AP42 Section: 11.1

Reference Number: 56

Title: Results Of The September 1, 1993 10 Micron Particulate Emission Compliance Test On The Baghouse Stack At The Commercial Asphalt Redrock Facility Located In Newport, Minnesota,

Pace, Inc., Golden Valley, MN,

September 23, 1993.

AP-42 Section	11.1
Reference	
Report Sect.	4
Reference	56

13942

RESULTS OF THE SEPTEMBER 1, 1993 10 MICRON PARTICULATE EMISSION COMPLIANCE TEST ON THE BAGHOUSE STACK AT THE COMMERCIAL ASPHALT REDROCK FACILITY LOCATED IN NEWPORT, MINNESOTA

Prepared For:	Mr. Brent Schlueter Commercial Asphalt Company
Prepared By:	PACE, Incorporated 1710 Douglas Drive North Golden Valley, Minnesota 55422
PACE Project No.:	930831.401
Report Date:	September 23, 1993

Field sampling was performed by me and personnel under my direct supervision.

Michael Loftus

Michael S. Loftus
Project Field Supervisor

All sampling, analysis and data reduction were performed by PACE, Incorporated under my supervision.

Jane E Parley for

Curtis H. Stock
Supervisor, Air Sampling Section

Table of Contents

INTRODUCTION

PACE, Incorporated personnel conducted 10 micron particulate (PM-10) and visible emission compliance testing on the Baghouse Stack at the Commercial Asphalt Redrock facility located in Newport, Minnesota. On-site testing was performed by a three member team consisting of M. Loftus, M. McDermott and K. Lattery. Coordination between plant operations and testing activities was provided by Mike Mahoney of Commercial Asphalt through direct contact with the test team leader. Testing was not witnessed by a representative of the Minnesota Pollution Control Agency. The test consisted of three independent one-hour samplings for PM-10 with concurrent integrated gas sampling for Orsat analyses.

The objectives of this project were to quantify PM-10 and visible emissions and compare them to applicable air emissions regulations stipulated by Minnesota Rules. Special provisions for this test program include operating at maximum capacity and firing on natural gas.

Results are summarized in the next section followed by descriptions of the process under investigation and test methods. All supporting data are included in subsequent appendices.

RESULTS SUMMARY

Results of particulate determinations and gas composition are summarized in Table 1. The sub-10-micron particulate emission rate averaged 1.11 LB/HR at an average particulate concentration of .0027 GR/DSCF. MPCA emissions regulations limit sources of this type to .02 GR/DSCF.

Opacity observations were recorded every 15 seconds for a one-hour period during the third run. These results are shown in Table 4. All of the 240 observations are zero percent. Within the one-hour observation period, the highest average opacity for a consecutive six-minute time span was zero percent. The average opacity for the one-hour period was zero percent.

Typically, PM-10 filter samples are saved and recovered in the laboratory. However, in this case, equipment considerations made it necessary to recover them in the field.

No problems were encountered in the sampling or analysis except that the team leader, Michael Loftus, suspected that the results from the first run would not be valid due to an error in a calculation for Method 201A. Upon realizing the error, he decided to conduct a fourth run. On this and after complete review of the test results, we believe that the values reported herein are an accurate representation of the source conditions at the time of the test.

SUMMARY OF THE RESULTS

Commercial Asphalt Company
Redrock Hot Mix Facility
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 22, 1993

TABLE 1
SUMMARY OF THE RESULTS

TEST 1

Baghouse Stack

PARAMETER	RUN 2	RUN 3	RUN 4	AVERAGE
Date of Run	9/1/93	9/1/93	9/1/93	
Time of Run	1158-1303	1421-1525	1619-1722	
Production Rate (TPH)	460.7	459.2	569.6	496.5
Recycle Usage (Percent)	29.5	29.5	30.2	29.7
Volumetric Flow Rate				
ACFM	93800	94400	95600	94600
DSCFM	50500	49200	45300	48300
Gas Temperature (°F)	253	253	253	253
Gas Moisture Content (%v/v)	25.7	28.0	34.6	29.4
Gas Composition (%v/v,Dry)				
CO2	3.5	3.7	4.7	4.0
O2	15.3	14.6	13.0	14.3
N2	81.2	81.7	82.3	81.7
Isokinetic Variation (%)	123.0	126.4	132.4	
Particulate Emission Rate (LB/HR)				
< 10 µm Particulate, LB/HR	1.13	1.12	1.07	1.11
Wet Catch (< 10 µm), LB/HR	0.53	0.52	0.50	0.52
Total < 10 µm, LB/HR	1.66	1.65	1.57	1.63
Particulate Concentration (GR/DSCF)				
> 10 µm Particulate	.0002	.0002	.0002	.0002
< 10 µm Particulate	.0026	.0027	.0028	.0027
Wet Catch (< 10 µm), GR/DSCF	.0012	.0012	.0013	.0013
% of Particulate < 10µm (Including WC)	94%	94%	94%	94%
% of Particulate < 10µm (Excluding WC)	92%	92%	92%	92%

RESULTS OF ORSAT AND MOISTURE DETERMINATIONS

Commercial Asphalt Company
Redrock Hot Mix Facility
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 22, 1993

TABLE 2

RESULTS OF ORSAT AND MOISTURE DETERMINATIONS

TEST 1

Baghouse Stack

PARAMETER	RUN 2	RUN 3	RUN 4
Date of Run	9/1/93	9/1/93	9/1/93
Time of Run	1158-1303	1421-1525	1619-1722
ORSAT (%v/v)			
Dry Basis			
Carbon Dioxide	3.50	3.70	4.70
Oxygen	15.30	14.60	13.00
Carbon Monoxide	*	*	*
Nitrogen	81.20	81.70	82.30
WetBasis			
Carbon Dioxide	2.60	2.67	3.08
Oxygen	11.36	10.52	8.51
Carbon Monoxide	*	*	*
Nitrogen	60.30	58.85	53.85
Portable Oxygen Monitor Result			
Time Weighted Average (%O2)	15.0	14.4	12.1
Moisture Collected (ml)	149.0	164.0	215.0
Moisture Content (%v/v)	25.73	27.97	34.57
Molecular Weight of Flue Gas (lb/lb-mole)			
Dry	29.17	29.18	29.27
Wet	26.30	26.05	25.38

*Carbon monoxide was not measured, assumed concentrations less than 0.01%.

Fo	1.600	1.703	1.681

RESULTS OF PM-10 DETERMINATIONS

Commercial Asphalt Company
Redrock Hot Mix Facility
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 22, 1993

TABLE 3
RESULTS OF PARTICULATE PM-10 DETERMINATIONS
TEST 1
Baghouse Stack

PARAMETER	RUN 2	RUN 3	RUN 4
Date of Run	9/1/93	9/1/93	9/1/93
Time of Run	1158-1303	1421-1525	1619-1722
Sample Duration (Min.)	61.3	60.0	60.0
Average Flue Gas Temperature (°F)	253.1	253.2	253.3
Moisture Content of Flue Gas (%v/v)	25.73	27.97	34.57
Particulate Collected (Mg)			
PM-10 Cyclone Catch	0.3	0.3	0.3
< 10 µm Particulate Weight	3.4	3.4	3.4
Wet Catch Weight (< 10 µm)	1.6	1.6	1.6
Volumetric Flow Rate			
ACFM	93820	94370	95570
DSCFM	50490	49250	45300
Sample Volume (Cubic Feet)			
Meter Conditions	21.21	21.08	20.28
Dry Standard	20.24	19.88	19.15
Isokinetic Variation (%)	123.0	126.4	132.4
Particulate Concentration*			
> 10 µm Particulate, GR/DSCF	0.0002	0.0002	0.0002
< 10 µm Particulate, GR/DSCF	0.0026	0.0027	0.0028
Wet Catch (< 10 µm), GR/DSCF	0.0012	0.0012	0.0013
% of Particulate < 10µm (Including WC)	94.4%	94.4%	94.4%
% of Particulate < 10µm (Excluding WC)	92.0%	92.0%	92.0%
Particulate Emission Rate*			
< 10 µm Particulate, LB/HR	1.13	1.12	1.07
Wet Catch (< 10 µm), LB/HR	0.53	0.52	0.50
Total < 10 µm, LB/HR	1.66	1.65	1.57
Actual Particulate Cut Diameter (µm)	10.00	10.00	10.00

RESULTS OF OPACITY OBSERVATIONS

Commercial Asphalt Company
Redrock Hot Mix Facility
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 3, 1993

TABLE 4
RESULTS OF OPACITY OBSERVATIONS
TEST 1

Baghouse Stack

Percent Opacity	Optical Density	Relative Frequency
0	0.000	100.00
5	0.022	0.00
10	0.046	0.00
15	0.071	0.00
20	0.097	0.00
25	0.125	0.00
30	0.155	0.00
35	0.187	0.00
40	0.222	0.00
45	0.260	0.00
50	0.301	0.00
55	0.347	0.00
60	0.398	0.00
65	0.456	0.00
70	0.523	0.00
75	0.602	0.00
80	0.699	0.00
85	0.824	0.00
90	1.000	0.00
95	1.301	0.00
99	2.000	0.00
Average > 0.0	0.000	**Total >** 100

Average Opacity Per Six Minute Period:

Period	Opacity	Period	Opacity
1	0.0	6	0.0
2	0.0	7	0.0
3	0.0	8	0.0
4	0.0	9	0.0
5	0.0	10	0.0

High Six Minute Average: 0.0
Maximum reading: 0.0
Minumum reading: 0.0

Observer: K. Lattery
Date of test: 9/1/93
Time of test: 1421-1521

NOTE: The high six minute average opacity might not coincide with any of the 10 reported six minute periods. The high value is the maximum consecutive period possible and may overlap two of the ten consecutive six-minute periods.

RESULTS OF PRELIMINARY SOURCE DETERMINATIONS

TABLE 5
RESULTS OF AIR FLOW DETERMINATIONS
TEST 1

Baghouse Stack

Date of Run	9/1/93
Time of Measurement	0755
Number of Sampling Ports	2
Number of Points Sampled	12
Barometric Pressure (In. Hg)	29.29
Static Pressure (In. WC)	-0.16
Absolute Flue Gas Pressure (In. Hg)	29.28
Average Flue Gas Temperature (F)	155.17
Average Moisture Content (%v/v)	29.2
Dry Molecular Weight of Flue Gas (lb/lb-mole)	29.24
Flue Gas Average Velocity (Feet/Second)	60.31
Duct Dimension (Inches)	65.0
Duct Cross-sectional Area (Square Feet)	23.04
Volumetric Flow Rate	
ACFM	83,380
SCFM	70,000
DSCFM	49,570

PROCESS DESCRIPTION

The Commercial Asphalt Company Redrock facility located in Newport, Minnesota uses a Boeing 600 Drum Mix model capable of producing asphalt paving material. The burner rating, at a setting of 100 percent, is 170 MMBTU/HR. Pollution control is facilitated by an Aeropulse FS11BO 12-65 baghouse in which all the bags were replaced within one month of the test date. The normal pressure drop across the control equipment is between 2 and 4 inches water. A relational flow diagram is represented by Figure 1.

For this series of tests, the average asphalt production rate was 496.5 TPH while using an average of 29.7 percent recycle materials. The Baghouse was operated at an average of 2.5 inches of water pressure drop and the average operating temperature of the drum mixer was 276°F. Natural gas was fired as fuel.

Commercial Asphalt Company

Newport, Minnesota
Redrock Hot Mix Facility
Asphalt Plant Flow Diagram

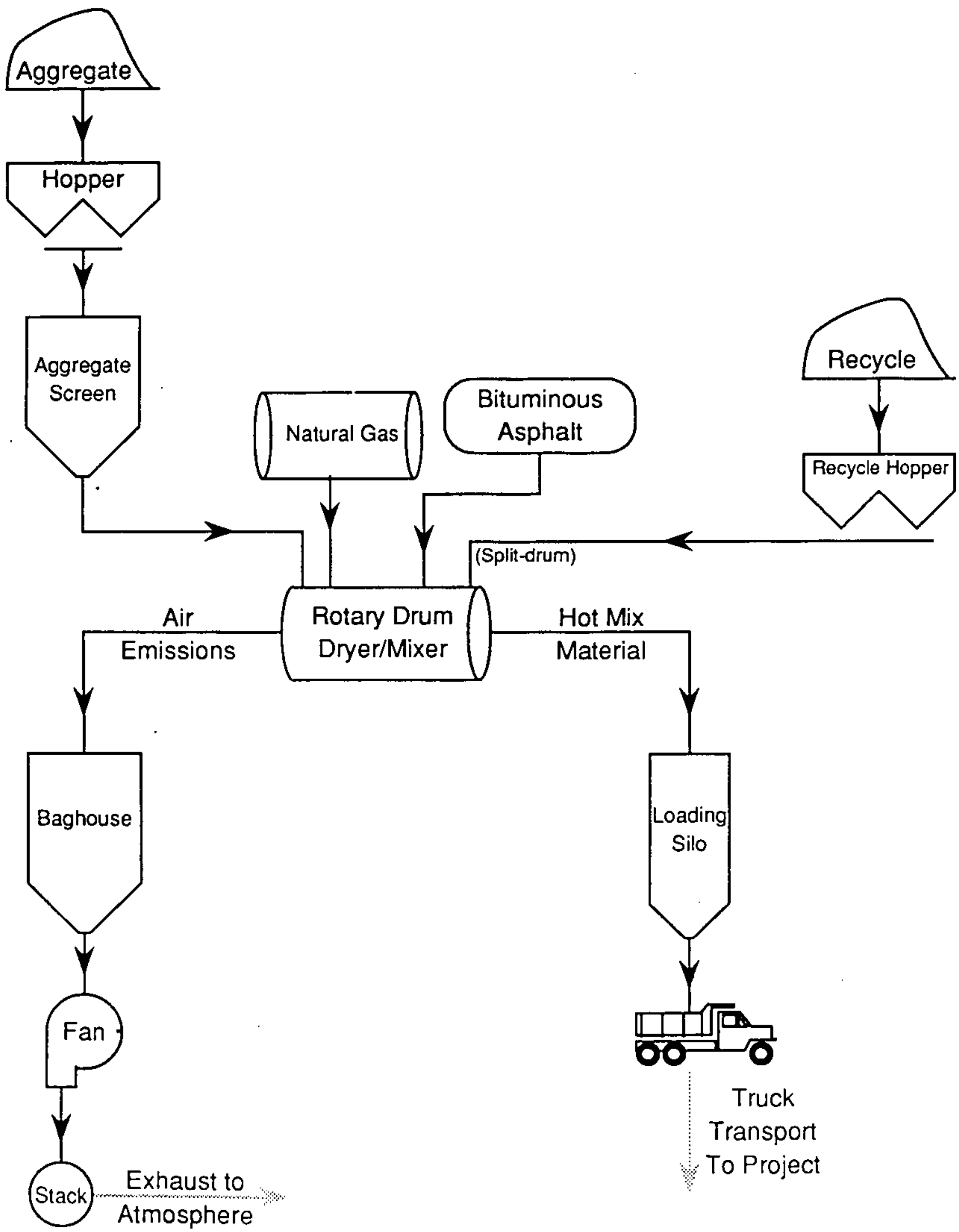


Figure 1

MSL 9/93

TEST PROCEDURES SUMMARY

Testing on the Baghouse Stack was performed from two test ports oriented at 90 degrees, approximately 3.0 duct diameters downstream of the nearest flow disturbance and 9.2 duct diameters upstream of the stack outlet. The duct dimension at this point was verified on-site and measures 65.0 inches in diameter. A 12 point traverse was used to extract representative flue gas samples. Each point was sampled approximately 5 minutes for a run duration of no less than 60 minutes. Test port and traverse point locations are displayed in Figures 2 and 3.

Particulate testing was performed in accordance with EPA Methods 1 - 5, 40 CFR 60, Appendix A. A preliminary velocity traverse and moisture estimation were conducted so that an appropriate sampling nozzle required for isokinetic sample withdrawal could be selected. A PACE sampling train that meets or exceeds the specifications outlined in the above reference was used to collect particulate samples. A temperature controlled glass-lined sampling probe was used to extract flue gas samples and transport them to an all glass filter and cyclone assembly in a temperature controlled oven. The back half of the particulate sampling train consisted of a series of three glass impingers, each of the first two prepared with 100 mls of deionized water, followed by a desiccant packed drying column. In addition, integrated gas samples were collected concurrently with the three particulate runs so that gas composition (Orsat) could be determined. Gas samples were verified in the field with a portable oxygen analyzer to ensure that no leakage occurred between the site and the laboratory. The portable oxygen analyzer was also used to monitor the oxygen content of the flue gas throughout the test.

Opacity evaluations were performed in accordance with EPA Method 9, 40 CFR 60, Appendix A. After positioning himself with respect to the sun, the source and plume (wind) direction, the certified observer proceeds to record opacity readings at 15 second intervals for one hour. A total of 240 observations is recorded in 60 minutes. The readings are integrated to calculate a one-hour average opacity and ten successive six-minute averages. In addition, computer spreadsheets are used to search the data set to find a group of 24 consecutive readings anywhere within the one-hour evaluation for the highest possible six-minute average.

Air flow determinations were performed in accordance with EPA Method 2 using traverse point protocols specified by EPA Method 1, 40 CFR 60, Appendix A. Point velocity measurements were conducted using a S-Type pitot tube and a Neotronics Model EDM-1 Electronic Digital Manometer. Source gas moisture content was estimated using wet bulb/dry bulb temperature measurements.

Commercial Asphalt Company
Newport, Minnesota
Redrock Hot Mix Facility
Drum Dryer Baghouse Stack

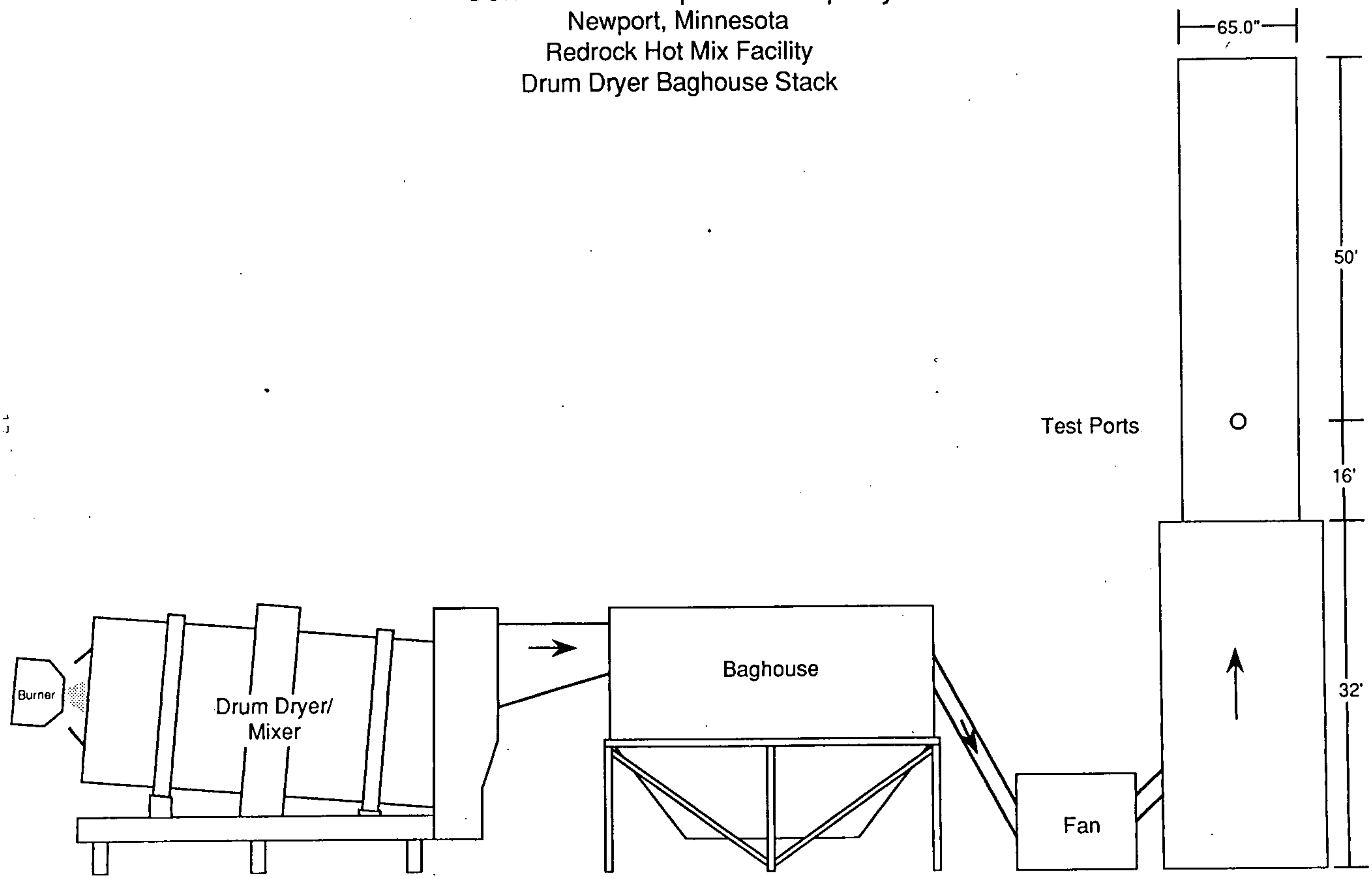
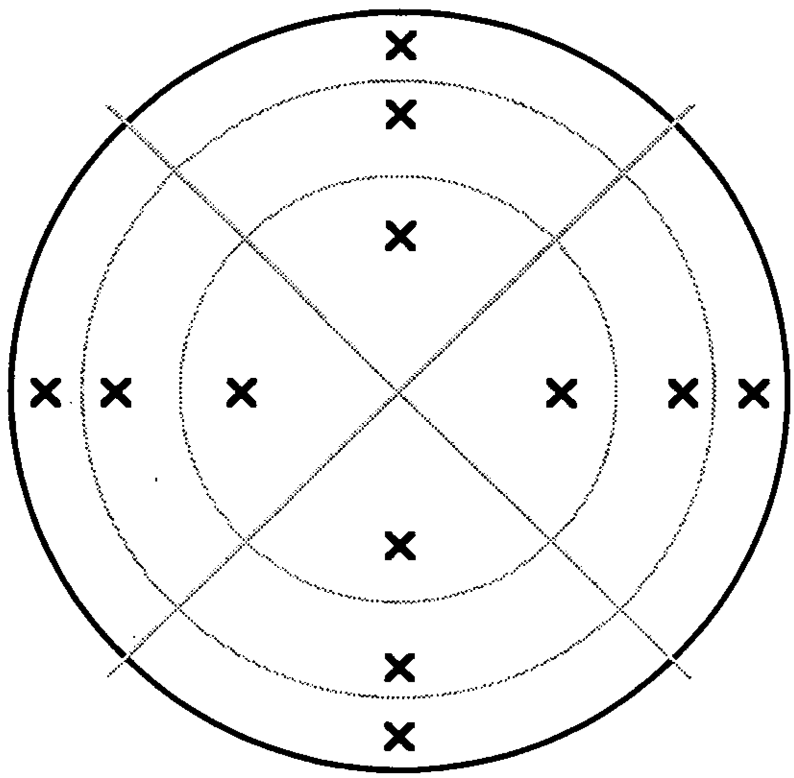


Figure 2

Commercial Asphalt Company

Newport, Minnesota
Redrock Hot Mix Facility
Baghouse Stack

Location of Traverse Points



Number of Test Ports	2
Total Number of Traverse Points	12
Number of Traverse Points Per Traverse	6
Duct Diameter (Inches)	65

Figure 3

APPENDIX A

Field Data Sheets and Notes

pace. INCORPORATED THE ASSURANCE OF QUALITY

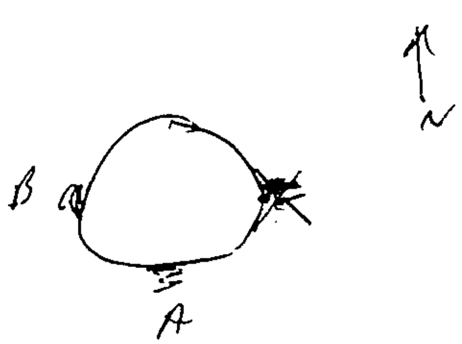
AIR SAMPLING DEPARTMENT

EPA Method 2 Field Data Sheet

Project CA Red rock
Test Location Baghouse Stack
Date 9-1-93 Test 1 Run
Operators MSL KJL
Barometric Pressure 29.29 Inches Hg
Static Pressure -.16 Inches H_2O
Pitot Leak Check - Positive OK Negative OK

Pitot Tube No. 19 C_p 843
Pressure Measurement Device oil manometer
Duct Dimensions 65 Inches
Port Length 2.5 Inches
Temp. - Dry Bulb see below °F, Wet Bulb 154 °F
Moisture Content 29 %
320P Oxygen Concentration 14 %
Time of Measurement 0755 (24 Hr. Clock)

Traverse Point Identification				Cyclonic Flow Yaw Angle	Velocity Head ΔP Inches H_2O	Stack Temperature °F
Point Number	% Of Diameter	Inches From: Wall	Inches From: Port			
B 1		2.83	5.33	°	.79	157
2		9.52	12.02	°	1.30	157
3		19.23	21.73	°	1.15	156
4		45.77	48.27	°	.80	157
5		55.48	57.98	°	.76	157
6		62.17	64.67	°	.75	156
A 1				°	.53	154
2				°	.67	154
3				°	.69	153
4				°	.91	153
5				°	1.05	154
6				°	1.15	154
				°		
				°		
				°		
				°		
				°		
				°		
				°		
				°		
				°		
				°		
				°		
				°		



Schematic of Duct Cross-Section

Computer Data Summary:

Stack Pressure 29.28 Inches Hg
Duct Area 23.043 Square Feet
Molecular Weight - M_d 29.67
Molecular Weight - M_s 26.29
Avg. Duct Temperature 155.17 °F
Average $\sqrt{\Delta P}$ .9302
Flue Gas Velocity 57.93 Feet/Sec.
Volumetric Flow Rate:
ACFM 82562
DSCFM 44412

roj.Name: CA Redrock
Date: 9-1-93

Source: Baghouse stack
City &State: Newport, MN.

Method 201A Summary Sheet

	RUN 1	RUN 2	RUN 3	RUN 4	Comments
Ps=	29.28	29.28	29.28	29.28	
Md=	29.36	29.36	29.36	29.36	
Mw=	26.06	26.52	26.52	26.29	
µs=	178.692	201.197	207.965	206.479	
Qs=	.476	.551	.575	.573	
ΔH(@Ts)=	.31	.38	.39	.37	
Vn=	63.3	73.21	76.4	76.13	
Vmin=	46.75	54.23	56.60	56.48	
Vmax=	73.14	84.75	88.45	88.19	
ΔPmin=	.52	.64	.67	.66	
ΔPmax=	1.3	1.56	1.65	1.62	
Avg. ΔP=	.88	.93	.97	.97	
Bws=	.29	.25	.25	.27	
Ts (avg)=	155.17	228.42	253.08	253.17	
Tm=	62	71.46	79.25	85.63	
Pb=	29.29	29.29	29.29	29.29	
Pg=	-.16	-.16	-.16	-.16	
Cp=	843	843	843	843	
Dn=	.150	.150	.150	150	
Cal. ΔH=	2.123	2.123	2.123	2.123	
F.G. Vel.=	59.93	67.39	67.80	68.78	
O2=	14	14	14	14	
CO2=	5	5	5	5	
N2&CO=	81	81	81	81	
D50=	9.97	9.93	10.00	10.00	

Nozzle	Nom. Dia.	Dn (sq.)	Nozzle	Nom. Dia.	Dn (sq.)
PM1-1	.135	.018	PM1-7		
PM1-2	.150	.023	PM1-8		
PM1-3	.165	.027	PM1-9		
PM1-4	.182	.033	PM1-10		
PM1-5	.198	.039	PM1-11		
PM1-6					

Ps= Stack Gas Pressure
Md= Mol. Weight of Stack Gas,dry
Mw= Mol. Weight of Stack Gas,in Water
µs= Viscosity of Stack Gas
Qs= Cyclone Flow Rate
ΔH(@ Ts)= ΔH at Est. Stack Temp.+ 460
Vn= Nozzle Velocity
Vmin= Minimum Gas Velocity in ft/ sec.
Vmax= Maximum Gas Velocity in ft/ sec.
ΔPmin= Minimum Velocity Head Value
ΔPmax= Maximum Velocity Head Value
Avg. ΔP= Average Velocity Head Reading

Bws= Fraction Moisture Content
Ts(avg)= Estimated Average Stack Temp.
Tm= Estimated Average Meter Temp.
Pb= Barometric Pressure
Pg= Stack Static Pressure
Cp=Calibrated Pitot Coefficient
Dn= Calibrated Nozzle Diameter
Cal. ΔH= Avg. Pressure Differential Across Meter
F.G. Vel.= Stack Gas Velocity in ft/ sec.
O2= Estimated Oxygen Content
CO2= Estimated Carbon Dioxide Content
N2&CO= Estimated Nitrogen &CO Content
D50=Dia. of part. w/50% probability of penetration

GH Redrock Run 1 1-1-93

29.29+(-.16 /13.6) = 29.28	Md=.44(5)+.32(14)+.28(81) = 2.2 4.48 22.68 = 29.~~17~~36	Mw=29.36(1-.29)+18(.29) = .71 = 26.06

us 152.418+.2552(155)+.000032355(24025)+.53147(14)-74.143(.29)
39.556 + . 777 + 7.441 21.50
=
us= 178.692

Qs=.002837(178.692) $\left[\frac{155+460}{26.06(29.28)}\right]^{.2949}$ = 1.3316

Qs= ~~.675~~ .476

ΔH= $\left[\frac{\cancel{.675}\ .476(.71)29.28}{(\cancel{3075}\ 615)}\right]^{2}$ (62 +460)(29.36(1.083)(2.123) / (29.29)

~~.0000484~~ .0002588 X 1203.055418

615 ΔH avg.= ~~.033~~ .31
665 ΔH + 50= .34
565 ΔH - 50= .29

Vn= 3.056 (.476) / ( ) 1.454656

.018=8081 ① .023=63.25 ② 503 .027= ③

.033 = ~~44.08~~ → ~~...~~ 292.66 30.42
Vn= ~~...~~ 63.3
~~53.8~~ 395.5

Vmin= .2457+ $\left[.3072-.2603\frac{(~~.1~~.1689)178.692}{(\quad)}\right]^{.5}$ 132.09/

.023 46.75
.027 ~~...~~ 35.88

= ~~...~~ .0692 .023 = ~~...~~ 503.036 .027 ~~...~~ 396.71 Vmin = 46.75

~~...~~ .0638 ~~...~~

Vmax= .4457+ $\left[.5690-.2603\frac{(.1689)178.692}{(\quad)}\right]^{.5}$

.023 ~~...~~ 73.14
.027 ~~68.08~~ 61.64

=
Vmax= 73.14

.0638 .069

ΔPmin= .00013686 X $\frac{(29.28)(26.06)(2185.56)}{(\cancel{155+460}\ 615)(.711)}$

= 3813.85

~~65~~ 615 ΔP min avg.= .52
665 ΔP min + 50= .56
565 ΔP min - 50= .48

ΔPmax= .00013686 X $\frac{(29.28)(26.06)(5349.46)}{(\cancel{460}\ 615)(.711)}$

= 9334.92

615 ΔP max avg.= 1.28
665 ΔP max + 50= 1.38
565 ΔP max - 50= 1.17

Dwell time= $\left(\frac{(\quad)}{(.88)}\right)^{.5}$ X $\frac{(60)}{(12)}$

Change Dwell time= $\frac{(\quad)}{(\quad)}$ X ( )

D50=.15625 $\left[\frac{615}{763.04}\right]^{.2091}$ $\left[\frac{178.692}{.476}\right]^{.7091}$

.149 X 66.92

0.97

pace.

AIR SAMPLING DEPARTMENT

EPA Method 201A Field Data Sheet

Project CA Redrock
Sample Location Baghouse stack
Date 9-1-93 Test 1 Run 1
Operators MSL KTL MM

Train No. 56,B3,P2
Meter Coef. ∂ .9946
Orifice Coef. ΔH@ 2.123
Nozzle No PM-2 D_n .150

Pitot Tube No. 19 C_p .843
Bar. Pres. 29.29 Ins. Hg
Static Pres. -.16 Ins. H_2O
Estimated MC 29 %

Sampling Train Leak Checks:
Pretest 0.010 @ 15 Ins. Hg
Posttest 0.011 @ 10.5 Ins. Hg
Pitot - Positive OK Negative OK

Point No.	Dwell Time	Time ΔT	Meter Vol. V_m Cubic Feet	Velocity Head - ΔP Inches WC	Orifice Meter - ΔH Inches WC	Point ΔV_m	Vacuum Inches Hg	Stack Temp. °F	Sampling Train Temperatures - °F: Oven	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	320 P Oxygen Percent	
		(0942)	(301.50)	$\Delta P_{(avg)}$ .88	ΔH- .31 @ 1.55										
A 6	5.25	5.25	303.09	1.00	.31	1.59	6.1	200	IN STACK	240	57	67	68	15.6	
5	5.25	10.50	304.67	.93	.31	1.60	6.5	203	FILTER	235	56	68	68	15.5	
4	5.00	15.50	306.33	.91	.34	1.64	7.5	219		240	57	69	68	14.9	
3	5.25	20.75	308.03	.95	.34	1.70	7.5	212		242	56	71	68	15.6	
2	5.00	25.75	309.63	.87	.34	1.60	7.5	213		239	56	72	68	15.2	
1	4.75	30.50	311.17	.78	.34	1.54	7.5	207		237	56	74	69	15.1	
B 6	4.50	35.00	312.63	.75	.34	1.46	7.5	242		229	59	74	70	15.3	
5	4.50	39.50	314.10	.75	.34	1.47	7.5	246		236	61	75	70	15.5	
4	4.75	44.25	315.63	.79	.34	1.53	7.5	244		238	63	76	71	15.5	
3	5.75	50.00	317.50	1.20	.34	1.87	7.5	253		238	62	77	71	14.7	
2	6.00	56.00	319.43	1.25	.34	1.93	7.5	254		248	62	78	72	15.1	
1	5.25	61.25	321.16	1.00	.34	1.73	7.5	248		249	63	79	72	14.7	
		(1047)													
		Ø=61.25	V_m = 19.66	.9619	$\overline{\Delta H}$=.335			$\overline{T}_s$ 228.42					$\overline{T}_m$ 71.46		

Samples Recovered: Filter No. 2977 ; ☒ Probe Wash; ☒ PM-10 Wash; ☒ Wet Catch; ☒ Other 202

V_{STD} = 19.03
MC = 25.17

Integrated Gas Sampling Data:

Box No. 3
Bag No. 1
Bag Vol. 40 Liters

Bag Material Tedlar
Leak Checks 0.00 cc/min @ 25"Hg
Posttest O_2 Reading 15.3
320 P No. OX-3

Moisture Recovery Data:

Impinger No.	1	2	3	4	Desiccant	Total
Final Volume	224	100	0	—	1417	
Initial Volume	100	100	0	—	1405	
Difference	124	100	0	—	12	136

AS 137

GR Redrock Run 2 7-1-93

Pg + (/13.6) = 29.28

Md=.44( )+.32( )+.28( ) = = 29.36

Mw=29.36 (1-.25)+18(.25) = ~~22.02~~ + 4.5 = 26.52

us 152.418+.2552(228)+.000032355(52174)+.53147(14)-74.143(.25)

= 58.1856+ 1.688 7.441 18.536

us= 201.197

Qs=.002837(201.197) [(688 ~~460~~) / (26.52(29.28)] ^.2949 =

Qs= .551

ΔH= [.551(.75)29.28 / (688)] ^2 (533 ~~400~~ (29.36)(1.083)(2.123) / (29.29))

.0003093 X 1226.103457

688 ΔH avg.= .38
738 ΔH + 50= ~~.34~~ .33
638 ΔH - 50= ~~.35~~ .44

Vn= 3.056 (.551) / ( ) .023

Vn= 73.21

Vmin= [.2457+ [.3072- .2603 (.742) 201.197 / (~~.0035~~ 626.406)] ^.5 .062]

=

Vmin = 54.23

Vmax= [.4457+ [.5690- .2603 (.742) 201.197 / (~~.0035~~ 626.406)] ^.5]

=

Vmax= 84.75

ΔPmin= .00013686 X (29.28)(26.52)(2940.89) / (~~400~~ 688)(.711)

=

688 ΔP min avg.= .64
738 ΔP min + 50= .60 ~~.53~~
638 ΔP min - 50= .69

ΔPmax= .00013686 X (29.28)(26.52)(7182.56) / (~~400~~ 688)(.711)

=

688 ΔP max avg.= 1.56
738 ΔP max + 50= ~~1.43~~ 1.45
638 ΔP max - 50= ~~1.69~~ 1.68

D50=.15625 [688 / 776.51] ^.2091 [201.197 / .551] .7091

.1514

9.93

Dwell time= ( ) / ( ) ^.5 X ( ) / ( )

Change Dwell time= ( ) / ( ) X ( )

(PS)(MW) = 776.51

TS+460 = 688

Pace Incorporated

AI AM NG PA MET

EPA Method 201A Field Data Sheet

Project CA Redrock
Sample Location Baghouse stack
Date 9-1-93 Test 1 Run 2
Operators MSL KJL MAM

Train No. CC, B3, P2
Meter Coef. ∂ .9946
Orifice Coef. ΔH@ 2.123
Nozzle No. PM-2 D_n .150

Pitot Tube No. 19 C_p .843
Bar. Pres. 29.29 Ins. Hg
Static Pres. -.16 Ins. H_2O
Estimated MC 25 %

Sampling Train Leak Checks:
Pretest 0.00 @ 15 Ins. Hg
Posttest 0.00 @ 11.5 Ins. Hg
Pitot - Positive OK Negative OK

Point No.	Dwell Time	Time ΔT	Meter Vol. V_m Cubic Feet	Velocity Head - ΔP Inches WC	Orifice Meter - ΔH Inches WC	Point ΔV_m	Vacuum Inches Hg	Stack Temp. °F	Sampling Train Temperatures - °F: Oven	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	320 P Oxygen Percent	
		(1158)	(321.40)	ΔP(avg) .93	ΔH=.38 @2.28										
B6	4.50	4.50	322.95	.75	.38	155	9.0	257	IN	235	64	76	75	16.8	
5	4.50	9.00	324.48	.73	.38	143	9.0	258	STACK	245	64	76	75	14.4	
4	4.50	13.50	326.05	.79	.38	157	9.0	258	Filter	249	63	77	75	14.5	
3	6.00	19.50	328.14	1.30	.38	209	9.0	255		249	64	78	75	14.5	
2	6.00	25.50	330.23	1.35	.38	209	9.0	254		241	60	80	76	14.5	
1	6.00	31.50	332.32	1.30	.38	209	9.0	256		239	57	82	76	14.3	
BA6	5.25	36.75	334.15	1.00	.38	183	9.0	255		234	59	83	77	15.3	
5	5.00	41.75	335.87	.91	.38	172	9.0	251		239	58	83	78	15.5	
4	5.00	46.75	337.60	.90	.38	173	9.0	247		241	62	84	78	14.8	
3	5.00	51.75	339.33	.90	.38	173	9.0	252		245	63	85	79	14.9	
2	4.75	56.50	340.98	.85	.38	165	9.0	248		242	64	87	79	15.1	
1	4.75	61.25	342.61	.84	.38	163	9.0	246		243	60	88	80	15.1	
		1303													
		θ=61.25	V_m = 21.21	.9784	$\overline{\Delta H}$ = .38			T_s = 253.08					T_m = 79.25		

Samples Recovered: Filter No. 2978 ; [X] Probe Wash; [X] PM-10 Wash; [X] Wet Catch; [X] Other 202

VSTO = 20.23
MC = 25.74

Integrated Gas Sampling Data:

Box No. 3
Bag No. 2
Bag Vol. 40 Liters

Bag Material Tedlar
Leak Checks 0.00 cc/min @ 25"Hg
Posttest O_2 Reading 15.2
320 P No. OK-3

Moisture Recovery Data:

Impinger No.	1	2	3	4	Desiccant	Total
Final Volume	242	102	0	—	1340	
Initial Volume	100	100	0	—	1335	
Difference	142	2	0	—	5	149

AS 137

CA Redrock Run 3 9-1-93

Ps= + (/13.6) = = 29.28	Md=.44( )+.32( )+.28( ) = = 29.36	Mw=29.36(1-)+18(.) = = 26.52

=152.418+.2552(253)+.000032355(64051)+.53147(14)-74.143(.25)

= ~~25~~ 64.57 + 2.072 7.441 − 18.536

=

μs= 207.965

Qs=.002837(207.965) [713 ~~400~~ / (29.36)]^.2949 =

Qs= .575

ΔH= [.575(.75) 29.36 / (713)]^2 (~~400~~ 539.25 (29.36)(1.083)(2.123) / (29.29))

= .0003153 X 1242.8115

713 ΔH avg.= .39

763 ΔH + 50= .34

663 ΔH - 50= .45

Vn= 3.056 (.575) / ( ) .023

Vn= 76.4

Vmin= [.2457+ [.3072- .2603 (.758) 207.965 / (667.79)]^.5]

=

Vmin = 56.60

Vmax= [.4457+ [.5690- .2603 (.758) 207.965 / (667.79)]^.5]

=

Vmax= 88.45

ΔPmin= .00013686 X (29.36)(26.52)(3203.56) / (~~400~~ 713)(.711)

= 506.943

713 ΔP min avg.= .67

763 ΔP min + 50= .63

663 ΔP min - 50= .72

ΔPmax= .00013686 X (29.36)(26.52)(7823.40) / (~~400~~ 713)(.711)

= 506.943

713 ΔP max avg.= 1.65

763 ΔP max + 50= 1.54

663 ΔP max - 50= 1.77

D50=.15625 [713]^.2091 [207.965 / .575].7091

.9823

= 10.00

Dwell time= ( ) / ( ) ^.5 X ( ) / ( )

Change Dwell time= ( ) / ( ) X ( )

(mw)(ps) = 776.51

EPA Method 201A Field Data Sheet

Project: CA Redrock
Sample Location: Baghouse stack
Date: 9-1-93 Test: 1 Run: 3
Operators: MSC, KJL

Train No.: C6, B3, P2
Meter Coef. ∂: .9946
Orifice Coef. ΔH@: 2.123
Nozzle No.: PM-2 D_n: .150

Pitot Tube No.: 19 C_p: .843
Bar. Pres.: 29.29 Ins. Hg
Static Pres.: -.16 Ins. H_2O
Estimated MC: 25 %

Sampling Train Leak Checks:
Pretest: 0.00 @ 15 Ins. Hg
Posttest: 0.00 @ 12.0 Ins. Hg
Pitot - Positive: OK Negative: OK

Point No.	Dwell Time	Time ΔT	Meter Vol. V_m Cubic Feet	Velocity Head - ΔP Inches WC	Orifice Meter - ΔH Inches WC	Point ΔV_m	Vacuum Inches Hg	Stack Temp. °F	Sampling Train Temperatures - °F: Oven	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	320 P Oxygen Percent	
		(1421)	(342.90)	ΔP(avg) .97	ΔH-.39 @253										
A 6	4.25	4.25	344.41	.70	.39	151	8.5	249	IN	237	57	84	83	15.5	
5	4.25	8.50	345.92	.69	.39	151	9.0	248	stack	250	56	83	83	14.7	
4	4.50	13.00	347.50	.77	.39	158	9.5	251	Filter	250	57	84	83	13.7	
3	5.25	18.25	349.35	1.10	.39	185	9.5	258		250	60	85	83	14.4	
2	5.75	24.00	351.40	1.20	.39	205	9.5	258		247	60	87	83	14.4	
1	6.25	30.25	353.62	1.45	.39	222	9.5	257		247	60	88	84	14.4	
B 6	5.00	35.25	355.48	1.00	.39	186	9.5	249		243	64	89	84	14.8	
5	5.00	40.25	357.13	.93	.39	165	9.5	251		241	59	88	84	14.2	
4	5.00	45.25	358.85	.94	.39	172	9.5	252		247	57	89	85	14.3	
3	5.00	50.25	360.60	.95	.39	185	9.5	254		244	57	90	85	14.3	
2	5.00	55.25	362.33	.97	.39	173	9.5	256		244	57	90	85	14.3	
1	4.75	60	363.98	.85		165	9.5	255		245	58	90	86	14.2	
		1525													
		Θ = 60	V_m = 21.08	.985	$\overline{\Delta H}$ = .39			$\overline{T_s}$ = 253.17					$\overline{T_m}$ = 85.63		

Samples Recovered: Filter No. 2979 ; [X] Probe Wash; [X] PM-10 Wash; [X] Wet Catch; [X] Other 202

VSTD = 19.88
MC = 27.97

Integrated Gas Sampling Data:

Box No.: 3
Bag No.: 3
Bag Vol.: 40 Liters

Bag Material: tedlar
Leak Checks: 0.00 cc/min. @ 25"Hg
Posttest O_2 Reading: 14.7
320 P No.: OX-3

Moisture Recovery Data:

Impinger No.	1	2	3	4	Desiccant	Total
Final Volume	259	100	0	—	1422	
Initial Volume	100	100	0	—	1417	
Difference	159	0	0	—	5	164

AS 137

CH Red Rock Run 7 4-1-75

Pb = + (/13.6) = 29.28

Md=.44( )+.32( )+.28( ) = = 29.36

Mw=29.36(1-.27)+18(.27) = 4.86 = 26.29

u = .152.418+.2552(253)+.000032355(64095)+.53147(14)-74.143(.77)

= + 6457 + 2.07 + 7.441 - 20.02

us= 206.479

Qs=.002837(206.479) [713 ~~460~~ / ( )]^.2949 =

Qs= .573

ΔH= [.573(.73)29.28 / (713)]^2 (545.63 ~~460~~)(29.36)(1.083)(2.123) / (29.29)

000295 X

713 ΔH avg.= .37

763 ΔH + 50= .32

663 ΔH - 50= .43

Vn= 3.056 ( ) / ( ) .573 / .033

Vn= 76.13

Vmin= [.2457+ [.3072- .2603 (.757)206.479 / (664.25)]^.5 .061]

=

Vmin = 56.48

Vmax= [.4457+ [.5690- .2603 (.757)206.479 / (664.25)]^.5 .061]

=

Vmax= 88.19

ΔPmin= .00013686 X (769.771)(3189.99 2455561.7) / (~~460~~)( ) 713 .711 506.943

=

713 ΔP min avg.= .66

763 ΔP min + 50= .62

~~663~~ ΔP min - 50= .71

ΔPmax= .00013686 X (769.771)(7777.48 5986878.6) / (~~460~~)(.711) 713

= 506.943

713 ΔP max avg.= 1.62

542.493 763 ΔP max + 50= 1.51

471.393 663 ΔP max - 50= 1.74

D50=.15625 [713 /] ^.2091 [/] .7091

= 10.00

Dwell time= ( ) / ( ) ^.5 X ( ) / ( )

Change Dwell time= ( ) / ( ) X ( )

(mw)(Ps) = 769.771

pace

EPA Method 201A Field Data Sheet

Project: CA Redrock
Sample Location: Baghouse Stack
Date: 9-1-93 Test: 1 Run: 4
Operators: MSC KJC MAW

Train No. C6, B3, P2
Meter Coef. ∂ .9946
Orifice Coef. ΔH@ 2.123
Nozzle No. PM-2 D_n .150

Pitot Tube No. 19 C_p .843
Bar. Pres. 29.29 Ins. Hg
Static Pres. -.16 Ins. H_2O
Estimated MC 27 %

Sampling Train Leak Checks:
Pretest 0.00 @ 15 Ins. Hg
Posttest 0.00 @ 12.5 Ins. Hg
Pitot - Positive OK Negative OK

Point No.	Dwell Time	Time ΔT	Meter Vol. V_m Cubic Feet	Velocity Head - ΔP Inches WC	Orifice Meter - ΔH Inches WC	Point ΔV_m	Vacuum Inches Hg	Stack Temp. °F	Oven	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	320 P Oxygen Percent	
		(1619)	(364.67)	$\Delta P_{(avg)}$ .97	ΔH-.37@253										
A 6	4.50	4.50	366.17	.76	.37	150	9.0	263	TN	248	62	85	84	12.4	
5	4.50	9.00	367.66	.75	.37	149	9.5	258	STACK	243	61	84	83	11.2	
4	4.50	13.50	369.25	.80	.37	159	10.0	260	FILTER	250	60	84	83	10.9	
3	5.50	19.00	371.12	1.20	.37	187	10.0	255		250	57	86	83	13.2	
2	6.00	25.00	373.13	1.40	.37	201	10.0	244		246	56	86	83	12.2	
1	6.00	31.00	375.17	1.40	.37	204	10.0	254		249	58	87	83	11.5	
B 6	500	36.00	376.86	.96	.37	169	10.0	248		245	63	87	83	12.2	
5	475	40.75	378.44	.85	.37	158	10.0	254		243	61	87	83	11.8	
4	500	45.75	380.13	.93	.37	169	10.0	259		242	60	87	83	12.6	
3	475	50.50	381.71	.88	.37	158	10.0	248		244	58	88	85	12.9	
2	475	55.25	383.34	.87	.37	163	10.0	248		241	58	88	84	12.3	
1	475	60	384.95	.84	.37	161	10.0	246		242	58	88	84	12.5	
		(1722)													
		⊘=60	V_m =20.28	.985	$\overline{\Delta H}$= .37			$\overline{T_s}$=253.25					$\overline{T_m}$=84.83		

Samples Recovered: Filter No. 2980 ; ☒ Probe Wash; ☒ PM-10 Wash; ☒ Wet Catch; ☒ Other 202

VSTD = 19.15
MC = 34.57

Integrated Gas Sampling Data:

Box No. 3
Bag No. 4
Bag Vol. 40 Liters

Bag Material Tedlar
Leak Checks 0.00 cc/min. @ 25"Hg
Posttest O_2 Reading 13.0
320 P No. OK-3

Moisture Recovery Data:

Impinger No.	1	2	3	4	Desiccant	Total
Final Volume	309	102	0	—	1344	
Initial Volume	100	100	0	—	1340	
Difference	209	2	0	—	4	215

AS 137

pace

AIR SAMPLING DEPARTMENT

Field Computer Summary

Project Name: CA Redrock

Sampling Location: Baghouse stack

Date of Test: 9-1-93

Test Number: 1

Operator M. Loftus

Initialization Parameters		Run Specific Input Parameters	Run 1	Run 2	Run 3	Run 4
Meter Coef. - ∂	= .9946	V/O	301.50	321.40	342.90	364.67
Orif. Coef. - ΔH@	= 2.123	No. Of Points	12	12	12	12
Pitot Coef. - C_p	= .843	MC	29	25	25	27
Nozzle Dia. - D_n	= .150	V/F	321.16	342.61	363.98	384.95
Bar. Pres. - P_b	= 29.29	Grams H_2O	136	149	164	215
Time/Point - ΔT	=	Run Time	61.25	61.25	60.0	60.0
Moisture Content	= 25	1-Rnd/2-Rect	1	1	1	1
% Oxygen	= 14	Diameter(Ins.)	65	65	65	65
Meter Temp. - t_m	= 62	Length(Ins.)	X	X	X	X
Static Pres. - P_g	= -.16	Width(Ins.)	X	X	X	X

PM-2

148

149

151

151

151

End Of Run Summary

	Run 1	Run 2	Run 3	Run 4
Avg. √ΔP	~~29.28~~ .9619	.9784	.9853	.985
Avg. ΔH	.335	.38	.39	.37
Avg. t_s	228.43	253.08	253.17	253.25
Avg. t_m	71.46	79.25	85.63	84.83
Standard Vol.	19.03	20.23	19.88	19.15
Moist. Content	25.17	25.75	27.97	34.57
Avg. Gas Vel.	64.99	67.39	67.80	68.78
% Isokinetic				
ACFM	89858	93174	93733	95089
DSCFM	50580	50127	48913	45069

AS 100 G

Company: C A Date(s): 9-1-93

Project No.: 930831.401

Significant Events & Notes

1) Arrived 0600. Ready to test 0930.

2) ~~Believe~~ Believe R1 has calculation error. Will run a 4th run to be safe. (ΔH+50 & ΔH-50)

3)

4)

5)

6)

7)

8)

9)

10)

11)

EPA METHOD 9 FIELD DATA SHEETS

pace®

AIR SAMPLING DEPARTMENT

EPA Method 9 Field Data Sheet

Project C.A. Redrock
Source No. 1 I.D. Baghouse Stack
Source No. 2 I.D. ____
Test No. 1

Evaluation Date 9-1-93
Observer K. Luttery
Certification Date 4-1-93

Source No. 1

Type of Source Asphalt Plant Control Device Baghouse
Fuel Type Natural Gas Load @ 460 ton/hr.

Source No. 2

Type of Source ____ Control Device ____
Fuel Type ____ Load ____

Source Height(s) 98' Outlet Dimensions 65"

Plume Description:

Type ☐ Coning ☐ Fanning ☐ Looping ☐ Lofting ☐ Fumigating ☒ NA

Color NA Length NA

Steam Plume ☐ Attached ☐ Detached ☒ No Visible Steam

Background Description (Type, color) Blue sky partly cloudy (white clouds)

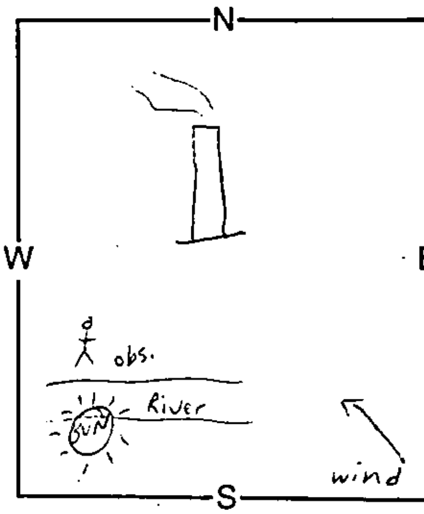
Meteorological Conditions (clear, % cloudy, etc.) Sunny, 40% Cloudy

Wind Direction SE Speed 15-20 mph
Ambient Temp. 70 °F

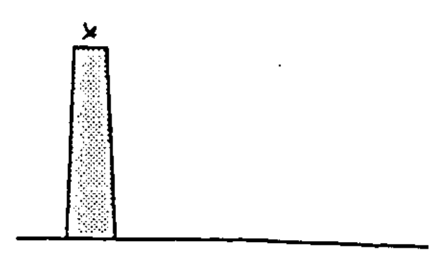
Location of Observer (direction and distance) SW about 325'

Personnel Present During Observation M. Loftus M. McDermott Mike, Mahoney

Show Observer's Position In Relation to the Source, Plume and Lighting



Show Point Where Readings Were Evaluated In Relation to the Source Outlet and the Steam Plume



Comments (include any changes to the above during evaluation) ____

pace®

EPA Method 9 Field Data Sheet
Page 2

Source No. 1
Time Start 1421 Time Stop 1521

Min. \ Sec.	0	15	30	45	Min. \ Sec.	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

Source No. 2
Time Start ________ Time Stop ________

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

Observer Signature [illegible signature]

VISIBLE EMISSION EVALUATOR CERTIFICATION

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Kevin Lattery

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

Thomas Rose
President

238353
Certificate Number

[illegible]
Vice President

Minneapolis
Location

David B. Savage, Jr.
Program Manager

April 1, 1993
Date of Issue

APPENDIX B
Laboratory Data and Reports

pace

AIR SAMPLING DEPARTMENT

EPA Method 3 Laboratory Summary Sheet

Project C.A. Redrock

Analyst K. Lattery

Sampling Location Baghouse Stack

Analysis Date 9-2-93

Sampling Date 9-1-93

Apparatus Leak Check - Pos. 0.00 Neg. 0.00

Project Number 930831.401

Apparatus Identification 08-1

Sample Type ☒ Integrated ☐ Grab

Test No.	Run No.	Orsat Analyzer Results			F_o	O_2 Analyzer Results		Sample Container
		% CO_2	% O_2	% CO		Field	Lab	
1	0	0.00	20.90			20.9	20.9	☐ Tedlar™ Bag ☐ Glass Bulb
1	1	3.90	15.30		1.647	15.3	15.3	☒ Tedlar™ Bag ☐ Glass Bulb
1	2	3.50	15.30		1.600	15.2	15.2	☒ Tedlar™ Bag ☐ Glass Bulb
1	3	3.70	14.60		1.703	14.7	14.7	☒ Tedlar™ Bag ☐ Glass Bulb
1	4	4.70	13.00		1.681	13.0	13.0	☒ Tedlar™ Bag ☐ Glass Bulb
								☐ Tedlar™ Bag ☐ Glass Bulb
								☐ Tedlar™ Bag ☐ Glass Bulb
								☐ Tedlar™ Bag ☐ Glass Bulb
								☐ Tedlar™ Bag ☐ Glass Bulb
								☐ Tedlar™ Bag ☐ Glass Bulb

Calculate F_o before evacuating any samples. Compare F_o to expected fuel values. If discrepancies exist, reanalyze samples. Calculate F_o as follows:

$$F_o = \frac{20.9 - \%\,O_2}{\%\,CO_2}$$

Comments

F_o Ranges For Common Fuels	
Anthracite Coal & Lignite	1.016 - 1.130
Bituminous Coal	1.083 - 1.230
Distillate Oil	1.260 - 1.413
Residual Oil	1.210 - 1.370
Wood	1.000 - 1.120
Wood Bark	1.003 - 1.130
Natural Gas	1.600 - 1.836
Propane	1.434 - 1.586
Butane	1.405 - 1.553

pace®

AIR SAMPLING DEPARTMENT

EPA Method 3 Laboratory Data Sheet

Project C.A. Redrock	Analyst K. Lattery
Sampling Location Baghouse Stack	Analysis Date 9-2-93
Sampling Date 9-1-93	Apparatus Leak Check - Pos. 0.00 Neg. 0.00
Project Number 930831.401	Apparatus Identification O3-1

	Aliquot Volume	CO_2	O_2
Test 1 Run 0	Zero Point 0.00 ml Sample Volume 100.00 ml	Initial Reading 0.00 ml Final Reading 0.00 ml Volume CO_2 0.00 ml % CO_2 0.00 %	Initial Reading 0.00 ml Final Reading 20.90 ml Volume O_2 20.90 ml % O_2 20.90 %
Duplicate	Zero Point ____ ml Sample Volume ____ ml	Initial Reading ____ ml Final Reading ____ ml Volume CO_2 ____ ml % CO_2 ____ %	Initial Reading ____ ml Final Reading ____ ml Volume O_2 ____ ml % O_2 ____ %
Average		% CO_2 0.00 %	% O_2 20.90 %
Test ____ Run ____	Zero Point ____ ml Sample Volume ____ ml	Initial Reading ____ ml Final Reading ____ ml Volume CO_2 ____ ml % CO_2 ____ %	Initial Reading ____ ml Final Reading ____ ml Volume O_2 ____ ml % O_2 ____ %
Duplicate	Zero Point ____ ml Sample Volume ____ ml	Initial Reading ____ ml Final Reading ____ ml Volume CO_2 ____ ml % CO_2 ____ %	Initial Reading ____ ml Final Reading ____ ml Volume O_2 ____ ml % O_2 ____ %
Average		% CO_2 ____ %	% O_2 ____ %

Comments:

pace®

EPA Method 3 Laboratory Data Sheet

Project: C.A. Redrock | Analyst: K. Laffery
Sampling Location: Baghouse Stack | Analysis Date: 9-2-93
Sampling Date: 9-1-93 | Apparatus Leak Check - Pos. 0.00 Neg. 0.00
Project Number: 930831.401 | Apparatus Identification: OB-1

	Aliquot Volume	CO_2	O_2
Test 1 Run 1	Zero Point 0.00 ml Sample Volume 100.00 ml	Initial Reading 0.00 ml Final Reading 3.40 ml Volume CO_2 3.40 ml % CO_2 3.40 %	Initial Reading 3.40 ml Final Reading 18.70 ml Volume O_2 15.30 ml % O_2 15.30 %
Duplicate	Zero Point 0.00 ml Sample Volume 100.00 ml	Initial Reading 0.00 ml Final Reading 3.40 ml Volume CO_2 3.40 ml % CO_2 3.40 %	Initial Reading 3.40 ml Final Reading 18.70 ml Volume O_2 15.30 ml % O_2 15.30 %
Average		% CO_2 3.40 %	% O_2 15.30 %
Test 1 Run 2	Zero Point 0.00 ml Sample Volume 100.00 ml	Initial Reading 0.00 ml Final Reading 3.50 ml Volume CO_2 3.50 ml % CO_2 3.50 %	Initial Reading 3.50 ml Final Reading 18.80 ml Volume O_2 15.30 ml % O_2 15.30 %
Duplicate	Zero Point 0.00 ml Sample Volume 100.00 ml	Initial Reading 0.00 ml Final Reading 3.50 ml Volume CO_2 3.50 ml % CO_2 3.50 %	Initial Reading 3.50 ml Final Reading 18.80 ml Volume O_2 15.30 ml % O_2 15.30 %
Average		% CO_2 3.50 %	% O_2 15.30 %

Comments:

pace®

EPA Method 3 Laboratory Data Sheet

Project C.A. Redrock
Analyst K. Lattery
Sampling Location Baghouse Stack
Analysis Date 9-2-93
Sampling Date 9-1-93
Apparatus Leak Check - Pos. 0.00 Neg. 0.00
Project Number 93083.401
Apparatus Identification 08-1

	Aliquot Volume	CO_2	O_2
Test 1 Run 3	Zero Point 0.00 ml Sample Volume 100.00 ml	Initial Reading 0.00 ml Final Reading 3.70 ml Volume CO_2 3.70 ml % CO_2 3.70 %	Initial Reading 3.70 ml Final Reading 18.30 ml Volume O_2 14.60 ml % O_2 14.60 %
Duplicate	Zero Point 0.00 ml Sample Volume 100.00 ml	Initial Reading 0.00 ml Final Reading 3.70 ml Volume CO_2 3.70 ml % CO_2 3.70 %	Initial Reading 3.70 ml Final Reading 18.30 ml Volume O_2 14.60 ml % O_2 14.60 %
Average		% CO_2 3.70 %	% O_2 14.60 %
Test 1 Run 4	Zero Point 0.00 ml Sample Volume 100.00 ml	Initial Reading 0.00 ml Final Reading 4.70 ml Volume CO_2 4.70 ml % CO_2 4.70 %	Initial Reading 4.70 ml Final Reading 17.70 ml Volume O_2 13.00 ml % O_2 13.00 %
Duplicate	Zero Point 0.00 ml Sample Volume 100.00 ml	Initial Reading 0.00 ml Final Reading 4.70 ml Volume CO_2 4.70 ml % CO_2 4.70 %	Initial Reading 4.70 ml Final Reading 17.70 ml Volume O_2 13.00 ml % O_2 13.00 %
Average		% CO_2 4.70 %	% O_2 13.00 %

Comments:

PARTICULATE ANALYTICAL DATA

pace®

INORGANIC LABORATORY

EPA Method 5 Particulate Gravimetric Sheet

Organic Condensibles

Project: Commercial Asphalt Co

Analyst: BCL

Sampling Location: Baghouse Stack

Analysis Date(s): 9-13-93

Sampling Date: 9-1-93

Sampling Reagent: DI

Test Number: 1

LDMS Entry: ______ Initials ______

Project Number: 930902.518

LDMS Validation: 9-16-93 Initials JMC

Method: EPA 202 BATCH ID 43387

Sample No. 22574.6	Sample No. 22575.4	Sample No. 22576.2
Run Number 4	Run Number 1	Run Number 2
Dish Number 25	Dish Number TIM	Dish Number Fe
Vol 500	Vol 500	Vol 450
Date/Time 9-15-93 0730	Date/Time 9-15-93 0730	Date/Time 9-15-93 0730
Gross Weight 99.4672 g	Gross Weight 99.7310 g	Gross Weight 115.9044 g
Date/Time 9-15-93 1045	Date/Time 9-16-93 0835	Date/Time 9-15-93 1045
Gross Weight 99.4669 g	Gross Weight 99.7307 g	Gross Weight 115.9040 g
Avg. Gross Wt. 99.4671 g	Avg. Gross Wt. 99.7308 g	Avg. Gross Wt. 115.9042 g
Dish Tare Wt. 99.4640 g	Dish Tare Wt. 99.7258 g	Dish Tare Wt. 115.9026 g
Difference 0.0031 g	Difference 0.0050 g	Difference 0.0016 g
Blank Weight -0.0003 g	Blank Weight -0.0003 g	Blank Weight -0.0003 g
Condensible Organic Wt. 0.0031 g	Condensible Organic Wt. 0.0050 g	Condensible Organic Wt. 0.0016 g
Transfer "Condensible Organic Wt." to Box Number 1.	Transfer "Condensible Organic Wt." to Box Number 2.	Transfer "Condensible Organic Wt." to Box Number 3.
WC 1 [0.0031] g	WC 2 [0.0050] g	WC 3 [0.0016] g

AS 105 A

pace.

INORGANIC LABORATORY

EPA Method 5 Particulate Gravimetric Sheet
Organic Condensibles

Project Commercial Asphalt
Sampling Location Baghouse Stack
Sampling Date 9-1-93
Test Number 1
Project Number 930902.512
Method: EPA 202

Analyst BDL
Analysis Date(s) 9-13-93
Sampling Reagent DI
LDMS Entry ______ Initials ______
LDMS Validation 9-16-93 Initials JMC
BATCH 1043387

Sample No. 22577.C	Sample No.	Sample No.
Run Number 3	Run Number	Run Number
Dish Number EPA	Dish Number	Dish Number
Vol 475		
Date/Time 9-15-93 0730	Date/Time	Date/Time
Gross Weight 115.5637 g	Gross Weight g	Gross Weight g
Date/Time 9-16-93 0830	Date/Time	Date/Time
Gross Weight 115.5635 g	Gross Weight g	Gross Weight g
Avg. Gross Wt. 115.5636 g	Avg. Gross Wt. g	Avg. Gross Wt. g
Dish Tare Wt. 115.5611 g	Dish Tare Wt. g	Dish Tare Wt. g
Difference 0.0025 g	Difference g	Difference g
Blank Weight -0.0003 g	Blank Weight g	Blank Weight g
Condensible Organic Wt. 0.0025 g	Condensible Organic Wt. g	Condensible Organic Wt. g
Transfer "Condensible Organic Wt." to Box Number 1.	Transfer "Condensible Organic Wt." to Box Number 2.	Transfer "Condensible Organic Wt." to Box Number 3.
WC 1 0.0025 g	WC 2 g	WC 3 g

AS 105 A

INORGANIC LABORATORY

EPA Method 5 Particulate Gravimetric Sheet

Particulate In Probe Wash

Project Commercial [illegible] Analyst BCL
Sampling Location Baghouse Stack Analysis Date(s) 9-13-93
Sampling Date 9-1-93 Cleanup Reagent(s) Acetone
Test Number 1 LDMS Entry ______ Initials ______
Project Number 930902.518 LDMS Validation 9-16-93 Initials JMC
BATCH [illegible]

Sample No. 22579.7
Run Number 1
Dish Number Joe
Reagent Vol. 50 ml

Date/Time 9-15-93 0715
Gross Weight 107.4953 g

Date/Time 9-15-93 0700
Gross Weight 107.4951 g

Avg. Gross Wt. 107.4952 g
Dish Tare Wt. 107.4927 g
Difference 0.0025 g

Blank Weight -0.0014 g

Particulate In
Rinse Weight 0.0025 g

Transfer "Particulate In Rinse Weight" to Box Number 1.

PW 1 [illegible] g

Sample No. 22581.9
Run Number 2
Dish Number W1
Reagent Vol. 10 ml

Date/Time 9-15-93 0715
Gross Weight 107.4381 g

Date/Time 9-15-93 1345
Gross Weight 107.4376 g

Avg. Gross Wt. 107.4378 g
Dish Tare Wt. 107.4375 g
Difference 0.0003 g

Blank Weight -0.0014 g

Particulate In
Rinse Weight 0.0003 g

Transfer "Particulate In Rinse Weight" to Box Number 2.

PW 2 0.0003 g

Sample No. 22582.7
Run Number 3
Dish Number 51
Reagent Vol. 50 ml

Date/Time 9-15-93 0715
Gross Weight 111.5131 g

Date/Time 9-15-93 1345
Gross Weight 111.5137 g

Avg. Gross Wt. 111.5131 g
Dish Tare Wt. 111.5091 g
Difference 0.0039 g

Blank Weight -0.0014 g

Particulate In
Rinse Weight 0.0033 g

Transfer "Particulate In Rinse Weight" to Box Number 3.

PW 3 [illegible] g

AS 105 A

pace®

INORGANIC LABORATORY

EPA Method 5 Particulate Gravimetric Sheet
Particulate In Probe Wash

Project Commercial Asphalt
Sampling Location Baghouse Stack
Sampling Date 9-[illegible]-93
Test Number 1
Project Number 930902.518

Analyst RDL
Analysis Date(s) 9-13-93
Cleanup Reagent(s) Acetone
LDMS Entry ______ Initials ______
LDMS Validation 9-16-93 Initials JMC

BATCH 1643388

Sample No. 33584.3	Sample No. ______	Sample No. ______
Run Number 4	Run Number ______	Run Number ______
Dish Number 50m	Dish Number ______	Dish Number ______
Reagent Vol. 40 ml	Reagent Vol. ______ ml	Reagent Vol. ______ ml
Date/Time 9-15-93 0730	Date/Time ______	Date/Time ______
Gross Weight 100.5361 g	Gross Weight ______ g	Gross Weight ______ g
Date/Time 9-15-93 1345	Date/Time ______	Date/Time ______
Gross Weight 100.53[illegible] g	Gross Weight ______ g	Gross Weight ______ g
Avg. Gross Wt. 100.5350 g	Avg. Gross Wt. ______ g	Avg. Gross Wt. ______ g
Dish Tare Wt. 100.5338 g	Dish Tare Wt. ______ g	Dish Tare Wt. ______ g
Difference 0.[illegible] g	Difference ______ g	Difference ______ g
Blank Weight -0.[illegible] g	Blank Weight ______ g	Blank Weight ______ g
Particulate In Rinse Weight 0.00[illegible] g	Particulate In Rinse Weight ______ g	Particulate In Rinse Weight ______ g
Transfer "Particulate In Rinse Weight" to Box Number 1.	Transfer "Particulate In Rinse Weight" to Box Number 2.	Transfer "Particulate In Rinse Weight" to Box Number 3.
PW 1 [illegible] g	PW 2 ______ g	PW 3 ______ g

AS 105 A

pace INCORPORATED
THE ASSURANCE OF QUALITY

INORGANIC LABORATORY

EPA Method 5 Particulate Gravimetric Sheet
Particulate In Probe Wash

Project: Commercial Asphalt	Analyst: SGL
Sampling Location: Baghouse Stack	Analysis Date(s): 9-13-93
Sampling Date: 9-7-93	Cleanup Reagent(s): Acetone
Test Number: 1	LDMS Entry: ______ Initials: ______
Project Number: 930905.513	LDMS Validation: 9-16-93 Initials: JMC

BATCH 10-3386

Sample No. 32563.0	Sample No. 32565.7	Sample No. 32566.5
Run Number 1	Run Number 2	Run Number 3
Dish Number JJL	Dish Number Jen	Dish Number PDH
Reagent Vol. 35 ml	Reagent Vol. 35 ml	Reagent Vol. 35 ml
Date/Time 9-15-93 0725	Date/Time 9-15-93 0730	Date/Time 9-15-93 0735
Gross Weight 97.7424 g	Gross Weight 100.5190 g	Gross Weight 105.3137 g
Date/Time 9-16-93 1315	Date/Time 9-16-93 0900	Date/Time 9-15-93 1245
Gross Weight 97.7435 g	Gross Weight 100.5190 g	Gross Weight 105.3138 g
Avg. Gross Wt. 97.7430 g	Avg. Gross Wt. 100.5190 g	Avg. Gross Wt. 105.3138 g
Dish Tare Wt. 97.7330 g	Dish Tare Wt. 100.5168 g	Dish Tare Wt. 105.3123 g
Difference 0.0044 g	Difference 0.0022 g	Difference 0.0015 g
Blank Weight -0.0014 g	Blank Weight -0.0014 g	Blank Weight -.0014 g
Particulate In Rinse Weight 0.0044 g	Particulate In Rinse Weight 0.0022 g	Particulate In Rinse Weight 0.0015 g
Transfer "Particulate In Rinse Weight" to Box Number 1.	Transfer "Particulate In Rinse Weight" to Box Number 2.	Transfer "Particulate In Rinse Weight" to Box Number 3.
PW 1 [ ] g	PW 2 [ ] g	PW 3 [ ] g

AS 105 A

pace®

INORGANIC LABORATORY

EPA Method 5 Particulate Gravimetric Sheet
Particulate In Probe Wash

Project Commercial [illegible] Analyst BC[illegible]
Sampling Location Baghouse Stack Analysis Date(s) 9-13-93
Sampling Date 9-1-93 Cleanup Reagent(s) Acetone
Test Number 1 LDMS Entry ______ Initials ____
Project Number 730 903 518 LDMS Validation 9-16-93 Initials JMC
BATCH ID 48834

Sample No. 82567.3	Sample No. ______	Sample No. ______
Run Number 4	Run Number ______	Run Number ______
Dish Number KMM	Dish Number ______	Dish Number ______
Reagent Vol. 35 ml	Reagent Vol. ______ ml	Reagent Vol. ______ ml
Date/Time 9-15-93 [illegible]	Date/Time ______	Date/Time ______
Gross Weight 108.[illegible] g	Gross Weight ______ g	Gross Weight ______ g
Date/Time 9-15-93 [illegible]	Date/Time ______	Date/Time ______
Gross Weight 108.[illegible] g	Gross Weight ______ g	Gross Weight ______ g
Avg. Gross Wt. 108.[illegible] g	Avg. Gross Wt. ______ g	Avg. Gross Wt. ______ g
Dish Tare Wt. 108.[illegible] g	Dish Tare Wt. ______ g	Dish Tare Wt. ______ g
Difference 0.[illegible] g	Difference ______ g	Difference ______ g
Blank Weight [illegible] g	Blank Weight ______ g	Blank Weight ______ g
Particulate In Rinse Weight [illegible] g	Particulate In Rinse Weight ______ g	Particulate In Rinse Weight ______ g
Transfer "Particulate In Rinse Weight" to Box Number 1.	Transfer "Particulate In Rinse Weight" to Box Number 2.	Transfer "Particulate In Rinse Weight" to Box Number 3.
PW 1 [illegible] g	PW 2 ______ g	PW 3 ______ g

AS 105

EPA Method 5 Particulate Gravimetric Sheet
Particulate On Filter

Project Commercial Asphalt Co
Analyst BOL
Sampling Location Baghouse Stack
Analysis Date(s) 9-10-93
Sampling Date 9-7-93
Filter Type fiberglass
Test Number 1
LDMS Entry
Initials
Project Number 930902.518
LDMS Validation 9-16-93
Initials JMC
BATCH ID 43386

Sample No. 22563.0	Sample No. 22565.7	Sample No. 22566.5
Run Number 1	Run Number 2	Run Number 3
Filter Number 2977	Filter Number 2978	Filter Number 2979
Date/Time 9-14-93 0730	Date/Time 9-14-93 0730	Date/Time 9-14-93 0730
Gross Weight 0.17898 g	Gross Weight 0.17879 g	Gross Weight 0.18018 g
Date/Time 9-14-93 1200	Date/Time 9-15-93 0730	Date/Time 9-14-93 1200
Gross Weight 0.17895 g	Gross Weight 0.17874 g	Gross Weight 0.18013 g
Avg. Gross Wt. 0.17896 g	Avg. Gross Wt. 0.17876 g	Avg. Gross Wt. 0.18016 g
Filter Tare Wt. 0.17718 g	Filter Tare Wt. 0.17753 g	Filter Tare Wt. 0.17903 g
Difference 0.00178 g	Difference 0.00123 g	Difference 0.00113 g
Particulate On Filter Weight 0.00178 g	Particulate On Filter Weight 0.00123 g	Particulate On Filter Weight 0.00113 g
Transfer "Particulate On Filter Weight" to Box Number 1.	Transfer "Particulate On Filter Weight" to Box Number 2.	Particulate On Filter Weight" to Box Number 3.
Sum particulate weights from each box labeled "1" and record in box labeled "T1."	Sum particulate weights from each box labeled "2" and record in box labeled "T2."	Sum particulate weights from each box labeled "3" and record in box labeled "T3."
AF 1 0.00178 g	AF 2 0.00123 g	AF 3 0.00113 g
Total T1 g	Total T2 g	Total T3 g

AS 105 A

pace®

INORGANIC LABORATORY

EPA Method 5 Particulate Gravimetric Sheet
Particulate On Filter

Project Commercial Asphalt Co
Sampling Location Baghouse Stack
Sampling Date 9-1-93
Test Number 1
Project Number 930902.518
BATCH 1043386

Analyst BOL
Analysis Date(s) 9-10-93
Filter Type Fiberglass
LDMS Entry ______ Initials ______
LDMS Validation 9-16-93 Initials JMC

Sample No. 22567.3	Sample No. ______	Sample No. ______
Run Number 4	Run Number ______	Run Number ______
Filter Number 2980	Filter Number ______	Filter Number ______
Date/Time 9-13-93 1200	Date/Time ______	Date/Time ______
Gross Weight 0.17851 g	Gross Weight ______ g	Gross Weight ______ g
Date/Time 9-14-93 0730	Date/Time ______	Date/Time ______
Gross Weight 0.17853 g	Gross Weight ______ g	Gross Weight ______ g
Avg. Gross Wt. 0.17852 g	Avg. Gross Wt. ______ g	Avg. Gross Wt. ______ g
Filter Tare Wt. 0.17660 g	Filter Tare Wt. ______ g	Filter Tare Wt. ______ g
Difference 0.00192 g	Difference ______ g	Difference ______ g
Particulate On Filter Weight 0.00192 g	Particulate On Filter Weight ______ g	Particulate On Filter Weight ______ g
Transfer "Particulate On Filter Weight" to Box Number 1.	Transfer "Particulate On Filter Weight" to Box Number 2.	Particulate On Filter Weight" to Box Number 3.
Sum particulate weights from each box labeled "1" and record in box labeled "T1."	Sum particulate weights from each box labeled "2" and record in box labeled "T2."	Sum particulate weights from each box labeled "3" and record in box labeled "T3."
AF 1 0.00192 g	AF 2 ______ g	AF 3 ______ g
Total T1 ______ g	Total T2 ______ g	Total T3 ______ g

AS 105 A

INORGANIC LABORATORY

EPA Method 5 Particulate Gravimetric Sheet

Reagent Blanks

Project: Commercial [illegible]
Sampling Location: [illegible] Stack
Sampling Date: 9-7-93
Test Number: 1
Project Number: 93[illegible] 51[illegible]

Analyst: BRL
Analysis Date(s):

Wet Catch			Probe Wash		
Type:	☐ Organic Condensibles (Extract.) ☐ Inorganic (Residual) ☐ Other ☐ Retain For Further Analyses EP		Type:	☒ Gravimetric ☐ Other ☐ Retain For Further Analyses 66	
Reagent	DI		Reagent	Acetone	
Volume	500	ml	Volume	100	ml
Date/Time	9-15-93 0730		Date/Time	9-15-93 073[illegible]	
Gross Weight	110.1683	g	Gross Weight	100.[illegible]	g
Date/Time	9-15-93 [illegible]		Date/Time	9-15-93 [illegible]	
Gross Weight	110.1678	g	Gross Weight	100.[illegible]	g
Avg. Gross Wt.	110.1680	g	Avg. Gross Wt.	[illegible]	g
Dish Tare Wt.	110.1[illegible]83	g	Dish Tare Wt.	[illegible]	g
Difference	-0.[illegible]	g	Difference	-0.[illegible]14	g
Blank Weight	-0.[illegible]	g	Blank Weight	-0.[illegible]	g

AGGREGATE ANALYSIS DATA SHEET

pace
INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Ms. Sue Turner

September 17, 1993
PACE Project Number: 930902518

Client Reference: C.A.Redrock 9/1/93

PACE Sample Number:			10 0225878	10 0225886	10 0225908
Date Collected:			09/01/93	09/01/93	09/01/93
Date Received:			09/02/93	09/02/93	09/02/93
Client Sample ID:			Baghouse StackAgMix T1R1	Baghouse StackAgMix T1R2	Baghouse StackAgMix T1R3
Parameter	Units	MDL			
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Moisture content	%	0.1	4.2	1.2	4.3

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Ms. Sue Turner
Page 6

September 17, 1993
PACE Project Number: 930902518

Client Reference: C.A.Redrock 9/1/93

PACE Sample Number:	10 0225924
Date Collected:	09/01/93
Date Received:	09/02/93
Client Sample ID:	Baghouse StackAgMix I1R4

Parameter	Units	MDL	I1R4
INORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Moisture content	%	0.1	4.9

The analyses of soil samples were performed 'as received' and do not reflect analyses on a dry weight basis unless indicated.

These data have been reviewed and are approved for release.

Mary Jo Connolly
Mary Jo Connolly
Project Manager

APPENDIX C

Calculation Equations and Report Nomenclature

Commercial Asphalt Company
Redrock Hot Mix Facility
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 24, 1993

APPENDIX C

METHOD 5 CALCULATION SUMMARY

TEST 1

Baghouse Stack

PARAMETER	RUN 2	RUN 3	RUN 4
Sample Duration (Minutes)	61.25	60	60
Barometric Pressure (inches Hg)	29.29	29.29	29.29
Static Pressure Of Duct (Inches H2O)	-0.16	-0.16	-0.16
Absolute Pressure Of Duct (Inches Hg)	29.28	29.28	29.28
Meter Coefficient	0.9946	0.9946	0.9946
Pitot Tube Coefficient	0.843	0.843	0.843
Nozzle Diameter (Inches)	0.15	0.15	0.15
Area Of Nozzle Opening (Square Feet)	0.000123	0.000123	0.000123
Average $\sqrt{\Delta P}$	0.9784	0.9794	0.9790
Average ΔH	0.38	0.39	0.37
Average Stack Temperature (°R)	713.08	713.17	713.25
Average Meter Temperature (°R)	539.25	545.63	544.83
Meter Volume (Cubic Feet)	21.21	21.08	20.28
Dry Standard Sample Volume (Cubic Feet)	20.24	19.88	19.15
Collected Condensate Volume (mls)	149.0	164.0	215.0
Volume Of Water Vapor (Standard Cubic Feet)	7.01	7.72	10.12
Moisture Content Of Flue Gas (% v/v)	25.73	27.97	34.57
Weight Of Particulate (mg)	1.6	1.6	1.6
Source Gas Velocity (Feet Per Second)	67.9	68.3	69.1
Isokinetic Variation (%)	123.0	126.4	132.4

Commercial Asphalt Company
Redrock Hot Mix Facility
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 24, 1993

APPENDIX C

METHOD 201 CALCULATION SUMMARY

TEST 1, RUN 2

Baghouse Stack

Sequential Point No.	Time Int. Minutes	Flue Gas Temp. (°R)	Flue Gas Viscosity	Gas Sample Rate(cf/sec.)	PM-10 Cut Dia. (μm)	Isokinetic Variation
1	4.50	717.0	209.2	0.5811	10.0	139.5
2	4.50	718.0	209.5	0.5821	10.0	139.7
3	4.50	718.0	209.5	0.5821	10.0	137.7
4	6.00	715.0	208.6	0.5792	10.0	106.8
5	6.00	714.0	208.4	0.5782	10.0	104.5
6	6.00	716.0	208.9	0.5802	10.0	106.4
7	5.25	715.0	208.6	0.5792	10.0	121.1
8	5.00	711.0	207.6	0.5752	10.0	124.8
9	5.00	707.0	206.5	0.5712	10.0	125.8
10	5.00	712.0	207.8	0.5762	10.0	126.0
11	4.75	708.0	206.7	0.5722	10.0	129.5
12	4.75	706.0	206.2	0.5702	10.0	128.3
Average of Points	5.10	713.1	208.1	0.577	10.0	124.2
From End Run Data	61.25	713.1	208.1	0.577	10.0	123.0

Note: Point data use run averages for moisture content, molecular weight, pressures and O2

Commercial Asphalt Company
Redrock Hot Mix Facility
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 24, 1993

APPENDIX C

METHOD 201 CALCULATION SUMMARY

TEST 1, RUN 3

Baghouse Stack

Sequential Point No.	Time Int. Minutes	Flue Gas Temp. (°R)	Flue Gas Viscosity	Gas Sample Rate(cf/sec.)	PM-10 Cut Dia. (μm)	Isokinetic Variation
1	4.25	709.0	205.0	0.5692	10.0	149.8
2	4.25	708.0	204.7	0.5682	10.0	150.9
3	4.50	711.0	205.5	0.5712	10.0	141.3
4	5.25	718.0	207.4	0.5781	10.0	119.2
5	5.75	718.0	207.4	0.5781	10.0	110.7
6	6.25	717.0	207.2	0.5771	10.0	104.2
7	5.00	709.0	205.0	0.5692	10.0	130.5
8	5.00	711.0	205.5	0.5712	10.0	120.3
9	5.00	712.0	205.8	0.5721	10.0	124.6
10	5.00	714.0	206.3	0.5741	10.0	126.2
11	5.00	716.0	206.9	0.5761	10.0	123.6
12	4.75	715.0	206.6	0.5751	10.0	132.4
Average of Points	5.00	713.2	206.1	0.573	10.0	127.8
From End Run Data	60.00	713.2	206.1	0.573	10.0	126.4

Note: Point data use run averages for moisture content, molecular weight, pressures and O2

Commercial Asphalt Company
Redrock Hot Mix Facility
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 24, 1993

APPENDIX C

METHOD 201 CALCULATION SUMMARY

TEST 1, RUN 4

Baghouse Stack

Sequential Point No.	Time Int. Minutes	Flue Gas Temp. (°R)	Flue Gas Viscosity	Gas Sample Rate(cf/sec.)	PM-10 Cut Dia. (μm)	Isokinetic Variation
1	4.50	723.0	203.1	0.5715	10.0	147.7
2	4.50	718.0	201.7	0.5665	10.0	147.5
3	4.50	720.0	202.2	0.5685	10.0	152.6
4	5.50	715.0	200.9	0.5635	10.0	119.2
5	6.00	706.0	198.4	0.5545	10.0	108.1
6	6.00	714.0	200.6	0.5625	10.0	110.2
7	5.00	708.0	199.0	0.5565	10.0	131.8
8	4.75	714.0	200.6	0.5625	10.0	138.4
9	5.00	719.0	202.0	0.5675	10.0	134.9
10	4.75	708.0	199.0	0.5565	10.0	135.3
11	4.75	708.0	199.0	0.5565	10.0	140.3
12	4.75	706.0	198.4	0.5545	10.0	140.8
Average of Points	5.00	713.3	200.4	0.562	10.0	133.9
From End Run Data	60.00	713.3	200.4	0.562	10.0	132.4

Note: Point data use run averages for moisture content, molecular weight, pressures and O2

Calculation Equations

EPA Method 2 Calculations

Flue Gas Linear Velocity

$$V_s = 85.49 \times C_p \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{\overline{T_s}}{P_s \times M_s}}$$

Volumetric Flow Rates - ACFM, SCFM & DSCFM

$$Q = 60 \times v_s \times A$$

$$Q_s = Q \times \left(\frac{528}{T_s}\right) \times \left(\frac{P_s}{29.92}\right) = Q \times 17.647 \times \left(\frac{P_s}{T_s}\right)$$

$$Q_{sd} = Q_s \times (1 - B_{ws})$$

Mass Flow Rate of Wet Flue Gas

$$m_g = \frac{4.995 \times Q_{sd} \times G_d}{1 - B_{ws}}$$

Actual Gas Density

$$\rho = \frac{0.04585 \times P_s \times M_s}{\overline{T_s}}$$

Where:

A	=	Cross-sectional area of duct at sample point (sq. ft.).
B_{ws}	=	Water vapor in gas stream (proportion by volume).
C_p	=	Pitot tube calibration coefficient.
G_d	=	Flue gas specific gravity relative to air, dimensionless.
m_g	=	Mass flow rate of wet flue gas (LB/HR).
M_s	=	Molecular weight of wet flue gas (LB/LB-mole).
P_s	=	Absolute gas pressure of duct (Inches Hg).
ΔP	=	Velocity pressure measured by pitot tube (Inches WC).
Q	=	Actual flue gas volumetric flow rate (ACFM).
Q_s	=	Volumetric gas flow at standard conditions (SCFM).
Q_{sd}	=	Dry standard volumetric gas flow rate (DSCFM).
T_s	=	Flue gas temperature (°R).
V_s	=	Flue gas linear velocity (feet per second).
ρ	=	Actual flue gas density (LB/CF).

Calculation Equations

EPA Method 3 Calculations

Dry Molecular Weight of Flue Gas

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$$

Wet Molecular Weight of Flue Gas

$$M_s = M_d \times (1 - B_{ws}) + (18 \times B_{ws})$$

Percent Excess Air

$$\%EA = 100 \times \left(\frac{\%O_2 - (0.05 \times \%CO)}{(0.264 \times \%N_2) - \%O_2 + (0.5 \times \%CO)} \right)$$

Fuel F-factor (for comparison)

$$F_o = \frac{20.9 - \%O_2}{\%CO_2}$$

Where:

B_{ws}	=	Water vapor in gas stream (proportion by volume).
$\%CO$	=	Carbon monoxide in gas stream (percent).
$\%CO_2$	=	Carbon dioxide in gas stream (percent).
$\%EA$	=	Excess air for combustion (percent).
F_o	=	Fuel F-factor for results comparison.
M_d	=	Molecular weight of dry flue gas (LB/LB-mole).
M_s	=	Molecular weight of wet flue gas (LB/LB-mole).
$\%N_2$	=	Nitrogen in gas stream (percent).
$\%O_2$	=	Oxygen in gas stream (percent).

Calculation Equations

EPA Method 4 Calculations

Sample Volume, Standard Conditions

$$V_{std} = 17.647 \times V_m \times Y \times \left(\frac{P_b + \frac{\overline{\Delta H}}{13.6}}{\overline{T_m}} \right)$$

Volume of Water Vapor Sampled

$$V_w = 0.047070 \times V_{lc}$$

Proportion of Water Vapor in Sampled Gas

$$B_{ws} = \frac{V_w}{V_w + V_{std}}$$

Where:

B_{ws}	=	Water vapor in gas stream (proportion by volume).
ΔH	=	Orifice meter differential pressure (Inches WC).
P_b	=	Barometric pressure (Inches Hg).
T_m	=	Sampling train meter temperature (°R).
V_{lc}	=	Total volume of liquid collected in sampling train (mls).
V_m	=	Volume of gas sample measured by gas meter (CF).
V_{std}	=	Gas volume corrected to standard conditions (DSCF).
V_w	=	Volume of water vapor in gas sample (SCF).
Y	=	Dry gas meter calibration coefficient.

Calculation Equations

EPA Method 5 Calculations

Sample Volume, Standard Conditions

$$V_{std} = 17.647 \times V_m \times Y \times \left(\frac{P_b + \frac{\overline{\Delta H}}{13.6}}{\overline{T_m}} \right)$$

Isokinetic Variation

$$I = 0.09450 \times \left(\frac{\overline{T_s} \times V_m}{P_s \times V_s \times A_n \times \theta \times (1 - B_{ws})} \right)$$

Particulate Concentration

$$C_s = 15.432 \times \left(\frac{m_n}{V_{std}} \right)$$

Particulate Mass Rate

$$m_p = 0.008571 \times C_s \times Q_{sd}$$

Where:

A_n	=	Cross-sectional area of nozzle opening (square feet).
B_{ws}	=	Water vapor in gas stream (proportion by volume).
C_s	=	Particulate concentration of gas stream (GR/DSCF).
ΔH	=	Orifice meter differential pressure (Inches WC).
I	=	Isokinetic variation of sampling rate (percent).
m_n	=	Total particulate collected in sampling train (grams).
m_p	=	Particulate mass flow rate (LB/HR).
P_b	=	Barometric pressure (Inches Hg).
P_s	=	Absolute gas pressure of duct (Inches Hg).
Q_{sd}	=	Dry standard volumetric gas flow rate (DSCFM).
T_m	=	Sampling train meter temperature (°R).
T_s	=	Flue gas temperature (°R).
V_m	=	Volume of gas sample measured by gas meter (CF).
V_{std}	=	Gas volume corrected to standard conditions (DSCF).
V_s	=	Flue gas linear velocity (feet per second).
Y	=	Dry gas meter calibration coefficient.
θ	=	Total sampling time of run (minutes).

Calculation Equations

Nomenclature

A	= Cross-sectional area of duct
A_n	= Cross-sectional area of nozzle
B_{ws}	= Water vapor in gas stream, proportion by volume
C_a	= Particulate concentration, actual, wet basis - GR/ACF
C_p	= Pitot tube calibration coefficient
C_s	= Particulate concentration at dry standard conditions - GR/DSCF
%EA	= Excess air, percent by volume
F_o	= Fuel factor
G_d	= Specific gravity relative to air, dimensionless
I	= Isokinetic variation, percent by volume
M_d	= Molecular weight of flue gas, dry, lb/lb-mole
m_g	= Mass flow of wet flue gas, LB/HR
m_n	= Total particulate collected, grams
m_p	= Particulate mass flow, LB/HR
M_s	= Molecular weight of flue gas, wet, lb/lb-mole
P_b	= Barometric pressure, uncompensated, inches of mercury
P_g	= Static pressure of duct, inches of water
P_s	= Absolute gas pressure of duct, inches of mercury
Q	= Actual flue gas volumetric flow rate, ACFM
Q_{sd}	= Dry flue gas volumetric flow rate corrected to standard conditions, DSCFM
$\overline{T_m}$	= Average dry gas meter temperature, °R
$\overline{T_s}$	= Average stack gas temperature, °R
$\emptyset$	= Total sampling time, minutes
V_{lc}	= Total volume of liquid collected in impingers and desiccant, ml
V_m	= Volume of gas sample measured by gas meter, cubic feet
V_{std}	= Volume of gas sample corrected to standard conditions, dry standard cubic feet
V_w	= Volume of water vapor in gas sample, corrected to standard conditions
V_s	= Linear velocity of flue gas, feet per second
Y	= Dry gas meter calibration factor
ΔH	= Orifice meter differential pressure, inches of water
ΔP	= Velocity pressure of flue gas, inches of water
ß	= Actual gas density, pounds per cubic foot

$Ps = Pb + (Pg/13.6)$

=

=

$Md = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

=

=

$Mw = Md\,(1 - Bws) + 18\,(Bws)$

=

=

$\mu s = 152.418 + .2552(ts) + .000032355(ts^2) + .53147(\%O_2) - 74.143(Bws)$

=

= μs = ______

$$Qs = .002837(\mu s)\left[\frac{ts+460}{Mw(Ps)}\right]^{.2949} =$$

Qs= ______

$$\Delta H = \left[\frac{Qs(1-Bws)Ps}{ts+460}\right]^{2} \quad \frac{(tm+460)(Md)(1.083)(Cal\ \Delta H)}{Pb}$$

ΔH avg.= ______

ΔH + 50= ______

= ΔH - 50= ______

$$Vn = \frac{3.056\,(Qs)}{Dn^2}$$

Vn= ______

$$Vmin = Vn\left[.2457 + \left[.3072 - .2603\,\frac{(Qs^{.5})\mu s}{Vn^{1.5}}\right]^{.5}\right]$$

= Vmin = ______

$$Vmax = Vn\left[.4457 + \left[.5690 - .2603\,\frac{(Qs^{.5})\mu s}{Vn^{1.5}}\right]^{.5}\right]$$

= Vmax= ______

$$\Delta Pmin = .00013686 \times \frac{Ps\,(Mw)\,(Vmin^2)}{(ts+460)(Cp^2)}$$

ΔP min avg.= ______

ΔP min + 50= ______

= ΔP min - 50= ______

$$\Delta Pmax = .00013686 \times \frac{Ps\,(Mw)\,(Vmax^2)}{(Ts+460)(Cp^2)}$$

ΔP max avg.= ______

ΔP max + 50= ______

= ΔP max - 50= ______

$$\text{Dwell time} = \left[\frac{\Delta P}{\Delta Pavg}\right]^{.5} \times \frac{\text{Tot. Run Time}}{\text{\# of points}}$$

$$\text{Change Dwell time} = Tn = \frac{t1}{(\Delta P1)^{.5}} \times (\Delta Pn)^{.5}$$

$$D50 = .15625\left[\frac{ts+460}{Mw\ Ps}\right]^{.2091}\left[\frac{\mu s}{Qs}\right]^{.7091}$$

APPENDIX D

Test Procedures

OXYGEN AND CARBON DIOXIDE CONCENTRATION (ORSAT)

Integrated gas samples are collected in 40 liter Tedlar™ bags and ultimately transferred to an Orsat gas analyzer for oxygen and carbon dioxide analyses. A PACE sampling train which meets or exceeds the specifications of EPA Method 3, 40 CFR 60, Appendix A is used to collect gas samples. Normally, gas samples are collected at the exhaust of an EPA Method 4 or 5 sampling train since this gas stream is moisture conditioned. Method 4 and 5 sampling equipment is maintained and checked to assure no leaks occur between the flue and the integrated gas sampler.

Gas samples are collected by drawing a portion of the stream through a chemically resistant diaphragm pump and delivering it to the Tedlar™ bag at a constant, settable rate depending on expected sampling time. At the conclusion of sampling, the bag and associated hardware is sealed and labeled. When multiple tests are to be performed, gas samples are often transferred to glass gas collection tubes for storage. A portable oxygen analyzer is used for this to ensure sample integrity.

Samples are analyzed by chemical absorption using an Orsat gas analyzer. Following positive and negative leak checks of the gas analyzer, the system is purged with the gas to be analyzed. The burret is filled with approximately 100 mls of sample gas and the exact volume recorded. The sample line stopcock is closed and the stopcock for the first bubbler containing carbon dioxide absorbent is opened. Several passes are made, bubbling the sample gas through the reagent and the absorbent is returned to the initial mark. The new volume of the burret is recorded and an additional 1-2 passes are made to verify total absorption. Similar procedures are used to quantify oxygen with the same gas aliquot and oxygen absorbent.

PM-10 PARTICULATE LOADINGS AND EMISSION RATES

Particulate emission rates were determined in accordance with EPA Methods 1-5, 40 CFR 60, Appendix A. Using traverse points determined with EPA Method 1, a preliminary velocity profile was obtained with respect to the velocity traverse, gas temperature, gas pressure and estimated moisture content. From this data sampling nozzles of the appropriate diameter to ensure isokinetic sampling were selected.

The particulate sampling train consists of a temperature controlled [illegible] lined sampling probe equipped with a S-type pitot tube and Type K thermocouples to monitor stack temperature and probe liner temperature. The sampling probe is attached to a sample module which houses an all glass in-line filter and cyclone assembly in a temperature controlled oven. The back half of the sampling train consists of a series of three glass impingers followed by a tared desiccant-packed drying column. The sample train is connected by means of a control and sampling umbilical cord to the control module. The control module houses a temperature monitored dry test gas meter, a calibrated orifice, dual inclined manometers, temperature controllers, and necessary flow rate control devices.

Particulate samples are collected by isokinetically extracting a sample gas stream from the flue by means of the sampling probe and passing the stream through the cyclone which collects larger, heavier particles. The sample gas stream then passes through a 4 inch diameter Gelman Type A/E glass fiber filter to collect finer particulates. The filter is followed by an ice-cooled impinger train and a desiccant packed drying column which quantitatively collects all moisture from the sample gas stream. The gas then passes through a leakless rotary vane sampling pump and a dry test gas meter which integrates the sample volume throughout the course of the test. A calibrated orifice is connected to the gas meter outlet to facilitate sample flow rate adjustment.

Representative particulate samples are collected by sampling the centroid of equal area sections of the duct for equal time periods. The sampling rate is adjusted at each traverse point to ensure isokinetic sampling. Pre-programmed field computers are used to facilitate rapid determination of the correct sampling rate.

Integrated gas samples are collected concurrently with particulate samples to determine a representative gas composition of the flue gas. Gas samples are collected in Tedlar™ bags throughout the course of the particulate run and analyzed with an Orsat gas analyzer.

At the end of each particulate run, the sampling train is disassembled and the samples recovered. The sampling filter is transferred from the filter holder to its dedicated petri dish. The probe nozzle is acetone rinsed, brushed, rinsed again and the washings placed in a uniquely labelled polyethylene container. The probe is similarly cleaned; acetone rinsed, brushed several times, rinsed again and the washing transferred to the same polyethylene container. The filter holder and cyclone are wiped free of silicone grease, acetone rinsed, brushed, rinsed and these washings added to the probe wash container. The container is tightly capped and the liquid level marked for transport. The impinger catch volume is determined to the nearest milliliter using a graduated cylinder. If the impinger catch is to be analyzed it is transferred to a separate polyethylene container, capped, and the liquid level marked. The desiccant-packed drying column is weighed in the field to the nearest 0.5 g and the weight of absorbed moisture added to the condensate for moisture calculations.

Particulate samples are transported back to the laboratory, logged in, and prepared for analyses. Filters are desiccated for 24 hours and weighed to a constant weight and the results recorded to the nearest 0.1 mg. Probe wash samples are evaporated at ambient temperatures to dryness in tared evaporating dishes. They are then desiccated for 24 hours and weighed to a constant weight. Results are reported to the nearest 0.1 mg.

WET CATCH ANALYSIS - ORGANIC CONDENSIBLES (EPA METHOD 202)

Particulate concentrations reported in this document include gravimetric results of both the dry catch and the organic wet catch. Organic condensibles were collected in a series of three ice-cooled all-glass impingers in the back half of the Method 5 sampling train. The first two impingers were intially prepared with 100 mls of deionized water in each and the third impinger was dry. After sampling, the volume of condensate in the impingers was determined and the contents transferred to an air-tight polyethylene sample container.

The wet catch was analyzed for condensible organic particulate with the methylene chloride extraction. Two 75 ml portions of methylene chloride were used to extract condensed organics from the impinger catches (wet catch). The extractions were evaporated at room temperature and desiccated to a constant weight. Gravimetric results were then added to dry catch results to calculate particulate concentrations.

APPENDIX E

Quality Assurance Data

SAMPLING TRAIN CALIBRATION DATA

Commercial Asphalt, Co.
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 22, 1993

Air Sampling Department Calibration Report

Pitot Tube Calibration Data

Pitot Tube Number : 19

Date of Calibration : 6/29/93

Calibration Technician: K. Lattery

A Side Calibration

Calibration Trial No.	ΔP(standard) Inches WC	ΔP(S-type) Inches WC	Pitot Coefficient
1	0.500	0.695	0.840
2	0.810	1.115	0.844
3	1.100	1.510	0.845
4	1.320	1.830	0.841
		A Side Average	0.842

B Side Calibration

Calibration Trial No.	ΔP(standard) Inches WC	ΔP(S-type) Inches WC	Pitot Coefficient
1	0.510	0.705	0.842
2	0.815	1.120	0.845
3	1.115	1.530	0.845
4	1.310	1.815	0.841
		B Side Average	0.843
		Pitot Tube Coefficient	**0.843**

Commercial Asphalt, Co.
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 22, 1993

Air Sampling Section Calibration Report

Dry Test Meter and Orifice Calibration Data

Control Module Number :	C-6	Calibration Technician:	K.Lattery
Date of Calibration :	7/15/93	Barometric Pressure :	29.20

Orifice Diff. Press., ΔH Inches WC	Dry Test Meter Vol. Cubic Ft.	Wet Test Meter Vol. Cubic Ft.	Dry Test Meter Temperatures, °F Inlet	Dry Test Meter Temperatures, °F Outlet	Wet Test Meter Temp., °F	Elapsed Time Minutes	Gas Meter Coefficient ∂	Orifice Coefficient ΔH@
0.50	5.065	5.000	81.5	78.0	73.0	13.408	0.9984	2.054
1.00	5.115	5.000	91.0	80.0	73.0	9.591	0.9979	2.080
1.75	5.055	5.000	80.0	75.0	73.0	7.303	0.9931	2.142
2.50	10.190	10.000	88.0	76.0	73.0	12.324	0.9917	2.161
3.50	10.230	10.000	92.0	79.0	73.0	10.486	0.9917	2.176

Average Meter Coefficient 0.9946

Average Orifice Coefficient 2.123

Commercial Asphalt, Co.
Newport, Minnesota
PACE Project No. 930831.401

PACE Incorporated
September 22, 1993

Air Sampling Department Calibration Report

Sampling Nozzle Calibration Data

Nozzle Number : 0-2

Date of Calibration : 8/30/93

Calibration Technician: K. Lattery

Measurement Position		Diameter Inches
1		0.150
2		0.149
3		0.151
4		0.152
5		0.150
	Average	0.150

The sampling nozzle is rotated and measured at 36 degree Increments. Diameters are measured to the nearest 0.001". All measurements must be within a range of 0.004".

APPENDIX F

Process/Source Information

Asphalt Plant Operating Conditions During Stack Testing

Rev/YH/93

Test Date(s) 9/1/93

Plant Mfr. & Model BOEING 600

Type (circle one): **Drum Mix** Conventional

Other (list): ______

Pollution Control Equipment: **Baghouse** Venturi Scrubber wet scrubber cyclone multiclone
(circle one)

If wet scrubbing: ______ % scrubber water recycled

List model: AEROPULSE FS 1180 12.65

Normal pressure drop across control equipment: 2 - 4 inches water

Air flow through control equipment: ______ acfm at ______ F

Was control equipment operating normally during testing? YES

Date & procedures of last maintenance/cleaning of control equipment

ALL BAGS REPLACED WITHIN LAST MONTH

Fuel:

Itemize all fuels and materials added to the combustion process during the test period. List fuel type used during testing (if oil, specify grade) NAT. GAS. If other units of measure are used, specify and calculate appropriate heat input.

Test No.___	Fuel Input (Gal/hr)	BTU/GAL (as received)	Heat Input (BTU/HR)	%Moisture (as received in aggregate) Virgin	recycle	combined
Run 1						
Run 2						
Run 3						

Is the above fuel substantially the highest sulfur containing fuel normally burned? ______

Production specific fuel usage: (circle one) measured or calculated: ______ cubic foot/ ton hot mix

______ gal/ton hot mix

No. of Burners: 1 Burner(s) rating: 170 MMBTU/HR = 100% setting

Operation:

	time 15 min. intervals	burner setting %	aggregate tons per hour	recycle tons per hour	asphalt tons per hour	Drum Mix temp. F	dust collector pressure drop inches water	scrubber water flow rate gpm	Other (list) TOTAL MIX/HR[?]
5	9:42	41	310	126	18.83	274°	2.4		454.83
	9:57	37	309	127	18.46	277°	2.5		454.46
	10:12	39	309	122	18.2	275°	2.4		449.20
	10:27	33	312	137	18.7	277°	2.5		467.70
	10:42		310	136	18.80	273°	2.6		464.80
									458.20
2ND	11:58	40	311	134	18.7	276°	2.5		463.70
	12:13	39	309	135	18.50	272°	2.5		462.50
	12:28	38	304	137	18.90	277°	2.4		459.90
	12:43	36	306	138	18.6	275°	2.4		462.60
	12:58	37	301	135	18.70	278°	2.5		454.70
						275.6	2.46		460.68

Plant Operator's Certification: I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By: Tom Richardson, Phone: (____) ______

Position: ______

Note: All information required must be completed and submitted as part of the performance test. Failure to submit the required information will result in an incomplete performance test report.

Company: COMMERCIAL ASPHALT CO.

Operation:

Test Date(s): 9/1/93

	time 15 min. intervals	burner setting %	aggregate tons per hour	recycle tons per hour	asphalt tons per hour	Drum Mix temp. F	dust collector pressure drop inches water	scrubber water flow rate gpm	Other (list) TOTAL	MIL PACE
3RD	2:21	36	306	132	18.24	273°	2.4		456.24	26.9
	2:36	34	308	135	18.49	271°	2.6		461.49	
	2:51	37	303	137	18.56	276°	2.4		458.56	
	3:06	39	304	136	18.32	279°	2.5		458.32	
	3:21		305	138	18.55	282°	2.4		461.55	
						276.2	2.46		459.23	
4TH	4:19	51	385	163	22.98	278°	2.7		570.98	[illegible]
	4:34	50	371	174	22.8	274°	2.5		567.80	20.6
	4:49	50	369	171	23.3	276°	2.6		563.30	20.2
	5:04	49	379	178	23.4	279	2.5		580.40	[illegible]
	5:19	47	367	175	23.5	271°	2.5		565.50	[illegible]
						275.6	2.52		569.60	
						275.8	$\frac{7.48}{3}$	= 2.49"		

Plant Operator's Certification: I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By:______________________, Phone: (____)______________

Position: ______________________

Note: All information required must be completed and submitted as part of the performance test. Failure to submit the required information will result in an incomplete performance test report.

REQUIRED DATA
for
COMBUSTION SOURCES

Company Name COMMERCIAL ASPHALT

C. Fuel Input

1. Itemize all fuels and materials that are added to the combustion process during the test period. Attach ultimate analysis of the fuel.

FUEL DESCRIPTION Coal:State, City, Mine Oil: Specify Grade	INPUT (LBS/HR) (GAL/HR)	& MOISTURE As Rec'd	As Rec'd (BTU/LB) (BTU/GAL)	HEAT INPUT (BTU/HR)
No. 1 NAT. GAS - ~~100%~~				APROX 75 - ~~MM~~ 85 MM
No. 2				
No. 3				
			TOTAL	

2. Are the above fuels substantially the same as those normally burned YES. If not, explain ______

3. Are the above fuels normally burned in the proportions shown above YES. If not, explain ______

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months. NONE

D. Equipment & Operating Data

1. Furnace No. PLANT 5 DRUM.
2. Furnace Mfg. HAUCK.
3. Type of Firing STRAIGHT GAS.
4. Furnace operating under normal operating conditions No ___;
Yes ✓.

5. Specify normal soot blowing frequency:

   a) source operating time blowing soot: _______ minutes/shift

   b) number of shifts per day _________

6. Specify soot blowing time during the test: start _________ end _______________ Wkhen was the last time before the test that you blew soot: (date & time) _______________

7. Specify normal ash pulling frequency:

   a) source operating time pulling ashes: ______ minutes/shift

   b) number of shifts per day _________

8. Specify ash pulling time during the test: start _________ end _______________ When was the last time before the test that you pulled ashes: (date & time) _______________

9. Date and procedures of last maintenance/cleaning of the boiler (please attach)

E. Instrument Data

1. Include a copy of chart records during test for the combustion efficiency indices (CO, O_2, CO_2, combustibles, steam flow, air flow, etc.)

F. Air Pollution Control Equipment

1. Type/model control equipment AERO PULSE FS1180-12.65
2. Air pressure drop across the control equipment 2.5" WC.
3. Air flow through the control equipment 93-96 ACFM.
4. Was the control equipment operating normally? YES.
5. Date and procedures of last maintenance/cleaning of control equipment.

____

____.

Plant Operator's Certification

I certify that the information submitted herein is accurate and correct and that no information requested was withheld from MPCA, Division of Air Quality.

By Michael Mahoney, Position EQUIP. MGR.

REQUIRED DATA
for
PROCESS EMISSIONS

Company Name COMMERCIAL ASPHALT

C. Equipment & Operating Data

1. Process Equip. No./Ident. PLANT #5.

2. Process Equip. Description DRUM MIX ASPHALT PLANT.

3. Process equipment operating under normal operating conditions:

   No______. Yes ✓. Process rate during the test 460 – 570TPH.
   (raw materials or finished product)

D. Instrument Data on Process Equipment

1. Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, lbs. per hour, pressure, air flow, etc.

E. Air Pollution Control Equipment

1. Type/model control equipment BAG HOUSE.

2. Air pressure drop across the control equipment 2.5" W.C

3. Air flow through the control equipment 93 - 96 ACFM.

4. Was the control equipment operating normally? YES.

5. Data of last major maintenance/cleaning of control equipment NEW BAGS IN AUGUST

F. Plant Manager's Certification

I certify that the information submitted herein is accurate and correct and that no information requessted was withheld from MPCA, Division of Air Quality.

By M. MAHONEY, Position EQUIP. MGR.

mlp47:21
Revised May 1987

AP42 Section: 11.1

Reference Number: 57

Title: Results Of A Source Emission Compliance Test On A Hot-Mix Asphalt Plant Process Scrubber Operated By L. C. Kruse & Sons, Inc., Windom, Minnesota,

MMT Environmental Services, Inc., St. Paul, MN,

June 18, 1993.