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: 11.1

Reference Number: 295

Title: *Source Sampling For Particulate Emissions, Stoneco, Inc., Maumee, OH,*

U. S. Environmental Consulting, Inc., Troy, MI,

June 11, 1992.

AP-42 Section 11.1
Reference
Report Sect. 4
Reference ~~294~~ 295

U. S. Environmental Consulting, Inc.
An Environmental/Energy Consulting Company
(Formerly "Safe Air, Inc.")

Particulate Emission Testing
Maumee Asphalt Plant
June 11, 1992

Prepared For:

STONECO, INCORPORATED
P.O. Box 29A
Maumee, Ohio 43537

Prepared By:

U.S ENVIRONMENTAL CONSULTING, INC.
1910 Barrett
Troy, Michigan 48084

June 18, 1992

USEC Project Number: OH059203E

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EXECUTIVE SUMMARY

U.S. Environmental Consulting, Inc. (USEC) was retained by Stoneco, Incorporated to measure the emissions from the Stoneco asphalt plant which is located in Maumee, Ohio. Testing was conducted on June 11, 1992 by USEC personnel Mark Wherrett and Tim Carrier.

The results of testing are as follows:

Stoneco, Maumee Asphalt Plant

Run Number	Flow Rate (SCFM)	Emission Rate (Lbs/Hr)	Emission Concentration (Grains/DSCF)
1	30148	3.021	0.015
2	30595	0.985	0.005
3	31516	1.053	0.005
Average	30753	1.686	0.008

INTRODUCTION

U.S. Environmental Consulting, Inc. (USEC) was retained by Stoneco, Incorporated to perform an emission test at the asphalt plant located in Maumee, Ohio. The purpose of the testing was to measure the particulate emissions from the exhaust stack of the baghouse. Testing was performed on June 11, 1992 by USEC personnel Mark Wherrett and Tim Carrier. Testing was performed under 90%+ operating conditions.

PROCESS DESCRIPTION

This facility is a propane fired, continuous drum mix plant.. The Ohio EPA permitted operating capacity of the plant is 325 tons/hour. During the test, materials used consisted of crushed limestone, gravel, natural or manufactured sand, asphalt cement (grades 10-20), and less than 10 percent recycled asphalt pavement.

The raw materials are fed onto a conveyor system and transported into the dryer. The materials are mixed, dried, and transported to storage silos until use.

SUMMARY OF SAMPLING METHODS

To measure the particulate emissions from the exhaust stack, USEC employed the use of the following U.S. EPA sampling methods (40 CFR, Part 60, Appendix A):

- Method 1 - Sample and Velocity Traverses For Stationary Sources
- Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
- Method 3 - Gas Analysis for Oxygen, Carbon Dioxide, and Percent Excess Air
- Method 4 - Determination of Moisture Content in Stack Gases
- Method 5 - Determination of Particulate Emission From Stationary Sources (Out-Stack Filtration Method)

RESULTS

Maumee Asphalt Plant

Run #	Flow Rate (SCFM)	Production Rate Tons/Hour	Percent Moisture	Emission Concentration (Grains/DSCF)	Emission Rate (Lbs/Hr)
Run 1	30148	283	20.47	0.015	3.021
Run 2	30595	289	21.73	0.005	0.985
Run 3	31516	287	22.56	0.005	1.053
Average	30753	286.3	21.59	0.008	1.686

DISCUSSION OF RESULTS

The result of testing measured an average emission rate of 0.008 grains per DSCF from the exhaust stack of the asphalt plant. These results indicate that the facility was operating below the maximum allowed particulate emission rate of 0.04 grains/DSCF the day the testing took place. No modifications to the sampling methods were performed.

Report Prepared By:

Mark R. Wherrett

Mark R. Wherrett
Manager, Technical Services
Air Quality Group

APPENDIX A

FIELD DATA SHEETS

U.S. ENVIRONMENTAL CONSULTING, INC.
PARTICULATE SAMPLING DATA AND CALCULATIONS

PLANT: STONECO, INC SOURCE: EXHST STACK
DATE: 6/11/92

	CLOCK TIME:	60.00	60.00	60.00
A.	RUN NUMBER	P-1	P-2	P-3
B.	STACK DIAMETER, In	48.000	48.000	48.000
C.	STACK AREA, Sq.Ft	12.57	12.57	12.57
D.	No. SAMPLE POINTS	24.00	24.00	24.00
E.	TOTAL SAMPLE TIME, MIN.	60.00	60.00	60.00
F.	NOZZLE DIAMETER, In.	0.250	0.250	0.250
G.	NOZZLE AREA, Sq.Ft.	0.00034	0.00034	0.00034
H.	CALIBRATION FACTORS:			
	PITOT TUBE, Cp	0.8400	0.8400	0.8400
	GAS METER, y	0.996	0.996	0.996
I.	BAROMETRIC PRESSURE, In.Hg.	30.08	30.10	30.12
J.	STACK STATIC PRESSURE In.H20	0.38	0.38	0.38
K.	STACK GAS TEMP.	269.96	268.38	267.54
L.	AVG. Sq. Rt. VEL. HEAD	0.81	0.81	0.84
M.	AVG. METER TEMP.	82.17	89.17	89.08
N.	AVG. METER PRESS., H20	1.45	1.54	1.63
O.	METER VOL., ACTUAL Cu. Ft.	40.88	40.95	41.92
P.	METER VOL., @STP	40.16	39.75	40.73
Q.	LIQUID VOL., H20 COND., Ml.	218.10	232.80	250.30
R.	VAPOR VOL., H20 COND., @STP, Cu.Ft.	10.34	11.03	11.86
S.	TOTAL GAS SAMPLED, @ STP, Cu.Ft.	50.50	50.78	52.60
T.	%MOISTURE IN EXHAUST GAS 1) AT TEST LOCATION	20.47	21.73	22.56
U.	DRY GAS COMP. %O2	13.3	13.2	14.2
	%CO2	5.0	4.9	4.1
	%CO	0.0	0.0	0.0
	%N2	81.7	81.9	81.7
V.	DENSITY & MOL. Wt. -STACK GAS			
	1)DRY, @ STP,Lbs/Cu.Ft.	0.0758	0.0758	0.0756
	2)WET, @ STP,Lbs/Cu.Ft.	0.0698	0.0694	0.0690
	3)WET @ STACK,Lbs/Cu.Ft.	0.0510	0.0508	0.0506
	4)MOL.Wt., @ STP,Lb/MOLE	29.34	29.32	29.23
W.	WEIGHT OF GAS SAMPLED:			
	1)DRY GAS,Lbs	3.05	3.01	3.08
	2)WET GAS,Lbs	3.53	3.53	3.63
X.	TOTAL PARTICULATE COLLECTED (GRAMS)	0.0383	0.0124	0.0133
Y.	AVERAGE GAS VELOCITY, FPM	3287	3326	3420

Z. STACK GAS FLOW RATE			
1)AT STACK, Qa, ACFM	41301	41795	42975
2)AT Std.,Qstd, SCFM	30148	30595	31516
3)Std. DRY,Qdg, SCFM	23976	23947	24407
AA. PERCENT EXCESS AIR	161	157	193
BB. CONCENTRATION CONVERSION FACTORS:			
1)50% E.A.,AFTER COLLECTOR	1.58	1.55	1.71
2)50% E.A.,BEFORE COLLECTOR	2.01	2.01	2.31
3)MOISTURE BEFORE COLLECTOR	1.16	1.17	1.18
CC. PARTICULATE CONCENTRATION:			
1)Lbs/1000 Lbs., ACTUAL	0.024	0.008	0.008
2)Lbs/1000 Lbs., DRY	0.028	0.009	0.010
3)Lbs/1000 Lbs., WET @ 50%E.A	0.038	0.012	0.014
4)Lbs/1000 Lbs., DRY @ 50%E.A	0.048	0.016	0.019
5)GRAINS / DSCF	0.015	0.005	0.005
6)POUNDS / HOUR	3.021	0.985	1.053
DD. PERCENT ISOKINETIC	102.8	101.8	102.4

++

U.S. ENVIRONMENTAL CONSULTING, INC.

PLANT: STONECO, INC
LOCATION: MAUMEE
DATE: 6/11/92

PARTICULATE EMISSION RATE

TEST No.	TEST DATE	STACK GAS FLOW RATE (DSCFM)	EMISSION CONC. RATE GRAIN PER DSCF	EMISSION CONC. RATE LBS/1000 LBS DRY-GAS	EMISSION CONC. RATE LBS/1000 LBS DRY 50%E A*	EMISSION RATE LBS/ HOUR
P-1	6/11/92	23976	0.015	0.028	0.048	3.021
P-2	6/11/92	23947	0.005	0.009	0.016	0.985
P-3	6/11/92	24407	0.005	0.010	0.019	1.053
AVERAGE		24110	0.008	0.015	0.027	1.686

* E A = EXCESS AIR

U.S. ENVIRONMENTAL CONSULTING, INC.

PITOT TRAVERSE DATA

PLANT:	STONECO,	IPITOT No.	4.00	STACK PRES. In. H20	0.38
DATE:	6/11/92	STACK DIA.	48.00	STACK TEMP. F.	258.54
TIME:	TIME	B.P. In.Hg.	30.08	STACK AREA Sq.Ft.	12.57
				SAMPLE POINTS	24.00
% H2O VOL	21.59	Cp :	0.84	Ps:	30.11

SAMPLE POINTS	SQRT PITOT DELTA	PITOT DELTA	STACK TEMP
1	0.68	0.46	216.00
2	0.72	0.52	225.00
3	0.81	0.66	232.00
4	0.82	0.68	248.00
5	0.88	0.78	253.00
6	0.90	0.81	259.00
7	0.79	0.62	265.00
8	0.76	0.58	270.00
9	0.73	0.53	270.00
10	0.70	0.49	270.00
11	0.70	0.49	268.00
12	0.66	0.44	267.00
13	0.53	0.28	225.00
14	0.66	0.43	250.00
15	0.72	0.52	260.00
16	0.73	0.54	265.00
17	0.80	0.64	268.00
18	0.82	0.67	273.00
19	0.88	0.78	274.00
20	0.87	0.76	273.00
21	0.86	0.74	272.00
22	0.82	0.67	270.00
23	0.78	0.61	267.00
24	0.76	0.58	265.00
AVERAGES:	0.77		258.54

****

1). Vs= 3100.12 (Gs= 0.932)

2). Qs= 38957.27

3). Qscfm= 28915.59 SCFM DRY=22673.76

Vs = 2.9 Cp 60 SQRT(Ts,ave+460)*AVE.SQRT(DELTA-P)*SQRT(29.92/Ps*1/Gs)

Qs = Vs*As AND Qscfm=Qs*530/(Ts+460)*Ps/29.92

U.S ENVIRONMENTAL CONSULTING, INC.

TEST No.: P-1

PLANT:	STONECO, INC	PITOT No:	4.00	CALIBRATION PITOT:	0.8400
DATE:	6/11/92	METER BOX:	1.00	NOZ. DIA. Inches :	0.2500
LOCATION:	MAUMEE	AMB TEMP F.	65.00	STACK DIA. Inches :	48.0000
OPERATOR:	MW	B.P. In.Hg.	30.08	STACK PRESS In. H2O:	0.3800
SOURCE:	EXHST STACK	ASSUMED %M:	20.0	H2O VOL. Ml. :	218.100
LEAK TST:	0.000	METER DEL-H	1.91	METER f:	3.030
Hg INT.:	15.00			Yd:	0.996
LEAK TST:	0.000			SAMPLE PTS:	24
Hg FIN.:	3.00			TOT.TIME:	60.00

****

SAMPLE POINTS	PITOT SQRT	ORIFICE No.	DRY GAS	METER TEMP F	STACK TEMP F	PITOT DELTA
1	0.56	0.61	899.35	75.00	252.00	0.31
2	0.73	1.10	900.50	77.00	242.00	0.54
3	0.85	1.42	901.92	78.00	265.00	0.72
4	0.85	1.41	903.65	78.00	274.00	0.72
5	0.94	1.72	905.30	80.00	276.00	0.88
6	0.94	1.99	907.20	84.00	278.00	0.89
7	0.86	1.67	909.90	84.00	278.00	0.74
8	0.84	1.58	912.00	84.00	278.00	0.70
9	0.80	1.45	913.55	84.00	278.00	0.64
10	0.75	1.27	915.25	85.00	278.00	0.56
11	0.74	1.24	916.82	85.00	277.00	0.55
12	0.72	1.18	918.39	82.00	276.00	0.52
13	0.62	0.90	919.98	80.00	240.00	0.38
14	0.64	0.95	921.40	80.00	253.00	0.41
15	0.67	1.02	922.58	81.00	264.00	0.45
16	0.73	1.19	924.05	82.00	267.00	0.54
17	0.78	1.37	925.58	82.00	270.00	0.61
18	0.81	1.48	927.38	83.00	272.00	0.66
19	0.95	2.04	929.05	84.00	274.00	0.91
20	0.96	2.06	931.00	85.00	284.00	0.93
21	0.95	1.97	933.20	85.00	283.00	0.90
22	0.91	1.86	934.82	85.00	275.00	0.83
23	0.88	1.75	936.70	84.00	272.00	0.78
24	0.85	1.62	938.52	85.00	273.00	0.72
			940.23			
FINAL #	0.81	1.45	40.88	82.17	269.96	

U.S ENVIRONMENTAL CONSULTING, INC.

TEST No.: P-2

PLANT:	STONECO, INC	PITOT No:	4.00	CALIBRATION PITOT:	0.8400
DATE:	6/11/92	METER BOX:	1.00	NOZ. DIA. Inches :	0.2500
LOCATION:	MAUMEE	AMB TEMP F.	70.00	STACK DIA. Inches :	48.0000
OPERATOR:	MW	B.P. In.Hg.	30.10	STACK PRESS In. H2O:	0.3800
SOURCE:	EXHST STACK	ASSUMED %M:	20.00	H2O VOL. Ml. :	232.800
LEAK TST:	0.001	METER DEL-H	1.91	METER f:	3.030
Hg INT.:	14.00			Yd:	0.996
LEAK TST:	0.001			SAMPLE PTS:	24
Hg FIN.:	3.00			TOT. TIME:	60.00

****

SAMPLE POINTS	PITOT SQRT	ORIFICE No.	DRY GAS	METER TEMP	STACK TEMP	PITOT DELTA
1	0.56	0.72	940.74	85.00	255.00	0.31
2	0.59	0.82	941.95	86.00	250.00	0.35
3	0.67	1.03	943.10	86.00	264.00	0.45
4	0.72	1.18	944.70	87.00	270.00	0.52
5	0.77	1.32	946.16	88.00	280.00	0.59
6	0.85	1.61	947.80	88.00	282.00	0.72
7	0.91	1.89	949.48	88.00	270.00	0.83
8	0.91	1.87	951.40	87.00	275.00	0.83
9	0.91	1.86	953.27	88.00	272.00	0.82
10	0.87	1.73	955.18	89.00	268.00	0.76
11	0.86	1.68	957.00	90.00	270.00	0.74
12	0.82	1.53	958.78	90.00	269.00	0.67
13	0.55	0.73	960.51	91.00	225.00	0.30
14	0.71	1.19	961.77	91.00	256.00	0.51
15	0.79	1.42	963.20	91.00	268.00	0.62
16	0.79	1.44	964.86	91.00	272.00	0.63
17	0.86	1.69	966.55	92.00	273.00	0.74
18	0.87	1.70	968.35	92.00	276.00	0.75
19	0.92	1.91	970.20	91.00	275.00	0.84
20	0.94	2.02	972.06	91.00	276.00	0.89
21	0.95	2.03	974.02	88.00	275.00	0.90
22	0.93	1.97	976.00	91.00	276.00	0.87
23	0.92	1.93	977.93	88.00	271.00	0.85
24	0.88	1.75	979.90	91.00	273.00	0.77
			981.69			
FINAL #	0.81	1.54	40.95	89.17	268.38	

U.S ENVIRONMENTAL CONSULTING, INC.

TEST No.: P-3

PLANT:	STONECO, INC	PITOT No:	4.00	CALIBRATION PITOT:	0.8400
DATE:	6/11/92	METER BOX:	1.00	NOZ. DIA. Inches :	0.2500
LOCATION:	MAUMEE	AMB TEMP F.	80.00	STACK DIA. Inches :	48.0000
OPERATOR:	MW	B.P. In.Hg.	30.12	STACK PRESS In. H20:	0.3800
SOURCE:	EXHST STACK	ASSUMED %M:	20.00	H20 VOL. Ml. :	250.300
LEAK TST:	NUMBER	METER DEL-H	1.91	METER f:	3.030
Hg INT.:	NUMBER			Yd:	0.996
LEAK TST:	NUMBER			SAMPLE PTS:	24
Hg FIN.:	NUMBER			TOT. TIME:	60.00

****

SAMPLE POINTS	PITOT SQRT	ORIFICE No.	DRY GAS	METER TEMP	STACK TEMP	PITOT DELTA
1	0.58	0.81	982.01	88.00	237.00	0.34
2	0.67	1.08	983.40	88.00	232.00	0.45
3	0.78	1.40	984.75	87.00	260.00	0.61
4	0.82	1.53	986.50	88.00	268.00	0.67
5	0.87	1.70	988.10	87.00	270.00	0.75
6	0.88	1.74	990.30	86.00	273.00	0.77
7	0.95	2.05	991.80	86.00	274.00	0.91
8	0.96	2.10	993.71	87.00	275.00	0.93
9	0.97	2.14	995.70	87.00	275.00	0.95
10	0.97	2.13	997.75	88.00	274.00	0.94
11	0.95	2.04	999.75	89.00	273.00	0.90
12	0.90	1.85	1001.90	92.00	274.00	0.81
13	0.66	1.04	1003.60	87.00	240.00	0.44
14	0.73	1.26	1005.04	89.00	253.00	0.54
15	0.81	1.49	1006.58	90.00	269.00	0.65
16	0.87	1.73	1008.30	91.00	274.00	0.76
17	0.92	1.93	1009.99	92.00	275.00	0.85
18	0.94	2.00	1011.93	91.00	275.00	0.88
19	0.92	1.93	1013.83	92.00	276.00	0.85
20	0.91	1.88	1015.75	88.00	274.00	0.83
21	0.89	1.80	1017.65	91.00	274.00	0.79
22	0.89	1.80	1019.47	92.00	273.00	0.79
23	0.62	0.86	1021.40	91.00	275.00	0.38
24	0.58	0.77	1022.68	91.00	278.00	0.34
			1023.93			
FINAL #	0.84	1.63	41.92	89.08	267.54	

APPENDIX B

ANALYTICAL SHEETS

U.S. ENVIRONMENTAL CONSULTING, INC.

PLANT: STONECO, INC TEST DATE: 6/11/92 TEST No.:P-1
SOURCE: EXHST STACK WTS. DATE: 6/16/92

****

FRACTION A ACETONE RINSES FRACTION A TOTAL WTS (mg) = 37.38

	ACE. RINSE (mg)	ACE BLANK (mg)	CONT. BLANK (mg)
LIQUID VL	98.00	114.00	
CONT. No.	27	31	30
FIN. WTS.	986.85	937.10	949.60
INT. WTS.	946.20	933.25	949.90
NET WTS.	40.65	3.85	-0.30 mg
CONT CORR	-0.30	-0.30	
NET WTS.	40.95	4.15 mg	
ACE CORR.	3.57		
FINAL WTS	37.38 mg		

FRACTION B FRONT FILTER FRACTION B TOTAL WTS (mg) = 0.90

	TEST FILTER	BLANK FILTER
FILTER No	7	10
FINAL WT.	361.45	350.50
INT. WT.	360.70	350.65
NET WT.	0.75	-0.15 mg
BLK. CORR	-0.15	
FINAL WT.	0.90 mg	

TOTAL WEIGHTS (mg) = 38.29
TOTAL WEIGHTS (g) = 0.0383

(1) DO NOT APPLY ANY WEIGHT LOSS CORRECTION FOR LIQUID BLANKS.

*BLANK CORR. WT.= FINAL USED WT./INITIAL BLANK WT * NET CHANGE IN BLANK
*ACE. CORR. WT.= RINSE LIQ./BLANK LIQ. * BLANK LIQ. GAIN IN WT.

U.S. ENVIRONMENTAL CONSULTING, INC.

PLANT: STONECO, INC TEST DATE: 6/11/92 TEST No: P-2
SOURCE: EXHST STACK WTS. DATE: 6/16/92

****

FRACTION A ACETONE RINSES FRACTION A TOTAL WTS (mg) = 13.72

	ACE. RINSE (mg)	ACE BLANK (mg)	CONT. BLANK (mg)
LIQUID VL	123.00	114.00	
CONT. No.	28	31	30
FIN. WTS.	978.65	937.10	949.60
INT. WTS.	960.75	933.25	949.90
NET WTS.	17.90	3.85	-0.30 mg
CONT CORR	-0.30	-0.30	
NET WTS.	18.20	4.15 mg	
ACE CORR.	4.48		
FINAL WTS	13.72 mg		

FRACTION B FRONT FILTER FRACTION B TOTAL WTS (mg) = -1.35

	TEST FILTER	BLANK FILTER
FILTER No	8	10
FINAL WT.	359.55	350.50
INT. WT.	361.05	350.65
NET WT.	-1.50	-0.15 mg
BLK. CORR	-0.15	
FINAL WT.	-1.35 mg	

TOTAL WEIGHTS (mg) = 12.38
TOTAL WEIGHTS (g) = 0.0124

(1) DO NOT APPLY ANY WEIGHT LOSS CORRECTION FOR LIQUID BLANKS.

*BLANK CORR. WT.= FINAL USED WT./INITIAL BLANK WT * NET CHANGE IN BLANK
*ACE. CORR. WT.= RINSE LIQ./BLANK LIQ. * BLANK LIQ. GAIN IN WT.

U.S. ENVIRONMENTAL CONSULTING, INC.

PLANT: STONECO, INC TEST DATE: 6/11/92 TEST No: P-3
SOURCE: EXHST STACK WTS. DATE: DATE

****

FRACTION A ACETONE RINSES FRACTION A TOTAL WTS (mg) = 12.14

	ACE. RINSE (mg)	ACE BLANK (mg)	CONT. BLANK (mg)
LIQUID VL	69.00	114.00	
CONT. No.	29	31	30
FIN. WTS.	956.95	937.10	949.60
INT. WTS.	942.60	933.25	949.90
NET WTS.	14.35	3.85	-0.30 mg
CONT CORR	-0.30	-0.30	
NET WTS.	14.65	4.15 mg	
ACE CORR.	2.51		
FINAL WTS	12.14 mg		

FRACTION B FRONT FILTER FRACTION B TOTAL WTS (mg) = 1.15

	TEST FILTER	BLANK FILTER
FILTER No	9	10
FINAL WT.	360.60	350.50
INT. WT.	359.60	350.65
NET WT.	1.00	-0.15 mg
BLK. CORR	-0.15	
FINAL WT.	1.15 mg	

TOTAL WEIGHTS (mg) = 13.29
TOTAL WEIGHTS (g) = 0.0133

(1) DO NOT APPLY ANY WEIGHT LOSS CORRECTION FOR LIQUID BLANKS.

*BLANK CORR. WT.= FINAL USED WT./INITIAL BLANK WT * NET CHANGE IN BLANK
*ACE. CORR. WT.= RINSE LIQ./BLANK LIQ. * BLANK LIQ. GAIN IN WT.

APPENDIX C

SAMPLE CALCULATIONS

U.S. ENVIRONMENTAL CONSULTING, INC.
CALCULATION EQUATIONS

A. Run Number
B. Stack Dimensions - inches (in)
C. Stack Area - square feet (ft^2)
D. Total Number of Sample Points
E. Duration of Sample Run - minutes (min)
F. Nozzle Diameter - inches
G. Nozzle Area - ft^2
H. Calibration Factors
   1) Pitot Tube (C_p)
   2) Gas Meter (Y_d)
I. Barometric Pressure - inches of Mercury ("Hg)
J. Static Pressure in Stack - inches of Water ("H_2O)
K. Average Stack Gas Temperature - °F
L. Average Square Root of Velocity Head - ($p^{1/2}$)
M. Average Meter Temperature - °F
N. Average Meter Pressure in inches of H_2O (H)
O. Meter Volume, Actual (Ft^3) = (Final - Initial)
P. Meter Volume @ Standard Temperature and Pressure (STP) =

$$\frac{H_2 * O * (530 * (I + (0.07355 * N)))}{((M + 460) * 29.92)}$$

Q. Liquid Volume of Water Condensed - milliliters (ml)
R. Vapor Volume of Water Condensed @ STP (Ft^3) = Q * 0.04707
S. Total Gas Sampled @ STP (Ft^3) = R + P
T. Percent Moisture in Exhaust Gas
   1) At Test Location = (R/S) * 100
U. Dry Gas Composition
   $\%O_2$
   $\%CO_2$
   %CO
   $\%N_2$
V. Density and Molecular Weight of Stack Gas

   1) Density Dry @ STP (Lbs/Ft^3) =

$$\frac{((\%O_2 * 0.0827) + (\%CO_2 * 0.1137) + ((\%CO + \%N_2) * 0.0724))}{100}$$

   2) Density Moist @ STP (Lbs/Ft^3) =

$$((V_1 * \frac{(100 - T_1)}{100} + (0.0465 * \frac{T_1}{100}))$$

   3) Density Moist Gas @ Stack Conditions (Lbs/Ft^3) =

$$\frac{(V_1 * 530 * (I + (0.07355 * J))}{(K + 460) \quad 29.92}$$

4) Molecular Weight, Dry @ STP (Lb/Lb-Mole) =

$V_1 * 386.9\ Ft^3/Lb\text{-}Mole$

W. Weight of Gas Sampled
1) Dry Gas (Lbs) = $(P * V_1)$
2) Moist Gas (Lbs) = $(S * V_t)$

X. Total Weight of Particulate Collected (grams)

Y. Average Stack Gas Velocity - Feet per Minute (FPM) =

$$\frac{(1096)}{(V_t)^{1/2}} * L * H_1$$

Z. Stack Gas Flow Rate
1) Stack Conditions Q_{actu} = $(C * Y)$
2) Standard Conditions Q_{actu} =

$$\frac{(Z_1 * (530) * (I + (0.07355 * J)))}{(K + 460) \qquad 29.92}$$

3) Standard Dry Conditions Q_{dstd} =

$$Z_t * \frac{(100 - T_1)}{100}$$

AA. Percent Excess Air =

$$\frac{(\%O_2) - (0.5 * \%CO)}{(0.264 * \%N_2) - (\%O_2) + (0.5 * \%CO)}$$

BB. Concentration Conversion Factors:

1) 50% Excess Air After Collector =

$$\frac{V_t + (18 * T_1)/(100 - T_1)}{(0.1826 * \%N_2) - (2.0592 * \%O_2) + V_t + (18 * T_1)/(100 - T_1)}$$

2) 50% Excess Air Before Collector =

$$\frac{V_t + (18 * T_1)/(100 - T_1)}{(0.1826 * \%N_2) - (2.0592 * \%O_2) + V_t + (18 * T_1)/(100 - T_1)}$$

3) Moisture Before Collector =

$$\frac{V_t + (18 * T_1)/(100 - T_1)}{V_t + (18 * T_1)/(100 - T_1)}$$

CC. Particulate Concentrations :

1) Lbs/1000 Lbs Actual = $\frac{(1000 * X)}{(454 * W_1)}$

2) Lbs/1000 Lbs Dry = $(CC_1 * BB_1)$

3) Lbs/1000 Lbs Actual @ 50% Excess Air = $(CC_1 * BB_1)$

4) Lbs/1000 Lbs Dry @ 50% Excess Air = $(CC_1 * BB_1)$

5) Grains/DSCF = $\frac{(X * 7000 * 100)}{(454 * S * (100 - T_1)}$

6) Lbs/Hr = $(Z_1 * V_1 * \frac{(1000 * X * 0.06)}{(454 * W_1)})$

DD. Percent Isokinetic = $\frac{(100 * 29.92 * (K + 460) * S)}{530 * (I + (0.07355 * J)) * E * G * Y}$

Note : Standard Temperature and Pressure = 29.92 in Hg, 70 °F

10/31/91

wp/mw/sample.cal

APPENDIX D

RAW DATA SHEETS

PITOT TRAVERSE DATA

Source: STONECO MAUMEE ASPHALT PLANT

DATE	TIME	PITOT NUMBER	STACK DIMENSION
6/11/92	0540	4	48"

Barometric (P_b)	Static (P_g)	GS	Stack Temp T_s	C_p	Stack Area A_s	WB Temp T_w	Bwo
	.38			.84	12.56		

Sampling Point	Pitot (Δp)	Stack Temp
1	.46	216
2	.52	225
3	.66	232
4	.68	248
5	.78	253
6	.81	259
7	.62	265
8	.58	270
9	.53	270
10	.49	270
11	.49	268
12	.44	267

Sampling Point	Pitot (Δp)	Stack Temp.
1	.28	225
2	.43	250
3	.52	260
4	.54	265
5	.64	268
6	.67	273
7	.78	274
8	.76	273
9	.74	272
10	.67	270
11	.61	267
12	.58	265
$\bar{X}$	.595	258.5

$V_s = 2.9\, C_p 60 \sqrt{T_s}\, \Delta_p \sqrt{\frac{29.92}{P_s}} \cdot \frac{1}{G_s}$ $\quad Q_s = V_s \cdot A_s$

$Q_{scfm} = Q_s \cdot \frac{530}{T_s} \cdot \frac{P_s}{29.92}$

$Q_{scfm} = 30914.7$

V=3173 =
Q_s=39886.4

'92

STACK SAMPLING DATA SHEET

PLANT: STONECO
RUN NUMBER: 1
LOCATION: MAUMEE
DATE: 6/1/92
METER ΔH: 1.511
Yd: 0.996

240 - 690
250 - 700
260 - 710
270 - 720

AMBIENT TEMP: 65
OPERATOR: MW
SAMPLE TRAIN #: 1
BAROMETRIC PRESSURE:
NOZZLE DIAMETER: 0.250
STACK DIAMETER: 48'

POINT	CLOCK TIME	DRY GAS METER FT³	PITOT IN. H₂O ΔP	ORIFICE ΔH, IN. H₂O DESIRED	ORIFICE ΔH, IN. H₂O ACTUAL	PUMP VACUUM, IN.HG GAUGE	STACK TEMP., °F	PROBE TEMP., °F	SAMPLE CASE TEMP., °F	IMPINGER TEMP., °F	DRY GAS TEMP., °F INLET	DRY GAS TEMP., °F OUTLET
715 1	0	899.35	.31	0.61	0.61	1	252	262	272	73	85	85
2	2.5	900.50	.54	1.10	1.10	1.5	242	263	269	56	78	75
3	5	901.92	.72	1.42	1.40	2.0	265	256	270	49	79	76
4	7.5	903.105	.72	1.41	1.41	2.0	274	253	270	49	86	76
5	10	905.30	.88	1.72	1.80	2.0	276	261	271	50	83	77
6	12.5	907.20	.89	1.99	2.00	2.0	278	259	272	59	88	79
7	15	909.90	.74	1.67	1.70	2.0	278	259	272	59	88	79
8	17.5	912.00	.70	1.58	1.60	1.5	278	268	274	64	88	79
9	20	913.55	.64	1.45	1.45	1.5	278	256	273	63	89	79
10	22.5	915.25	.56	1.27	1.30	1.5	278	255	273	64	90	80
11	25	916.82	.55	1.24	1.25	1.5	277	271	271	65	89	80
12	27.5	918.39	.52	1.18	1.20	1.5	276	268	270	66	86	78
745	30	919.98										

2.03

ΔH = 846.72 Cp² D⁴ (1- WV/100)² Md/Ms Ps/Pm Tm/Ts ΔP

Filter # 7

Leak Test Initial 0.0 @ 15
Final 0.0 @ 3

Orsat Measurement					
Test	Time	CO_2	O_2	CO	N_2
1		5.0	13.3		
2		5.0	13.3		
3					

Volume of Liquid Water Collected	Impinger volume, ml (218) 1	2	3	4	Silica Gel weight g
Final	240	156	8		710.6
Initial	100	100	dry	—	696.5
Liquid Collected	140	56	3		14.1

STACK SAMPLING DATA SHEET

PLANT: STONECO
RUN NUMBER: 1 Page 2
LOCATION: MANMEE
DATE: 6/11/92
METER ▲H:
Yd:

250
260-720
270-730

AMBIENT TEMP:
OPERATOR:
SAMPLE TRAIN #:
BAROMETRIC PRESSURE:
NOZZLE DIAMETER:
STACK DIAMETER:

POINT	CLOCK TIME	DRY GAS METER FT³	PITOT IN. H₂O ▲P	ORIFICE ▲H, IN. H₂O DESIRED	ORIFICE ▲H, IN. H₂O ACTUAL	PUMP VACUUM, IN.HG GAUGE	STACK TEMP., °F	PROBE TEMP., °F	SAMPLE CASE TEMP., °F	IMPINGER TEMP., °F	DRY GAS TEMP., °F INLET	DRY GAS TEMP., °F OUTLET
750 1	30	919.98	.38	0.90	0.90	1.0	240	282	265	63	81	78
2	32.5	921.40	.41	0.95	0.95	1.5	253	263	267	63	81	79
3	35	922.58	.45	1.02	1.05	1.5	264	272	267	61	82	81
4	37.5	924.05	.54	1.19	1.20	1.5	267	262	268	60	83	81
5	40	925.58	.61	1.37	1.40	2.0	270	268	271	59	84	81
6	42.5	927.38	.66	1.48	1.50	2.0	272	270	271	59	84	82
7	45	929.05	.91	2.04	2.05	2.0	274	274	270	59	85	82
8	47.5	931.00	.93	2.06	2.10	2.0	284	265	272	60	87	82
9	50	933.20	.90	1.97	2.00	2.0	283	262	270	59	88	83
10	52.5	934.82	.83	1.86	1.90	2.0	275	274	269	60	87	82
11	55	936.70	.78	1.75	1.75	2.0	272	261	269	61	86	82
12	57.5	938.50	.72	1.62	1.60	2.0	273	252	268	62	87	83
840	60	940.23										

▲H = 846.72 Cp² D⁴ (1- WV/100)² Md/Ms Ps/Pm Tm/Ts ▲P

Filter #

Leak Test Initial _____ @ _____
Final _____ @ _____

Orsat Measurement					
Test	Time	CO_2	CO_2	CO	N_2
1					
2					
3					

Volume of Liquid Water Collected	Impinger volume, ml 1	2	3	4	Silica Gel weight g
Final					
Initial					
Liquid Collected					

STACK SAMPLING DATA SHEET

PLANT: STONECO
RUN NUMBER: 2 Page 1
LOCATION: MAUMEE
DATE: 6/11/02
METER ΔH: 1.911
Yd: 0.996

200 - 720
270 - 730
290 - 740

AMBIENT TEMP: 70
OPERATOR: MW
SAMPLE TRAIN #: 1
BAROMETRIC PRESSURE:
NOZZLE DIAMETER: 0.250
STACK DIAMETER: 48

POINT	CLOCK TIME	DRY GAS METER FT³	PITOT IN. H₂O ΔP	ORIFICE ΔH, IN. H₂O DESIRED	ORIFICE ΔH, IN. H₂O ACTUAL	PUMP VACUUM, IN.HG GAUGE	STACK TEMP., °F	PROBE TEMP., °F	SAMPLE CASE TEMP., °F	IMPINGER TEMP., °F	DRY GAS TEMP., °F INLET	DRY GAS TEMP., °F OUTLET
89 w 1	0	940.74	.31	0.72	0.72	1.0	255	280	228		86	84
2	2.5	941.95	.35	0.82	0.82	1.0	250	267	265		86	86
3	5	943.10	.45	1.03	1.05	1.0	264	252	271		86	86
4	7.5	944.70	.52	1.18	1.20	1.5	270	277	275	64	88	87
5	10	946.16	.59	1.32	1.35	1.5	280	271	275	62	89	87
6	12.5	947.80	.72	1.61	1.61	1.8	282	274	274	61	89	87
7	15	949.48	.83	1.89	1.90	2.0	270	246	261	68	87	89
8	17.5	951.40	.83	1.87	1.90	2.0	275	272	274	57	87	87
9	20	953.27	.82	1.86	1.90	2.0	272	262	274	54	88	88
10	22.5	955.13	.76	1.73	1.75	2.0	268	266	272	54	90	89
11	25	957.00	.74	1.68	1.70	2.0	270	272	272	57	91	89
12	27.5	958.78	.67	1.53	1.55	2.0	269	266	273	58	92	89
	30	960.51										

ΔH = 846.72 $C_p^2 D^4 (1 - WV/100)^2$ Md/Ms Ps/Pm Tm/Ts ΔP

Filter # 8

Leak Test Initial 0.001 @ 14
Final 0.001 @ 3

Orsat Measurement					
Test	Time	CO_2	O_2	CO	N_2
1		4.9	13.2		
2		4.9	13.2		
3					

Volume of Liquid Water Collected	Impinger volume ml 27.8				Silica Gel weight
	1	2	3	4	g
Final	294	125	2		703.2
Initial	100	100	[illegible]	—	691.4
Liquid Collected	194	25	0		11.8

32

STACK SAMPLING DATA SHEET

PLANT: STONECO
RUN NUMBER: 2 page 2
LOCATION: Maumee
DATE: 6/11/92
METER ▲H:
Yd:

AMBIENT TEMP:
OPERATOR:
SAMPLE TRAIN #:
BAROMETRIC PRESSURE:
NOZZLE DIAMETER:
STACK DIAMETER:

POINT	CLOCK TIME	DRY GAS METER FT³	PITOT IN. H₂O ▲P	ORIFICE ▲H, IN. H₂O		PUMP VACUUM, IN.HG GAUGE	STACK TEMP., °F	PROBE TEMP., °F	SAMPLE CASE TEMP., °F	IMPINGER TEMP., °F	DRY GAS TEMP., °F		
				DESIRED	ACTUAL						INLET	OUTLET	
1	30	960.51	.30	0.73	0.73	1.0	275	257	270	70	92	89	9
2	32.5	961.77	.51	1.19	1.20	1.5	256	277	271	65	92	91	9
3	35	963.20	.62	1.42	1.40	1.5	268	263	269	63	92	90	9
4	37.5	964.86	.63	1.44	1.45	1.8	272	277	271	61	92	90	9
5	40	966.55	.74	1.69	1.70	2.0	273	268	272	61	93	91	9
6	42.5	968.35	.75	1.70	1.70	2.0	276	267	272	62	94	90	9
7	45	970.20	.84	1.91	1.90	2.0	275	272	269	61	92	89	9
8	47.5	972.06	.89	2.02	2.00	2.0	276	272	269	62	92	89	9
9	50	974.02	.90	2.03	2.05	2.2	275	272	267	62	90	87	8
10	52.5	976.00	.87	1.97	2.00	2.2	276	270	272	65	93	89	9
11	55	977.93	.85	1.93	1.95	2.0	271	272	266	64	89	87	8
12	57.5	979.90	.77	1.75	1.75	2.0	273	268	273	62	92	89	9
	60	981.69											

▲H = 846.72 Cp² D⁴ (1- WV/100)² Md/Ms Ps/Pm Tm/Ts ▲P

Filter #

Leak Test Initial _____ @ _____
Final _____ @ _____

Orsat Measurement					
Test	Time	CO_2	CO_2	CO	N_2
1					
2					
3					

Volume of Liquid Water Collected	Impinger volume ml				Silica Gel weight
	1	2	3	4	g
Final					
Initial					
Liquid Collected					

STACK SAMPLING DATA SHEET

PLANT: STONECO
RUN NUMBER: 3 pos. 1
LOCATION: MAUMEE
DATE: 6/11/92
METER ▲H: 1.511
Yd: 0.996

AMBIENT TEMP: 80
OPERATOR: mw
SAMPLE TRAIN #: 1
BAROMETRIC PRESSURE:
NOZZLE DIAMETER: 0.250
STACK DIAMETER: 48

POINT	CLOCK TIME	DRY GAS METER FT³	PITOT IN. H₂O ▲P	ORIFICE ▲H, IN. H₂O DESIRED	ORIFICE ▲H, IN. H₂O ACTUAL	PUMP VACUUM, IN.HG GAUGE	STACK TEMP., °F	PROBE TEMP., °F	SAMPLE CASE TEMP., °F	IMPINGER TEMP., °F	DRY GAS TEMP., °F INLET	DRY GAS TEMP., °F OUTLET
1210 E 1	0	982.01	.34	0.81	0.81	1.5	237	234	240	81	89	87
2	2.5	983.40	.45	1.08	1.08	2.0	232	265	243	73	87	89
3	5	984.75	.61	1.40	1.40	2.0	260	264	261	69	86	88
4	7.5	986.50	.67	1.58	1.58	2.5	268	274	274	68	88	88
5	10	988.10	.75	1.70	1.70	3.0	270	273	274	65	88	87
6	12.5	990.30	.77	1.74	1.75	3.0	273	264	275	63	87	86
7	15	991.80	.91	2.05	2.05	3.5	274	263	273	64	87	86
8	17.5	993.71	.93	2.10	2.10	3.5	275	275	275	63	88	87
9	20	995.70	.95	2.14	2.15	3.5	275	271	273	63	89	86
10	22.5	997.75	.94	2.13	2.15	3.5	274	266	275	64	90	86
11	25	999.75	.90	2.04	2.05	3.5	273	276	275	64	92	87
12	27.5	1001.90	.81	1.85	1.85	3.0	274	274	276	64	95	89
	30	1003.60										

▲H = 846.72 Cp² D⁴ (1- WV/100)² Md/Ms Ps/Pm Tm/Ts ▲P

Filter # 9

Leak Test Initial 0.001 @ 13
Final 0.001 @ 3

Orsat Measurement					
Test	Time	CO_2	O_2	CO	N_2
1		4.1	14.2		
2		4.1	14.2		
3					

Volume of Liquid Water Collected	Impinger volume, ml 1	2	3	4	Silica Gel weight 9
Final	283	137	5		691.6
Initial	100	100	0	—	666.3
Liquid Collected	183	37	5		25.3

250.3

STACK SAMPLING DATA SHEET

PLANT: STINECO
RUN NUMBER: 3 page 2
LOCATION: Maumee
DATE: 6/11/90
METER ▲H: 1.911
Yd: 0.996

AMBIENT TEMP: 80
OPERATOR: mo
SAMPLE TRAIN #: 1
BAROMETRIC PRESSURE:
NOZZLE DIAMETER: 0.250
STACK DIAMETER: 48

POINT	CLOCK TIME	DRY GAS METER FT³	PITOT IN. H₂O ▲P	ORIFICE ▲H, IN. H₂O		PUMP VACUUM, IN.HG GAUGE	STACK TEMP., °F	PROBE TEMP., °F	SAMPLE CASE TEMP., °F	IMPINGER TEMP., °F	DRY GAS TEMP., °F		
				DESIRED	ACTUAL						INLET	OUTLET	
1	30	1003.60	.44	1.04	1.05	2.0	240	282	273	67	89	86	8
2	32.5	1005.04	.54	1.26	1.30	2.5	253	272	272	65	90	89	8
3	35	1006.58	.65	1.49	1.50	3.0	269	278	271	66	91	89	7
4	37.5	1008.30	.76	1.73	1.75	3.0	274	277	273	66	93	90	91
5	40	1009.99	.85	1.93	1.95	3.5	275	275	272	65	94	90	92
6	42.5	1011.93	.88	2.00	2.00	3.5	275	273	271	64	93	89	9
7	45	1013.83	.85	1.93	1.95	3.0	276	268	271	65	94	90	92
8	47.5	1015.75	.83	1.88	1.90	3.0	274	272	270	63	91	86	8
9	50	1017.65	.79	1.80	1.80	3.0	274	276	272	65	93	89	91
10	52.5	1019.47	.79	1.80	1.80	3.0	273	265	270	65	95	90	92
11	55	1021.40	.38	0.86	0.86	2.0	275	261	268	65	93	89	91
12	57.5	1022.68	.34	0.77	0.77	2.0	278	263	273	65	93	89	91
	60	1023.93											

▲H = 846.72 $C_p^2 D^4 (1 - WV/100)^2$ Md/Ms Ps/Pm Tm/Ts ▲P

Filter #_____

Leak Test Initial _____ @ _____
Final _____ @ _____

Orsat Measurement					
Test	Time	CO_2	CO_2	CO	N_2
1					
2					
3					

Volume of Liquid Water Collected	Impinger volume, ml				Silica Gel weight
	1	2	3	4	5
Final					
Initial					
Liquid Collected					

U.S. Environmental Consulting Particulate Weight Sheet

STONECO MAUMEE COMPLIANCE

RUN #	Dish #	ML	Initial Wt.	1st Wt.	2nd Wt.	Filter #	Initial Wt.	1st Wt.	2nd Wt.
1	27	98	0.9462	0.9868	0.9869	7	0.3607	0.3615	0.3614
2	28	123	0.96075	0.9787	0.9786	8	0.36105	0.3596	0.3595
3	29	69	0.9426	0.9569	0.9570	9	0.3596	0.3606	0.3606
Blank	30	—	0.9499	0.9495	0.9597	10	0.35065	0.3505	0.3505
Acetone Blk	31	114	0.93325	0.9371	0.9371				

APPENDIX E

CALIBRATION DATA SHEETS
DIAGRAMS

PITOT TUBE CALIBRATION

Pitot tube calibration number 4 Date 5/25/92

Calibrated by MW

A Side Calibration

Run No.	Δp_{std} cm H_2O (in. H_2O)	Δp_s cm H_2O (in. H_2O)	$C_{p(s)}$	Deviation $C_{p(s)}-\bar{C}_{p(A)}$
1	0.08	0.11	0.844	0.00
2	0.08	0.11	0.844	0.00
3	0.08	0.11	0.844	0.00
		$\bar{C}_{p(side\ A)}$	0.844	

B Side Calibration

Run No.	Δp_{std} cm H_2O (in. H_2O)	Δp_s cm H_2O (in. H_2O)	$C_{p(s)}$	Deviation $C_{p(s)}-\bar{C}_{p(B)}$
1	0.08	0.11	0.844	0.008
2	0.08	0.115	0.832	0.004
3	0.08	0.115	0.832	0.004
		$\bar{C}_{p(side\ B)}$	0.836	

C_p 0.84

Figure 4-10. Pitot tube calibration data.

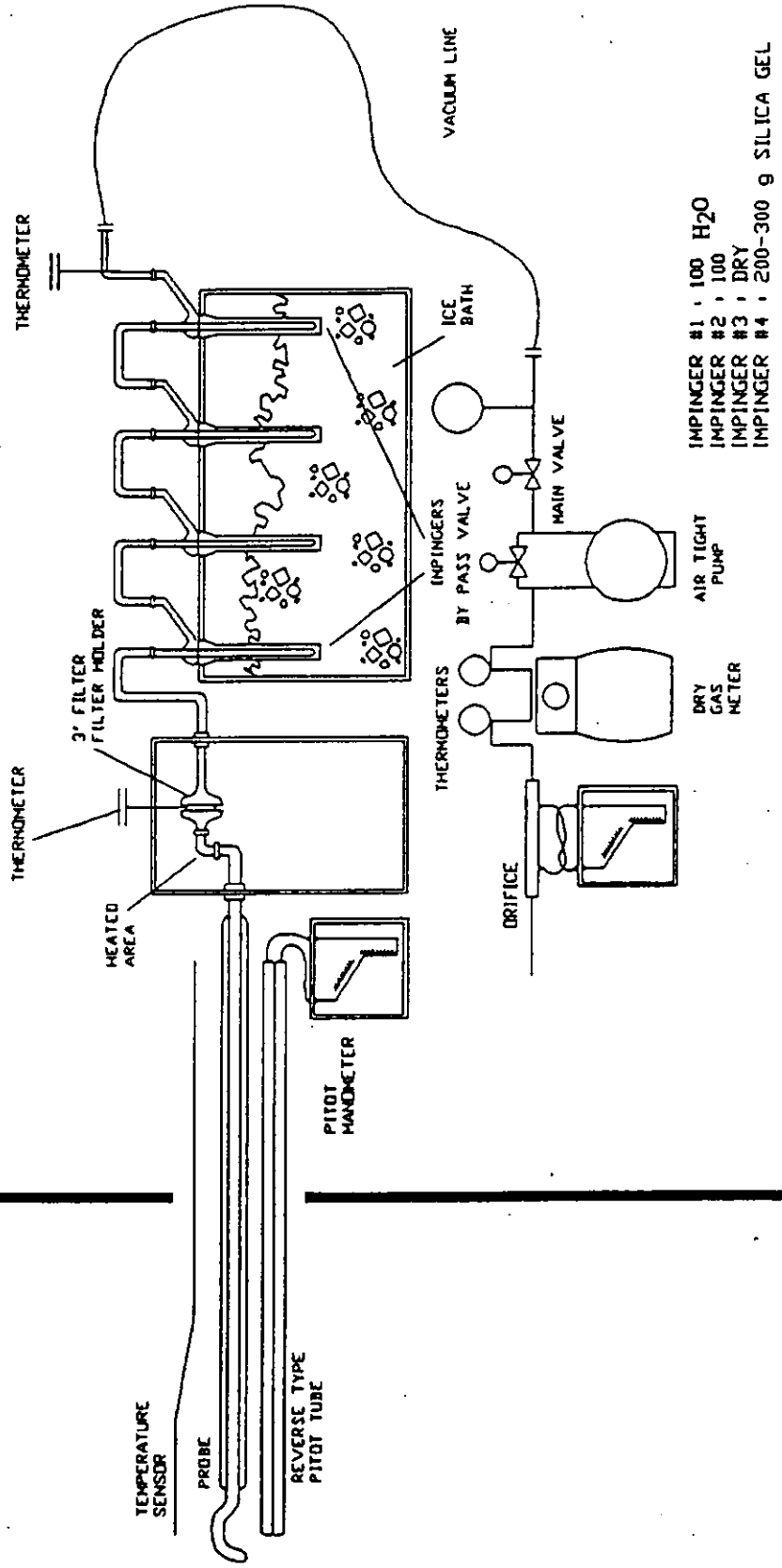
CALIBRATION SHEET

U.S. ENVIRONMENTAL CONSULTING, INC.
1910 BARRETT
TROY, MICHIGAN 48084

Date: 05/22/92
Serial Number: 80489

			Run 1	Run 2	Run 3
1.	Barometeric Pressure	:	30.27	30.27	30.27
2.	Orifice Setting, Delta H	:	2.00	0.75	6.00
3.	Final Reading (Test)	:	928.583	939.266	950.212
4.	Initial Reading (Test)	:	918.002	928.836	939.863
5.	Volume V(T) Cubic Feet	:	10.581	10.430	10.349
6.	Temp Initial T(T(I)) F	:	71	71	72
7.	Temp Final T(T(F)) F	:	71	72	72
8.	Final Reading (Box)	:	30.291	41.103	52.107
9.	Initial Reading (Box)	:	19.600	30.550	41.705
10.	Volume, V(B) Cubic Feet	:	10.691	10.553	10.402
11.	Temp Initial T(B(I)) F	:	73	77	78
12.	Temp Final T(B(F)) F	:	77	78	84
13.	Elapsed Time, Minutes	:	14.0	22.0	8.0
	Delta H		1.9325	1.8366	1.9643
	Yd		0.9923	0.9977	0.9972

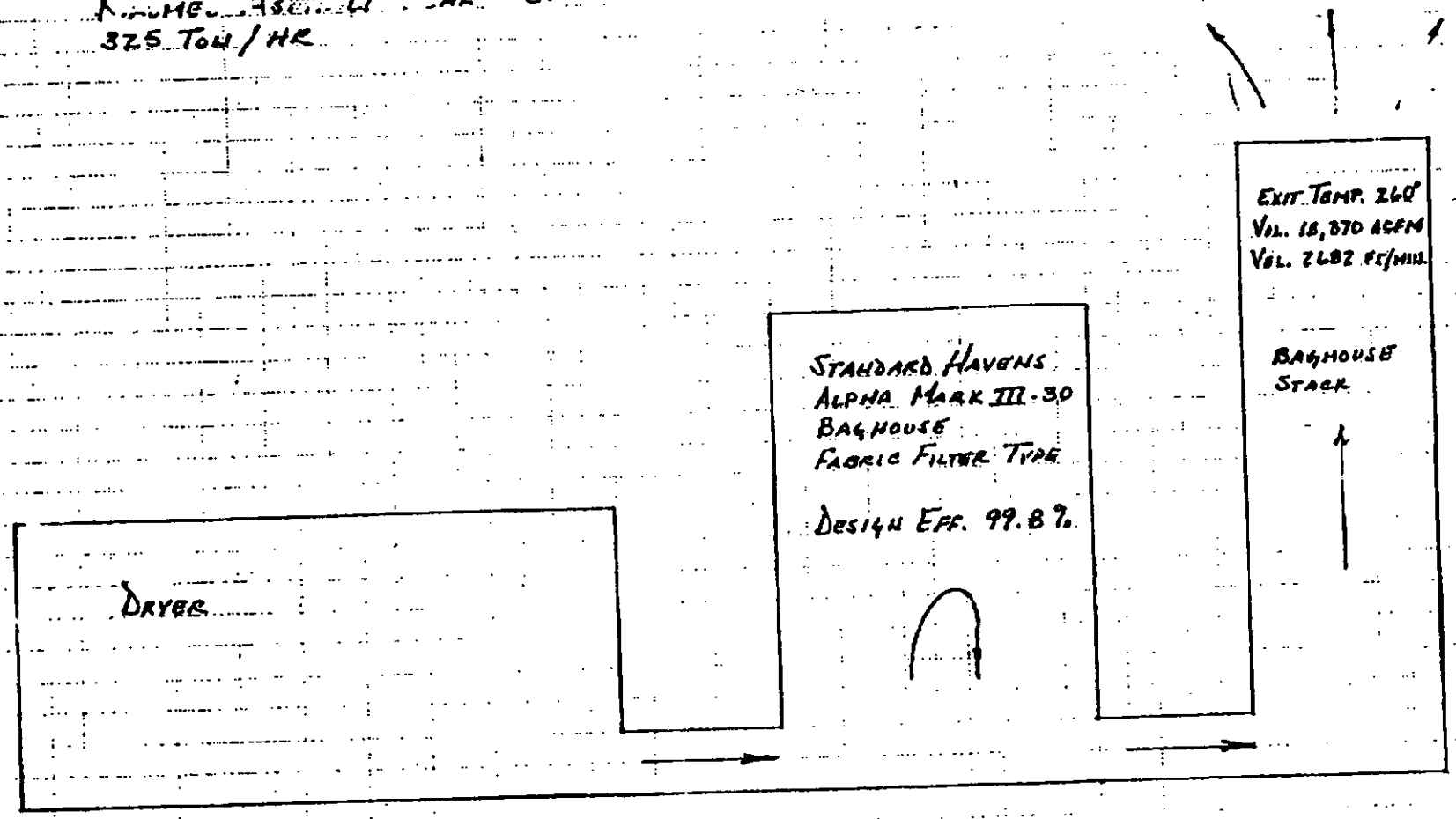
Calibration performed by: Mark McHarg



US ENVIRONMENTAL PROTECTION AGENCY
METHOD 5

P.A. NUMBER	DIAGRAM NUMBER I
	FILE NAME
DATE	DRAWN BY
	EM

MAUMEE ASPHALT PLANT #31
325 TON/HR



Maumee Asphalt Plant #3
1360 Ford Street
Maumee, Ohio 43537

Process Emission Flow

MAUMEE PLANT #31

STONECO, INC.

SAMPLING LOCATION DIMENSIONS

* INSIDE DIAMETER: 48" (4.0')
* UPSTREAM DISTANCE: 51" (4.3') = 1.1 DUCT DIAMETERS
* DOWNSTREAM DISTANCE: 333" (27'9") = 6.9 DUCT DIAMETERS

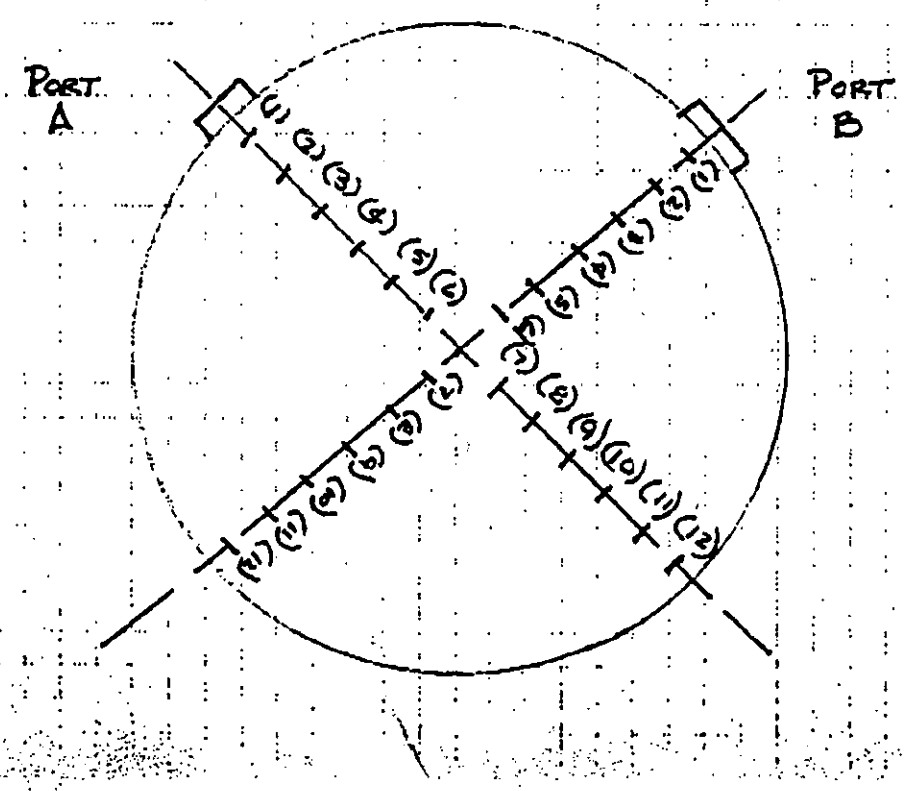
NUMBER OF TEST PORTS: 02

NUMBER OF TRAVERSE POINTS: 24

SAMPLING POINT DISTANCES FROM STACK WALL:

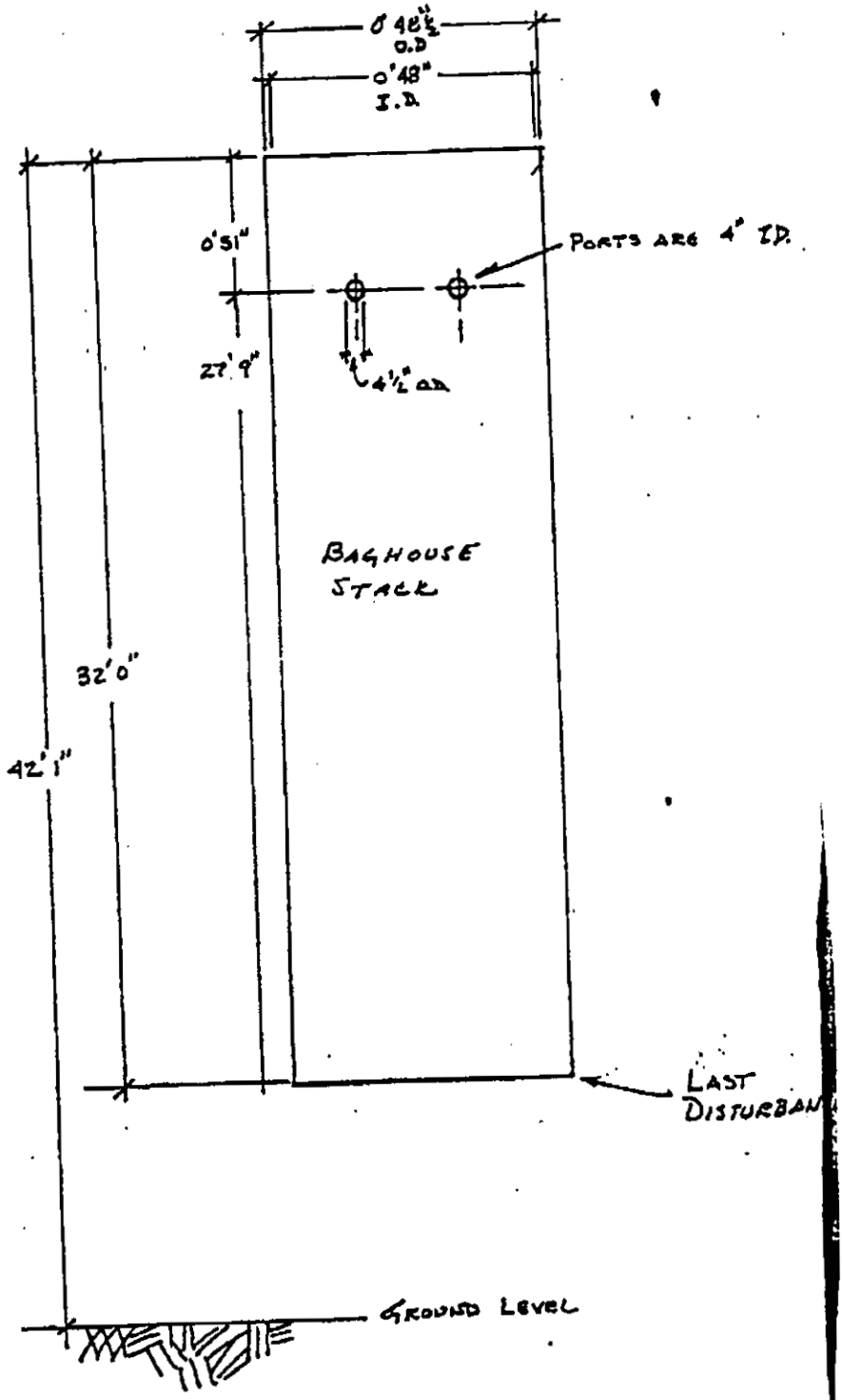
(1)	1.0"	(7)	30.9"
(2)	3.2"	(8)	36.0"
(3)	5.7"	(9)	39.5"
(4)	8.5"	(10)	42.3"
(5)	12.0"	(11)	44.8"
(6)	17.1"	(12)	47.0"

* NOTE: STACK AND OTHER PERTINENT DIMENSION TO BE VERIFIED BY STACK TESTING FIRM IN THE FIELD.



MAUMEE ASPHALT PLANT #31

*NOTE: STACK AND OTHER PERTINENT DIMENSIONS TO BE VERIFIED BY STACK TESTING FIRM IN THE FIELD.



NOTE: THERE ARE A TOTAL OF 2 PORTS LOCATED ON THIS STACK.