

AP42 Section: 11.1

Reference Number: 383

Title: Stack Emission Test, Northeast Asphalt, Inc.,
Control 56 Plant, Ripon, WI,

Environmental Technology and Engineering
Corporation, Elm Grove, WI,

September 3, 1997.

Benzene

Sec. 11.1

Ref. 383

Report to

NORTHEAST ASPHALT, INC.

Waukesha, Wisconsin

for

**STACK EMISSION TEST
CONTROL 56 PLANT
WDNR FID NO. 420042150**

September 3, 1997

by

ENVIRONMENTAL TECHNOLOGY & ENGINEERING CORPORATION

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ETE

SUMMARY

On September 3, 1997, Environmental Technology & Engineering Corp. personnel performed stack emissions testing at the Northeast Asphalt, Inc. Control 56 Plant located in Ripon, Wisconsin. The tests were performed as a provision of a new Air Pollution Control Permit issued by the State of Wisconsin Department of Natural Resources. Tests were performed in order to determine compliance with the applicable particulate emission limitation. Tests were also performed to determine formaldehyde emissions as a BACT provision. Additional tests were performed to determine plant specific emission factors for benzene, and chlorobenzenes. All measured particulate emissions were well below the limits shown in the following table:

TEST NO.	PARTICULATE	FORMALDEHYDE
1	0.003 gr/dscf	0.09 lb/hr
2	0.002	0.10
3	0.002	0.08
AVERAGE	0.002 gr/dscf	0.09 lb/hr
DNR LIMIT	0.039	NA
% OF LIMIT	6.0 %	

The following table summarizes the other test parameter results in terms of the average plant production rate of 292 tons per hour:

TEST NO.	BENZENE	CHLORO BENZENE	DICHLORO BENZENE	TRICHLORO BENZENE
1	0.032 lb/hr	<0.007 lb/hr	<0.008 lb/hr	<0.010 lb/hr
2	0.082	<0.008	<0.009	<0.012
3	0.081	<0.007	<0.009	<0.011
AVERAGE	0.065 lb/hr	<0.007 lb/hr	<0.009 lb/hr	<0.011 lb/hr
FACTOR	0.0002 lb/ton	<0.00002 lb/ton	<0.00003 lb/ton	<0.00004 lb/ton

1.0 GENERAL

On September 3, 1997, Environmental Technology & Engineering Corp. (ETE) personnel performed stack emissions testing at the Northeast Asphalt, Inc. Control 56 plant located in Ripon, Wisconsin. The purpose of the testing was to determine the particulate and formaldehyde emissions from the plant as a condition of a new Air Pollution Control Permit issued by the State of Wisconsin Department of Natural Resources (WDNR). Additional parameters tested at this time were benzene, chlorobenzene, dichlorobenzene, and trichlorobenzene. These parameters were tested to establish plant specific emission factors for use in emission inventories.

Pete Tolsma and Kevin Ebertz of Northeast Asphalt were responsible for assuring proper operating conditions throughout the testing. During the test the plant production rate was approximately 292 tons per hour and included approximately 15 % recycled asphalt. The plant was fired with natural gas. A log of plant activity throughout the test was kept and is included in the APPENDIX. All testing was coordinated with Kevin Ebertz. Matt Hostack of the DNR was notified of the test but did not witness. The field tests, corresponding laboratory analysis, and report preparation were performed by ETE personnel; Bill Dick was the test team leader.

The following sections of this report document the activities and results of the test program. The report presents all of the relevant data collected. Discussions on the interpretation of the data are provided where appropriate. The report, therefore, includes much necessary detail. The results, however, have been presented in the SUMMARY section at the beginning of this report for those readers not wishing to be burdened by the details.

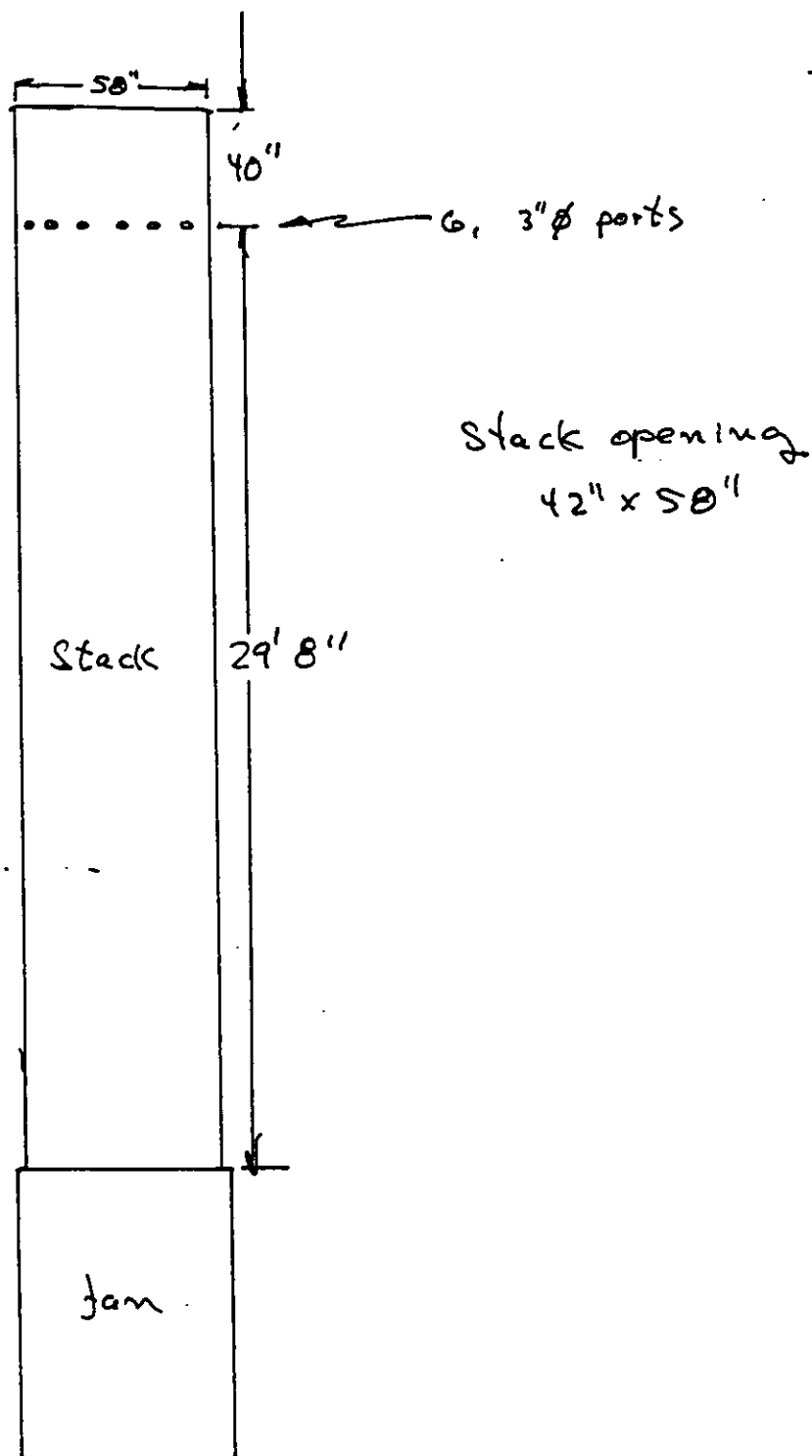
2.0 RESULTS

Isokinetic sampling for particulate matter was performed in accordance with the procedures outlined in EPA Method 17. Formaldehyde testing was performed in accordance with Method 0011 (non-isokinetic). Benzene and chlorobenzene sampling was performed on charcoal tubes in accordance with EPA Method 18. A brief summary of the methods is included in Section 3.0 of this report.

The tests were performed in the final discharge stack at the location shown in Figure 2-1. This same figure also depicts the location of the exact test points relative to the stack wall. Detailed results of the testing to determine particulate matter emissions are shown in Tables 2-1 through 2-3. All results were well below the permit limits. The results are summarized below:

TEST NO.	PARTICULATE
1	0.003 gr/dscf
2	0.002
3	0.002
AVERAGE	0.002 gr/dscf
DNR LIMIT	0.039
% OF LIMIT	6.0 %

#56
Ripon



NORTHEAST ASPHALT

3-Sep-97

CONTROL 58 RIPON

TABLE 2-1

TEST NO.	1			
BAROMETRIC PRESSURE	29.60	IN HG		
TIP DIAMETER	0.250	IN		
STACK DIMENSIONS	42	IN	58	IN
STACK AREA	16.917	FT ²		
SAMPLING TIME PER POINT	2.5	MIN		
NUMBER OF POINTS	24			
METER VOLUME	39.45	FT ³		
PITOT COEFFICIENT	0.84			
METER COEFFICIENT	1.004			
PARTICULATE COLLECTED	0.0068	GRAMS		
WATER COLLECTED	281	ML		
STATIC PRESSURE	-0.35	IN H ₂ O		

ORSAT RESULTS

CO₂
4.80%O₂
12.20%CO
0.00%N₂
83.00%

POINT	STACK TEMP DEG F	DELTA P IN H ₂ O	ORIFICE DEL P IN H ₂ O	METER TEMP DEG F	VELOCITY AFPS
1	185	0.65	1.45	52	52.60
2	192	0.70	1.55	53	54.88
3	198	0.65	1.45	54	53.13
4	200	0.65	1.45	55	53.21
5	202	0.65	1.45	55	53.29
6	205	0.68	1.50	58	54.63
7	210	0.68	1.50	60	54.83
8	210	0.54	1.20	61	48.86
9	210	0.75	1.65	64	57.59
10	212	0.72	1.60	65	56.51
11	212	0.62	1.35	66	52.44
12	210	0.60	1.30	66	51.51
13	208	0.72	1.60	69	56.34
14	210	0.56	1.25	70	49.76
15	210	0.55	1.22	71	49.31
16	206	0.50	1.10	71	46.88
17	212	0.68	1.50	73	54.92
18	214	0.58	1.30	74	50.79
19	214	0.50	1.10	75	47.16
20	212	0.62	1.35	76	52.44
21	214	0.70	1.55	78	55.80
22	215	0.62	1.35	78	52.55
23	212	0.62	1.35	79	52.44
24	210	0.70	1.55	80	55.63

AVERAGE	208		1.40	67	52.81
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DRY STANDARD VOLUME	39.31	SCF
PERCENT WATER VAPOR	25.18	% VOL
FLOW RATE	53604	ACFM
	31353	DSCFM
	53276	M ³ /HR
PARTICULATE CONCENTRATION	0.003	GR/DSCF
PARTICULATE EMISSION RATE	0.73	LB/HR
LB PART PER 1000 LB GAS	0.004	
ISOKINETIC PERCENT	103.7	

NORTHEAST ASPHALT

3-Sep-97

CONTROL 56 RIPON

TABLE 2-2

TEST NO.	2			
BAROMETRIC PRESSURE	29.60	IN HG		
TIP DIAMETER	0.250	IN		
STACK DIMENSIONS	42	IN	58	IN
STACK AREA	16.917	FT3		
SAMPLING TIME PER POINT	2.5	MIN		
NUMBER OF POINTS	24			
METER VOLUME	38.42	FT3		
PITOT COEFFICIENT	0.84			
METER COEFFICIENT	1.004			
PARTICULATE COLLECTED	0.0062	GRAMS		
WATER COLLECTED	248	ML		
STATIC PRESSURE	-0.35	IN H2O		

ORSAT RESULTS

CO2	
4.80%	

O2
12.40%

CO
0.00%

N2
82.80%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	185	0.70	1.55	68	54.37
2	190	0.65	1.45	68	52.59
3	192	0.62	1.35	69	51.44
4	195	0.60	1.32	70	50.72
5	197	0.65	1.45	70	52.88
6	200	0.60	1.32	71	50.92
7	202	0.52	1.15	72	47.47
8	205	0.65	1.45	73	53.20
9	205	0.70	1.55	73	55.20
10	210	0.62	1.35	74	52.15
11	210	0.55	1.22	75	49.12
12	210	0.50	1.10	76	46.83
13	212	0.72	1.60	79	56.28
14	210	0.72	1.60	80	56.20
15	210	0.65	1.45	81	53.40
16	208	0.60	1.32	82	51.22
17	210	0.70	1.55	83	55.41
18	210	0.68	1.50	84	54.61
19	212	0.65	1.45	85	53.48
20	210	0.60	1.30	86	51.30
21	210	0.62	1.35	90	52.15
22	208	0.65	1.45	90	53.32
23	206	0.65	1.45	90	53.24
24	205	0.62	1.35	90	51.95

AVERAGE	205		1.40	78	52.48
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DRY STANDARD VOLUME	38.33	SCF
PERCENT WATER VAPOR	23.34	% VOL
FLOW RATE	53264	ACFM
	32060	DSCFM
	54476	M3/HR
PARTICULATE CONCENTRATION	0.002	GR/DSCF
PARTICULATE EMISSION RATE	0.68	LB/HR
LB PART PER 1000 LB GAS	0.004	
ISOKINETIC PERCENT	98.9	

NORTHEAST ASPHALT

3-Sep-97

CONTROL 56 RIPON

TABLE 2-3

TEST NO.	3			
BAROMETRIC PRESSURE	29.60	IN HG		
TIP DIAMETER	0.250	IN		
STACK DIMENSIONS	42	IN	58	IN
STACK AREA	16.917	FT ²		
SAMPLING TIME PER POINT	2.5	MIN		
NUMBER OF POINTS	24			
METER VOLUME	38.23	FT ³		
PITOT COEFFICIENT	0.84			
METER COEFFICIENT	1.004			
PARTICULATE COLLECTED	0.0058	GRAMS		
WATER COLLECTED	272	ML		
STATIC PRESSURE	-0.35	IN H ₂ O		

ORSAT RESULTS

CO₂
5.00%O₂
12.00%CO
0.00%N₂
83.00%

POINT	STACK TEMP DEG F	DELTA P IN H ₂ O	ORIFICE DEL P IN H ₂ O	METER TEMP DEG F	VELOCITY AFPS
1	185	0.62	1.35	89	51.35
2	188	0.65	1.45	90	52.70
3	190	0.68	1.50	91	53.98
4	195	0.65	1.45	92	52.98
5	200	0.70	1.55	92	55.19
6	205	0.62	1.35	92	52.14
7	208	0.65	1.45	92	53.50
8	210	0.50	1.10	92	47.00
9	210	0.72	1.60	93	56.39
10	212	0.72	1.60	94	56.48
11	210	0.65	1.45	94	53.58
12	212	0.60	1.32	94	51.56
13	212	0.70	1.55	95	55.69
14	210	0.55	1.22	96	49.29
15	212	0.55	1.22	96	49.36
16	215	0.52	1.15	96	48.10
17	212	0.70	1.55	96	55.69
18	215	0.60	1.32	97	51.67
19	216	0.50	1.10	97	47.21
20	220	0.60	1.32	97	51.86
21	218	0.68	1.50	98	55.13
22	216	0.62	1.35	98	52.57
23	215	0.60	1.32	99	51.67
24	212	0.68	1.50	100	54.89

AVERAGE	208		1.39	95	52.50
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DRY STANDARD VOLUME	38.22	SCF
PERCENT WATER VAPOR	25.10	% VOL
FLOW RATE	53286	ACFM
	31173	DSCFM
	52968	M ³ /HR
PARTICULATE CONCENTRATION	0.002	GR/DSCF
PARTICULATE EMISSION RATE	0.63	LB/HR
LB PART PER 1000 LB GAS	0.004	
ISOKINETIC PERCENT	101.4	

Formaldehyde results are included as Table 2-4.

TABLE 2-4

TEST NO	FORMALDEHYDE
1	0.09 lb/hr
2	0.10
3	0.08
AVERAGE	0.09 lb/hr
FACTOR	0.0003 lb/ton

Benzene and chlorobenzene results are included in Table 2-5.

TABLE 2-5

TEST NO.	BENZENE	CHLORO BENZENE	DICHLORO BENZENE	TRICHLORO BENZENE
1	0.032 lb/hr	<0.007 lb/hr	<0.008 lb/hr	<0.010 lb/hr
2	0.082	<0.008	<0.009	<0.012
3	0.081	<0.007	<0.009	<0.011
AVERAGE	0.065 lb/hr	<0.007 lb/hr	<0.009 lb/hr	<0.011 lb/hr
FACTOR	0.0002 lb/ton	<0.00002 lb/ton	<0.00003 lb/ton	<0.00004 lb/ton

NORTHEAST ASPHALT
CONTROL 56 PLANT
FORMALDEHYDE RESULTS

TABLE 2-4

Sample No.	Meter Vol. ft3	Meter Temp deg F	Standard Vol liters	Form Captured ug	Form Conc mg/m3	Flow Rate m3/hr	Form ER lb/hr	Production Rate TPH	Emission Factor lb/ton
C56-1	2.00	54	61.24	44.38	0.72	53276	0.09	292	0.0003
C56-2	2.00	59	60.65	50.59	0.83	54476	0.10	292	0.0003
C56-3	2.07	70	61.47	41.77	0.68	52968	0.08	291	0.0003
AVERAGE									
					0.75		0.09		0.0003

Meter Gama 1.064
Bar.Pressure 29.60

Calculations Standard Volume = Meter Vol * Meter Gama*Bar.Pressure*28.32*528/(29.92*(460+Meter Temp))

Concentration = ug/liters = mg/m3

Emission Rate = mg/m3 * m3/hr/453600

3.0 METHODS

3.1 Particulate

The equipment used to sample was the Western Precipitation Division of the Joy Manufacturing Company Emission Parameter Analyzer. Samples were collected in accordance with EPA Method 17.

The sampling train consisted of a probe tip, an in-stack thimble holder with tared thimble, and a tared back up filter. A series of four impingers followed in an ice bath. The first was a modified Greenburg-Smith impinger with 100 ml of distilled water; the second was a Greenburg-Smith impinger with 100 ml of the same solution; the third was a modified Greenburg Smith impinger dry; and the fourth was also a modified Greenburg-Smith impinger containing a tared quantity of Silica Gel. The gas then passed through a vacuum pump, calibrated dry gas meter, and a calibrated orifice. A schematic drawing of the sampling train is included.

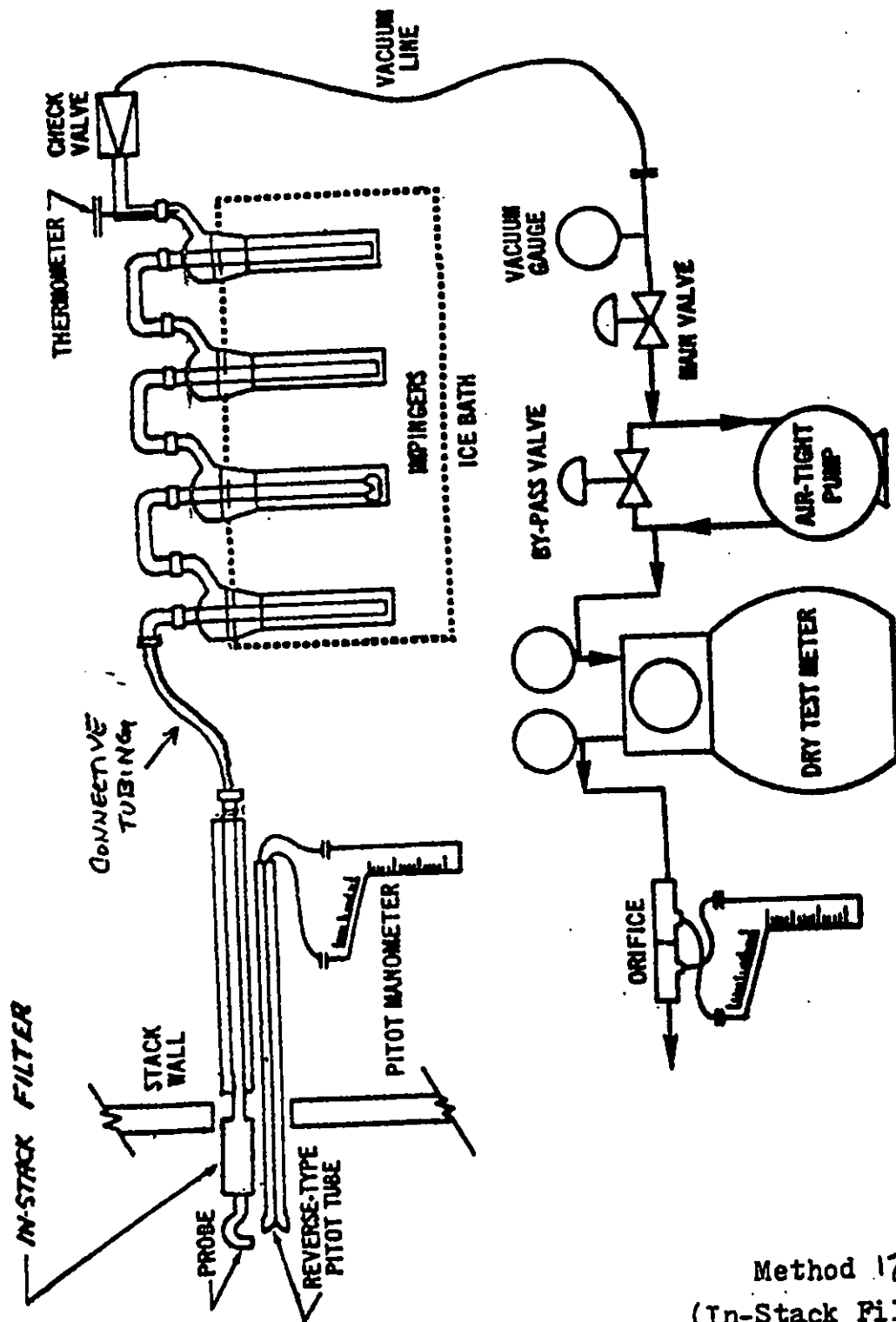
The temperatures of the stack gas stream, as well as strategic locations within the sampling devices, were monitored by RTDs and read directly from a gauge on the control unit.

The initial gas stream velocity was obtained from a preliminary traverse using an "S" type pitot tube. The initial moisture was estimated from previous tests of similar processes. This data, along with the stack temperature, was used to set a nomograph so that rapid calculations of isokinetic sampling conditions could be made.

The principle of the method was to collect the sample representative of the exhaust by adjusting the sample collection velocity to match the exhaust gas stream velocity at the point of collection. The velocity at the point of collection was measured with an "S" type pitot tube attached to the probe and the collection velocity was matched to the stack gas velocity by adjusting the flow as indicated by the calibrated orifice.

At the completion of the test, the impinger contents were measured and weighed for determination of the actual moisture content of the exhaust gas stream. The probe tip was washed and brushed with acetone and placed in a tared beaker and evaporated at room temperature. The thimble and beaker were then desiccated to the tared humidity conditions and weighed for the determination of total particulate.

A computer was used to calculate the stack velocities, emission concentrations, emission rates and volumetric flow rates using the field and laboratory data.



Method 17
(In-Stack Filter)

Particulate sampling train.

3.2 Benzene and Chlorobenzenes

Sampling for these specific organic compounds was performed in accordance with EPA Method 18 - "Measurement of Gaseous Organic Compound Emissions by Gas Chromatography." Samples were drawn from the exhaust gas stream onto solid sorbent tubes (charcoal) using an SKC pump with a stroke counter to measure the sample volume. A minimum of two tubes were placed in series. At the completion of the tests the tubes were desorbed and analyzed by a gas chromatograph equipped with a flame ionization detector. Standard concentrations of compounds were prepared by injecting a known quantity into a tube and then desorbing and analyzing the tube in the same manner as the samples.

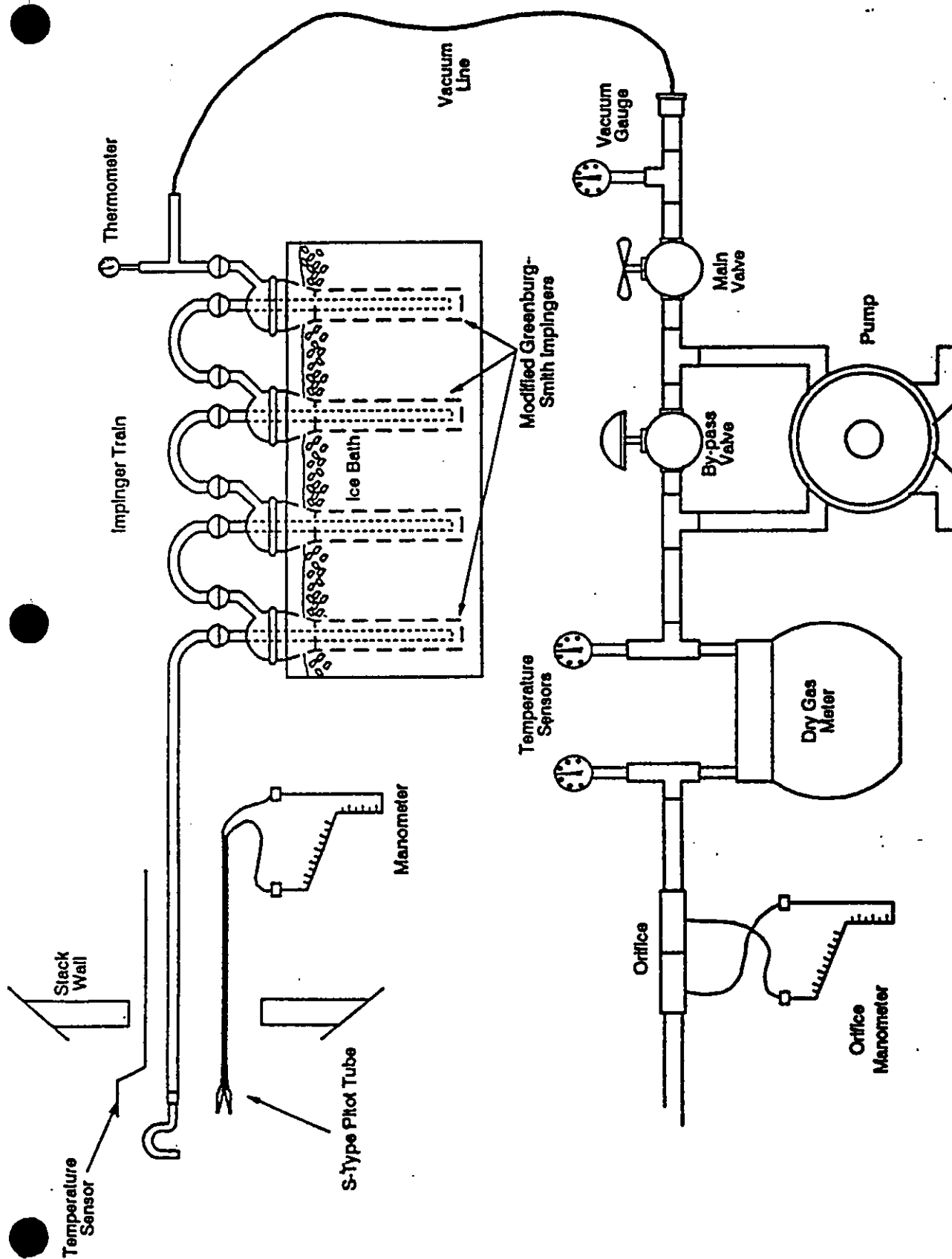
The concentrations of the exhaust gas stream were then determined by comparing the response of the standards to the response to the exhaust stack samples. Sample retention times and peak areas were used to quantify the compound emissions. The compound concentrations were then used in conjunction with the exhaust gas flow rates to determine organic compound emission rates in units of pounds per hour (lb/hr).

3.4 Formaldehyde

The sampling and analysis were performed using procedures outlined in EPA Method 0011, the method required by the Wisconsin Department of Natural Resources for determining formaldehyde emissions.

Sampling was performed by drawing a known quantity of stack exhaust through appropriate sampling media by means of a battery operated pump. The media consisted of a train of three midjet impingers; the first two contained 10 ml of a DNPH solution and were followed by an empty impinger and a water trap. The impingers were set in an ice water bath to accommodate the temperature of the gas stream sampled. The sampling volumes were determined through the use of a calibrated dry gas meter.

Following the sampling, the samples were sealed and returned to the lab for analysis. The samples were analyzed via HPLC methods as described by the EPA. A blank was handled in the field in a method identical to the samples and also submitted for analysis



Formaldehyde Sampling Train

4.0 CALIBRATIONS

4.1 Particulate

The probe tips, pitot tubes, dry gas meters, and orifices were calibrated prior to the test according to standard procedures as to procedures published by the EPA. The values obtained were:

Probe tip diameter	0.250"
Pitot tube coeff.	0.84
Orifice coeff.	1.814
Dry Gas Meter	1.004

4.2 VOC

An SKC pump was used for VOC sampling were calibrated with a wet test meter through sampling apparatus prior to and following the tests. The value obtained was:

SKC 4	0.456 cc/count
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4.3 Formaldehyde

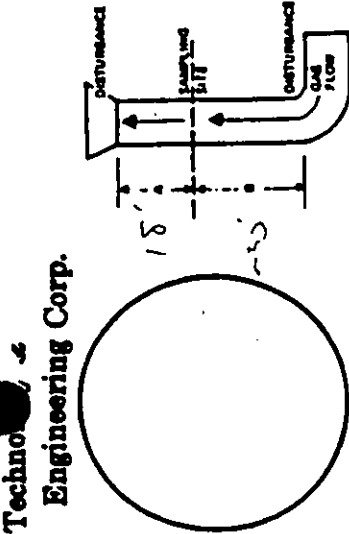
A dry gas meter was used to determine the sample volume obtained in the formaldehyde tests. This dry gas meter was calibrated with a wet test meter. The value obtained was:

Dry Gas Meter	1.064
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APPENDIX A

Field and Laboratory Data

PARTICULATE FIELD DATA



PLANT NORTHWEST AIRPORT AMBIENT TEMPERATURE 50
 DATE 9-3-97 BAROMETRIC PRESSURE 29.60
 LOCATION River ASSUMED MOISTURE, % 20
 OPERATOR WJN/CJA PROBE LENGTH, in. 5' +
 STACK NO. Critical 50 NOZZLE DIAMETER, in. 1/4
 RUN NO. 1 STACK DIAMETER, in. 42 x 58
 SAMPLE BOX NO. 1 PROBE HEATER SETTING -
 METER BOX NO. 1 HEATER BOX SETTING -

CROSS SECTION

TRAVERSE POINT NUMBER	SAMPLING TIME (A), min.	STATIC PRESSURE (in. H ₂ O)	STACK TEMPERATURE (T _s), °F	VELOCITY HEAD (V _p) (1/T _p)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (in. H ₂ O) ACTUAL DESIRED	GAS SAMPLE VOLUME (V _m), ft ³	GAS SAMPLE TEMPERATURE AT DRY GAS METER		SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	REFERENCE	VACUUM in. Hg	VELOCITY ft/min
A1	0840		185	.65	1.45	278.00	INLET (T _{m in}), °F	OUTLET (T _{m out}), °F	1700H		PUMP VACUUM gauge		
2	0845		192	.70	1.55	79.7		52	21.06 f		794653		
3	0850	-3.38	198	.65	1.45	81.4		53			825/26		
4	0855		200	.65	1.45	83.2		54					
5	0855		202	.65	1.45	84.9		55					
6	0900		205	.68	1.50	86.6		58					
7	0905	-3.30	210	.68	1.50	88.2		60					
8	0910		210	.55	1.20	89.9		61					
9	0915		210	.75	1.41	91.5		64					
10	0920		212	.72	1.40	93.3		65					
11	0925	-3.35	212	.62	1.35	95.0		66					
12	0930		210	.60	1.30	96.7		68					
13	0935		208	.72	1.60	98.2		69					
14	0940		210	.56	1.25	300.0		70					
15	0945		210	.55	1.22	01.5		71					
16	0950	-3.35	206	.50	1.10	03.1		71					
17	0955		212	.68	1.50	04.6		73					
18	1000		214	.58	1.30	06.2		74					
19	1005	-3.32	214	.50	1.10	07.7		75					
20	1010		212	.62	1.35	09.2		76					
21	1015		214	.70	1.55	10.9		78					
22	1020		215	.62	1.35	12.4		78					
23	1025	-3.32	212	.62	1.35	14.1		79					
24	1030		210	.70	1.55	15.8		80					
25	1035					317.15							

573

ORSAT RESULTS

CO2 9.8
 CO 12.2
 N2

LEAK CHECKS

Pre 2.01
 Pitot 2.01
 Post 2.01

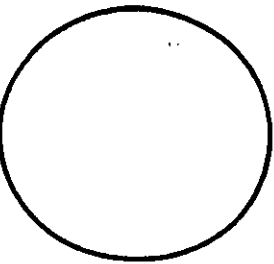
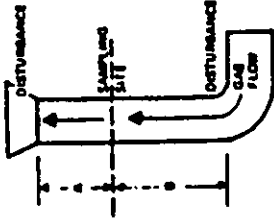
PROCESS WEIGHT RATE

C FACTOR

METER AM, 1.014

PARTICULATE FIELD DATA

PLANT Volvo - 1st April METER & H. 60
 DATE 9-3-97 AMBIENT TEMPERATURE 60
 LOCATION R100 BAROMETRIC PRESSURE 20
 OPERATOR WJD/csh ASSUMED MOISTURE, % 51+
 STACK NO. Carsten 56 PROBE LENGTH, in. 1/4
 RUN NO. 2 NOZZLE DIAMETER, in. 40 x 50
 SAMPLE BOX NO. 2 PROBE HEATER SETTING -
 METER BOX NO. 1 HEATER BOX SETTING -



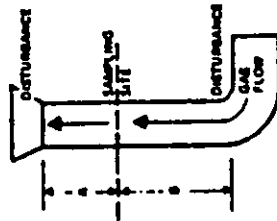
CROSS SECTION

PROCESS WEIGHT RATE LEAK CHECKS
 ORSAT RESULTS
 CO2 4.8 on Pre 2.01 22"
 CO 13.5 on Pitot 5.12
 N2 87.1 on Post 4.01 21"
 on Pitot 4.2

TRAVERSE POINT NUMBER	SAMPLING TIME (A), min.	STATIC PRESSURE (in. H ₂ O)	STACK TEMPERATURE (T _s), °F	VELOCITY HEAD (V _p) (1/2 ρ V ²)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) (in. H ₂ O)	GAS SAMPLE VOLUME (V _m), ft ³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET (T _{m in}), °F	OUTLET (T _{m out}), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY f/s
F 1	111230		185	.70	1.55	319.00		68	314.04/50	825/74	3	
2	15		190	.65	1.45	20.6		68	316.04/62	847/90		
3	174	-32	192	.62	1.35	22.2		69	200/59			
4	20		195	.602	1.32	23.8		70				
E 5	221/23		197	.65	1.45	25.6		70				
6	257		200	.60	1.32	27.1		71				
7	28	-33	202	.52	1.15	28.2		72				
8	32		205	.65	1.45	30.3		73				
D 9	3435		205	.70	1.55	31.9		73				
10	36		210	.62	1.35	23.6		74				
11	38	-35	210	.55	1.22	36.3		75				
12	41		210	.50	1.10	36.8		76				
C 13	437/44		212	.72	1.60	32.2		79				
14	665		210	.72	1.60	39.9		80				
15	49	-35	210	.65	1.45	41.6		81				
16	517		208	.60	1.32	43.3		82				
B 17	545/4		210	.70	1.55	44.5		83				
18	57		210	.68	1.50	46.6		84				
19	59	-36	212	.65	1.45	48.3		85				
20	62		210	.60	1.30	50.0		86				
A 21	651/05		210	.62	1.35	51.6		90				
22	671		208	.65	1.45	52.9		90				
23	12	-35	206	.65	1.45	54.5		90				
24	125		202	.62	1.35	56.1		90				
	175					357.42						

PARTICULATE FIELD DATA

PLANT NOGENT/ASPH AMBIENT TEMPERATURE 65 METER AM, _____
 DATE 9-3-97 BAROMETRIC PRESSURE _____ C FACTOR _____
 LOCATION Buron ASSUMED MOISTURE, % 20 PROCESS WEIGHT RATE _____
 OPERATOR WJG/CJH PROBE LENGTH, in. 51+ ORSAT RESULTS _____
 STACK NO. Control 56 NOZZLE DIAMETER, in. 14 CO2 5.0 LEAK CHECKS _____
 RUN NO. 3 STACK DIAMETER, in. 62x56 CO 1.20 Pre 6.01 22
 SAMPLE BOX NO. 3 PROBE HEATER SETTING _____ On Pitot 1+
 METER BOX NO. 3 HEATER BOX SETTING _____ On Pitot 1+



CROSS SECTION

TRAVERSE POINT NUMBER	SAMPLING TIME (H), min.	STATIC PRESSURE (in. H ₂ O)	STACK TEMPERATURE (T _s), °F	VELOCITY HEAD (V _p), (1/2 V ²)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (in. H ₂ O) ACTUAL DESIRED	GAS SAMPLE VOLUME (V _m), ft ³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET (T _{m,in}), °F OUTLET (T _{m,out}), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY ft/s
A 1	1207+		185	.62	1.35	359.00		316.00/20	847903	3	
2	30		188	.65	1.41	60.6		318.07/10	872425		
3	271	-.38	190	.68	1.50	62.2		2.07/70			
4	35		195	.45	1.45	63.9					
5	37+20		200	.70	1.51	65.6					
6	461		205	.62	1.35	67.3					
7	43	-.37	208	.45	1.45	68.4					
8	457		210	.50	1.10	70.4					
9	42/23+		210	.72	1.60	72.0					
10	51		212	.72	1.60	73.7					
11	53+	-.35	210	.65	1.41	75.4					
12	56		212	.60	1.32	77.1					
13	58/54		212	.70	1.51	78.6					
14	61+		210	.55	1.22	80.3					
15	64	-.35	212	.55	1.22	81.8					
16	661		215	.52	1.15	83.3					
17	67/69+		212	.70	1.55	84.7					
18	13		215	.60	1.55	86.4					
19	10+		216	.50	1.10	87.9					
20	11	-.38	220	.60	1.32	89.3					
21	194/20		218	.62	1.50	90.9					
22	21		216	.67	1.33	92.5					
23	25	-.32	215	.60	1.32	94.1					
24	27+		212	.68	1.50	95.6					
	1330					97.23					

LABORATORY DATA SHEET
PARTICULATE & WATER COLLECTED

JOB NAME NEA C56 R.pon

DATE OF TEST 9-3-77

JOB NO. _____

TEST ENGINEER WJD

RUN NO. 1 STACK Baghouse

Sample Box 1 Filter T-873

Wash Bottle. -

Beaker No. 1

WATER COLLECTED

<u>Impinger No.</u>	<u>Final Wt. g</u>	<u>Initial Wt. g</u>	<u>Collected grams</u>
<u>1</u>	<u>245</u>	<u>100</u>	<u>145</u>
<u>2</u>	<u>219</u>	<u>100</u>	<u>119</u>
<u>3</u>	<u>15</u>	<u>0</u>	<u>15</u>
<u>SIL GEL</u>	<u>702</u>	<u>700</u>	<u>2</u>
		TOTAL	<u><u>281</u></u>

PARTICULATE COLLECTED

	<u>Final Wt. g</u>	<u>Tare Wt. g</u>	<u>Collected grams</u>
Filter	<u>1.0153</u>	<u>1.0102</u>	<u>0.0051</u>
Washings (0.0003)	<u>106.3433</u>	<u>106.3413</u>	<u>0.0017</u>
		TOTAL	<u><u>0.0068</u></u>

WATER COLLECTED GRAMS

PARTICULATE COLLECTED GRAMS

NOTES:

LABORATORY DATA SHEET
PARTICULATE & WATER COLLECTED

JOB NAME NEA C56 Ripon

DATE OF TEST 9.3.97

JOB NO. _____

TEST ENGINEER WJD

RUN NO. 2 STACK Baghouse

Sample Box 2 Filter T-875

Wash Bottle. —

Beaker No. 2

WATER COLLECTED

<u>Impinger No.</u>	<u>Final Wt. g</u>	<u>Initial Wt. g</u>	<u>Collected grams</u>
<u>1</u>	<u>237</u>	<u>100</u>	<u>137</u>
<u>2</u>	<u>198</u>	<u>100</u>	<u>98</u>
<u>3</u>	<u>6</u>	<u>0</u>	<u>6</u>
<u>SIC GEL</u>	<u>630</u>	<u>623</u>	<u>7</u>
		TOTAL	<u><u>248</u></u>

PARTICULATE COLLECTED

	<u>Final Wt. g</u>	<u>Tare Wt. g</u>	<u>Collected grams</u>
Filter	<u>0.9861</u>	<u>0.9759</u>	<u>0.0052</u>
Washings (0.0003)	<u>110.5799</u>	<u>110.5786</u>	<u>0.0010</u>
		TOTAL	<u><u>0.0062</u></u>

WATER COLLECTED GRAMS

PARTICULATE COLLECTED GRAMS

NOTES:

LABORATORY DATA SHEET
PARTICULATE & WATER COLLECTED

JOB NAME NEA CS6 Ripon
JOB NO. _____

DATE OF TEST 9-3-97
TEST ENGINEER WJD

RUN NO. 3 STACK Baghouse

Sample Box 3 Filter T-876 Wash Bottle. —
Beaker No. 3

WATER COLLECTED

<u>Impinger No.</u>	<u>Final Wt. g</u>	<u>Initial Wt. g</u>	<u>Collected grams</u>
<u>1</u>	<u>241</u>	<u>100</u>	<u>141</u>
<u>2</u>	<u>182</u>	<u>100</u>	<u>82</u>
<u>3</u>	<u>43</u>	<u>0</u>	<u>43</u>
<u>5/L GEL</u>	<u>628</u>	<u>622</u>	<u>6</u>
		TOTAL	<u><u>272</u></u>

PARTICULATE COLLECTED

	<u>Final Wt. g</u>	<u>Tare Wt. g</u>	<u>Collected grams</u>
Filter	<u>1.0003</u>	<u>0.9962</u>	<u>0.0041</u>
Washings (0.0003)	<u>94.1768</u>	<u>94.1748</u>	<u>0.0017</u>
		TOTAL	<u><u>0.0058</u></u>

WATER COLLECTED GRAMS

PARTICULATE COLLECTED GRAMS

NOTES:

ASPHALT PLANT STACK TEST DATA

Date Sept 3, 1997
FID # 420 042150

Control # 56

Time	Burner %	PSI Fuel Pressure	Production TPH	Aggregate TPH	A/C TPH	RAP TPH	Mix Temp	Stack Temp	Photo-belic	Magne-belic	Fuel Flow Rate	CO ppm	CO2 ppm	O2 %
8:30	38	2	288	280	4.9%	15%	307	220	.16	4.8	2.2			
8:45	38	2	292	280	4.9%	15%	302	220	.16	4.6	2.2			
9:00	39	2	292	280	4.9%	15%	300	220	.20	4.4	2.2			
9:15	40	2	293	280	4.9%	15%	300	225	.14	5.0	2.2			
9:30	38	2	295	280	4.9%	15%	301	225	.18	4.4	2.2			
9:45	39	2	292	280	4.9%	15%	302	227	.20	4.6	2.2			
11:15	38	2	292	280	4.9%	15%	307	210	.16	5.2	2.25			
11:30	37	2	290	280	4.9%	15%	305	225	.16	4.6	2.25			
11:45	37	1.5	292	280	4.9%	15%	305	227	.14	5.1	2.25			
12:00	35	1.5	294	280	4.9%	15%	302	230	.18	5.5	2.25			
12:15	35	1.5	292	280	4.9%	15%	303	230	.16	5.0	2.25			
12:30	35	1.5	292	280	4.9%	15%	304	230	.16	5.2	2.25			
12:45	36	1.5	291	280	4.9%	15%	301	215	.18	4.6	2.22			
13:00	40	2	290	280	4.9%	15%	301	227	.20	5.0	2.22			
13:15	38	2	289	280	4.9%	15%	302	230	.14	4.6	2.22			
13:30	36	1.5	292	280	4.9%	15%	306	235	.22	5.2	2.22			

Fuel Type Neatural Gas Sulfur in Fuel % * Record time in 15-minute intervals during stack test runs.

**GAS CHROMATOGRAPH ANALYSIS SHEET
METHOD 18 DATA**

**CLIENT
PROCESS/STACK
CALIBRATION FACTORS**

**NORTHEAST ASPHALT
Control 56 Plant**

PARAMETER	STD ug	STD AREA	FACTOR
Benzene	14.5	141129	0.0001027

RECOVERY FACTOR 1.00

TEST

1

PUMP	SKC2	
PUMP CAL	0.456	cc/count
PUMP COUNTS	25473	counts
SAMPLE VOLUME	11.62	std liters
PEAK AREA	30487	
WT OF BENZENE	3.13	ug
BENZ CONCENTRATION	0.27	mg/m3
BENZ EMISSION RATE	0.032	lb/hr
STACK FLOW RATE	53276	m3/hr
PRODUCTION RATE	292	tph
BENZENE EMISSION FACTOR	0.0001	lb/ton

TEST

2

PUMP	SKC2	
PUMP CAL	0.456	cc/count
PUMP COUNTS	22777	counts
SAMPLE VOLUME	10.39	std liters
PEAK AREA	69325	
WT OF BENZENE	7.12	ug
BENZ CONCENTRATION	0.69	mg/m3
BENZ EMISSION RATE	0.082	lb/hr
STACK FLOW RATE	54476	m3/hr
PRODUCTION RATE	292	tph
BENZENE EMISSION FACTOR	0.0003	lb/ton

TEST

3

PUMP	SKC2	
PUMP CAL	0.456	cc/count
PUMP COUNTS	24526	counts
SAMPLE VOLUME	11.18	std liters
PEAK AREA	75742	
WT OF BENZENE	7.78	ug
BENZ CONCENTRATION	0.70	mg/m3
BENZ EMISSION RATE	0.081	lb/hr
STACK FLOW RATE	52968	m3/hr
PRODUCTION RATE	291	tph
BENZENE EMISSION FACTOR	0.0003	lb/ton

AVERAGE BENZENE EMISSION RATE	0.065	lb/hr
AVERAGE BENZENE EMISSION FACTOR	0.0002	lb/ton

**GAS CHROMATOGRAPH ANALYSIS SHEET
METHOD 18 DATA**

**CLIENT
PROCESS/STACK
CALIBRATION FACTORS**

**NORTHEAST ASPHALT
Control 58 Plant**

PARAMETER	STD ug	STD AREA	FACTOR
Chlorobenzene	18.3	158288	0.0001156

RECOVERY FACTOR 1.00

TEST

1

PUMP	SKC2	
PUMP CAL	0.456	cc/count
PUMP COUNTS	25473	counts
SAMPLE VOLUME	11.62	std liters
PEAK AREA	-6000	
WT OF CBENZ	-0.69	ug
CBENZ CONCENTRATION	-0.06	mg/m3
CBENZ EMISSION RATE	-0.007	lb/hr
STACK FLOW RATE	53276	m3/hr

TEST

2

PUMP	SKC2	
PUMP CAL	0.456	cc/count
PUMP COUNTS	22777	counts
SAMPLE VOLUME	10.39	std liters
PEAK AREA	-6000	
WT OF CBENZ	-0.69	ug
CBENZ CONCENTRATION	-0.07	mg/m3
CBENZ EMISSION RATE	-0.008	lb/hr
STACK FLOW RATE	54476	m3/hr

TEST

3

PUMP	SKC2	
PUMP CAL	0.456	cc/count
PUMP COUNTS	24526	counts
SAMPLE VOLUME	11.18	std liters
PEAK AREA	-6000	
WT OF CBENZ	-0.69	ug
CBENZ CONCENTRATION	-0.06	mg/m3
CBENZ EMISSION RATE	-0.007	lb/hr
STACK FLOW RATE	52968	m3/hr

AVERAGE EMISSION RATE -0.007 lb/hr

**GAS CHROMATOGRAPH ANALYSIS SHEET
METHOD 18 DATA**

**CLIENT
PROCESS/STACK
CALIBRATION FACTORS**

**NORTHEAST ASPHALT
Control 56 Plant**

PARAMETER	STD ug	STD AREA	FACTOR
Di-Chlorobenzene	21.7	159891	0.0001357

RECOVERY FACTOR 1.00

**TEST
1**

PUMP	SKC2
PUMP CAL	0.456 cc/count
PUMP COUNTS	25473 counts
SAMPLE VOLUME	11.62 std liters
PEAK AREA	-6000
WT OF DICBENZ	-0.81 ug
DICBENZ CONCENTRATION	-0.07 mg/m3
DICBENZ EMISSION RATE	-0.008 lb/hr
STACK FLOW RATE	53276 m3/hr

**TEST
2**

PUMP	SKC2
PUMP CAL-	0.456 cc/count
PUMP COUNTS	22777 counts
SAMPLE VOLUME	10.39 std liters
PEAK AREA	-6000
WT OF DICBENZ	-0.81 ug
DICBENZ CONCENTRATION	-0.08 mg/m3
DICBENZ EMISSION RATE	-0.009 lb/hr
STACK FLOW RATE	54476 m3/hr

**TEST
3**

PUMP	SKC2
PUMP CAL	0.456 cc/count
PUMP COUNTS	24526 counts
SAMPLE VOLUME	11.18 std liters
PEAK AREA	-6000
WT OF DICBENZ	-0.81 ug
DICBENZ CONCENTRATION	-0.07 mg/m3
DICBENZ EMISSION RATE	-0.009 lb/hr
STACK FLOW RATE	52968 m3/hr

AVERAGE EMISSION RATE -0.009 lb/hr

**GAS CHROMATOGRAPH ANALYSIS SHEET
METHOD 18 DATA**

**CLIENT
PROCESS/STACK
CALIBRATION FACTORS**

**NORTHEAST ASPHALT
Control 56 Plant**

PARAMETER	STD ug	STD AREA	FACTOR
Tri-Chlorobenzene	24.1	140922	0.000171

RECOVERY FACTOR 1.00

**TEST
1**

PUMP	SKC2	
PUMP CAL	0.456	cc/count
PUMP COUNTS	25473	counts
SAMPLE VOLUME	11.62	std liters
PEAK AREA	-6000	
WT OF TRICBENZ	-1.03	ug
TRICBENZ CONCENTRATION	-0.09	mg/m3
TRICBENZ EMISSION RATE	-0.010	lb/hr
STACK FLOW RATE	53276	m3/hr

**TEST
2**

PUMP	SKC2	
PUMP CAL	0.456	cc/count
PUMP COUNTS	22777	counts
SAMPLE VOLUME	10.39	std liters
PEAK AREA	-6000	
WT OF TRICBENZ	-1.03	ug
TRICBENZ CONCENTRATION	-0.10	mg/m3
TRICBENZ EMISSION RATE	-0.012	lb/hr
STACK FLOW RATE	54476	m3/hr

**TEST
3**

PUMP	SKC2	
PUMP CAL	0.456	cc/count
PUMP COUNTS	24526	counts
SAMPLE VOLUME	11.18	std liters
PEAK AREA	-6000	
WT OF TRICBENZ	-1.03	ug
TRICBENZ CONCENTRATION	-0.09	mg/m3
TRICBENZ EMISSION RATE	-0.011	lb/hr
STACK FLOW RATE	52968	m3/hr

AVERAGE EMISSION RATE -0.011 lb/hr

Data Analysis Technologies, Inc.
6385 Shier Rings Rd.
Dublin, OH 43016

Sample Analysis Certificate

Environmental Technology and Engineering, Inc.
13020 West Bluemound Rd.
Elm Grove, WI 53122

Date: 9/10/97
Project ID: 0997011
Sample Date: 9/4/97
Sample Time: NA
Date Received: 9/8/97

Attn: Bill Dick
Project #: 2211 & 2210
Sampled by: NA

FORMALDEHYDE ANALYSIS BY METHOD TO-5

Project: 0997011

0997011-5	56-1	Formaldehyde	46.10
0997011-6	56-2	Formaldehyde	52.31
0997011-7	56-3	Formaldehyde	43.49
0997011-8	56-B (Blank)	Formaldehyde	1.72
0997011-MB	Method Blank	Formaldehyde	0.43 J

D: Dilution result

J: Analyte detected but below our lowest
calibrator.

Reviewed and approved for release by:


President

Date: 9/10/97

APPENDIX B

Sample Calculations

SAMPLE CALCULATION

BAROMETRIC PRESSURE, in Hg (Pb) = 29.200
 STACK PRESSURE, in Hg (Pb + Pg/13.6) = 29.178
 TIP DIAMETER, in (An = $\pi D^2/576$) = .2450
 STACK AREA, sq ft (A) = 10.560
 SAMPLING TIME PER POINT, min = 2.50
 NUMBER OF POINTS = 24
 GAS METER VOLUME, acf (Vm) = 66.06
 WATER COLLECTED, ml (Vf - Vi) = 86.00
 PARTICULATE COLLECTED, grams (Mn) = 0.0755
 CO2 = 0.60 O2 = 21.00 CO = 0.00 N2 = 78.40
 WET MOLECULAR WEIGHT, lb/mole (Ms) = 28.45

SAMPLING POINT	STACK TEMP deg F	PITOT DEL P inches	ORIFICE DEL H inches	GAS METER OUTLET T deg F	GAS VELOCITY fps
1	110	1.450	4.05	32	72.51
2	110	1.350	3.75	32	69.97
3	110	1.350	3.75	32	69.97
4	110	1.300	3.70	32	68.66
5	110	1.250	3.60	32	67.33
6	110	1.250	3.60	32	67.33
7	110	1.050	2.95	32	61.71
8	110	1.000	2.85	32	60.22
9	110	1.000	2.85	34	60.22
10	110	1.050	2.95	34	61.71
11	110	0.950	2.75	38	58.69
12	115	0.950	2.75	38	58.95
13	115	1.300	3.70	42	68.96
14	115	1.250	3.60	42	67.62
15	115	1.200	3.40	42	66.26
16	115	1.200	3.40	42	66.26
17	115	1.150	3.30	44	64.86
18	115	1.150	3.30	46	64.86
19	115	1.050	2.95	48	61.98
20	115	1.150	3.30	48	64.86
21	115	1.000	2.85	50	60.48
22	115	1.100	3.15	50	63.43
23	115	1.050	2.95	50	61.98
24	115	0.900	2.55	50	57.38
AVG VALUES	113		3.250	40	64.42

TOTAL GAS WITHDRAWN, scf = 69.39
 DRY GAS WITHDRAWN, scf (Vmstd) = 65.35
 WATER VAPOR WITHDRAWN, scf (Vwstd) = 4.05
 PERCENT WATER VAPOR (%H2O) = 5.83
 ACTUAL WET FLOW RATE, acfm = 40,819.39
 STANDARD DRY FLOW RATE, scfm (Qs) = 34,558.69
 PARTICULATE CONCENTRATION, grains/dscf (Cs) = 0.018
 PARTICULATE EMISSION RATE, lb/hr (ER) = 5.325
 PARTICULATE EMISSIONS, lb/1000 lb (EC) = 0.033
 PERCENT OF ISOKINETIC SAMPLING (I) = 101.67

SAMPLE CALCULATIONS

1. DRY MOLECULAR WEIGHT (Md) lb/lb-mole

$$Md = .44\% \text{ CO}_2 + .32\% \text{ O}_2 + .282\% \text{ N}_2 + .28\% \text{ CO}$$

2. WATER VAPOR PERCENT (%H₂O)

$$Vw \text{ std} = 0.04707 \cdot (V_f - V_i)$$

where: $Vw \text{ std}$ = standard cubic feet of water vapor
 V_f = Final volume of impingers, ml
 V_i = Initial volume of impingers, ml

$$\%H_2O = Vw \text{ std} \cdot 100 / (Vm \text{ std} + Vw \text{ std})$$

where $Vm \text{ std}$ = standard cubic feet of gas sampled

3. WET MOLECULAR WEIGHT (Ms) lb/lb-mole

$$Ms = Md \cdot (1 - \%H_2O/100) + 18 \cdot \%H_2O/100$$

4. STACK PRESSURE (Ps) in. Hg

$$Ps = Pb + Pg/13.6$$

where: Pb = barometric pressure (uncorrected), in. Hg
 Pg = stack gauge pressure, in. H₂O
13.6 = specific gravity of mercury (Hg)

5. AVERAGE STACK VELOCITY (Vs) feet per second

$$Vs = K_p \cdot C_p \cdot (\text{DELP}) \cdot Ts_{avg} / (Ps \cdot Ms)$$

where: K_p = 85.49 unit conversion
 C_p = 0.85, pitot tube calibration factor
DELP = square root of velocity head, in. H₂O
 Ts_{avg} = average stack temperature, deg R (460+F)
 Ps = stack pressure
 Ms = wet molecular weight

6. STACK GAS FLOW RATE (Qs) std cubic feet per minute

$$Qs = 60 \cdot (1 - \%H_2O/100) \cdot Vs \cdot A \cdot (528 \cdot Ps / Ts_{avg} / 29.92)$$

where: A = stack area, ft²
528 = std temperature, deg R
29.92 = std pressure, in. Hg

7. DRY GAS VOLUME (V_m std) std cubic feet

$$V_m \text{ std} = GAMA * (V_m - (AL - .02)t) * (P_b + DELH/13.6) / 29.92$$

where: GAMA = dry gas meter calibration factor
 V_m = volume of dry gas metered, cubic feet
AL = post test leak rate, cubic feet per minute
 t = total time of test, minutes
DELH = average orifice pressure drop, in.H₂O

8. PARTICULATE CONCENTRATION (C_s) grains/dry std cubic foot

$$C_s = M_n * 15.43 / V_m \text{ std}$$

where: M_n = particulate captured, grams
15.43 = grains per gram

9. EMISSION RATE (ER) pounds per hour

$$PMRA = \frac{M_n * A * 60}{(t * A_n * 453.6)} \quad \text{AREA METHOD lb/hr}$$

$$PMRC = \frac{C_s * Q_s * 60}{(15.43 * 453.6)} \quad \text{CONC. METHOD lb/hr}$$

$$ER = (PMRA + PMRC) / 2$$

where: A_n = area of sampling nozzle, square feet

10. EMISSION CONCENTRATION (EC) lb/1000 lb exhaust gas

$$EC = ER * 386700 * (1 - \%H_2O/100) / (Q_s * 60 * M_s)$$

where: 386700 = cubic feet per lb mole * 1000

11. ISOKINETIC SAMPLING PERCENTAGE (I) %

$$I = PMRA / PMRC$$