.29
03/09/93 10:45:29	109.8	35.50	1.36
03/09/93 10:45:59	109.2	35.50	1.33
03/09/93 10:46:29	109.1	35.50	1.30
03/09/93 14:54:52	-1.20	-0.45	1.19
03/09/93 14:55:22	-1.20	-0.45	1.52
03/09/93 14:55:52	-1.20	-0.45	1.43
03/09/93 14:56:22	-1.20	-0.45	1.37
03/09/93 14:56:52	-1.20	-0.45	1.29
03/09/93 14:57:22	-1.20	-0.45	1.38
03/09/93 14:57:52	-1.20	-0.45	1.43
03/09/93 14:58:22	-1.20	-0.45	1.51
03/09/93 14:58:52	-1.20	-0.45	1.48
03/09/93 14:59:22	-1.20	-0.45	1.13
03/09/93 14:59:52	-1.20	-0.45	1.15
03/09/93 15:00:22	-1.20	-0.45	1.52
03/09/93 15:00:52	-1.20	-0.45	1.21
03/09/93 15:01:23	-1.20	-0.45	1.32
03/09/93 15:01:52	-1.20	-0.45	1.36
03/09/93 15:02:22	-1.20	-0.45	1.25
03/09/93 15:02:52	-1.20	-0.45	1.36
03/09/93 15:03:22	-1.20	-0.45	1.27
03/09/93 15:03:52	-1.20	-0.45	1.24
03/09/93 15:04:22	-1.20	-0.45	1.29
03/09/93 15:04:52	-1.20	-0.45	1.35
03/09/93 15:05:22	-1.20	-0.45	1.24
03/09/93 15:05:52	-1.20	-0.45	1.36
03/09/93 15:06:22	-1.20	-0.45	1.16
03/09/93 15:06:52	-1.20	-0.45	1.18
03/09/93 15:07:22	-1.20	-0.45	1.21
03/09/93 15:07:52	-1.20	-0.45	1.19
03/09/93 15:08:22	-1.20	-0.45	1.31
03/09/93 15:08:52	-1.20	-0.45	1.51

FLUKE HYDRA DATA LOGGER INFORMATION FOR CHATTAHOOCHEE BRICK CO

03/09/93 15:09:23	-1.20	-0.45	1.48
03/09/93 15:09:52	-1.20	-0.45	1.45
03/09/93 15:10:22	-1.20	-0.45	1.32
03/09/93 15:10:52	-1.20	-0.45	1.42
03/09/93 15:11:22	-1.20	-0.45	1.35
03/09/93 15:11:52	-1.20	-0.45	1.21
03/09/93 15:12:22	-1.20	-0.45	1.27
03/09/93 15:12:52	-1.20	-0.45	1.31
03/09/93 15:13:22	-1.20	-0.45	1.33
03/09/93 15:13:52	-1.20	-0.45	1.42
03/09/93 15:14:22	-1.20	-0.45	1.51
03/09/93 15:14:52	-1.20	-0.45	1.41
03/09/93 15:15:22	-1.20	-0.45	1.32
03/09/93 15:15:52	-1.20	-0.45	1.27
03/09/93 15:16:22	-1.20	-0.45	1.29
03/09/93 15:16:52	-1.20	-0.45	1.31
03/09/93 15:17:22	-1.20	-0.45	1.36
03/09/93 15:17:52	-1.20	-0.45	1.34
03/09/93 15:18:22	-1.20	-0.45	1.39
03/09/93 15:18:52	-1.20	-0.45	1.41
03/09/93 15:19:22	-1.20	-0.45	1.43
03/09/93 15:19:52	-1.20	-0.45	1.40
03/09/93 15:20:22	-1.20	-0.45	1.39
03/09/93 15:20:52	-1.20	-0.45	1.37
03/09/93 15:21:22	-1.20	-0.45	1.34
03/09/93 15:21:52	-1.20	-0.45	1.30
03/09/93 15:22:22	-1.20	-0.45	1.36
03/09/93 15:22:52	-1.20	-0.45	1.42
03/09/93 15:23:22	-1.20	-0.45	1.42
03/09/93 15:23:52	-1.20	-0.45	1.47
03/09/93 15:24:22	-1.20	-0.45	1.38
03/09/93 15:24:52	-1.20	-0.45	1.36
03/09/93 15:25:22	-1.20	-0.45	1.39
03/09/93 15:25:52	-1.20	-0.45	1.36
03/09/93 15:26:22	-1.20	-0.45	1.34
03/09/93 15:26:52	-1.20	-0.45	1.31
03/09/93 15:27:22	-1.20	-0.45	1.28
03/09/93 15:27:52	-1.20	-0.45	1.22
03/09/93 15:28:22	-1.20	-0.45	1.25
03/09/93 15:28:52	-1.20	-0.45	1.27
03/09/93 15:29:22	-1.20	-0.45	1.28
03/09/93 15:29:52	-1.20	-0.45	1.34
03/09/93 15:30:22	-1.20	-0.45	1.33
03/09/93 15:30:52	-1.20	-0.45	1.37
03/09/93 15:31:22	-1.20	-0.45	1.38
03/09/93 15:31:52	-1.20	-0.45	1.36
03/09/93 15:32:22	-1.20	-0.45	1.41
03/09/93 15:32:52	-1.20	-0.45	1.32
03/09/93 15:33:22	-1.20	-0.45	1.15
03/09/93 15:33:52	-1.20	-0.45	1.52
03/09/93 15:34:22	-1.20	-0.45	1.21
03/09/93 15:34:52	-1.20	-0.45	1.32
03/09/93 15:35:22	-1.20	-0.45	1.36

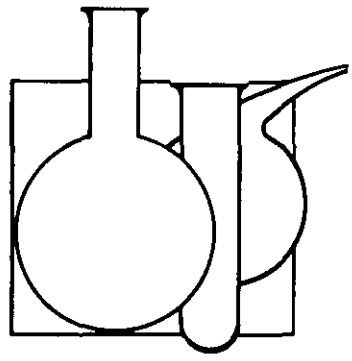
FLUKE HYDRA DATA LOGGER INFORMATION FOR CHATTAHOOCHEE BRICK CO

03/09/93 15:35:52	-1.20	-0.45	1.25
03/09/93 15:36:22	-1.20	-0.45	1.36
03/09/93 15:36:52	-1.20	-0.45	1.27
03/09/93 15:37:22	-1.20	-0.45	1.24
03/09/93 15:37:52	-1.20	-0.45	1.29
03/09/93 15:38:22	-1.20	-0.45	1.35
03/09/93 15:38:52	-1.20	-0.45	1.24
03/09/93 15:39:22	-1.20	-0.45	1.36
03/09/93 15:39:52	-1.20	-0.45	1.16
03/09/93 15:40:22	-1.20	-0.45	1.18
03/09/93 15:40:52	-1.20	-0.45	1.21
03/09/93 15:41:22	-1.20	-0.45	1.19
03/09/93 15:41:52	-1.20	-0.45	1.31
03/09/93 15:42:22	-1.20	-0.45	1.51
03/09/93 15:42:52	-1.20	-0.45	1.48
03/09/93 15:43:22	-1.20	-0.45	1.45
03/09/93 15:43:52	-1.20	-0.45	1.32
03/09/93 15:44:22	-1.20	-0.45	1.42
03/09/93 15:44:52	-1.20	-0.45	1.35
03/09/93 15:45:22	-1.20	-0.45	1.21
03/09/93 15:45:52	-1.20	-0.45	1.27
03/09/93 15:46:22	-1.20	-0.45	1.31
03/09/93 15:46:52	-1.20	-0.45	1.33
03/09/93 15:47:22	-1.20	-0.45	1.42
03/09/93 15:47:52	-1.20	-0.45	1.51
03/09/93 15:48:22	-1.20	-0.45	1.41
03/09/93 15:48:52	-1.20	-0.45	1.32
03/09/93 15:49:23	-1.20	-0.45	1.27
03/09/93 15:49:52	-1.20	-0.45	1.29
03/09/93 15:50:22	-1.20	-0.45	1.31
03/09/93 15:50:52	-1.20	-0.45	1.36
03/09/93 15:51:22	-1.20	-0.45	1.34
03/09/93 15:51:53	-1.20	-0.45	1.39
03/09/93 15:52:22	-1.20	-0.45	1.41
03/09/93 15:52:52	-1.20	-0.45	1.43
03/09/93 15:53:22	-1.20	-0.45	1.40
03/09/93 15:53:52	-1.20	-0.45	1.39
03/09/93 15:54:22	-1.20	-0.45	1.37
03/09/93 15:54:52	-1.20	-0.45	1.34
03/09/93 15:55:22	-1.20	-0.45	1.30
03/09/93 15:55:52	-1.20	-0.45	1.36
03/09/93 15:56:22	-1.20	-0.45	1.42
03/09/93 15:56:53	-1.20	-0.45	1.42
03/09/93 15:57:22	-1.20	-0.45	1.47
03/09/93 15:57:52	-1.20	-0.45	1.38
03/09/93 15:58:22	-1.20	-0.45	1.36
03/09/93 15:58:52	-1.20	-0.45	1.39
03/09/93 15:59:22	-1.20	-0.45	1.36
03/09/93 15:59:52	-1.20	-0.45	1.34
03/09/93 16:00:22	-1.20	-0.45	1.31
03/09/93 16:00:52	-1.20	-0.45	1.28
03/09/93 16:01:22	-1.20	-0.45	1.22
03/09/93 16:01:52	-1.20	-0.45	1.31

FLUKE HYDRA DATA LOGGER INFORMATION FOR CHATTAHOOCHEE BRICK CO

03/09/93 16:02:22	-1.20	-0.45	1.51
03/09/93 16:02:52	-1.20	-0.45	1.48
03/09/93 16:03:22	-1.20	-0.45	1.45
03/09/93 16:03:52	-1.20	-0.45	1.32
03/09/93 16:04:22	-1.20	-0.45	1.42
03/09/93 16:04:52	-1.20	-0.45	1.35
03/09/93 16:05:22	-1.20	-0.45	1.21
03/09/93 16:05:52	-1.20	-0.45	1.27
03/09/93 16:06:22	-1.20	-0.45	1.31
03/09/93 16:06:52	-1.20	-0.45	1.33
03/09/93 16:07:22	-1.20	-0.45	1.42
03/09/93 16:07:52	-1.20	-0.45	1.51
03/09/93 16:08:22	-1.20	-0.45	1.41
03/09/93 16:08:52	-1.20	-0.45	1.32
03/09/93 16:09:22	-1.20	-0.45	1.27
03/09/93 16:09:52	-1.20	-0.45	1.29
03/09/93 16:10:22	-1.20	-0.45	1.31
03/09/93 16:10:52	-1.20	-0.45	1.36
03/09/93 16:11:22	-1.20	-0.45	1.34
03/09/93 16:11:52	-1.20	-0.45	1.39
03/09/93 16:12:22	-1.20	-0.45	1.41
03/09/93 16:12:52	-1.20	-0.45	1.43
03/09/93 16:13:22	-1.20	-0.45	1.40
03/09/93 16:13:52	-1.20	-0.45	1.39
03/09/93 16:14:22	-1.20	-0.45	1.37
03/09/93 16:14:52	-1.20	-0.45	1.34
03/09/93 16:15:22	-1.20	-0.45	1.30
03/09/93 16:15:52	-1.20	-0.45	1.36
03/09/93 16:16:22	-1.20	-0.45	1.42
03/09/93 16:16:52	-1.20	-0.45	1.42
03/09/93 16:17:22	-1.20	-0.45	1.47
03/09/93 16:17:52	-1.20	-0.45	1.38
03/09/93 16:18:22	-1.20	-0.45	1.36
03/09/93 16:18:52	-1.20	-0.45	1.39
03/09/93 16:19:22	-1.20	-0.45	1.36
03/09/93 16:19:52	-1.20	-0.45	1.34
03/09/93 16:20:22	-1.20	-0.45	1.31
03/09/93 16:20:52	-1.20	-0.45	1.28
03/09/93 16:21:22	-1.20	-0.45	1.22
03/09/93 16:21:52	-1.20	-0.45	1.25
03/09/93 16:22:22	-1.20	-0.45	1.27
03/09/93 16:22:52	-1.20	-0.45	1.28
03/09/93 16:23:22	-1.20	-0.45	1.34
03/09/93 16:23:52	-1.20	-0.45	1.33
03/09/93 16:24:22	-1.20	-0.45	1.37

Plant Operation Data



V. PLANT OPERATIONAL DATA

The following information was supplied by Mr. Dave McNees of General Shale Corporation for the test series at Chattahoochee Brick Company on March 9, 1993.

PROCESS INFORMATION

PLANT: ATLANTA, #30 DATE: 3-9-93

Brick Rate:

Car Schedule = 43 Minutes = 1.395 Cars/Hour

Car Count = 3822 S/S Brick/Car

Hourly Rate = 5331.69 S/S Brick/Hour

GREEN Brick Weight = 4.625 Lbs. BURNED BRICK WT. 4.0 lbs.

Brick Rate = 24659.07 Lbs./Hour

Fuel Rate:

Total = 33.9 Therms/M Brick

Coal = 11.66 Tons/Day

971.25 Lbs./Hour = 77.9 % of Btu's

Natural Gas = 92600 MCF/Day

3858.$\overline{33}$ Cu. Ft./Hour = 22.1 % of Btu's

Total Process Weight:

24659.07 Lbs. Brick/Hour

\+ 971.25 Lbs. Coal/Hour

25630.32 Total Lbs./Hour

12.815 Tons/Hour

CONTAMINATED SOIL: 2.5 % Of Total S/S Green Brick Wt.

Coal Analysis:

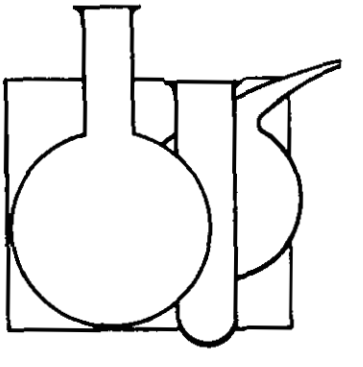
14015 Btu/Lb.

1.09% Sulfur

4.38% Ash

Allowable Emissions:

Calibrations



VI. CALIBRATIONS

Meter Box

The meter box is initially calibrated every 6 months at the fixed settings of 0.5, 1.0, 1.5, 2.0, and 2.5 inches of H_2O. Upon return to the laboratory from this test data was reduced and the average meter pressure for the test series was determined. The calibration point closest point to the average meter pressure was used to provide a meter correction factor (for an average meter pressure of 1.75 a 1.50 inches H_2O was used and a mcf of 1.0685 was used to modify the meter volumes).

Pitot Tubes

The S type tubes are calibrated against a standard pitot tube (Cp=0.99) in a wind tunnel with a capacity to generate a test section velocity of approximately 3000 feet/minute every 6 months. Additionally the pitot tube is measured as to its specifications and alignment. Upon return, the intercomponent spacings and the face opening alignment of the pitot tube assembly were rechecked and if no changes are noticed; it shall be assumed that the coefficient of the assembly had not changed.

Temperature Measurements

All temperature devices (impinger, meter box, hot box and stack) are calibrated every 6 months against an ASTM mercury-in-glass reference thermometer or a reference thermocouple and potentiometer calibrated by fixed points, e.g., ice bath and boiling water (corrected to barometric pressure). Upon return the stack temperature device was recalibrated within 10% of the average absolute stack temperature. If the device being tested agrees within 1.5% of the reference device, the temperature data taken in the field shall be considered valid.

VI. CALIBRATIONS Continued

Barometric Pressure

An aneroid barometer capable of measuring atmospheric pressure to within 0.1 inches Hg was used. If this device is defective the following alternate method shall be used. The barometric reading may be obtained from a nearby national weather service station, in which case the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of minus 0.1 inches Hg per 100 feet elevation increase or vice versa for elevation decrease.

Specific Test Equipment and Measurements

The equipment used during these tests was as follows:

Location	Kiln	Dryer
Probe:	17-28	17-28
Meter Box:	#100	
Stack Temp:	Omega III	Omega III
Impinger	#1	#1
Avg. Temp:	242	94
Rec. Temp:	250	100

The Omega III was recalibrated at the recalibration temperatures indicated. The temperature device agreed exactly with an ASTM mercury-in-glass reference thermometer to its original calibration. The intercomponent spacing and the face opening alignment of the Pitot Tube assembly was rechecked and no changes were noticed; therefore, it was assumed that the coefficient of the assembly had not changed.

GUARDIAN SYSTEMS INC
Initial Meter Calibration Box 100
on 1/13/93

Run Number	1	2	3	4	5
Barometric Pres, in Hg	29.55	29.55	29.55	29.55	29.55
Orifice pres drop, in H20	0.5	1.0	1.5	2.0	2.5
Pres Wet Test Meter, in H20	-0.20	-0.40	-0.60	-0.80	-1.00
Gas Volume Wet Init, CF	0.000	0.000	0.000	0.000	0.000
Gas Volume Wet Final, CF	6.000	8.400	10.302	11.723	13.313
Gas Volume Dry Init, CF	317.100	308.400	297.800	286.002	272.400
Gas Volume Dry Final, CF	323.088	316.752	307.903	297.557	285.622
Temp Wet Init, C	19.0	19.0	19.0	19.0	19.0
Temp Wet Final, C	19.0	19.0	19.0	19.0	19.0
Dry Gas Temp Init In, F	94	100	101	107	106
Dry Gas Temp Final In, F	93	100	105	111	114
Dry Gas Temp Init Out, F	84	85	85	86	86
Dry Gas Temp Final Out, F	83	85	86	88	88
Run Time, sec	900	900	900	900	900
Meter Calibration Factor, Y	1.0427	1.0523	1.0685	1.0684	1.0594
Average Y	1.0583				
Qm	0.4124	0.5780	0.7083	0.8068	0.9146
Km	0.7329	0.7257	0.7262	0.7158	0.7263
Average Km	0.7254				
Delta H@	1.71	1.75	1.75	1.80	1.75
Average H@	1.75				

SIGNATURE Tom E Grau

GUARDIAN SYSTEMS INC
Temperature Calibration for Omega-III
on 12/4/92 on 100 Box

Actual Temperature, F	Reading Temperature, F	Correction in Reading, F
50	45	5
100	93	7
150	146	4
200	195	5
250	247	3
300	296	4
350	346	4
400	395	5
450	445	5
500	495	5
550	545	5
600	593	7
650	644	6
700	697	3
750	744	6
800	792	8
850	844	6
900	893	7
950	945	5
1000	994	6

Regression Output:

Constant	4.369548
Std Err of Y Est	1.266889
R Squared	0.999983
No. of Observations	20
Degrees of Freedom	18

Read	Actual
113	118

X Coefficient(s)	1.00179
Std Err of Coef.	0.000984

SIGNATURE Jeffrey E. Sanderson

GUARDIAN SYSTEMS INC
Pitot Calibration Form

Date: 12/4/92 Probe #: 17-28

Calibrated By: Robert Scoggins Average Velocity, f/m 2,982

Side A

Run #	Pstd	Ptype s	Cp(s)	Deviation
1	0.55	0.67	0.897	0.000
2	0.55	0.67	0.897	0.000
3	0.55	0.67	0.897	0.000

Avg Cp = 0.897 Avg = 0.000

Is average deviation less than or equal to 0.01? YES

Side B

Run #	Pstd	Ptype s	Cp(s)	Deviation
1	0.57	0.69	0.900	-0.000
2	0.57	0.69	0.900	-0.000
3	0.57	0.69	0.900	-0.000

Avg Cp = 0.900 Avg = -0.000

Is average deviation less than or equal to 0.01? YES

Is average PCF equal to or less than 0.01 YES

Average PCF = 0.898

SIGNATURE Robert Scoggins

Scott Specialty Gases, Inc.

E.P.A. PROTOCOL CERTIFICATE OF ANALYSIS

Shipped from:
Scott Specialty Gases
Route 611
Plumsteadville, PA 18949
Purchase order 334

Shipped to:
Guardian Systems
305 Ashville Rd
Leids, AL 35094
Project number 42276

Certified per E.P.A. Protocol #1 Procedure #G1 Section number 3.0.4
Certified accuracy +/- 2% NIST traceable

Cylinder number	Cylinder pressure	Date of assay
ALM008182	1900 p.s.i.g.	11-06-1992

Component	Certified concentration	Expiration date
Sulfur dioxide	93.6 P.P.M.	5-06-1993
Nitrogen	Balance gas	

Standard		Analyzer	
Type	: CEM1694	Make	: HORIBA SO2
Concentration	: 94 P.P.M.	Model	: CFA-321A
Cylinder number	: AAL14164	Serial number	: 58437182
		Analytical principle	: NDIR
		Date of calibration	: 10-09-1992

Raw data units - VOLT	Drift Compensation	Concentration of customer cylinder	Calibration curve equations
			X = T/10^IFACTOR
			Y = E*T^4+D*T^3+C*T^2+B*T
First analysis 10-26-1992			Conc = (Y*K+A)*10^YFACTOR
Z=0.00332 R=0.37220 T=0.37540	K= 102.580	93.7 P.P.M.	A= -.1798283
R=0.37430 Z=0.00185 T=0.37640	K= 101.990	93.4 P.P.M.	B= 250.8874
Z=0.00077 T=0.37610 R=0.37140	K= 102.910	94.1 P.P.M.	C= 0
			D= 0
Second Analysis 11-06-1992			E= 0
			X FACTOR = 0
Z=0.00195 R=0.37985 T=0.38027	K= 103.191	93.5 P.P.M.	Y FACTOR = 0
R=0.38352 Z=0.00080 T=0.38088	K= 103.342	93.3 P.P.M.	
Z=0.00048 T=0.38757 R=0.38820	K= 103.435	93.6 P.P.M.	

Analyst Walter Sabitus

Approved by Ted Neeme

Walter Sabitus

Mark S. Sirinides / Ted Neeme

33914.563

Scott Specialty Gases, Inc.

E.P.A. PROTOCOL CERTIFICATE OF ANALYSIS

Shipped from:
Scott Specialty Gases
Route 611
Plumsteadville, PA 18949
Purchase order 334

Shipped to:
Guardian Systems
305 Ashville Rd
Leids, AL 35094
Project number 42278

Certified per E.P.A. Protocol #1 Procedure #G1 Section number 3.0.4
Certified accuracy +/- 1% NIST traceable

Cylinder number	Cylinder pressure	Date of assay
ALM010156	1950 p.s.i.g.	10-30-1992

Component	Certified concentration	Expiration date
Sulfur dioxide	190.1 P.P.M.	4-30-1993
Nitrogen	Balance gas	

Standard		Analyzer	
Type	: GMIS	Make	: HORIBA SO2
Concentration	: 252.3 P.P.M.	Model	: CFA-321A
Cylinder number	: ALM024260	Serial number	: 56437102
		Analytical principle	: NDIR
		Date of calibration	: 10-26-1992

Raw data units VOLT	Drift Compensation	Concentration of customer cylinder	Calibration curve equations
			X = T/10^XFACTOR
			Y = E*X^4+D*X^3+C*X^2+B*X
First analysis 10-22-1992			Conc = (Y*K+A)*10^YFACTOR
Z=0.00116 R=1.17681 T=0.76175	K= 101.088	192 P.P.M.	A= .0003186567
R=1.17579 Z=0.00114 T=0.75944	K= 101.178	191 P.P.M.	B= 2.345795
Z=0.00099 T=0.76249 R=1.18080	K= 100.741	191 P.P.M.	C= .4185901
			D= -.2351873
Second Analysis 10-30-1992			E= 0
			X FACTOR = 2
Z=0.00114 R=1.01629 T=0.75576	K= 100.238	189 P.P.M.	Y FACTOR = 0
R=1.01999 Z=0.00078 T=0.75293	K= 99.899	188 P.P.M.	
Z=0.00082 T=0.75826 R=1.02025	K= 99.875	189 P.P.M.	

Analyst Christine Rush

Christine Rush

Approved by Mark Sirinides

Mark S. Sirinides / Ted Neeme

33907.534

Scott Specialty Gases, Inc.

E.P.A. PROTOCOL CERTIFICATE OF ANALYSIS

Shipped from:
Scott Specialty Gases
Route 611
Plumsteadville, PA 18949
Purchase order 334

Shipped to:
Guardian Systems
305 Ashville Rd
Leids, AL 35094
Project number 42276

Certified per E.P.A. Protocol #1 Procedure #G1 Section number 3.0.4
Certified accuracy +/- 1% NIST traceable

Cylinder number	Cylinder pressure	Date of assay
ALM008182	1900 p.s.i.g.	10-26-1992

Component	Certified concentration	Expiration date
Nitric Oxide	94.2 P.P.M.	4-26-1993
Oxides of Nitrogen	95.2 P.P.M.	
Nitrogen	Balance gas	

Standard		Analyzer	
Type	: GMIS	Make	: TECO
Concentration	: 74.9 P.P.M.	Model	: 10
Cylinder number	: AAL017849	Serial number	: 9741-111-5
		Analytical principle	: CHEMILUMINESCENT
		Date of calibration	: 09-04-1992

Raw data units VOLT	Drift Compensation	Concentration of customer cylinder	Calibration curve equations
			X = T/10^XFACTOR
			Y = E*X^4+B*X^3+C*X^2+B*X
First analysis 10-19-1992			Conc = (Y*K+A)*10^YFACTOR
Z=0.00000 R=6.87700 T=8.69100	K= 0.000	94.7 P.P.M.	A= 0
R=6.89600 Z=0.00000 T=8.64300	K= 0.000	93.9 P.P.M.	B= 0
Z=0.00000 T=8.63200 R=6.92200	K= 0.000	93.4 P.P.M.	C= 0
			D= 0
Second Analysis 10-26-1992			E= 0
			X FACTOR = 0
Z=0.00000 R=6.98200 T=8.72800	K= 0.000	93.6 P.P.M.	Y FACTOR = 0
R=6.99300 Z=0.00000 T=8.81200	K= 0.000	94.4 P.P.M.	
Z=0.00000 T=8.82800 R=6.95500	K= 0.000	95.1 P.P.M.	

Analyst Walter Sabitus

Walter Sabitus

Approved by [signature]

Mark S. Sirini

33914.563

Scott Specialty Gases, Inc.

E. P. A. PROTOCOL CERTIFICATE OF ANALYSIS

Shipped from:
Scott Specialty Gases
Route 611
Plumsteadville, PA 18949
Purchase order :
6094

Shipped to:
GUARDIAN SYSTEMS, INC
305 ASHVILLE RD
LEEDS, AL 35094
ATTN: PO #6094

Project No 38985

Certified per E.P.A. Protocol # 1 Procedure #G1 Section # 3.0.4
Certified accuracy +/- 1 % NIST Traceable

Cylinder number	AAL9551	Cylinder pressure 2100 psig.		Date of assay:	7-1-92
Component		Certified concentration		Expiration date:	1-1-94
NITRIC OXIDE		239	ppm		
OXIDES OF NITROGEN		240			
NITROGEN		Balance			

Standard		Analyzer	
Type	CRM1685	Make	: TECO
Concentration	245 ppm	Model	: 10
Cylinder #	ALM024202	Serial number	: 9741-111-S
		Analytical principle	: Chemiluminesence
		Date of calibration	: 4-13-92

Raw data units:		VOLTS	Concentration of Customer Cylinder	
First analysis		6-24-92		
Z1=0.0000	R1=7.1610	T1=6.9570	238	ppm
R2=7.1210	Z2=0.0000	T2=6.9480	239	ppm
Z3=0.0000	T3=6.9010	R3=7.1190	238	ppm
Second analysis:		7-1-92		
Z1=0.0000	R1=8.8850	T1=8.6910	240	ppm
R2=8.9130	Z2=0.0000	T2=8.7020	239	ppm
Z3=0.0000	T3=8.7110	R3=8.9230	239	ppm

Analyst _____ Approved by _____
Mark S. Sirinides/Ted Neeme

AIRCO

Airco Special Gases
4551 North Access Road
Chattanooga
Tennessee 37415

Telephone: 615-877-4387
FAX: 615-877-8694

ANALYTICAL REPORT

TO: GUARDIAN SYSTEMS
LEEDS, AL

DATE REPORTED: 08/24/92
REFERENCE: VERBAL
TEST NUMBER: 22617
FILL DATE: 08/04/92

MATERIAL SUBMITTED: TWO COMPONENT MIXTURE

SPECIFICATION NUMBER: AIRCO SPECIFICATION

METHOD OF ANALYSIS: NDIR

RESULT OF INVESTIGATION: CYLINDER # CC49196

COMPONENT	SPECIFICATION	CONCENTRATION
CARBON MONOXIDE	300 PPM	296 PPM
NITROGEN	BALANCE	BALANCE

BY: _____
AUTHORIZED SIGNATURE

A member of The BOC Group

AIRCO

Airco Special Gases
4551 North Access Road
Chattanooga
Tennessee 37415

Telephone: 615-877-4387
FAX: 615-877-8694

ANALYTICAL REPORT

TO: GUARDIAN SYSTEMS
LEEDS, AL

DATE REPORTED: 08/24/92
REFERENCE: VERBAL
TEST NUMBER: 22614
FILL DATE: 08/04/92

MATERIAL SUBMITTED: TWO COMPONENT MIXTURE

SPECIFICATION NUMBER: AIRCO SPECIFICATION

METHOD OF ANALYSIS: NDIR

RESULT OF INVESTIGATION: CYLINDER # CC3513

COMPONENT	SPECIFICATION	CONCENTRATION
CARBON MONOXIDE	600 PPM	613 PPM
NITROGEN	BALANCE	BALANCE

BY: _____
AUTHORIZED SIGNATURE

AIRCO

Airco Special Gases
4551 North Access Road
Chattanooga
Tennessee 37415

Telephone: 615-877-4387
FAX: 615-877-8694

ANALYTICAL REPORT

TO: AIRCO RETAIL - BIRMINGHAM
BIRMINGHAM, AL

DATE REPORTED: 10/12/92
REFERENCE: 513565
TEST NUMBER: 23053
FILL DATE: 09/15/92

MATERIAL SUBMITTED: TWO COMPONENT MIXTURE

SPECIFICATION NUMBER: AIRCO SPECIFICATION

METHOD OF ANALYSIS: NDIR

RESULT OF INVESTIGATION: CYLINDER # CC14636

COMPONENT	SPECIFICATION	CONCENTRATION
CARBON MONOXIDE	900 PPM	867 PPM
NITROGEN	BALANCE	BALANCE

BY: _____
AUTHORIZED SIGNATURE

Scott Specialty Gases, Inc.

Shipped From: 1290 COMBERMERE STREET
TROY MI 48083
Phone: 313-589-2950 Fax: 313-589-2134

CERTIFICATE OF ANALYSIS

C A E INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE IL 60067

PROJECT #: 05-47230-002
PO#: 7769-71500
ITEM #: 05023451 2AL
DATE: 2/05/93

CYLINDER #: AAL14486 ANALYTICAL ACCURACY: +-1%

BLEND TYPE : ACUBLEND MASTER GAS

COMPONENT	REQUESTED GAS CONC MOLES		ANALYSIS (MOLES)	
PROPANE	25.	PPM	24.94	PPM
NITROGEN		BAL		BAL

ACUBLEND MASTER GAS
ALM030713 AAL3924

ANALYTICAL METHOD: AMG

ANALYST: ANALYST

APPROVED BY: S. C. Shapiro
SUPERVISOR

PLUMSTEADVILLE, PENNSYLVANIA / TROY, MICHIGAN / HOUSTON, TEXAS / DURHAM, NORTH CAROLINA
WAKEFIELD, MASSACHUSETTS / LONGMONT, COLORADO

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET TROY, MI 48083 PHONE: (313) 589-2980 FAX NO: (313) 589-2134

Date: 7/22/92

C A E INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE, IL 60067

Our Project No.: 0539614

Your P.O. No.: 5911-71500

Gentlemen:

Thank you for choosing Scott for your Specialty gas needs. The analyses for the gases ordered, as reported by our laboratory, are listed below. Results are in volume percent, unless otherwise indicated.

ANALYTICAL REPORT

Cyl. No. _____ Analytical Accuracy ±1%AMG

Component	Concentration
PROPANE	25.02PPM
NITROGEN	BALANCE

ALM007072,ALM01074L,ALM008939,AAL3922

Cyl. No. _____ Analytical Accuracy ±1%AMG

Component	Concentration
PROPANE	54.99PPM
NITROGEN	BALANCE

AAL5446,AAL13169,AAL16672

Cyl. No. _____ Analytical Accuracy ±1%AMG

Component	Concentration
PROPANE	85.39PPM
NITROGEN	BALANCE

ALM008412,ALM010063,ALM014623

Cyl. No. _____ Analytical Accuracy ±1%AMG

Component	Concentration
PROPANE	252.5PPM
NITROGEN	BALANCE

ALM023223,ALM030283,ALM017150,AAL17881

Analyst _____

Approved _____

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

CERTIFIED REFERENCE MATERIALS EPA PROTOCOL GASES
ACUBLEND® CALIBRATION & SPECIALTY GAS MIXTURES PURE GAS
ACCESSORY PRODUCTS CUSTOM ANALYTICAL SERVICES
PLUMSTEADVILLE, PENNSYLVANIA / SAN BERNARDINO, CALIFORNIA / HOUSTON, TEXAS / WHEELING, ILLINOIS

Scott Specialty Gases, Inc.

Shipped From: 1290 COMBERMERE STREET
TROY MI 48083
Phone: 313-589-2950 Fax: 313-589-2134

CERTIFICATE OF ANALYSIS

C A E INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE IL 60067

PROJECT #: 05-45066-001
PO#: 7284-71500
ITEM #: 05023451 2AL
DATE: 12/09/92

CYLINDER #: ALM010501 ANALYTICAL ACCURACY: +/-1%

BLEND TYPE : ACUBLEND MASTER GAS

COMPONENT	REQUESTED GAS CONC MOLES		ANALYSIS (MOLES)	
PROPANE	85.	PPM	85.29	PPM
NITROGEN		BAL		BAL

ACUBLEND MASTER GAS
ALM010062 ALM023651 ALM013274

ANALYTICAL METHOD: AMG

ANALYST: _____ ANALYST

APPROVED BY: S. C. Shapiro SUPERVISOR