AP42 Section: 11.1

Reference Number: 285

Title: Source Sampling For Particulate Emissions, South Coast Carlsbad, Carlsbad, CA,

San Diego County Air Pollution, San Diego, CA,

July 30, 1991.

MIDWEST F
MBI Carlsbad (Unit #1) 7/30/91 P.O.#926 TEST #91
AND E POLLUTION CONTROL DISTRICT, 9150 CHESAPEAKE DRIVE, SAN DIEGO, CA. 92123
40 Cary,
SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE
FAX (919) 677-0065

TEST SITE: South Coast- Carlsbad (Unit #1)
3701 Haymar Road
Carlsbad, CA 92088

TEST WITNESS - AVERAGE

TEST #: 91211.1, .2, & .3 APP#: 900344 P.O.#:926 TEST DATE: 7/30/91

Type of plant (Asphalt /Perlite / Combustion) : asphalt

UNIT TESTED: Baghouse

EQUIPMENT: Asphalt batch plant

TESTED BY: Tracer Technologies	DATE: 7/30/91
SITE PERSONNEL: Ken Kindler	DATE: 7/30/91
APCD ENGINEER: Andy Segal	DATE: 7/30/91
LAB ANALYSIS BY: David Shina	DATE: 8/19/91
REPORT BY: David Shina	DATE: 9/16/91
REVIEWED BY: Gary Smith & Linda Twaddle	DATE: 10/16/91
APPROVED BY: Robert Telesnicki for CWR	DATE: 11/5/91

C.W. RIDENOUR, SENIOR AIR POLLUTION CHEMIST

This report has been reviewed and found to be representative of the testing that was performed.

TEST	PERMIT LIMIT	MEASURED	PERFORMANCE
RULE 54 DUST & FUMES	40 lbs/hr	4.29 lbs/hr	PASSED
RULE 260.92	0.04 gr/DSCF	0.03 gr/DSCF	PASSED

SUMMARY:

ITEM	Vm	Bws	Cs	E	I	Qstd	ts	PROD RATE
UNITS	ft^3	%	gr/dscf	lbs/hr	%	dscfm	°F	tons/hr
VALUE	44.751	13.30	0.030	4.292	101	1.64E+04	209	93.52

SYSTEM DESCRIPTION:

This asphalt plant combines crushed rock and and sand with asphalt oil in batch loads of varying sizes. The rock and sand are heated in a rotary drum to dry them. The exhaust from this dryer is routed through a baghouse and finally to a stack. It is the emissions from this stack that are the subject of this report.

PROCEDURES:

The testing procedure for a test witness is as follows: The contractor performs three particulate tests, under the direction of any APCD personnel present at the test. The contractor gives a representative sample of the testing performed, the audit sample, to the District and the contractor keeps the other 2 samples. The District performs all the necessary tests on the audit sample, using District equipment and personnel. The contractor performs these same tests on their 2 samples. The values from all 3 tests are then averaged to get the official APCD results.

The testing procedures and equipment utilized in these tests are based on EPA New Source Performance Standards Method 5. Any deviations are in the contractor's Source Test Protocol and have been approved by the District. The sampling train was modified to use a front and back-end filter. The back-end filter was placed between the 3rd & 4th impinger. The 4th impinger was filled with silica gel.

CALCULATIONS

All equations are from EPA CFR 40, July 1, 1990, Parts 53-60, Appendix A, Methods 1-5 inclusive.

PARTICULATE SAMPLING:

The test consisted of sampling at 16 traverse points, 8 from each of 2 sample ports (fig.2), collected from 54 inches below the stack (fig.3). All field data was transferred to the computer printout. All calculations were done by the computer and the emissions were compared to rules 54 and 260.92 of the SDAPCD.

ANALYSES:

Gas: *CONTRACTOR-* An integrated bag sample was collected during the test and analyzed by the contractor.
Particulate: *APCD-* All procedures follow EPA guidelines, except where noted in the SDAPCD QA manual.
CONTRACTOR- All procedures follow EPA guidelines, except where noted in their Source Test Protocol.

EQUIPMENT:

All testing equipment was provided by the contractor and approved by the District. All particualte analysis was provided by the contractor, except for Run #1, the District's audit sample. This equipment was calibrated by the District.

South Coast-Carlsbad (Unit #1) 7/30/91 P.O.#926 TEST #91211.1,.2..3

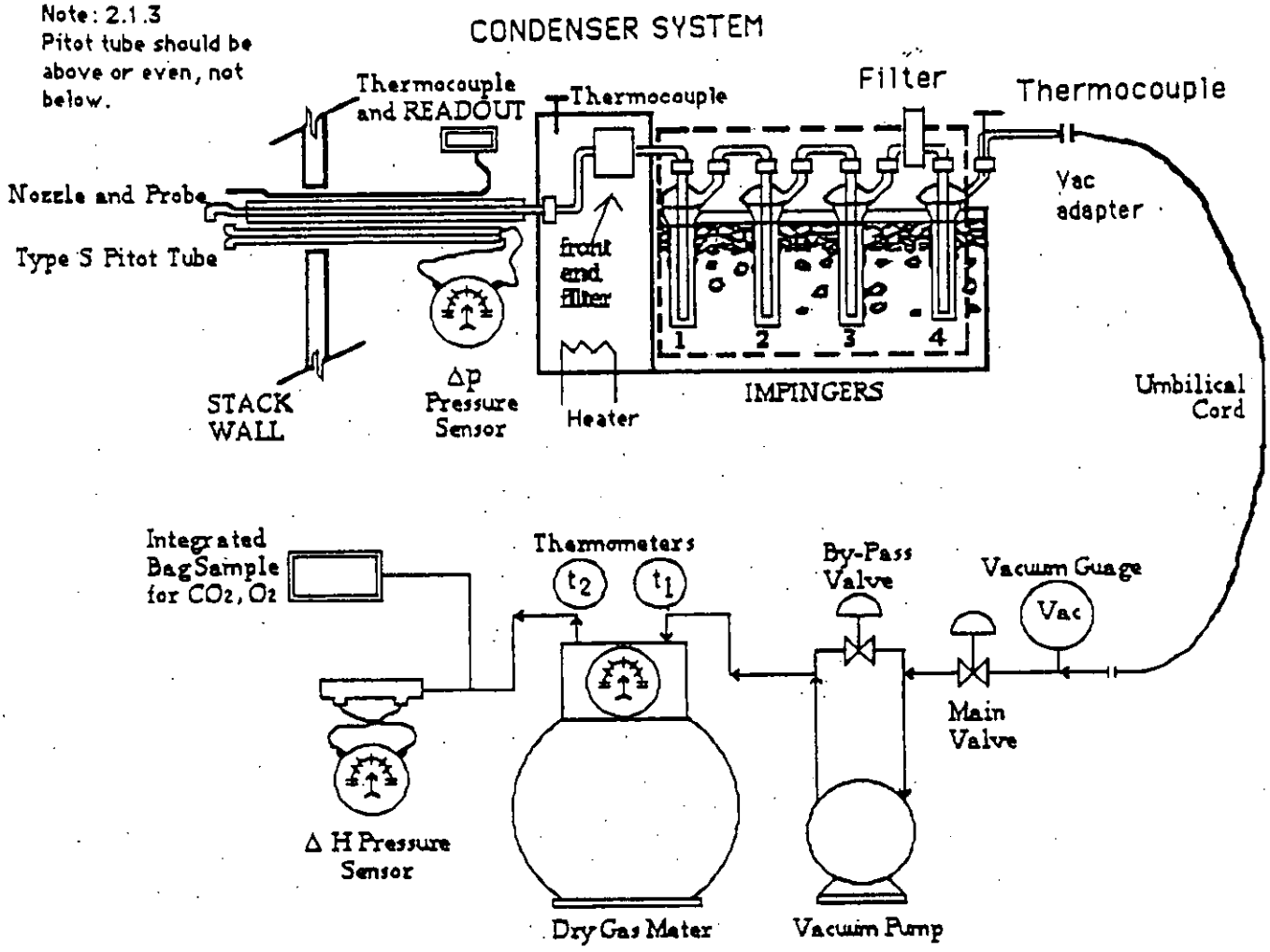
		APCD RUN 1	APCD RUN 2	TRACER RUN 2	APCD RUN 3	TRACER RUN 3	OVERALL AVG
TEMPERATURES:							
01)	ts = (Σ ts(n))/total n's	213	203	203	210	210	209
02)	Ts = ts+460	673	663	663	670	670	669
03)	tm= (Σ [(t 1(n)+t 2t(n))/2]/total n's	85	79	79	82	82	82
04)	Tm= (t1+t2)/2 + 460	545	539	539	542	542	542
05)	H= (Σ H(n))/total n's	46	51	51	49	49	49
06)	Tstd	528	528	528	528	528	528
PRESSURES:							
07)	Pbar= [(P @S.L.)+[ft. above S.L.*(-0.1 in Hg/100ft)]]	30.00	30.03	29.43	30.01	29.41	29.85
08)	Pg= read from pressure sensing device	-0.68	-0.68	-0.68	-0.68	-0.68	-0.68
09)	Ps= Pbar + (Pg/13.6)	29.95	29.98	29.38	29.96	29.36	29.96
10)	ΔH	1.634	1.706	1.706	1.709	1.709	1.683
11)	Pm= Pbar+(ΔH/13.6)	30.12	30.16	29.57	30.14	29.57	29.75
12)	Pstd	29.92	29.92	29.92	29.92	29.92	29.92
VOLUME:							
13)	Vm= Vm(end)-Vm(begin)	44.222	44.535	44.550	45.486	45.486	44.751
14)	Y	1.0092	1.0092	1.0092	1.0092	1.0092	1.0092
15)	Vm'= Vm*Y	44.629	44.945	44.950	45.904	45.909	45.165
16)	Vpw @ ti = from appendix	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17)	corr Vwm = [[(Vm'*Vpw@imp/Ps)*Pm*Tstd]/(Tm*Pstd)]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18)	Vm std = [[Vm'*(Tstd/Tm)*(Pm/Pstd)]-corr Vwm]	43.536	44.377	43.592	45.018	44.169	43.766
19)	Vlc= Σ Volume of impingers)	140.300	135.300	135.300	151.300	151.300	142.300
20)	∂	0.002201	0.002201	0.002201	0.002201	0.002201	0.002201
21)	R	21.85	21.85	21.85	21.85	21.85	21.85
22)	MwH2O	18	18	18	18	18	18
23)	Vw std = [[(Vlc*∂*R*Tstd)/(Pstd*MwH2O)]+corr Vwm]	6.6222	6.3862	6.3900	7.1414	7.1400	6.7174
CALCULATIONS:							
	MOISTURE-						
24)	Bws(1) =(Vw std)/(Vw std+Vm std)100						
25)	Vpw @ ts = from appendix						
26)	Bws(2) =[(Vpw @ ts)/Ps]*100						
27)	Bws = lower value of equation 24 or 26	13.20	12.58	12.76	13.69	13.92	13.30
	MOLECULAR WEIGHT-						
28)	%O2	18.00	16.70	16.70	16.20	16.20	16.97
29)	%CO2	1.80	1.90	1.90	2.80	2.80	2.17
30)	%N2+Inerts+%CO	80.20	81.40	81.40	81.00	81.00	80.87
31)	Md=[0.440(%CO2)]+[0.320*(%O2)]+[0.280(%N2+inerts+%CO)]	29.01	28.97	28.97	29.10	29.10	29.03
32)	Ms=Md*(1-Bws)+18.0*(Bws)	27.55	27.59	27.57	27.58	27.58	27.56
	FLOW-						
33)	ΔP	0.863	0.883	0.883	0.904	0.904	0.883
34)	Cp	0.840	0.840	0.840	0.840	0.840	0.840
35)	vs= 85.49*Cp*[[(Ts*ΔP)/(Ps*Ms)]^.5]	60.21	60.42	57.36	61.48	58.06	58.87
36)	As=3.14*[(Ds)^2/4]	6.87	6.87	6.87	6.87	6.87	6.87
37)	Qs = (vs)*As*60	2.48E+04	2.49E+04	2.36E+04	2.53E+04	2.44E+04	2.43E+04
38)	Qstd =17.64*Qs*(1-Bws)*Ps/Ts	1.69E+04	1.74E+04	1.61E+04	1.72E+04	1.62E+04	1.64E+04
	EMISSIONS-						
	FRONT HALF						
39)	mn (front)	0.10334	0.07735		0.06019		
40)	Cs (front) =15.43*mn(front)/Vm std	0.036626	0.026895		0.02063		
41)	E (front) = (0.00857)*(Qstd)*Cs (front)	5.3088	4.000594		3.04803		
	BACK HALF						
42)	mn (back)	0.00386	0.00752		0.00607		
43)	Cs (back) =15.43*mn(back)/Vm std	0.001368	0.002615		0.002081		
44)	E (back) = (0.00857)*(Qstd)*Cs (back)	0.198297	0.388939		0.307386		
	TOTAL						
45)	mn (total) = mn(front)+mn(back)	0.10720	0.08488	0.08450	0.06626	0.06630	0.08618
46)	Cs (total) =15.43*mn(total)/Vm std	0.0380	0.0295	0.0300	0.0227	0.0231	0.0304
47)	E (total) = (0.00857)*(Qstd)*Cs (total)	5.51	4.39	4.85	3.36	3.72	4.47
ISOKINETICS:							
48)	An=3.14*[(Dn)^2/4]	0.0408	0.0408	0.0408	0.0408	0.0408	0.0408
49)	I=.09450(Ts*Vm std)/Ps*vsAnØ(1-Bws)	97	97	102	99	103	101

APPENDIX

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

FIGURE 1

CONDENSER SYSTEM



LEGEND

No. 1 Mod- 100 ML Deionized Water

No. 2 Std - 100 ML Deionized Water

No. 3 Mod- Dry

No. 4 Mod- Silica gel

Mod - Modified Type Greenburg-Smith
Std - Standard Type " "

FIELD DATA ABBREVIATIONS

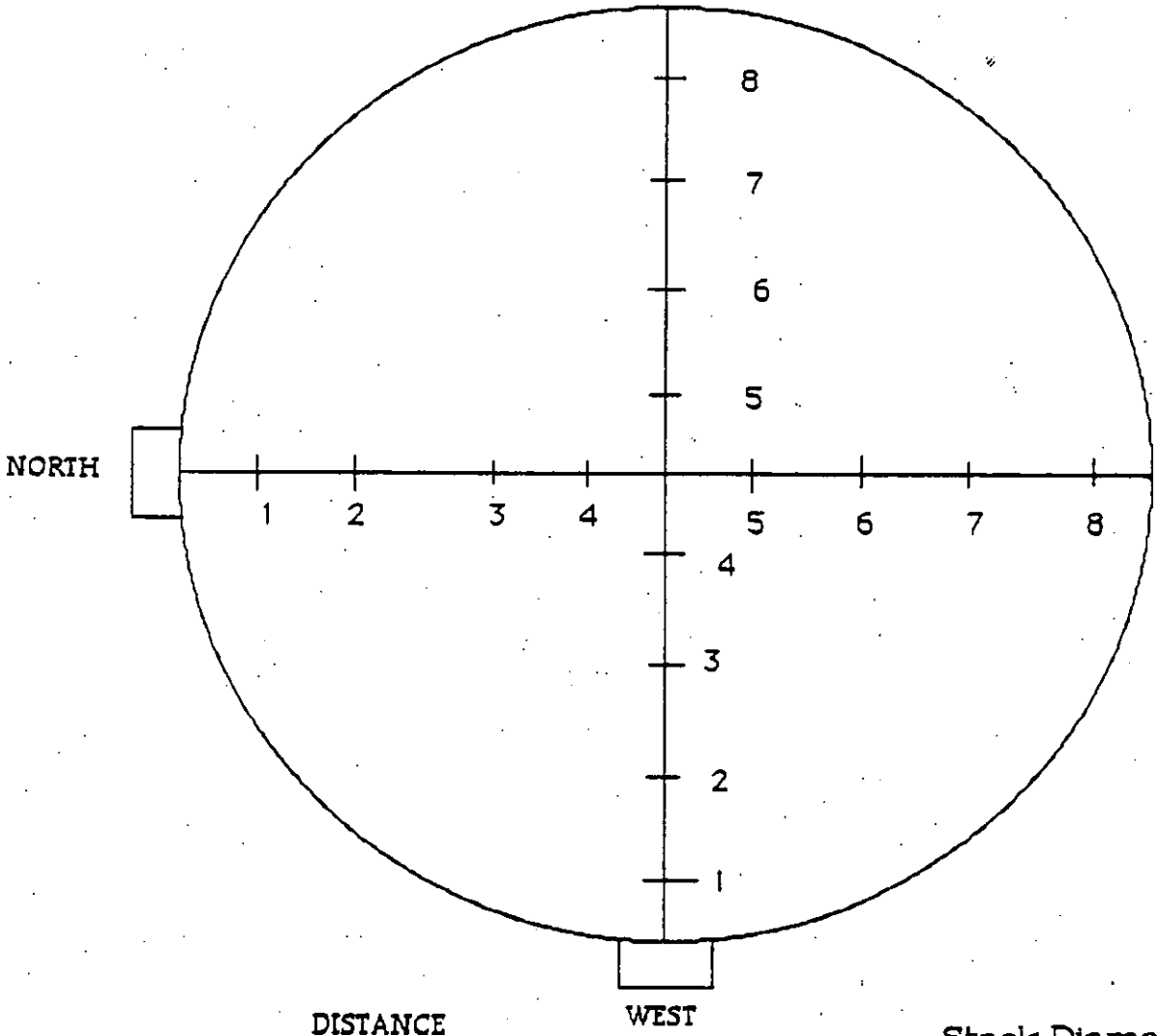
PT = Point Number
T_s = Stack Temperature
Δp = Pitot Tube Pressure Differential; in H_2O
V_s = Stack Velocity, fps
ΔH = Orifice Meter Pressure Drop, in H_2O
t_1 = Meter Inlet Temperature, °F
t_2 = Meter Outlet Temperature, °F
Pm = Pump Vacuum, in Hg
ti = Impinger Temperature
P_{bar} = Barometric Pressure

FIGURE 1: PARTICULATE MATTER SAMPLING TRAIN

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

INDUSTRIAL ASPHALT, MISSION VALLEY

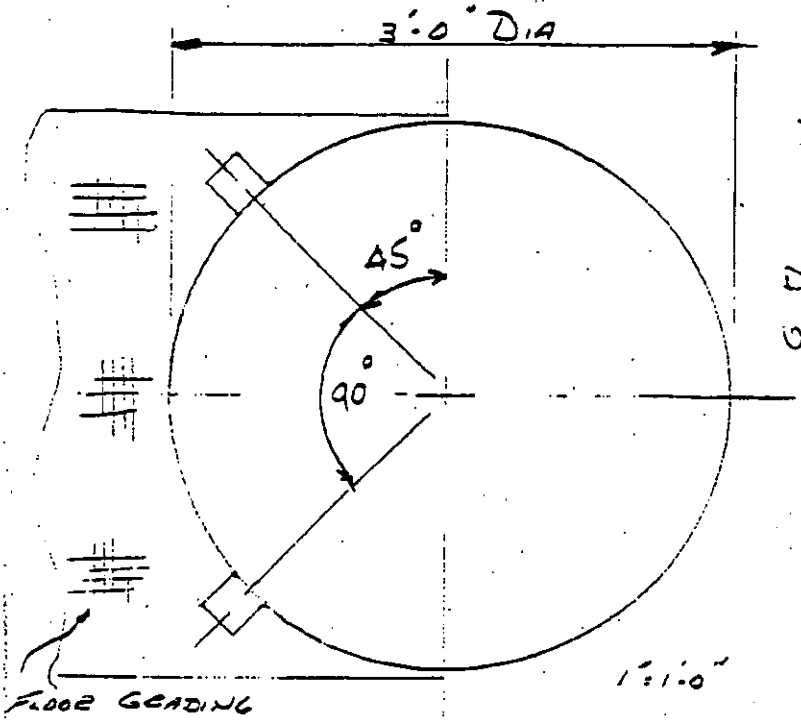
TRAVERSE POINTS



POINT #	DISTANCE INTO STACK	
1	1.14	IN.
2	3.73	
3	6.89	
4	11.47	
5	24.03	
6	28.61	
7	31.77	
8	34.36	

Stack Diameter=

FIGURE 2



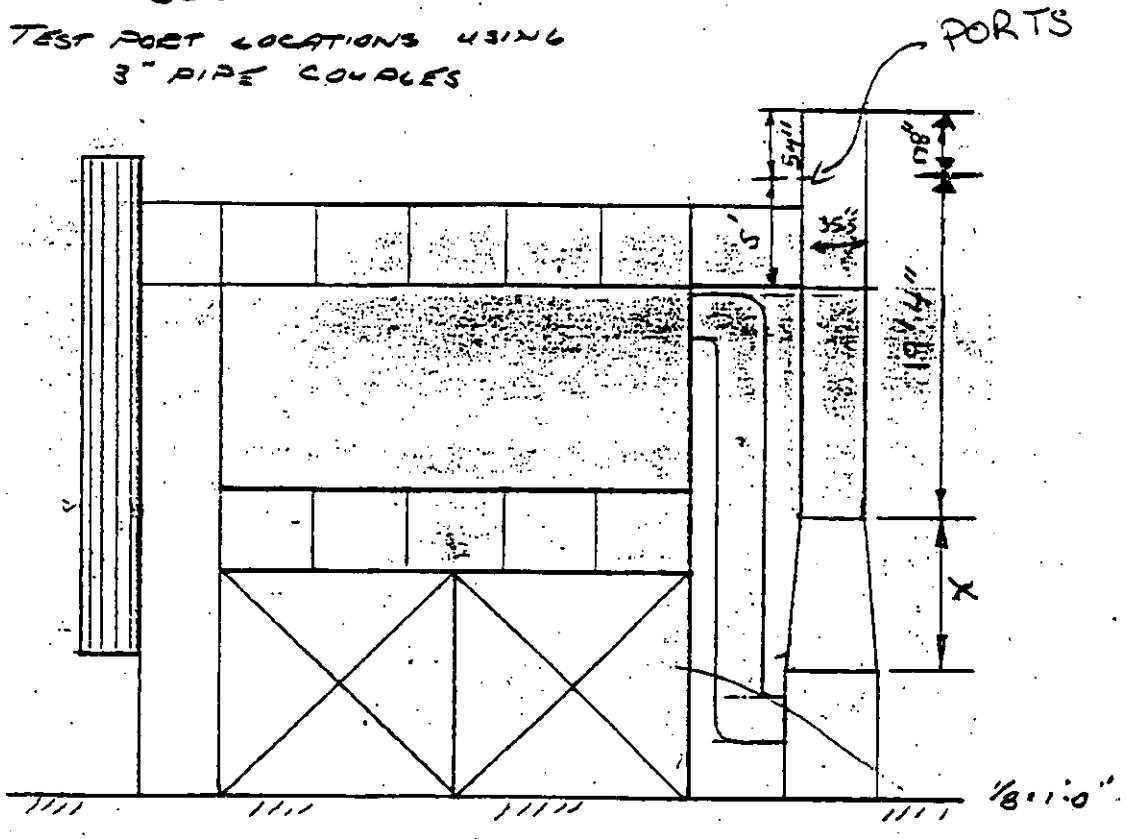
I.D = 2' 11 1/2" = 2.958'

DOWNSTREAM = 6.53D

UPSTREAM = 1.52D

SEC. A-A

TEST PORT LOCATIONS USING 3" PIPE COUPLES



X = DIMESION OF LAST RESTRICTOR TO BLOWER. ESTIMATED TO BE 3'-0"

FIG. 3

NOMENCLATURE

symbol	units	explanation	equation
	A		
An	in^2,	nozzle area	π/4((Dn)^2)
As	ft^2	stack area	π/4((Ds)^2) or L x W
	B		
Bws(1)	%	fractional stack gas moisture-equ 1	((Vw std)/(Vw std+Vm std))100
Bws(2)	%	fractional stack gas moisture-equ 2	((Vpw @ ts)/Ps)100
Bws	%	water vapor in the gas stream	lower of Bws(1) and Bws(2)
	C		
C12	gr/dscf	corr for grain loading at 12% CO2	(12*Cs)/(%CO2)
CO	%	carbon monoxide	read from measuring device(s) (or Asphalt plants)
CO2	%	carbon dioxide	read from measuring device
Corr Vwm	ft^3	correction for Vw w/o silica gel	((Vm*(Vpw@ti)/Ps)*Tm*Tstd)/ (Tm*Ptd)
Cp	none	pitot tube correction factor	see EPA method 3
Cs(front)	gr/dscf	concentration of particulate in stack gas, corrected to STP-for front	(15.43*mn(front))/(Vm std)
Cs(back)	gr/dscf	concentration of particulate in stack gas, corrected to STP-for back	(15.43*mn(back))/(Vm std)
Cs(total)	gr/dscf	concentration of particulate in stack gas, corrected to STP-for total	(15.43*mn(total))/(Vm std)
	D		
∂ (density)	lb/ml	density of water at STP	0.002201 (see CRC)
Ds	in or ft	stack diameter	measure at site
Dn	in	nozzle diameter	avg of at least three measurements
	E		
E.A.	%	Excess air (for combustion)	((%O2-.5*%CO)*100)/ (.264*%N2-%O2-.5*%CO)
E(front)	lbs/hr	part. emissions rate-front	(0.00857)(Qsd*Cs(front))
E(back)	lbs/hr	part. emissions rate-back	(0.00857)(Qsd*Cs(back))
E(total)	lbs/hr	part. emissions rate-total	(0.00857)(Qsd*Cs(total))
	H		
ΔH	in H2O	average differential pressure across the orifice meter	avg of the readings from the pressure measuring device
ΔH@	none	orifice pressure differential at STP	see EPA Method 5 Appendix
	I		
I	%	isokinetics	[0.09450*Ts*Vm std]/ [Ps*vs*Ø*An/144)*(1-(Bws/100))]
	M		
Md	g/g-mole	dry stack gas molecular wgt	0.44(%CO2)+0.320(%O2)+0.280 (%N2+inerts+CO)
mn(back)	g	particulate in impingers	measurement from lab analysis
mn(front)	g	particulate in nozzle & probe	measurement from lab analysis
mn(total)	g	total particulate collected	measurement from lab analysis
Ms	g/g-mole	wet stack gas molecular wgt	Md(1-Bws)+18.0(Bws)
MW CO2	g/mole	mo. wgt of carbon dioxide	44 (see periodic table)
MW N2	g/mole	mo. wgt of nitrogen	28 (see periodic table)
MW O2	g/mole	mo. wgt of oxygen	32 (see periodic table)
MW H2O	g/mole	mo. wgt of water	18 (see periodic table)
	N		
N2	%	percent nitrogen	100-(%CO2+%O2+%CO+inerts)
	O		
O2	%	percent oxygen	read from measuring device

NOMENCLATURE (cont.)

NOMENCLATURE (concl.)

symbol	units	explanation	equation
	P		
ΔP	in H2O	pitot diff. press./velocity head of stack gas	read from measuring device
Pbar	in Hg	baromentric pressure at sampling pt	read from press measuring device
π(pi)	none	the ratio of the circumference of a circle to its diameter	3.14159 (see CRC)
Pm	in Hg	absolute meter pressure	Pbar+(ΔH/13.6)
Ps	in Hg	absolute stack pressure	Pbar+(Pstatic/13.6)
Pg	in H2O	static pressure of stack	read from pressure sensing device
Pstd	in Hg	press at std conditions (29.92)	see CFR
	Q		
Qs	acfm	flow rate	vs*Ao*60
Qstd	dscfm	dry volumetric stack gas flow rate, corrected to STP	17.64*Qs(1-Bws)*(Ps/Ts)
	R		
R	in Hg-ft^3/°R-lb-mo	ideal gas constant	21.85 (see CRC)
	S		
S.L.	none	Sea Level	read from a relief map
	T		
ti	°F	dry gas meter inlet temp, uncorrected	read from temp sensing device
t2	°F	dry gas meter outlet temp,uncorrected	read from temp sensing device
t1 corr	°F	dry gas meter outlet temp,corrected	t1 + temperature correction
t2 corr	°F	dry gas meter outlet temp,corrected	t2 + temperature correction
s(theta)	min	sampling time/point	Θ/tn
Σ(Theta)	min	total sampling time	none
ti	°F	impinger outlet temp	read from temp sensing device
tm	°F	dry gas meter temp in F	(t1+t2)/2
Tm	°R	dry gas meter temp in R	tm+460
tn	none	tll number or traverse pts	summation of the traverse points
ts	°F	stack temp in F	read from temp sensing device
Ts	°R	stack temp in R	ts+460
Tstd	°R	temp at std conditions (528)	see CFR
	V		
Vlc	ml	water collected from impingers and the silica gel (if applicable)	from lab analysis
Vm	ft^3	sample gas volume, uncorrected	read from dry gas meter
Vm'	ft^3	sample gas volume, corrected	Vm*Y
Vm std	ft^3	volume of gas sample by the dry gas meter,corrected to STP	((Vm'*Tstd)Pm)/((Pstd*Tm)-corr Vm)
Vpw@ts	in Hg	vapor pressure of water at ts	see CRC water vapor press. tables
Vpw@ti	in Hg	vapor pressure of water at ti	see CRC water vapor press. tables
vs	ft/sec	stack gas velocity	85.49*Cp((Ts*ΔP)/(Ps*Ms))^0.5
Vw std	ft^3	Vol. of water vapor in gas sample, corrected to STP	(Vlc*∂*R*Tstd)/(Pstd*MW H2O)+corr Vwm
	Y		
Y	none	dry gas meter calibration factor	see CFR 40, parts 53-60

Conversion Factors

(multiply by the number)			
0.002669	in Hg-ft^3/°R-ml	conversion to get in Hg-ft^3/R	see CRC
0.00857	lb/gr-min/hr	conv from gr/min to lb/hr	see Lange's Handbook of Chemistry
0.04707	ft^3/ml	conversion from ml to ft^3	see Lange's Handbook of Chemistry
15.43	gr/g	conversion from g to gr	see Lange's Handbook of Chemistry
85.49	(ft/sec)-(lb-in Hg/lb-mo-°R-in H20))^.5	conversion factor to get velocity in ft/sec	see CRC
(divide by the number)			
144	in^2/ft^2	conversion from in^2 to ft^2	see CRC
13.6	in H20/in Hg	conversion from in H20 to in Hg	see CRC
(add to the number)			
460	°R/°F	conversion from F to R	see CRC

APCD TEST NO. 91211 JULY 30, 1991

APCD COMPLIANCE TEST ENGINEERING REPORT

SOUTH COAST ASPHALT PRODUCTS CO.
3701 HAYMAR ROAD, CARLSBAD, CA
ASPHALT PLANT NO. 1 (P/O # 0926)
(TRACER TECHNOLOGIES LAB.)

E. COMPOSITION PER 1 TON BATCH

	COLD MIX	3/8" FINE	3/8" MED
BIN #1 SAND & DUST	1722 LBS	1323 LBS	1315 LBS
BIN #2 3/8" ROCK	150 LBS	550 LBS	561 LBS
ASPHALT OIL	128 LBS (SC800)	127 LBS (AR4000)	124 LBS (AR4
	2000 LBS	2000 LBS	2000 LBS
	1/2" MED	3/4 MED	
BIN #1 SAND & DUST	1037 LBS	856 LBS	
BIN #2 3/8" ROCK	569 LBS	474 LBS	
BIN #3 1/2" ROCK	284 LBS	379 LBS	
BIN #4 3/4" ROCK	—	190 LBS	
ASPALT OIL	110 LBS (AR4000)	101 LBS (AR4000)	
	2000 LBS	2000 LBS	

I ASPHALT PRODUCTION / OPERATIONAL DATA DURING SAMPLING TESTS

ME	Test Pt	Material Temp °F	Damper Position %	Baghouse ΔP "H2O	Remarks
332	1 E				START TEST No. 1
341		314	32	5.0	
349					NO VISIBLE EMISSION AT STACK
908	8 E				EAST PORT TEST COMPLETE
					PLT. SHUTDOWN
914					PLT. STARTUP
916	1 W				WEST PORT TEST START
921					NO V. E AT DRYER SEALS
934		300	32	5.0	STACK TEMP. 220°F
952	8 W	297	32	5.0	TEST NO. 1 COMPLETE
118	1 E				START TEST No. 2
123		290	32	6.5	
136		341/286	32	5.0	MATERIAL CHANGEOVER
149		292	32	5.0	
154	8 E				EAST PORT TEST COMPLETE
1234	1 W	294	32	5.0	WEST PORT TEST START
1259		314	32	6.0	
1310	8 W				TEST NO. 2 COMPLETE
1319		294	32	4.9	
1341		314	32	4.9	
1356		320	32	6.0	
1353	1 E				START TEST No. 3
1416		303	32	6.0	

TIME	TEST PT.	MATERIAL TEMP. °F	DAMPER POSITION %	BAGHOUSE ΔP "H₂O	REMARKS
426		315	32	5.9	
430	8E				EAST TEST PORT COMPLET.
1434	1W				WEST PORT TEST START
1502		186	32	5.2	COLD MIX 6 MIN SHUTDN
1526	8W				TEST NO. 3 COMPLETE
					PLT SHUTDN AFTER TEST

TEST NO. 1

PRODUCTION TIME 85 MINS. (1.42 HRS)
PRODUCTION WEIGHT 164.65 TONS
AV'G. PRODUCTION RATE 115.95 TONS/HR

TEST NO. 2

PRODUCTION TIME 112 MINS. (1.87 HRS)
PRODUCTION WEIGHT 171.06 TONS
AV'G PRODUCTION RATE 91.5 TONS/HR

TEST NO. 3

PRODUCTION TIME 132 MINS (2.2 HRS)
PRODUCTION WEIGHT 160.83
AV'G. PRODUCTION RATE 73.1 TONS/HR

COMMENTS:

1. These tests were conducted by Tracer Technologies Lab. and witnessed by APCD personnel DAVID SHINA and ANDREW SEGAL