File

JOHN ASHCROFT
Governor

G. TRACY MEHAN III
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176
Jefferson City, MO 65102

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Divisionof Parks, Recreation,
and Historic Preservation

December 18, 1991

Mr. William D. Eckhoff
President, Masters & Jackson Paving Company
P. O. Box 1187
Springfield, MO 65801

Dear Mr. Eckhoff:

My staff has reviewed the report of emission tests conducted by AirSource Technologies on your Double Barrel Astec Asphalt Plant near Willard, Missouri. Testing was conducted on August 5 & 6, 1991. The reported average particulate concentration of 0.0068 gr/DSCF was less than the NSPS maximum (0.04 gr/DSCF), and the observed opacity was below the NSPS maximum (20%). Our review of the test data is in substantial agreement with these findings. In light of the foregoing, the facility was found to be in compliance at the time of the test with permit # 0391-007.

Production at the time of the test averaged 420 tons per hour which shall be the maximum permitted production rate for this facility. Pressure drop across the baghouse was not reported by AirSource Technologies, but was recorded by APCP personnel for a single run. During this run pressure drop averaged approximately 2 inches of water. To ensure continued compliance with permit conditions, a comparable level should be maintained whenever the facility is in operation. Annual production at this facility is limited to 350,000 tons.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Steve Feeler
Compliance Unit Chief

SF:pyb

JOHN ASHCROFT
Governor

G. TRACY MEHAN III
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MEMORANDUM

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Divisionof Parks, Recreation,
and Historic Preservation

DATE: December 19, 1991

TO: Greene County file

FROM: Peter Yronwode

SUBJECT: Masters & Jackson Paving Co.; Asphalt Plant Stack test

Masters & Jackson Paving Company received permit # 0391-007 to construct an Astec Double Barrel asphalt plant near Willard, Missouri. On August 5 & 6, 1991 a particulate emission test was run on the plant by AirSource Technologies.

During the test the plant was run at 420 tons per hour and pressure drop across the bag house (recorded by APCP) averaged @2 inches of water. The three test runs met isokinetic sampling criteria, reported opacity averaged less than 1%, and reported average particulate concentration was 0.0068 gr/DSCF. At the time of testing the facility was in compliance with New Source Performance Standards (0.04 gr/DSCF and 20%). Annual production is limited to 350,000 tons.

The original presentation of the report by AirSource Technologies was unsatisfactory. Important data was omitted and the required format was not followed. A better report was finally submitted five months after the test was performed in which baghouse data was still missing. Because of the extremely low emissions at this plant the report was accepted but the testing firm was warned that omission of such information in future reports would result in their rejection by APCP.

SOURCE EMISSIONS REPORT
OF
MASTERS & JACKSON
SPRINGFIELD, MISSOURI
(Willard/Springfield Facility)

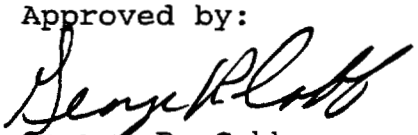
BY
AIRSOURCE TECHNOLOGIES
11635 WEST 83RD TERRACE
LENEXA, KANSAS 66215

AirSource Project No. 411117/R

PREFACE

This report was prepared by AirSource Technologies in response to a test that was conducted at Masters-Jackson's Willard/Springfield, Missouri, plant on August 5 and 6, 1991. Any questions concerning this report should be directed to Mr. George Cobb, General Manager.

Approved by:



George R. Cobb
General Manager

November 25, 1991

SECTION 1

INTRODUCTION

A compliance test was conducted for particulates and opacity by AirSource Technologies on Masters- Jackson's asphalt drum mixer facility, located near Willard/Springfield, Missouri. Three 1-hour runs were conducted by George Cobb, Karl Baker and Dan Rigdon on August 5 and 6, 1991. This report presents the results and methodology used to perform these tests.

The appendices contain the following:

Appendix A: Computer Calculatons
Appendix B: Example Calculations
Appendix C: Field Data Forms
Appendix D: Laboratory Data
Appendix E: Pretest Calibrations
Appendix F: Posttest Calibrations
Appendix G: Participants
Appendix H: Process Data

PLANT NAME: Masters & Jackson — Test Hill Asphalt Plant

LOCATION: Willard, MO DATE: 8/5-6/91 RUN NO: 1

USE FOR ANY TEST WITH A SQUARE OR RECTANGULAR STACK

NUMBER OF POINTS	24	PERCENT OXYGEN	14.50
TIME, MINUTE/POINT	2.50	PERCENT CARBON DIOXIDE	5.50
LEAK RATE, FT3/MIN	0.000	PERCENT CARBON MONOXIDE	0.00
BAR PRESS, INCH Hg	29.92	Cp (PITOT COEFFICIENT)	0.840
STATIC PRESS (in H2O)	0.39	NOZZLE DIAMETER, INCHES	0.238
STACK EXIT LENGTH IN	49.00	INITIAL METER VOL, FT3	84.502
STACK EXIT WIDTH IN	33.00	FINAL METER VOL, FT3	136.482
IMPINGER H2O, ML	248.6	METER CORR FACT, Y	1.014
SILICA GEL H2O, GM	9.8	PARTIC COLLECTED, MG	31.40

PT NO	STACK TEMP (Ts)	VELOC PRESS (dPs)	ORIFICE PRESS (dH)	METER TEMP INLET (Tmi	METER TEMP OUTLET (Tmo)	SQR ROOT VELOC PRESS
1	204.0	1.40	3.20	102	101	1.183
2	214.0	1.40	3.15	99	100	1.183
3	219.0	1.30	2.90	101	101	1.140
4	219.0	1.20	2.70	102	101	1.095
5	215.0	1.60	3.60	103	102	1.265
6	215.0	1.60	3.60	103	101	1.265
7	212.0	1.40	3.20	106	102	1.183
8	203.0	1.10	2.50	106	102	1.049
9	201.0	1.70	3.90	104	101	1.304
10	200.0	1.30	3.00	104	102	1.140
11	201.0	1.00	2.30	105	102	1.000
12	206.0	0.94	2.15	105	102	0.970
13	214.0	1.40	3.15	104	102	1.183
14	223.0	0.98	2.20	104	102	0.990
15	227.0	0.75	1.70	107	104	0.866
16	226.0	0.60	1.35	107	104	0.775
17	225.0	1.20	2.70	107	105	1.095
18	231.0	0.94	2.10	107	105	0.970
19	231.0	0.71	1.60	108	106	0.843
20	228.0	0.62	1.40	108	106	0.787
21	224.0	0.88	1.20	108	106	0.938
22	226.0	0.88	2.00	109	107	0.938
23	225.0	0.70	1.60	110	108	0.837
24	225.0	0.58	1.30	112	109	0.762
25						
26						
27						
28						
29						
30						
AVG	217.3	1.091	2.44	105.5	103.4	1.0317

STACK GAS MOL WT. WET	27.20	AVG ABS STACK TEMP (deg R)	677.3
STACK VELOCITY (ft/sec)	67.55	AVG ABS METER TEMP (deg R)	564.4
STD VOL SAMPLED (std ft2)	49.58	METER LEAK RATE (ft3/min)	0.000
AVG METER TEMP (deg F)	104.42	SAMPLE VOL LK CORR'D (ft3)	51.98
PERCENT MOISTURE (%)	19.70	AVG ABS STACK PRESS (in Hg)	29.95
STD STACK FLOW RATE (DSCFM)	28519.71	VOL H2O IN METER GAS (std ft3)	12.16
		H2O IN GAS STREAM (vol frac)	0.197
ISOKINETIC SAMPLING RATE (%)	105.27	NOZZLE AREA (ft2)	0.00031
PARTIC EMISSION RATE (lb/hr)	2.3890	STACK AREA (ft2)	11.229
PARTICULATE CONC (gr/DSCF)	0.009773	STACK EQUIV DIAMETER (ft)	39.44

PLANT NAME:Masters & Jackson TEST UNIT:Asphalt Plant

LOCATION: Willard, MO DATE: 8/5-6/91 RUN NO: 3

USE FOR ANY TEST WITH A SQUARE OR RECTANGULAR STACK

NUMBER OF POINTS	24	PERCENT OXYGEN	16.20
TIME, MINUTE/POINT	2.50	PERCENT CARBON DIOXIDE	6.00
LEAK RATE, FT3/MIN	0.000	PERCENT CARBON MONOXIDE	0.00
BAR PRESS, INCH Hg	28.85	Cp (PITOT COEFFICIENT)	0.840
STATIC PRESS (in H2O)	0.39	NOZZLE DIAMETER, INCHES	0.174
STACK EXIT LENGTH IN	49.00	INITIAL METER VOL, FT3	188.308
STACK EXIT WIDTH IN	33.00	FINAL METER VOL, FT3	215.553
IMPINGER H20, ML	160.2	METER CORR FACT, Y	1.014
SILICA GEL H20, GM	5.3	PARTIC COLLECTED, MG	15.10

PT NO	STACK TEMP (Ts)	VELOC PRESS (dPs)	ORIFICE PRESS (dH)	METER TEMP INLET (Tmi	METER TEMP OUTLET (Tmo)	SQR ROOT VELOC PRESS
1	189	0.90	0.55	113	110	0.949
2	195	1.50	0.91	111	111	1.225
3	201	1.60	0.96	112	112	1.265
4	205	1.30	0.78	113	113	1.140
5	215	1.60	0.94	113	112	1.265
6	223	1.60	0.93	114	113	1.265
7	222	1.30	0.76	114	112	1.140
8	222	0.90	0.52	114	112	0.949
9	218	1.60	0.94	114	112	1.265
10	217	1.20	0.70	107	108	1.095
11	216	0.94	0.54	101	102	0.970
12	217	0.62	0.35	99	99	0.787
13	217	1.50	0.86	98	99	1.225
14	222	0.90	0.51	98	99	0.949
15	221	0.74	0.42	98	99	0.860
16	215	0.70	0.40	96	96	0.837
17	215	1.70	0.97	94	95	1.304
18	159	1.20	0.72	78	78	1.095
19	190	0.79	0.45	79	79	0.889
20	194	0.64	0.37	80	79	0.800
21	196	1.20	0.69	81	79	1.095
22	198	1.20	0.69	82	80	1.095
23	196	0.94	0.54	83	80	0.970
24	192	0.58	0.33	84	81	0.762
25						
26						
27						
28						
29						
30						
AVG	206.5	1.131	0.66	99.0	98.3	1.0498

STACK GAS MOL WT. WET	26.87	AVG ABS STACK TEMP (deg R)	666.5
STACK VELOCITY (ft/sec)	69.87	AVG ABS METER TEMP (deg R)	558.7
STD VOL SAMPLED (std ft2)	25.21	METER LEAK RATE (ft3/min)	0.000
AVG METER TEMP (deg F)	98.67	SAMPLE VOL LK CORR'D (ft3)	27.25
PERCENT MOISTURE (%)	23.61	AVG ABS STACK PRESS (in Hg)	28.88
STD STACK FLOW RATE (DSCFM)	27498.02	VOL H20 IN METER GAS (std ft3)	7.79
		H20 IN GAS STREAM (vol frac)	0.236
ISOKINETIC SAMPLING RATE (%)	103.85	NOZZLE AREA (ft2)	0.00017
PARTIC EMISSION RATE (lb/hr)	2.1788	STACK AREA (ft2)	11.229
PARTICULATE CONC (gr/DSCF)	0.009244	STACK EQUIV DIAMETER (ft)	39.44

PLANT NAME: Masters & Jackson TEST UNIT: Asphalt Plant

LOCATION: Willard, MO DATE: 8/5-6/91 RUN NO: 4

USE FOR ANY TEST WITH A SQUARE OR RECTANGULAR STACK

NUMBER OF POINTS	24	PERCENT OXYGEN	14.70
TIME, MINUTE/POINT	2.50	PERCENT CARBON DIOXIDE	6.20
LEAK RATE, FT3/MIN	0.000	PERCENT CARBON MONOXIDE	0.00
BAR PRESS, INCH Hg	28.97	Cp (PITOT COEFFICIENT)	0.840
STATIC PRESS (in H2O)	0.39	NOZZLE DIAMETER, INCHES	0.238
STACK EXIT LENGTH IN	49.00	INITIAL METER VOL, FT3	218.317
STACK EXIT WIDTH IN	33.00	FINAL METER VOL, FT3	264.073
IMPINGER H2O, ML	199.1	METER CORR FACT, Y	1.014
SILICA GEL H2O, GM	14.0	PARTIC COLLECTED, MG	3.20

PT NO	STACK TEMP (Ts)	VELOC PRESS (dPs)	ORIFICE PRESS (dH)	METER TEMP INLET (Tmi	METER TEMP OUTLET (Tmo)	SQR ROOT VELOC PRESS
1	219	0.86	1.70	84	83	0.927
2	227	0.52	1.00	89	85	0.721
3	225	0.47	0.92	91	86	0.686
4	223	0.47	0.92	92	87	0.686
5	221	0.95	1.90	92	88	0.975
6	219	0.73	1.50	96	89	0.854
7	219	0.59	1.20	96	90	0.768
8	214	0.53	1.05	97	91	0.728
9	213	1.20	2.40	96	91	1.095
10	211	0.81	1.65	100	92	0.900
11	212	0.71	1.45	101	94	0.843
12	211	0.62	1.25	102	95	0.787
13	211	1.40	2.85	100	95	1.183
14	211	1.00	2.05	103	96	1.000
15	210	0.91	1.85	104	97	0.954
16	208	0.65	1.35	104	98	0.806
17	207	1.50	3.10	103	98	1.225
18	207	1.50	3.00	104	99	1.225
19	206	1.30	2.70	105	98	1.140
20	204	0.92	1.90	104	99	0.959
21	200	1.40	2.90	102	99	1.183
22	201	1.50	3.00	102	98	1.225
23	201	1.50	3.00	102	98	1.225
24	201	1.45	3.00	102	98	1.204
25						
26						
27						
28						
29						
30						
AVG	211.7	0.979	1.99	98.8	93.5	0.9708

STACK GAS MOL WT. WET	27.38	AVG ABS STACK TEMP (deg R)	671.7
STACK VELOCITY (ft/sec)	64.12	AVG ABS METER TEMP (deg R)	556.1
STD VOL SAMPLED (std ft2)	42.85	METER LEAK RATE (ft3/min)	0.000
AVG METER TEMP (deg F)	96.15	SAMPLE VOL LK CORR'D (ft3)	45.76
PERCENT MOISTURE (%)	18.97	AVG ABS STACK PRESS (in Hg)	29.00
STD STACK FLOW RATE (DSCFM)	26668.32	VOL H2O IN METER GAS (std ft3)	10.03
	✓ 27662.0	H2O IN GAS STREAM (vol frac)	0.190
ISOKINETIC SAMPLING RATE (%)	97.28	NOZZLE AREA (ft2)	0.00031
PARTIC EMISSION RATE (lb/hr)	0.2634	STACK AREA (ft2)	11.229
PARTICULATE CONC (gr/DSCF)	0.001153	STACK EQUIV DIAMETER (ft)	39.44

0.0067 gr/DSCF

1.61 #/hr

SECTION 2

SUMMARY OF RESULTS

2.1 Particulate Emission and Opacity Results

Table 2-1 presents the particulate emission results and the opacity averages taken during the particulate runs.

Table 2-1

Parameters	Results		
	Run 1	Run 3	Run 4
Particulate Collected, g	0.0314	0.0151	0.0032
Particulate Concentration,			
Actual (gr/cu ft)	0.0061	0.0054	0.0007
Dry Std. (gr/scf)	0.0101	0.0092	0.0012
Emission Rate, lb/hr	2.41	2.17	0.26
Opacity, %	0.0	0.0	0.0

2.2 Sampling Train Results

Table 2-2 summarizes the sample train results as determined by measurement and calculations.

Table 2-2

Parameters	Results		
	Run 1	Run 3	Run 4
Sampling Time, min	60	60	60
Sample Volume, dscf	47.935	25.208	42.848
Isokinetics, %	104.2	103.9	97.4
Oxygen Concentration, %	14.5	16.2	24.7
Carbon Dioxide Concentration, %	5.5	6.0	6.2
Stack Gas Moisture, %	20.2	23.6	19.0
Average Stack Temp., °F	217	206	212
Actual Flow Rate, acfm	46,340	47,069	43,196
Stack Flow Rate, dscf/min	27,877	27,492	26,663

2.3 Discussion of Results

The results show the plant is within compliance of the 0.04 gr/dscf allowable particulate concentration. The opacity averages were within the 20% limit. The plant was operated at an average production rate of 450 tons per hour.

After completion of Run 2, it was determined that the filter was installed incorrectly; therefore, it was decided to run a fourth run. The field data for this run is not included in this report.

There were no plant interruptions during the testing.

SECTION 3

SOURCE OPERATION

The Willard/Springfield plant is located two miles southeast of Willard, Missouri. The unit is a Double Barrel Aztec with a capacity of 511 T/hr @ 0% moisture. No. 2 diesel is used as fuel at a rate of 420 gal/hr during operation. A schematic of the plant is shown in Figure 3-1.

During operation on August 5 and 6, 3,300 T and 1,823 T of asphalt were produced, respectively. This averages to 420 T/hr production rate.

Appendix H provides the production data provided by the plant.

MASTERS-JACKSON PAVING COMPANY

Willard/Springfield

PROCESS FLOW DIAGRAM

Double Barrel Aztec

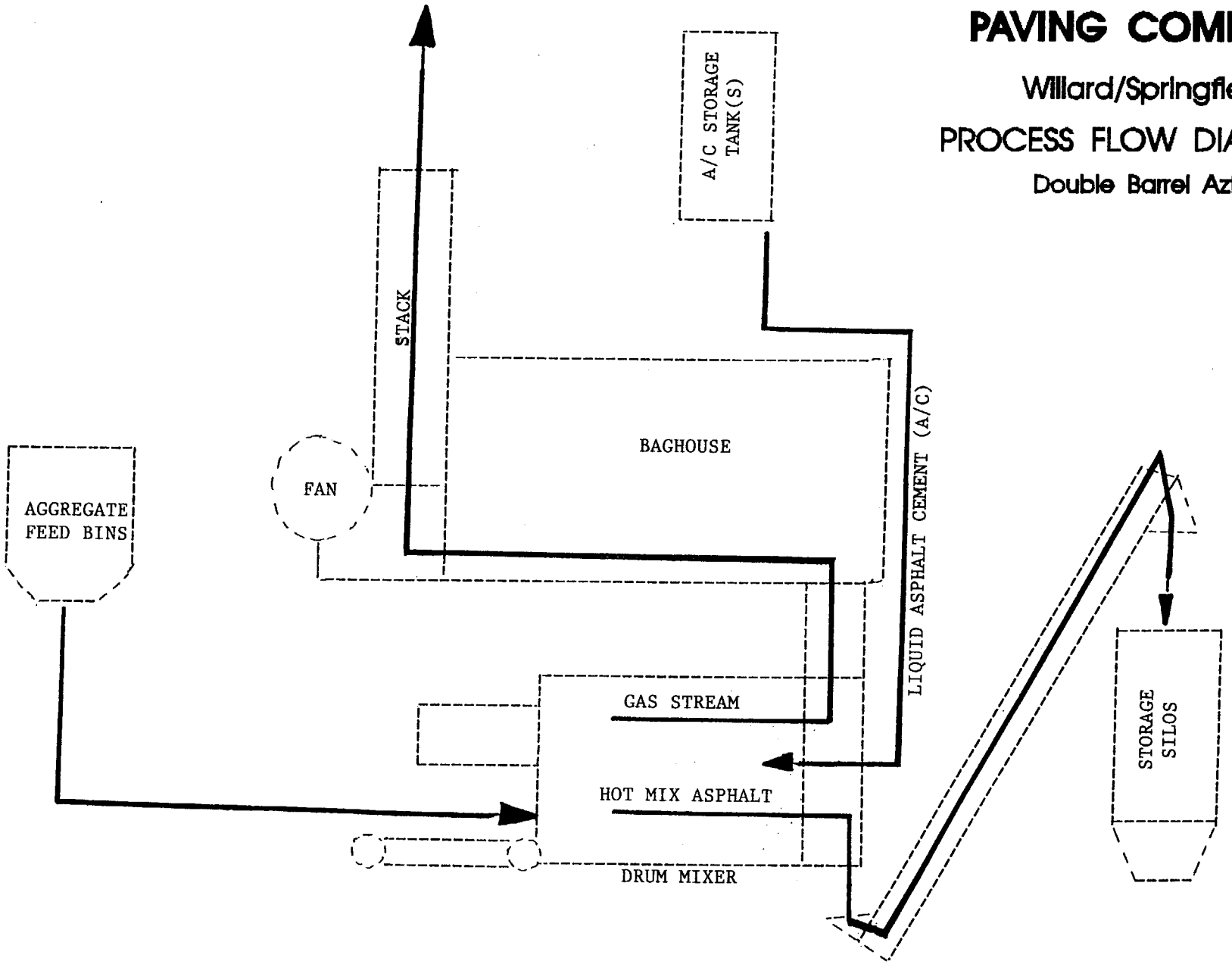
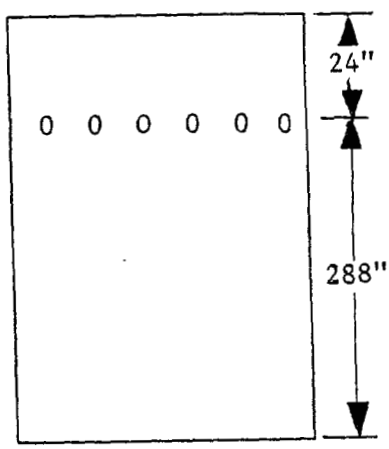


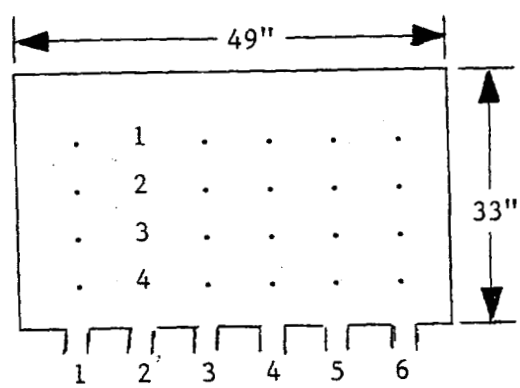
Figure 3-1

SECTION 4

SAMPLING AND ANALYSIS

The sample ports are located 0.6 diameters upstream and 7.3 diameters downstream from disturbances. The stack dimensions are 33"x49". Four sample points per port, for a total of 24, were used to perform the test runs. Below is a summary of the port and sample point locations.





Sampling was conducted using a USEPA Method 5 sampling train. The train consists of a heat-traced borosilicate glass probe liner housed in a stainless steel sheath; a high efficiency glass fiber filter supported on a Teflon frit, mounted in a glass holder; four glass impingers; and a flow control module containing a leakless vacuum pump, a dry gas meter, an orifice meter and appropriate valves, gauges, and associated hardware to permit control and monitoring of the gas sampling rate. The four impingers are of the Greenburg-Smith design as follows:

* The first is a modified Greenburg-Smith, containing 100 ml of distilled H_2O.

* The second is a standard Greenburg-Smith, containing 100 ml of distilled H_2O.

* The third and fourth impingers are of the modified Greenburg-Smith design. The third is empty, but intended to collect any carryover of moisture. The fourth contains approximately 200g of blue, indicating

A cyclone was not used because particulate emissions were expected to be low. The filter was housed in a temperature-controlled oven maintained at 248°F + 25°F.

Sampling was conducted in accordance with the procedures outlined in EPA Reference Method 5. The samples were collected isokinetically over a 60 minute traverse of the stack as required by 40 CFR 60 Appendix A, Methods 1-5. All pitot and sample train leak checks for all runs were within the method criteria.

The sample recovery from the M5 particulate train was as follows:

* Container 1 - Filter: Teflon-coated forceps were used to remove the filter and place it in a labeled glass petri dish.

* Container 2 - Front-half Rinse: The probe nozzle, probe liner, and all glassware, up to and including, the front-half of the filter housing were rinsed and brushed with acetone a minimum of three times.

* The condensate and silica gel impinger were weighed using a triple beam balance.

A multipoint composite stack gas sample was taken during each test run and analyzed for percentage oxygen and carbon dioxide according to EPA Reference Method 3 (40 CFR 60). The sample was taken simultaneously with the Method 5 sampling, from the exhaust of the Method 5 sampling train console.

The particulate matter analyses were performed by AirSource Technologies according to the procedures established in EPA Reference Method 5, paragraph 4.3. The filters were desiccated for 24 hours and weighed to a constant weight. A blank filter was taken in the field and used as a control.

The front half rinses were measured volumetrically. The contents were transferred to tared beakers and evaporated to dryness at ambient temperature and pressure. The beakers were desiccated for 24 hours and weighed to a constant weight. An acetone blank was taken in the field and used as a control.

The opacity measurements were done according to EPA Reference Method 9.

APPENDIX A

COMPUTER FORMS

FILE NAME - 411117r1
RUN # - 1
LOCATION - STACK
DATE - 8/05/91
PROJECT # - 411117

PROG.=VER 06/27/89
08-21-1991 04:26:17

Initial Meter Volume (Cubic Feet)=	84.502	
Final Meter Volume (Cubic Feet)=	136.482	
Meter Factor=	1.014	
Final Leak Rate (cu ft/min)=	0.002	
Net Meter Volume (Cubic Feet)=	52.708	
Gas Volume (Dry Standard Cubic Feet)=	47.935	
Barometric Pressure (in Hg)=	28.92	
Static Pressure (Inches H20)=	0.39	
Percent Oxygen=	14.5	
Percent Carbon Dioxide=	5.5	
Moisture Collected (ml)=	258.4	
Percent Water=	20.2	
Average Meter Temperature (F)=	104	
Average Delta H (in H20)=	2.44	
Average Delta P (in H20)=	1.091	
Average Stack Temperature (F)=	217	
Dry Molecular Weight=	29.46	
Wet Molecular Weight=	27.14	
Average Square Root of Delta P (in H20)=	1.0317	
% Isokinetic=	104.2	
Pitot Coefficient=	0.84	
Sampling Time (Minutes)=	60.0	
Nozzle Diameter (Inches)=	0.238	
Stack Axis #1 (Inches)=	33.0	
Stack Axis #2 (Inches)=	49.0	
Rectangular Stack		
Stack Area (Square Feet)=	11.23	
Stack Velocity (Actual, Feet/min)=	4,127	
Flow Rate (Actual, Cubic ft/min)=	46,340	
Flow rate (Standard, Wet, Cubic ft/min)=	34,955	
Flow Rate (Standard, Dry, Cubic ft/min)=	27,877	

Particulate Loading - Front Half

Particulate Weight (g)=	0.0314	Corr. to 7% O2 & 12% CO2
Particulate Loading, Dry Std. (gr/scf)=	0.0101	0.0217 0.0220
Particulate Loading, Actual (gr/cu ft)=	0.0061	
Emission Rate (lb/hr)=	2.41	

No Back Half Analysis

* * METRIC UNITS * *

FILE NAME - 411117r1
RUN # - 1
LOCATION - STACK
DATE - 8/05/91
PROJECT # - 411117

PROG.=VER 06/27/89
08-21-1991 04:26:18

Initial Meter Volume (Cubic Meters)=	2.393
Final Meter Volume (Cubic Meters)=	3.865
Meter Factor=	1.014
Final Leak Rate (cu m/min)=	0.0001
Net Meter Volume (Cubic Meters)=	1.492
Gas Volume (Dry Standard Cubic Meters)=	1.357
Barometric Pressure (mm Hg)=	735
Static Pressure (mm H20)=	10
Percent Oxygen=	14.5
Percent Carbon Dioxide=	5.5
Moisture Collected (ml)=	258.4
Percent Water=	20.2
Average Meter Temperature (C)=	40
Average Delta H (mm H20)=	61.9
Average Delta P (mm H20)=	27.7
Average Stack Temperature (C)=	103
Dry Molecular Weight=	29.46
Wet Molecular Weight=	27.14
Average Square Root of Delta P (mm H20)=	5.1996
% Isokinetic=	104.2
Pitot Coefficient=	0.84
Sampling Time (Minutes)=	60.0
Nozzle Diameter (mm)=	6.05
Stack Axis #1 (Meters)=	0.838
Stack Axis #2 (Meters)=	1.245
Rectangular Stack	
Stack Area (Square Meters)=	1.043
Stack Velocity (Actual, m/min)=	1,258
Flow rate (Actual, Cubic m/min)=	1,312
Flow rate (Standard, Wet, Cubic m/min)=	990
Flow rate (Standard, Dry, Cubic m/min)=	789

Particulate Loading - Front Half

Particulate Weight (g)=	0.0314	Corr. to 7% O2 & 12% CO2
Particulate Loading, Dry Std. (mg/cu m)=	23.1	49.8 50.5
Particulate Loading, Actual (mg/cu m)=	13.9	
Emission Rate (kg/hr)=	1.09	

No Back Half Analysis

FILE NAME - 411117r1
RUN # - 1
LOCATION - STACK
DATE - 8/05/91
PROJECT # - 411117

PROG.=VER 06/27/89
08-21-1991 04:26:33

Point #	Delta P (in. H20)	Delta H (in. H20)	Stack T (F)	Meter T In(F)	Meter T Out(F)
1	1.400	3.20	204	102	101
2	1.400	3.15	214	99	100
3	1.300	2.90	219	101	101
4	1.200	2.70	219	102	101
5	1.600	3.60	215	103	102
6	1.600	3.60	215	103	101
7	1.400	3.20	212	106	102
8	1.100	2.50	203	106	102
9	1.700	3.90	201	104	101
10	1.300	3.00	200	104	102
11	1.000	2.30	201	105	102
12	0.940	2.15	206	105	102
13	1.400	3.15	214	104	102
14	0.980	2.20	223	104	102
15	0.750	1.70	227	107	104
16	0.600	1.35	226	107	104
17	1.200	2.70	225	107	105
18	0.940	2.10	231	107	105
19	0.710	1.60	231	108	106
20	0.620	1.40	228	108	106
21	0.880	1.20	224	108	106
22	0.880	2.00	226	109	107
23	0.700	1.60	225	110	108
24	0.580	1.30	225	112	109

Fraction	Final Wt. (g)	Tare Wt. (g)	Blank Wt. (g)	Net Wt. (g)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	43.1663	43.1625	0.0002	0.0036

Fraction	Final Wt. (g)	Tare Wt. (g)	Vol. (ml)	Net Wt. (g)
PROBE RINSE	74.9569	74.9291	170.0	0.0278
IMPINGERS	0.0000	0.0000	0.0	0.0000

Probe Rinse Blank (mg/ml)= 0.0000
Impinger Blank (mg/ml)= 0.0000

FILE NAME - 411117r3 PROG.=VER 06/27/89
RUN # - 3 08-21-1991 05:07:11
LOCATION - STACK
DATE - 8/5/91
PROJECT # - 411117

Initial Meter Volume (Cubic Feet)=	188.308	
Final Meter Volume (Cubic Feet)=	215.553	
Meter Factor=	1.014	
Final Leak Rate (cu ft/min)=	0.002	
Net Meter Volume (Cubic Feet)=	27.626	
Gas Volume (Dry Standard Cubic Feet)=	25.208	
Barometric Pressure (in Hg)=	28.85	
Static Pressure (Inches H20)=	0.39	
Percent Oxygen=	16.2	
Percent Carbon Dioxide=	6.0	
Moisture Collected (ml)=	165.5	
Percent Water=	23.6	
Average Meter Temperature (F)=	99	
Average Delta H (in H20)=	0.66	
Average Delta P (in H20)=	1.131	
Average Stack Temperature (F)=	206	
Dry Molecular Weight=	29.61	
Wet Molecular Weight=	26.87	
Average Square Root of Delta P (in H20)=	1.0498	
% Isokinetic=	103.9	
Pitot Coefficient=	0.84	
Sampling Time (Minutes)=	60.0	
Nozzle Diameter (Inches)=	0.174	
Stack Axis #1 (Inches)=	33.0	
Stack Axis #2 (Inches)=	49.0	
Rectangular Stack		
Stack Area (Square Feet)=	11.23	
Stack Velocity (Actual, Feet/min)=	4,192	
Flow Rate (Actual, Cubic ft/min)=	47,069	
Flow rate (Standard, Wet, Cubic ft/min)=	35,993	
Flow Rate (Standard, Dry, Cubic ft/min)=	27,492	

Particulate Loading - Front Half

Particulate Weight (g)=	0.0151	Corr. to 7% O2 & 12% CO2
Particulate Loading, Dry Std. (gr/scf)=	0.0092	0.0269 0.0184
Particulate Loading, Actual (gr/cu ft)=	0.0054	
Emission Rate (lb/hr)=	2.17	

No Back Half Analysis

* * METRIC UNITS * *

FILE NAME - 411117r3
RUN # - 3
LOCATION - STACK
DATE - 8/5/91
PROJECT # - 411117

PROG.=VER 06/27/89
08-21-1991 05:07:11

Initial Meter Volume (Cubic Meters)=	5.332
Final Meter Volume (Cubic Meters)=	6.104
Meter Factor=	1.014
Final Leak Rate (cu m/min)=	0.0001
Net Meter Volume (Cubic Meters)=	0.782
Gas Volume (Dry Standard Cubic Meters)=	0.714
Barometric Pressure (mm Hg)=	733
Static Pressure (mm H20)=	10
Percent Oxygen=	16.2
Percent Carbon Dioxide=	6.0
Moisture Collected (ml)=	165.5
Percent Water=	23.6
Average Meter Temperature (C)=	37
Average Delta H (mm H20)=	16.8
Average Delta P (mm H20)=	28.7
Average Stack Temperature (C)=	97
Dry Molecular Weight=	29.61
Wet Molecular Weight=	26.87
Average Square Root of Delta P (mm H20)=	5.2908
% Isokinetic=	103.9
Pitot Coefficient=	0.84
Sampling Time (Minutes)=	60.0
Nozzle Diameter (mm)=	4.42
Stack Axis #1 (Meters)=	0.838
Stack Axis #2 (Meters)=	1.245
Rectangular Stack	
Stack Area (Square Meters)=	1.043
Stack Velocity (Actual, m/min)=	1,278
Flow rate (Actual, Cubic m/min)=	1,333
Flow rate (Standard, Wet, Cubic m/min)=	1,019
Flow rate (Standard, Dry, Cubic m/min)=	778

Particulate Loading - Front Half

Particulate Weight (g)=	0.0151	Corr. to 7% O2 & 12% CO2
Particulate Loading, Dry Std. (mg/cu m)=	21.2	61.7 42.3
Particulate Loading, Actual (mg/cu m)=	12.3	
Emission Rate (kg/hr)=	0.99	

No Back Half Analysis

FILE NAME - 411117r3
RUN # - 3
LOCATION - STACK
DATE - 8/5/91
PROJECT # - 411117

PROG.=VER 06/27/89
08-21-1991 05:07:27

Point #	Delta P (in. H20)	Delta H (in. H20)	Stack T (F)	Meter T In(F)	Meter T Out(F)
1	0.900	0.55	189	113	110
2	1.500	0.91	195	111	111
3	1.600	0.96	201	112	112
4	1.300	0.78	205	113	113
5	1.600	0.94	215	113	112
6	1.600	0.93	223	114	113
7	1.300	0.76	222	114	112
8	0.900	0.52	222	114	112
9	1.600	0.94	218	114	112
10	1.200	0.70	217	107	108
11	0.940	0.54	216	101	102
12	0.620	0.35	217	99	99
13	1.500	0.86	217	98	99
14	0.900	0.51	222	98	99
15	0.740	0.42	221	98	99
16	0.700	0.40	215	96	96
17	1.700	0.97	215	94	95
18	1.200	0.72	159	78	78
19	0.790	0.45	190	79	79
20	0.640	0.37	194	80	79
21	1.200	0.69	196	81	79
22	1.200	0.69	198	82	80
23	0.940	0.54	196	83	80
24	0.580	0.33	192	84	81

Fraction	Final Wt. (g)	Tare Wt. (g)	Blank Wt. (g)	Net Wt. (g)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	29.0229	29.0210	0.0002	0.0017

Fraction	Final Wt. (g)	Tare Wt. (g)	Vol. (ml)	Net Wt. (g)
PROBE RINSE	67.5795	67.5661	145.0	0.0134
IMPINGERS	0.0000	0.0000	0.0	0.0000

Probe Rinse Blank (mg/ml)= 0.0000
Impinger Blank (mg/ml)= 0.0000

FILE NAME - 411117r4 PROG.=VER 06/27/89
RUN # - 4 08-21-1991 04:30:35
LOCATION - STACK
DATE - 8/6/91
PROJECT # - 411117

Initial Meter Volume (Cubic Feet)=	218.317	
Final Meter Volume (Cubic Feet)=	264.073	
Meter Factor=	1.014	
Final Leak Rate (cu ft/min)=	0.003	
Net Meter Volume (Cubic Feet)=	46.397	
Gas Volume (Dry Standard Cubic Feet)=	42.848	
Barometric Pressure (in Hg)=	28.97	
Static Pressure (Inches H20)=	0.39	
Percent Oxygen=	14.7	
Percent Carbon Dioxide=	6.2	
Moisture Collected (ml)=	213.1	
Percent Water=	19.0	
Average Meter Temperature (F)=	96	
Average Delta H (in H20)=	1.99	
Average Delta P (in H20)=	0.979	
Average Stack Temperature (F)=	212	
Dry Molecular Weight=	29.58	
Wet Molecular Weight=	27.38	
Average Square Root of Delta P (in H20)=	0.9708	
% Isokinetic=	97.4	
Pitot Coefficient=	0.84	
Sampling Time (Minutes)=	60.0	
Nozzle Diameter (Inches)=	0.238	
Stack Axis #1 (Inches)=	33.0	
Stack Axis #2 (Inches)=	49.0	
Rectangular Stack		
Stack Area (Square Feet)=	11.23	
Stack Velocity (Actual, Feet/min)=	3,847	
Flow Rate (Actual, Cubic ft/min)=	43,196	
Flow rate (Standard, Wet, Cubic ft/min)=	32,909	
Flow Rate (Standard, Dry, Cubic ft/min)=	26,663	

Particulate Loading - Front Half

Particulate Weight (g)=	0.0032	Corr. to 7% O2 & 12% CO2
Particulate Loading, Dry Std. (gr/scf)=	0.0012	0.0026 0.0022
Particulate Loading, Actual (gr/cu ft)=	0.0007	
Emission Rate (lb/hr)=	0.26	

No Back Half Analysis

* * METRIC UNITS * *

FILE NAME - 411117r4 PROG.=VER 06/27/89
RUN # - 4 08-21-1991 04:30:35
LOCATION - STACK
DATE - 8/6/91
PROJECT # - 411117

Initial Meter Volume (Cubic Meters)=	6.182	
Final Meter Volume (Cubic Meters)=	7.477	
Meter Factor=	1.014	
Final Leak Rate (cu m/min)=	0.0001	
Net Meter Volume (Cubic Meters)=	1.314	
Gas Volume (Dry Standard Cubic Meters)=	1.213	
Barometric Pressure (mm Hg)=	736	
Static Pressure (mm H20)=	10	
Percent Oxygen=	14.7	
Percent Carbon Dioxide=	6.2	
Moisture Collected (ml)=	213.1	
Percent Water=	19.0	
Average Meter Temperature (C)=	36	
Average Delta H (mm H20)=	50.4	
Average Delta P (mm H20)=	24.9	
Average Stack Temperature (C)=	100	
Dry Molecular Weight=	29.58	
Wet Molecular Weight=	27.38	
Average Square Root of Delta P (mm H20)=	4.8927	
% Isokinetic=	97.4	
Pitot Coefficient=	0.84	
Sampling Time (Minutes)=	60.0	
Nozzle Diameter (mm)=	6.05	
Stack Axis #1 (Meters)=	0.838	
Stack Axis #2 (Meters)=	1.245	
Rectangular Stack		
Stack Area (Square Meters)=	1.043	
Stack Velocity (Actual, m/min)=	1,172	
Flow rate (Actual, Cubic m/min)=	1,223	
Flow rate (Standard, Wet, Cubic m/min)=	932	
Flow rate (Standard, Dry, Cubic m/min)=	755	

Particulate Loading - Front Half

Particulate Weight (g)=	0.0032	Corr. to 7% O2 & 12% CO2
Particulate Loading, Dry Std. (mg/cu m)=	2.6	5.9 5.1
Particulate Loading, Actual (mg/cu m)=	1.6	
Emission Rate (kg/hr)=	0.12	

No Back Half Analysis

FILE NAME - 411117r4
RUN # - 4
LOCATION - STACK
DATE - 8/6/91
PROJECT # - 411117

PROG.=VER 06/27/89
08-21-1991 04:30:51

Point #	Delta P (in. H20)	Delta H (in. H20)	Stack T (F)	Meter T In(F)	Meter T Out(F)
1	0.860	1.70	219	84	83
2	0.520	1.00	227	89	85
3	0.470	0.92	225	91	86
4	0.470	0.92	223	92	87
5	0.950	1.90	221	92	88
6	0.730	1.50	219	96	89
7	0.590	1.20	219	96	90
8	0.530	1.05	214	97	91
9	1.200	2.40	213	96	91
10	0.810	1.65	211	100	92
11	0.710	1.45	212	101	94
12	0.620	1.25	211	102	95
13	1.400	2.85	211	100	95
14	1.000	2.05	211	103	96
15	0.910	1.85	210	104	97
16	0.650	1.35	208	104	98
17	1.500	3.10	207	103	98
18	1.500	3.00	207	104	99
19	1.300	2.70	206	105	98
20	0.920	1.90	204	104	99
21	1.400	2.90	200	102	99
22	1.500	3.00	201	102	98
23	1.500	3.00	201	102	98
24	1.450	3.00	201	102	98

Fraction	Final Wt. (g)	Tare Wt. (g)	Blank Wt. (g)	Net Wt. (g)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	31.7917	31.7887	0.0002	0.0028

Fraction	Final Wt. (g)	Tare Wt. (g)	Vol. (ml)	Net Wt. (g)
PROBE RINSE	67.6061	67.6057	100.0	0.0004
IMPINGERS	0.0000	0.0000	0.0	0.0000

Probe Rinse Blank (mg/ml)= 0.0000
Impinger Blank (mg/ml)= 0.0000

APPENDIX B

EXAMPLE CALCULATIONS

NOMENCLATURE

Equation No.	Symbol	Description	Units
1	Vi	Initial meter reading	dcf
	Vf	Final meter reading	dcf
	Vm	Volume meter, actual	dcf
2	Pb	Barometric pressure	in. Hg
	ΔH_{avg}	Average orifice pressure drop	in. H_2O
	Tm_{avg}	Average meter temperature	°F
	Vm_{std}	Volume meter, standard conditions	dscf
3	Vlc	Total moisture collected	grams
	Wvc_{std}	Volume of water vapor collected, standard conditions	ft^3
	% H_2O	Percent moisture by volume	-
4	Mf	Mole fraction of dry gas	-
5	% CO_2	Percent carbon dioxide by volume, dry	-
	% O_2	Percent oxygen by volume, dry	-
	% CO	Percent carbon monoxide by volume, dry	-
	% N_2	Percent nitrogen by volume, dry	-
6	Md	Molecular weight, dry stack gas	lb/lb-mole
7	Ms	Molecular weight, stack gas	lb/lb-mole
8	θi	Sampling time interval	minutes
	Dn	Diameter of nozzle	inches
	ΔPs	Velocity head of S pitot	in. H_2O
	Ts	Temperature of stack gas	°F
	Vm_i	Volume of meter per sampling interval	ft^3
9	ΔPs_{avg}	Average velocity head of S pitot	in. H_2O
	Ts_{avg}	Average temperature of stack gss	°F
	Ps	Stack pressure, absolute	in. Hg
	Vs	Average stack gas velocity	fpm
10	θ	Total time of test	minutes
	% I	Percent isokinetic	-
11	ID	Inside diameter of stack	inches
	As	Area of stack	in^2
12	Qs	Stack flowrate, dry standard conditions	dscfm
13	m_n	Total particulate matter collected	mg
	Cs_{std}	Concentration of particulate collected, dry basis, standard conditions	gr/dscf
14	Cs_{act}	Concentration of particulate collected, actual conditions	gr/acf
15	Ep	Particulate emission rate	lb/hr

PARTICULATE CALCULATION EQUATIONS

1. $Vm = Vf - Vi$

2. $Vm_{std} = \dfrac{17.64\ (Vm)\left(Pb + \dfrac{\Delta H_{avg}}{13.6}\right)}{Tm_{avg} + 460}$

3. $Vwc_{std} = 0.0471\ (Vlc)$

$$\% H_2O = \frac{100\ (Vwc_{std})}{Vm_{std} + Vwc_{std}}$$

4. $Mf = \dfrac{100 - \% H_2O}{100}$

5. $\% N_2 = 100 - (\% CO_2 + \% O_2 + \% CO)$

6. $Md = (\% CO_2 \times 0.44) + (\% O_2 \times 0.32) + (\% N_2 + \% CO \times 0.28)$

7. $Ms = (Md \times Mf) + 18(1 - Mf)$

8. $Vm_i = \dfrac{5.168\ (Tm + 460)\ (Cp)\ (\theta i)\ (Mf)\ (Dn^2)}{\sqrt{Pb}} \times \sqrt{\dfrac{\Delta Ps}{Ts + 460}}$

9. $Vs = 5{,}128.8\ (\sqrt{\Delta Ps}_{avg}) \sqrt{\dfrac{Ts_{avg} + 460}{Ps \times Ms}} \times C_p$

10. $\% I = \dfrac{1{,}039\ (Ts_{avg} + 460)\ (Vm_{std})}{Vs\ (\theta)\ (Ps)\ (Mf)\ (Dn^2)}$

PS = Meter Pressure + (0.74 x Static Pressure)

11. $As = \pi\left(\dfrac{ID}{2}\right)^2$

12. $Qs = \dfrac{0.122\ (Vs)\ (As)\ (Mf)\ (Ps)}{Ts_{avg} + 460}$

13. $Cs_{std} = 0.0154\left(\dfrac{m_n}{Vm_{std}}\right)$

14. $Cs_{act} = \dfrac{17.64\ (Cs_{std})\ (Ps)\ (Mf)}{Ts_{avg} + 460}$

15. $Ep = 0.00857\ (Cs_{std})\ (Qs)$

Example Calculations
Run 1

1) $Vm = (136.482-84.502)(1.014)$
$= 52.708$ dcf

2) $Vm_{std} = (17.64)(52.708)(28.92+2.44/13.6)/564$
$= 47.935$ dscf

3) $Vwc_{std} = (0.0471)(258.4)$
$= 12.171\ ft^3$

$\%\ H_2O = (100)(12.171)/(47.935+12.171)$
$= 20.2\%$

4) $Mf = (100-20.2)/100$
$= 0.798$

5) $\%\ N_2 = 100-(5.5+14.5+0)$
$= 80.0\%$

6) $Md = (5.5)(0.44)+(14.5)(0.32)+(80.0+0)(0.28)$
$= 29.46$ lb/lb-mole

7) $Ms = (29.46)(0.798)+18(1-0.798)$
$= 27.14$ lb/lb-mole

8) Not applicable

9) $Vs = (5128.8)(1.0317)\sqrt{678/(29.21)(27.14)}\ \ (.84)$
$= 4127$

10) $\%\ I = \left[(1039)(677)(47.935)\right] / \left[\dfrac{(4127)(60)(29.21)(0.798)}{(0.238)^2}\right]$
$= 104.2\%$

11) $As = 33x49$
$= 1617\ in^2$

12) $Qs = (0.122)(4127)(1617)(0.798)(29.21)/(677)$
$= 27,877$

13) $Cs_{std} = 0.0154\ (31.4/47,935)$
$= 0.0101$ gr/dscf

APPENDIX C

FIELD DATA FORMS

AIRSOURCE TECHNOLOGIES

RUN NUMBER Preliminary

TRAIN —

DATE 8-5-91

PLANT Maskon - Jackson - Springfield

PROJECT NUMBER 411117

SAMPLING LOCATION Stack

PROJECT LEADER Baker

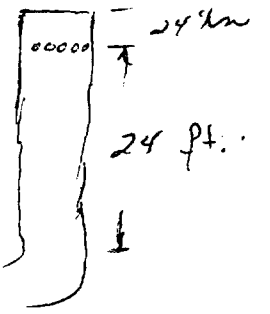
CONSOLE OPERATOR Cobb

LAB PERSON Cobb

SUPPORT PERSONNEL R-Sdon

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Masters & Jackson - Springfield
DATE 8-5-91
SAMPLING LOCATION Stack
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE A) 35"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE. (DISTANCE B) 2"
STACK I.D.. (DISTANCE A - DISTANCE B) 33" x 49"
NEAREST UPSTREAM DISTURBANCE 24 in
NEAREST DOWNSTREAM DISTURBANCE 24 ft
CALCULATOR Cobb



SCHEMATIC OF SAMPLING LOCATION

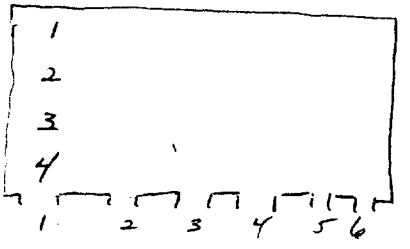
TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1 8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	-	33	4 1/8	2"	6 1/8
2	-		12 3/8		14 3/8
3	-		20 5/8		22 5/8
4	-		28 7/8		30 7/8

EPA (Dur) 232
4 72

PRELIMINARY VELOCITY TRAVERSE

PLANT Mistiq x Jackson - Springfield
DATE 8-5-91
LOCATION Stack
STACK I.D. 334
BAROMETRIC PRESSURE, IN. Hg 28.92
SITE TO BARO. ELEVATION (ft.) 0
CORRECTED BARO. PRESSURE 28.92
TEMPERATURE METER NO. 2
THERMOCOUPLE I.D. NO. 3
PITOT(Cp) 3
TIME (24 HR.)
OPERATORS Gold / R. Rodan
STACK GAUGE PRES. (STATIC, IN. H_2O) .39
PITOT LEAK CK. AT ≥ 3" H_2O) ok

REMARKS:



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD ΔP_s, IN H_2O	STACK TEMP. T_s, °F	CYCLONIC FLOW DET. ΔP_s AT 0° REFERENCE	CYCLONIC FLOW DET. ANGLE (α) WHICH YIELDS A NULL ΔP
3 - 1	1.5	216	.29	6
2	1.25	216	-.03	2
3	.94	219	-.05	2
4	.73	222	-.03	4
5 - 1	1.2	217	.28	5
2	.93	216	.05	3
3	.67	215	-.05	2
4	.56	212	-.02	8
AVERAGES	.97	217		

TRAVERSE POINT NUMBER	VELOCITY HEAD ΔP_s, IN. H_2O	STACK TEMP T_s, °F	CYCLONIC FLOW DET. ΔP_s AT 0° REFERENCE	CYCLONIC FLOW DET. ANGLE (α) WHICH YIELDS A NULL ΔP
AVERAGES				

* AVERAGE OF α MUST BE +10 DEGREES TO BE ACCEPTABLE

AIRSOURCE TECHNOLOGIES

RUN NUMBER 1

TRAIN Particulate

DATE 8-5-91

PLANT Masters + Jackson - Springfield

PROJECT NUMBER 411117

SAMPLING LOCATION Stack

PROJECT LEADER Baker

CONSOLE OPERATOR Cobb

LAB PERSON Cobb

SUPPORT PERSONNEL Rydon

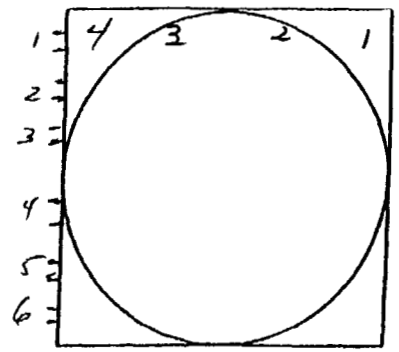
FIELD DATA

RUN NO. 1
PROJECT NO. 41117
PLANT Master-Jackson-Springfield
DATE 8-5-91
SAMPLING LOCATION Stack
SAMPLE TYPE Particulate
OPERATOR Cobb
FILTER NO. A9
RECORD DATA EVERY 2.5 MIN.
UMBILICAL/SAMPLER HOOKUP 2

PROBE NO. P1
PROBE LENGTH AND TYPE 5' glass
SAMPLE BOX NO. 2
METER BOX NO. 2

THERMOCOUPLE I.D. NO. 1
UMBILICAL CORD I.D. NO. 50'
UMBILICAL CORD I.D. NO. -
NOZZLE NO. A8

NOZZLE DIA. .238
ASSUMED MOISTURE % 15
METER ΔH@ 1.879 by 1.859
METER CORRECTION 1.859 1.014
PITOT NO. 1
PITOT COEFFICIENT .84
BAROMETRIC PRESSURE 28.92
SITE TO BARO. ELEVATION (ft.) 0
CORRECTED B.P. (0.1 in./100 ft.) 28.92
STATIC PRESSURE .39



SCHEMATIC OF TRAVERSE POINT LAYOUT

PITOT LEAK CHECK ≥ 3" H_2O

	INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL
TIME (24 hr)	1116	1244				
PASS/FAIL		Pass				

SAMPLE TRAIN LEAK CHECKS

	INITIAL	FINAL	INITIAL	FINAL	INITIAL
TIME (24 hr)	1110	1240			
VACUUM, in. Hg	≥15"	10"	≥15"		≥15"
CFM	0.003	0.002			
VOLUMES					
FINAL					
INITIAL					
DIFFERENCE					

SAMPLE TRAIN LEAK CHECKS

	FINAL	INITIAL	FINAL	INITIAL	FINAL
TIME (24 hr)					
VACUUM, in. Hg		≥15"		≥15"	
CFM					
VOLUMES					
FINAL					
INITIAL					
DIFFERENCE					

INITIAL VOLUME 84.502
FINAL VOLUME 136.482
LEAK CHECK VOLUME 0.0
ADJUSTED FINAL VOLUME 136.482

COMMENTS

RUN NO. 1 SAMPLING LOCATION Stack p. 1 of 1

DATE 8-5-91 PROJECT NO. 411117 OPERATOR Cobb

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr.) / SAMPLING TIME, min (0 / 1119)	GAS METER READING (V_m), ft³ INITIAL 84.502 DESIRED	GAS METER READING (V_m), ft³ ACTUAL	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMP. (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VAC., in. Hg	IMPINGER TEMP., °F	PROBE TEMP., °F	FILTER TEMP., °F		
1-1	2.5 1121	87.04	-	1.4	3.2	3.2	204	102	101	8	65	250	255		
2	5 1124	89.55	89.32	1.4	3.14	3.15	214	99	100	8	63	254	254		
3	7.5 1126	91.96	91.70	1.3	2.9	2.9	219	101	101	8	66	247	255		
1132 ↓ 4	10 1129	94.29	93.944	1.2	2.68	2.7	219	102	101	7	68	249	253		
2-1	12.5 1134	96.98	-	1.6	3.6	3.6	215	103	102	9	65	255	254		
2-2	15 1137	100.65 a	-	1.6	3.6	3.6	215	103	101	9	63	254	254		
3	17.5 1139	102.21	-	1.4	3.18	3.2	212	106	102	8	64	253	255		
1147 ↓ 4	20 1142	104.47	104.321	1.1	2.53	2.5	203	106	102	7	65	248	255		
3-4	22.5 1149	107.27	107.01	1.7	3.91	3.9	201	104	101	10	65	253	254		
2	25 1152	109.73	109.53	1.3	3.0	3.0	200	104	102	8	64	251	255		
3	27.5 1154	111.89	111.70	1.0	2.3	2.3	201	105	102	6	63	251	253		
1201 ↓ 4	30 1157	113.97	113.309	.94	2.15	2.15	206	105	102	4	64	254	251		
4 1	32.5 1203	116.50	115.72	1.4	3.16	3.15	214	104	102	8	65	253	252		
2	35 1206	118.59	117.86	.98	2.18	2.2	223	104	102	6	63	252	252		
3	37.5 1208	120.43	119.73	.75	1.67	1.7	227	107	104	5	65	255	259		
1215 ↓ 4	40 1211	122.08	121.356	.6	1.33	1.35	226	107	104	4	65	256	254		
5-1	42.5 1217	124.41	124.161	1.2	2.68	2.7	225	107	105	6	65	253	253		
2	45 1220	126.46	125.66	.94	2.08	2.1	231	107	105	6	55	249	254		
3	47.5 1222	128.25	127.48	.71	1.57	1.6	231	108	106	5	55	248	253		
1228 ↓ 4	50 1225	129.93	129.06	.62	1.36	1.4	228	108	106	4	56	253	251		
6-1	52.5 1230	131.93	130.98	.88	1.97	1.2	224	107	106	5	62	254	252		
2	55 1233	133.93	132.92	.88	1.97	2.0	226	109	107	5	56	254	252		
3	57.5 1236	135.72	-	.7	1.57	1.6	225	110	108	5	58	250	253		
4	60 1238	137.35	136.482	.58	1.3	1.3	225	112	109	4	60	251	254		

COMMENTS a) 99.67 b) 123.60

PARTICULATE
(w/back half work up)

Run No. Run 1 Date: 8-5-91
Project No. 41117 Plant: Western Bakers Springfield

Recovery Person Cobb/Rigdon

SAMPLE BOX NO. 2

FILTER NO. A9 Color/Condition ______

IMP. 1	IMP. 2	IMP. 3	IMP. 4
MGBS	GBS	MGBS	MGBS
H2O	H2O	DRY	SILICA
100 ml	100 ml		

	FINAL	INITIAL	DIFFERENCE	
IMP.1	797.6	587.5	210.1	
IMP.2	554.3	520.5	33.8	
IMP.3	487.4	482.7	4.7	
IMP.4	688.3	678.5	9.8	% Blue 60
		TOTAL	(258.4)	

Sample Bottles

	FRONT HALF ACETONE	CONDENSATE H2O
FINAL		
INITIAL		
DIFFERENCE	( )	( )
LEVEL MARKED		

Blanks

FILTER ______ ______ ACETONE ______ ______ WATER ______ ______

COMMENTS: ______

Volumes

MOISTURE VOLUME 258.4
CONDENSATE H2O ______

FRONT HALF ACETONE ______
BACK HALF RINSE ______

Reviewed by ______ Date ______

INTEGRATED SAMPLING DATA FORM
FOR U.S. EPA METHOD 3

Plant Morton Jackson Springfield Run No. 1
Project No. 411127 Date 8-5-91

Samle Location Stack
Sample Type (~~Multi-Point~~, Single-Point)
Bag Type (Mylar, Tedlar)
Console No. 2

Leak Check: Before 0 After 0
Flow Meter Setting 0.5 L/min
Total Sampling Time (min.) 57
Estimated Actual Volume (liters) 28.5

Time 24 Hr Clock	Flow Meter Reading	Comments
1121	.5 L/min	Start
1299		Stop
1132		Start
1142		Stop
1147		Start
1157		Stop
1201		Start
1211		Stop
1215		Start
1225		Stop
1228		Start
1238		Stop

OXYGEN AND CARBON DIOXIDE BY ~~ORSAT~~ Fyrite

PROJECT NO. 41117 RUN NO. 1
SAMPLE NO. 1 DATE 8-5-91
PLANT SAMPLING LOCATION Stack
ANALYSIS TIME (24hr-CLOCK) 1100
SAMPLE TYPE (BAG, GRAB)
OPERATOR Cobb

ORSAT LEAK CHECK BEFORE ANALYSIS:
BURETTE _____ CHANGE IN 4 MIN.
PIPETTES _____ CHANGE IN 4 MIN.
ORSAT LEAK CHECK AFTER ANALYSIS:
BURETTE _____ CHANGE IN 4 MIN.
PIPETTES _____ CHANGE IN 4 MIN.

GAS \ RUN	1		2		3		AVERAGE NET VOLUME
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET	
CO_2	1 5.5 2 3		1 5.5 2 3		1 5.5 2 3		5.5
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	1 14.5 2 3		1 14.5 2 3		1 14.5 2 3		14.5

Acceptance Criteria

CO_2	> 4%	.3% by Volume	O_2	≥ 15%	.2% by Volume
	≤ 4%	.2% by Volume		< 15%	.3% by Volume

Comments:

AIRSOURCE TECHNOLOGIES

RUN NUMBER 3

TRAIN Particulate

DATE 8-5-91

PLANT Masters - Jackson - Springfield

PROJECT NUMBER 4111117

SAMPLING LOCATION Stack

PROJECT LEADER Baker

CONSOLE OPERATOR Cobb

LAB PERSON Cobb

SUPPORT PERSONNEL Rizdon

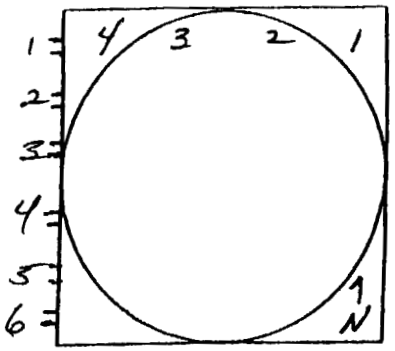
FIELD DATA

RUN NO. 3
PROJECT NO. 411117
PLANT Moskau/Yerkom-Springfield
DATE 8-5-91
SAMPLING LOCATION Stack
SAMPLE TYPE Particulate
OPERATOR Cobb
FILTER NO. 1007
RECORD DATA EVERY 2.5 MIN.
UMBILICAL/SAMPLER HOOKUP 4

PROBE NO. 3
PROBE LENGTH AND TYPE 5' glass
SAMPLE BOX NO. 4
METER BOX NO. 2

THERMOCOUPLE I.D. NO. 3
UMBILICAL CORD I.D. NO. 50
UMBILICAL CORD I.D. NO. —
NOZZLE NO. E3

NOZZLE DIA. .174
ASSUMED MOISTURE % 20
METER ΔH@ 1.859
METER CORRECTION 1.014
PITOT NO. 3
PITOT COEFFICIENT .84
BAROMETRIC PRESSURE 28.85
SITE TO BARO. ELEVATION (ft.) 0
CORRECTED B.P. (0.1 in./100 ft.) 28.85
STATIC PRESSURE .39



SCHEMATIC OF TRAVERSE POINT LAYOUT

PITOT LEAK CHECK ≥ 3" H_2O

	INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL
TIME (24 hr)	1543	1751				
PASS/FAIL		Pass				

SAMPLE TRAIN LEAK CHECKS

	INITIAL	FINAL	INITIAL	FINAL	INITIAL
TIME (24 hr)	1542	1752			
VACUUM, In. Hg	≥ 15"	3"	≥ 15"		≥ 15"
CFM	0.006	0.002			
VOLUMES					
FINAL					
INITIAL					
DIFFERENCE					

SAMPLE TRAIN LEAK CHECKS

	FINAL	INITIAL	FINAL	INITIAL	FINAL
TIME (24 hr)					
VACUUM, In. Hg		≥15"		≥15"	
CFM					
VOLUMES					
FINAL					
INITIAL					
DIFFERENCE					

INITIAL VOLUME 188.308
FINAL VOLUME 215.553
LEAK CHECK VOLUME 0.000
ADJUSTED FINAL VOLUME 215.553

COMMENTS

RUN NO. 3 SAMPLING LOCATION Stack p. 1 of 4

DATE 8-5-91 PROJECT NO. 4111117 OPERATOR Cobb

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr.) / SAMPLING TIME, min (0 / 1600)	GAS METER READING (V_m), ft³ INITIAL 188.308 DESIRED	GAS METER READING (V_m), ft³ ACTUAL	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMP. (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VAC., in. Hg	IMPINGER TEMP., °F	PROBE TEMP., °F	FILTER TEMP., °F		
1-1	2.5 1602	189.37	189.33	.9	0.55	.55	189	113	110	2	65	260	253		
2	5 1605	190.74	190.70	1.5	.91	.91	195	111	111	3	63	253	252		
3	7.5 1607	192.15	—	1.6	.96	.96	201	112	112	3	59	261	251		
1643 ↓ 4	10 1610	193.42	193.39	1.3	.78	.78	205	113	113	2	54	249	253		
2-1	12.5 1615	194.82	194.77	1.6	.94	.94	215	113	112	2	62	259	252		
2	15 1618	196.21	196.10	1.6	.93	.93	223	114	113	3	58	252	252		
3	17.5 1620	197.46	197.33	1.3	.76	.76	222	114	112	3	57	262	253		
1625 ↓ 4	20 1623	198.50	198.397	.9	.52	.52	222	114	112	2	58	252	251		
3-1	22.5 1627	199.89	199.74	1.6	.94	.94	218	114	112	2	59	253	249		
	25 1630	201.09	200.95	1.2	.70	.7	217	107	108	2	56	244	240		
	27.5 1632	202.14	202.03	.94	.54	.54	216	101	102	2	56	256	244		
1637 ↓	30 1635	202.99	202.856	.62	.35	.35	217	99	99	1	58	244	248		
4-1	32.5 1639	204.30	—	1.5	.86	.86	217	98	99	2	60	255	250		
2	35 1642	205.32	205.28	.9	.51	.51	222	98	99	2	59	251	251		
3	37.5 1644	206.24	206.17	.74	.42	.42	221	98	99	2	59	252	254		
1648 ↓ 4	40 1647	207.14	207.147	.7	.4	.4	215	96	96	2	58	245	249		
1650 adj ↓ 5-1	42.5 1650	208.53	208.555	1.7	.97	.97	215	94	95	2	57	249	249		
2	45 1733	209.72	209.68	1.2	.72	.72	159	78	78	2	65	256	250		
1730 3	47.5 1735	210.66	210.68	.79	.45	.45	190	79	79	2	59	247	249		
1738 ↓ 4	50 1738	211.51	211.485	.64	.36	.37	194	80	79	2	62	258	251		
6-1	52.5 1740	212.66	212.63	.69	.69	.69	196	81	79	2	57	257	253		
2	55 1743	213.82	—	1.2	.69	.69	198	82	80	2	54	247	251		
3	57.5 1745	214.85	214.76	.94	.54	.54	196	83	80	2	55	256	253		
4	60 1748	215.66	215.553	.58	.33	.33	192	84	81	2	58	250	252		

COMMENTS ΔP down due to leak 1.2

PARTICULATE
(w/back half work up)

Run No. 3 Date: 8-5-91
Project No. 41117 Plant: Mistras-Jackson-Springfield
Recovery Person Cobb/Rizdon

SAMPLE BOX NO. 4

FILTER NO. 1007 Color/Condition Clean

IMP. 1	IMP. 2	IMP. 3	IMP. 4
MGBS	GBS	MGBS	MGBS
H2O	H2O	DRY	SILICA
100 ml	100 ml		

	FINAL	INITIAL	DIFFERENCE
IMP.1	756.7	614.4	142.3
IMP.2	605.9	591.1	14.8
IMP.3	501.7	498.0	3.1
IMP.4	700.9	695.6	5.3

% Blue 50

TOTAL (165.5)

Sample Bottles

	FRONT HALF ACETONE	CONDENSATE H2O
FINAL		
INITIAL		
DIFFERENCE	( )	( )
LEVEL MARKED		

Blanks

FILTER _____ _____ ACETONE _____ _____ WATER _____ _____

COMMENTS: _____

Volumes

MOISTURE VOLUME 165.5 FRONT HALF ACETONE _____
CONDENSATE H2O _____ BACK HALF RINSE _____

Reviewed by _____ Date _____

INTEGRATED SAMPLING DATA FORM
FOR U.S. EPA METHOD 3

Plant Martin-Jackson Run No. 3
Project No. 411117 Date 8-5-91

Samle Location Stack
Sample Type (Multi-Point, Single-Point)
Bag Type (Mylar, Tedlar)
Console No. 2

Leak Check: Before Ø After Ø
Flow Meter Setting 16 L/min
Total Sampling Time (min.) 49
Estimated Actual Volume (liters) 24.5

Time 24 Hr Clock	Flow Meter Reading	Comments
1614	.6 L/min	Start
1623		Stop
1625		Start
1635		Stop
1637		Start
1647		Stop
1648		Start
1650		Stop
1730		Start
1738		Stop
1738		Start
1748		Stop

OXYGEN AND CARBON DIOXIDE BY ORSAT

PROJECT NO. 4111 17 RUN NO. 3
SAMPLE NO. 3 DATE 8-5-91
PLANT SAMPLING LOCATION Stack
ANALYSIS TIME (24hr-CLOCK) 1805
SAMPLE TYPE (BAG, GRAB) BAG
OPERATOR [illegible]

ORSAT LEAK CHECK BEFORE ANALYSIS:
BURETTE _____ CHANGE IN 4 MIN.
PIPETTES _____ CHANGE IN 4 MIN.
ORSAT LEAK CHECK AFTER ANALYSIS:
BURETTE _____ CHANGE IN 4 MIN.
PIPETTES _____ CHANGE IN 4 MIN.

RUN / GAS	1		2		3		AVERAGE NET VOLUME
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET	
CO_2	1 6 2 3		1 6 2 3		1 6 2 3		6
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	1 16.5 2 3		1 16.0 2 3		1 16.0 2 3		16.2

Acceptance Criteria

CO_2	> 4%	.3% by Volume	O_2	≥ 15%	.2% by Volume
	≤ 4%	.2% by Volume		< 15%	.3% by Volume

Comments:

AIRSOURCE TECHNOLOGIES

RUN NUMBER 4

TRAIN Particulate

DATE 8-6-91

PLANT Mistic + Jackson - Springfield

PROJECT NUMBER 41017

SAMPLING LOCATION Stack

PROJECT LEADER Baker

CONSOLE OPERATOR Cobb

LAB PERSON Cobb

SUPPORT PERSONNEL Kisdon

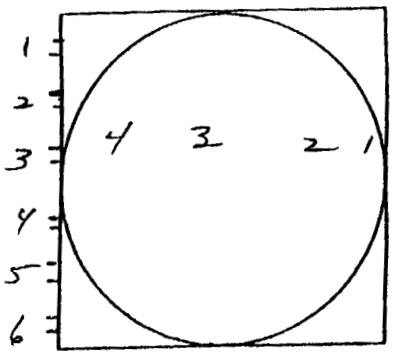
FIELD DATA

RUN NO. 4
PROJECT NO. 411117
PLANT Master Johnson - Springfield
DATE 8-6-91
SAMPLING LOCATION Stack
SAMPLE TYPE Particulate
OPERATOR Cobb
FILTER NO. 1009
RECORD DATA EVERY 2.5 MIN.
UMBILICAL/SAMPLER HOOKUP 3

PROBE NO. 2
PROBE LENGTH AND TYPE 5' glass
SAMPLE BOX NO. 3
METER BOX NO. 2

THERMOCOUPLE I.D. NO. 2
UMBILICAL CORD I.D. NO. 50
UMBILICAL CORD I.D. NO. —
NOZZLE NO. A6

NOZZLE DIA. .238
ASSUMED MOISTURE % 20
METER ΔH@ 1.859
METER CORRECTION 1.014
PITOT NO. 2
PITOT COEFFICIENT .84
BAROMETRIC PRESSURE 28.97
SITE TO BARO. ELEVATION (ft.) 0
CORRECTED B.P. (0.1 in./100 ft.) 28.97
STATIC PRESSURE .39



SCHEMATIC OF TRAVERSE POINT LAYOUT

PITOT LEAK CHECK ≥ 3" H_2O

	INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL
TIME (24 hr)	0720	0841				
PASS/FAIL		Pass				

SAMPLE TRAIN LEAK CHECKS

	INITIAL	FINAL	INITIAL	FINAL	INITIAL
TIME (24 hr)	0723	0839			
VACUUM, In. Hg	≥ 15"	19"	≥ 15"		≥ 15"
CFM	0.012	0.003			
VOLUMES					
FINAL					
INITIAL					
DIFFERENCE					

SAMPLE TRAIN LEAK CHECKS

	FINAL	INITIAL	FINAL	INITIAL	FINAL
TIME (24 hr)					
VACUUM, In. Hg		≥ 15"		≥ 15"	
CFM					
VOLUMES					
FINAL					
INITIAL					
DIFFERENCE					

INITIAL VOLUME 218.317
FINAL VOLUME 264.073
LEAK CHECK VOLUME 0.000
ADJUSTED FINAL VOLUME 264.073

COMMENTS

RUN NO. 4 SAMPLING LOCATION Stack p. 1 of 1

DATE 8-6-91 PROJECT NO. 411117 OPERATOR Cobb

	TRAVERSE POINT NUMBER	CLOCK TIME (24-hr.) / SAMPLING TIME, min (0727 / 0)	GAS METER READING (V_m), ft³ INITIAL 218.317 DESIRED	GAS METER READING (V_m), ft³ ACTUAL	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMP. (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VAC., in. Hg	IMPINGER TEMP., °F	PROBE TEMP., °F	FILTER TEMP., °F		
	6-1	2.5 0729	220.12	220.07	.86	1.68	1.7	219	84	83	6	65	256	254		
	2	5 0732	221.53	221.60	.52	1.01	1.0	227	89	85	4	60	256	258		
0739	3	7.5 0734	222.87	222.94	.47	.92	.92	225	91	86	4	59	250	258		
↓	4	10 0737	224.21	224.24	.47	.92	.92	223	92	87	4	59	252	257		
	5-1	12.5 0741	226.13	-	.95	1.87	1.9	221	92	88	7	61	255	257		
	2	15 0744	227.82	227.68	.73	1.45	1.5	219	96	89	6	61	253	254		
0750	3	17.5 0746	229.34	229.21	.59	1.17	1.2	219	96	90	5	61	253	254		
↓	4	20 0749	230.79	230.675	.53	1.06	1.05	214	97	91	4	63	253	254		
	4-1	22.5 0752	232.97	232.67	1.2	2.41	2.4	213	96	91	10	64	255	253		
	2	25 0755	234.76	234.54	.81	1.64	1.65	211	100	92	6	64	253	254		
	3	27.5 0757	236.47	236.16	.71	1.44	1.45	212	101	94	5	61	254	254		
0801	4	30 0800	238.05	237.714	.62	1.26	1.25	211	102	95	5	56	253	253		
↓	3-1	32.5 0803	240.43	239.95	1.4	2.84	2.85	211	100	95	13	58	254	254		
	2	35 0806	242.44	242.03	1.0	2.04	2.05	211	103	96	9	58	254	253		
	3	37.5 0808	244.37	243.96	.91	1.86	1.85	210	104	97	8	58	252	253		
0812	4	40 0811	246.00	-	.65	1.33	1.35	208	104	98	5	58	254	254		
↓	2-1	42.5 0815	248.48	-	1.5	3.08	3.1	207	103	98	17	59	252	254		
	2	45 0818	250.97	250.18	1.5	3.09	3.0	207	104	99	19	60	250	250		
	3	47.5 0820	253.38	252.47	1.3	2.68	2.7	206	105	98	14	61	253	254		
0825	4	50 0823	255.24	254.524	.92	1.90	1.9	204	104	99	7	62	250	250		
↓	1-1	52.5 0827	257.64	256.95	1.4	2.91	2.9	200	102	99	19	61	252	254		
	2	55 0830	260.13	259.32	1.5	3.11	3.0	201	102	98	19	62	250	251		
	3	57.5 0832	262.62	261.71	1.5	3.11	3.0	201	102	98	19	63	252	252		
	4	60 0835	265.07	264.073	1.45	3.0	3.0	201	102	98	19	63	252	253		

COMMENTS

PARTICULATE

Run No. 4 Date: 8-8-91
Project No. 41117 Plant: Masters Taskers Springfield

Recovery Person Cliff Hartman

SAMPLE BOX NO. 3

FILTER NO. 1008/009 Color/Condition Clear

IMP. 1	IMP. 2	IMP. 3	IMP. 4
MGBS	GBS	MGBS	MGBS
H2O	H2O	DRY	SILICA
100 ml	100 ml		

	FINAL	INITIAL	DIFFERENCE
IMP.1	769.4	587.3	182.1
IMP.2	606.8	593.0	13.8
IMP.3	488.3	485.1	3.2
IMP.4	641.0	627.0	14.0

% Blue 50

TOTAL (213.1)

Sample Bottles

FRONT HALF
ACETONE

FINAL
INITIAL
DIFFERENCE ( )

LEVEL MARKED

Blanks

FILTER ACETONE

COMMENTS:

Volumes

MOISTURE VOLUME 213.1 FRONT HALF ACETONE

Reviewed by Date

INTEGRATED SAMPLING DATA FORM
FOR U.S. EPA METHOD 3

Plant Master / Jackson - Springfield Run No. 4
Project No. 41117 Date 8-6-91

Samle Location Stack
Sample Type (~~Multi-Point~~, Single-Point)
Bag Type (Mylar, Tedlar)
Console No. 2

Leak Check: Before 0 After 0
Flow Meter Setting 0.5 l/min
Total Sampling Time (min.) 54 min
Estimated Actual Volume (liters) 27 L

Time 24 Hr Clock	Flow Meter Reading	Comments
0728	0.5 l/min	Start
0737		Stop
0741		Start
0749		Stop
0751		Start
0800		Stop
0803		Start
0811		Stop
0811		Start
0823		Stop
0827		Start
0835		Stop

OXYGEN AND CARBON DIOXIDE BY ~~ORSAT~~ Fyrite

PROJECT NO. 41117 RUN NO. 4

SAMPLE NO. 4 DATE 8-6-91

PLANT SAMPLING LOCATION Stack

ANALYSIS TIME (24hr-CLOCK) _____

SAMPLE TYPE (BAG, GRAB) _____

OPERATOR CBK

ORSAT LEAK CHECK BEFORE ANALYSIS:

BURETTE _____ CHANGE IN 4 MIN.

PIPETTES _____ CHANGE IN 4 MIN.

ORSAT LEAK CHECK AFTER ANALYSIS:

BURETTE _____ CHANGE IN 4 MIN.

PIPETTES _____ CHANGE IN 4 MIN.

RUN / GAS	1		2		3		AVERAGE NET VOLUME
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET	
CO_2	1 5.5 2 3		1 5.0 2 3		1 5.0 2 3		6.2
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	1 14.5 2 3		1 15.0 2 3		1 14.5 2 3		14.7

Acceptance Criteria

CO_2	> 4%	.3% by Volume	O_2	≥ 15%	.2% by Volume
	≤ 4%	.2% by Volume		< 15%	.3% by Volume

Comments:

IOWA DEPARTMENT OF NATURAL RESOURCES

VISIBLE EMISSIONS OBSERVATIONS

PLANT NAME: ASTEC Asphalt

ADDRESS:

DATE: 8-5-91

TIME OF OBSERVATION

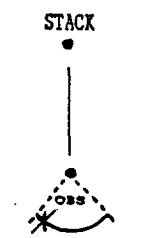
BEGIN: 0845 END: 0945

SOURCE IDENTIFICATION: Asphalt plant

REGULATION(S): Method 9

FUEL BURNED:

OBSERVATION POINT/POSITION OF SUN



DISTANCE FROM STACK: 600 yds

DIRECTION FROM STACK: ~~N~~ ~~E~~ SE

STACK HEIGHT: 30'

SKY CONDITION: Clear

WIND SPEED: 5-10 mph

WIND DIRECTION: ~~S~~ ~~E~~ SE

TEMPERATURE: 80°

COLOR OF PLUME: None

ODORS: ( ) Yes (X) No

COMMENTS:

OPACITY READINGS

RANGE: 0 TO: / AVERAGE: 0

SIGNATURE OF OBSERVER: Karl A Ry

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

IOWA DEPARTMENT OF NATURAL RESOURCES

VISIBLE EMISSIONS OBSERVATIONS

PLANT NAME: Astec Asphalt

ADDRESS:

DATE: 8-5-91

TIME OF OBSERVATION

BEGIN: 0947 END: 1047

SOURCE IDENTIFICATION: Asphalt Plant

REGULATION(S): Method 9

FUEL BURNED:

OBSERVATION POINT/POSITION OF SUN

DISTANCE FROM STACK: 60 yds DIRECTION FROM STACK: NE

STACK HEIGHT: 30'

SKY CONDITION: Clear

WIND SPEED: 5-10 mph WIND DIRECTION: SE

TEMPERATURE: 80° COLOR OF PLUME: None

ODORS: [ ] Yes [X] No

COMMENTS

OPACITY READINGS

RANGE: 0 TO: 0 AVERAGE: 0

SIGNATURE OF OBSERVER: [signature]

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

IOWA DEPARTMENT OF NATURAL RESOURCES

VISIBLE EMISSIONS OBSERVATIONS

PLANT NAME: Aztec Asphalt

ADDRESS:

DATE: 8-5-91

TIME OF OBSERVATION

BEGIN: 1048 END: 1148

SOURCE IDENTIFICATION: Asphalt plant

REGULATION(S): Method 9

FUEL BURNED:

OBSERVATION POINT/POSITION OF SUN

DISTANCE FROM STACK: 60 yds DIRECTION FROM STACK: NE

STACK HEIGHT: 30'

SKY CONDITION: Clear

WIND SPEED: 5-10 mph WIND DIRECTION: SE

TEMPERATURE: 88° COLOR OF PLUME: None

ODORS: [ ] Yes [X] No

COMMENTS

OPACITY READINGS

RANGE	TO	AVERAGE

SIGNATURE OF OBSERVER

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

APPENDIX D

LABORATORY DATA

FILTER WEIGHINGS

Project No._____ Analyst:_____
Filter Type and Size:_____
Weight Unit:_____
Filter Treatment:_____

Tare Weighing:

Date/Time:	8-4-91 / 2200	8-5-91 / 0600 ~~1600~~	1	
Balance Check:				
Weight Value:	33	50		
Initial Check:	32.9995	49.9998		
Final Check:	32.9996	49.9997		
Filter No.	First Weighing	Second Weighing	Third Weighing	Average
1007 ✓	29.0208	29.0211		29.0210
1008	30.6414	30.6414		
1009 ✓	31.7886	31.7887		31.7887
1010 ✓	32.3480	32.3481		32.3481
1011	31.2551	31.2554		

Final Weighing:

Date/Time:	8-20-91 / 1900	8-21-91 / 1530	1	
Balance Check:				
Weight Value:	35	35		
Initial Check:	34.9995	34.9995		
Final Check:	34.9995	34.9994		
Sample/Filter No.	First Weighing	Second Weighing	Third Weighing	Average
1007	29.0230	29.0228		29.0229
1009	31.7917	31.7917		31.7917
1010	32.3484	32.3482		32.3483

FILTER WEIGHINGS

Project No. 411140 Analyst: Cobb
Filter Type and Size: Quartz 3"
Weight Unit: g
Filter Treatment: dessicate 24 hrs, weigh constant weight

Tare Weighing:

Date/Time:	6-21 1715	6-22 0945	6-23 0930	
Balance Check:				
Weight Value:	40	40	40	
Initial Check:	39.9993	39.9993	39.9993	
Final Check:	39.9993	39.9993	39.9994	
Filter No.	First Weighing	Second Weighing	Third Weighing	Average
A8	42.8735	42.8731		42.8733
A9 ✓	43.1626	43.1624		43.1625
A10	44.7666	44.7664		44.7665
A11	46.2150	46.2144	46.2142	46.2143
A12 ✓	42.7194	42.7184	42.7184	42.7184

Final Weighing:

Date/Time:	8-20-91 1980	1	1	
Balance Check:				
Weight Value:	35			
Initial Check:	34.9995			
Final Check:	34.9995			
Sample/Filter No.	First Weighing	Second Weighing	Third Weighing	Average
A8				
A10				
A11				
A9	43.1665	43.1660		43.1663

Original

BEAKER WEIGHINGS

Project No._____ Analyst:_____
Beaker Type and Size:_____
Weight Unit:_____
Beaker Treatment:_____

Tare Weighing:

Date/Time:	0230 / 8-16	5:30 / 8-16	/	
Balance Check:				
Weight Value:	25g	100g		
Initial Check:	24.9995	99.9995		
Final Check:	24.9997	99.9996		

Beaker No.	First Weighing	Second Weighing	Third Weighing	Average
1053 ✓	67.5660	67.5661		67.5661
1054 ✓	67.6962	67.6966		67.6964
1055 ✓	67.6055	67.6059		67.6057
1056	67.6386	67.6389		
1057	67.5585	67.5587		
1058	see other sheet			
1059	67.5176	67.5178		

Final Weighing:

Date/Time:	8-21-91 / 1830	8-21-91 / 1500	/	
Balance Check:				
Weight Value:	75	75		
Initial Check:	74.9990	74.9989		
Final Check:	74.9989	74.9989		

Sample/Beaker No.	First Weighing	Second Weighing	Third Weighing	Average	Vol mls
1053	67.5796	67.5794		67.5795	145
1054	67.7007	67.7007		67.7007	100
1055	67.6062	67.6060		67.6061	100

Original

BEAKER WEIGHINGS

Project No. _____ Analyst: Gossett/Cobb

Beaker Type and Size: 150ml glass

Weight Unit: grams

Beaker Treatment: desiccated 24 hrs

Tare Weighing:

Date/Time:	7/15/91 1120	7-17-91 1340	7-18-91 0910	
Balance Check:				
Weight Value:	75g	74.9990	74.9988	
Initial Check:	74.9988	74.9989	74.9989	
Final Check:	74.9987			
Beaker No.	First Weighing	Second Weighing	Third Weighing	Average
1020 ✓	76.3796	76.3801		76.3799
1019 ✓	78.0840	78.0843		78.0842
1024 ✓	76.6895	76.6899		76.6897
1025 ✓	73.9344	73.9347		73.9346
1022 ✓	79.4540	79.4545		79.4543
1023 ✓	74.9288	74.9293		74.9291
1018 ✓	75.4085	75.4091	75.4091	75.4091

Final Weighing:

Date/Time:	8-20-91 1830	8-21-91 1500	/	
Balance Check:				
Weight Value:	75			
Initial Check:	74.9990			
Final Check:	74.9989			
Sample/Beaker No.	First Weighing	Second Weighing	Third Weighing	Average	Vol mls
1023	74.9568	74.9569		74.9569	170

APPENDIX E

PRETEST CALIBRATIONS

CONSOLE WORKSHEET

NAME Karl Baker K FACTOR .6405 PROJECT #_____

DATE 8-9-91 TRAIN ID 2 PREVIOUS Y FACTOR 1.014

ORIFICE # 7 PYROMETER # _____

	RUN NUMBER 1	2
DGM		
FINAL READING	271.2	275.6
INITIAL READING	267.1	271.5
INLET & OUTLET TEMPERATURES		
INITIAL	25/24	28/25
FINAL	28/25	81/26
TIME Sec	300	300
ORIFICE RDG. ^H	2.3	2.7
BAR. PRESSURE	29.13	29.13
ROOM TEMP.	23.9/23.8	27.8/23.7
PUMP VACUUM Hg"	15	15

CONSOLE CALIBRATION

Project			Orifice number
Date	8-9-91		Orifice K factor
Operator	Baker		Previous Y factor
Console Number	2		

	Run 1	Run 2
Final DGM Volume	271.200	275.600
Inital DGM Volume	267.100	271.500
Net DGM Volume (Vm)	4.100	4.100
In/Out DGM Temp.		
Inlet Deg. F		
initial	75.0	78.0
final	78.0	81.0
Outlet Deg. F		
initial	74.0	75.0
final	75.0	76.0
Avg. DGM Temp Deg. F	75.5	77.5
Time, sec.	300.0	300.0
Orifice DH, in. H2O	2.30	2.30
Baro. Press., in. Hg	29.13	29.13
Room temp., Deg. F		
initial	73.9	73.8
final	73.8	73.7
Avg.Room Temp.	73.9	73.8
Pump Vacuum, in. Hg	15	15
Vcr (std)	4.038	4.038
Vm (std)	3.957	3.942
Y Factor	1.020	1.024
Delta H@	1.981	1.973
Average Y	1.022	
Average Delta H@	1.977	
+/- 2% criteria		
Percent of Avg Y	.19	
	PASS	
+/- 5% criteria		
Percent of final Y	.81	
	PASS	

BRACKETING WORKSHEET

NAME Kal Baker K.FACTOR 1. .5683 2. .6564

PROJECT # _____ DATE 8-9-91 TRAIN I.D. 2

ORIFICE # 1. 9 2. 8

DGM	1	2
Final Reading	284.90	280.7
Initial reading	281.3	276.5
Difference	_____	_____
INLET & OUTLET TEMP.		
Initial	82/77	81/76
Final	85/78	83/77
Avg. Temp.	_____	_____
Time	300	300
Orifice rdg. ^H	1.8	2.4
Bar. Pressure	29.13	29.13
Room Temp.	73.8/73.7	73.8/73.9
Pump Vacuum	15	15

ORFICE BRACKETING

Project		Bracket Orfices:	
Date	8-9-91	Orifice No. 1	9
Operator	Baker	Orifice N0.1 K factor	.
Orfice Number	7	Orifice No. 2	8
Orfice Y factor	1.022	Orifice N0.2 K factor	.

	Orfice #1	Orfice #2
Final DGM Volume	284.900	280.700
Inital DGM Volume	281.300	276.500
Net DGM Volume (Vm)	3.600	4.200
In/Out DGM Temp.		
Inlet		
initial	82.0	81.0
final	85.0	83.0
Outlet		
initial	77.0	76.0
final	78.0	77.0
Avg. DGM Temp	80.5	79.3
Time, sec.	300.0	300.0
Orifice DH, in. H2O	1.80	2.40
Baro. Press., in. Hg	29.13	29.13
Room temp., Deg. F		
initial	73.8	73.8
final	73.7	73.9
Avg. Room Temp.	73.8	73.9
Pump Vacuum, in. Hg	15	15
Vcr (std)	3.583	4.138
Vm (std)	3.438	4.026
Y Factor (brackets)	1.042	1.028
+/- 2% criteria		
Percent of Y	1.97	.55
	PASS	PASS

GRC 6/11/90

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English Units)

OPERATOR Karl Baker DATE 8-9-91 METER BOX # 2 PLANT _____

PROJECT # _____ BAR. PRESSURE 29.13 ORIFICE # 7

PRETEST Y 1.014

	ORIFICE MANOMETER (ΔH)	DRY GAS METER (Vd)	INLET TEMP. °F	OUTLET TEMP. °F	AVG. TEMP. °F	TIME MIN.	VACUUM SETTING in Hg	Yi
1.	2.3	4.1	77	75	75.5	5	15	1.020
2.	2.3	4.1	80	76	77.5	5	15	1.024

AVERAGE Y 1.022

ΔH = Pressure differential across orifice, H2O

Vd = Gas volume passing through the dry gas meter

THERMOCOUPLE CALIBRATION SHEET

Date 8/20/91 Thermocouple Number UH 2

Ambient Temp. 77.8 F Barometric Pressure 29.13 in. Hg

Calibrator Blane Wood Reference: mercury-in-glass ASTM

other

Reference point number [a]	Source[b] (specify)	Reference thermometer temperature, F	Thermocouple potentiometer temperature, F	Temperature difference ± 2 °F
1	Ambient	77.8	76.7	1.1°
2	Ice	34.2	32.9	1.3°

a Every 50°F for each reference point

b Type of calibration system used

c $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%$.

THERMOCOUPLE CALIBRATION SHEET

Date 8/20/91 Thermocouple Number UH3

Ambient Temp. 77.8 F Barometric Pressure 25.13 in. Hg

Calibrator Blaine Wood Reference: mercury-in-glass ATM

other

Reference point number [a]	Source[b] (specify)	Reference thermometer temperature, F	Thermocouple potentiometer temperature, F	Temperature difference ~~≤~~ 2°F
1	Ambient	77.8	76.2	1.6
2	ICE	34.2	33.0	1.2

a Every 50°F for each reference point

b Type of calibration system used

c $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%.$

THERMOCOUPLE CALIBRATION SHEET

Date 8-20-91 Thermocouple Number VH 4

Ambient Temp. 80 F Barometric Pressure 29.13 in. Hg

Calibrator Ted Hartman Reference: mercury-in-glass 18-89° Serial No 1946

other

Reference point number [a]	Source[b] (specify)	Reference thermometer temperature, F	Thermocouple potentiometer temperature, F	Temperature difference ≤ ±2°F
~~Ambient T~~ 1	Ambient	80	79.4	0.6
2	Ice Bath	32	32.5	0.5

a Every 50°F for each reference point

b Type of calibration system used

c $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%$.

THERMOCOUPLE CALIBRATION SHEET

Date 8-9-91 Thermocouple Number T1

Ambient Temp. 74° F Barometric Pressure 29.13 in. Hg

Calibrator Kurt Baker Reference: mercury-in-glass ASTM

other

Reference point number [a]	Source[b] (specify)	Reference thermometer temperature, F	Thermocouple potentiometer temperature, F	Temperature difference %
1	Ambient	74	72.7	
2	Ice	32.6	32.2	
3	Oven	120.4	120.8	

a Every 50°F for each reference point

b Type of calibration system used

c $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%.$

THERMOCOUPLE CALIBRATION SHEET

Date 5-9-91 Thermocouple Number T2

Ambient Temp. 74° F Barometric Pressure 29.13 in. Hg

Calibrator Karl Baker Reference: mercury-in-glass ASTM

other

Reference point number [a]	Source[b] (specify)	Reference thermometer temperature, F	Thermocouple potentiometer temperature, F	Temperature difference %
1	Ambient	74	72.8	
2	Ice	32.6	32.4	
3	Oven	120.4	120.4	

a Every 50°F for each reference point

b Type of calibration system used

c $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right]$ 100 $\leq$ 1.5%.

THERMOCOUPLE CALIBRATION SHEET

Date 8-9-91 Thermocouple Number T3

Ambient Temp. 74° F Barometric Pressure 29.13 in. Hg

Calibrator Karl Baker Reference: mercury-in-glass ASTM

other

Reference point number [a]	Source[b] (specify)	Reference thermometer temperature, F	Thermocouple potentiometer temperature, F	Temperature difference %
1	Ambient	74	72.8	
2	Ice	32.6	32.5	
3	Oven	120.4	120.8	

a Every 50°F for each reference point

b Type of calibration system used

c $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right]$ 100 $\leq$ 1.5%.

PITOT TH 1
4-9-91
HARTMAN

Pitot tube assembly level? ✓ yes _____ no

Pitot tube openings damaged? _____ yes (explain below) ✓ no

α_1 = 0 ° (<10°), α_2 = 1 ° (<10°), β_1 = 4 ° (<5°),
β_2 = 3 ° (<5°)

γ = 4 °, θ = 0.5 °, A = 0.951 cm (in.)

z = A sin γ = 0.066 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = 0.0083 cm (in.); <0.08 cm (<1/32 in.)

P_A 0.476 cm (in.) P_b 0.471 cm (in.)

D_t = 0.376 cm (in.)

Comments: _____

_____

_____

Calibration required? _____ yes ✓ no

Type S pitot tube inspection data form.

PITOT 2
6-9-91
Hartman

Pitot tube assembly level? ✓ yes _____ no

Pitot tube openings damaged? _____ yes (explain below) ✓ no

α_1 = 1 ° (<10°), α_2 = 0.5 ° (<10°), β_1 = 1 ° (<5°),
β_2 = 0.5 ° (<5°)

γ = 0.5°, θ = 0.5°, A = 0.941 cm (in.)

z = A sin γ = 0.0082 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = 0.0082 cm (in.); <0.08 cm (<1/32 in.)

P_A .471 cm (in.) P_b .470 cm (in.)

D_t = 0.373 cm (in.)

Comments: _____

_____

_____

Calibration required? _____ yes ✓ no

Type S pitot tube inspection data form.

PITOT 3
8-9-91
HARTMAN

Pitot tube assembly level? ✓ yes _____ no

Pitot tube openings damaged? _____ yes (explain below) ✓ no

α_1 = 1 ° (<10°), α_2 = 1 ° (<10°), β_1 = 1 ° (<5°),
β_2 = 2 ° (<5°)

γ = 0.5 °, θ = 1 °, A = 0.946 cm (in.)

z = A sin γ = 0.0083 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = 0.0165 cm (in.); <0.08 cm (<1/32 in.)

P_A 0.473 cm (in.) P_b 0.473 cm (in.)

D_t = 0.375 cm (in.)

Comments: _____

Calibration required? _____ yes ✓ no

Type S pitot tube inspection data form.

NOZZLE CALIBRATION

Date: 7-20-91 Calibrated by: Karl Baker

Nozzle Set: A

Nozzle #	Meas. #1	Meas. #2	Meas. #3	Avg	P/F
A 8	.237	.239	.238	.238	

NOZZLE CALIBRATION

Date: 5-13-91 **Calibrated by:** Karl Baker

Nozzle Set: E

Nozzle #	Meas. #1	Meas. #2	Meas. #3	Avg	P/F
E1	.393	.391	.392	.392	Pass
E2	.287	.289	.287	.288	Pass
E3	.174	.174	.173	.174	Pass
~~174~~					

APPENDIX F

POSTTEST CALIBRATIONS

CONSOLE WORKSHEET

(Chang e

NAME Karl Baker K FACTOR ~~.6405~~ .6564 PROJECT # _____

DATE 2-30-91 TRAIN ID 2 PREVIOUS Y FACTOR ~~1.04~~ .007 .006

ORIFICE # ~~8~~ 8 PYROMETER # N/A

	RUN NUMBER 1	2
DGM		
FINAL READING	66.20	71.1
INITIAL READING	61.90	66.80
INLET & OUTLET TEMPERATURES		
INITIAL	94 / 85	91 / 86
FINAL	96 / 87	96 / 89
TIME Sec	300	300
ORIFICE RDG. ^H	2.4	2.4
BAR. PRESSURE	29.84	29.84
ROOM TEMP.	84.6 / 84.2	84.8 / 85.2
PUMP VACUUM Hg"	19	19

CONSOLE CALIBRATION

Project	411052 25 mm	Orifice number	8
Date	7/30/91	Orifice K factor	.6564
Operator	Baker	Previous Y factor	1.006
Console Number	2		

	Run 1	Run 2
Final DGM Volume	66.200	71.100
Inital DGM Volume	61.900	66.800
Net DGM Volume (Vm)	4.300	4.300
In/Out DGM Temp.		
Inlet Deg. F		
initial	94.0	91.0
final	96.0	96.0
Outlet Deg. F		
initial	85.0	86.0
final	87.0	89.0
Avg. DGM Temp Deg. F	90.5	90.5
Time, sec.	300.0	300.0
Orifice DH, in. H2O	2.40	2.40
Baro. Press., in. Hg	29.84	29.84
Room temp., Deg. F		
initial	84.6	84.8
final	84.7	85.2
Avg.Room Temp.	84.7	85.0
Pump Vacuum, in. Hg	19	19
Vcr (std)	4.196	4.195
Vm (std)	4.136	4.136
Y Factor	1.015	1.014
Delta H@	1.858	1.860

Average Y	1.014
Average Delta H@	1.859

+/- 2% criteria		
Percent of Avg Y	.02	
	PASS	
+/- 5% criteria		
Percent of final Y	.83	
	PASS	

BRACKETING WORKSHEET

NAME Karl Baker K.FACTOR 1. .6405 2. .8004

PROJECT # _____ DATE 7-30-91 TRAIN I.D. 2

ORIFICE # 1. 7 2. 13

DGM	1	2
Final Reading	28.20	84.40
Initial reading	23.50	80.20
Difference		
INLET & OUTLET TEMP.		
Initial	93/89	93/90
Final	96/90	96/91
Avg. Temp.		
Time	300	300
Orifice rdg. ^H	3.6	2.3
Bar. Pressure	29.84	29.84
Room Temp.	85.4/86	86/86.4
Pump Vacuum	19	19

ORFICE BRACKETING

Project	411125	Bracket Orfices:	
Date	7/30/91	Orifice No. 1	13
Operator	Baker	Orifice N0.1 K factor	.8004
Orfice Number	8	Orifice No. 2	7
Orfice Y factor	1.014	Orifice N0.2 K factor	.6405

	Orfice #1	Orfice #2
Final DGM Volume	78.700	84.400
Inital DGM Volume	73.500	80.200
Net DGM Volume (Vm)	5.200	4.200
In/Out DGM Temp.		
Inlet		
initial	93.0	93.0
final	96.0	96.0
Outlet		
initial	89.0	90.0
final	90.0	91.0
Avg. DGM Temp	92.0	92.5
Time, sec.	300.0	300.0
Orifice DH, in. H2O	3.60	2.30
Baro. Press., in. Hg	29.84	29.84
Room temp., Deg. F		
initial	85.4	86.0
final	86.0	86.4
Avg. Room Temp.	85.7	86.2
Pump Vacuum, in. Hg	19	19
Vcr (std)	5.112	4.089
Vm (std)	5.003	4.024
Y Factor (brackets)	1.022	1.016
+/- 2% criteria		
Percent of Y	.78	.21
	PASS	PASS

THERMOCOUPLE CALIBRATION SHEET

Data 6-22-91 Thermocouple Numbe Coosuleek #K2

Ambient Temp. _____ F Barometric Pressure _____ in. Hg

Calibrator Cobb Reference: mercury-in-glass ASTM

other _____

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, F (°C)	Thermocouple potantiometer temperature, F (°C)	Temperature difference %
1	ice	33.2	33.2	0.0%
2	Ambient	74.2	74.8	.1%

[a] Every 30°C (50°F) for each reference point

[b] Type of calibration system used

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

THERMOCOUPLE CALIBRATION SHEET

Date 6-22-91 Thermocouple Numbe Boosted #3

Ambient Temp. _____ F Barometric Pressure _____ in. Hg

Calibrator Cobb Reference: mercury-in-glass ASTM

other _____

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, F (°C)	Thermocouple potentiometer temperature, F (°C)	Temperature difference %
1	Ice	33.2	33.1	0.02%
2	Ambient	74.2	74.8	0.1%

[a] Every 30°C (50°F) for each reference point

[b] Type of calibration system used

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

THERMOCOUPLE CALIBRATION SHEET

Date 6-22-91 Thermocouple Numbe Goosneck #4

Ambient Temp. _____ F Barometric Pressure ASTM in. Hg

Calibrator Cobb Reference: mercury-in-glass _____

other _____

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, F (°C)	Thermocouple potentiometer temperature, F (°C)	Temperature difference %
1	ice	32.6	32.5	0.02%
2	Ambient	74.0	74.8	0.15%

[a] Every 30°C (50°F) for each reference point

[b] Type of calibration system used

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

THERMOCOUPLE CALIBRATION SHEET

Date 2-21-91 Thermocouple Number #1

Ambient Temp. 86.4 F Barometric Pressure 29.44 in. Hg

Calibrator Karl Baker Reference: mercury-in-glass ASTM

other

Reference point number [a]	Source[b] (specify)	Reference thermometer temperature, F	Thermocouple potentiometer temperature, F	Temperature difference %
1) Ice →		32.2	32	
2) Ambient →		86.4	85.8	
3) Oven →		192.8	192.2	

a Every 50°F for each reference point

b Type of calibration system used

c $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right]$ 100 ≤ 1.5%.

THERMOCOUPLE CALIBRATION SHEET

Date 7-21-91 Thermocouple Number P2

Ambient Temp. 86.4 F Barometric Pressure 29.44 in. Hg

Calibrator Karl Baker Reference: mercury-in-glass ASTM

other

Reference point number [a]	Source[b] (specify)	Reference thermometer temperature, F	Thermocouple potentiometer temperature, F	Temperature difference %
1	ICE	32.2	32.2	
2	Ambient	86.4	86.2	
3	Oven	192.8	191.8	

a Every 50°F for each reference point

b Type of calibration system used

c $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right]$ $100 \leq 1.5\%$.

THERMOCOUPLE CALIBRATION SHEET

Date 7-21-91 Thermocouple Number P3

Ambient Temp. 86.4 F Barometric Pressure 29.44 in. Hg

Calibrator K. Baker Reference: mercury-in-glass ASTM

other

Reference point number [a]	Source[b] (specify)	Reference thermometer temperature, F	Thermocouple potentiometer temperature, F	Temperature difference %
1	ICE	32.2	32.2	0
2	Ambient	86.4	86.2	
3	Oven	192.8	192.6	

a Every 50°F for each reference point

b Type of calibration system used

c $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right]$ 100 $\leq$ 1.5%.

5-21-91
Pitot #1

Pitot tube assembly level? ✓ yes _____ no

Pitot tube openings damaged? _____ yes (explain below) ✓ no

α_1 = 1 ° (<10°), α_2 = 1 ° (<10°), β_1 = 0 ° (<5°),

β_2 = 1 ° (<5°)

γ = 1 °, θ = 0.5 °, A = .961 cm (in)

z = A sin γ = ~~.0838~~ .0167 ~~.0162~~ cm (in.); <0.32 cm (<1/8 in.),

w = A sin θ = ~~.0164~~ .00838 cm (in.); <0.08 cm (<1/32 in.)

P_A .481 cm (in.) P_b .480 cm (in.)

D_t = .371 cm (in.)

Comments: _____

_____

_____

Calibration required? _____ yes ✓ no

Type S pitot tube inspection data form.

7-21-91
Pitot #2

Pitot tube assembly level? ✓ yes _____ no

Pitot tube openings damaged? _____ yes (explain below) ✓ no

α_1 = 1 ° (<10°), α_2 = 1 ° (<10°), β_1 = 1 ° (<5°),
β_2 = 0.5 ° (<5°)

γ = 1 °, θ = 0.5 °, A = .933 cm (in.)

z = A sin γ = .0162 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = .0081 cm (in.); <0.08 cm (<1/32 in.)

P_A .963 cm (in.) P_b .966 cm (in.)

D_t = .323 cm (in.)

Comments: _____

_____

_____

Calibration required? _____ yes ✓ no

Type S pitot tube inspection data form.

7-21-91
pitot #3

Pitot tube assembly level? ✓ yes _____ no

Pitot tube openings damaged? _____ yes (explain below) ✓ no

α_1 = 1 ° (<10°), α_2 = 1 ° (<10°), β_1 = 1 ° (<5°),
β_2 = 1 ° (<5°)

γ = 1 °, θ = 0.5 °, A = .945 cm (in.)

z = A sin γ = .0165 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = .008883 cm (in.); <0.08 cm (<1/32 in.)

P_A .402 cm (in.) P_b .403 cm (in.)

D_t = .374 cm (in.)

Comments: _____

_____

_____

Calibration required? _____ yes ✓ no

Type S pitot tube inspection data form.

EQUIPMENT USE LIST FOR SAMPLING TRAINS AND TRAVERSES

Project # 411117 Date 8/5 & 8/6-91 Operator Cobb

Barometer			

M5

Console #	2		
Pyrometer	2		
Temperature Controller #	2		
Probe #	P1	P3	P2
Nozzle #	A8	E3	A6
Pitot #	~~E3~~ P1	P3	P2
Stack Thermocouple #	P1	P3	P2
Sample Box #	2	4	3
Umbilical Hookup #	2	4	3
Umbilical #			
Umbilical #			

VOST

Console #			
Pyrometer			
Tenax Thermocouple #			
VOST Train Box #			
Temperature Controller #			
Probe Heater #			

Comment:: _____

_____

APPENDIX G

PARTICIPANTS

PARTICIPANTS

George Cobb	General Manager
Karl Baker	Project Manager
Dan Rigdon	Consultant
Opacity	Craig Euritt Project Manager

APPENDIX H

PROCESS DATA

MASTERS-JACKSON PAVING CO.

P.O. BOX 1187
SPRINGFIELD, MISSOURI 65801
(417) 881-5581

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA

Contractors for

- *Asphalt Paving*
- *Road Resurfacing*
- *Site Preparation*
- *Road Widening*

November 20, 1991

Mr. George Cobb
AirSource Technologies
11635 w. 83rd Terrace
Lenexa, Ks. 66215

RE: Astec Plant

Dear George:

This letter is to confirm our conversation today that during testing our plant was operating 450 tons per hour.

Also, copies are enclosed of the three job mixes that we ran during the days of testing.

If you have any further questions, please feel free to give me a call.

Sincerely,

MASTERS-JACKSON PAVING CO.

Donnie Mantle

Donnie Mantle
Vice-President

DM/lm

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 4

To George Cobb	From Donnie
Co.	Co. Masters Jackson
Dept.	Phone #
Fax #	Fax #

Disk #5

ELF ASPHALT, INC. LABORATORY
ASPHALT CONCRETE

DATE August 7, 1989 DESIGN NO. EA-9039

PROJECT NO. City of Springfield, Missouri

CONTRACTOR: Master Jackson Paving Springfield, Missouri PRODUCER: Master Jackson Paving Springfield, Missouri

MATERIAL	SOURCE	% USED
1/2" Chips	Conco Quarry at Willard, Missouri	65
Screenings	Conco Quarry at Willard, Missouri	35

Asphalt Cement (PAC-30) Elf Asphalt, Inc. at Memphis, Tenn

Lab No. Percent passing	1/2" chips	Scrn's	Combined Aggregate	Job Formula	Req'd Spec's
3/4"	100		100	100	100
1/2"	99		99	99	95-100
3/8"					
No.4	45	100	64	64	60-90
No.10	12	87	38	38	35-65
No.40	7	50	22	22	10-30
No.80					
No.200	4.2	19.0	9.4	9	4-12
% Asphalt Cement ~~(PAC-30)~~ (A/C 20)				5.0	
Mix temperature @ discharge from mixer, °F				325	±20

Tests on Asphalt Cement:

	Found	Required
Pen. @ 25°C		60-100
Viscosity @ 60°C		2000 400
Viscosity @ 135°C		300 Min
Residue from RTFO		
Viscosity @ 60°C		8000 Max
Ductility @ 25°C		50 Min
Spec. Grv. @ 60°F	1.023	

Test on Aggregates

	Found	Required
Plasticity Index	non-plastic	6 Max
Sand Equivalent		40 Min
L.A. Abrasion % Wear		40 Max
Durability (DC)		40 Min
Fracturred Faces		70 m/2
BISG	2.674	
Marshall Weight	1100	

TESTS ON COMPRESSED MIXTURE: (50 Blows)

Percent Asphalt	Spec.Grav Specimen	Max.Theo Spec.Grav	% Voids	% Voids Req'd	V.M.A. (%)	VMA Req'd	Flow 0.01 in	Flow Req'd	Marshall Stab.
5.0	2.370	2.474	4.2	--	15.8	--	12	--	3100.7
5.5	2.396	2.456	2.4	--	15.3	--	14	--	2778.1
6.0	2.401	2.438	1.5	--	15.6	--	20	--	2461.9
6.5	2.422	2.420	1.0	--	15.3	--	23	--	2534.2

Retained Strength % Required 75 N/A% Minimum

Recommend 5.0 % Asphalt Cement (PAC-30)
Compacted Wt. 109 lbs/sq.yd./1" thickness
Max. Theo. Spec. Grav. @ 5.0 % Asph. Cement is 2.474 (154.4 pcf)

MEETS SPECIFICATION REQUIREMENTS
August 7, 1989

REGISTERED PROFESSIONAL ENGINEER
LAURENCE A. PECK
9523

MISSOURI HIGHWAY AND TRANSPORTATION DEPARTMENT - DIVISION OF MATERIALS AND RESEARCH BP91-21M

PLANT MIX BITUMINOUS SURFACE LEVELING

PROJECT= C039-266(102)M and Combinations ROUTE= 266 COUNTY= Greene DATE= 4/17/91

PRODUCT CODE / FACILITY CODE / PRODUCER-LOCATION	IDENT.	SP.GR.	%ABS.	FORMATION / LEDGES / % CHERT
100207SLLS / 3009800218 / Conco #2, Willard, MO	91- 1714	2.644	1.5	Burl. / 2E-1E & 5W-2W
100204SLLS / 3009800218 / Conco #2, Willard, MO	91- 1715	2.665		Burl. / 2E-1E & 5W-2W
1002MSSLMSCT / 3062300117 / Bedrock Gravel, Wentworth, MO	91- 1495	2.689		Flint Sd.
1015ACVG..0100 / 3046400127 / Total Petroleum, Arkansas City, KS	91- 477	1.003		AC-10

MATERIAL IDENT.	91 1714	91 1715	91 1495		91 1714	91 1715	91 1495	COMB GRAD
91021				PERCENT	55.0	30.0	15.0	
3/4"	100.0	100.0	100.0		55.0	30.0	15.0	100.0
1/2"	100.0	100.0	100.0		55.0	30.0	15.0	100.0
#4	49.0	100.0	97.0		27.0	30.0	14.6	71.6
#8	15.0	97.0	66.0		8.3	29.1	9.9	47.3
#30	9.0	64.0	27.0		5.0	19.2	4.1	28.3
#200	3.7	21.0	3.0		2.0	6.3	.5	8.8

LABORATORY CHARACTERISTICS AASHTO T-165				MIX COMPOSITION
	D=	2.453	% VOIDS= 5.01	MIN. AGG. 95.0 %
	d=	2.330	V.M.A. = 16.71	ASPHALT CONTENT 5.0 %
	STABIL=	518	%FILLED= 70.0	

MISSOURI HIGHWAY AND TRANSPORTATION DEPARTMENT - DIVISION OF MATERIALS AND RESEARCH 8891-156

PLANT MIX BITUMINOUS BASE

F.A.-32-1(18)

PROJECT= F.A.-32-1(19) ROUTE= 32 COUNTY= Polk DATE= 9/12/91

PRODUCT CODE / FACILITY CODE / PRODUCER-LOCATION	IDENT.	SP.GR.	%ABS.	FORMATION / LEDGES / % CHERT
1004CABBLS / 3009800218 / Conco Qys., Willard, MO	90- 2775	2.658	1.5	Burl. LS / 2-3
1015ACVG..0200 / 30425C0127 / Sinclair Oil Corp., Tulsa, OK	90- 1124	1.002		AC-20

MATERIAL	90	90	
IDENT.	2775	2775	
90086	PERCENT	100.0	COMB GRAD
1"	100.0	100.0	100.0
1/2"	80.0	80.0	80.0
#4	46.0	46.0	46.0
#8	37.0	37.0	37.0
#30	22.0	22.0	22.0
#200	7.8	7.8	7.8

LABORATORY	D= 2.487	% VOIDS= 4.38	MIX COMPOSITION		
CHARACTERISTICS	d= 2.378	V.M.A. = 14.37	MIN.AGG.	95.7	%
AASHTO T-165	STABIL= 654	%FILLED= 69.5	ASPHALT CONTENT	4.3	%

CALIBRATION NUMBER = 00112 MASTER GAUGE BACKGROUND COUNT = 2238 CURVE COEFFICIENTS - A1 = 4.511472

MASTER GAUGE SERIAL NO. = 770 SAMPLE WEIGHT = 7200 - A2 = 3.157167

DEC 03 '91 10:39 MASTERS JACKSON PAVING CO

Submitted to: Missouri Air Pollution Control Program (APCP)

PROPOSED TEST PLAN

Date submitted: June 3, 1991

Attention: Doug Elley
Proposed Test Date: June 18, 1991

1. Facility Information

Name: Masters-Jackson Paving Company (~~Joplin~~ Springfield, Missouri, Facility)

Address: 4166 West Kearney, Springfield, MO 65801

Name and title of contact: Robert Wallis, Dir. of Asphalt Plant Operations

Telephone number of contact: (417)881-5581

2. Air Pollution Source Information

Type of source: Asphalt Plant

Permit number of source to be tested: 0391-007

Address of source: 2 miles Southeast of Willard, MO @ Conco Quarry ← go in greeny

Take 160 about 4 mi W of Springfield + cross over RR bridge + look to

Directions to source (or map attached): (See attached map.)

Initial start-up date: May 1, 1991

3. Testing Firm Information

Name of firm: AirSource Technologies

Address: 11635 W. 83rd Terrace

Lenexa, KS 66215

Name and title of contact: Craig A. Euritt, Project Coordinator

Telephone number of contact: (913)492-1613 FAX: (913)492-1012

Number of employees of firm: 6

Number of employees actually engaged in air pollution source testing: 5

Organizational chart with names & titles of personnel: (please attach)

Location and description of laboratory facilities:

Anatech Laboratories, Ludington, Michigan

Full line analytical.

Subcontractor(s) utilized by firm for source testing activities: None

Number of air pollution sources previously tested by firm: Not available.

Sources tested by firm in Missouri in past 3 years (source, test, date):

Not available.

4. Performance Test Information

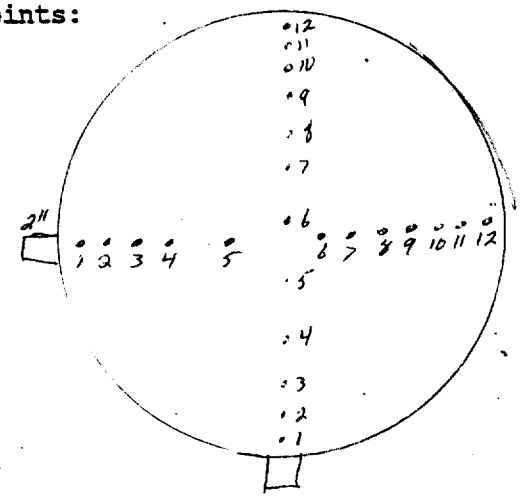
Pollutants to be sampled:

	Pollutant	Number of Sampling Points	Total Time Per Test Run	Number of Test Runs	Test Method to be Used
1	Particulate	24	1 hr.	3	1-5
2	Opacity	According	to state	DNR	9
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Cross sectional drawing of stack or duct showing dimensions, sampling port locations, and sampling points:

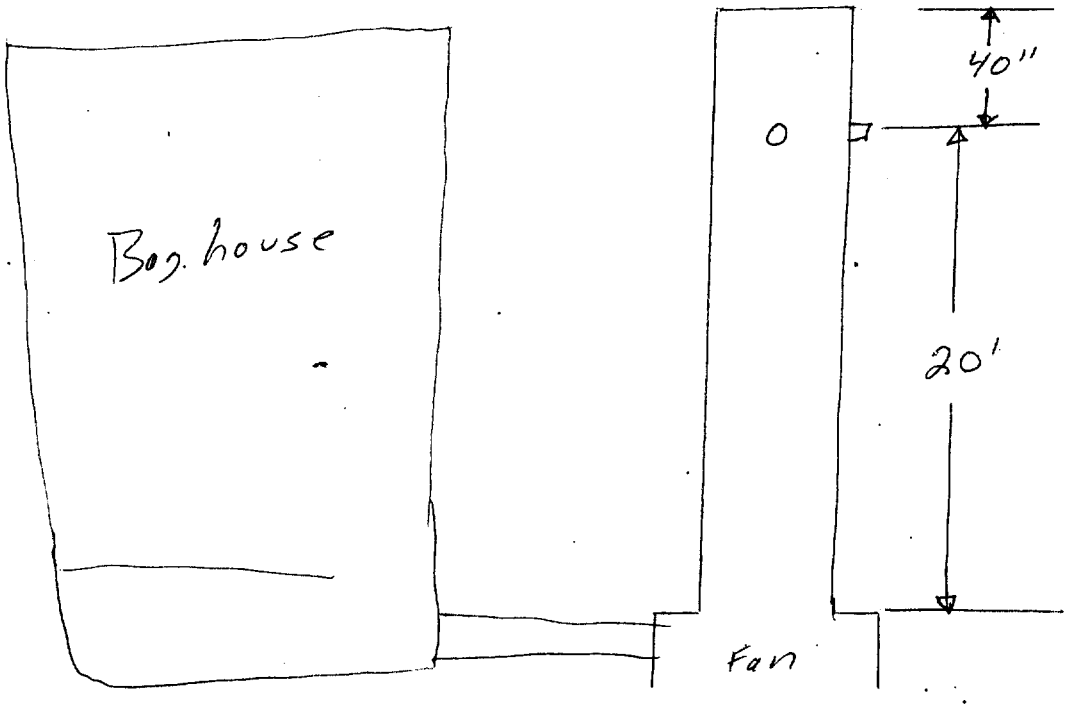
Distance from wall

1"
2.68
4.72
7.08
10.0
14.24
25.76
30.0
32.92
35.28
37.32
39.16



Nipple distance = 2"
Stack diameter = 40"

Drawing of sampling location showing stack or duct dimensions, air pollution control equipment, fans, and location(s) of disturbances which affect sampling location determination:



5. General

A. Sampling Equipment Information:

The manufacturer and model of the sampling equipment to be used by the tester for the performance tests, along with a description of any equipment which may differ from that required by the specified method(s).

Nutech Model 2010 Stack Sampler

B. Test Procedures:

A description of any test procedures to be used in the conduct of the performance tests which may differ from the specified method(s).

None, unless specified by DNR.

C. Analytical Procedures:

A description of any analytical procedures which differ from the specified method(s).

None

D. Data Sheets:

A sample of all field data sheets which do not provide the data shown on the example sheets in 40 CFR 60 for the specified method(s).

E. Air Pollution Control Equipment:

Types and manufacturers of all control equipment;

Baghouse (See Page 5)

Design or guarantee efficiency; _____

Design gas volume at full load (acfm); _____

Design pressure drop; _____

Maintenance schedule and method of recordkeeping; _____

6. Source Operation

A description of the source operation including as a minimum the following:

For Asphalt Concrete Plants

a. Type of plant (continuous, batch, portable, permanent)
Specify if drum mix plant and give name of manufacturer and model;
Double Barrel Aztec

b. Manufacturer and model of dryer and other major components;
Aztec

c. Rated capacity of unit, tons/hr (specify aggregate moisture content);
450 5% Moisture

d. Normal production rate, tons/hr;
330 tons per hour

e. Number of burners; 1 Hawk Star Jet

f. Type(s) of fuel (Indicate percentages of each when more than one type is burned); Natural Gas (Back-up #2 diesel fuel)

g. Normal fuel consumption rate; 140,000 cubic ft. per hr. (800 gal. per hr. diesel)

h. Pugmill batch size, lb; None

i. Description of scavenger system; Aztec Cyclone/Aztec Baghouse

j. Aggregate source; Conco Quarries

k. Size distribution of feed for mixes with maximum percentage of fines (material passing number 200 sieve); D-Mix 10% - 200

l. Normal operating schedule; March 1 - to Dec. 31

m. Normal maintenance schedule for plant, along with a description of the operating difficulties encountered thus far; and Jan. 1 - Feb. 28
No difficulties.

n. Process flow diagram showing flow of feed, asphalt, product, stack gases, fly ash, and air pollution control device liquid, where applicable.

ORGANIZATION CHART

AIRSOURCE TECHNOLOGIES

George R. Cobb	General Manager
Craig A. Euritt	Project Coordinator
Ted Hartman	Project Manager
D. Bart Gossett	Project Manager
Karl Baker	Project Manager
Rosalie Kalb	Office Manager