

Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources*. AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

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

*Rpt checked & OK
7-27-90
CJC*

SUMMARY:
SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST WITNESS

TEST SITE: California Commercial Asphalt Corporation
9235 Caminito, Santa Fe
San Diego, Ca 92126-0880

TEST #: 90078 P.O.# 870054 TEST DATE: Mar19,90

EQUIPMENT: Asphalt Drum Mix Plant, Glascon Drum
Mixer (600 Tons/Hr), vented to Havens
Alpha Mark 3 Baghouse.

UNIT TESTED: Baghouse exhaust stack

SITE PERSONNEL: Jim Saint-Martin

APCD PERSONNEL: C.J.Cooney

REPORT BY: T.Prevo DATE 7/26/90

APPROVED BY: DATE:

C.W. RIDENOUR
SENIOR AIR POLLUTION CHEMIST

PARAMETERS:	MEASURED:
STACK GAS FLOW RATE (DSCFM):	<u>41209</u>
STACK GAS TEMPERATURE °F (AVG):	<u>275</u>
PRODUCTION RATE (AVG): tons/hr	<u>550 Tons/Hr</u>

RESULTS: Based upon APCD Method 5 Standards relating to the entire impinger catch.

TEST	PERMIT LIMIT	MEASURED	PERFORMANCE
RULE 54 DUST AND FUME	40.00 lb/hr	7.80 lbs/hr	PASSED
RULE 260.92	0.04 grains/dscf	0.022 grains/dscf	PASSED

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 California Commercial Asphalt Corporation. The test was performed on the Exhaust Stack of a fabric filter dust collector serving the drum mix asphalt plant.

System Description:

The crushed rock, sand, and hot asphalt oil are heated and mixed in the rotary drum. The rock and sand are dried in a rotary dryer which is heated by #2 Diesel fuel. The exhaust from this drum is vented through a baghouse, the emissions to the atmosphere from this rotary drum 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:

Preliminary calculations were based upon data from previous tests. 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 from each of 2 sample ports as shown in Figure 1. The sample was collected 66 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:

The oxygen and carbon dioxide content of the stack gas was measured using electronic instrumentation.

SITE
DATE

CCAC	
3/20/90	Test #

OPERATOR YOrk

Date of Calcs: 7/27/90

Enter

Pitot Coeff	0.84
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Nozzle Diam (in.)	0.249	inches
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TRAVERSE POINT NUMBER	GAS METER READING (Vm), ft3	Stack (ΔP) in. HOH	DGM (ΔH) in. HOH ACTUAL	DRY GAS METER TEMPERATURE		STACK TEMP (Ts) F	Temp Impngr F	stack velocity ft/sec	%CO2
				INLET F	OUTLET F				
				892.330					
		0.67	1.23	71	69	273	60	56.25	2.50
		0.76	1.40	71	70	277	52	60.08	2.50
		0.79	1.46	71	71	282	55	61.46	2.50
		0.81	1.49	72	73	285	55	62.36	2.50
		0.80	1.47	74	74	286	58	62.01	2.50
		0.73	1.29	75	75	285	57	59.20	2.50
		0.70	1.23	76	75	287	59	58.05	2.50
		0.83	1.46	78	76	287	59	63.21	2.50
		0.90	1.82	79	76	289	59	65.91	2.50
		1.00	1.92	81	81	280	59	69.05	2.50
		1.00	1.92	82	83	276	60	68.87	2.50
		0.67	1.27	85	85	190	58	52.97	2.50
		0.72	1.36	85	79	200	59	55.34	2.50
		0.94	1.78	88	79	263	54	66.18	2.50
		0.94	1.78	85	80	274	54	66.68	2.50
		0.86	1.63	88	84	287	56	64.34	2.50
		0.74	1.40	88	80	289	56	59.76	2.50
		0.66	1.25	89	82	289	57	56.44	2.50
		0.57	1.08	89	82	287	57	52.38	2.50
		0.56	1.06	90	86	285	56	51.85	2.50
		0.58	1.10	90	86	284	57	52.73	2.50
		0.61	1.15	92	85	283	56	54.04	2.50
		0.61	1.15	93	89	281	55	53.97	2.50
		0.55	1.04	93	95	280	55	51.21	2.50

Final Vol

939.675

Vol DGM Cu Ft	Avg In. HOH ΔP	Avg In. HOH ΔH	Avg T1	Avg T2	Avg Ts	Avg Ti	Avg Velocity ft/sec	Avg %CO2
47.345	0.75	1.41	82.71	79.79	275	56.79	59.35	2.50

These give

Avg Temp DGM	81.3
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Vel Wtd CO2	2.50
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SITE: California Commercial Asphalt Corporation

OPERATOR: Jim Saint-Martin

TEST DATE: 1/1/04

TEST: 90078

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			
1	892.330	0.67	1.23	71	69	273	60	56.49
2		0.76	1.40	71	70	277	53	60.33
3		0.79	1.46	71	71	282	55	61.71
4		0.81	1.49	72	73	285	55	62.62
5		0.80	1.47	74	74	286	58	62.27
6		0.73	1.29	75	75	285	57	59.44
7		0.70	1.23	76	75	287	59	58.29
8		0.83	1.46	78	76	287	59	63.47
9		0.90	1.82	79	76	289	59	66.18
10		1.00	1.92	81	81	280	59	69.34
11		1.00	1.92	82	83	276	60	69.15
12		0.67	1.27	85	85	190	58	53.19
13		0.72	1.36	85	79	200	59	55.56
14		0.94	1.78	88	79	263	54	66.45
15		0.94	1.78	85	80	274	54	66.95
16		0.86	1.63	88	81	287	56	64.61
17		0.74	1.40	88	80	289	56	60.01
18		0.66	1.25	89	82	289	57	56.67
19		0.57	1.08	89	82	287	57	52.60
20		0.56	1.06	90	86	285	56	52.06
21		0.58	1.10	90	86	284	57	52.95
22		0.61	1.15	92	85	283	56	54.27
23		0.61	1.15	93	89	281	55	54.19
24	939.675	0.55	1.04	93	95	280	55	51.42

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

 47.345 0.75 1.41 83 80 275 57 59.59

59.35

DATA SUMMARY:

PRESSURES

P bar 30.09 in Hg
P static 0.02 in H2O
Ps 30.09 in Hg

AVERAGE TEMPERATURES

ts = 275 F
tm = 1/2(avg.t1+avg.t2) = 81 F
ti = 57 F

VOLUMES

Vm, meter 47.345 ft^3
Vlc, impingers 304.0 ml

VAPOR PRESSURES

Vpw @ imp = 0.000 inHg

METER BOX PARAMETERS

$\Delta H@$ = 1.88 inH2O
 ΔP = 0.75 inH2O
 ΔH = 1.41 inH2O
METER BOX I.D.# D-10

NOZZLE AND PROBE

Dn = 0.249 in
An = Dn^2* π /4 = .0487 in^2
Cp = 0.840
Y = .9800

STACK MEASUREMENTS

%CO2 2.50
%CO 0.00
%O2 15.20
%N2 82.30

STACK PARAMETERS

Stack Diameter = 5.17 ft
Ao=Area stack = 20.97 ft^2

\emptyset = sampling time 72 minutes

mn=particulate collect'd 0.0654 grams

CALCULATIONS:

			EQUATION NUMBER
corr Vwm = ((Vm**Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = water volume correction at meter w/o silica gel =	0.00	ft^3	1
Vm std = (Vm*Tstd*Pm/(Pstd*Tm))-corr Vwm = dry meter volume corrected to STP	= 45.68	ft^3	2
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	= 30.19	in Hg	3
Tm= (t1+t2)/2 + 460 = meter temperature	= 541.2	°R	4
Ts = ts+460 = corrected stack temperature	= 735.0	°R	5
Ps= Pbar + (P static/13.6)= corrected stack pressure =	30.09	in Hg	6
Vw std = Vlc*∂*R*Tstd/(Pstd*MwH2O)+corr Vwm = water volume at STP	= 14.35	ft^3	7
Bws = (Vw std)/(Vw std+Vm std)*100 = percent moisture =	23.90	%	8
mn= grams of particulate (from laboratory sheet)	= 0.0654	grams	9
Cs = 15.43*mn/Vm std = grain loading (dry)	= 0.022	grains/dscf	10
Vm'= Vm*Y = Corrected dry gas meter volume	= 46.40	ft^3	11
Md=0.440(%CO2)+0.320*(%O2)+0.280(N2+inerts+CO) Dry gas molecular weight	= 29.01	g/g*mole	12
Ms=Md*(1-Bws)+18.0*(Bws) Stack gas molecular weight-wet basis	= 26.38	g/g*mole	13

Handwritten initials: AIF

EQUATION
NUMBER

14	$vs = 85.49 \cdot Cp \cdot ((Ts \cdot \Delta P) / (Ps \cdot Ms))^{.5}$	= stack velocity	(ft/s)=	59.59
15	$Qs = (vs) \cdot Ao \cdot 60$	= stack flow rate	(acfm)=	74,979.3
16	$Qstd = 17.64 \cdot Qs \cdot (1 - Bws) \cdot Ps / Ts$	= flow rate at STP	(dscfm)=	41,208.8
17	$I = 144 \cdot 100 \cdot Ts \cdot (.002669 \cdot Vlc + (Vm' / Tm) \cdot Pm) / (60 \cdot \emptyset \cdot vs \cdot Ps \cdot An)$	= isokinetic	(%) =	95.39
18	$E = (0.00857) \cdot (Qstd) \cdot Cs$	= particulate emission rate	(lbs/hr) =	7.80

SUMMARY OF CALCULATIONS:

$I = \% \text{ isokinetics} =$	95.4	%
$Cs = \text{grain loading (dry)} =$	0.022	grains/dscf
$E = \text{particulate emission rate} =$	7.80	lbs/hr
$\% \text{ CO}_2 =$	2.50	%
$C_{12} = \text{grain loading at 12\% CO}_2$		
$= (12) \cdot (Cs) / \% \text{CO}_2 =$	0.106	grains/dscf
$\% \text{ Excess Air} =$		
$\frac{(\% \text{O}_2 - \% \text{CO}) \cdot 100}{(.264(\% \text{N}_2) - (\% \text{O}_2) - 0.5(\% \text{CO}))}$	=	232.9 %

NOMENCLATURE:

* = multiplication

/ = division

^ = exponentiation

Vm = sample gas volume, uncorrected = (ft³)

Vm' = sample gas volume, corrected = Vm*Y = ft³

ΔP = root mean pitot tube differential pressure

$$= (\text{summation}(\text{press.diff. across pitot tubes}^{.5})/\text{number entries})^2 = (\text{in H}_2\text{O})$$

ΔH = average differential pressure across the orifice = (in H₂O)

t1 = dry gas meter inlet temperature = (°F)

t2 = dry gas meter outlet temperature = (°F)

ts = stack temperature = (°F)

ti = Impinger out temperature = (°F)

vs = stack gas velocity = $85.49 \cdot C_p \cdot (T_s \cdot \Delta P / (P_s \cdot M_s))^{.5} = (\text{ft/s})$

Pbar = barometric pressure = (in Hg)

Pstatic = stack static pressure = (in Hg)

Ps = Absolute stack pressure = $P_{\text{bar}} + (P_{\text{static}}/13.6) = (\text{in Hg})$

tm = dry gas meter temperature = $(t_1 + t_2)/2 = (\text{°F})$

Vlc = collected water, impingers = (ml)

Vpw = Vapor pressure of water = (in Hg)

ΔH @ = orifice pressure differential that equates to 0.75 cfm of air @ 68°F and 29.92 in Hg

Dn = nozzle diameter = (in)

An = nozzle area = $\pi \cdot D_n^2 / 4 = (\text{in}^2)$

π = the ratio of circumference of a circle to its diameter = 22/7 (dimensionless)

Cp = pitot tube coefficient = (dimensionless)

Y = meter box coefficient = (dimensionless)

CO₂ = carbon dioxide = (%)

CO = carbon monoxide = (%)

O₂ = oxygen = (%)

N₂ = nitrogen = (%)

Ø = sampling time = (minutes)

mn = particulate found in sample train = (grams)

Ao = stack area = stack diameter²*π/4 if round; length *width if rectangular = (ft²)

Corr Vwm = $((V_m' \cdot V_{pw@imp} / P_s) \cdot P_m \cdot T_{std}) / (T_m \cdot P_{std}) = (\text{ft}^3)$

Pm = absolute meter pressure = $P_{\text{bar}} + (\Delta H / 13.6) = (\text{in Hg})$

Tstd = temperature at standard conditions = (528°R)

Tm = dry gas meter temperature = $(t_1 + t_2) / 2 + 460 = (\text{°R})$

Pstd = pressure at standard condition = (29.92 in. Hg)

Vm std = dry corrected volume of meter = $V_m' \cdot T_{std} \cdot P_m / (P_{std} \cdot T_m) - \text{corr Vwm} = (\text{ft}^3)$

Ts = stack temperature = (°R)

Vw std = water volume at STP = $V_{lc} \cdot \partial \cdot R \cdot T_{std} / (P_{std} \cdot M_{wH_2O}) = (\text{ft}^3)$

NOMENCLATURE: cont.

ρ = density of water at STP = 0.002201 = (lb/ml)

R = ideal gas constant = 21.85 in. Hg*ft³/°R*lb*mole

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

Bws = fractional stack gas moisture content = (Vw std+Corr Vwm)/(Vwstd+Corr Vwm+Vm std)
= (%/100)

Cs = grain loading = 15.430*mn/Vm std = (grains/dscf)

Mw = molecular weight = (g/g*mole)

Ms = wet stack gas molecular weight = Md*(1-Bws)+Bws*18 = (g/g*mole)

Qs = flow rate = vs*Ao*60 = (acfm)

Qstd = flow rate at standard conditions = 17.68*Qs*(1-Bws)*Ps/Ts = (dscfm)

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

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

MwH₂O = molecular weight of water = 17.98 (g/g*mole)

CONSTANTS:

0.00847 lb/(gr*min/hr) = 1 lb/7000grains*60 min/hr

13.6 in H₂O/in Hg

17.68 °R/in Hg

60 sec/min

32 g/g*mole = O₂ molecular weight

44 g/g*mole = CO₂ molecular weight

28 g/g*mole = N₂ molecular weight

18 g/g*mole = H₂O molecular weight

85.49 (ft/sec)*(lb*in Hg/(lb*mole*°R*in H₂O))^{.5}

0.04707 = ft³/ml

460 (demensionless) = conversion °F to °R

144 in²/ft²

15.43 gr/g

0.002669 in Hg*ft³/(°R*ml)

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

SUMMARY:
SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE:

APCD Method

TEST #:

2

P.O.#

TEST DATE:

EQUIPMENT:

Calculations checked on Yorkk Calculations

UNIT TESTED:

SITE PERSONNEL:

APCD PERSONNEL:

REPORT BY:

DATE:

APPROVED BY:

DATE:

C.W. RIDENOUR
SENIOR AIR POLLUTION CHEMIST

PARAMETERS:

MEASURED:

STACK GAS FLOW RATE (DSCFM):

35992

STACK GAS TEMPERATURE °F (AVG):

262

PRODUCTION RATE (AVG): tons/hr

RESULTS: Based upon APCD Method 5 Standards relating to the entire impinger catch.

TEST	PERMIT LIMIT	MEASURED	PERFORMANCE
RULE 54 DUST AND FUMES	40.00 lb/hr	4.45 lbs/hr	PASSED

TEST REFERENCE:

San Diego Air Pollution Control District Quality Assurance Manual Method 5 for Particulate

SITE: 0

OPERATOR:

TEST DATE: 1/1/04

TEST: 0

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			
				1	940			
2	941.575	0.41	0.79	87	88	280	51	44.14
3	943.075	0.46	0.89	88	90	276	50	46.63
4	944.675	0.49	0.95	89	93	276	51	48.12
5	946.34	0.52	1.01	88	93	275	53	49.54
6	948.09	0.59	1.15	89	96	274	53	52.73
7	949.89	0.69	1.34	88	96	272	54	56.95
8	951.84	0.71	1.38	90	100	269	56	57.65
9	953.81	0.72	1.40	89	100	266	58	57.93
10	955.85	0.72	1.40	91	102	263	60	57.81
11	957.77	0.65	1.26	89	101	255	62	54.63
12	959.66	0.50	0.97	91	102	218	63	46.66
	961.395							
1	961.589	0.36	0.70	88	91	191	64	38.79
2	963.025	0.76	1.48	89	91	205	64	56.97
3	964.99	0.76	1.48	89	96	229	65	57.99
4	967.025	0.72	1.40	89	98	258	67	57.61
5	969.05	0.65	1.26	89	100	269	69	55.16
6	970.925	0.57	1.11	90	94	271	70	51.72
7	972.75	0.52	1.01	90	98	275	71	49.54
8	974.48	0.47	0.91	90	98	280	72	47.26
9	976.14	0.47	0.91	89	97	280	70	47.26
10	977.8	0.47	0.91	90	98	284	66	47.38
11	979.44	0.46	0.89	90	98	282	67	46.81
12	981.1	0.45	0.87	89	94	280	66	46.24
	982.721							

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
	42.527	0.56	1.09	89	96	262	62	50.79

DATA SUMMARY:

PRESSURES

P bar 33.17 30.09 in Hg

P static 0.02 in H2O

Ps 30.09 in Hg ✓

AVERAGE TEMPERATURES

ts = 262 F

tm = 1/2(avg.t1+avg.t2) = 92 F

ti = 62 F

VOLUMES

Vm, meter 42.527 ft³

Vlc, impingers 260.0 ml

VAPOR PRESSURES

Vpw @ imp = 0.560 inHg

METER BOX PARAMETERS

$\Delta H@$ = 1.88 inH2O

ΔP = 0.56 inH2O

ΔH = 1.09 inH2O

METER BOX I.D.# 710989

NOZZLE AND PROBE

Dn = 0.249 in

An = Dn²* π /4 = .0487 in²

Cp = 0.840

Y = .9800

STACK MEASUREMENTS

%CO2 5.40

STACK PARAMETERS

Stack Diameter = 5.17 ft

%CO 0.00

Ao=Area stack = 20.97 ft²

%O2 12.00

%N2 82.60

Ø = sampling time 72 minutes

mn=particulate collect'd 0.0375 grams

CALCULATIONS:

		EQUATION NUMBER
corr Vwm = ((Vm'*Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = water volume correction at meter w/o silica gel =	0.00 ft ³	1
Vm std = (Vm'*Tstd*Pm)/(Pstd*Tm)-corr Vwm = dry meter volume corrected to STP	= 40.17 ft ³	2
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	= 30.17 in Hg	3
Tm= (t1+t2)/2 + 460 = meter temperature	= 552.4 °R	4
Ts = ts+460 = corrected stack temperature	= 721.9 °R	5
Ps= Pbar + (P static/13.6)= corrected stack pressure =	30.09 in Hg	6
Vw std = Vlc*Ø*R*Tstd/(Pstd*MwH2O)+corr Vwm = water volume at STP	= 12.27 ft ³	7
Bws = (Vw std)/(Vw std+Vm std)*100 = percent moisture =	23.40 %	8
mn= grams of particulate (from laboratory sheet)	= 0.0375 grams	9
Cs = 15.43*mn/Vm std = grain loading (dry)	= 0.014 grains/dscf	10
Vm'= Vm*Y = Corrected dry gas meter volume	= 41.68 ft ³	11

$$M_d = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(N_2 + \text{inerts} + CO)$$

Dry gas molecular weight = 29.34 g/g*mole 12

$$M_s = M_d * (1 - B_{ws}) + 18.0 * (B_{ws})$$

Stack gas molecular weight-wet basis = 26.69 g/g*mole 13

EQUATION
NUMBER

14 $v_s = 85.49 * C_p * ((T_s * \Delta P) / (P_s * M_s))^{.5}$ = stack velocity (ft/s) = 50.79

15 $Q_s = (v_s) * A_o * 60$ = stack flow rate (acfm) = 6.39E+04

16 $Q_{std} = 17.64 * Q_s * (1 - B_{ws}) * P_s / T_s$ = flow rate at STP (dscfm) = 3.60E+04

17 $I = \frac{144 * 100 * T_s * (.002669 * V_{lc} + (V_m' / T_m) * P_m)}{(60 * \emptyset * v_s * P_s * A_n)}$
= isokinetic (%) = 96.04

18 $E = (0.00857) * (Q_{std}) * C_s$ = particulate emission rate (lbs/hr) = 4.45

SUMMARY OF CALCULATIONS:

Is this an Asphalt Plant (Yes/No)?

I = % isokinetics = 96.0 %

Cs = grain loading (dry) = 0.014 grains/dscf

E = particulate emission rate = 4.45 lbs/hr

$$\% \text{CO}_2 = 5.40 \%$$

$$\begin{aligned} \text{C12} &= \text{grain loading at 12\% CO}_2 \\ &= (12) * (\text{Cs}) / \% \text{CO}_2 = 0.032 \text{ grains/dscf} \end{aligned}$$

Does not apply to asphalt plants.

$$\begin{aligned} \% \text{ Excess Air} &= \\ &= \frac{(\% \text{O}_2 - \% \text{CO}) * 100}{(.264(\% \text{N}_2) - (\% \text{O}_2) - 0.5(\% \text{CO}))} = 122.4 \% \end{aligned}$$

CCAC

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

RUN 3

SUMMARY:
SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE:

#3

*Calculations
checked
on job's calculations.*

TEST #:

P.O.#

TEST DATE:

EQUIPMENT:

UNIT TESTED:

SITE PERSONNEL:

APCD PERSONNEL:

REPORT BY:

DATE:

APPROVED BY:

DATE:

C.W. RIDENOUR
SENIOR AIR POLLUTION CHEMIST

PARAMETERS:

MEASURED:

STACK GAS FLOW RATE (DSCFM):

38585

STACK GAS TEMPERATURE °F (AVG):

268

PRODUCTION RATE (AVG): tons/hr

RESULTS: Based upon APCD Method 5 Standards relating to the entire impinger catch.

TEST	PERMIT LIMIT	MEASURED	PERFORMANCE
RULE 54 DUST AND FUME	40.00 lb/hr	8.87 lbs/hr	PASSED

TEST REFERENCE:

San Diego Air Pollution Control District Quality Assurance Manual Method 5 for Particulate

SITE: 0

OPERATOR:

TEST DATE: 1/1/04

TEST: 0

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			
1	983.035	0.44	0.83	84	78	236	63	44.47
2	984.875	0.54	1.02	84	83	257	59	50.01
3	986.89	0.58	1.10	84	83	264	59	52.08
4	988.96	0.62	1.07	84	85	279	59	54.40
5	991.12	0.67	1.27	84	85	280	62	56.59
6	993.35	0.73	1.33	85	95	284	62	59.23
7	995.645	0.88	1.67	85	94	285	63	65.07
8	998.21	0.75	1.42	86	97	280	62	59.87
9	1000.55	0.85	1.63	85	96	282	63	63.82
10	1003.03	0.87	1.65	86	98	282	62	64.57
11	1005.55	0.68	1.29	86	97	262	62	56.31
12	1008.075	0.52	0.98	86	96	219	61	47.75
	1010.125							
1	1010.651	0.52	0.98	82	81	273	62	49.62
2	1012.625	0.55	1.04	83	87	277	57	51.17
3	1014.62	0.60	1.14	83	89	278	55	53.48
4	1016.78	0.63	1.19	84	92	279	56	54.84
5	1018.86	0.62	1.17	84	95	283	56	54.55
6	1021.02	0.64	1.21	84	94	278	58	55.23
7	1023.175	0.60	1.14	85	97	284	59	53.70
8	1025.31	0.74	1.40	87	97	282	59	59.55
9	1027.6	0.83	1.57	86	99	282	59	63.07
10	1030.02	0.87	1.65	86	99	279	60	64.44
11	1032.61	0.84	1.59	87	97	265	60	62.72
12	1035.02	0.25	0.47	87	97	152	60	31.44
	1036.576							

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
	53.015	0.66	1.24	85	92	268	60	55.33

DATA SUMMARY:

PRESSURES

P bar 30.09 in Hg

P static 0.02 in H2O

Ps 30.09 in Hg

AVERAGE TEMPERATURES

ts = 268 F

tm = 1/2(avg.t1+avg.t2) = 89 F

ti = 60 F

VOLUMES

Vm, meter 53.015 ft³

Vlc, impingers 338.0 ml

VAPOR PRESSURES

Vpw @ imp = 0.430 inHg

METER BOX PARAMETERS

$\Delta H@$ = 1.88 inH2O

ΔP = 0.66 inH2O

ΔH = 1.24 inH2O

METER BOX I.D.# 710989

NOZZLE AND PROBE

Dn = 0.249 in

An = Dn²* π /4 = .0487 in²

Cp = 0.840

Y = .9800

STACK MEASUREMENTS

STACK PARAMETERS

%CO2 5.40

Stack Diameter = 5.17 ft

%CO 0.00

Ao=Area stack = 20.97 ft²

%O2 12.00

%N2 82.60

Ø = sampling time 84 minutes

mn=particulate collect'd 0.0877 grams

CALCULATIONS:

		EQUATION NUMBER
corr Vwm = ((Vm'*Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = water volume correction at meter w/o silica gel =	0.00 ft ³	1
Vm std = (Vm'*Tstd*Pm)/(Pstd*Tm)-corr Vwm = dry meter volume corrected to STP	= 50.45 ft ³	2
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	= 30.18 in Hg	3
Tm= (t1+t2)/2 + 460 = meter temperature	= 548.5 °R	4
Ts = ts+460 = corrected stack temperature	= 727.6 °R	5
Ps= Pbar + (P static/13.6)= corrected stack pressure =	30.09 in Hg	6
Vw std = Vlc*Δ*R*Tstd/(Pstd*MwH2O)+corr Vwm = water volume at STP	= 15.95 ft ³	7
Bws = (Vw std)/(Vw std+Vm std)*100 = percent moisture	= 24.03 %	8
mn= grams of particulate (from laboratory sheet)	= 0.0877 grams	9
Cs = 15.43*mn/Vm std = grain loading (dry)	= 0.027 grains/dscf	10
Vm'= Vm*Y = Corrected dry gas meter volume	= 51.95 ft ³	11

$$M_d = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(N_2 + \text{inerts} + CO)$$

Dry gas molecular weight = 29.23 g/g*mole 12

$$M_s = M_d(1 - B_{ws}) + 18.0(B_{ws})$$

Stack gas molecular weight-wet basis = 26.53 g/g*mole 13

EQUATION
NUMBER

14 $v_s = 85.49 \cdot C_p \cdot ((T_s \cdot \Delta P) / (P_s \cdot M_s))^{.5}$ = stack velocity (ft/s) = 55.33

15 $Q_s = (v_s) \cdot A_o \cdot 60$ = stack flow rate (acfm) = 6.96E+04

16 $Q_{std} = 17.64 \cdot Q_s \cdot (1 - B_{ws}) \cdot P_s / T_s$ = flow rate at STP (dscfm) = 3.86E+04

17 $I = 144 \cdot 100 \cdot T_s \cdot (.002669 \cdot V_{lc} + (V_m' / T_m) \cdot P_m) / (60 \cdot \emptyset \cdot v_s \cdot P_s \cdot A_n)$
= isokinetic (%) = 96.43

18 $E = (0.00857) \cdot (Q_{std}) \cdot C_s$ = particulate emission rate (lbs/hr) = 8.87

SUMMARY OF CALCULATIONS:

Is this an Asphalt Plant (Yes/No)?

I = % isokinetics = 96.4 %

Cs = grain loading (dry) = 0.027 grains/dscf

E = particulate emission rate = 8.87 lbs/hr