AP42 Section: 11.1

Reference Number: 231

Title: Source Sampling For Particulate Emissions, I. A. Construction Corp.,San Diego, CA,

San Diego Air Pollution Control District, San Diego, CA,

October 6, 1989.

AP-42 Section 11.1
Reference
Report Sect. 4
Reference 231 ~~232~~
Same facility as Ref # 233-235

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
9150 CHESAPEAKE DRIVE
SAN DIEGO, CA. 92123

SUMMARY:
SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE: INDUSTRIAL ASPHALT
8150 FRIARS RD.
SAN DIEGO, CA 92108

TEST #: 89279 P/O # : 30431 TEST DATE: 06 OCTOBER 1989

EQUIPMENT: Asphalt batch plant, Hot-mix (350-ton/hr), Stansteel model RM80 Plant, S/N 903, 5 ton batcher, Genco model FP103 oil/gas burner (103MM BTU/hr), 8'D*36' rotary dryer Micropul model 760 J-10-TRH C, dust collector; Symons Sand & Rock Screening System, aggregate & sand storage, transfer & weigh system, with water spray dust control; Liquidasphalt Storage, transfer & weigh system.

UNIT TESTED: Baghouse

SITE PERSONNEL:	Jeff Ordones	
APCD PERSONNEL:	George Mazis and John Jackson	
REPORT BY:	J.Jackson	DATE: 06 DECEMBER 89
APPROVED BY:	C.W. Ridenour	DATE: 12/7/89

C.W. RIDENOUR
SENIOR AIR POLLUTION CHEMIST

PARAMETERS:	MEASURED:
STACK GAS FLOW RATE (DSCFM):	33,368
STACK GAS TEMPERATURE °F (AVG):	198
PRODUCTION RATE (AVG):	286 Ton/hr

RESULTS:

TEST	PERMIT LIMIT	MEASURED PARTICULATE	PERFORMANCE
RULE 54 DUST AND FUME	40.00 lbs/hr	41.4 lbs/hr	Above Emission Limits
RULE 21 PERMIT CONDITIONS	0.04 gr/dscf	0.147 gr/dscf	Above Emission Limits

TEST REFERENCE:
San Diego Air Pollution Control District Quality Assurance Manual Method 5 for Particulate Emissions from Stationary Sources.

TEST DESCRIPTION

Introduction:
This report presents the results of particulate loading and gas volume tests at Industrial Asphalt, Mission Valley The test was performed on a baghouse stack serving the hot mix plant.

System Description:
This asphalt plant combines crushed rock and sand with hot asphalt oil in batch loads of varying sizes. The rock and sand are dried in a rotary drier which is heated by natural gas. The exhaust from this drier is pulled through a baghouse, the emissions to the atmosphere from this baghouse are the subject of this report.

Procedures:
The procedures and equipment utilized in performing these tests are based on EPA New Source Performance Standards Method 5. The sampling train was modified to exclude the front-end filter and include a back-end filter, per the San Diego Air Pollution Control District Method 5 testing guidelines. The calculations were designed to include the impinger catch so that the test results can be compared to Rule 54 of SDAPCD.

Velocity Traverse:
Prior information regarding the stack velocity profile eliminated the need for a separate exploratory traverse. Temperature and pitot tube data collected during actual sampling were used to calculate stack volume.

Particulate Sampling:
This sample consisted of 24 traverse points, 12 pts. from each of 2 sample ports as shown in Figure 1&2. The sample was collected 67 inches below the top of the stack. Field data associated with sample collection has been transferred to computer printout and is shown in the report. Calculations were done by computer and are also shown within the report.

Gas Analysis:
An integrated bag sample was collected on site and measured. The oxygen and carbon dioxide content of the stack gas was measured using a Teledyne model #320P-4 serial # 66676, and an Anarad gas analyzer model # AR-400, serial# 305, respectively, as per Method 3 in SDAPCD test guidelines.

SITE Industrial Asphalt, Mission Valley OPERATOR J.Jackson

TEST DATE: 06 OCTOBER 1989 TEST #: 89279

DATA SUMMARY: *

TRAVERSE POINT NUMBER	GAS METER READING (Vm), ft3	PRESS. DIFF. ACROSS PITOT TUBES	PRESS. DIFF. ACROSS ORIF. ACTUAL	DRY GAS METER TEMPERATURE		STACK TEMP	IMP. TEMP	STACK FLOW (velocity)
				INLET	OUTLET			
	405.028							
1		3.90	3.90	92	78	191	54	128
2		4.00	4.00	100	78	191	54	130
3		4.00	4.00	103	78	193	54	130
4		4.20	4.20	106	79	196	56	134
5		4.10	4.10	108	79	196	57	132
6		3.80	3.80	110	80	197	61	127
7		2.60	2.60	111	80	194	57	105
8		2.60	2.60	113	80	191	56	105
9		2.40	2.40	115	80	195	59	101
10		2.50	2.50	117	81	196	56	103
11		2.20	2.20	117	81	197	53	97
12		2.15	2.15	118	81	197	54	96
13		3.15	3.15	99	84	201	47	116
14		3.15	3.15	115	83	201	47	116
15		3.10	3.10	118	83	201	47	115
16		3.10	3.10	118	83	202	48	115
17		3.00	3.00	118	83	202	49	114
18		2.92	2.92	118	83	201	46	112
19		3.35	3.35	119	83	201	48	120
20		3.50	3.50	119	84	201	57	123
21		3.40	3.40	119	84	201	50	121
22		3.05	3.05	119	85	200	43	114
23		2.80	2.80	120	85	200	57	110
24	462.020	2.33	2.33	119	85	199	52	100

* Pressures are in inches of water, temperatures are in degrees Fahrenheit, velocities are in ft/sec. All measurements are actual -uncorrected- values.

Average:	Vm	ΔP	ΔH	t1	t2	ts	ti	vs
	56.992	3.14	3.14	113	82	198	53	115

DATA SUMMARY:

PRESSURES

P bar 30.0 in Hg

P static -3.00 in H2O

Ps 29.8 in Hg

AVERAGE TEMPERATURES

ts = 198 F

tm = 1/2(ave.t1+ave.t2) = 97 F

ti = 53 F

VOLUMES

Vm, meter 56.992 cu ft

Vlc, impingers 314.2 ml

VAPOR PRESSURES

Vpw @ stack = 22.52 inHg

Vpw @ imp = 0.41 inHg

METER BOX PARAMETERS

ΔH@ = 1.93 inH2O

ΔP = 3.14 inH2O

ΔH = 3.14 inH2O

METER BOX I.D.# C138

NOZZLE AND PROBE

Dn = 0.194 in

An = Dn^2*π/4 = .0295 sq in

Cp = 0.840

Y = .9822

STACK MEASUREMENTS

%CO2 3.40

%CO 0.00

%O2 14.50

%N2 82.10

ø = sampling time 60 minutes

mn=particulate collect'd 0.5010 grams

STACK PARAMETERS

Stack Diameter = 3.17 ft

Ao=Area stack = 7.89 sq ft

CALCULATIONS

			EQUATION NUMBER
Vm std = Vm*Y*Tstd*Pm/(Pstd*Tm)	=	52.72 ft^3	1
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	=	30.23 in Hg	2
Tm=(avg t1+avg t2)/2+ 460	=	557.3 °R	3
Ts = absolute stack temperature = 460 + ts	=	657.7 °R	4
Ps= Pbar + (P static/13.6)	=	29.78 in Hg	5
Vw std =Vlc*∂*R*Tstd/(Pstd*Md)	=	14.97 ft^3	6
Bws = moisture =Vw std/(Vw std+Vm std)	=	0.2228	7
mn= grams of particulate (from laboratory sheet)	=	0.5010 grams	8
Cs = grain loading (dry) =15.43*mn/Vm std	=	0.1466 grains/dscf	9

GAS ANALYSIS

component	gas comp.	Bws	Mw g/g*mole	Mw wet
H2O	22.28%	0.2228	18	4.01
		1 - Bws		
Oxygen	14.5%	0.7772	32	3.61
Carbon monoxide	0.0%	0.7772	28	0.00
Carbon dioxide	3.4%	0.7772	44	1.16
N2 + inerts	82.1%	0.7772	28	17.99

Md = average dry molecular weight	(g/g*mol)=	26.77
vs= 85.49*Cp*((Ts*ΔP)/(Ps*Ms))^.5	(ft/s)=	115.24
Qs = stack flow rate = vs*Ao*60	(acfm)=	54,554
Qstd =17.38*Qs*(1-Bws)*Ps/Ts =flow rate at STP	(dscfm)=	33,368
I = 144*100*Ts*(.002669*Vlc+(Vm/Tm)*Pm)/(60*ø*vs*Ps*An) =isokinetic rate	(%) =	101.97
E = particulate emission rate = (0.00847)*(Qstd)*Cs	(lbs/hr) =	41.44

SUMMARY OF CALCULATIONS

I = % isokinetics = 102.0 %

Cs = grain loading (dry) = 0.147 grains/dscf

E = particulate emission rate = 41.44 lbs/hr

% CO2 = 3.40 %

C12 = grain loading at 12% CO2
= (12)*(Cs)/%CO2 = 0.517 grains/dscf

$$\% \text{ Excess Air} = \frac{(\%O2 - \%CO) * 100}{(.264(\%N2) - (\%O2) - 0.5(\%CO))} = 202.1 \%$$

NOMENCLATURE:

Pstd = pressure at standard condition = (29.92 in. Hg)
Tstd = temperature at standard conditions = (528°R)
Pbar = barometric pressure = (in Hg)
Pstatic = stack static pressure = (in Hg)
Ps = Absolute stack pressure = Pbar +(Pstatic/13.6) = (in Hg)
t1 = dry gas meter inlet temperature = (°F)
t2 = dry gas meter outlet temperature = (°F)
ts = stack temperature = (°F)
Ts = stack temperature = (°R)
Tm = dry gas meter temperature =(t1+t2)/2 +460 = (°R)
ti = Impinger out temperature = (°F)
vs = stack gas velocity = 85.49*Cp*(Ts*ΔP/(Ps*Ms))^.5 = (ft/s)
Ms = stack gas molecular weight = Md*(1-Bws)+Bws*18 = (g/g*mole)
Vm = sample gas volume, uncorrected = (cu ft)
Vlc = collected water,impingers = (ml)
Vpw = Vapor pressure of water = (in Hg)
ΔH @ = orifice pressure differential that equates to 0.75 cfm of air @ 68ºF and 29.92 in Hg
= (in Hg*cu ft/°R)

ΔP = (summation (press.diff. across pitot tubes^.5)/number entries)^2 = (in H2O)
ΔH = average differential pressure across the orifice = (in H2O)
Dn = nozzle diameter = (in)
An = nozzle area = π*Dn^2/4 = (in^2)
Cp = pitot tube coefficient = (dimensionless)
Y = meter box coefficient = (dimensionless)
CO2 = carbon dioxide = (%)
O2 = oxygen = (%)
CO = carbon monoxide = (%)
N2 = nitrogen = (%)
Ao = stack area = (ft^2)
ø = sampling time = (minutes)
corrVwm= water volume correction at meter w/o silica gel
Corr Vwm =(Vm*Ms*Pm/(R*Tm))*(.04747) = (ft^3)
Vm std = corrected volume of meter = Vm*Y*T std*Pm/(Pstd*Tm) = (ft^3)
Pm = absolute meter pressure = Pbar+(ΔH/13.6) = (in Hg)
Vw std = water volume at STP = Vlc*∂*R*Tstd/(Pstd*Md) = (ft^3)
∂ = density of water at STP = 0.002201 = (lb/ml)
Mw = molecular weight = (grams/mole)
R = ideal gas constant = 21.85 in. Hg*ft^3/°R*lb*mole
Bws = fractional stack gas moisture content = Vw std/(Vwstd+ Vm std) = (%/100)
mn = particulate found in sample train = (grams)
Cs = grain loading = 15.430*mn/Vm std = (grains/dscf)

NOMENCLATURE: cont.

Md = dry stack gas molecular weight = 0.32*%O2+0.44*%CO2+0.28(100-%O2-%CO2)
= (g/g*mole)

vs = stack vel. =85.49*(((Md*Pbar/(Ts*ΔP))^.5)*Cp*(ΔP^.5)*(Ts/(Ps*Ms))^.5
= (ft/s)

I = isokinetics = 144*100*Ts*(.002669*Vlc+Vm/Tm)*Pm/(60*Ø*vs*Ps*An) = (%)

Qs = flow rate = v std*Ao*60 = (acfm)

Qstd = flow rate at standard conditions = 17.38*Qs*(1-Bws)*Ps/Ts = (dscfm)

Ao = stack area = stack diameter^2*π/4 if round; length *width if rectanglar = (ft^2)

E = particulate emissions rate = 0.00847*Cs*Qstd = (lbs/hr)

* = multiplication

/ = division

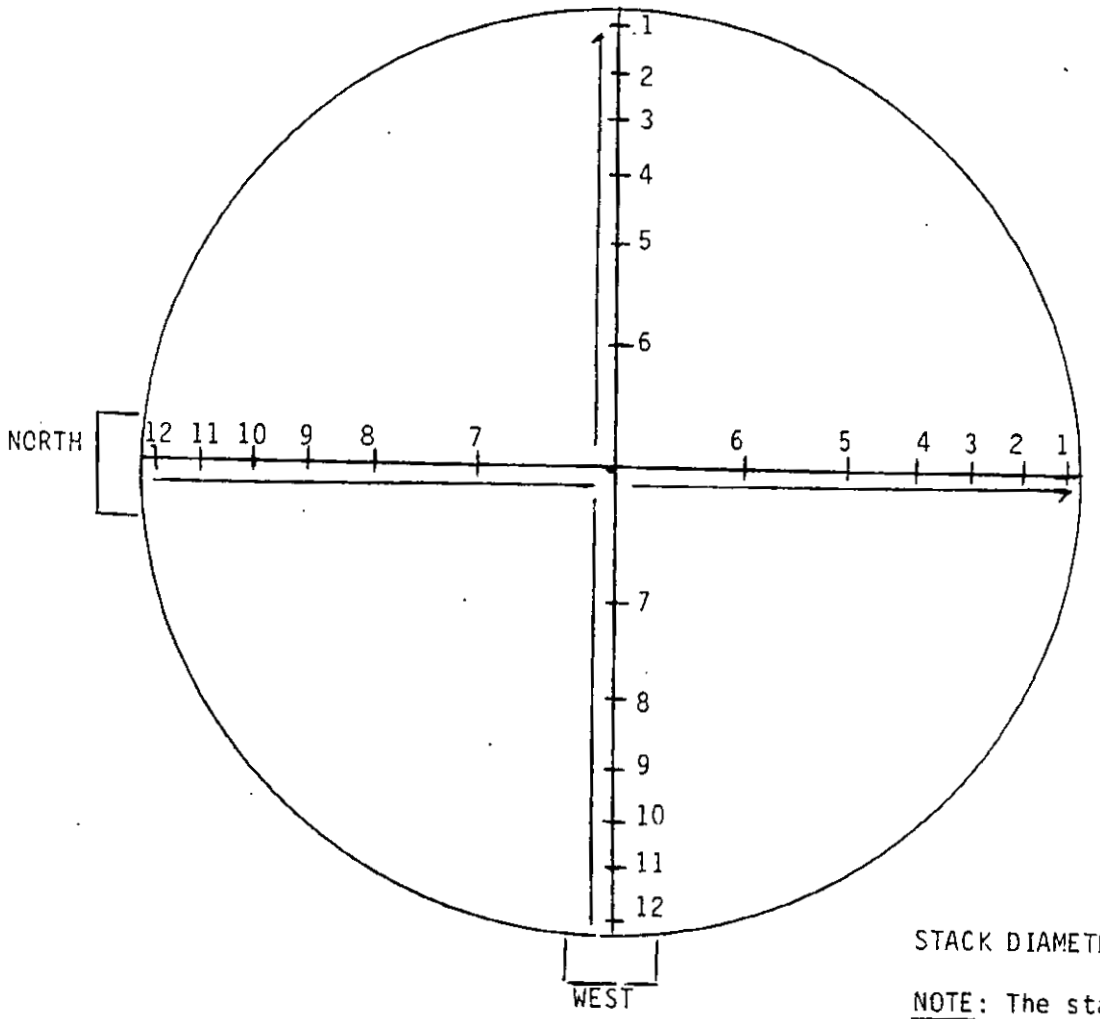
^ = exponentiation

- for all constants not defined consult Code of Federal Regulations 40, pt.60,App A, Meth. 5.

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

INDUSTRIAL ASPHALT, MISSION VALLEY

TRAVERSE POINTS



STACK DIAMETER = 38"

NOTE: The stack is oblong by 2". Therefore, on E-W traverse points 1 & 2 and 11 & 12 were combined.

POINT #	DISTANCE INTO STACK
1	0.8 in.
2	2.5
3	4.5
4	6.7
5	9.5
6	13.5
7	24.5
8	28.5
9	31.3
10	33.5
11	35.5
12	37.2

FIGURE 1.

INDUSTRIAL ASPHALT
MISSION VALLEY

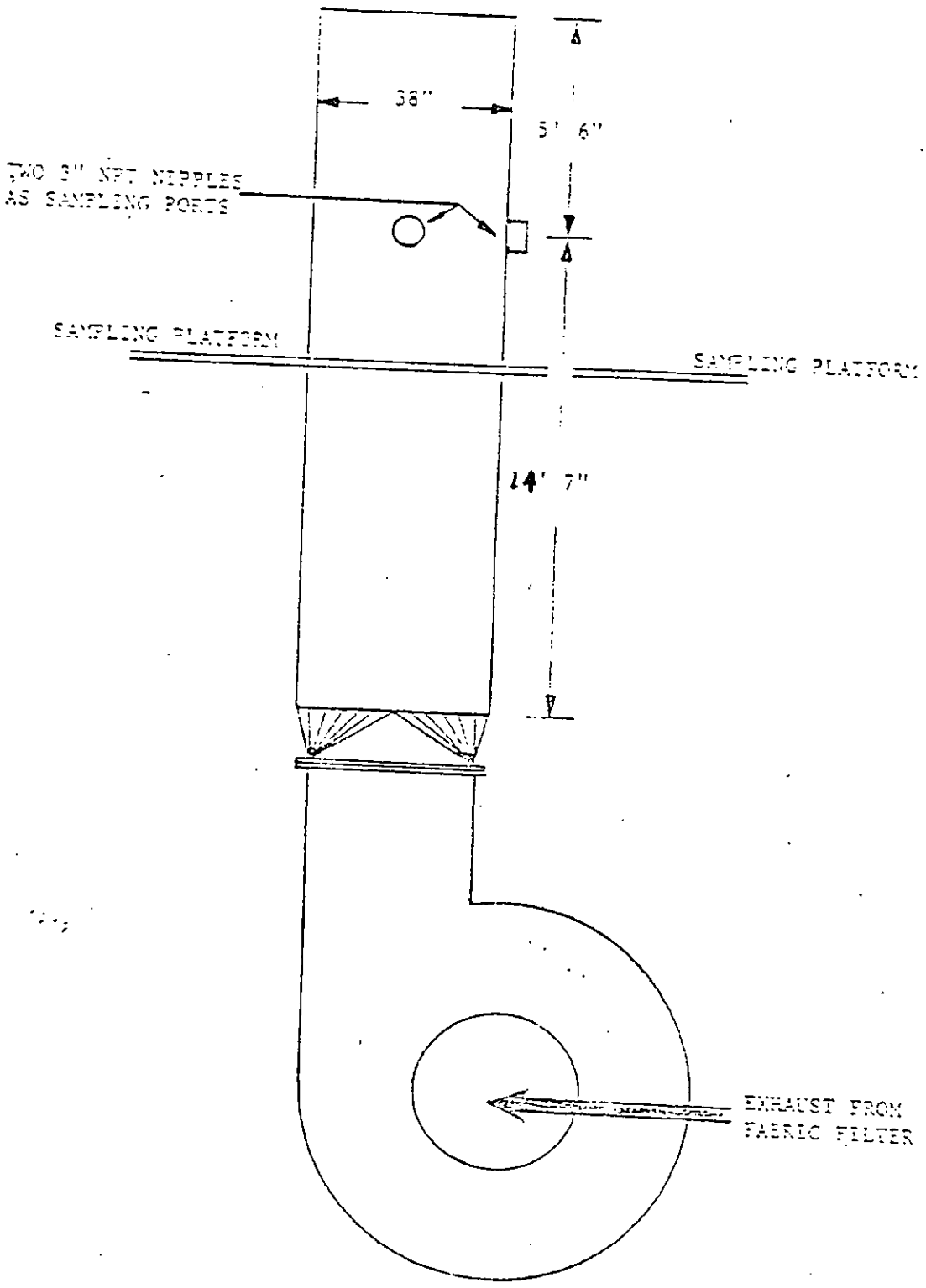


FIG:2 SITE DESCRIPTION

TEST BACKUP DATA →

APCD ENGINEERING OBSERVATION REPORT

APCD TEST NO. 89279 TEST DATE: OCTOBER 6, 1989

INDUSTRIAL ASPHALT, INC.
8150 FRIARS ROAD
SAN DIEGO, CA 92108

P/O NO.: 30431

I. ASPHALT COMPOSITION FOR A 4 TON BATCH

	SHEET MIX	3/8" FINE	3/8" BERM	3/4" FINE
Bin #1 Sand & Dust	7360 lbs	5596 lbs	4852 lbs	3179 lbs
Bin #2 3/8" Rock	---	1868 lbs	2612 lbs	1589 lbs
Bin #3 1/2" Rock	---	---	---	1589 lbs
Bin # 4 3/4" Rock	---	---	---	1211 lbs
Asphalt Oil	640 lbs	536 lbs	536 lbs	432 lbs
	8000 lbs (AR 8000)	8000 lbs (AR 8000)	8000 lbs (AR 8000)	8000 lbs (AR 8000)

II. ASPHALT PRODUCTION/OPERATIONAL DATA DURING SAMPLING TESTS

Time	Test Pt.	Material Temp °F	Baghouse ΔP "H_2O	Fan ΔP "H_2O	Damper Pos %	Burner Pos. %	Remarks
0722	E-1						Start Test Start Prod. Count
0729		316	7.0	.30	74	58	
0745		298	5.5	.22	54	60	Silo Truck Loading
0753	E-12						Traverse Complete
0758	N-1						Start Traverse
0802		303	6.0	.25	55	58	Pulse Press 80 psig
0812	N-6						No V.E. at Dryer Rotary Seals
0828	N-12						End Test
0830		306	6.1	.25	63	56	End Prod. Count

Production Time: 0722 - 0830 = 68 minutes (1.13 Hours)

Production:	Sheet Mix	24.97 Tons	
	3/8" Fine	33.00 Tons	
	3/8" Berm	7.99 Tons	
	3/4" Fine	257.01 Tons	(Silo 180.72 Tons)
		322.97 Tons	

Average Production Rate: 322.97 Tons/1.13 Hours = 285.8 Tons/Hr

Comments

1. This test was conducted by the San Diego Air Pollution Control District (APCD) Source Test Team.

2. The baghouse exhaust stack was evaluated for APCD Rule 54 particulate emissions (40 lbs/hr maximum) and APCD Rule 50 (visible emissions not to exceed Ringelmann No.1 (20% opacity) for excess of three minutes in any 60 minute consecutive period).

3. The sampling time was 2.5 minutes per point, and 12 points per traverse for each port for a total of 24 test points. (Circular exhaust stack).

4. The maximum "blue smoke" visible emissions observed at the plant truck drop area was 40% opacity. No visible emissions were observed at the truck loading tunnel entrance or exit. The "blue smoke" visible emissions at the silo truck drop was 0% opacity. The "blue smoke" visible emissions at the silo Universal Air Precipitator exhaust stack control system varied from 0 to 20% opacity. The Universal Air Precipitator is an electric static precipitator (ESP) which had the following control settings:

Section	Milliamps	Setting
Top	3.5	90
Middle	3.5	90
Bottom	3.5	90

5. There were no visible emissions observed at the baghouse exhaust stack. A steam plume that was almost detached existed at the exhaust stack. There were no visible emissions observed at the rotary dryer seals. The asphalt plant was in compliance with APCD Rule 50.

6. The rotary dryer was fired with natural gas.

Andrew Segal

ANDREW SEGAL
Associate Air Pollution Control Engineer

AS:ap 110189

SDC APCD METHOD 5 LAB SHEET

SITE = Industrial Asphalt, Friars Rd. P.O. #030431

TEST # = #89279

VOLUMES

(1) IMPINGER VOLUMES

	final		initial		Δ
#1	774.4 ml	-	537.7 ml	=	236.7
#2	609.5 ml	-	538.2 ml	=	71.3
#3	463.5 ml	-	458.4 ml	=	5.1
#4	442.4 ml	-	441.3 ml	=	1.1

TOTAL VOLUME LIQUID COLLECTED = 314.2

comments: Front half and back half rinses were combined in one beaker.
Acetone used: Spectrum, Lot #DJ 023.
Heavy, med. brown loading in probe and first impinger.

(2) BEAKER RINSES

ACETONE		**WATER**	
BKR ID =	#79	BKR ID =	#82
FRONT HALF =	ml	FRONT HALF =	ml
BACK HALF =	300 ml	BACK HALF =	110.8 ml
BEAKER RINSES =	60 ml	BEAKER RINSES =	50 ml
		IMPINGERS =	200 ml
total acetone =	360.0 ml	total water =	360.8 ml

* All data and calculations may be found on file at the San Diego County Air Pollution Control District.

SDC APCD METHOD 5 LAB SHEET

TEST # = #89279

STANDARDS

volume Ac = 300 ml volume water = 1000 ml

	ACETONE	WATER
BKR ID =	#80	#84
f:	49.4858 g	50.5691 g
i:	49.4855 g	50.5691 g
Δ:	0.0003 g	0 g

Limits:

limit for acetone is 7.9 µg/ml (7.9 * 10^-6 g/ml)
limit for water is 4 µg/ml (4 * 10^-6 g/ml)

The Acetone **PASSED** The Water **PASSED**

1E-06 g/ml 0 g/ml

(3) CORRECTIONS- (volume used)*(std wt)

	ACETONE	**WATER**
FRONT HALF =	0 g	0 g
BACK HALF =	0.0003 g	0 g
BKR RINSES =	6E-05 g	0 g

tot. front half =	0 g	tot. impingers =	0 g
tot. back half =	0.0003 g		
total rinses =	6E-05 g	**total grams from solvents =**	**0.0004 g**