AP42 Section:	11.7
Reference:	9
Title:	Metropolitan Ceramics, Canton, Ohio, Tunnel Kiln #3 Exhaust Stack, Particulate, SO2, NOx, Hydrofluoric Acid Emission Evaluation, Conducted - November 17-18, 1993, Envisage Environmental Incorporated, Richfield, OH, December 16, 1993.

Envisage Environmental Incorporated
P.O. Box 152, Richfield, Ohio 44286
Phone (216) 526-0990

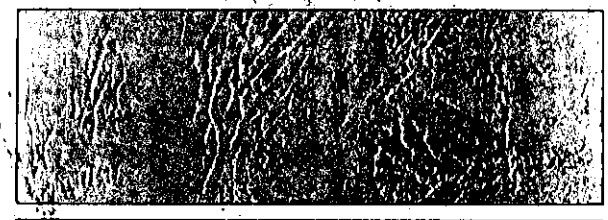
AP-42 Section 11.7
Reference 9
Report Sect. 4
Reference 5

REPORT NO. 93
COMPANY Met
TITLE Comp
DATE 11-17/18-93

METROPOLITAN CERAMICS
CANTON, OHIO

TUNNEL KILN #3 EXHAUST STACK
PARTICULATE, SO2, NOx, HYDROFLUORIC ACID
EMISSION EVALUATION

CONDUCTED - NOVEMBER 17-18, 1993

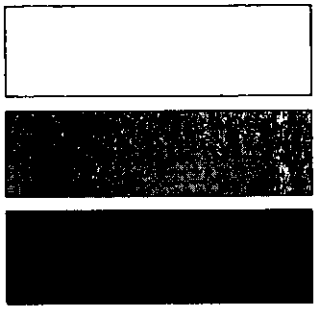


[redacted]

[redacted]

SOURCE EVALUATION RESULTS

PREPARED BY



Envisage Environmental Incorporated

P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

Envisage Environmental Incorporated

[redacted]

December 16, 1993

Mr. Philip McGuinness
Metropolitan Ceramics Inc.
1201 Millerton Road S.E.
Canton, Ohio 44707

Dear Mr. McGuinness:

The following report is the result of the particulate, hydrofluoric acid, nitrogen oxides, and sulfur dioxide emission evaluation conducted on November 17 & 18, 1993 at the Metropolitan Ceramics Inc., Canton, Ohio. Testing was performed at the exhaust stack serving the # 3 Tunnel Kiln.

The results are true and accurate to the degree specified in the pertinent sections of the Code of Federal Regulations, in force at the time of testing concerning source sampling for the above compounds.

I am looking forward to answering any questions you may have and assisting you in the future.

Respectfully submitted,

Frank J. Hezoucky
Manager, Source Sampling
ENVISAGE ENVIRONMENTAL INC.

P.O. Box 152 Richfield, Ohio 44286 Phone (216) 526-0990 Fax (216) 526-8555

TABLE OF CONTENTS

Envisage Environmental Incorporated

P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

INTRODUCTION

Envisage
Environmental
Incorporated
P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

INTRODUCTION

On November 17 & 18, 1993 Envisage Environmental Inc. conducted a particulate, hydrofluoric acid, nitrogen oxides, and sulfur dioxide emission evaluation at the Metropolitan Ceramics Inc., Canton, Ohio. The testing was performed at the exhaust stack serving the # 3 Tunnel Kiln. The operation of the kiln and systems involved were monitored throughout the duration of the testing by Metropolitan Ceramics Inc. personnel.

The purpose of the evaluation was to determine the emission rates from the unit to verify compliance with the applicable emission limitations set forth by the Ohio EPA. The Envisage testing team consisted of Messrs. Gregory Sinkovich, James Gray, Eric Hevener, Jamie Kingsborough, David Donelson, and Terry Campbell. Mr. Philip McGuinness, Metropolitan Ceramics, coordinated the testing. The Ohio EPA was also present during the testing and was represented by Mr. Rick Miller.

Results are presented in this report for pounds per hour and grains per dry standard cubic foot of emitted particulate, hydrofluoric acid, nitrogen oxides, sulfur dioxide, as well as the various velocity, volumetric and temperature measurements associated with these tests.

DESCRIPTION OF PROGRAM

Envisage Environmental Incorporated
P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

DESCRIPTION OF PROGRAM

The testing was conducted at the exhaust stack serving the # 3 Tunnel Kiln. The emission test consisted of three (3) test runs of USEPA Methods 1 - 5, 6C, 7E, and 13. Each of the tests were performed over a sixty (60) minute period. Test methods 1-2, 6C and 7E were performed on November 17, 1993, and test methods 1-5, and 13 were performed on November 18, 1993.

Particulate and hydrofluoric acid sampling, consisted of twelve (12) sample/traverse points being utilized in each of the two (2) ports for a total of twenty four (24) sample/traverse points. The samples were withdrawn for two and one half (2.5) minutes at each sample/traverse point. Samples were taken from the gas streams isokinetically through a .61 inch nozzle and a five (5) foot Pyrex lined probe. The entire length of the probe was heated and attached to a standard EPA Method 1-5 sample train. The hot box temperature was maintained between 223 and 273 degrees Fahrenheit. Exit gas temperature of the impingers was maintained below 68 degrees Fahrenheit with an ice bath. The nozzle, probe and connecting glassware were cleaned before testing and at the conclusion of each test run. Leak checks of the pitot tube lines and the sample train were all acceptable by EPA regulations.

Testing for sulfur dioxide was performed in accordance with USEPA Method 6C, Determination of Sulfur Dioxide Emissions from Stationary Sources (instrumental analyzer procedure). A single representative sampling point was utilized in the gas stream, Samples were withdrawn at a constant rate through a heated Teflon sample line. Samples were relayed to a Bovar photometric infrared analyzer which performs continuous analysis of sulfur dioxide.

Testing for nitrogen oxides was performed in accordance with USEPA Method 7E, Determination of Nitrogen Oxides Emissions from Stationary Sources. A single representative sampling point was utilized in the gas stream, Samples were withdrawn at a constant rate through a heated Teflon sample line. Samples were relayed to a Meloy Chemilumenizer which performs continuous analysis of total oxides of nitrogen

DESCRIPTION OF PROGRAM - continued

All constant emission monitors were calibrated before and after each sample run with USEPA Protocol I calibration gases.

Flue gas analysis was conducted by drawing an integrated air bag sample and analyzing it on a Hays Republic Model 621A "Orsat" Portable Gas Analyzer. The average of these readings for each run were used in calculating the emission rates.

Calibration of the equipment used, including the dry gas meter, temperature measuring devices, orifice meter, and the "S" type pitot tube was conducted within 60 days of the test date. Copies of the data are included in this report.

All analytical procedures were performed in accordance with the methods specified in the Code of Federal Regulations, Title 40, Part 60, Volume 43. Blanks were collected and analyzed on the distilled water, and acetone used in the evaluation. The residue from the distilled water was less than could be measured on a 0.1 milligram analytical balance and was considered zero. The acetone blank was recorded and incorporated into the results.

The example equations included in this report uses the figures from Run # 1.

TEST RESULTS
SUMMARY

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P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

TEST RESULTS SUMMARY

Metropolitan Ceramics

Tunnel Kiln #3 Exhaust Stack

PARAMETER		RUN # 1	RUN # 2	RUN # 3	$\bar{x}$
Particulate Emissions					
Pounds/hour	3	0.9018	0.7821	0.8487	.8442
Grains/dscf		0.0152	0.0132	0.0138	
NOx Emissions					
Pounds/hour	5	3.05	2.59	3.13	2.92
Pounds/dscf		6.18E-06	5.26E-06	6.07E-06	
Sulfur Dioxide Emissions					
Pounds/hour	14.25	2.05	2.05	1.88	1.99
Pounds/dscf		4.16E-06	4.16E-06	3.66E-06	
Hydrofluoric Acid Emissions					
Pounds/hour	2.2	1.92	1.95	2.11	1.99
Grains/dscf		0.0323	0.0328	0.0344	
System Flow Rates					
Feet/second		8.91	8.89	9.11	
ACFM		10,493	10,477	10,734	
DSCFM		6,928	6,916	7,160	
Moisture Content					
Volume percent		6.20	6.61	6.25	
Stack Temperature		262	258	254	

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P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

TEST RESULTS
DETAILED

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P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

TEST RESULTS

Metropolitan Ceramics

Tunnel Kiln #3 Exhaust Stack

		Symbol	Units	SAMPLE TRAIN # 1 RUN # 1	RUN # 2	RUN # 3
Time of Day				0927 1013	1046 1150	1222 1327
1	Gas Volume-dry,std.	Vmstd	cu. ft.	43.18	43.39	43.18
2	Condensate Vapor Vol.	Vwstd	cu. ft.	2.85	3.07	2.88
3	Gas Stream Moisture	Bws	vol.dec	0.0620	0.0661	0.0625
4	Mol.Wt-flue gas (dry)	Msd	lb/lb mo.	30.01	30.03	30.01
5	Mol.Wt-flue gas (wet)	Ms	lb/lb mo.	29.27	29.23	29.26
6	Flue Gas Velocity	Vs	ft/sec	8.91	8.89	9.11
7	Flue Gas Volume-Actual	ACFM	cu. ft.	10,493	10,477	10,734
8	Flue Gas Volume-Std.	DSCFM	cu. ft.	6,928	6,916	7,160
9	Particulate Conc.	Cs				
	- Probe		gr/dscf	0.0034	0.0026	0.0031
	- Filter		gr/dscf	0.0118	0.0106	0.0107
	- Hydrogen Fluoride		gr/dscf	0.0323	0.0328	0.0344
	- Total Particulate		gr/dscf	0.0152	0.0132	0.0138
10	Emission Rate	E				
	- Probe		lb/hr	0.2016	0.1539	0.1908
	- Filter		lb/hr	0.7002	0.6282	0.6579
	- Hydrogen Fluoride		lb/hr	1.9198	1.9456	2.1098
	- Total Particulate		lb/hr	0.9018	0.7821	0.8487
11	Isokinetic Rate	I	%	100.5	101.2	97.2

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P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

TEST RESULTS

Metropolitan Ceramics

Tunnel Kiln #3 Exhaust Stack

		Symbol	Units	Constant Monitor Sampling RUN # 1	RUN # 2	RUN # 3
Time of Day				0927 1013	1046 1150	1222 1327
1	Gas Stream Moisture	Bws	vol.dec	0.0643	0.0651	0.0491
2	Mol.Wt-flue gas (dry)	Msd	lb/lb mo.	30.01	30.03	30.01
3	Mol.Wt-flue gas (wet)	Ms	lb/lb mo.	29.24	29.24	29.42
4	Flue Gas Velocity	Vs	ft/sec	10.02	10.02	10.22
5	Flue Gas Volume-Actual	ACFM	cu. ft.	11,803	11,805	12,034
6	Flue Gas Volume-Std.	DSCFM	cu. ft.	8,228	8,218	8,577
7	Concentrations.	Cs				
	- Nitrogen Oxides		lbs/dscf	6.18E-06	5.26E-06	6.07E-06
	- Sulfur Dioxide		lbs/dscf	4.16E-06	4.16E-06	3.66E-06
8	Emission Rate	E				
	- Nitrogen Oxides		lb/hr	3.05	2.59	3.13
	- Sulfur Dioxide		lb/hr	2.05	2.05	1.88

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P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

SAMPLE POINT LOCATION DIAGRAM

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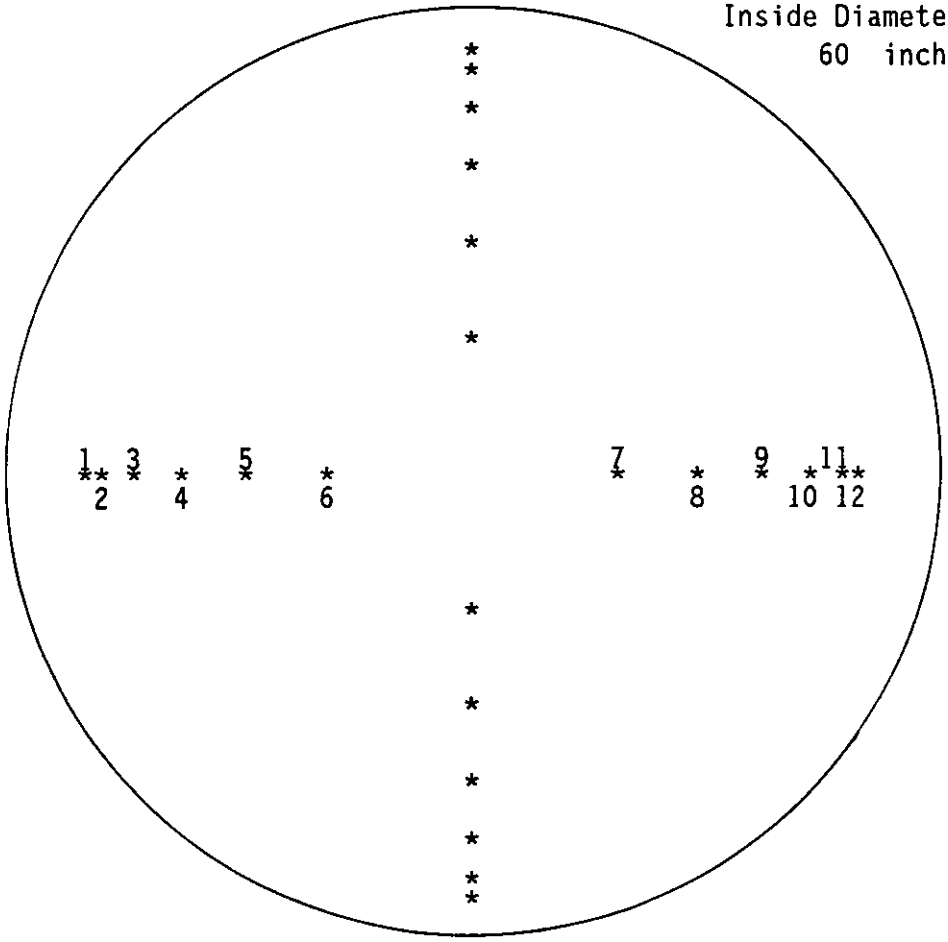
Phone (216) 526-0990

SAMPLE POINT LOCATIONS

Metropolitan Ceramics
Canton, Ohio
3 Tunnel Kiln Exhaust



Point #	Distance From Inside Wall	Point #	Distance From Inside Wall
1	58.7 inches	7	21.4 inches
2	56.0 inches	8	15.0 inches
3	52.9 inches	9	10.6 inches
4	49.4 inches	10	7.1 inches
5	45.0 inches	11	4.0 inches
6	38.6 inches	12	1.3 inches

Envisage Environmental Incorporated
P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

LABORATORY SECTION

Envisage
Environmental
Incorporated
P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

LABORATORY SUMMARY SHEET

Metropolitan Ceramics

Tunnel Kiln #3 Exhaust Stack

				SAMPLE TRAIN # 1		
		Symbol	Units	RUN # 1	RUN # 2	RUN # 3
1	Sampling Time	t	minutes	60.0	60.0	60.0
2	Barometric Pressure	Pb	in. Hg	28.78	28.78	28.78
3	Static Pressure	Pg	in. H2O	-0.02	-0.02	-0.02
	Stack Pressure	Ps	in. Hg	28.78	28.78	28.78
4	Gas Meter Volume	Vm	cu. ft.	45.06	45.83	45.79
5	Stack Area	A	sq. ft.	19.63	19.63	19.63
6	Nozzle Diameter	Dn	dec. in.	0.61	0.61	0.61
7	Meter Temperature		degrees F	72.1	78.6	80.1
		Tm	degrees R	532.1	538.6	540.1
8	Stack Temperature		degrees F	261.5	258.5	253.8
		Ts	degrees R	721.5	718.5	713.8
9	Velocity Head	^P	in. H2O	0.134	0.134	0.138
10	Orifice Pressure	^H	in. H2O	1.55	1.56	1.06
11	Carbon dioxide	CO2	%	8.4	8.5	8.4
12	Oxygen	O2	%	16.5	16.5	16.4
13	Carbon monoxide	CO	%	0.0	0.0	0.0
14	Nitrogen	N2	%	75.1	75.0	75.1
15	Pitot Coefficient	Cp		0.84	0.84	0.84
16	Water Collected	Vlc	ml	60.6	65.2	61.2
	Sample Weight:	Mn				
17	- Probe		g	0.0095	0.0073	0.0087
18	- Filter		g	0.0330	0.0298	0.0300
19	- Hydrogen Fluoride		g	0.0905	0.0923	0.0962

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Phone (216) 526-0990

LABORATORY SUMMARY SHEET

Metropolitan Ceramics

Tunnel Kiln #3 Exhaust Stack

				Constant Monitor Sampling		
		Symbol	Units	RUN # 1	RUN # 2	RUN # 3
1	Sampling Time	t	minutes	60.0	60.0	60.0
2	Barometric Pressure	Pb	in. Hg	28.78	28.78	28.78
3	Static Pressure	Pg	in. H2O	-0.02	-0.02	-0.02
	Stack Pressure	Ps	in. Hg	28.78	28.78	28.78
4	Stack Area	A	sq. ft.	19.63	19.63	19.63
5	Stack Temperature		degrees F	221.7	222.0	217.6
		Ts	degrees R	681.7	682.0	677.6
6	Velocity Head	^P	in. H2O	0.155	0.155	0.159
7	Carbon dioxide	CO2	%	8.4	8.5	8.4
8	Oxygen	O2	%	16.5	16.5	16.4
9	Carbon monoxide	CO	%	0.0	0.0	0.0
10	Nitrogen	N2	%	75.1	75.0	75.1
11	Pitot Coefficient	Cp		0.84	0.84	0.84
12	Sample Weight:	Mn				
	- Nitrogen Oxides		PPM	51.8	44.0	50.8
	- Sulfur Dioxide		PPM	25.0	25.0	22.0

Envisage Environmental Incorporated
P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

NSL ANALYTICAL SERVICES, INC.
QUALITY MATERIALS & ENVIRONMENTAL TESTING SINCE 1945
7650 HUB PARKWAY, CLEVELAND, OHIO 44125
PHONE: (216) 447-1550 FAX: (216) 447-0716

Envisage Environmental, Inc.
P.O. Box 152
Richfield, OH 33286

Attn: Frank Hezoucky

Date: 15 December 1993
Report#: 12073-33E
Lab#: 17077-17082
PO#:

DEC 15 1993

Client Description: Liquid/Filters J/N 93-2007

Envisage Description	Hydrofluoric Acid (mg/l)
1 250 ml	360.0
2 255 ml	360.0
3 250 ml	360.0

Envisage Description	Hydrofluoric Acid (ug/filter)
1A 1008 NA	480.0
2A 953 NA	480.0
3A 952 NA	1200.0

We certify the above analysis to be the true results based on the designated samples.

Roger Danals

Roger Danals, Environmental Manager

LABORATORY SHEET

COMPANY METRO CERAMICS

DATE 11-18-93

LOCATION H_2O

Part 2 HF.

RUN	1	2	3	
CASE	45	88	64	
WATER				
IMPINGERS				
FINAL	250.00	255.00	250	
INITIAL	200.00	200.00	200.00	
NET	50	55	50	
SILICA GEL				
FINAL	241.9	241.5	242.5	
INITIAL	231.3	231.3	231.3	
NET	10.6	10.2	11.2	
PARTICULATE	160	15	11	
PROBE				
FINAL	128.7167	158.2129	165.7368	
INITIAL	205	110	130 mL	
NET				
FILTER	0008	+953	952	
FINAL	.6499	.6417	.6450	
INITIAL	.6169	.6019	.6150	
NET				
IMPINGERS				
FINAL				
INITIAL				
NET				

ORSAT ANALYSIS WORK SHEET

DATE: 18 Nov 93

LOCATION: Metro Ceramics

OPERATOR: D Donelson

RUN # 1

	1		2		3		
	ACTUAL	NET	ACTUAL	NET	ACTUAL	NET	AVERAGE
CO_2	8.4	8.4	8.4	8.4	8.5	8.5	
O_2	24.9	16.5	24.9	16.5	25.0	16.5	
CO	24.9	0	24.9	0	25.0	0	

RUN # 2

	1		2		3		
	ACTUAL	NET	ACTUAL	NET	ACTUAL	NET	AVERAGE
CO_2	8.6	8.6	8.5	8.5	8.5	8.5	
O_2	25.1	16.5	25.0	16.5	25.0	16.5	
CO	25.1	0	25.0	0	25.0	0	

RUN # 3

	1		2		3		
	ACTUAL	NET	ACTUAL	NET	ACTUAL	NET	AVERAGE
CO_2	8.4	8.4	8.5	8.5	8.4	8.4	
O_2	24.8	16.4	24.9	16.4	24.9	16.5	
CO	24.8	0	24.9	0	24.9	0	

COMMENTS: _____

FH-8-92

Envisage Environmental Incorporated
P.O. Box 152 Richfield, Ohio 44286
Phone (216) 525-0990

EMISSION SAMPLING EQUIPMENT SPECIFICATIONS

Envisage Environmental Incorporated
P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

Equipment and Specifications
U.S.E.P.A. Reference methods 1-5

Control Unit (Meter Box)	Equipment Designation
___ Envisage Environmental Inc.	Control Unit #'s MB- 08 & 09
X Anderson Samplers	Control Unit #'s MB- 01 - 02
___ Remanufactured R.A.C.	Control Unit #'s MB- 03 - 07

Sample Box	
X E.E.I.	SB- 01, 02 & 05 - 07
___ Remanufactured R.A.C.	SB- 03 & 04
___ E.E.I. Special Design	SB- 08 - 11

Impingers - per sample train (each set changed for each test run)

X E.E.I.	3 Modified Smith Greenburg type
X E.E.I.	1 Smith Greenburg type

Probes	length	Lining types
___ E.E.I.	3 foot	SS, PYREX, QUARTZ, TEFLON
X E.E.I.	5 foot	SS, PYREX, QUARTZ, TEFLON
___ E.E.I.	3 foot	SS, PYREX, TEFLON
___ E.E.I.	7 foot	SS, PYREX, TEFLON
___ E.E.I.	10 foot	SS, PYREX, TEFLON
___ E.E.I.	12 foot	SS, PYREX, TEFLON
___ E.E.I.	15 foot	SS, PYREX, TEFLON
___ E.E.I.	24 foot	SS, TEFLON

Temperature Sensors	Equipment Designation
___ Omega Engineering	PY- 01 & 02
___ Thermo Electric	PY- 03 - 08
X Fluke 51	PY- 01 - 02 - 03 - 04 - 05
___ Fisher Scientific	Mercury Thermometer
___ Fisher Scientific	Bimetallic Thermometer

Pressure Gauges	Type
X Dwyer Incline Manometer	Oil, 0 - 10 inch water
___ Dwyer Magnehelic	Magnetic/Mechanical 0 - 1 inch water
X Dwyer Magnehelic	Magnetic/Mechanical 0 - 10 inch water
___ Dwyer "U" Tube Manometer	Mercury, 36 inches
___ Dwyer "U" Tube Manometer	Water, 72 inches
___ Dwyer Microtector (Micro - Manometer)	Water, 0 - 1 inches of water

Chemicals and Reagents	
X Water	Deionized/ Distilled
X Acetone	Reagent Grade (<0.001% residual)
X Silica Gel	6 - 16 Mesh
X Stopcock Grease	Acetone- Insoluble & Heat Resistant

Envisage Environmental Incorporated
P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

FIELD DATA SHEETS

Envisage Environmental Incorporated
P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

PLANT Nevada Cement DATE 11/15 RUN# 1 CASE# 45 LOCATION page 1 of 3

POINT NUMBER	SAMPLE TIME	GAS METER READING	VELOCITY HEAD Δp	Δp	ORIFICE PRESSURE	STACK TEMP	GAS METER TEMP IN	GAS METER TEMP OUT	PUMP VACUUM	FILTER HOLDER	IMPINGER TEMP
1	0/11:21	843.50	.02		1.7	262	58	55	4	250	45
2	2.5	845.55	.01		1.7	262	63	67	4	250	48
3	5	847.55	.02		1.7	262	74	69	5	250	48
4	7.5	849.47	.02		1.7	265	76	69	5	245	45
5	10	851.45	.02		1.7	265	77	66	5	249	48
6	12.5	853.55	.02		1.7	265	78	67	5	250	48
7	15	855.36	.02		1.7	265	79	65	5	250	48
8	17.5	857.35	.02		1.7	265	80	69	5	250	48
9	20	859.75	.03		2.5	264	81	67	5	250	48
10	22.5	861.70	.02		1.7	264	81	68	5	250	48
11	25	863.63	.02		1.7	264	82	68	5	250	48
12	27.5	865.70	.02		1.7	261	81	66	5	250	45
1	30	867.63	.02		1.7	260	66	62	5	250	45
2	32.5	869.56	.02		1.7	256	70	67	5	250	48
3	35	871.59	.02		1.7	256	75	68	5	247	48
4	37.5	873.56	.02		1.7	256	79	69	5	250	48
5	40	875.60	.02		1.7	260	79	65	5	250	45
6	42.5	877.52	.02		1.7	260	81	68	5	250	48
7	45	879.52	.02		1.7	261	81	67	5	250	48
8	47.5	881.42	.02 .01		.84	261	81	69	4	250	45
9	50	882.56	.01		.84	261	686	69	4	250	48
10	52.5	884.29	.01		.84	260	80	70	4	250	48
11	55	885.70	.01		.84	260	79	70	4	250	48
12	57.5	887.13	.01		.84	260	79	69	4	250	48
	60/12:36	888.56									

SAMPLE TRAIN LEAK CHECKS

PRE-TEST 0 CFM @ 15 "Hg POST-TEST 0 CFM @ 15 "Hg

PITOT TUBE LEAK CHECKS

PRE-TEST #2 0 @ 6.0' POST-TEST #2 0 @ 6.5

#4 0 @ 6.5 #4 0 @ 6.5

45.06 0.018 1.554 261.542°F 72.063°F

PLANT Holcim Conway DATE 11/18/16 RUN# 2 CASE# 83 LOCATION page 2 of 2

POINT NUMBER	SAMPLE TIME	GAS METER READING	VELOCITY HEAD Δp	VELOCITY HEAD √Δp	ORIFICE PRESSURE	STACK TEMP	GAS METER TEMP IN	GAS METER TEMP OUT	PUMP VACUUM	FILTER HOLDER	IMPINGER TEMP
1	0/1:29	888.83	.02		1.7	256	80	70	4.0	238	50
2	2.5	890.89	.02		1.7	259	81	70	4.0	240	.50
3	5	892.90	.02		1.7	260	82	71	4.0	240	50
4	7.5	894.87	.02		1.7	260	82	72	4.0	241	50
5	10	896.91	.02		1.7	259	83	72	4.0	242	50
6	12.5	898.86	.02		1.7	260	83	72	4.0	243	51
7	15	900.82	.02		1.7	260	83	72	4.0	244	52
8	17.5	902.79	.02		1.7	259	84	73	4.0	245	52
9	20	904.78	.02		1.7	259	85	73	4.0	246	54
10	22.5	906.75	.02		1.7	258	85	73	4.0	246	54
11	25	908.76	.01		.84	258	85	74	4.0	248	54
12	27.5	910.19	.01		.84	259	85	74	4.0	249	55
1	30	911.68	.02		1.7	257	84	73	4.0	245	55
2	32.5	913.59	.02		1.7	257	84	73	4.0	244	55
3	35	915.55	.02		1.7	256	82	73	4.0	243	57
4	37.5	917.52	.02		1.7	256	82	73	4.0	242	57
5	40	919.46	.02		1.7	257	83	74	4.0	240	58
6	42.5	921.48	.02		1.7	257	84	75	4.0	240	58
7	~~40~~ 45	923.43	.02		1.7	258	85	75	4.0	242	59
8	~~42.5~~ 47.5	925.37	.02		1.7	259	86	75	4.0	243	60
9	~~45~~ 50	927.35	.02		1.7	259	86	75	4.0	245	60
10	~~47.5~~ 52.5	929.20	.02		1.7	260	86	75	4.0	247	62
11	55	931.23	.01		.84	260	87	75	4.0	248	62
12	57.5	933.20	.01		.84	259	87	75	4.0	250	62
240	60/	934.66									

SAMPLE TRAIN LEAK CHECKS

PRE-TEST 0 CFM @ 15 "Hg POST-TEST 0 CFM @ 15 "Hg

PITOT TUBE LEAK CHECKS

PRE-TEST #2 @ 6.5 POST-TEST #2 @ 6.5

#4 @ 6.5 #4 @ 6.5

45.83 0.018 1.557 258.458°F 78.563°F

PLANT Metro Ceramics DATE 18 Nov 93 RUN# 3 CASE# 64 LOCATION page of

POINT NUMBER	SAMPLE TIME	GAS METER READING	VELOCITY HEAD Δp	√Δp	ORIFICE PRESSURE	STACK TEMP	GAS METER TEMP IN	GAS METER TEMP OUT	PUMP VACUUM	FILTER HOLDER	IMPINGER TEMP
1	0 322	938.19	.02		1.7	256	80	72	4.0	238	52
2	2.5	940.35	.02		1.7	258	80	72	4.0	238	52
3	5	942.19	.02		1.7	254	82	72	4.0	239	52
4	7.5	944.28	.02		1.7	253	82	73	4.0	240	54
5	10	946.15	.02		1.7	254	83	73	4.0	240	54
6	12.5	948.14	.02		1.7	252	83	73	4.0	241	55
7	15	950.12	.02		1.7	253	84	74	4.0	242	55
8	17.5	952.10	.02		1.7	254	85	74	4.0	243	55
9	20	954.04	.02		1.7	252	85	74	4.0	244	56
10	22.5	954.04	.02		1.7	253	86	74	4.0	245	56
11	25	957.98	.02		1.7	254	86	74	4.0	245	58
12	27.5	959.92	.02		1.7	254	86	74	4.0	248	58
1	30	961.88	.01		.84	255	87	74	4.0	248	59
2	32.5	963.28	.02		1.7	253	87	75	4.0	250	60
3	35	964.67	.02		1.7	253	88	75	4.0	250	60
4	37.5	966.60	.02		1.7	254	88	75	4.0	252	60
5	40	968.51	.02		1.7	254	88	76	4.0	253	60
6	42.5	970.44	.02		1.7	255	88	76	4.0	254	61
7	45	972.35	.02		1.7	253	87	76	4.0	255	61
8	47.5	974.35	.02		1.7	253	87	76	4.0	255	62
9	50	976.22	.02		1.7	254	87	77	4.0	253	62
10	52.5	978.16	.02		1.7	254	88	77	4.0	252	62
11	55	980.08	.02		1.7	253	88	77	4.0	250	63
12	57.5	982.04	.01		.84	252	88	77	4.0	248	63
	60	983.98									

SAMPLE TRAIN LEAK CHECKS

PRE-TEST 0 CFM @ 15 "Hg POST-TEST 0 CFM @ 15 "Hg

PITOT TUBE LEAK CHECKS

PRE-TEST #2 0 @ 6.2 POST-TEST #2 0 @ 6.3

#4 0 @ 6.4 #4 0 @ 6.4

45.75 0.019 .1378 1.058 253.75°F 80.063

PLANT Metropolitan Ceramics DATE 11/17/93 RUN# Mc-1 LOCATION Kiln page 1 of 1

POINT NUMBER	VELOCITY PRESSURE Δp	[redacted]	TEMPERATURE °F	√Δp
1	.02		205	.141
2	.02		205	.141
3	.03		206	.173
4	.03		206	.173
5	.03		210	.173
6	.03		212	.173
7	.04		212	.20
8	.03		213	.173
9	.03		213	.173
10	.03		214	.173
11	.03		214	.173
12	.02		215	.141
1	.02		209	.141
2	.02		212	.141
3	.02		215	.141
4	.03		215	.173
5	.03		217	.173
6	.03		219	.173
7	.02		222	.141
8	.02		225	.141
9	.02		225	.141
10	.02		225	.141
11	.02		225	.141
12	.02		225	.141

PITOT TUBE LEAK CHECKS

PRE-TEST #2 OK 6.1
#4 OK 7.0

POST-TEST #2 OK 6.5
#4 OK 5.1

214.96

.158

PLANT Metropolitan Ceramics DATE 11/17/93 RUN# post-1 LOCATION K:/n page 1 of 1

POINT NUMBER	VELOCITY PRESSURE Δp	TEMPERATURE DRY T_S	TEMPERATURE WET T_{SU}	√Δp
1	.03	231		.173
2	.03	232		.173
3	.03	230		.173
4	.03	225		.173
5	.03	227		.173
6	.03	227		.173
7	.03	229		.173
8	.02	231		.141
9	.02	230		.141
10	.02	230		.141
11	.01	231		.10
12	.01	231		.10
1	.02	221		.141
2	.02	224		.141
3	.02	224		.141
4	.03	225		.173
5	.03	229		.173
6	.03	231		.173
7	.03	230		.173
8	.03	230		.173
9	.02	230		.141
10	.02	230		.141
11	.02	229		.141
12	.01	224		.100

PITOT LUBE LEAK CHECKS

PRE-TEST #2 ~~0~~ 6.2 POST-TEST #2 ~~0~~ 6.8

#4 ~~0~~ 5.7 #4 ~~0~~ 6.8

Static -.35

228.38

.152

PLANT Metropolitan Ceramics DATE 11/17/93 RUN# Post 2 LOCATION Kiln page 1 of 1

POINT NUMBER	VELOCITY PRESSURE Δp	TEMPERATURE DRY T_s	TEMPERATURE WET T_{sw}	$\sqrt{\Delta p}$
1	.02	215		.141
2	.02	217		.141
3	.02	218		.141
4	.03	218		.173
5	.03	220		.173
6	.03	220		.173
7	.03	221		.173
8	.03	221		.173
9	.025	221		.158
10	.025	220		.158
11	.025	217		.158
12	.02	215		.141
1	.02	209		.141
2	.02	209		.141
3	.02	211		.141
4	.03	212		.173
5	.03	~~212~~		.173
6	.03	213		.173
7	.03	214		.173
8	.03	216		.173
9	.025	216		.158
10	.025	215		.158
11	.02	212		.141
12	.02	212		.141

PITOT TUBE LEAK CHECKS

PRE-TEST #2 0 @ 6.9 POST-TEST #2 0 @ 5.0

#4 0 @ 6.0 #4 0 @ 5.9

215.58

.158

PLANT Metropolitan Ceramics DATE 11/17/93 RUN# Post 3 LOCATION Kiln page 1 of 1

POINT NUMBER	VELOCITY PRESSURE Δp	TEMPERATURE DRY T_S	TEMPERATURE WET T_{SW}	$\sqrt{\Delta p}$
1	.03	211		.173
2	.03	213		.173
3	.03	213		.173
4	.035	215		.187
5	.035	215		.187
6	.03	217		.173
7	.03	217		.173
8	.03	217		.173
9	.02	220		.141
10	.02	221		.141
11	.02	221		.141
12	.02	221		.141
1	.02	216		.141
2	.02	218		.141
3	.025	214		.158
4	.025	221		.158
5	.025	223		.158
6	.03	223		.173
7	.03	225		.173
8	.025	225		.159
9	.025	227		.158
10	.025	226		.158
11	.02	225		.141
12	.02	223		.141

PITOT TUBE LEAK CHECKS

PRE-TEST #2 @ 4.9 POST-TEST #2 @ 7.0

#4 @ 5.9 #4 @ 6.1

219.63

.160

CALIBRATION SECTION

Envisage
Environmental
Incorporated
P.O. Box 152 Richfield, Ohio 44286
Phone (216) 526-0990

CALIBRATION FREQUENCY

The frequency of calibration is dictated by the Code of Federal Regulations, Volume 42, Number 160, August 18, 1977. The regulations state that you must "use methods and equipment which have been approved by the Administrator to calibrate the orifice meter, pitot tube, dry gas meter, and probe heater. Recalibrate after each test".

The methods of calibration are determined from "maintenance, Calibration, and Operation of Isokinetic Source Sampling Equipment," published by the U.S.EPA Office of Air Program Publications APTD-0576. Per the above listed regulations, the equipment was checked after the stack test and values of Y, Cp(Test), and nozzle diameter had not appreciably changed from the acceptable tolerances.

NOZZLE DIAMETER CALIBRATION

I.D. of nozzles are checked immediately prior to and immediately following the stack test. If the prior deviation exceeds $\pm$.001 inches on an average or $\pm$.002 inches maximum, the nozzle is reworked.

BAROMETER CALIBRATION

The aneroid barometers used by Envisage are calibrated to our mercury in glass barometer which is NBS traceable. Calibration occurs before and after each field use.

THERMOCOUPLE CALIBRATION

DATE: September 30, 1993

Type: K	low		Medium		High		Average
Sensor #	Reading	Ref	Reading	Ref	Reading	Ref	Deviation
1	40	41	80	79	212	212	0.67
2	40	40	79	79	212	212	0.00
3	41	40	79	80	212	212	0.67
4	40	40	79	79	212	212	0.00
5	41	41	79	79	212	212	0.00
6	43	43	79	79	212	212	0.00
7	44	45	79	79	212	212	0.33
8	43	44	80	80	212	212	0.33
9	44	44	80	80	212	212	0.00
10	44	44	80	80	212	213	0.33
11	44	45	80	80	212	213	0.67
12	45	45	80	80	212	212	0.00
13	45	45	79	79	212	212	0.00
14	42	41	79	79	212	212	0.33
15	42	41	79	79	212	212	0.33
16	41	41	80	80	212	212	0.00
17	40	40	80	80	212	212	0.00
18	40	40	80	80	212	213	0.33
19	40	41	81	81	212	212	0.33
20	41	41	81	81	212	212	0.00
21	42	42	81	81	212	212	0.00
22	42	42	81	81	212	212	0.00
23	42	42	81	81	212	212	0.00
24	43	43	81	81	212	212	0.00

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"S" TYPE PITOT TUBE CALIBRATION

"S" Type Pitot Tube (Probe) # 501 - 5 ft Probe

Calibration Date: September 30, 1993

$$C_p = C_{std} \sqrt{\frac{\Delta p_{std}}{\Delta p_p}} \qquad \text{(EPA Equation 2-2)}$$

where:

C_p = Coefficient of Type S pitot tube, dimensionless

C_{std} = Coefficient of Standard Pitot Tube (0.99), dimensionless

Δp_{std} = Velocity head measured by standard pitot tube, inches H_2O

Δp_p = Velocity head measured by Type S pitot tube, inches H_2O

	Δp_{std}	Δp_p	C_p
Side A	0.23	0.32	0.839
Side B	0.23	0.32	0.839
Side A	0.46	0.63	0.846
Side B	0.46	0.63	0.846
Side A	0.82	1.14	0.840
Side B	0.82	1.14	0.840
		Average -	0.84

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GRASEBY ANDERSEN

CONTROL UNIT CALIBRATION
(English Units)

Date 9-7-93

Metering System Identification: 893-795

Barometric pressure, P_b = 29.39 in. Hg

Model Number 90-800

Orifice manometer setting ΔH in. H_2O	Spirometer (wet meter) gas volume V_w ft^3	Dry gas meter volume V_m ft^3	Temperatures				Time Θ min
			Spirometer (wet meter) t_w °F	Dry Gas Meter			
				Inlet t_i °F	Outlet t_o °F	Average t_m °F	
1.0	5	5.193	75.2	115	82	98.5	8.80
2.0	5	5.184	75.0	121	82	101.5	6.33
4.0	5	5.195	76.4	125	84	104.5	4.50

Calculations

ΔH in. H_2O	Y $\frac{V_w P_b (t_m + 460)}{V_m \left[P_b + \frac{\Delta H}{13.6}\right](t_w + 460)}$	ΔH@ $\frac{0.0317\ \Delta H}{P_b(t_o + 460)} \left[\frac{(t_w + 460)\,\Theta}{V_w}\right]^2$
1.0	1.00	1.76
2.0	1.01	1.83
4.0	1.00	1.85
Average	1.00	1.81

Y = Ratio of reading of wet test meter to dry test meter; tolerance for individual values ±0.02 from average.

ΔH@ = Orifice pressure differential that equates to 0.75 cfm of air @ 68 °F and 29.92 inches of mercury, in. H_2O; tolerance for individual values ±0.20 from average.

Calibrated by: MDC

GRASEBY ANDERSEN
4801 FULTON INDUSTRIAL BLVD. ATLANTA, GA 30336-2003, USA
TEL: 404 691 1910 FAX: 404 691 6315
Toll Free: 800 241 6898

EMISSION SAMPLING NOMENCLATURE

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SAMPLING NOMENCLATURE

A	=	Cross sectional area of stack or duct, $ft.^2$.
A_n	=	Cross sectional area of nozzle entry plane, $ft.^2$.
B_{ws}	=	Water vapor in gas stream, proportion by volume.
C	=	Nomograph correction factor, dimensionless.
C_s	=	Concentration of particulate matter in gas stream, dry basis-corrected to standard conditions, gr/dscf.
D_n	=	Nominal diameter of probe nozzle entry plane, in.
E	=	Particulate Emission Rate, lb./hr.
$\hat{}H$	=	Average pressure differential across orifice, in. of H_2O.
$\hat{}H_@$	=	Orifice meter calibration factor, in. of H_2O.
I	=	Percent of isokinetic sampling, %.
K_p	=	Pitot tube constant, 85.49 ft./sec.
M_d	=	Molecular weight of gas, dry basis, lb./lb.-mole.
M_n	=	Total amount of particulate matter collected, g.
M_s	=	Molecular weight of gas, wet basis, lb./lb.-mole.
M_w	=	Molecular weight of water, 18 lb./lb.-mole.
P_{bar}	=	Barometric pressure, in. of H_g.
P_g	=	Pressure differential from gas stream to atmosphere, (static pressure) in. of H_2O.
P_s	=	Absolute gas stream pressure, $(P_{bar} + P_g/13.6)$ in. of H_g.
P_{std}	=	Absolute pressure at standard conditions, 29.92 in. of H_g.
P_w	=	Density of water, 0.0022 lb./ml.

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SAMPLING NOMENCLATURE - continued

$\sqrt{P}_{avg}$ = Average of the square roots of the velocity head readings, in. of H_2O.

Q = Volumetric flow rate at gas stream conditions, A.C.F.M.

Q_{std} = Dry volumetric gas flow rate corrected to standard conditions, D.S.C.F.M.

R = Ideal gas constant, 21.85 in. of H_2-ft^3/ °R-lb.-mole.

t = Total sampling time, minutes.

T_m = Average dry gas meter temperature, °R.

T_s = Average absolute gas stream temperature, °R.

T_{std} = Standard absolute temperature, 528° rankine.

V_{lc} = Volume of water collected in impingers and silica gel, ml.

V_m = Volume of gas sample measured at meter box (meter conditions), $ft.^3$.

$V_{m(std)}$ = Volume of gas sample measured at meter box (corrected to standard conditions), $ft.^3$.

V_s = Average gas stream velocity, ft./sec.

$V_{w(std)}$ = Volume of water vapor in gas sample (standard conditions), $ft.^3$.

13.6 = Specific gravity of mercury (H_g).

$\%CO_2$ = Percent by volume of CO_2 in gas stream (dry basis).

$\%O_2$ = Percent by volume of O_2 in gas stream (dry basis).

%CO = Percent by volume of CO in gas stream (dry basis).

$\%N_2$ = Percent by volume of N_2 in gas stream (dry basis).

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EMISSION SAMPLING CALCULATIONS

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1) Volume of dry gas sampled through meter box at standard conditions,

$$V_{m(std)} = V_m \left[\frac{T_{std}}{T_m} \right] \left[\frac{P_b + \frac{\Delta H}{13.6}}{P_{std}} \right]$$

(EPA Equation 5-1)

Where:

$V_{m(std)}$ = Volume of gas sample measured at meter box (corrected to standard conditions), ft^3.

V_m = Volume of gas sample measured at meter box (meter conditions), ft^3.

T_{std} = Standard absolute temperature, 528^0 Rankine.

T_m = Average dry gas meter temperature, ^0R.

P_{bar} = Barometric Pressure, in. Hg.

ΔH = Average pressure differential across orifice, in. H_2O.

13.6 = Specific gravity of mercury (Hg).

P_{std} = Absolute pressure at standard conditions, 29.92 in. Hg.

Example: Run 1

V_m = 45.06 ft^3

T_m = 532.1 ^0R

ΔH = 1.55 in. H_2O

P_{bar} = 28.78 in. Hg

$$V_{m(std)} = 45.06 \left[\frac{528.0}{532.1} \right] \left[\frac{28.78 + \frac{1.55}{13.6}}{29.92} \right]$$

$$= 45.06 \quad (0.9922) \quad (0.9657)$$

$$= \underline{43.18} \quad ft^3$$

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2) Volume of water vapor collected at standard conditions,

$$V_{w(std)} = V_{lc} \left[\frac{P_w}{M_w} \right] \left[\frac{(R)(T_{std})}{P_{std}} \right]$$

(EPA Equation 5-2)

Where:

$V_{w(std)}$ = Volume of water vapor in gas sample (standard conditions) ft^3.
V_{lc} = Volume of water collected in impingers & silica gel, ml.
P_w = Density of water, 0.0022 lb/ml.
M_w = Molecular weight of water, 18 lb/lb-mole.
R = Ideal gas constant, 21.85 in. Hg-ft^3/ ^oR-lb-mole.
T_{std} = Standard absolute temperature, 528 ^{o} Rankine.
P_{std} = Absolute pressure at standard conditions, 29.92 in. Hg.

Example: Run 1

V_{lc} = 60.6 ml

$$V_{w(std)} = 60.6 \left[\frac{0.0022}{18.0} \right] \left[\frac{(21.85)(528.0)}{29.92} \right]$$

= 2.85 ft^3

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3) Moisture content of gas stream,

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

(EPA Equation 5-3)

Where:

B_{ws} = Water vapor in gas stream, proportion by volume.

$V_{w(std)}$ = Volume of water vapor in gas sample (standard conditions) ft^3.

$V_{m(std)}$ = Volume of gas sample measured at meter box (corrected to standard conditions), ft^3.

Example: Run 1

$V_{w(std)}$ = 2.85 ft^3

$V_{m(std)}$ = 43.18 ft^3

$$B_{ws} = \frac{2.85}{43.18 + 2.85}$$

$$= 0.0620$$

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4) Dry Molecular Weight of gas in gas stream,

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

(EPA Equation 3-2)

Where:

M_d = Molecular weight of gas, dry basis, lb/lb-mole.

0.440 = Molecular weight of CO_2 divided by 100.

0.320 = Molecular weight of O_2 divided by 100.

0.280 = Molecular weight of N_2 or CO (same for both compounds) divided by 100.

% CO_2 = Percent by volume of CO_2 in gas stream (dry basis).

% O_2 = Percent by volume of O_2 in gas stream (dry basis).

% CO = Percent by volume of CO in gas stream (dry basis).

% N_2 = Percent by volume of N_2 in gas stream (dry basis).

Example: Run 1

% CO_2 = 8.4

% O_2 = 16.5

% CO = 0.0

% N_2 = 75.1

M_d = 0.440 (8.4) + 0.320 (16.5) + 0.280 (75.1)

= 3.696 + 5.280 + 21.028

= 30.00 lb/lb-mole

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5) Molecular Weight of gas in gas stream,

$$M_s = M_d (1 - B_{ws}) + M_w (B_{ws})$$

(EPA Equation 2-5)

Where:

M_s = Molecular weight of gas, wet basis, lb/lb-mole.

M_d = Molecular weight of gas, dry basis, lb/lb-mole.

B_{ws} = Water vapor in gas stream, proportion by volume.

M_w = Molecular weight of water, 18 lb/lb-mole.

Example: Run 1

M_d = 30.00 lb/lb-mole

B_{ws} = 0.0620

M_s = 30.00 (1 - 0.0620) + 18 (0.0620)

= 28.145 + 1.115

= 29.26 lb/lb-mole

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6) Average Gas Stream Velocity,

$$V_s = K_p \, C_p \, \Delta P_{avg} \sqrt{\frac{T_s}{P_s \, M_s}}$$

(EPA Equation 2-9)

Where:

V_s = Average gas stream velocity, ft/sec.

K_p = Pitot tube constant, $85.49 \; \frac{ft}{sec} \left[\frac{(lb/lb\text{-}mole)(in.Hg)}{(^oR)(in.H_2O)} \right]^{1/2}$

C_p = Pitot tube coefficient, dimensionless.

ΔP_{avg} = Average of the square roots of the velocity head readings, $(\sqrt{\Delta p})$ $(in.H_2O)$.

T_s = Average absolute gas stream temperature, ^oR.

P_s = Absolute gas stream pressure, $(P_{bar} + P_g/13.6)$ in.Hg.

P_{bar} = Barometric Pressure, in. Hg.

P_g = Pressure differential from gas stream to atmosphere, (static pressure) $in.H_2O$.

M_s = Molecular weight of gas, wet basis, lb/lb-mole.

Example: Run 1

C_p = 0.84

ΔP_{avg} = 0.134 $in.H_2O^{1/2}$

T_s = 721.5 ^oR

P_s = $P_{bar} + P_g /13.6 = 28.78 + -0.02 /13.6 = 28.78$ in.Hg

M_s = 29.26 lb/lb-mole

$$V_s = (85.49)(0.84) (0.134) \sqrt{\frac{721.5}{(28.78) (29.26)}}$$

$$= 8.91 \text{ ft/sec}$$

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7) Volumetric Flow Rate at Gas Stream Conditions,

$Q = A \times V_s \times 60$

Where:

Q = Volumetric flow rate at gas stream conditions, A.C.F.M.

A = Cross sectional area of stack or duct, ft^2.

V_s = Average gas stream velocity, ft/sec.

60 = Conversion factor from seconds to minutes.

Example: Run 1

$A = 19.63 \ ft^2$

$V_s = 8.91 \ ft/sec$

$Q = (19.63) (8.91) 60$

$= 10,494$ ACFM

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Phone (216) 526-0990

8) Volumetric Flow Rate at Standard Conditions,

$$Q_{sd} = 60 \quad (1 - B_{ws}) \quad V_s \quad A \left[\frac{T_{std}}{T_s} \right] \left[\frac{P_s}{P_{std}} \right]$$

(EPA Equation 2-10)

Where:

Q_{sd} = Dry volumetric gas flow rate corrected to standard conditions, S.C.F.M.

60 = Conversion factor from seconds to minutes.

B_{ws} = Water vapor in gas stream, proportion by volume.

V_s = Average gas stream velocity, ft/sec.

A = Cross sectional area of stack or duct, ft^2.

T_{std} = Standard absolute temperature, 528 ^{o} Rankine.

T_s = Average absolute gas stream temperature, ^oR.

P_s = Absolute gas stream pressure, $(P_{bar} + P_g/13.6)$ in.Hg.

P_{bar} = Barometric Pressure, in. Hg.

P_g = Pressure differential from gas stream to atmosphere, (static pressure) in.H_2O.

P_{std} = Absolute pressure at standard conditions, 29.92 in. Hg.

Example: Run 1

B_{ws} = 0.0620

V_s = 8.91 ft/sec

A = 19.63 ft^2

T_s = 721.5 ^oR

P_s = $P_{bar} + P_g /13.6 = 28.78 + -0.02 /13.6 = 28.78$ in.Hg

$$Q_{sd} = 60 \quad (1 - 0.0620) \quad (8.91) \quad (19.63) \quad \frac{528.0}{721.5} \quad \frac{28.78}{29.92}$$

= 6,929 SCFM

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9) Gas Stream Particulate Concentration,

$$C_s = 15.43 \text{ gr./g} \left[\frac{M_n}{V_{m(std)}} \right]$$

(EPA Equation 5-6)

Where:

C_s = Concentration of particulate matter in gas stream, dry basis-corrected to standard conditions, gr/dscf.

M_n = Total amount of particulate matter collected in probe wash and on filter, g.

$V_{m(std)}$ = Volume of gas sample measured at meter box (corrected to standard conditions), ft^3.

Example: Run 1

$M_n = 0.0425$ g

$V_{m(std)} = 43.18$ ft^3

$$C_s = 15.43 \left[\frac{0.0425}{43.18} \right]$$

$$= 0.0152 \text{ gr/dscf}$$

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10) Particulate Emission Rate,

$$E = Q_{sd} \; C_s \left[\frac{1 \text{ pound}}{7000 \text{ grains}}\right] \left[\frac{60 \text{ minutes}}{1 \text{ hour}}\right]$$

Where:

E = Particulate Emission Rate, lb/hr.

Q_{sd} = Dry volumetric gas flow rate corrected to standard conditions, S.C.F.M.

C_s = Concentration of particulate matter in gas stream, dry basis-corrected to standard conditions, gr/dscf.

Example: Run 1

Q_{sd} = 6,929 ft^3

C_s = 0.0152 gr/dscf

$$E = (\; 6,929 \;) \; (\; 0.0152 \;) \left[\frac{60}{7000}\right]$$

$$= 0.90 \text{ lb/hr}$$

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11) Percent of Isokinetic Sampling,

$$I = \frac{100\ T_s \left[K_3\ V_{lc} + \left[\frac{V_m}{T_m} \right] \left[P_{bar} + \frac{\Delta H}{13.6} \right] \right]}{60\ A_n\ V_s\ P_s\ t}$$

(EPA Equation 5-7

Where:

I = Percent of Isokinetic sampling, %.

T_s = Average absolute gas stream temperature, ^oR.

K_3 = Constant, 0.002669 in.Hg-ft^3/ml-^oR.

V_{lc} = Volume of water collected in impingers & silica gel, ml.

V_m = Gas sample volume measured at meter box (meter conditions), ft^3.

T_m = Average dry gas meter temperature, ^oR.

P_{bar} = Barometric Pressure, in. Hg.

ΔH = Average pressure differential across orifice, in. H_2O.

t = Total sampling time, minutes.

V_s = Average gas stream velocity, ft/sec.

P_s = Absolute gas stream pressure, in.Hg.

D_n = Nominal diameter of probe nozzle tip, inches.

A_n = Cross sectional area of nozzle, ft^2.

Example: Run 1

T_s	=	721.5	^oR	ΔH	=	1.55	in.H_2O
V_{lc}	=	60.6	ml	t	=	60.0	min.
V_m	=	45.06	ft^3	V_s	=	8.91	ft/sec
T_m	=	532.1	^oR	P_s	=	28.78	in.Hg
A_n	=	0.0020294	ft^2	P_{bar}	=	28.78	in.Hg

$$I = \frac{721.5\ (\ 100\ ) \left[0.002669\ (\ 60.6\ ) + \left[\frac{45.06}{532.1} \right] \left[28.78 + \frac{1.55}{13.6} \right] \right]}{60\ (0.0020294\ )\ (\ 8.91\ )\ (\ 28.78\ )\ (\ 60.0\ )}$$

$$= 100.5\ \%$$

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9) Gas Stream NOx Concentration,

$$C_{nox} = \frac{ppm \left[\frac{MW}{M.V.}\right] \left[\frac{1\ Pound}{453.59\ grams}\right]}{10^6}$$

Where:

C_{nox} = Concentration of Nitrogen Oxides (as NO2) in gas stream, dry basis at standard conditions, lb/dscf.

ppm = Average concentration of NOx as measured at detector

MW = Molecular Weight of Compound used for comparison and/or instrument calibrarion, g/g-mole.

M.V. = Volume occupied by one mole of gas at standard conditions of 68^0 Fahrenheit and 29.92" Hg, 0.849531 ft^3/mole.

Example: Run 1

PPM = 51.8 ppm

MW = 46.010 g

$$C_{nox} = \frac{51.8 \left[\frac{46.010}{0.849531}\right] \left[\frac{1\ Pound}{453.59\ grams}\right]}{10^6}$$

$$= 6.185 \times 10^{-6}\ lb/dscf$$

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10) NOx Emission Rate,

$$E_{nox} = Q_{sd} \; C_{nox} \left| \frac{60 \text{ minutes}}{1 \text{ hour}} \right|$$

Where:

E = NOx Emission Rate, lb/hr.

Q_{sd} = Dry volumetric gas flow rate corrected to standard conditions, S.C.F.M.

C_{nox} = Concentration of NOx in gas stream, dry basis, corrected to standard conditions, lb/dscf.

Example: Run 1

Q_{sd} = 8,245 ft^3

C_{nox} = 6.185×10^{-6} lb/dscf

E = (8,245) (6.185×10^{-6}) (60)

= 3.060 lb/hr

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CHART RECORDINGS

Envisage
Environmental
Incorporated
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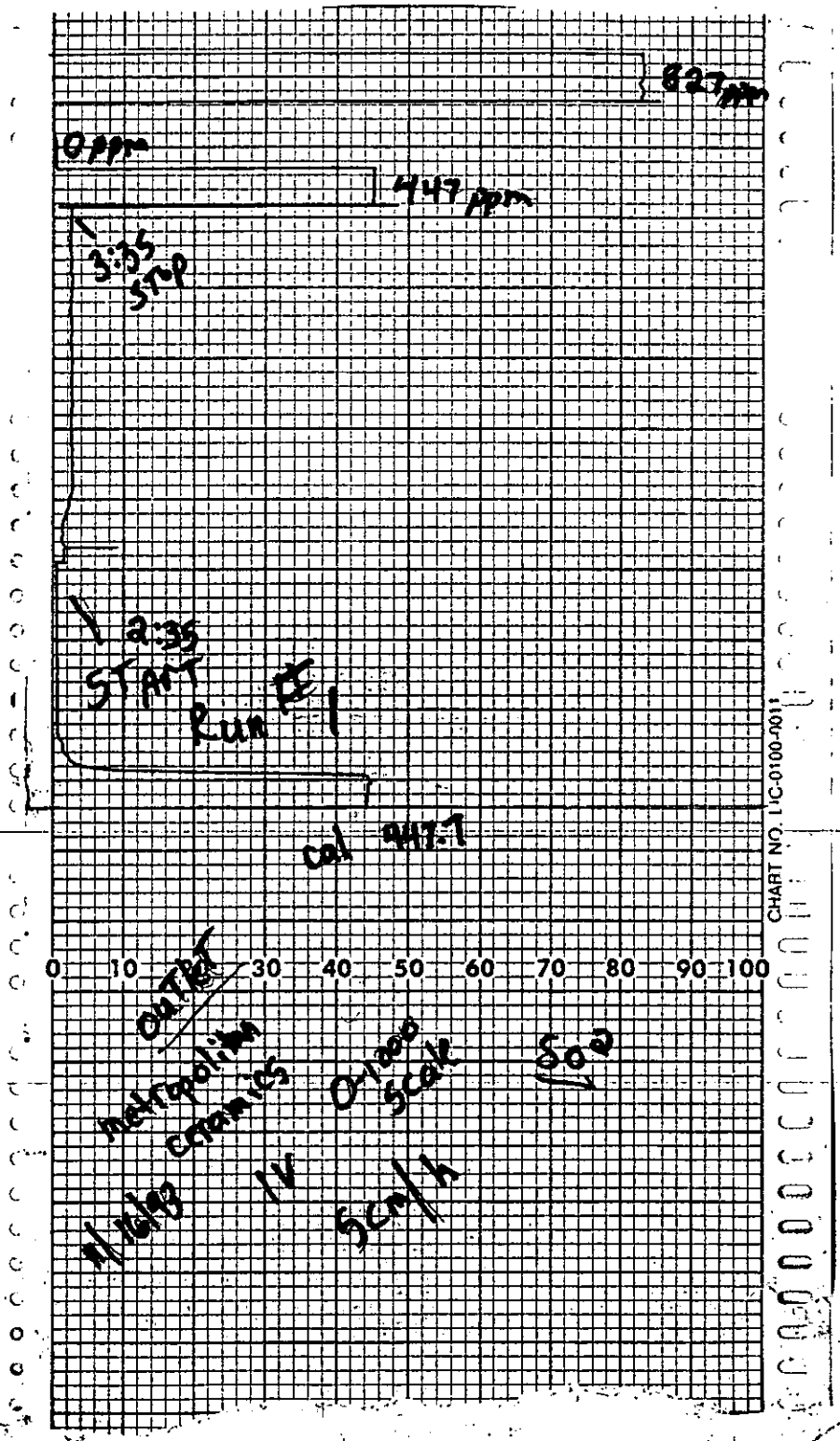
Phone (216) 526-0990


627 ppm
0 ppm
947 ppm
3:35 STOP
2:35 START
Run #1
cal 947.1
0 10 20 30 40 50 60 70 80 90 100
outlet
Metropolitan
Alfred ceramics
1V
0-1000 scale
SO2
5cm/h
CHART NO. 11C-0100-9011

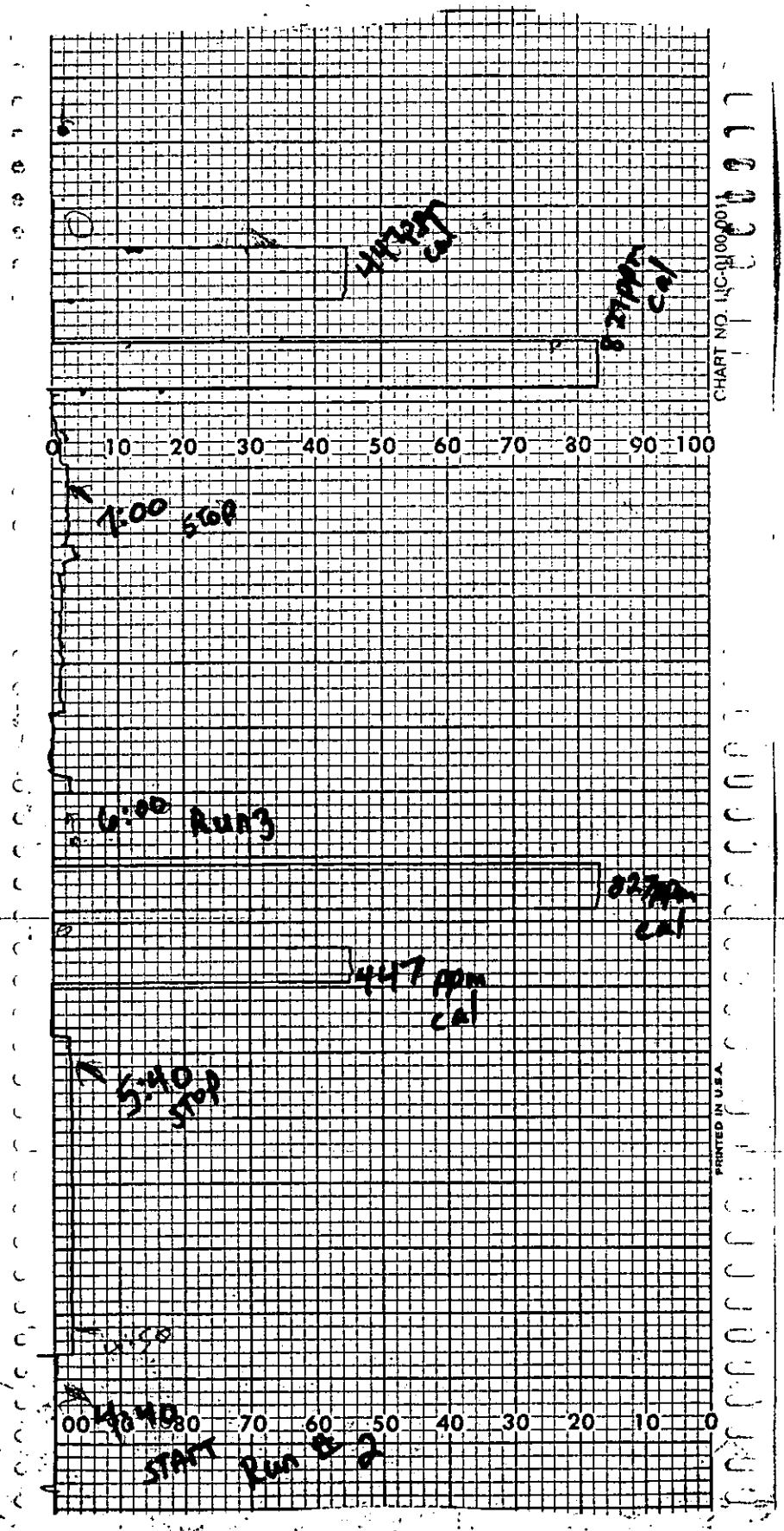


CHART NO. MC-0100-0011
0 10 20 30 40 50 60 70 80 90 100
447 ppm cal
START cal
1:00 STOP
6:00 RUN3
447 ppm cal
START cal
5:40 STOP
100 90 80 70 60 50 40 30 20 10 0
START RUN #2
PRINTED IN U.S.A.

11/17/93

NO_x

Run #1

PM 49 • 88 ppm Calibration gasses

0-100 scale

0 2:40 = 60 ppm

1. 60 ppm	21. 40	41. 50
2. 60 ppm	22. 45	42. 40
3. 60	23. 40	43. 40
4. 60	24. 40	44. 40
5. 60	25. 50	45. 50
6. 60	26. 50	46. 50
7. 60	27. 55	47. 60
8. 60	28. 50	48. 60
9. 60	29. 50	49. 55
2:50 10. 60	3:10 30. 55	3:30 50. 50
11. 60	31. 50	51. 55
12. 50	32. 55	52. 55
13. 55	33. 55	53. 55
14. 60	34. 55	54. 50
15. 60	35. 50	55. 50
16. 50	36. 50	56. 50
17. 50	37. 50	57. 50
18. 50	38. 50	58. 40
19. 50	39. 55	59. 40
3:00 20. 40	3:20 40. 55	3:40 60. 40

End Cal. 45 ppm for 49 ppm cal gas

89 ppm for 88 ppm cal gas

0 for 0

NO_x

45 / 88 ppm cal gas 0-100 scale

Run 2

4:40	0	40 ppm	.21	50	41 40
	1	45	.22	45	42 40
	2	45	.23	50	43 40
	3	40	.24	45	44 40
	4	50	.25	40	45 40
	5	50	.26	45	46 40
	6	50	.27	45	47 40
	7	50	.28	50	48 40
	8	50	.29	50	49 40
	9	50	5:10 .30	45	5:30 50 40
4:50	10	50	.31	45	51 40
	11	50	.32	40	52 40
	12	50	.33	45	53 40
	13	50	.34	40	54 40
	14	40	.35	40	55 40
	15	45	.36	40	56 40
	16	45	.37	40	57 40
	17	45	.38	40	58 40
	18	45	.39	40	59 35
	19	40	5:20 .40	40	5:40 60 35
5:00	20	45			

Post cal → 48 for 45 ppm cal gas

88 for 88 ppm cal gas

0 for 0

NO_x

Run 3 · 49+88ppm cal gas · 0-100 scale

:00	0	30ppm		
	1	35	21 · 55	· 41 50
	2	30	· 22 60	· 42 45
	3	40	· 23 50	· 43 45
	4	45	· 24 50	· 44 50
	5	50	· 25 50	· 45 50
	6	40	· 26 55	· 46 50
	7	40	· 27 60	· 47 50
	8	50	· 28 55	· 48 40
	9	50	· 29 50	· 49 40
6:10	10	60	6:30 50	6:50 50
	11	60	· 31 50	· 51 50
	12	60	· 32 50	· 52 55
	13	60	· 33 50	· 53 55
	14	50	· 34 50	· 54 50
	15	50	· 35 55	· 55 50
	16	50	· 36 50	· 56 50
	17	55	· 37 55	· 57 50
	18	50	· 38 50	· 58 55
	19	55	· 39 50	· 59 60
6:20	20	50	· 6:40 40	· 60 60

Post cal — for 49ppm cal gas

for 88ppm cal gas

unglazed ceramic tile

STACK TEST
OBSERVATION REPORT
METROPOLITAN INDUSTRIES
15 76 05 1149 P006
NOVEMBER 17 & 18, 1993

On the above date, I arrived at Metropolitan Industries, located at 1201 Millerton Rd. SE on the outskirts of Canton, to observe a stack test on a new 150' stainless steel stack for P006. This source is the #3 tunnel kiln for the tile "firing". At that time, the #3 tunnel kiln was the only kiln connected to the stack. The #1 & #2 kilns are scheduled to be connected to the stack some time in December of 1993. The ductwork is run to the current #1 & #2 kiln emission stacks, but the final connections have not been made. These ductwork extensions were sealed off from the outside air (at this time since not connected) by valves installed for such a purpose as to isolate each kiln exhaust, if necessary. These valves were in the closed position during all testing. The testing was to be done by Envisage Environmental Inc. The weather on November 17, was cold and rainy. In fact, tornado warnings were issued for Stark County. Because of the conditions, it was determined to postpone the particulate and Hf portion of the test, and to run only that for SO_2, NO_x and CO. The rest of the parameters would be done on the 18th. My contacts were Mr. Philip McGuinness of Metropolitan, and Eric Hevener & James Gray of Envisage on the 17th, and Greg Sinkovich of Envisage on the 18th. My job was to observe the test runs and to conduct VE observations utilizing Method 9.

The information obtained from Philip McG. concerned the P006 source. The maximum temperature in the peak compartment was running at 1150°C. The feed rate was set at 90% capacity (36 cars per day). That is 40 minutes per car. Each car contained 1.848 Tons of tile products. At 90% capacity, that is 66.528 T/D. 100% would be 73.92 T/D These tiles were of the same consistency for the entire test - 40% clay and 60% shale. This particular mixture is called a "250" mix. Tile samples were collected by Philip McG. to correspond to the SO_2 testing. Such tiles were collected ahead of time to correspond to the cars. Once it was calculated which cars were in what position at a particular time during the testing, those tile samples were pulled for composite testing. (At the current time, all composite sample tests are run by Stark Ceramics, with intermittent sample checks done by NSL for cross checking. I received a year to date printout of all the composite sampling that has been done, and the results of the tests. See the attached printout.) Philip McG. also informed me that Envisage was asked by Metropolitan to include two more parameters in their testing, just to document that Metropolitan does not have a problem with them. Those two parameters are VOC and Pb. The VOC was to be run with the other gases, and the Pb would be tested for by a separate sampling train at the time of the Particulate and Hf testing. While talking with Philip McG., he informed me (when he saw the P006 copy of PTI conditions and STC's I had with me) that there was a typo and mistake made, and of which Dan Schiltz, of our office, had already submitted a modification to OEPA for. On page 4 of Application No. 15-883, 14.25 lbs SO_2/yr should read *52.77 lbs SO_2/hr or 19.26 lbs SO_2/hr. The * was to denote combined emissions from P004, P005 and P006.

My observations on the 17th consisted of watching only one run on the gas sampling end of the test. VOC, NO_x, SO_2 and CO were all checked by utilizing CEM's (continuous emission monitors). The SO_2 and CO used strip charts for recording results. The VOC and NO_x recordings were done by hand, every minute. I observed the equipment being calibrated using EPA Protocol 1 gases. Each run was conducted for one hour, with the standardized gases being run after each run to verify the results. Since I only observed the first run, I can only account for what I saw during that time period. Everything appeared scientifically correct, to my knowledge, with the exception of what I observed concerning the SO_2 CEM operation. It appeared that this unit was sensitive to pressure flow of gas through the unit. This is

understandable, and it appeared that all precautions were taken as to control the amount of gas flowing through the unit. All gas samples were feed pumped into a glass manifold which had an excess flow port at the end. A line was run from this manifold to the SO_2 CEM and another pump was installed after the CEM in order to pull the sample through the machine at a steady rate. This setup appeared fine. However, what did not make sense was that the CEM indicated that the standard SO_2 sample readings could be altered by changing the Protocol 1 gas tank regulator setting.(?) As the pressure increased, the concentration increased. After working with the unit to initially calibrate it, the sampling was done and then the standards run through the unit again. However, the regulator was moved in the process of checking the standards instead of leaving it set as it was during the calibration process. In my own personal opinion, this should invalidate the test for SO_2. The following information is what I recorded concerning the standard checks and a quick, visual average of the readings (in ppm) during the stack testing:

POLLUTANT	AVER. TEST RDG.	STD.	✓	STD.	✓	STD.	✓
CO	≈4	702	704	200	192	97.1	83
SO_2	≈22	827	815			447.7	?
NO_x	≈60			88.1	89	49.48	48.5
VOC	≈10	800	750			56	≈50

Results will have to be looked at in order to make a final determination.

My observations on the 18th consisted of doing VE readings on the emissions from the 150' stack while the P006 source was operating at 90% capacity. All dampers were observed being checked to assure they were closed. This test period was to determine particulate, Hf and Pb emission levels, if any. During this testing period, Envisage appeared to have some problems with getting a correct stack temperature and flow rate. Originally, their instruments showed no flow velocity and a stack temperature of about 150°F. Metropolitan checked their stack exhaust temperature at the source and indicated that they were emitting exhaust about 300°F. Without Metropolitan making any adjustments, Envisage kept working and eventually established a stack temperature of about 256°F and a Δp (velocity indicator) of .02" (H_2O). This made sense because the source (P006) is a long way from the stack (about 264'). Before starting, the temperature and velocity were lost again, but Greg Sinkovich was able to re-establish readings. The first two runs were done during periods in which the background for the VE's was a grayish sky. By the third run, the sky had cleared to a blue background. It is assumed that the readings during the third run are more representative of the emissions from the source. Especially since a continuous flow of emissions could be detected while standing directly below the stack before and between the first two runs. Leak check observations could not be made by myself because all equipment was on the stack platform, about 75' above the ground, and in which a safety harness was essential in order to climb the stack ladder. Other than the noted problems, everything else appeared to be o.k.

Rick L. Miller
Staff Field Inspector

METRO BRICK

TK3TESTS.XLS

EMISSION DATA FOR COMPLIANCE TEST 11/17/93 & 11/18/93 TK#3

PRODUCTION CLAY/SHALE SAMPLES FOR SULFUR DETERMINATION

CAR #'s FROM END OF ZONE 6 TO START OF ZONE 2

TEST 1	48,194,183,5,152,30,105,73,173,91,41,9,20,82,21.
TEST 2	5,152,30,105,73,173,91,41,9,20,82,21,81,83,4,130.
TEST 3	152,30,105,73,173,91,41,9,20,82,21,81,83,4,130,107.

SAMPLES TO NSL	% SULFUR	SAMPLES TO STARK		% SULFUR	AVERAGE % SULFUR
TEST 1	**0.059**	TEST 1	A	**0.076**	
			B	**0.072**	**0.069**
TEST 2	**0.055**	TEST 2	A	**0.068**	
			B	**0.07**	**0.06433**
TEST 3	**0.04**	TEST 3	A	**0.06**	
			B	**0.076**	**0.05867**

CARBON AND SULFUR TESTING 1993

DAILY CLAY/SHALE SAMPLES OF 10gms TOTAL COLLECTED TO REPRESENT THE DAYS PRODUCTION COLOR, ACCUMULATED FOR A 7 DAY PERIOD, TO GIVE A COMPOSITE SAMPLE FOR TESTING AT STARK CERAMICS FOR CARBON AND SULFUR CONTENT

3.10.93 MONTHLY AVERAGE SULFUR % NOT TO EXCEED 0.1 %S limit

E.G. 310 PRODUCTION COLOR (70% SHALE, 30% CLAY) REPRESENTED BY 7gms SHALE AND 3gms CLAY

SAMPLE DATES	PRODUCTION COLORS		CARBON %	SULFUR %	TOTAL %	MONTH AVER.% SULFUR	KILN Schedule c.p.d	Average Wet Tons/car	WetTons Kiln/day	Dry Tons TOTAL /kiln/day
12/30...1/10	507,57x		0.21	0.126	0.336		35	2.2	77	64.68
1/11...1/17	57x,105		0.229	0.136	0.365		35	2.2	77	64.68
1/18...1/24	105,107		0.233	0.134	0.367		35	2.2	77	64.68
1/25...1/31	105\107308250		0.219	0.212	0.431	0.152	35	2.2	77	64.68
2/1...2/7	250,350	#3 B/jay	0.241	0.052	0.293		35	2.2	77	64.68
2/8...2/14	310		0.241	0.188	0.429		35	2.2	77	64.68
2/15...2/21	310,31X		0.277	0.11	0.387		35	2.2	77	64.68
*2/22...2/28	31X,507		0.151	0.104	0.255	0.10	35	2.2	77	64.68
*3/1...3/7	507,		0.22	0.082	0.302		32-3.4.93	2.2	73	61.512
3/8...3/14	507,101,57X		0.293	0.136	0.429		35-3.12.9	2	70	58.992
3/15...3/21	57X,15X		0.266	0.092	0.358		35	2	70	58.8
3/22...3/28	15X,105		0.241	0.09	0.327		32-3.28.9	2.2	70	58.8
3/29...4/4	310		0.147	0.176	0.323	0.1144	32	2.2	70	58.8
4/5...4/11	310,31X	FL	0.223	0.068	0.291		32	2.2	70	58.8
4/12...4/18	31X,505		0.226	0.124	0.35		32	2.2	70	58.8
4/19...4/25	505,107		0.289	0.208	0.497		32	2.2	70	58.8
4/26...5/2	107,308,250	Sad/Brk	0.223	0.14	0.363	0.135	32	2.2	70	58.8
*5/3...5/9	250,105,		0.272	0.178	0.17	0.45	32	2.2	70	58.8
*5/10...5/16	105,507		0.368	0.182	0.17	0.55	32	2.2	70	58.8
*5/17...5/23	507,57X		0.285	0.238	0.19	0.523	32	2.2	70	58.8
*5/24...5/30	57X,310		0.285	0.196	0.15	0.481	0.198	0.1	32	2.2	70	58.8
5/31...6/6	310		0.118	0.078	0.196		35-6.1.93	2.2	77	64.68
6/7...6/13	310,31X	S of clays	0.227	0.086	0.313		35	2.2	77	64.68
6/14...6/20	31X,109		0.159	0.078	0.237		35	2.2	77	64.68
6/21...6/27	109,240,107		0.245	0.12	0.365	0.0905	35	2.2	77	64.68
6/28...7/4	507		0.166	0.188	0.354		35	2.2	77	64.68
7/5...7/11	507,57X		0.191	0.132	0.323		39-7.7.93	2.2	85.8	72.072
7/12...7/18	57X		0.234	0.09	0.324		40-7.13.93	2.2	88	73.92
7/19...7/25	57X,105	New North	0.288	0.314	0.602		40	2.2	88	73.92
7/26...8/1	240,250,	No grog	0.178	0.099	0.277	0.1646	40	2.2	88	73.92
8/2...8/8	308,310		0.248	0.105	0.353		38-8.2.93	2	76	63.84
8/9...8/15	310		0.13	0.01	0.14		40-8.5.93	2.2	88	73.92
8/16...8/22	310,350,31X	31X MIX	0.181	0.058	0.239		40	2.2	88	73.92

To date Average	0.1293	M/LOW	0.1317
ALL FIGS		M/HIGH	0.1357
		av of avs	

* SAMPLES SENT TO NSL FOR CROSS CHECKS

CARBON AND SULFUR TESTING 1993

DAILY CLAY/SHALE SAMPLES OF 10gms TOTAL COLLECTED TO REPRESENT THE DAYS PRODUCTION COLOR, ACCUMULATED FOR A 7 DAY PERIOD, TO GIVE A COMPOSITE SAMPLE FOR TESTING AT STARK CERAMICS FOR CARBON AND SULFUR CONTENT

E.G. 310 PRODUCTION COLOR (70% SHALE, 30% CLAY) REPRESENTED BY 7gms SHALE AND 3gms CLAY

SAMPLE DATES	PRODUCTION COLORS		CARBON %	SULFUR %	TOTAL %		KILN Schedule c.p.d	Average Wet Tons/car	WetTons Kiln/day	Dry Tons TOTAL /kiln/day
8/23...8/29	31X,310,101	SMPL "B"	0.171	0.07	0.241	0.0608	38	2.2	83.6	70.224
8/30...9/5	101,BISQ	SMPL "B"	0.256	0.178	0.434		37	2.2	81.4	68.376
9/6...9/12	507clay grog	SMPL "B"	0.21	0.182	0.392		38-9.5.93	2.2	83.6	70.224
9/13...9/19	507,57X	SMPL "B"	0.243	0.13	0.373		39—40	2.2	85.8	72.072
9/20...9/26	57X		0.24	0.186	0.568		40	2.2	88	73.92
9/27...10/3	57X . 107 . 310	310 80:20	0.231	0.168	0.405	0.1688	38—40	2.2	88	73.92
10/4...10/10	310		0.157	0.048	0.205		40—38	2.2	88	73.92
10/11...10/17	310,31X	labtstcly	0.116	0.044	0.16		40	2.2	88	73.92
10/18...10/24	31X,105	prodtstcly	0.202	0.134	0.336		40	2.2	88	73.92
10/25...10/31	105,15X308250						40	2.2	88	73.92
11/1...11/7	250,507						35	2.2	77	64.68
11/8...11/14	507						36	2.2	79.2	71.28
11/15...11/21									0	0
11/22...11/28									0	0
11/29...12/5									0	0
12/6...12/12									0	0
12/13...12/19									0	0
12/20...12/26									0	0

To date Average	0.1287	M/LOW	0.128
ALL FIGS		M/HIGH	0.1311
		av of avs	

YEAR	1993 AVERAGE %

* SAMPLES SENT TO NSL FOR CROSS CHECKS

SCHEDULE 0F 40 c.p.d thru'put 73.92 tons/day 2.2 tons average /car*0.64(-16% for moisture content)

0.1287% S IS EQUAL TO 69.4486 TONS SO2/KILN/YEAR

0.1311% S IS EQUAL TO 70.7437 TONS SO2/KILN/YEAR

Envisage Eric Hevener } wed.
James Gray }
Greg Sinkovich - Thurs.

Particulate Sampling - Observation Checklist

Date: 11/17/93 & 11/18/93
Observer(s): Rick L. Miller - Canton LAA

Facility: Metropolitan Industries 15 76 05 1149
Source: P006 #3 Kiln (Tunnel Kiln)
Test Firm: Envisage Environmental Inc.

Sampling Method(s):
RM 5 [X]; 5A [ ]; 5B [ ]; 5D [ ]; 5E [ ]; 5F [ ]; 8 [ ]; 12 [ ]; 17 [ ];
or other [X] (If other, please describe.) 1-5, 6C, 7E, 10 & 13A

Are there any modifications to the specified reference method(s)?
Yes [ ]; No [X] (If yes, please describe modification.) _____

Do the inlet (if applicable) and outlet sampling locations meet the requirements specified in RM 1?
Yes [X]; No [ ] (If no, how was (were) the location(s) modified to allow sampling?) _____

If inlet/outlet sampling is being performed, are the samples being taken simultaneously? N/A
Yes [ ]; No [ ] (If no, be sure that the source operating parameters are the same when they switch from one to the other.)

If cyclonic flow is present and other sampling locations do not exist, how will the samples be withdrawn? NA
Directional probe technique [ ]; Alignment technique [ ]; other [ ]
(If other, please describe.) _____

Is the sampling train set up properly, in accordance with the reference method or as agreed upon in the pre-test meeting?
Yes [X]; No [ ] (If no, correct problems and continue, if possible.)

Check to ensure that the sampling equipment has been recently calibrated (i.e., meter box, thermometers/thermocouples, pitot tubes, etc.) OK [X]; not OK [ ]

Type of filter: Glass fiber
Is the filter assembly positioned properly?
Yes [X]; No [ ] (If no, adjust and continue, if possible. Please note that the filter may be changed during the test run; however, it is recommended that the entire filter assembly be changed.)

CO ~24	702	704	200	192	97.1	83
SO_2 ~22	827	815			447.7	
NO_x ~60			88.1	89	49.48	48.5
VOC ~10	800	750			56	~50

blue - gas std. red - corresponding reading on instrument

is less. If the sampling was stopped during the test run to change a sampling train component, be sure the sampling train is leak-checked again.)

Periodically record readings from the test firm's raw data sheet(s) (i.e., delta H, delta P, initial gas volume, filter numbers, filter box temperatures, etc.). Or photocopies of the raw data sheets may be requested from the test firm. (Attach the readings and/or photocopies to this checklist.)

Check to ensure that the sample train recovery procedures are conducted properly (i.e., filter handling, probe wash, liquid transfers, appropriate sample recovery solution(s), recovery of nozzel catch, etc.).

Will there be additional sampling and/or analyses performed (i.e., particle size distributions, back-half analysis, HCl analysis, metals analysis, etc.)?
Yes [X]; No [] (If yes, please describe.) (3A) F Hf acid gases (6C) SO_2 (7E) NO_x (10) CO

Methanol & bag for VOC & PM analysis done also to document results for their own purpose.

Optional checks/verifications:

The test firm may be asked to do a ten (10) minute run on their dry gas meter for calibration verification. Operate the meter at the delta H setting obtained from the test firm's calibration sheet. Record the volume collected, the dry gas meter temperature and the barometric pressure. Calculate a dry gas meter calibration check value, Yc, as follows:

$$Yc = \frac{10}{Vm}\left[\frac{0.0319 * Tm}{Pbar}\right]^{1/2}$$

Where:

Yc = dry gas meter calibration check value (dimensionless)
10 = ten minute verification run

Compare the Yc value with the dry gas meter calibration factor Y to determine that: $0.97\ Y < Yc < 1.03\ Y$. If the Yc value is not within this range the meter should be recalibrated and if completed the run and/or test should be voided.

The test firm may be required to perform at least one actual moisture determination. (This check should be performed after the first run.)

Measure or have the test firm remeasure the nozzle diameter to verify it's calibration. (This should be performed for each nozzle utilized.)

Control Equipment - Compliance Demonstration Checklist

Electrostatic Precipitators (ESP):

Type (i.e., hot-side, cold-side, etc.): _____

Number of chambers (sections): _____
Number of fields/chamber: _____
Number and identification of the fields out of service during the test period: _____

Indicate the secondary voltage and current for each operating field: _____

Indicate the spark rate from each operating field:

Indicate the ESP's rapping sequence: _____

Indicate the temperature necessary to bring the ESP on line:

Additional information or comments: _____

* * * * * * * *

Fabric Filter (baghouse):

Type of filtration (pulse jet, reverse air, shakers, etc.):

Number of compartments: _____
Number of bags/compartment: _____
Indicate pressure drop: _____
Indicate operating temperature: _____
Indicate the flow rate to the system: _____
Indicate the bag cleaning sequence: _____
Additional information or comments: _____

* * * * * * *

1201 Millerton Rd. SE
Canton, OH 44707
Mr. Philip McGuinness 484-8483

Ohio EPA Source Number	Source Identification/ Description	BAT Determination	Applicable Federal and OAC Rules	Permit Allowable Mass Emissions and/ or Control & Usage Requirements
P006	Natural Gas Fired Tile Tunnel Kiln; Kiln #3	Limit of Sulfur Content in Raw Materials; Limit Of Amount of Raw Materials Used In a Day; Natural Gas Usage; 45 meter High Stack For Sources P004, P005 and P006	3745-31-05 3745-17-07 3745-18-06 (D)(1) 3745-17-11	3 lbs PM/hr 13.14 tons PM/yr 14.25 lbs SO_2/yr *231.13 tons SO_2/yr 5 lbs NO_x/hr 21.9 tons NO_x/yr 2.2 lbs Fluorides/ hr; 9.64 tons Fluorides/yr

*52.77 lbs SO_2/hr. or 19.26 lbs SO_2/hr Modification

* The combined SO_2 emissions from P004, P005 and P006.

SUMMARY
TOTAL PERMIT TO INSTALL ALLOWABLE EMISSIONS

Pollutant	Tons/Year
SO_2	231.13 **
PM	13.14
NO_x	21.9
Fluorides	9.64

** Combined emissions from P004, P005 and P006.

PERFORMANCE TEST REQUIREMENTS

The permittee shall conduct, or have conducted, performance testing on the air contaminant source(s) in accordance with procedures approved by the Agency. Two copies of the written report shall be submitted and signed by the person responsible for the test, describing the test procedures followed and the results of such tests. The Director, or an Ohio EPA representative, shall be allowed to witness the tests, examine testing equipment, and require the acquisition or submission of data and information necessary to assure that the source operation and testing procedures provide a valid characterization of the emissions from the source and/or the performance of the control equipment.

ADDITIONAL SPECIAL TERMS AND CONDITIONS

1. The sulfur content of the raw materials (clay and shale) used in kilns [#1 (P004), #2 (P005) and #3 (P006)] shall not exceed .157% on a monthly weighted average. This limit may be adjusted based on the stack test results after startup. A weekly analysis of sulfur content taken from daily clay and shale samples should be determined.

   At any one time, only two the three kilns can be using a 100% clay mix with no shale. The third kiln must be using a mix with a shale content of at least 40%.

   No more than 79 tons of raw materials shall be used in each kiln in any one day.

   The facility shall maintain monthly records which:

   1. list the average sulfur content (percent) of daily clay and shale composite samples;
   2. list the clay and sulfur content of mixes used in each kiln each day; and
   3. list the daily tonnage of the clay and shale used in each kiln.

   These monthly records shall be retained in the facility files for at least two (2) years and shall be made available for inspection upon request of the Director or any authorized representative of the Director during normal business hours.

   This facility shall submit quarterly reports to the Canton City Health Department, Air Pollution Control Division, 420 Market Ave North, Canton, Ohio 44702, which summarize:

   1. the monthly weighted average sulfur content of the raw materials (clay and shale) used;
   2. the daily clay and shale content of raw material used; and
   3. the daily tonnage of the raw materials (clay and shale) used in each of the three kilns.

   These quarterly reports shall be submitted by February 15, May 15, August 15 and November 15 of each year and shall cover the previous calendar quarter.

2. The stack servicing kiln (P006) will be a minimum of 45 meters high above the ground.

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PLANT Nevo. Ceram DATE 11/15 RUN# 1 CASE# 45 LOCATION page 1 of 3

POINT NUMBER	SAMPLE TIME	GAS METER READING	VELOCITY HEAD √Δp	ORIFICE PRESSURE	STACK TEMP	GAS METER TEMP IN	GAS METER TEMP OUT	PUMP VACUUM	FILTER HOLDER	IMPINGER TEMP
1	0/11:21	843.50	.02	1.7	262	58	55	4	250	45
2	2.5	845.55	.02	1.7	262	63	67	4	250	48
3	5	847.55	.02	1.7	262	74	69	5	250	48
4	7.5	849.47	.02	1.7	265	76	69	5	245	48
5	10	851.45	.02	1.7	265	77	66	5	249	48
6	12.5	853.55	.02	1.7	265	78	67	5	250	48
7	15	855.36	.02	1.7	265	79	68	5	250	48
8	17.5	857.35	.02	1.7	265	80	69	5	250	48
9	20	859.78	.03	2.5	264	81	67	5	250	48
10	22.5	861.70	.02	1.7	264	81	68	5	250	48
11	25	863.65	.02	1.7	264	82	68	5	250	48
12	27.5	865.70	.02	1.7	261	81	66	5	250	45
1	30	867.63	.02	1.7	260	66	62	5	250	45
2	32.5	869.56	.02	1.7	256	70	67	5	250	47
3	35	871.59	.02	1.7	256	75	68	5	242	48
4	37.5	873.56	.02	1.7	256	79	69	5	250	48
5	40	875.60	.02	1.7	260	79	65	5	250	48
6	42.5	877.52	.02	1.7	260	81	68	5	250	48
7	45	879.52	.02	1.7	261	81	67	5	250	48
8	47.5	881.42	.01	.84	261	81	69	4	250	45
9	50	882.56	.01	.84	261	80	69	4	250	48
10	52.5	884.29	.01	.84	260	80	70	4	250	48
11	55	885.70	.01	.84	260	79	70	4	250	48
12	57.5	887.13	.01	.84	266	79	69	4	250	48
	60/12.36	888.56								

SAMPLE TRAIN LEAK CHECKS

PRE-TEST 0 CFM @ 15 "Hg POST-TEST 0 CFM @ 15 "Hg

PITOT TUBE LEAK CHECKS

PRE-TEST #2 0 @ 6.0 POST-TEST #2 0 @ 6.5
#4 0 @ 6.5 #4 0 @ 6.5

HF

PLANT Tesoro Corp DATE 11/18/14 RUN# 2 CASE# 83 LOCATION page 2 of 3

POINT NUMBER	SAMPLE TIME	GAS METER READING	VELOCITY HEAD Δp	√Δp	ORIFICE PRESSURE	STACK TEMP	GAS METER TEMP IN	GAS METER TEMP OUT	PUMP VACUUM	FILTER HOLDER	IMPINGER TEMP
01	0/1:29	888.83	.02		1.7	256	80	70	4.0	238	50
2	2.5	890.89	.02		1.7	259	81	70	4.0	240	50
3	5	892.90	.02		1.7	260	82	71	4.0	240	50
4	7.5	894.87	.02		1.7	260	82	72	4.0	241	50
5	10	896.91	.02		1.7	259	83	72	4.0	242	50
6	12.5	898.86	.02		1.7	260	83	72	4.0	243	51
7	15	900.82	.02		1.7	260	85	72	4.0	244	52
8	17.5	902.79	.02		1.7	259	84	73	4.0	245	52
9	20	904.78	.02		1.7	259	85	73	4.0	246	54
10	22.5	906.75	.02		1.7	258	85	73	4.0	246	54
11	25	908.76	.01		.84	258	85	74	4.0	248	54
12	27.5	910.19	.01		.84	259	85	74	4.0	249	55
1	30	911.68	.02		1.7	257	84	73	4.0	245	55
2	32.5	913.59	.02		1.7	254	84	73	4.0	244	55
3	35	915.55	.02		1.7	256	82	73	4.0	243	57
4	37.5	917.52	.02		1.7	256	82	73	4.0	242	57
5	40	919.46	.02		1.7	257	83	74	4.0	240	58
6	42.5	921.48	.02		1.7	257	84	75	4.0	240	58
7	~~40~~ 45	923.43	.02		1.7	258	85	75	4.0	242	59
8	~~42.5~~ 47.5	925.37	.02		1.7	259	86	75	4.0	243	60
9	~~45~~ 50	927.35	.02		1.7	259	86	75	4.0	245	60
10	~~47.5~~ 52.5	929.20	.02		1.7	260	86	75	4.0	247	62
11	55	931.23	.01		.84	260	87	75	4.0	248	62
12	57.5	933.20	.01		.84	259	87	75	4.0	250	62
240	60/	934.66									

SAMPLE TRAIN LEAK CHECKS

PRE-TEST 0 CFM @ 12 "Hg POST-TEST 0 CFM @ 15 "Hg

PITOT TUBE LEAK CHECKS

PRE-TEST #2 @ 6.5 POST-TEST #2 @ 6.5

#1 @ 6.5 #1 @ 6.5

PLANT Metro Ceramics DATE 18 Nov 93 RUN# 3 CASE# 64 LOCATION page of

POINT NUMBER	SAMPLE TIME	GAS METER READING	VELOCITY HEAD Δp	Δp	ORIFICE PRESSURE	STACK TEMP	GAS METER TEMP IN	GAS METER TEMP OUT	PUMP VACUUM	FILTER HOLDER	IMPINGER TEMP
1	0 322	938.19	.02		1.7	256	80	72	4.0	238	52
2	2.5	940.35	.02		1.7	258	80	72	4.0	238	52
3	5	942.19	.02		1.7	254	82	72	4.0	239	52
4	7.5	944.28	.02		1.7	253	82	73	4.0	240	54
5	10	946.15	.02		1.7	254	83	73	4.0	240	54
6	12.5	948.14	.02		1.7	252	83	73	4.0	241	55
7	15	950.12	.02		1.7	253	84	74	4.0	242	55
8	17.5	952.10	.02		1.7	254	85	74	4.0	243	55
9	20	954.08	.02		1.7	252	85	74	4.0	244	56
10	22.5	954.04	.02		1.7	253	86	74	4.0	245	56
11	25	957.98	.02		1.7	254	86	74	4.0	245	58
12	27.5	959.92	.02		1.7	254	86	74	4.0	248	58
1	30	961.88	.01		.84	255	87	74	4.0	248	59
2	32.5	963.28	.02		1.7	253	87	75	4.0	250	60
3	35	964.67	.02		1.7	253	88	75	4.0	250	60
4	37.5	966.60	.02		1.7	254	88	75	4.0	252	60
5	40	968.51	.02		1.7	254	88	76	4.0	253	60
6	42.5	970.44	.02		1.7	255	88	76	4.0	254	61
7	45	972.35	.02		1.7	253	87	76	4.0	255	61
8	47.5	974.39	.02		1.7	253	87	76	4.0	255	62
9	50	976.22	.02		1.7	254	87	77	4.0	253	62
10	52.5	978.16	.02		1.7	254	88	77	4.0	252	62
11	55	980.04	.02		1.7	253	88	77	4.0	250	63
12	57.5	982.04	.01		.84	252	88	77	4.0	248	63
	60	983.98									

SAMPLE TRAIN LEAK CHECKS

PRE-TEST 0 CFM @ 15 "Hg POST-TEST 0 CFM @ 15 "Hg

PITOT TUBE LEAK CHECKS

PRE-TEST #2 0 @ 6.2 POST-TEST #2 0 @ 6.3

#4 0 @ 6.4 #4 0 @ 6.4

(P3)

PLANT Metro Ceramics DATE 18Nov93 RUN# 1 CASE# 81 LOCATION page of

POINT NUMBER	SAMPLE TIME	GAS METER READING	VELOCITY HEAD √Δp	ORIFICE PRESSURE	STACK TEMP	GAS METER TEMP IN	GAS METER TEMP OUT	PUMP VACUUM	FILTER HOLDER	IMPINGER TEMP
1	0 ~~1133~~	533.87	.02	2.3	253	102	62	5	235	50
2	2.5	535.83	.02	2.3	251	101	63	5	237	50
3	5	537.98	.02	2.3	260	98	63	5	238	50
4	7.5	540.11	.02	2.3	260	96	63	5	239	50
5	10	542.26	.02	2.3	265	95	63	5	240	51
6	12.5	544.42	.02	2.3	264	95	63	5	240	51
7	15	546.64	.02	2.3	265	94	63	5	242	51
8	17.5	549.10	.02	2.3	264	93	63	5	243	52
9	20	551.25	.03	3.55	263	94	63	5	243	52
10	22.5	553.44	.02	2.3	264	96	63	5	244	52
11	25	555.63	.02	2.3	256	96	63	5	246	52
12	27.5	557.84	.02	2.3	263	96	63	5	248	53
1	30	560.38	.02	2.3	264	95	63	5	250	53
2	32.5	562.49	.02	2.3	265	96	63	5	250	55
3	35	564.70	.02	2.3	256	95	61	5	246	55
4	37.5	566.86	.02	2.3	259	98	62	5	245	55
5	40	569.10	.02	2.3	260	99	62	5	243	55
6	42.5	571.20	.02	2.3	261	101	63	5	240	58
7	45	573.39	.02	2.3	261	101	64	5	240	58
8	47.5	575.55	.01	1.1	263	101	64	5	242	58
9	50	577.17	.01	1.1	264	101	64	5	243	59
10	52.5	578.78	.01	1.1	262	102	64	5	247	60
11	55	580.33	.01	1.1	261	102	65	5	246	60
12	57.5	581.90	.01	1.1	262	101	64	5	245	61
	60	583.47								

SAMPLE TRAIN LEAK CHECKS

PRE-TEST 0 CFM @ 15 "Hg POST-TEST 0 CFM @ 15 "Hg

PITOT TUBE LEAK CHECKS

PRE-TEST #2 0 @ 6.0 POST-TEST #2 0 @ 6.0

#4 0 @ 6.0 #4 0 @ 6.0

PLANT Metro Ceramics DATE 18Nov93 RUN# 2 CASE# 38 LOCATION page of

POINT NUMBER	SAMPLE TIME	GAS METER READING	VELOCITY HEAD Δp	Δp	ORIFICE PRESSURE	STACK TEMP	GAS METER TEMP IN	GAS METER TEMP OUT	PUMP VACUUM	FILTER HOLDER	IMPINGER TEMP
1	0	583.53	.02		2.3	250	86	56	5.0	238	52
2	2.5	585.40	.02		2.3	251	86	56	5.0	240	52
3	5	587.47	.02		2.3	260	89	57	5.0	242	52
4	7.5	589.56	.02		2.3	260	90	56	5.0	245	52
5	10	591.9	.02		2.3	259	89	57	5.0	245	52
6	12.5	593.60	.02		2.3	260	92	58	5.0	240	52
7	15	595.69	.02		2.3	260	93	58	5.5	240	52
8	17.5	597.79	.02		2.3	260	94	57	5.5	238	52
9	20	599.83	.02		2.3	258	95	58	5.5	239	52
10	22.5	601.89	.02		2.3	258	97	61	5.5	246	52
11	25	604.0	.01		1.1	258	97	61	5.5	246	52
12	27.5	605.6	.01		1.1	258	96	62	5.5	246	52
1	30	607.1	.02		2.3	249	94	60	5.0	237	52
2	32.5	609.0	.02		2.3	253	93	59	5.0	240	52
3	35	611.1	.02		2.3	249	94	60	5.0	240	52
4	37.5	613.25	.02		2.3	250	90	60	5.5	245	52
5	40.0	615.30	.02		2.3	250	90	60	5.5	245	52
6	42.5	617.41	.02		2.3	253	89	62	5.5	247	52
7	45	619.50	.02		2.3	255	90	61	5.5	247	52
8	47.5	621.59	.02		2.3	257	90	62	5.5	248	52
9	50	623.70	.02		2.3	255	91	62	5.5	250	52
10	52.5	625.87	.02		2.3	254	92	62	5.5	250	52
11	55	627.50	.01		1.1	254	93	63	5.5	246	52
12	57.5	629.0	.01		1.1	255	87	62	5.5	248	52
	60	630.4									

SAMPLE TRAIN LEAK CHECKS

PRE-TEST 0 CFM @ 15 "Hg POST-TEST 0 CFM @ 15 "Hg

PITOT TUBE LEAK CHECKS

PRE-TEST #2 0 @ 6.5 POST-TEST #2 0 @ 6.5

#4 0 @ 62 #4 0 @ 6.2

RUN #3 38

(P6)

PLANT Metro Ceramics DATE 18Nov93 RUN# 3 CASE# 16 (RUN 3) LOCATION page of

POINT NUMBER	SAMPLE TIME	GAS METER READING	VELOCITY HEAD Δp	√Δp	ORIFICE PRESSURE	STACK TEMP	GAS METER TEMP IN	GAS METER TEMP OUT	PUMP VACUUM	FILTER HOLDER	IMPINGER TEMP
1	0	630.6	.02		2.30	250	97	65	6.0	240	54
2		632.67	.02		2.30	250	98	66	6.0	243	54
3	5	634.45	.02		2.30	253	99	69	6.0	242	54
4		636.54	.02		2.30	251	92	65	6.0	242	54
5	10	638.39	.02		2.30	251	91	65	6.0	245	54
6		640.50	.02		2.30	253	90	65	6.0	248	54
7	15	642.35	.02		2.30	252	90	65	6.0	250	54
8		644.32	.02		2.30	252	90	65	6.0	250	54
9	20	646.30	.02		2.30	254	92	66	6.0	254	54
10		648.29	.02		2.30	252	92	65	6.0	254	54
11	25	650.25	.02		2.30	251	93	65	6.0	255	54
12		652.15	.02		2.30	250	93	67	6.0	254	54
1	30	654.20	.01		1.10	251	94	66	5.0	250	54
2		655.70	.01		1.10	249	81	65	5.0	250	54
3	35	657.14	.01		1.10	249	82	65	5.0	249	54
4		658.65	.01		1.10	250	82	64	5.0	251	56
5	40	660.60	.02		2.30	249	84	64	5.0	249	56
6		662.70	.02		2.30	250	88	64	9.0	250	56
7	45	664.79	.02		2.30	251	88	64	9.0	249	56
8		666.90	.02		2.30	252	98	66	9.0	249	56
9	50	668.79	.02		2.30	250	101	66	9.0	245	56
10		671.89	.02		2.30	249	102	67	9.0	249	56
11	55	673.25	.02		2.30	252	103	67	9.0	248	56
12		675.40	.02		2.30	252	103	68	9.0	250	56
	60	677.50									

SAMPLE TRAIN LEAK CHECKS

PRE-TEST 0 CFM @ 15 "Hg POST-TEST 0 CFM @ 15 "Hg

PITOT TUBE LEAK CHECKS

PRE-TEST #2 0 @ 6.5 POST-TEST #2 0 @ 6.5

#4 0 @ 6.2 #4 0 @ 6.2

APPENDIX K

OEPA STACK TEST REVIEW SUMMARY FORM

APPLICATION NUMBER 15760511149 P006

FACILITY NAME METROPOLITAN CERAMICS

SOURCE DESCRIPTION (OR SCC CODE) KILN No. 3

CONTROL EQUIPMENT NONE

DATE(S) OF TEST NOV 17-18, 1993

FINAL TEST REPORT RECEIVED ON DEC 21, 1993

POLLUTANT(S) TESTED PM, SO_2, NO_x, HF

TEST METHOD 1-5, 6C, 7E, 13

TEST FIRM ENVISAGE ENVIRONMENTAL INC.

EMISSION RATES*:	PM	SO_2	NO_x	HF		PM	SO_2	NO_x	HF
ACTUAL (lb(s)/hr)	.84	1.99	2.92	1.99	ALLOWABLE**	3	14.25	5	2.2

OPERATING RATES*:

DURING TEST** 5544 $\frac{LB}{HR}$ MAXIMUM** 6160 $\frac{LB}{HR}$

EMISSION FACTOR*** ----------

COMMENTS: ALL TESTS PASSED. BIG MARGIN of SO_2 IS BECAUSE MUCH of S WAS CHEMICALLY BOUND TO CLAY AND NOT RELEASED TO BECOME SO_2

I HEREBY VERIFY THAT THE INFORMATION CONTAINED WITHIN THE STACK TEST REPORT HAS BEEN REVIEWED AND IT HAS BEEN DETERMINED THAT THE TEST PROCEDURES, ANALYSES AND CALCULATIONS ARE:

[X] AN ACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

[ ] AN UNACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

12/21/93
DATE OF REVIEW

Mark Sasko
REVIEWED BY

- BASED ON 3 RUN AVERAGE
** SPECIFY APPLICABLE UNITS
*** SPECIFY UNITS OF MASS INPUT

Run # 1

VISIBLE EMISSION OBSERVATION FORM

COMPANY NAME: Metropolitan Industries
LOCATION: 1201 Millerton Rd. SE
LOCATION:
CITY: Canton | STATE: OH | ZIP: 44707

PROCESS EQUIPMENT: Tile Tunnel Kiln #3 | OPERATING MODE: 75 T/D max
CONTROL EQUIPMENT: | OPERATING MODE:

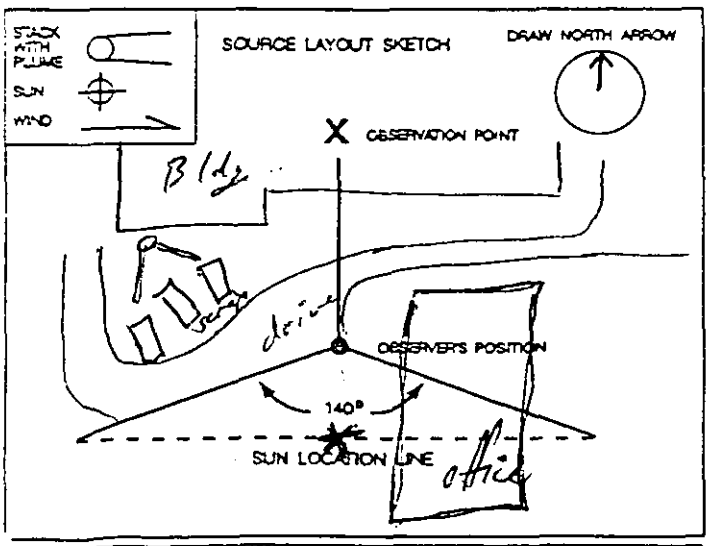
DESCRIBE EMISSION POINT: Top of Rail station stack - 5' in dia.

HEIGHT ABOVE GROUND LEVEL: START ~150' END | HEIGHT RELATIVE TO OBSERVER: START ~150' END
DISTANCE FROM OBSERVER: START ~700' END | DIRECTION FROM OBSERVER: START N END
VERTICAL ANGLE TO OBS. PT.: START 15° END | DIRECTION TO OBS. PT.: START N END

DESCRIBE EMISSIONS: START Continuous END
EMISSION COLOR: START Bluish wht. END | IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐ NA ☑
DISTANCE OF OBSERVATION POINT FROM EMISSION OUTLET: START ~4-5' END

DESCRIBE PLUME BACKGROUND: START sky END
BACKGROUND COLOR: START grey/wht END | SKY CONDITIONS: START broken END
WIND SPEED: START 4-5 mph END | WIND DIRECTION: START E-SE END
AMBIENT TEMP: START 43°F END | WET BULB TEMP: | RH PERCENT:

SOURCE LAYOUT SKETCH



ADDITIONAL INFORMATION:

FORM NUMBER: | PAGE 1 OF 6

OBSERVATION DATE: 11/18/93 | START TIME: 11:23 | END TIME: 11:53

SEC / MIN	0	15	30	45	COMMENTS
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30	0	0	0	5	

OBSERVER'S NAME (PRINT): Rick L. Miller
OBSERVER'S SIGNATURE: Rick L. Miller | DATE: 11/18/93
ORGANIZATION: Canton LAA
CERTIFIED BY: ETA | DATE: 9/93

CONTINUED ON VEO FORM NUMBER:

VISIBLE EMISSION OBSERVATION FORM

DATA REDUCTION TABLE

SET NUMBER	TIME	OPACITY	
	START -- END	SUN	AVERAGE

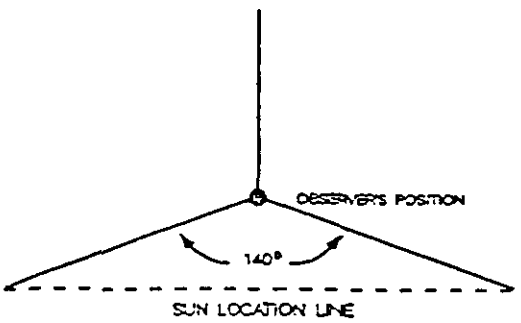
STACK WITH PLUME
SUN
WIND

SOURCE LAYOUT SKETCH

same

X OBSERVATION POINT

DRAW NORTH ARROW



ADDITIONAL INFORMATION

FORM NUMBER | PAGE 2 OF 6

OBSERVATION DATE 11/18/93 | START TIME 11:53 | END TIME 12:23

SEC / MIN	0	15	30	45	COMMENTS
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25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	5	0	5	0	
29	0	0	0	0	
30	0	0	0	0	

OBSERVER'S NAME (PRINT) R.L. Miller

OBSERVER'S SIGNATURE R.L. Miller | DATE 11/18/93

ORGANIZATION Canfor LAA

CERTIFIED BY ETA | DATE 9/93

CONTINUED ON VEO FORM NUMBER

Run #2

VISIBLE EMISSION OBSERVATION FORM

COMPANY NAME: Metropolitan Industries
LOCATION: 1201 Millerton Rd SE.
LOCATION:
CITY: Canton | STATE: OH | ZIP: 44707

PROCESS EQUIPMENT: Tile Tunnel Kiln #3 | OPERATING MODE: 75T/D max
CONTROL EQUIPMENT: | OPERATING MODE:

DESCRIBE EMISSION POINT: Top of Rnd. stainless steel - 5' in dia.

HEIGHT ABOVE GROUND LEVEL	HEIGHT RELATIVE TO OBSERVER
START ~150' END	START ~150' END
DISTANCE FROM OBSERVER	DIRECTION FROM OBSERVER
START ~700' END	START N END
VERTICAL ANGLE TO OBS. PT.	DIRECTION TO OBS. PT.
START 15° END	START N END

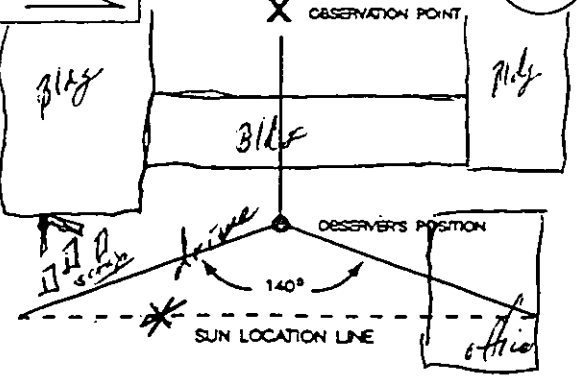
DESCRIBE EMISSIONS: START intermittent END
EMISSION COLOR: START Blend light END
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐ NA ☑
DISTANCE OF OBSERVATION POINT FROM EMISSION OUTLET: START 4-5' END

DESCRIBE PLUME BACKGROUND: START Sky END

BACKGROUND COLOR	SKY CONDITIONS
START gray/wht END	START overcast END
WIND SPEED	WIND DIRECTION
START 1-5 mph END	START E-SE END
AMBIENT TEMP	WET BULB TEMP	RH PERCENT
START 44°F END		

STACK WITH PLUME
SUN
WIND

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



ADDITIONAL INFORMATION:

FORM NUMBER: | PAGE 3 OF 6

OBSERVATION DATE: 11/18/93 | START TIME: 13:25 | END TIME: 13:55

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27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

OBSERVER'S NAME (PRINT): R. K. L. Miller
OBSERVER'S SIGNATURE: R. K. L. Miller | DATE: 11/18/93
ORGANIZATION: Canton LAA
CERTIFIED BY: ETA | DATE: 9/93

CONTINUED ON VEO FORM NUMBER:

VISIBLE EMISSION OBSERVATION FORM

DATA REDUCTION TABLE

SET NUMBER	TIME	OPACITY	
	START -- END	SUM	AVERAGE

FORM NUMBER | PAGE 4 OF 6

OBSERVATION DATE 11/18/93 | START TIME 13:55 | END TIME 14:25

SEC / MIN	0	15	30	45	COMMENTS
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	5	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	*switching points
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
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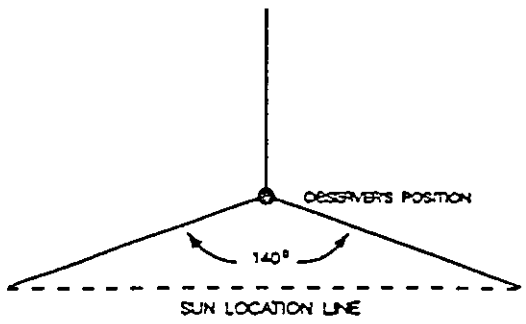
25	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

STACK WITH PLUME
SUN
WIND

SOURCE LAYOUT SKETCH

DRAW NORTH ARROW



OBSERVER'S NAME (PRINT) Rick L. Miller

OBSERVER'S SIGNATURE Rick L. Miller | DATE 11/18/93

ORGANIZATION Canton LAA

CERTIFIED BY ETA | DATE 9/93

OPTIONAL INFORMATION

CONTINUED ON VEO FORM NUMBER

Run #3

VISIBLE EMISSION OBSERVATION FORM

COMPANY NAME: Metropolitan Industries
LOCATION: 1201 Millerton Rd. SE
LOCATION:
CITY: Canton | STATE: OH | ZIP: 44707

PROCESS EQUIPMENT: Tile Tunnel Kiln #3 | OPERATING MODE: 25 T/D max.
CONTROL EQUIPMENT: | OPERATING MODE:

DESCRIBE EMISSION POINT: Top of Rnd. stainless stack - 5' in dia.

HEIGHT ABOVE GROUND LEVEL: START ~15-0' END | HEIGHT RELATIVE TO OBSERVER: START ~150' END
DISTANCE FROM OBSERVER: START ~750' END | DIRECTION FROM OBSERVER: START NE END
VERTICAL ANGLE TO OBS. PT.: START 15° END | DIRECTION TO OBS. PT.: START NE END

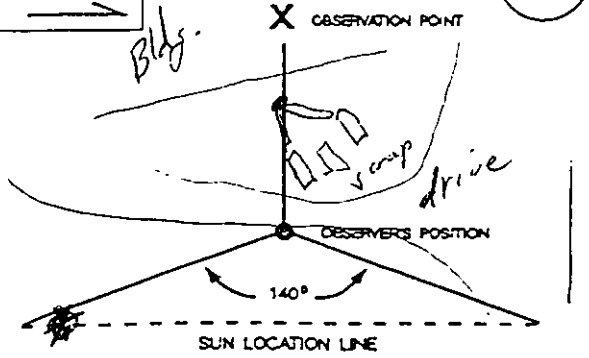
DESCRIBE EMISSIONS: START intermittent END (detached) Continuous
EMISSION COLOR: START Wht. END | IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐ NA ☑
DISTANCE OF OBSERVATION POINT FROM EMISSION OUTLET: START 4-5' END

DESCRIBE PLUME BACKGROUND: START Sky END
BACKGROUND COLOR: START blue END | SKY CONDITIONS: START Scattered END
WIND SPEED: START 1-3 mph END | WIND DIRECTION: START END
AMBIENT TEMP: START 45°F END | WET BULB TEMP: | RH PERCENT:

STACK WITH PLUME
SUN
WIND

SOURCE LAYOUT SKETCH

DRAW NORTH ARROW



ADDITIONAL INFORMATION:

FORM NUMBER: | PAGE 5 OF

OBSERVATION DATE: 11/18/93 | START TIME: 15:21 | END TIME: 15:51

SEC / MIN	0	15	30	45	COMMENTS
1	0	0	0	0	
2	0	0	S	S	excellent blue background
3	S	S	S	S	# bright sun
4	S	S	S	S	
5	S	S	S	S	
6	S	S	S	S	
7	S	S	S	S	
8	S	S	S	S	
9	S	S	S	S	
10	S	S	S	0	
11	S	S	S	S	
12	S	S	S	S	
13	S	S	S	S	
14	0	S	0	S	
15	S	S	S	S	
16	S	S	S	S	
17	S	S	S	S	
18	S	S	S	S	
19	S	S	S	S	
20	S	S	S	S	
21	S	S	S	S	
22	S	S	S	S	
23	S	S	S	S	
24	S	S	S	S	
25	S	S	S	S	
26	S	S	S	S	
27	S	S	S	S	
28	S	S	S	S	
29	S	S	S	S	
30	S	S	S	S	

OBSERVER'S NAME (PRINT): Rick L. Miller
OBSERVER'S SIGNATURE: Rick L. Miller | DATE: 11/18/93
ORGANIZATION: Canton L Ind
CERTIFIED BY: ETA | DATE: 9/93

CONTINUED ON VEO FORM NUMBER:

ETA Revised 05-01-92

VISIBLE EMISSION OBSERVATION FORM

DATA REDUCTION TABLE

SET NUMBER	TIME	OPACITY	
	START -- END	SUM	AVERAGE

FORM NUMBER

PAGE 6 OF 6

OBSERVATION DATE 11/18/93 | START TIME 15:51 | END TIME 16:21

SEC / MIN	0	15	30	45	COMMENTS
1	S	S	S	S	
2	S	S	S	S	
3	S	S	S	S	
4	S	S	S	S	
5	S	S	S	S	
6	S	S	S	S	
7	S	S	0	S	
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14	S	S	S	S	
15	S	S	S	S	
16	S	S	S	S	
17	S	S	S	S	
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23	S	S	S	S	
24	S	S	S	S	
25	S	S	S	S	
26	S	S	S	S	
27	S	S	S	—	sem: - blocked view
28	S	S	S	S	
29	S	S	S	S	
30	S	S	S	S	

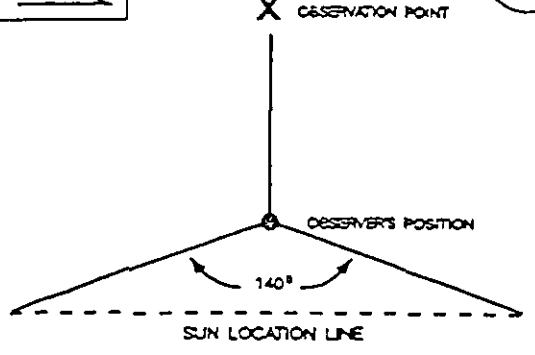
STACK WITH PLUME

SUN

WIND

SOURCE LAYOUT SKETCH

DRAW NORTH ARROW



OBSERVER'S NAME (PRINT) Rick L. Miller

OBSERVER'S SIGNATURE Rick L. Miller | DATE 11/18/93

ORGANIZATION Caaten L.A.A.

CERTIFIED BY ETA | DATE 9/93

ADDITIONAL INFORMATION

CONTINUED ON VEO FORM NUMBER