AP42 Section: 11.1

Reference Number: 278

Title: Source Sampling For Particulate Emissions, R. E. Hazard Contracting Co., San Diego, CA,

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

October 3, 1990.

apcd
County of San Diego

R. J. Sommerville
Air Pollution Control Officer

May 13, 1991

R .E. Hazard Contracting Co.
Attention: Plant Superintendent
P.O. Box 229000
San Diego, CA 92122

SUBJECT: **RENEWAL TEST REPORT**

The enclosed test report is the result of testing done at your facility.

If you have any questions, please call me at (619) 694-3359.

C. W. Ridenour
Senior Air Pollution Chemist

CWR:jo

Enclosures

AIR POLLUTION CONTROL DISTRICT
9150 Chesapeake Drive, San Diego, California 92123-1095
(619) 694-3307 FAX (619) 694-2730

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

SUMMARY:
SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE: R.E. Hazard
10050 Black Mountain Rd.
San Diego, CA 92126

TEST #: 90276 P.O.# 442 TEST DATE 10/3/90

EQUIPMENT: Asphalt batch plant, Hot-mix (300-Ton/hr cap), Dryer, 109m btu/hr. Input capacity; Standard Havens baghouse, 9660 ft^2 cloth area; 50,000 scfm blower: suspended oil particle control; enclosure for three (3) astec hb 200 ton storage silos enclosed conveyor to silo load-in area; three silo batchers; one 10,000 cfm blower; a associated vent ducting to the plant knock-out box.

UNIT TESTED: Baghouse

SITE PERSONNEL: AL TILLY
APCD PERSONNEL: J. CAWYER, D. SHINA
REPORT BY: J. CAWYER DATE 1/7/91
APPROVED BY: C.W. Ridenour DATE: 1/9/91
C.W. RIDENOUR
SENIOR AIR POLLUTION CHEMIST

PARAMETERS:	MEASURED:
STACK GAS FLOW RATE (DSCFM):	27996
STACK GAS TEMPERATURE °F (AVG):	224
PRODUCTION RATE (AVG): tons/hr	285

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	11.69 lbs/hr	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 R.E. Hazard . The test was performed on the baghouse exhaust.

System Description:
This asphalt plant combines crushed rock and sand with hot asphalt oil in batch loads of 7000 lbs. The rock and sand are dried in a rotary dryer which is heated by natural gas. The exhaust from this dryer is vented 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:
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 48 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 electronic instrumentation.

SITE: R.E. Hazard

OPERATOR J. CAWYER

TEST DATE: 10/3/90

TEST: 90276

DATA SUMMARY: #

TRAVERSE POINT NUMBER	GAS METER READING (Vm), ft3	PRESS. DIFF. ACROSS PITOT TUBES	PRESS. DIFF. ACROSS ORIF.	DRY GAS METER TEMPERATURE		STACK TEMP	IMP. TEMP	STACK FLOW (velocity)
				INLET	OUTLET			
	787.500		ACTUAL					
1	789.341	1.00	1.60	84	112	218	60	67.59
2	791.183	1.00	1.55	84	115	219	56	67.64
3	792.96	1.10	1.80	83	119	212	56	70.58
4	794.783	1.10	1.80	84	110	213	60	70.63
5	796.571	1.00	1.60	84	110	213	59	67.34
6	798.394	1.00	1.60	85	116	217	58	67.54
7		0.85	1.40	85	118	219	59	62.36
8	801.809	0.80	1.30	85	119	219	60	60.50
9	803.388	0.75	1.20	85	119	218	60	58.54
10	804.964	0.75	1.20	85	120	220	60	58.62
11	806.506	0.70	1.10	86	120	217	59	56.51
12	807.84	0.50	0.80	86	120	214	59	47.65
13	809.266	0.65	1.00	86	100	228	66	54.89
14	810.69	0.65	1.00	87	112	217	57	54.45
15	812.149	0.65	1.00	86	116	229	57	54.93
16	813.608	0.70	1.10	86	117	229	56	57.01
17	815.257	0.70	1.10	86	119	230	57	57.05
18	817.02	0.90	1.40	86	120	230	56	64.69
19	819.235	1.45	2.30	86	123	248	55	83.17
20	821.627	1.65	2.60	87	125	256	55	89.22
21	823.966	1.60	2.60	88	126	230	55	86.25
22	826.038	1.30	2.10	88	125	230	54	77.75
23	828.105	1.15	1.80	88	125	222	55	72.70
24	829.891	0.80	1.30	88	124	217	57	60.41

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	tl	vs
	42.391	0.95	1.51	85.75	117.92	223.54	57.75	65.34

DATA SUMMARY:

PRESSURES

P bar 29.52 in Hg

P static -0.80 in H2O

Ps 29.46 in Hg

AVERAGE TEMPERATURES

ts = 224 F

tm = 1/2(avg.t1+avg.t2) = 102 F

ti = 58 F

VOLUMES

Vm, meter 42.391 ft^3

Vlc, impingers 258.6 ml

VAPOR PRESSURES

Vpw @ Imp = 0.4858 inHg

METER BOX PARAMETERS

ΔH@ = 2.6123 inH2O

ΔP = 0.95 inH2O

ΔH = 1.51 inH2O

METER BOX I.D.# D337

NOZZLE AND PROBE

Dn = 0.205 in

An = Dn^2*π/4 = .0330 in^2

Cp = 0.848

Y = .9796

STACK MEASUREMENTS

%CO2 4.80

%CO 0.00

%O2 14.20

%N2 81.00

Ø = sampling time 72 minutes

mn=particulate collect'd 0.1200 grams

STACK PARAMETERS

Stack Diameter = 4.00 ft

Ao=Area stack = 12.57 ft^2

CALCULATIONS:

		UNITS		EQUATION NUMBER
corr Vwm = ((Vm'*Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = water volume correction at meter w/o silica gel	=	0.64	ft^3	1
Vm std = (Vm'*Tstd*Pm/(Pstd*Tm))-corr Vwm = dry meter volume corrected to STP	=	38.01	ft^3	2
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	=	29.63	in Hg	3
Tm= (t1+t2)/2 + 460 = meter temperature	=	561.8	°R	4
Ts = ts+460 = corrected stack temperature	=	683.5	°R	5
Ps= Pbar + (P static/13.6)= corrected stack pressure	=	29.46	in Hg	6
Vw std = Vlc*∂*R*Tstd/(Pstd*MwH2O)+corr Vwm = water volume at STP	=	12.84	ft^3	7
Bws = (Vw std)/(Vw std+Vm std)*100 = percent moisture	=	25.25	%	8
mn= grams of particulate (from laboratory sheet)	=	0.1200	grams	9
Cs = 15.43*mn/Vm std = grain loading (dry)	=	0.049	grains/d dscf	10
Vm'= Vm*Y = Corrected dry gas meter volume	=	41.53	ft^3	11
Md=0.440(%CO2)+0.320*(%O2)+0.280(N2+inerts+CO) Dry gas molecular weight	=	29.34	g/g*mole	12
Ms=Md*(1-Bws)+18.0*(Bws) Stack gas molecular weight-wet basis	=	26.47	g/g*mole	13

		UNITS	EQUATION NUMBER
vs= 85.49*Cp*((Ts*ΔP)/(Ps*Ms))^.5 = stack velocity	65.34	(ft/s)	14
Qs = (vs)*Ao*60 = stack flow rate	49262	(acfm)	15
Qstd =17.64*Qs*(1-Bws)*Ps/Ts =flow rate at STP	27996	(dscfm)	16
I = 144*100*Ts*(.002669*Vlc+(Vm'/Tm)*Pm)/ (60*Ø*vs*Ps*An) =isokinetic	103.29	(%)	17
E = (0.00857)*(Qstd)*Cs = particulate emission rate	11.69	(lbs/hr)	18

SUMMARY OF CALCULATIONS:

Enter the type of plant. (Asphalt/Combustion) Asphalt

I = % isokinetics = 103.3 %

Cs = grain loading (dry) = 0.049 grains/dscf

E = particulate emission rate = 11.69 lbs/hr

% CO2 = 4.80 %

NOMENCLATURE:

* multiplication
/ division
^ exponentiation
Vm sample gas volume, uncorrected = (ft^3)
Vm sample gas volume, corrected = Vm*Y = ft^3
ΔP root mean pitot tube differential pressure
= (summation(press.diff. across pitot tubes^.5)/number entries)^2 = (in H2O)
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*Cp*(Ts*ΔP/(Ps*Ms))^.5 = (ft/s)
Pbar = barometric pressure = (in Hg)
Pstatic = stack static pressure = (in Hg)
Ps = Absolute stack pressure = Pbar +(Pstatic/13.6) = (in Hg)
tm = dry gas meter temperature =(t1+t2)/2 = (°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 @ 68ºF and 29.92 in Hg
Dn = nozzle diameter = (in)
An = nozzle area = π*Dn^2/4 = (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 diameter^2*π/4 if round; length *width if rectanglar = (ft^2)
Corr Vwm = ((Vm'*Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = (ft^3)
Pm = absolute meter pressure = Pbar+(ΔH/13.6) = (in Hg)
Tstd = temperature at standard conditions = (528°R)
Tm = dry gas meter temperature =(t1+t2)/2+460 = (°R)
Pstd = pressure at standard condition = (29.92 in. Hg)
Vm std = dry corrected volume of meter = Vm'*T std*Pm/(Pstd*Tm)-corr Vwm = (ft^3)
Ts = stack temperature = (°R)
Vw std = water volume at STP = Vlc*∂*R*Tstd/(Pstd*MwH2O) = (ft^3)

NOMENCLATURE: cont.

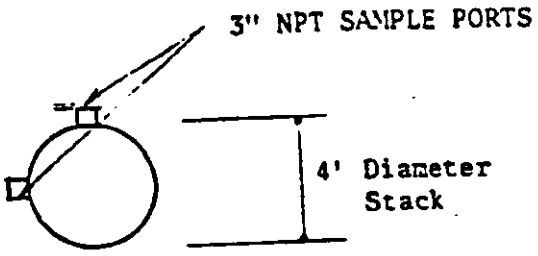
∂ = density of water at STP = 0.002201 = (lb/ml)
R = ideal gas constant = 21.85 in. Hg*ft^3/°R*lb*mole
Md = dry stack gas molecular weight = 0.32*%O2+0.44*%CO2+0.28(100-%O2-%CO2)
= (g/g*mole)
Bws = fractional stack gas moisture content = (Vw std+Corr Vwm)/(Vwstd+Corr Vwm+Vm std)
= (%/100)
Cs = grain 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:

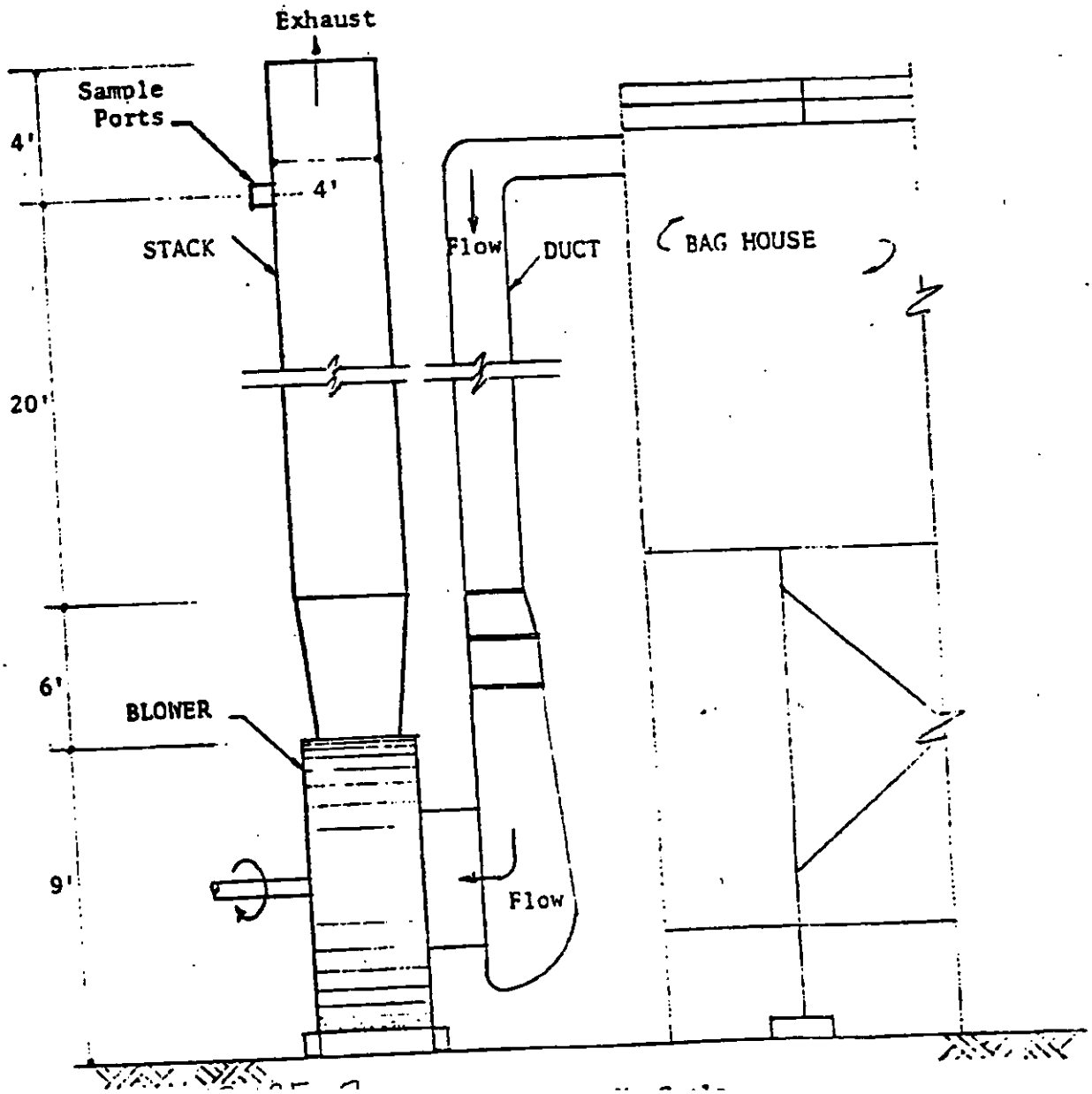
0.00847 lb/(gr*min/hr) = 1 lb/7000grains*60 min/hr
13.6 in H2O/in Hg
17.68 °R/in Hg
60 sec/min
32 g/g*mole = O2 molecular weight
44 g/g*mole = CO2 molecular weight
28 g/g*mole = N2 molecular weight
18 g/g*mole = H2O molecular weight
85.49 (ft/sec)*(lb*in Hg/(lb*mole*°R*in H2O))^.5
0.04707 = ft^3/ml
460 (demensionless) = conversion °F to °R
144 in^2/ft^2
15.43 gr/g
0.002669 in Hg*ft^3/(°R*ml)

SITE DESCRIPTION

HAZARD ASPHALT



Top View



QC DNS.

San Diego County APCD Method 5 Lab Sheet

SITE = _____

TEST # = _____

VOLUMES

(1) IMPINGER VOLUMES

	final		initial		Δ
#1	561.10 g	-	437.20 g	=	123.90 g
#2	571.80 g	-	441.90 g	=	129.90 g
#3	339.25 g	-	335.30 g	=	3.95 g
#4	359.12 g	-	358.30 g	=	0.82 g

† TOTAL VOLUME LIQUID COLLECTED = 258.57 ml

comments:

The acetone and DI water rinses were kept separate by front and back half .
Blanks were run on both the acetone and DI water solvents.

† The density of water is 1 g/ml

SITE = _____

TEST # = _____

(2) BEAKER RINSES

	ACETONE	WATER	
BKR ID =	174/172	188&191/218	
FRONT HALF =	100.00 ml	250.00 ml	ml
F.H. RINSES =	30.00 ml	100.00 ml	ml
BACK HALF =	200.00 ml	350.00 ml	ml
B.H. RINSES =	15.00 ml	84.00 ml	ml
SEPARATORY FUNNEL RINSE =	0.00 ml	IMPINGERS = 200.00 ml	

total acetone =	345.0 ml	total water =	984.0 ml	total Pet Ether =	0.0 ml

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

SITE = _____

TEST # = _____

STANDARDS

volume Ac = 418.0 ml volume water = 561.0 ml volume = _____ ml

	ACETONE	WATER	
BKR ID =	179	224	N/A
f:	30.7647 g	50.1702 g	_____ g
i:	30.7624 g	50.1689 g	_____ g
Δ:	0.0023 g	0.0013 g	0.0000 g

Limits:

limit for acetone is 10.0 µg/ml (10.0 * 10^-6 g/ml)
limit for water is 4 µg/ml (4 * 10^-6 g/ml)

The Acetone **PASSED**	The Water **PASSED**	The **PASSED**
5.5024E-06 g/ml	2.3173E-06 g/ml	0 g/ml

SITE = _____

TEST # = _____

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

ACETONE		WATER			
FRONT HALF =	0.00071531 g	FRONT HALF =	0.00081105 g	FRONT HALF =	0.000000 g
BACK HALF =	0.00118301 g	BACK HALF =	0.00100570 g	BACK HALF =	0.000000 g
SEP. FUNNEL =	0.00000000 g	IMPINGERS =	0.00046346 g		

tot. front half = 0.001526 g

total back half = 0.002189 g

sep. funnel + impingers = 0.000463 g

total grams from solvents = **0.0042** g

SITE = _____

TEST # = _____

	FRONT HALF	BACK HALF
ACETONE		
BKR ID =	174	172
f:	29.0641 g	30.4677 g
i:	29.0572 g	30.4632 g
Δ:	0.0069 g	0.0045 g

WATER			
BKR ID =	188	218	191
f:	28.3783 g	48.5069 g	27.1414 g
i:	28.3418 g	48.4489 g	27.1241 g
Δ:	0.0365 g	0.0580 g	0.0173 g