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Title: Report Of Air Pollution Source Testing For Particulate Matter At Calmat (Industrial Asphalt Corp.) Pala Indian Reservation, Pala, CA,

Engineering Science, Irwindale, CA,

February 25, 1990.

REPORT OF AIR POLLUTION SOURCE TESTING FOR PARTICULATE MATTER

Conducted on:

December 12, 1990

Conducted at:

CALMAT (INDUSTRIAL ASPHALT CORPORATION)
PALA INDIAN RESERVATION, PALA, CALIFORNIA

Submitted on:

February 25, 1991

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REPORT OF AIR POLLUTION SOURCE TESTING FOR PARTICULATE MATTER AT CALMAT (INDUSTRIAL ASPHALT CORPORATION) PALA INDIAN RESERVATION, PALA, CA

INTRODUCTION

On December 12, 1990 Engineering-Science,(ES) Pasadena, CA, conducted air pollution source testing on an asphalt batch plant operated by Industrial Asphalt Corporation at their facility at Pala, California. The source tested was the rotary dryer baghouse exhaust stack. The unit is operated under Authority to Construct, Application No. 890709, granted by the San Diego Air Pollution Control District (SDAPCD). Testing was conducted to determine the emission rate of particulate matter.

The testing was coordinated by Mr. Dwight Beavers and Paul Mason of Industrial Asphalt. The testing was observed by Ms. C.W. Ridenour and Mr. G.D. Smith of SDAPCD. Also, Mr. Andy Segal and Mr. Dean Carlson of the SDAPCD did the engineering observation report and production rate sample calculations which are located in Appendix D. The ES testing team was comprised of Messrs. Dennis Bautista (team leader), Dwight J.Wieman, and Nick Nielsen

PROCESS DESCRIPTION

Industrial Asphalt Corporation, a division of Calmat operates a Hot Asphalt Batch Plant at the Pala Indian Reservation in Pala, California.

Aggregate supplied by the Calmat quarry located adjacent to the plant is carried via belt conveyor to the batch plant. To remove moisture, it is heated and dried in a diesel oil fired rotary dryer. This hot aggregate is then mixed with hot asphalt oil to form a "batch". This "batch" is either poured into waiting trucks or stored in silos. The plant can produce a maximum of 225 tons per hour, but normal operating rates are about 200 tons per hour. During the particulate testing the average production rate was 217.8 tons per hour. Figure 1 is a representation of the facilities process diagram.

TEST METHODOLOGY

Location and Number of Traverse Points

EPA Method 1 was used to determine the number and location of the traverse points. A 24 point traverse sampling was selected, utilizing two ports.

A cyclonic flow check was conducted at each traverse point. An S-type pitot tube connected to an inclined oil manometer was used for the determination. The pitot

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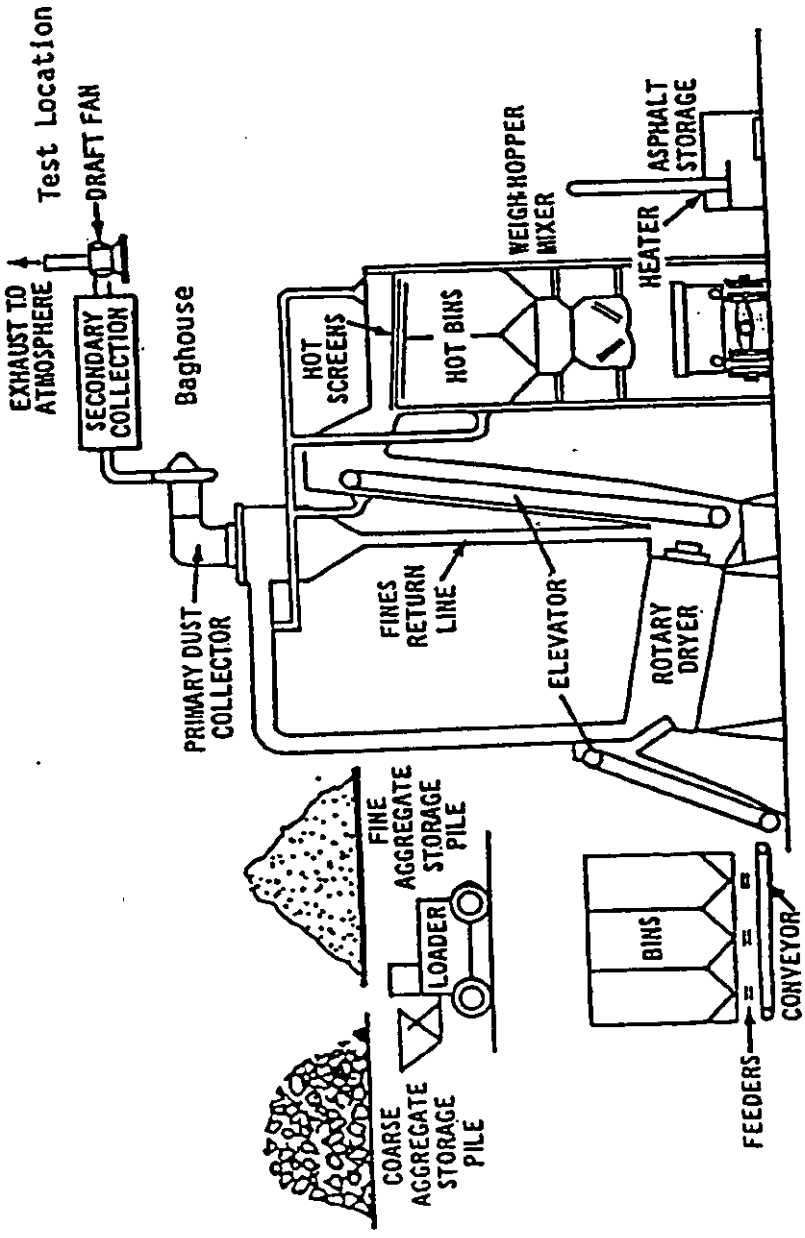
PROCESS DIAGRAM



tube was positioned so the planes of the face openings were perpendicular to the stack cross-sectional plane. This was referred to as the "0^{o}" reference position, the manometer should read zero to indicate no cyclonic flow. If the manometer did not read zero the pitot tube is rotated until a zero reading is obtained. The angle of rotation was measured to the nearest degree. The average of all the rotation angles were 15^{o}. Although cyclonic flow was more than the 10^{o} limit, the test was allowed by SDAPCD.

Stack Velocity and Temperature Traverse

EPA Method 2 was used to determine the velocity of the stack gas and stack gas temperature at the time of the testing. An S-type pitot tube connected to an inclined oil manometer and a K-type (chomel-alumel) thermocouple connected to a temperature read out device were used to traverse the 24 sampling points. The nozzle size required to achieve isokinetic sampling rates were calculated from the measurements.

Stack Gas Molecular Weight

The carbon dioxide (CO_2), oxygen (O_2), and carbon monoxide (CO) concentrations in the stack gas were determined from integrated bag samples collected in Tedlar bags and analyzed by Orsat in accordance with EPA Method 3.

Stack Gas Moisture Content

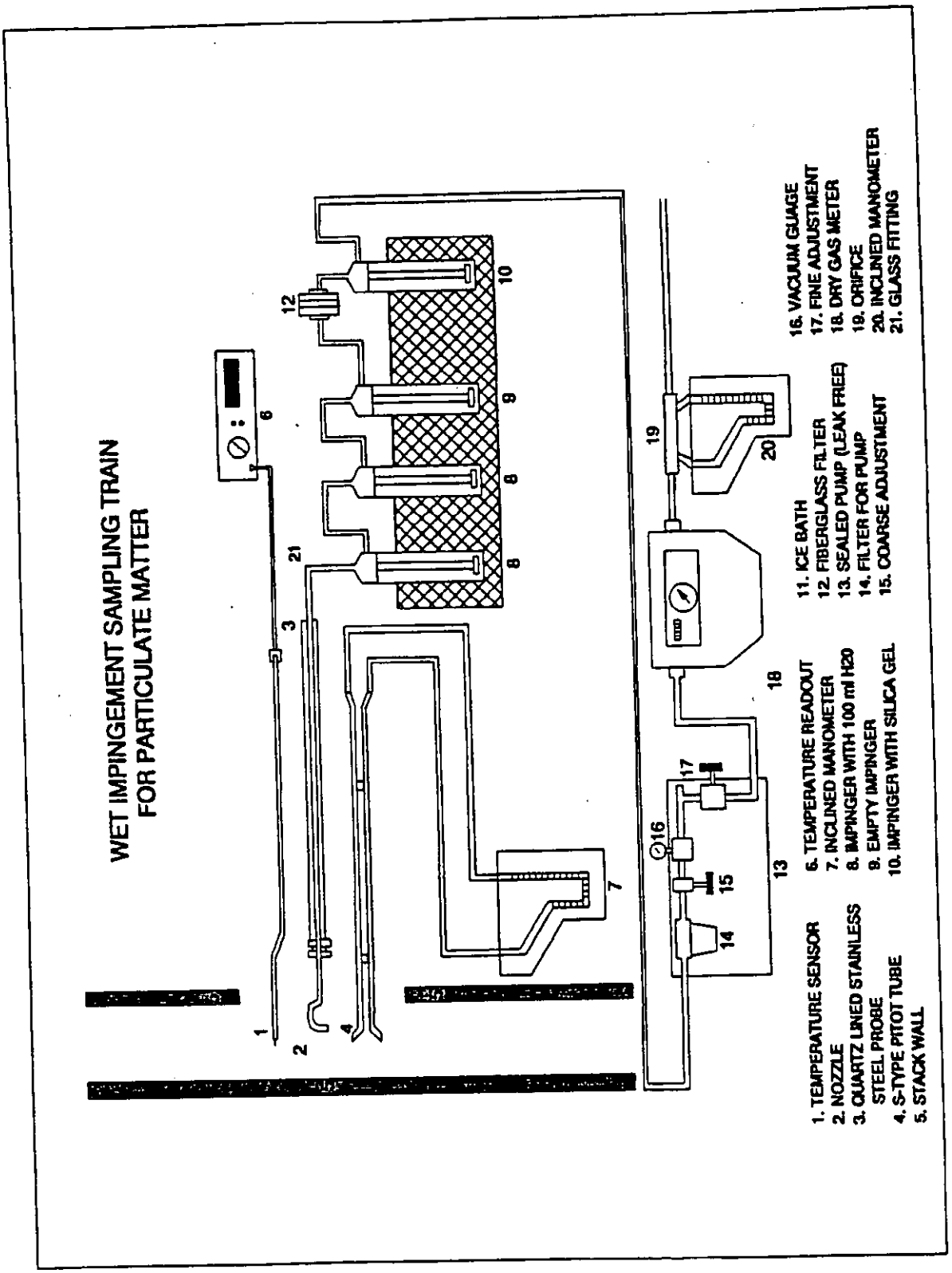
The moisture content of the stack gas was determined in conjunction with the particulate matter train. The moisture was determined gravimetrically by the weight gain in each impinger in accordance with EPA Method 4.

Particulate Matter

The particulate matter sampling train was based on EPA Method 5, modified to exclude the front end filter and include a back end filter to comply with the SDAPCD testing guidelines.

The sampling train was comprised of a quartz lined heated probe connected with a short glass "L" shape adaptor to four impingers in series. The first and second impingers were each charged with 100 ml. of deionized water. The third impinger was empty and the fourth impinger contained approximately 400 grams of indicating silica gel. A fiberglass filter was located between the third and fourth impingers and was operated at ambient temperature. Figure 2 is a diagram of the particulate matter sampling train.

FIGURE 2


WET IMPINGEMENT SAMPLING TRAIN
FOR PARTICULATE MATTER
1. TEMPERATURE SENSOR
2. NOZZLE
3. QUARTZ LINED STAINLESS STEEL PROBE
4. S-TYPE PITOT TUBE
5. STACK WALL
6. TEMPERATURE READOUT
7. INCLINED MANOMETER
8. IMPINGER WITH 100 ml H20
9. EMPTY IMPINGER
10. IMPINGER WITH SILICA GEL
11. ICE BATH
12. FIBERGLASS FILTER
13. SEALED PUMP (LEAK FREE)
14. FILTER FOR PUMP
15. COARSE ADJUSTMENT
16. VACUUM GUAGE
17. FINE ADJUSTMENT
18. DRY GAS METER
19. ORIFICE
20. INCLINED MANOMETER
21. GLASS FITTING

Three particulate matter trains were run for a period of 72 minutes each. The trains were leak checked prior to and at the conclusion of each run. The nozzle, probe, and glass adaptor were each rinsed with acetone and deionized water. The liquid gain in the impingers were determined. The liquids in the impingers were recovered and the impingers were rinsed with deionized water and acetone. The filter was recovered and placed in a tared petri dish, and the front half of the filter holder was rinsed with deionized water and acetone. The weight gain in the silica gel impinger was determined with an electronic scale Ohaus, Model #1500.

Analyses were performed both by ES and SDAPCD laboratories. One complete set of samples (Run #1, with blanks) was turned over to the SDAPCD for analysis. The rest of the samples (Run #2 and #3) were analyzed at the ES laboratory. Analysis involved the drydown of the nozzle-probe washes, liquid catch, and filter. An organic extraction with petroleum ether was performed on the liquid catch as specified by SDAPCD analytical procedures.

QUALITY ASSURANCE

The Quality Assurance procedures that were employed for this project were based on the guidelines published by the EPA in "Quality Assurance Handbooks for Air Pollution Measurement Systems", Volume III, EPA-600/4-77-0276.

Field Testing Quality Assurance

Prior to and at the conclusion of field sampling, each meter box dry gas meter and orifice was calibrated against a wet test meter. The results of orifice calibration were expressed as the delta H@ at various pressure drops (in inches of water) to achieve 0.75 CFM, as specified in EPA publication APTD-0576. The dry gas meter accuracy was expressed as gamma (Y) and was determined as the ratio between the meter box dry gas meter and the wet test meter.

Exhaust gas, filter, meter and impinger temperatures were monitored using a type-K thermocouple connected to an Omega Model 601 digital readout.

Exhaust gas velocity was determined for establishing isokinetic sampling rates and volumetric flow using an S-type pitot tube attached to the probe as specified in EPA Method 2.

At the conclusion of each test run the sampling train was leak checked at a vacuum equal to or greater than the highest vacuum observed during the test runs. Each sampling train was considered leak free since the leak rate was less than 0.02 CFM.

At the beginning of the field testing program, a probe wash and flexible line wash were obtained and identified as field blanks. The probe wash technique, all sampling and recovery reagents, sample containers and sample handling used for the test runs were identical to those used to obtain the field blanks.

Laboratory Quality Assurance

Filter drydown weights were obtained using an analytical balance. Prior to conducting weighings, the accuracy of the balance was checked with a 100 mg Class S weight. All weighings were conducted in an environmentically controlled balance room maintained at 70 ^{O}F, with a relative humidity of less than or equal to 50%. All samples were conditioned and desiccated before weighing and a constant weight was defined as +/-0.5 mg between consecutive weighings with an elapsed time between weighings greater than 6 hours. All weight data are recorded in a permanently bound notebook maintained in the balance room.

All reagents for charging the sample train and sample recovery were ACS reagent grade materials. ES participates in the EPA inter-laboratory quality assurance program.

Sample Custody

A specific Chain-of-Custody procedure was used for this project. The elements of this plan include:

- o Train component identification
- o Sample identification
- o Sample labels
- o Documentation
- o Chain of custody forms

The sequence of activities concerned with sample custody together with identification and tracking procedures are described below:

1. Sample train prepared by the laboratory including filter holders, impingers, and other sampling equipment identified by tags and codes.

2. Sample train issued to test team and master log filled out. Sample I.D. number stickers issued according to test identification code.

3. Train returned to recovery area when a valid sample is obtained. Sample train accompanied by all field data sheets.

4 Recovery team recoved samples using appropriate containers, affixed sample I.D. labels to sample containers, to master log, to field data sheet, and to train recovery sheet.

5. All samples returned to ES Pasadena laboratory with Chain-of-Custody form.

6. Samples transferred or shipped to appropriate laboratory with Chain-of-Custody form.

7. Samples examined at each transfer point for integrity (broken containers, loss in liquid, or seal integrity).

Upon completing the required analysis, the analyst returned the Chain-of-Custody form along with results to ES. All samples were accounted for by the ES laboratory supervisor and the project manager. Each laboratory identified samples in its own laboratory notebooks by the ES I.D. number as well as any internal identification. Notebooks are retained by each laboratory according to usual laboratory practices.

RESULTS

The results of the testing are presented in Tables 1 and 2. The samples from Run #1 and reagent/filter blanks were given to a representative of the SDAPCD. Data from Run #1 and the averages from all three runs are not included in the tables at the request of SDAPCD. Tables 3 and 4, are summaries of plant process data, and production rate. Supporting data and process calculations of the production rate were provided to ES by Andy Segal and Dean Carlson of SDAPCD and are included in the Appendix. Additional supporting data are located in the Appendix.

Table 1
Summary of Exhaust Gas Flow Data
Baghouse Exhaust Stack
Pala Asphalt Plant
Pala, California
December 12, 1990

Parameter	Results		
	Run 1	Run 2	Run 3
Time (hours)		1105-1222	1318-1439
Stack Temp. (^{o}F)		204	193
Moisture (%)		19.6	22.2
Oxygen (%)		14.1	13.4
Carbon Dioxide (%)		4.5	5.5
Molecular Wt. (dry)		29.28	29.42
Molecular Wt. (wet)		27.19	26.88
Velocity (fps)		52.42	51.52
Flow			
ACFM		29,901	29,385
DSCFM		18,536	17,924

Note: 1) For all **Run #1** data, please see SDAPCD report.

Table 2
Summary of Particulate Matter Flow Data
Baghouse Exhaust Stack
Pala Asphalt Plant
Pala, California
December 12, 1990

Parameter		Results Run 1	Run 2	Run 3
Time (hours)			1105-1222	1318-1439
Front Half	(gr/DSCF)		0.0028	0.0026
	(gr/ACF)		0.0017	0.0016
	(lb/hr)		0.44	0.41
Back Half	(gr/DSCF)		0.0077	0.0072
	(gr/ACF)		0.0048	0.0044
	(lb/hr)		1.22	1.10
Total	(gr/DSCF)		0.0105	0.0098
	(gr/ACF)		0.0065	0.0060
	(lb/hr)		1.66	1.51

Note: 1) For all Run #1 data, please see SDAPCD report.

2) Particulates in organic fractions were less than 0.01 mg.

Table 3
Summary of Production and Operational Data
Baghouse Exhaust Stack
Pala Asphalt Plant
Pala, California
December 12, 1990

Production Results					
Time	Baghouse Delta P (inch water)	Material Temp. (^{O}F)	Baghouse Inlet Temp (^{O}F)	Damper Position (Deg.)	Exhaust Fan Ammeter (Amps)
0750	Start test/Production count.				
0830	4.8	291	230	62	85
0900	4.9	294	225	62	85
1020	4.9	293	228	65	85
1200	5.0	296	220	65	85
1430	4.9	294	212	66	85
1439	End test/Production count.				
1500	5.0	292	219	66	85
Average	4.9	294	223	64	85

Note: Baghouse inlet temperature operational limit was 275 ^{O}F. (Nomex bag material design limit is 420 ^{O}F. Production total time was 6.82 hrs (0750 to 1439).

Table 4
Summary of Batch Mix Type
Baghouse Exhaust Stack
Pala Asphalt Plant
Pala, California
December 12, 1990

	Batch Results				
Type	3/8" (lbs)	1/2" (lbs)	3/4" (lbs)	Berm (lbs)	Sheet (lbs)
Sand	1,146	908	778	1,138	1,816
3/8 rock	714	756	474	710	NA
1/2 rock	NA	209	380	NA	NA
3/4 rock	NA	NA	247	NA	NA
Filler	20	19	19	20	20
Oil AR 4000	120	108	102	NA	164
Oil AR 8000	NA	NA	NA	132	NA
Total	2,000	2,000	2,000	2,000	2,000

APPENDICES

APPENDIX A

FIELD DATA

Engineering-Science, Pasadena, California

Plant: Pala
Source: BH Stack
Date: 12/12/90
Run: 2 1105-1222
Standard Temp = 60 deg F Standard Press = 29.92 in Hg

FLOW DATA

STACK DIAMETER (inches)	41.75
STACK CROSS-SECTIONAL AREA (sq feet)	9.51
BAROMETRIC PRESSURE (inches Hg)	29.42
OXYGEN CONTENT (%)	14.1
CARBON DIOXIDE CONTENT (%)	4.5
MOISTURE CONTENT (%)	19.6
STACK TEMPERATURE (deg F)	204
STACK STATIC PRESSURE (inches water)	0.37
DRY STACK GAS MOLECULAR WEIGHT	29.28
VELOCITY PRESSURE (sq rt inches water)	0.80
PITOT TUBE CORRECTION FACTOR	0.84
VELOCITY (ft per sec)	52.42
EXHAUST GAS FLOW RATE (ACFM)	29,901
EXHAUST GAS FLOW RATE (DSCFM)	18,536

SAMPLING DATA

DRY GAS VOLUME SAMPLED (DCF)	48.509
DRY GAS VOLUME SAMPLED (DSCF)	45.989
DRY GAS METER TEMPERATURE (deg F)	76
DRY GAS METER GAMMA	0.99
AVERAGE ORIFICE PRESSURE (inches water)	1.55
TOTAL RUN TIME (min)	72
NOZZLE DIAMETER (inches)	0.250
ISOKINETIC (%)	96.3

LABORATORY DATA

MOISTURE RECOVERED (mls)	240.60
PARTIC. FROM NOZ., PROBE & WASHES (mg)	7.60
PARTICULATE FROM FILTER (mg)	0.70
PARTICULATE FROM IMPINGERS (mg)	22.90

PARTICULATE DATA

FRONT HALF	(gr/DSCF)	0.0028
	(gr/ACF)	0.0017
	(lb/hr)	0.44
BACK HALF	(gr/DSCF)	0.0077
	(gr/ACF)	0.0048
	(lb/hr)	1.22
TOTAL	(gr/DSCF)	0.0105
	(gr/ACF)	0.0065
	(lb/hr)	1.66

Engineering-Science, Pasadena, California

Plant: Pala
Source: BH Stack
Date: 12-12-90
Run: 3 PM 1318-1439
Standard Temp = 60 deg F Standard Press = 29.92 in Hg

FLOW DATA

STACK DIAMETER (inches)	41.75
STACK CROSS-SECTIONAL AREA (sq feet)	9.51
BAROMETRIC PRESSURE (inches Hg)	29.42
OXYGEN CONTENT (%)	13.4
CARBON DIOXIDE CONTENT (%)	5.5
MOISTURE CONTENT (%)	22.2
STACK TEMPERATURE (deg F)	193
STACK STATIC PRESSURE (inches water)	0.37
DRY STACK GAS MOLECULAR WEIGHT	29.42
VELOCITY PRESSURE (sq rt inches water)	0.79
PITOT TUBE CORRECTION FACTOR	0.84
VELOCITY (ft per sec)	51.52
EXHAUST GAS FLOW RATE (ACFM)	29,385
EXHAUST GAS FLOW RATE (DSCFM)	17,924

SAMPLING DATA

DRY GAS VOLUME SAMPLED (DCF)	46.476
DRY GAS VOLUME SAMPLED (DSCF)	44.556
DRY GAS METER TEMPERATURE (deg F)	70
DRY GAS METER GAMMA	0.99
AVERAGE ORIFICE PRESSURE (inches water)	1.51
TOTAL RUN TIME (min)	72
NOZZLE DIAMETER (inches)	0.250
ISOKINETIC (%)	96.3

LABORATORY DATA

MOISTURE RECOVERED (mls)	272.90
PARTIC. FROM NOZ., PROBE & WASHES (mg)	7.60
PARTICULATE FROM FILTER (mg)	0.01
PARTICULATE FROM IMPINGERS (mg)	20.70

PARTICULATE DATA

FRONT HALF	(gr/DSCF)	0.0026
	(gr/ACF)	0.0016
	(lb/hr)	0.41
BACK HALF	(gr/DSCF)	0.0072
	(gr/ACF)	0.0044
	(lb/hr)	1.10
TOTAL	(gr/DSCF)	0.0098
	(gr/ACF)	0.0060
	(lb/hr)	1.51

ES ENGINEERING-SCIENCE COMPANIES

Particulate Matter #2

FIELD DATA

K = 2.4

PAGE 1 OF 2

Plant CAL MAT PACA
Date 12-12-90
Test Site Stack outlet
Run Number #2, P.M.
Operator N.N. D.J.

Ambient Temp 70°
Barometer 29.42
Stack Pressure 7.37
Stack H2O ± 20
Stack Dia 41.75

Meter ΔH@ 1.983
Meter Gamma .785
Meter Box I Brown II
Nozzle Diameter .248" ± .25
Probe Length 5½ ft

Probe Mat'l Quartz
Filter Number 091146
Samp Box I —
PRE LEAK 0.014 @ 15" Hg
POST-LEAK Orsat, impinger Both tried O.K.

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	TEMPERATURES METER INLET	TEMPERATURES METER OUT	TEMPERATURES IMPINGER	TEMPERATURES FILTER	PUMP VAC. "Hg
1	6	1105	983.290	.55	1.32	1.3	213	85	83	63	N/A	3
2	3	1108	985.3	.61	1.46	1.5	214	80	79	60		3
3	6	1111	987.3	.69	1.66	1.7	210	81	79	56		3
4	9	1114	989.3	.74	1.77	1.8	210	81	79	54		3
5	12	1117	991.5	.73	1.75	1.8	209	81	78	51		4
6	15	1120	993.7	.74	1.77	1.8	207	80	77	49		3
7	18	1123	996.0	.68	1.63	1.6	203	79	76	49		3
8	21	1126	998.0	.62	1.49	1.5	201	77	76	51		3
9	24	1129	000.0	.60	1.44	1.4	199	77	75	51		3
10	27	1132	002.0	.57	1.37	1.4	197	77	74	52		3
11	30	1135	003.9	.59	1.42	1.4	197	77	74	58		3
12	33	1138	5.8	.53	1.27	1.3	199	77	75	54		3
	36	1141	7.681		port	Many						
AVERAGE /SUM												

ES ENGINEERING-SCIENCE COMPANIES

#2 Particulate meter

K = 2.4

Plant CAL MAT LACA
Date 12-12-90
POST LEAK RATE:

Run Number #2 P.M
Operator D.J. N.N

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H20)		TEMPERATURES					PUMP VAC. "Hg
					Desired	Actual	STACK (Ts)	METER INLET	METER OUT	IMPINGER	FILTER	
1	36	1147	7,681	.59	1.42	1.4	201	75	73	60	NA	1
2	39	1150	10.0	.62	1.49	1.5	204	77	73	56		1
3	42	1153	11.6	.66	1.58	1.6	206	78	73	55		1
4	48	1156	13.7	.65	1.56	1.6	206	78	73	52		1
5	48	1156	13.7	0.69	1.65	1.7	205	77	72	51		1
6	51	1201	17.8	0.67	1.61	1.6	204	77	72	52		1
7	54	1204	19.9	0.69	1.65	1.7	203	77	72	53		1
8	57	1207	21.9	0.67	1.61	1.6	201	77	72	54		1
9	60	1210	23.9	0.66	1.58	1.6	200	77	72	54		1
10	63	1213	25.9	0.66	1.58	1.6	200	76	72	54		1
11	66	1216	27.8	0.62	1.49	1.5	200	77	72	53		1
12	69	1219	29.8	0.58	1.39	1.4	199	77	72	54		
	72	1222	31.799	END TEST								
AVERAGE /SUM	72		48.509	0.80		1.55	204	76				

ES ENGINEERING-SCIENCE COMPANIES

#7 P.M. K = 2.4

FIELD DATA

PAGE 1 OF 2

Plant CAL MAT DACA
Date 12-12-90
Test Site Stack Outlet
Run Number #3, 1.m.
Operator D.J., N.N

Ambient Temp 70°
Barometer 29.42
Stack Pressure -.37
Stack H2O % 20%
Stack Dia 41.75"

Meter Alle 1.982
Meter Gamma .985
Meter Box # Dawn II
Nozzle Diameter .2487 ≈ 1/4
Probe Length 5½ ft

Probe Mat'l Quartz
Filter Number 091146
Samp Box # —
PRE LEAK 0.003
POST LEAK 0.002 @ 16" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	TEMPERATURES METER INLET	TEMPERATURES METER OUT	TEMPERATURES IMPINGER	TEMPERATURES FILTER	PUMP VAC. "Hg
1	0	1318	31.877	.56	1.34	1.3	195	69	68	64	N/A	7
2	3	1321	33.7	.62	1.47	1.5	194	69	68	63		7
3	6	1324	35.7	.77	1.85	1.9	195	70	69	62		14
4	9	1327	37.5	.72	1.73	1.7	198	71	69	61		14
5	12	1330	39.6	.74	1.78	1.8	199	72	69	59		14
6	15	1333	41.6	0.76	1.82	1.8	198	72	69	56		15
7	18	1336	43.8	0.65	1.56	1.6	196	72	69	57		14
8	21	1339	45.7	0.61	1.46	1.5	192	71	69	57		14
9	24	1342	47.8	0.58	1.39	1.4	190	72	69	57		14
10	27	1345	49.7	0.53	1.27	1.3	188	72	69	56		9
11	30	1348	51.6	0.44	1.06	1.1	188	72	69	55		8
12	33	1351	53.4	0.42	1.01	1.0	189	73	69	55		
	36	1354	55.035	Pert Change								
AVERAGE /SUM												

ES ENGINEERING-SCIENCE COMPANIES

1:13 PM

Pr = 2.4

pr leak 0.000 @ 15 in Hg

Plant Cal-Mat - Pad 9
Date 12-12-90
POST LEAK RATE 0.002 @ 15" Hg

Run Number 5
Operator BS Metsa

add 36 minutes to meter #5

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H20) Desired	ORIFICE PRESSURE (delta H, "H20) Actual	TEMPERATURES STACK (Ts)	TEMPERATURES METER INLET	TEMPERATURES METER OUT	TEMPERATURES IMPINGER	TEMPERATURES FILTER	PUMP VAC. "Hg
1	0	1404	55.035	0.51	1.22	1.2	189	68	67	55	N/A	8
2	3	1407	56.8	0.58	1.39	1.4	190	70	68	52		10
3	6	1410	58.6	0.56	1.34	1.3	191	72	68	50		10
4	9	1413	60.5	0.57	1.37	1.4	192	72	68	50		12
5	12	1416	62.3	0.55	1.32	1.3	191	73	69	51		10
6	15	1419	64.1	0.61	1.46	1.5	194	73	69	53		13
7	18	1422	66.1	0.67	1.61	1.6	195	74	69	54		13
8	21	1425	68.1	0.72	1.73	1.7	196	73	69	54		15
9	24	1428	70.0	0.72	1.73	1.7	195	73	68	55		16
10	27	1431	72.1	0.77	1.85	1.9	194	73	69	56		20
11	30	1433	74.3	0.78	~~1.75~~	1.8	194	72	69	55		20
12	33	1436	76.4	0.63	1.51	1.5	193	72	69	55		15
	36	1439	78.353	END TEST			—					
AVERAGE /SUM	72		46.476	0.79		1.51	193	70				

ENGINEERING SCIENCE

Pasadena, California

PRELIMINARY VELOCITY TRAVERSE DATA

Plant Calnev @ PALA — Date 12/12/90

Location BH. stack outlet — Stack I.D. 41.75"

Barometric Pressure — Static Pres +0.37 "H2O

Operators MN, OH

A

TRAVERSE POINT NUMBER	VELOCITY HEAD	STACK TEMP.	CYCLONIC FLOW ANGLE
1	0.44	135	20
2	0.56	140	11
3	0.58	140	18
4	0.55	142	17
5	0.57	143	20
6	0.56	144	18
7	0.56	144	15
8	0.58	145	13
9	0.66	143	15
10	0.63	136	15
11	0.58	135	15
12	0.55	131	17
AVERAGE			

B

TRAVERSE POINT NUMBER	VELOCITY HEAD	STACK TEMP.	CYCLONIC FLOW ANGLE
1	0.59	130	17
2	0.65	135	17
3	0.76	140	17
4	0.76	141	16
5	0.71	145	16
6	0.68	143	11
7	0.66	143	17
8	0.61	145	15
9	0.65	142	11
10	0.62	140	9
11	0.56	140	9
12	0.51	135	10
AVERAGE	NAP	140	14.96

↓ 0.78 ≈ 15

APPENDIX B

LAB DATA

Date Analyzed: 12/17/90

Technician: Rani

ENGINEERING-SCIENCE, INC.
LABORATORY DATA FOR
PARTICULATE DRYDOWNS
Method #5.1

Project No.: WA220

Project Name: PALA

BEAKER/ FILTER NO.	FRACTION	TOTAL VOLUME	ALIQUOT VOLUME	ALIQUOT FACTOR (AF)	GROSS WT (g)	TARE WT (g)	NET WT x AF (mg)	- BLANK (mg)	= FINAL WT (mg)
E.S. Laboratory Control No.: 9012150 Field Sample ID: BLANK									
091130	FILTER	—	—	1	38.6201	38.6193	0.8	—	0.8
#8	CRUSIBLE	500ml	500ml	1	18.1203	18.1204	<0.01	—	<0.01
6344	IMPINGER	500ml	500ml	1	101.1402	101.1406	<0.01	—	<0.01
6347	ORGANIC	500ml	500ml	1	101.8588	101.8592	<0.01	—	<0.01
6335	DI H2O PROBE	350ml	350ml	1	104.3407	104.3411	<0.01	—	<0.01
E.S. Laboratory Control No.: 9012148 Field Sample ID: 2									
091146	FILTER	—	—	1	32.1879	32.1864	1.5	0.8	0.7
#6	CRUSIBLE	755ml	755ml	1	18.3869	18.3849	2.0	<0.01	2.0
6342	IMPINGER	755ml	755ml	1	101.7150	101.6941	20.9	<0.01	20.9
6345	ORGANIC	755ml	755ml	1	103.1845	103.1852	<0.01	<0.01	<0.01
6333	DI H2O PROBE	350ml	350ml	1	101.9976	101.9933	4.3	<0.01	4.3
E.S. Laboratory Control No.: 9012149 Field Sample ID: 3									
091145	FILTER	—	—	1	30.5479	30.5481	<0.01	0.8	<0.01
#7	CRUSIBLE	620ml	620ml	1	18.3653	18.3620	3.3	<0.01	3.3
6343	IMPINGER	620ml	620ml	1	108.4540	108.4366	17.4	<0.01	17.4
6346	ORGANIC	620ml	620ml	1	100.4589	100.4595	<0.01	<0.01	<0.01
6334	DI H2O PROBE	370ml	370ml	1	103.6545	103.6508	3.7	<0.01	3.7
E.S. Laboratory Control No.: Field Sample ID:									

Date Analyzed: 12/17/90

Technician: Rami

ENGINEERING-SCIENCE, INC.
LABORATORY DATA FOR
PARTICULATE DRYDOWNS
Method #5.1

Project No.: WA22D

Project Name: PALA

BEAKER/ FILTER NO.	FRACTION	TOTAL VOLUME	ALIQUOT VOLUME	ALIQUOT FACTOR (AF)	GROSS WT (g)	TARE WT (g)	NET WT x AF (mg)	- BLANK (mg)	= FINAL WT (mg)
E.S. Laboratory Control No.: 9012150 Field Sample ID: BLANK Acetone rinse (Probe & Impinger)									
6338	PROBE	175ml	175ml	1	103.7733	103.7736	<0.01	—	<0.01
6341	IMPINGER	500ml	500ml	1	103.8790	103.8800	<0.01	—	<0.01
E.S. Laboratory Control No.: 9012148 Field Sample ID: 2 Acetone rinse (Probe & Impinger)									
6336	PROBE	105ml	105ml	1	1028907	102.8874	3.3	<0.01	3.3
6339	IMPINGER	350ml	350ml	1	107.3351	107.3351	<0.01	<0.01	<0.01
E.S. Laboratory Control No.: 9012149 Field Sample ID: 3 Acetone rinse (Probe & Impinger)									
6337	PROBE	185ml	185ml	1	102.3607	102.3568	3.9	<0.01	3.9
6340	IMPINGER	140ml	140ml	1	103.3027	103.3033	<0.01	<0.01	<0.01
E.S. Laboratory Control No.: Field Sample ID:									

TRAIN RECOVERY SHEET

Date 12/13/91 Run # 1 Method # 5.1

Facility PAZA Type PM

Technician DMB Imp. Solution H_2O

	Solution	Vol. (ml)	Volume Marked?	
Nozzle- Probe Rinse				
Umbilical Rinse				
		Final (ml)	Initial (ml)	Net (ml)
Impinger # 1	H_2O	280.5	100	180.5
Impinger # 2	H_2O	135.5	100	35.5
Impinger # 3	MT	12	~~0~~	12.0
Description				
Impinger Rinse				
		Final (g)	Initial (g)	
Silica Gel (Description)		826.9	798.2	28.7
Filter # (Description)		Total Moisture		256.7 ml

Field Blanks

Disposition/Comments

Engineering-Science
75 N. Fair Oaks Ave.
Pasadena, CA 91109

PM

TRAIN RECOVERY SHEET

E.S. # 9012148

DATE 12/13/90

FACILITY PALA

TECHNICIAN DWB

RUN # 2 METHOD 5.1

TYPE PM

IMP. SOLUTION H_2O

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE	H_2O	350.5	
~~CYCLONE RINSE~~ nozz - probe rinse	acetone	105	

		FINAL (ml)	INITIAL (ml)	NET (ml)
IMPINGER # 1	H_2O	275	100	175
IMPINGER # 2	H_2O	133	100	33
IMPINGER # 3	MT	8	0	8
IMPINGER # /				
DESCRIPTION				
IMPINGER RINSE				

		FINAL (g)	INITIAL (g)	
SILICA GEL (DESCRIPTION)		881.8	857.2	24.6
FILTER # 091146 (DESCRIPTION)			TOTAL MOISTURE	240.6 (g)

~~FIELD BLANKS~~

~~mob wash~~ H_2O : 350 ml

acetone:

~~DISPOSITION/COMMENTS~~

imp wash: H_2O : 350 ml

acetone: 350 ml.

TRAIN RECOVERY SHEET

DATE 12-13-90 E.S.#9012149 RUN # 3 METHOD 5.1

FACILITY Pala TYPE P.M.

TECHNICIAN R.O. IMP. SOLUTION H_2O

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

		FINAL (ml)	INITIAL (ml)	NET (ml)
IMPINGER # 1	H_2O	325	100	225
IMPINGER # 2	H_2O	120	100	20
IMPINGER # 3	Mt	5	0	5
IMPINGER #				
DESCRIPTION				
IMPINGER RINSE				

		FINAL (g)	INITIAL (g)	
SILICA GEL (DESCRIPTION)		861.0	838.1	22.9
FILTER # (DESCRIPTION)		TOTAL MOISTURE		272.9 (g)

FIELD BLANKS

DISPOSITION/COMMENTS

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Pala Calmat
DATE 12/12/90 analyzed 12/14/90
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION Bag House stack outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) tedlar bags
ANALYTICAL METHOD Orsat M. 3
AMBIENT TEMPERATURE 75-80 °F
OPERATOR HSO & DOB

COMMENTS: Run #1

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	5.2	5.2	5.4	5.4	5.2	5.2	5.3	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.0	13.8	19	13.6	19.0	13.8	13.7	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Pala · Calmat
DATE 12/12/90 · analyzed · 12/14/90
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION DH stack outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Tedlar bags
ANALYTICAL METHOD orsat M: 3
AMBIENT TEMPERATURE 75 - 80 °F
OPERATOR HSO & DBB

COMMENTS:
Run #2

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	4.6	4.6	4.4	4.4	4.6	4.6	4.5	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	17.8	13.2	18.8	14.4	19.2	14.6	14.1	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Palo Cabinet
DATE 12/12/00. analyzed 12/14/00
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION Dog House stack outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) tedlar bags
ANALYTICAL METHOD orsat M: 3
AMBIENT TEMPERATURE 75 – 80 °F
OPERATOR HSO - DHS

COMMENTS:
Run # 3

GAS \ RUN	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	5.5	5.5	5.4	5.4	5.5	5.5	5.5	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.8	13.3	19.0	13.6	18.8	13.3	13.4	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Our) 230
4/72

APPENDIX C

QUALITY ASSURANCE AND CALIBRATIONS

ENGINEERING SCIENCE
Pasadena, California

POST TEST METER BOX CALIBRATION FORM

Meter Box No. BROWN II Date 01-11-91 Calibrated by D MARSDEN.

Barometric Pressure 29.85 Ambient Temp 65 Pre Test Y_i 0.985

Project Name PALA. Project No. WA220 Hrun 1.9 Vac 20

Orifice Manometer (in. H_2O) H	Gas Volume: Wet Test Meter (ft^3) V_w	Gas Volume: Dry Gas Meter (ft^3) V_d	Temperatures: Wet Test Meter (° F) T_w	Temperatures: Dry Gas Meter (° F) T_d	Time (min) T_i	Y_i	$H@_i$
1.9	10.493	10.467	65	67	14	1.001	—
1.9	11.171	11.207	65	68	15	0.997	—
1.9	11.113	11.145	64	69	15	1.002	—
						Y_i AVG	1.000

METER BOX CALIBRATION HISTORY

Last Calibration Date 10-03-90 Calibrated by D MARSDEN

$H_@$ of Calibration 1.98 Y_i of Calibration 0.985

ENGINEERING SCIENCE

Pasadena, California

SOURCE SAMPLING NOZZLE CALIBRATION

Project No. WA 220 Date 11-02-90.

Calibrated by Q/A D/L Instrument BAUSCH & LOMB DIGICAL TC

Nozzle Number	Nominal Size	Reading Number			Average
		1	2	3	
140	1/8"	.126	.127	.128	.127
186	1/8	.125	.126	.126	.1257
180	3/16	.1855	.1845	.186	.1853.
143.	1/8	.127	.127	.128	.1273.
177	3/16	.182	.183	.183	.1827
185	1/8	.1285	.1275	.128	.128
304	1/8	.1285	.1275	.1285	.1278.
178.	3/16	.178	.1775	.1775	.1778
ES 11	3/16	.179	.178	.178	.1783.
157	1/4	.249	.250	.250	.2497
98	1/4	.240	.241	.241	.2407
152	5/16	.301	.300	.300	.300
	1/4	~~.25~~	~~.25~~	~~.249~~	~~.2497~~

4PALA

Calmat-Pala on 10/28/91 — P.O.#117 TEST #91301

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

SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE: Calmat-Pala
Pala Indian Reservation
Pala, CA 92059

ERRATA

TEST #: 91301 P.O.# 117 TEST DATE: 10/28/91

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

UNIT TESTED: Asphalt plant

EQUIPMENT: baghouse

TESTED BY:	David Shina, Linda Twaddle, Gary Smith, & Andy Fuchs	DATE: 10/28/91
SITE PERSONNEL:	Paul Mason	DATE: 10/28/91
APCD ENGINEER:	Earnest Davis	DATE: 10/28/91
LAB ANALYSIS BY:	David Shina	DATE: 11/6/91
REPORT BY:	David Shina	DATE: 11/6/91
REVIEWED BY:	Linda Twaddle	DATE:
APPROVED BY:		DATE:

ROBERT YELENOSKY, ACTING 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	4.03 lbs/hr	PASSED

SUMMARY:

ITEM	Vm	Bws	Cs	E	I	Qstd	ts	PROD RATE
UNITS	ft^3	%	gr/dscf	lbs/hr	%	dscfm	°F	tons/hr
VALUE	51.167	31.27	0.035	4.031	108	1.34E+04	248	240.50

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 procedures and equipment utilized in these tests are based on EPA New Source Performance Standards Method 5. The sampling train was modified to utilize a back-end filter and 5th impinger filled with silica gel (fig. 1), as outlined by the SDAPCD QA manual.

CALCULATIONS

All preliminary assumptions and calculations are based on data obtained from previous tests. 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 24 traverse points, 12 from each of 2 sample ports (fig.2), collected from 77 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 rule 54 of the SDAPCD.

ANALYSES:

Gas: An integrated bag sample was collected during the test and analyzed at the APCD lab.

Particulate: All procedures follow EPA guidelines, except where noted in the SDAPCD QA manual.

EQUIPMENT:

All testing and analysis equipment was calibrated according to EPA guidelines.

Analysis:	*Collection:*	*Sampling:*	*Temp./Press.:*
CO2-Anarad AR400	Filter-Gelman	L/S Box-Napp	Thermocouples-Omega
O2-Teledyne Ryan 320 P4	Holder-Gelman	Umbilical cord-Napp	Read out-Omega
Macrobalance-Sargent Welch	Beakers-Pyrex	Cold/Hot box-Napp	Barometric-calc. by APCD
Microbalance-Sartorious	Impingers-Ace	Pitobe tube-Napp	L/S box-Dwyer magnehelic

Calmat-Pala on 10/28/91 — P.O.#117 TEST #91301

Trav. Pt	Vm (ft^3) 506.861	ΔP (in H2O)	ΔH (in H2O)	t 1(unc) (°F)	t 2(unc) (°F)	Stack Temp (°F)	Imp Temp (°F)	velocity (ft/sec)
†† East 12		0.350	2.700	66.00	82.00	247.00	50	41.34
11		0.350	2.700	64.00	84.00	249.00	48	41.40
10		0.390	3.000	66.50	98.00	254.00	48	43.86
9		0.420	3.200	66.00	100.00	254.00	51	45.51
8		0.450	3.500	67.00	102.00	256.00	56	47.18
7		0.470	3.600	67.00	104.00	258.00	58	48.28
6		0.620	4.000	68.00	105.00	259.00		50.82
5		0.520	4.000	69.00	106.00	260.00	61	50.86
4		0.510	3.800	69.50	107.00	258.00	59	50.29
3		0.520	4.000	70.00	108.00	255.00	56	50.68
2		0.470	3.600	70.00	108.00	256.00	55	48.18
East 1		0.470	3.600	71.00	109.00	254.00	54	48.15
South 12		0.250	1.900	74.00	71.00	149.00	53	32.43
11		0.370	2.900	74.00	102.00	190.00	48	40.76
10		0.420	3.200	73.00	106.00	242.00	47	45.13
9		0.450	3.500	73.00	108.00	259.00	46	47.28
8		0.500	3.800	74.00	110.00	260.00	47	49.67
7		0.500	3.900	74.00	110.00	261.00	47	49.90
6		0.510	3.900	74.00	111.00	260.00	48	50.36
5		0.510	3.900	75.00	112.00	258.00	48	50.29
4		0.480	3.700	75.50	113.00	258.00	48	48.79
3		0.430	3.300	76.00	114.00	257.00	50	46.15
2		0.460	3.600	77.00	114.50	260.00	50	47.70
South 1	558.028	0.430	3.300	78.00	116.00	253.00	51	46.02

	Vm (ft*^3)	ΔP (in H2O)	ΔH (in H2O)	t 1 (°F)	t 2 (°F)	ts (°F)	ti (°F)	vs (ft/sec)
Average:	51.167	0.445	3.446	71.27	104.19	248	51	46.72

MISCELLANEOUS:

Ø = 60.0 min
tn = 24 points
ø = 2.5 min

NOZZLE & PROBE:

Dn = 0.310 in
An = 0.0755 in^2
Cp = 0.846

METER BOX PARAMETERS:

ΔH@ = 2.7254
Y = 0.9782
Box ID = D-337

PRESSURES:

Pbar = 29.46 in Hg
Pg = -0.38 in H2O
Silica gel(yes/no) yes
Vpw @ ts = 58.63 in Hg
Vpw @ ti = 0.0000 in Hg

VOLUME:

start leak rate = 0.010 cfm
Pass/Fail PASS
final leak rate = 0.000 cfm
Pass/Fail PASS
Vm 51.167 ft^3

TEMPERATURES:

t1 corr = 0.40 °F
t2 corr = 0.10 °F
tm = 88 °F
ts = 248 °F
ti = 51 °F

STACK PARAMETERS:

circular (yes/no) yes
Ds = 3.48 f t
Length = N/A f t
As = 9.51 ft^2

LAB DATA:

mn(front) = 0.02492 g
mn(back) = 0.08385 g
mn(total) = 0.10877 g
Vlc 461.69 ml

STACK GAS MEASUREMENTS:

CO2 = 3.20 %
O2 = 17.40 %
CO = 0.00 %
N2 = 79.40 %

†† The stack has 2-5 inch ports, so we had to adapt a impinger train support at the site, because we do not have 5"-3" scale down unirail port adapters. Our impinger train support forced me to combine points 12 & 11 on the east port. We could sample all the points on the south port.

TEMPERATURES:

01)	ts = (Σ ts(n))/total n's		248 °F
02)	Ts = ts+460		708 °R
03)	tm= (Σ {(t 1(n)+t 2t(n))/2}/total n's		88 °F
04)	Tm= (t1+t2)/2 + 460		548 °R
05)	ti= (Σ ti(n))/total n's		51 °F
06)	Tstd		528 °R

PRESSURES:

07)	Pbar= {(P @ S.L.)+[ft. above S.L.*(-0.1 in Hg/100ft)]}		29.46 in Hg
08)	Pg= read from pressure sensing device		-0.38 in H2O
09)	Ps= Pbar + (Pg/13.6)		29.43 in Hg
10)	ΔH		3.45 in H20
11)	Pm= Pbar+(ΔH/13.6)		29.71 in Hg
12)	Pstd		29.92 in Hg

VOLUME:

13)	Vm= Vm(end)-Vm(begin)		51.167 ft^3
14)	Y		0.9782
15)	Vm'= Vm*Y		50.052 ft^3
16)	Vpw @ ti = from appendix		0.0000
17)	corr Vwm = {[(Vm'*Vpw@imp/Ps)*Pm*Tstd]/(Tm*Pstd)}		0.0000 ft^3
18)	Vm std = {[Vm'*(Tstd/Tm)*(Pm/Pstd)]-corr Vwm}		47.894 ft^3
19)	Vlc= (Σ Volume of impingers)		461.69 ml
20)	∂		0.002201 lb/ml
21)	R		21.85 Hg-ft^3/°R-lb-mo
22)	MwH2O		18.00 g/g-mo
23)	Vw std = {[(Vlc*∂*R*Tstd)/(Pstd*MwH2O)}+corr Vwm}		21.7918 ft^3

CALCULATIONS:

MOISTURE-

24)	Bws(1) =(Vw std)/(Vw std+Vm std)100	31.27 %	
25)	Vpw @ ts = from appendix	58.63 in Hg	
26)	Bws(2) =[(Vpw @ ts)/Ps]*100	199.20 %	
27)	Bws = lower value of equation 24 or 26		31.27 %

MOLECULAR WEIGHT-

28)	%O2		17.40 %
29)	%CO2		3.20 %
30)	%N2+inerts+%CO		79.40 %
31)	Md=[0.440(%CO2)]+[0.320*(%O2)]+[0.280(%N2+inerts+%CO)]		29.21 g/g*mole
32)	Ms=Md*(1-Bws)+18.0*(Bws)		25.70 g/g*mole

FLOW-

33)	ΔP		0.445 in H2O
34)	Cp		0.846
35)	vs= 85.49*Cp*{[(Ts*ΔP)/(Ps*Ms)]^.5}		46.719 ft/s
36)	As=3.14*[(Ds)^2/4]		9.51 ft^2
37)	Qs = (vs)*As*60		2.66E+04 acfm
38)	Qstd =17.64*Qs*(1-Bws)*Ps/Ts		1.34E+04 dscfm

EMISSIONS-

FRONT HALF

39)	mn (front)			0.02492 g
40)	Cs (front) =15.43*mn(front)/Vm std	0.0080		0.008 grains/dscf
41)	E (front) = (0.00857)*(Qstd)*Cs (front)			0.92 lbs/hr

BACK HALF

42)	mn (back)			0.08385 g
43)	Cs (back) =15.43*mn(back)/Vm std	0.0270		0.027 grains/dscf
44)	E (back) = (0.00857)*(Qstd)*Cs (back)			3.11 lbs/hr

TOTAL

45)	mn (total) = mn(front)+mn(back)			0.10877 g
46)	Cs (total) =15.43*mn(total)/Vm std	0.0350		0.035 grains/dscf
47)	E (total) = (0.00857)*(Qstd)*Cs (total)			4.03 lbs/hr

ISOKINETICS:

48)	An=3.14*[(Dn)^2/4]			0.0755 in^2
49)	I=.09450(Ts*Vm std)/Ps*vsAnØ(1-Bws)	107.88 %=		108 %

AP-42 Section Reference Report Sect. Reference

Calmat-Pala on 10/28/91 P.O.#117 TEST #

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

SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE: Calmat-Pala
Pala Indian Reservation
Pala, CA 92059

TEST #: 91301 P.O.# 117 TEST DATE: 10/28/91

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

UNIT TESTED: Asphalt plant

EQUIPMENT: baghouse

TESTED BY:	David Shina, Linda Twaddle, Gary Smith, & Andy Fuchs	DATE: 10/28/91
SITE PERSONNEL:	Paul Mason	DATE: 10/28/91
APCD ENGINEER:	Earnest Davis	DATE: 10/28/91
LAB ANALYSIS BY:	David Shina	DATE: 11/6/91
REPORT BY:	David Shina	DATE: 11/6/91
REVIEWED BY:	Linda Twaddle	DATE: 11-21-91
APPROVED BY:	Robert Yelenosky	DATE: 11/26/91

ROBERT YELENOSKY, ACTING 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	4.03 lbs/hr	PASSED

SUMMARY:

ITEM	Vm	Bws	Cs	E	I	Qstd	ts	PROD RATE
UNITS	ft^3	%	gr/dscf	lbs/hr	%	dscfm	°F	tons/hr
VALUE	51.167	31.27	0.035	4.031	108	1.34E+04	248	240.50

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 procedures and equipment utilized in these tests are based on EPA New Source Performance Standards Method 5. The sampling train was modified to utilize a back-end filter and 5th impinger filled with silica gel (fig. 1), as outlined by the SDAPCD QA manual.

CALCULATIONS

All preliminary assumptions and calculations are based on data obtained from previous tests. 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 24 traverse points, 12 from each of 2 sample ports (fig.2), collected from 77 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 rule 54 of the SDAPCD.

ANALYSES:

Gas: An integrated bag sample was collected during the test and analyzed at the APCD lab.

Particulate: All procedures follow EPA guidelines, except where noted in the SDAPCD QA manual.

EQUIPMENT:

All testing and analysis equipment was calibrated according to EPA guidelines.

Analysis:	*Collection:*	*Sampling:*	*Temp./Press.:*
CO2-Anarad AR400	Filter-Gelman	L/S Box-Napp	Thermocouples-Omega
O2-Teledyne Ryan 320 P4	Holder-Gelman	Umbilical cord-Napp	Read out-Omega
Macrobalance-Sargent Welch	Beakers-Pyrex	Cold/Hot box-Napp	Barometric-calc. by APCD
Microbalance-Sartorious	Impingers-Ace	Pitobe tube-Napp	L/S box-Dwyer magnehelic

Calmat-Pala on 10/28/91 P.O.#117 TEST #91301

Trav. Pt	Vm (ft^3)	ΔP	ΔH	t 1(unc)	t 2(unc)	Stack Temp	Imp Temp	velocity
	506.861	(in H2O)	(in H20)	(°F)	(°F)	(°F)	(°F)	(ft/sec)
11 East 12		0.350	2.700	66.00	82.00	247.00	50	41.34
11		0.360	2.700	64.00	84.00	249.00	48	41.40
10		0.390	3.000	65.50	88.00	254.00	48	43.86
9		0.420	3.200	66.00	100.00	254.00	51	45.51
8		0.450	3.500	67.00	102.00	256.00	56	47.18
7		0.470	3.600	67.00	104.00	258.00	58	48.28
6		0.520	4.000	68.00	105.00	259.00		50.82
5		0.520	4.000	69.00	106.00	260.00	61	50.86
4		0.510	3.900	69.50	107.00	258.00	59	50.29
3		0.520	4.000	70.00	108.00	255.00	56	50.68
2		0.470	3.600	70.00	108.00	255.00	55	48.18
East 1		0.470	3.600	71.00	109.00	254.00	54	48.15
South 12		0.250	1.900	74.00	71.00	149.00	53	32.43
11		0.370	2.900	74.00	102.00	190.00	48	40.76
10		0.420	3.200	73.00	106.00	242.00	47	45.13
9		0.450	3.500	73.00	108.00	259.00	46	47.28
8		0.500	3.900	74.00	110.00	260.00	47	49.87
7		0.500	3.900	74.00	110.00	261.00	47	49.90
6		0.510	3.900	74.00	111.00	260.00	48	50.36
5		0.510	3.900	75.00	112.00	258.00	48	50.29
4		0.480	3.700	75.50	113.00	258.00	48	48.79
3		0.430	3.300	76.00	114.00	257.00	50	46.15
2		0.460	3.500	77.00	114.50	256.00	50	47.70
South 1	558.028	0.430	3.300	78.00	116.00	253.00	51	46.02

	Vm (ft^3)	ΔP (in H2O)	ΔH (in H2O)	t 1 (°F)	t 2 (°F)	ts (°F)	ti (°F)	vs (ft/sec)
Average:	51.167	0.445	3.446	71.27	104.19	248	51	46.72

MISCELLANEOUS:

Ø = 60.0 min
tn = 24 points
ø = 2.5 min

NOZZLE & PROBE:

Dn = 0.310 in
An = 0.0755 in^2
Cp = 0.846

METER BOX PARAMETERS:

ΔH@ = 2.7254
Y = 0.9782
Box ID = D-337

PRESSURES:

Pbar = 29.46 in Hg
Pg = -0.38 in H2O
Silica gel(yes/no) yes
Vpw @ ts = 58.63 in Hg
Vpw @ ti = 0.0000 in Hg

VOLUME:

start leak rate = 0.010 cfm
Pass/Fail PASS
final leak rate = 0.000 cfm
Pass/Fail PASS
Vm 51.167 ft^3

TEMPERATURES:

t1 corr = 0.40 °F
t2 corr = 0.10 °F
tm = 88 °F
ts = 248 °F
ti = 51 °F

STACK PARAMETERS:

circular (yes/no) yes
Ds = 3.48 f t
Length = N/A f t
As = 9.51 ft^2

LAB DATA:

mn(front) = 0.02492 g
mn(back) = 0.08385 g
mn(total) = 0.10877 g
Vlc 461.69 ml

STACK GAS MEASUREMENTS:

CO2 = 3.20 %
O2 = 17.40 %
CO = 0.00 %
N2 = 79.40 %

†† The stack has 2-5 inch ports, so we had to adapt a impinger train support at the site, because we do not have 5"-3" scale down unirail port adapters. Our impinger train support forced me to combine points 12 & 11 on the east port. We could sample all the points on the south port.

TEMPERATURES:

01)	ts = (Σ ts(n))/total n's		248 °F
02)	Ts = ts+460		708 °R
03)	tm= (Σ {(t 1(n)+t 2t(n))/2}/total n's		88 °F
04)	Tm= (t1+t2)/2 + 460		548 °R
05)	ti= (Σ ti(n))/total n's		51 °F
06)	Tstd		528 °R

PRESSURES:

07)	Pbar= {(P @ S.L.)+[ft. above S.L.*(-0.1 in.Hg/100ft)]}		29.46 in Hg
08)	Pg= read from pressure sensing device		-0.38 in H2O
09)	Ps= Pbar + (Pg/13.6)		29.43 in Hg
10)	ΔH		3.45 in H20
11)	Pm= Pbar+(ΔH/13.6)		29.71 in Hg
12)	Pstd		29.92 in Hg

VOLUME:

13)	Vm= Vm(end)-Vm(begin)		51.167 ft^3
14)	Y		0.9782
15)	Vm'= Vm*Y		50.052 ft^3
16)	Vpw @ tl = from appendix		0.0000
17)	corr Vwm = {[(Vm'*Vpw@Imp/Ps)*Pm*Tstd]/(Tm*Pstd)}		0.0000 ft^3
18)	Vm std = {[Vm'*(Tstd/Tm)*(Pm/Pstd)]-corr Vwm}		47.894 ft^3
19)	Vlc= (Σ Volume of impingers)		461.69 ml
20)	∂		0.002201 lb/ml
21)	R		21.85 Hg-ft^3/°R-lb-mo
22)	MwH2O		18.00 g/g-mo
23)	Vw std = {[(Vlc*∂*R*Tstd)/(Pstd*MwH2O)]+corr Vwm}		21.7918 ft^3

CALCULATIONS:

MOISTURE-

24)	Bws(1) =(Vw std)/(Vw std+Vm std)100	31.27 %	
25)	Vpw @ ts = from appendix	58.63 in Hg	
26)	Bws(2) =[(Vpw @ ts)/Ps]*100	199.20 %	
27)	Bws = lower value of equation 24 or 26		31.27 %

MOLECULAR WEIGHT-

28)	%O2		17.40 %
29)	%CO2		3.20 %
30)	%N2+inerts+%CO		79.40 %
31)	Md=[0.440(%CO2)]+[0.320*(%O2)]+[0.280(%N2+inerts+%CO)]		29.21 g/g*mole
32)	Ms=Md*(1-Bws)+18.0*(Bws)		25.70 g/g*mole

FLOW-

33)	ΔP		0.445 in H2O
34)	Cp		0.846
35)	vs= 85.49*Cp*{[(Ts*ΔP)/(Ps*Ms)]^.5}		46.719 ft/s
36)	As=3.14*[(Ds)^2/4]		9.51 ft^2
37)	Qs = (vs)*As*60		2.66E+04 acfm
38)	Qstd =17.64*Qs*(1-Bws)*Ps/Ts		1.34E+04 dscfm

EMISSIONS-

FRONT HALF

39)	mn (front)			0.02492 g
40)	Cs (front) =15.43*mn(front)/Vm std	0.0080		0.008 grains/dscf
41)	E (front) = (0.00857)*(Qstd)*Cs (front)			0.92 lbs/hr

BACK HALF

42)	mn (back)			0.08385 g
43)	Cs(back)=15.43*mn(back)/Vm=(12/%CO2)*Cs(back)	0.0270		0.027 grains/dscf
44)	E (back) = (0.00857)*(Qstd)*Cs (back)			3.11 lbs/hr

TOTAL

45)	mn (total) = mn(front)+mn(back)			0.10877 g
46)	Cs(total)=15.43*mn(total)/Vm=(12/%CO2)*Cs(total)	0.0350		0.035 grains/dscf
47)	E (total) = (0.00857)*(Qstd)*Cs (total)			4.03 lbs/hr

ISOKINETICS:

48)	An=3.14*[(Dn)^2/4]			0.0755 in^2
49)	I=.09450(Ts*Vm std)/Ps*vsAnØ(1-Bws)	107.88 %=		108 %

APPENDIX

CALMAT-Pala on 10/28/91 P.O.#117 TEST#91301

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

LABORATORY ANALYSIS OF PARTICULATE TEST

TEST SITE: Calmat-Pala
Pala Indian Reservation
Pala, CA 92059

TEST # 91301.0 P.O.# 117 TEST DATE: 10/28/91

LAB ANALYSIS BY: David N. Shina DATE: 11/6/91

LAB REPORT BY: David N. Shina DATE: 11/6/91

REVIEWED BY: Linda Twaddle DATE:

(1) IMPINGER VOLUMES

	FINAL WEIGHT		INITIAL WEIGHT		NET WEIGHT
#1	807.96 g	-	552.38 g	=	255.58 g
#2	720.19 g	-	540.67 g	=	179.52 g
#3	469.17 g	-	458.16 g	=	11.01 g
#4	450.59 g	-	447.45 g	=	3.14 g
SILICA GEL CONTAINER:					
#5	828.87 g	-	816.43 g	=	12.44 g

Tot. Vol.= 461.69 g

(2) BLANKS

STD = Net Wgt(solv) / Tot. Vol(solv. used)

	ACETONE:	WATER:	ORGANIC:
VOLUMES:			
BKR ID =	91101	91127	
Initial=	200.00 ml	200.00 ml	ml
tot. Rinses=	30.00 ml	30.00 ml	ml
Tot. Vol=	230.00 ml	230.00 ml	0.00 ml
WEIGHTS:			
final=	29.1612 g	29.9974 g	g
initial=	29.1599 g	29.9968 g	g
net=	0.0013 g	0.0006 g	0.0000 g
LIMIT: 0.001% = 10 ppm = 0.000010g/ml		LIMIT: 4ppm = 4mg/L = 0.000004g/ml	LIMIT: 0.001% = 10 ppm = 0.000010g/ml
STD =	5.65217E-06 g/ml	STD = 2.60870E-06 g/ml	STD = N/A g/ml
	0.000565 %	0.000261 %	N/A %
=	5.65 ppm	2.61 ppm	N/A ppm
The Blank	PASSED	The Blank PASSED	The Blank N/A

(3) WEIGHT

FRONT HALF	BACK HALF
ACETONE	**ACETONE**
WEIGHT (uncorrected):	*WEIGHT (uncorrected):*
BKR ID= 91114	BKR ID= 91103
final= 29.1280 g	final= 29.2957 g
initial= 29.1235 g Wgt. Ac= 0.0045 g	initial= 29.2921 g Wgt. Ac.= 0.0036 g
VOLUME:	*VOLUME:*
Initial= 120.00 ml	Initial= 150.00 ml
tot. rinses= 30.00 ml	tot. Rinses= 30.00 ml
Sep funnel= 0.00 ml Tot. Vol= 150.00 ml	Sep. funnel= 0.00 ml Tot. Vol= 180.00 ml
WEIGHT FROM SOLVENT:	*WEIGHT FROM SOLVENT:*
Total Vol * Acetone STD = 0.000848 g	Total Vol * Acetone STD = 0.001017 g
WEIGHT (corrected):	*WEIGHT (corrected):*
Wgt(corr)= Wgt(unc)-Wgt from solvent= 0.003652 g	Wgt(corr)= Wgt(unc)-Wgt from solvent= 0.002583 g
WATER:	**WATER:**
WEIGHT (uncorrected):	*WEIGHT (uncorrected):*
BKR ID= 91126	BKR ID= 91051
final= 26.5936 g	final= 49.5703 g
initial= 26.5716 g Wgt. Water= 0.0220 g	initial= 49.4876 g Wgt. Water= 0.0827 g
VOLUMES:	*VOLUMES:*
Initial= 250.00 ml	Initial= 350.00 ml
tot. Rinses= 30.00 ml	tot. Rinses= 40.00 ml
Tot. Vol = 280.00 ml	imp. charge= 197.53 ml Tot. Vol= 587.53 ml
WEIGHT FROM SOLVENT:	*WEIGHT FROM SOLVENT:*
Total Vol * Water STD = 0.000730 g	Total Vol * Water STD = 0.001533 g
WEIGHT (corrected):	*WEIGHT (corrected):*
Wgt(corr)= Wgt(unc)-Wgt from solvent= 0.021270 g	Wgt(corr)= Wgt(unc)-Wgt from solvent= 0.081167 g
ORGANIC:	**ORGANIC:**
WEIGHT (uncorrected):	*WEIGHT (uncorrected):*
BKR ID=	BKR ID=
final= g	final= g
initial= g Wgt. Org= 0.0000 g	initial= g Wgt. Org= 0.0000 g
VOLUMES:	*VOLUMES:*
tot. Rinses= ml Tot. Vol= 0.00 ml	tot. Rinses= ml Tot. Vol= 0.00 ml
WEIGHT FROM SOLVENT:	*WEIGHT FROM SOLVENT:*
Total Vol * Organic STD = N/A g	Total Vol * Organic STD = N/A g
WEIGHT (corrected):	*WEIGHT (corrected):*
Wgt(corr)= Wgt(unc)-Wgt from solvent= N/A g	Wgt(corr)= Wgt(unc)-Wgt from solvent= N/A g
FILTERS:	**FILTERS:**
WEIGHT:	*WEIGHT:*
ID No.=	ID No.= 89065
final= g	final= 1.5966 g
initial= g Wgt. Filter= 0.0000 g	initial= 1.5965 g Wgt. Filter= 0.0001 g

PARTICULATE COLLECTED (front half):

ΣWgt corrected + Wgt filter= mn (front)= 0.02492 g

PARTICULATE COLLECTED (back half):

ΣWgt corrected + Wgt filter= mn (back)= 0.08385 g

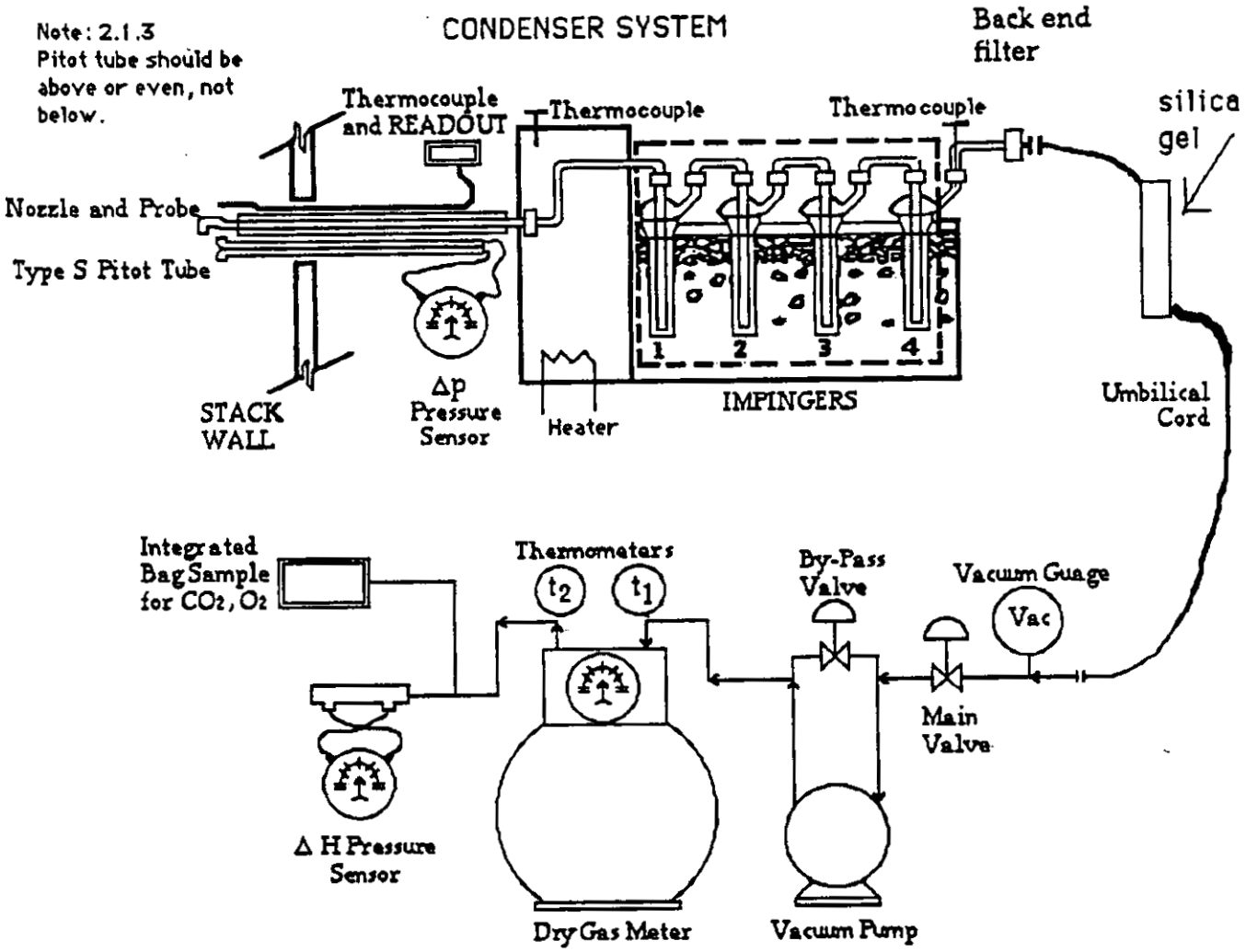
TOTAL PARTICULATE COLLECTED:

mn(front) + mn(back) = 0.10877 g

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- Dry

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

FIELD DATA ABBREVIATIONS

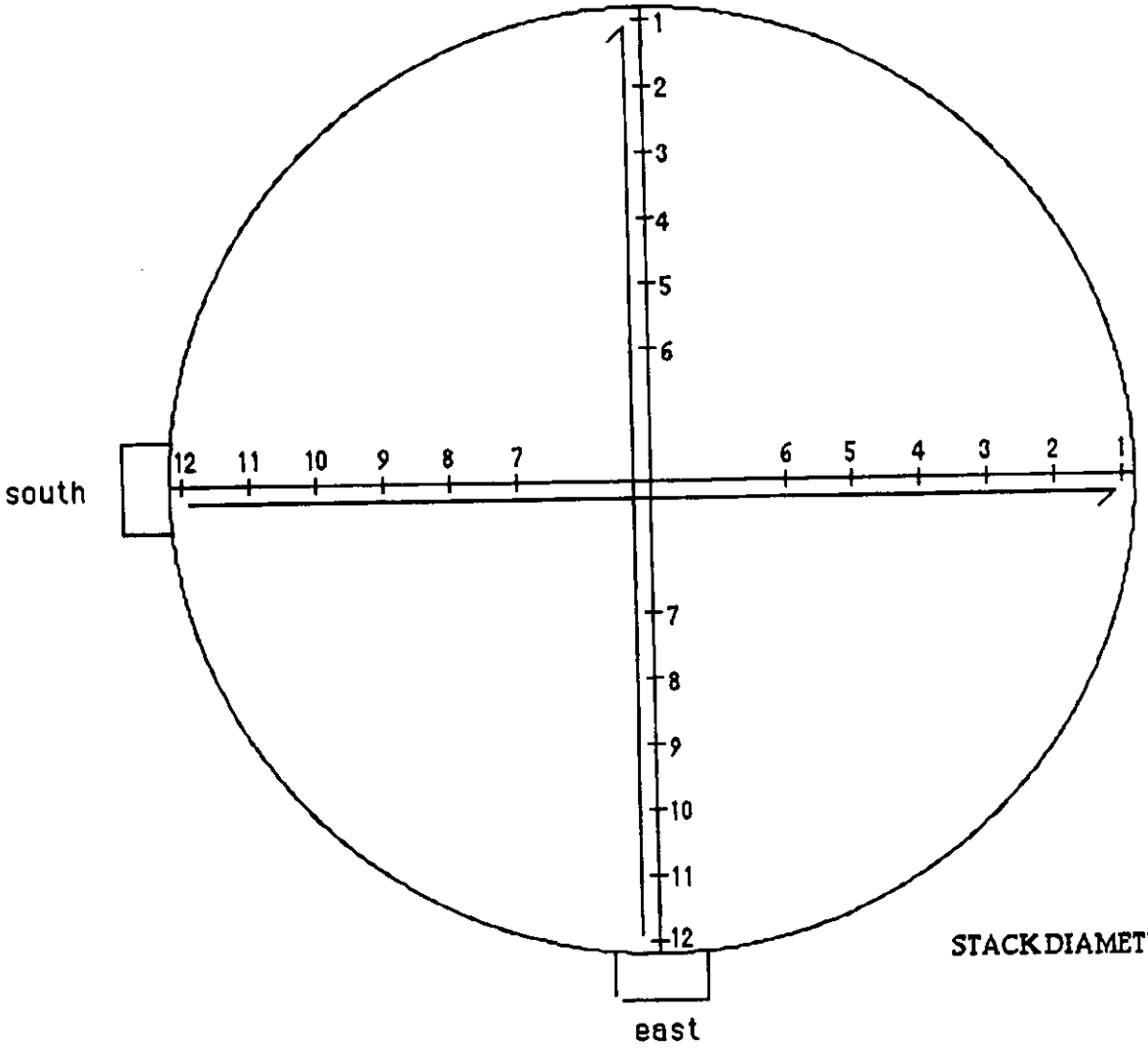
PT = Point Number
T_s = Stack Temperature
Δp = Pitot Tube Pressure Differential, in H_2O
V_s = Stack Velocity, fps
ΔH = Orifice Meter Pressure Drop, in H_2O
t_1 = Meter Inlet Temperature, °F
t_2 = Meter Outlet Temperature, °F
Pm = Pump Vacuum, in Hg
ti = Impinger Temperature
P_{bar} = Barometric Pressure

FIGURE 1 : PARTICULATE MATTER SAMPLING TRAIN

SAN DI_O COUNTY AIR POLLUTION CONTRC_ISTRICT

CALMAT-PALA

TRAVERSE POINTS



STACK DIAMETER = 41.75"

POINT	DISTANCE (inches)
1)	2.1
2)	6.7
3)	11.8
4)	17.7
5)	25.0
6)	35.6
7)	64.4
8)	75.0
9)	82.3
10)	88.2
11)	93.3
12)	97.9

FIGURE 1

Figure 3

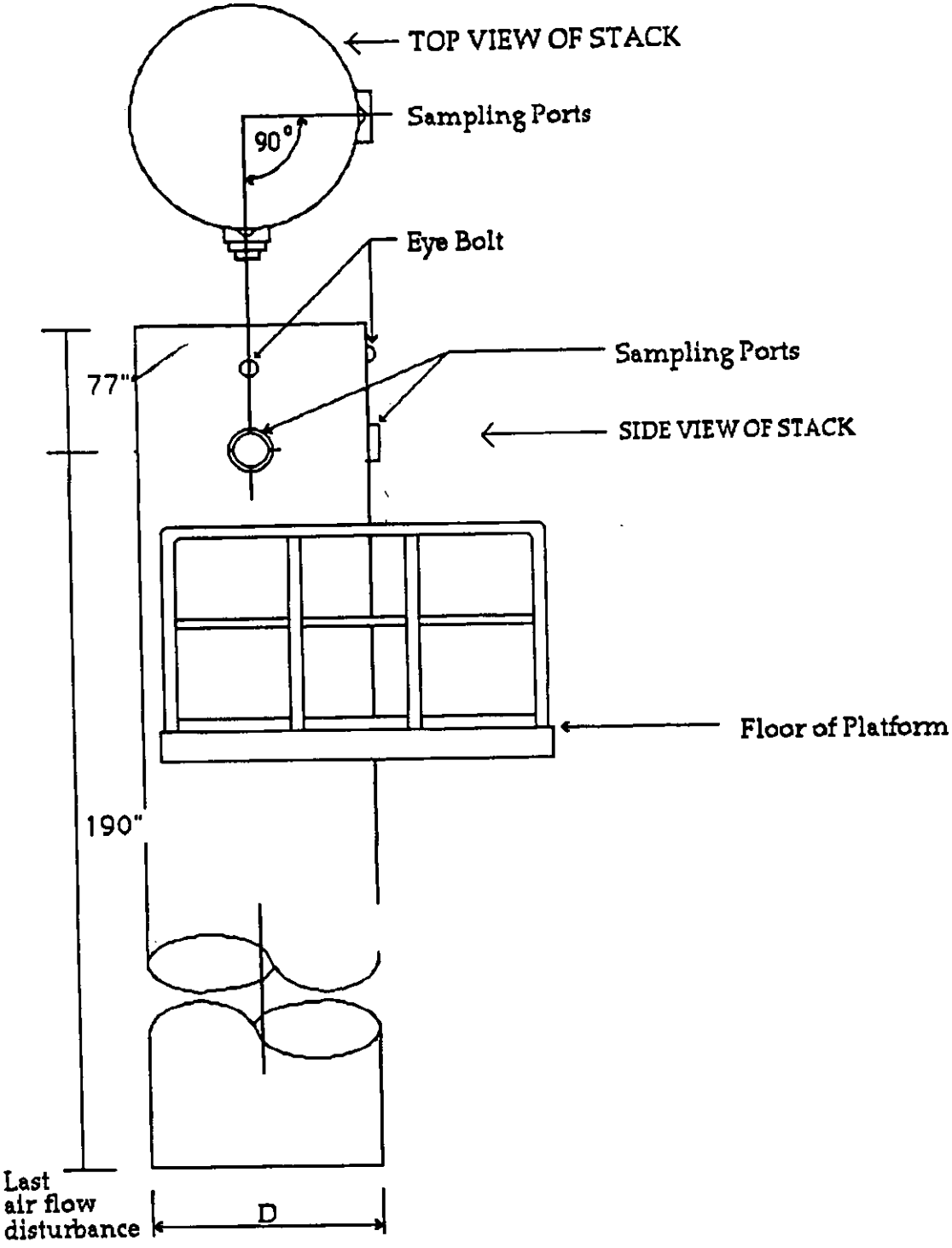


Figure 3

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(0 for Asphalt plants)
CO2	%	carbon dioxide	read from measuring device
Corr Vwm	ft^3	correction for Vw w/d silica gel	((Vm*(Vpw@td)/Ps)*Pm*Tstd)/ (Tm*Pstd)
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	barometric pressure at sampling pt.	read from press measuring device
π(pi)	none	the ratio of the circumference of a circle to its diameter	3.14165 (see CRC)
Pm	in Hg	abeoulte meter pressure	Pbar+(ΔH/13.6)
Ps	in Hg	absolute stack pressure	Pbar+(PstaHc/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		
t1	°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.	°R	dry gas meter outlet temp,corrected	t2 + temperature correction
ø(theta)	min	sampling time/point	Ø/tn
Ø(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	tal number of 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
	U		
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*ø*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

Mechanical Engineering
Source Test Report
Permit Renewal Test

Engineer: Earnest Davis
Test: Particulate Matter
P.O. no.: 0017
Test Start Time: 7:45

Test Date: 10/28/91
Source: Industrial Asphalt
Highway 76 Pala CA 92059
Test Stop Time: 8:15

Equipment Description: Hot-mix Asphalt Batch Plant

I Asphalt Production Data

Bin #	MATERIAL NAME	TONS @ 8.33	TONS @ 8.59	Prod. Rate TPH
AG1	Sand & Rock Dust	267.73	320.48	121.73
AG2	3/8" Rock	214.95	255.50	93.58
AG3	1/2" Rock	58.01	68.93	25.20
AG4	3/4" Rock	0.00	0.00	0.00
AG5	Filler	0.00	0.00	0.00
AC1	Asphalt Oil AR4000	62520	75168	29187
AC2	Asphalt Oil AR8000	0.00	0.00	0.00
Total		63060.69	75812.91	29427.51

II. Asphalt Composition for 1 Ton Batch

Bin #	Material	3/8"	3/4"	Berm	1/2"	Sheet
AG1	Sand & Dust	1146 lb.s	778 lb.s	1138 lb.s	908 lb.s	1816 lb.s
AG2	3/8" Rock	714	474	710	756	
AG3	1/2" Rock	0.00	380		209	
AG4	3/4" Rock	0.00	247			
AC5	Filler	20.00	19	20	19	20
AC1	Alt Oil AR4000	120.00	102		108	164
AC2	Alt Oil AR8000	0.00	0.00	132	0.00	0 lbs
Total		2000 lbs	2000 lbs	2000 lbs	2000 lbs	2000 lbs

III Summary of Data

Average production Rate : 240.50 TPH (excluding asphalt oil)

Material Temperature °F: 309 ± 7*

Baghouse Pressure "H_2O: 4.8 ± 0.1

Exhaust Ammeter Amps : 75 ± 0

Fuel type: diesel

Fuel rate: 4.1 GPM

Burner Position (range): 80% to 85%*

Visible emissions (% opacity):

Baghouse exhaust stack : 0%
Rotary aft dryer seal : 0%**
Rotary forward dryer seal : 10% (generated intermittently)
Truck drop area : 20% ±10 per drop ; blue smoke; less than 30 seconds duration per drop
Underground asphalt tank vent: 0% (no asphalt unloading was witnessed).

---

*During a 2 minute period of time proceeding an aggregate feed rate readjustment (slowing the throughput), the material temperature reached 327°F as the burner compensated with a corresponding minimum burner position of 29%.

**A gap existed between the burner assembly and the dryer drum ranging from 1 "at the top to 5" at the bottom (of the burner assembly/dryer drum interface). The flame of the burner was clearly visible.

RAW DATA SHEETS

Dashiell
10/28/8 91

P.O. # 117 (1/4)

Dalmart Pala
015
Test # 91301

<u>CpS</u>

The ΔP_{avg} = .445 in H_2O from test

<u>P_s low</u>	<u>Avg</u>	<u>Cp low</u>
.310		
.300	.3083	.8427
.315		

<u>Ps middle</u>		<u>Cp middle</u>
.445	.445	x

<u>Ps high</u>		<u>Cp high</u>
.670		
.760	.7033	.8513
.680		

$$\frac{.445-.3083}{.7033-.3083} = \frac{x-.8427}{.8513-.8427}$$

$$\frac{.1367}{.3950} = \frac{x-.8427}{.0086} \quad ; \quad .3461 = \frac{x-.8427}{.0086}$$

$$.0030 = x - .8427 \quad ; \quad x = .846$$

Cashman

10/28/91

P.O. #117

Calvert-Pyle

Test # 91301

016

IMPINGERS (2/4)

	PRE-TEST					POST-TEST			
Date	Imp	WGT Imp	Imp + H2O	WGT H2O	Imp + H2O + INSERT	Date	WGT (all)	NET GAIN	COMMENTS
10/27	1	325.06	423.23	98.17	552.38	10/28	807.96	255.58	
	2	312.75	412.11	99.36	540.67		720.19	179.52	
	3	—	—	—	458.16		469.17	11.01	
	4	—	—	—	447.45		450.59	3.14	
	5	—	—	—	816.43		828.87	12.44	
		Imp. Vol = 1953		197.53		TOTAL =		461.69	

WEIGHTS

Date	Beaker #	INIT WGT	WGT 1 11/4, 2pm	WGT 2 11/5, 10am	WGT 3 11/6 9am	WGT 4	COMMENTS	FINAL
Al	87065	1.5965	1.5968	1.5966	1.5966		white	1.5966
Ba Ac	91103	29.2921	29.2959	.2955	.2957		clear	29.2957
Ba Wa	91061	49.4875	49.5702	.5703	.5703		black ppt	49.5703
Fr Ac	91114	29.1235	29.1282	.1280	.1280		some wh. ppt	29.1280
Fr Wa	91126	28.5718	28.5939	.5938	.5938		tan ppt	28.5938
BL Ac	91101	29.1599	29.1615	.1613	.1612		clear	29.1612
BL Wa	91127	29.9968	29.9976	.9974	.9974		clear	29.9974

GAS

Date	Trial 1 %	Trial 2 %	Trial 3 %	cal#	cal gas	AVG	COMMENTS	GAS
10/28	3.2	3.2	3.2	24.9	52	3.2		CO_2
10/27	17.4	17.4	17.4	20.8	—	17.4		O_2

SOLVENTS

Acetone: Omnisolve, EMSCIENCE
**H650AK0116O012, Lot # 9132

Ouslum
10/28/91

ccilmont-Pala
017
Test # 91301

P.O. #117
ACETONE (3/4)

Date	Rinse	Vol	Label	COMMENTS
10/28	INIT	120	Fr Ac	Clear
10/29	1°	30	91114	
	2°			
TOTAL =				

Date	Rinse	Vol	Label	COMMENTS
10/28	INIT	150	Back Ac	Clear
	1°	30	91103	
	2°			
TOTAL =				

DATE	RINSE	VOL	Label	COMMENTS
10/28	INIT	200	Blank Ac	
	1°	30	91101	
	2°			
TOTAL =				

Oushima
10/28/91

P.O. #117

WATER (4/A)

CaliMCH-Pala
018
TEST # 91301

DATE	RINSE	VOL	LABEL	COMMENTS
10/28	INIT	250	FT H_2O	
10/29	1°	30	91126	Brown
	2°			
TOTAL=				

DATE	RINSE	VOL	LABEL	COMMENTS
10/28	INIT	350	Back H_2O	
" "	1°	40	91061 ~~91127~~	
—	2°			
TOTAL=				

DATE	RINSE	VOL	LABEL	
10/28	INIT	200	Blank Wat	
	1°	30	91127	
	2°			
TOTAL=				

BAROMETRIC PRESSURE REQUEST

SITE: Calmat - Pala | TEST#: 91301 | P.O.#: 0117 | DATE: 10/24/91

TO: ~~Tom~~ HAL ~~Don~~ | OF: Met | DATE: 10/24

FROM: David S. | OF: MTS | DATE: 10/24

ADDRESS: Calmat Co. Highway 76 Pala Indian Reservation
7mi E of I-15

TEST DATE: 10/28/91 | TEST TIME: 6am - 12pm

I need the usual hourly breakdown

GRADE LEVEL: 550 Feet above MSL

+ - _____ Feet above Grade

ALTITUDE: 550 Feet above MSL

CALCULATIONS:

06 - ~~29.43~~ " Hg
07 - 29.44"
08 - 29.46"
09 - 29.46"
10 - 29.44"
11 - 29.42"
12 - 29.40"

7:30 - 9:00

29.45 + 29.46 + 29.46 = 29.46

SIGNATURE: _____ DATE: 10/28/91 TIME: N40PST

METHOD 5 EQUIPMENT CHECKLIST

MISCELLANEOUS

_____ Camera & film
_____ Ice chest
_____ Ice
_____ 3 Tedlar bags
_____ Duct tape

TOOL BOX

_____ Assorted monkey wrenches
_____ Assorted open-end wrenches
_____ Assorted screwdrivers
_____ 3' pipe wrench
_____ Port (wire) brush
_____ Tape measure

SAFETY

_____ First aid box
_____ Hard hat
_____ Ear plugs
_____ Safety shoes
_____ Safety cones

LAB/FIELD EQUIPMENT

_____ Acetone
_____ Foil
_____ Parafilm
_____ Distilled water
_____ Kimwipes
_____ Vac. grease
_____ 100 ml graduated cylinder
_____ Sample collection bottles
_____ Nozzle brush
_____ Probe brush

CALCULATION EQUIPMENT

_____ Source Test brief case
    _____ Calibration notebook
    _____ Stopwatch
    _____ Nomograph
    _____ Calculator
    _____ Assorted pens
    _____ Tape measure
    _____ White out (2 bottles)
    _____ Labels
    _____ Scissors
    _____ Teflon tape
    _____ L/S Box fuses

SAMPLING EQUIPMENT (main)

_____ L/S Box
    _____ Pitot tube leak test equipment
    _____ Thermocouple read-out
    _____ Electrical cords (50' & 100')
    _____ Umbilical cord
_____ Cold/Hot box
    _____ Impingers (Impingers 1-4)
    _____ Imp-imp connections
    _____ Imp-probe connections
    _____ Spare set of both sets of connections
    _____ 100ml of water in 1st 2 impingers
    _____ Impinger clips
    _____ Silica gel impinger with vac. adapter
    _____ Filter & Filter holder
    _____ Spare filter & filter holder
    _____ Heating coil
_____ Probe
_____ Spare probe
_____ Nozzle box (selection of nozzles & nuts)

SAMPLING EQUIPMENT (reserve)

_____ L/S Box
    _____ Pitot tube leak test equipment
    _____ Umbilical cord
_____ Cold/Hot box
    _____ Impingers (Impingers 1-4)
    _____ Imp-imp connections
    _____ Imp-probe connections
    _____ 100ml of water in 1st 2 impingers
    _____ Impinger clips
    _____ Silica gel impinger with vac. adapter
    _____ Filter & Filter holder
    _____ Heating coil

STACK EQUIPMENT

_____ Unirail
    _____ Port/nipple adapters
    _____ 2 C -clamps
    _____ 2 unirails with rollers
    _____ Chains
    _____ 2 nylon straps
_____ Rope (25' and 50')
_____ Pail
_____ Gloves (leather)
_____ Gloves (heat resistant)
_____ Rags and diapers

EQUIPMENT DATA SHEET

SITE: Calmat - Pal | TEST#: 91301 | P.O.#: 117 | DATE: 10/28/91

EQUIPMENT CHECK:

MAIN:	TYPE	ID#	SIZE	UNITS	CLEANED	CHECKED	CAL. DATE
Nozzle Dia.	Napp		.310	in	DW	GDS	6/91
Pitot Tube	Napp	SN-7	5	ft	DW	GDS	6/91
Tedlar Bag	Stc	Calmat			DW	DW	—
L/S Box	Napp	0337	—	—	—	—	6/91
Stack Temp Sensor	Omega	N/A	—	—	—	—	6/91
Box Temp Sensor	Omega	N/A	—	—	—	—	6/91
Imp. Temp Sensor	omega	N/A	—	—	—	—	6/91
ΔP Sensor	Dwyer	—	0-5	inH_2O	—	—	6/91
ΔH Sensor	Dwyer	—	0-5	inH_2O	—	—	6/91
Cold Box	Napp	Blue 4	—	—	—	—	—
Hot Box	Napp	Blue 4	—	—	—	—	—
Thermoc. Display	on LS box	—	—	—	—	—	—

RESERVE							
Nozzle Dia.							
Pitot Tube							
Tedlar Bag							
L/S Box	Same as above						
Stack Temp Sensor							
Box Temp Sensor							
Imp. Temp Sensor							
ΔP Sensor							
ΔH Sensor							
Cold Box							
Hot Box							
Thermoc. Display							

SIGNATURE: DW DATE: 10/27/91 TIME: _____

LAB DATA SHEET

SITE: Calmat-Palo | TEST#: | P.O.#: 117 | DATE: 10/28

COLD BOX#: ~~Free~~ Blue 4 | HOT BOX#: Blue 4

PRE TEST MEASUREMENTS POST-TEST

	A	B	C	D	E		F	G
DATE	IMP No.	TRAP(w/o H2O) grams	TRAP (w/ H2O) grams	water (C-B) grams	INSERT + H2O grams	DATE	IMPINGER+H2O grams	H2O COLLECTED (F-E) grams
10/27	1	325.06 g	423.23 g	98.17 g	553.38 g	10/28	807.96 g	255.50 g
	2	312.75 g	412.11 g	99.36 g	540.67 g		722.19 g	179.52 g
	3	g	g	— g	458.16 g		469.17 g	11.01 g
	4	g	g	— g	447.45 g		450.59 g	3.14 g
	5	g	816.43 g	— g	816.93 g		829.87 g	12.44 g
		g	g	g	g		g	g

14753

TTL WGT GAIN FROM IMP (ΣG): 466.69 g

SN7

PreTest: SIGNATURE: 10/27/91 12 pm DATE: TIME:

PostTest: SIGNATURE: DATE: 10/28 TIME: 1:30

GAS ANALYSIS

DATE	TRIAL	INSTRUMENT	RANGE	GAS	PERCENT
	1			CO2	3.2 %
	2			CO2	3.2 %
	3			CO2	3.2 %
	AVG			CO2	%
	1			O2	17.4 %
	2			O2	17.9 %
	3			O2	17.4 %
	AVG			O2	%

cal=20.8

PreTest: SIGNATURE: DATE: 10/27 TIME: 12pm

PostTest: SIGNATURE: DATE: 10/28 TIME: 1:30

FILTER DATA

VARIABLE	WEIGHTS
(1) ID #	89065
(2) PRETEST	g
(3) POST-TEST	g
REC. AMT (3-2)	g

1.5907

cal # 24.9
5.1490 calgas CO2

Yc METER CHECK

SITE: Calmat - Polk TEST#: P.O#: #117 Date: 10.27

P bar= 29.41 in Hg L/S Box= 0337 ΔH@= 2.2254 T1 corr= +1.4 °F

Y= .4782 0.97*Y= .9489 1.03*Y= 1.0075 T2 corr= +1 °F

Yc=(5 min/Vm) * {[(0.0319*Tm)/Pb]^0.5} run L/S box at ΔH@ for 5 minutes

PRE-TEST 5 MINUTE Y CHECK

	Volume	t1 (unc)	t1 (corr)	t2 (unc)	t2 (corr)	tavg (t1(c)+t2(c))/2
initial(i)	496.892 ft^3	66 °F	66.4 °F	91.5 °F	91.6 °F	79 °F
final(f)	500.841 ft^3	68 °F	68.4 °F	107 °F	107.1 °F	87.75 °F

Vm(f) - Vm(i): Vm= 3.949 ft^3

(tavg-i+tavg-f)/2: tm= 83.38 °F tm+460 °R/°F: Tm= 543.38 °R

Yc=(5 min/ 3.949 Vm ft^3)*{[(.0319* 543.38 °R Tm)/ 29.41 in Hg Pbar]^0.5}= .9720

0.97*Y < Yc < 1.03*Y = .9489 < .9720 < 1.0075 (PASS) FAIL

SIGNATURE: DM DATE: 10/27 TIME: 12.50

POST-TEST 5 MINUTE Y CHECK

	Volume	t1 (unc)	t1 (corr)	t2 (unc)	t2 (corr)	tavg (t1(c)+t2(c))/2
initial(i)	562.012 ft^3	74 °F	74.4 °F	102 °F	102.1 °F	88.25 °F
final(f)	565.863 ft^3	77 °F	77.4 °F	113.5 °F	113.6 °F	95.5 °F

Vm(f) - Vm(i): Vm= 3.851 ft^3

(tavg-i+tavg-f)/2: tm= 91.8 °F tm+460 °R/°F: Tm= 551.88 °R

Yc=(5 min/ 3.851 Vm ft^3)*{[(.0319* 551.88 °R Tm)/ 29.41 in Hg Pbar]^0.5}= 1.0045

0.97*Y < Yc < 1.03*Y = .9489 < 1.0045 < 1.0075 (PASS) FAIL

DM 10/28 2:15

Nomograph Calculations

TEST #: Cellmet-Rubin DATE: 10/28

SITE 91301 P.O. # 117

Pm, absolute	29.53 / 29.43
Ps, absolute	
Tm, absolute	85
∂H@ across meter	2.725H
% moisture	20%
correction factor	1.150
Ts, absolute	275
∂P stack	.2755 = .40
ideal nozzle diam	.264
nozzle used	.310
test differential pressure	1.85/.24 = 7.71

~~509~~

~~50~~ / .6887 = ~~720~~ / 24 = 3 min/pt

50 / .8451 = 59.10 / 24 = 2.4 min/pt ≈ 2.5 min/pt

Figure 5-8

SITE: _____ TEST#: _____ P.O _____ DATE: _____

PIT (ΔP end) in. H2O − (ΔP start) in. H2O = (ΔP calc = 0 to Pass). (15 sec. min.) in H2O

PRE(+):	3.3	3.3	0	in 15 sec	(P)	F
PRE(-):	2.7	2.7	0	in 15 sec	(P)	F
POST(+):	3.1	3.1	0	in 15 sec	(P)	F
POST(-):	2.1	2.1	0	in 15 sec	(P)	F

VAC (Vend) ft^3 − (Vstart) ft^3 = (Vcalc =< 0.02 cfm) @ (vac) in. Hg. in 1 min

PRE:	505.584	505.584	.001	@ 15 in	1 min	(P)	F
POST:	558.888	558.888	0.0	@ 9 in	1 min	P	F

OPER: _____

T1 corr: +1.4 °F T2 corr: +1.1 °F

Pbar _____ in Hg Dn: 3.48 in

Ps: -.38 in H2O T amb: unk °F

Probe ID: _____ L/S box: 0.337

Probe len: 5 ft ΔH@: 2.7254

Cp: _____ Y: .9782

Dn: .310 in C. box: _____

K= 2.71 time/pt= 2.5 min

TRA PT NO	SAMPLING TIME min	GAS METER ft3, Vm Vm	PRESS DIFF ACROSS PIT TUBES in H2O ΔP	PRESS DIFF. ACROSS THE ORIFICE. in H2O ΔH DESIRED	ΔH ACTUAL	STACK TEMP, °F °F th I	BOX TEMP, °F °F th II	IMPINGER TEMP, °F °F th III	DRY GAS METER TEMP, °F INLET (T1)	DRY GAS METER TEMP, °F OUTLET (T2)	PUMP VAC in. Hg	CLOCK TIME Hr:min
		506.861										7:45 Start
1	2.5	508.041	.35	2.69	2.7	247		50	66	82	3	
2	5.0	509.885	.35	3.69	2.7	249	106	48	64	84	3	
3	7.5	511.975	.39	3.00	3.0	254	181	48	65	98	4	
4	10.0	514.123	.42	3.2	3.2	254		51	66	100	5	
5	12.5	516.493	.45	3.47	3.5	256	237	56	67	102	7	
6	15	518.802	.47	3.62	3.6	258	260	58	67	104	7	
7	17.5	521.325	.52	4.00	4.0	259	285		68	105	8	
8	20	523.682	.52	4	4	260	301	61	69	106	6.5	
9	22.5	525.932	.51	3.9	3.9	258	304	59	69.5	107	6	
10	25	528.232	.52	4	4	255	316	56	70	108	6	
11	27.5	530.458	.47	3.62	3.6	255	324	55	70	108	5.5	
12	30	532.630	.47	3.62	3.6	254	331	54	71	109	5.5	8:15 Stop
1	2.5	534.569	.25	1.9	1.9	145	158	53	74	71	4	8:27 start
2	5.0	536.650	.37	2.85	2.9	140	226	48	74	102	5	
3	7.5	538.891	.42	3.2	3.2	247	246	47	73	106	5	
4	10.0	541.010	.43	3.46	3.45	259	278	46	73	108	5.5	
5	12.5	543.325	.50	3.85	3.9	260	299	47	74	110	6	
6	15	545.567	.50	3.85	3.9	261	311	47	74	110	6	
7	17.5	547.849	.51	3.9	3.9	260	316	48	74	111	6	
8	20	550.134	.51	3.9	3.9	258	308	48	75	112	6	
9	22.5	552.372	.48	3.7	3.7	258	310	48	75.5	113	6	
10	25	554.493	.43	3.3	3.2	257	322	50	76	114	5.5	
11	27.5	556.657	.46	3.5	3.5	256	332	50	77	114.5	6	
12	30	558.828	.43	3.3	3.3	253	340	51	78	116	5.5	8:46

??SITE NAME?? on ??TEST D.__:?? P.O.#????? TEST #?????

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

SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE: Calmat Pala

TEST #: 91301 P.O.# 117 TEST DATE: 10/28/91

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

UNIT TESTED: Asphalt

EQUIPMENT: baghouse

TESTED BY: D. Shina et al DATE: 10/28/91

SITE PERSONNEL: P. Mason DATE: 10/28/91

APCD ENGINEER: E. Davis DATE: 10/28/91

LAB ANALYSIS BY: D. Shina DATE: 11/6/91

REPORT BY: D. Shina DATE: 11/6/91

REVIEWED BY: L. Twaddle DATE:

APPROVED BY: DATE:

ROBERT YELENOSKY, 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	4.03 lbs/hr	PASSED

SUMMARY:

ITEM	Vm	Bws	Cs	E	I	Qstd	ts	PROD RATE
UNITS	ft^3	%	gr/dscf	lbs/hr	%	dscfm	°F	tons/hr
VALUE	51.167	31.27	0.035	4.033	108	1.34E+04	248	240.50

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 procedures and equipment utilized in these tests are based on EPA New Source Performance Standards Method 5. The sampling train was modified to utilize a back-end filter and 5th impinger filled with silica gel (fig. 1), as outlined by the SDAPCD QA manual.

CALCULATIONS

All preliminary assumptions and calculations are based on data obtained from previous tests. 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 32 traverse points, 4 from each of 8 sample ports (fig.2), collected from 18 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 rule 54 of the SDAPCD.

ANALYSES:

Gas: An integrated bag sample was collected during the test and analyzed at the APCD lab.

Particulate: All procedures follow EPA guidelines, except where noted in the SDAPCD QA manual.

EQUIPMENT:

All testing and analysis equipment was calibrated according to EPA guidelines.

Analysis:	*Collection:*	*Sampling:*	*Temp./Press.:*
CO2-Anarad AR400	Filter-Gelman	L/S Box-Napp	Thermocouples-Omega
O2-Teledyne Ryan 320 P4	Holder-Gelman	Umbilical cord-Napp	Read out-Omega
Macrobalance-Sargent Welch	Beakers-Pyrex	Cold/Hot box-Napp	Barometric-calc. by APCD
Microbalance-Sartorious	Impingers-Ace	Pitobe tube-Napp	L/S box-Dwyer magnehelic

??SITE NAME?? on ??TEST D~~A~~E??

P.O.#????? TEST #?????

Trav. Pt	Vm (ft^3)	ΔP	ΔH	t 1(unc)	t 2(unc)	Stack Temp	Imp Temp	velocity
	506.861	(in H2O)	(in H2O)	(°F)	(°F)	(°F)	(°F)	(ft/sec)
1		0.350	2.700	65.00	82.00	247.00	50	41.36
2		0.350	2.700	64.00	84.00	249.00	48	41.42
3		0.390	3.000	65.50	98.00	254.00	48	43.88
4		0.420	3.200	66.00	~~100.00~~	254.00	51	45.54
5		0.450	3.500	67.00	102.00	256.00	56	47.20
6		0.470	3.600	67.00	104.00	258.00	58	48.31
7		0.520	4.000	68.00	105.00	259.00		50.85
8		0.520	4.000	69.00	106.00	260.00	61	50.88
9		0.510	3.900	69.50	107.00	258.00	59	50.32
10		0.520	4.000	70.00	108.00	255.00	56	50.70
11		0.470	3.600	70.00	108.00	255.00	55	48.20
12		0.470	3.600	71.00	109.00	254.00	54	48.17
1		0.250	1.900	74.00	71.00	149.00	53	32.45
2		0.370	2.900	74.00	102.00	190.00	48	40.78
3		0.420	3.200	73.00	108.00	242.00	47	46.15
4		0.450	~~3.500~~	73.00	108.00	259.00	46	47.30
5		0.500	3.800	74.00	110.00	260.00	47	49.89
6		0.500	3.900	74.00	110.00	261.00	47	49.93
7		0.510	3.900	74.00	111.00	260.00	48	50.39
8		0.510	3.900	75.00	112.00	258.00	48	50.32
9		0.480	3.700	75.50	113.00	256.00	46	48.82
10		0.430	3.300	76.00	114.00	257.00	50	46.17
11		0.460	3.600	77.00	114.50	256.00	50	47.72
12	558.028	0.430	3.300	78.00	116.00	253.00	51	46.04

	Vm (ft^3)	ΔP (in H2O)	ΔH (in H2O)	t 1 (°F)	t 2 (°F)	ts (°F)	ti (°F)	vs ~~(ft/sec)~~
Average:	51.167	0.445	3.446	71.27	104.19	248	51	46.74

MISCELLANEOUS:

Ø = 60.0 min
tn = 24 points
ø = 2.5 min

NOZZLE & PROBE:

Dn = 0.310 in
An = 0.0755 in^2
Cp = 0.846

METER BOX PARAMETERS:

ΔH@ = 2.7254
Y = 0.9782
Box ID = D 337

PRESSURES:

Pbar = 29.46 in Hg
Pg = -0.38 in H2O
Silica gel(yes/no) YES
Vpw @ ts = 58.63 in Hg
Vpw @ ti = 0.0000 in Hg

VOLUME:

start leak rate = 0.010 cfm
Pass/Fail PASS
final leak rate = 0.000 cfm
Pass/Fail PASS
Vm 51.167 ft^3

TEMPERATURES:

t1 corr = 0.40 °F
t2 corr = 0.10 °F
tm = 88 °F
ts = 248 °F
ti = 51 °F

STACK PARAMETERS:

circular (yes/no) YES
Ds = 3.48 f t
Length = N/A f t
As = 9.51 ft^2

LAB DATA:

mn(front) = 0.02492 g
mn(back) = 0.08385 g
mn(total) = 0.10877 g
Vlc 461.69 ml

STACK GAS MEASUREMENTS:

CO2 = 3.20 %
O2 = 17.40 %
CO = 0.00 %
N2 = 79.40 %

??SITE NAME?? on ??TEST D~~E??

P.O.#????? TEST #?????

TEMPERATURES:

01)	ts = (Σ ts(n))/total n's	248 °F
02)	Ts = ts+460	708 °R
03)	tm= (Σ [(t 1(n)+t 2t(n))/2)/total n's	88 °F
04)	Tm= (t1+t2)/2 + 460	548 °R
05)	ti= (Σ ti(n))/total n's	51 °F
06)	Tstd	528 °R

PRESSURES:

07)	Pbar= {(P @ S.L.)+[ft. above S.L.*(-0.1 in Hg/100ft)]}	29.46 in Hg
08)	Pg= read from pressure sensing device	-0.38 in H2O
09)	Ps= Pbar + (Pg/13.6)	29.43 in Hg
10)	ΔH	3.44 in H2O
11)	Pm= Pbar+(ΔH/13.6)	29.71 in Hg
12)	Pstd	29.92 in Hg

VOLUME:

13)	Vm= Vm(end)-Vm(begin)	51.167 ft^3
14)	Y	0.9782
15)	Vm'= Vm*Y	50.052 ft^3
16)	Vpw @ ti = from appendix	0.0000
17)	corr Vwm = {[(Vm'*Vpw@Imp/Ps)*Pm*Tstd]/(Tm*Pstd)}	0.0008 ft^3
18)	Vm std = {[Vm'*(Tstd/Tm)*(Pm/Pstd)]-corr Vwm}	47.893 ft^3
19)	Vlc= (Σ Volume of impingers)	461.69 ml
20)	∂	0.002201 lb/ml
21)	R	21.85 Hg-ft^3/°R-lb-mo
22)	MwH2O	18.00 g/g-mo
23)	Vw std = {[(Vlc*∂*R*Tstd)/(Pstd*MwH2O)]+corr Vwm}	21.7918 ft^3

CALCULATIONS:

MOISTURE-

24)	Bws(1) =(Vw std)/(Vw std+Vm std)100	31.27 %	
25)	Vpw @ ts = from appendix	58.63 in Hg	
26)	Bws(2) =[(Vpw @ ts)/Ps]*100	199.20 %	
27)	Bws = lower value of equation 24 or 26		31.27 %

MOLECULAR WEIGHT-

28)	%O2	17.40 %
29)	%CO2	3.20 %
30)	%N2+inerts+%CO	79.40 %
31)	Md=[0.440(%CO2)]+[0.320*(%O2)]+[0.280(%N2+inerts+%CO)]	29.21 g/g*mole
32)	Ms=Md*(1-Bws)+18.0*(Bws)	25.70 g/g*mole

FLOW-

33)	ΔP	0.445 in H2O
34)	Cp	0.846
35)	vs= 85.49*Cp*{[(Ts*ΔP)/(Ps*Ms)]^.5}	46.741 ft/s
36)	As=3.14*[(Ds)^2/4]	9.51 ft^2
37)	Qs = (vs)*As*60	2.67E+04 acfm
38)	Qstd =17.64*Qs*(1-Bws)*Ps/Ts	1.34E+04 dscfm

EMISSIONS-

FRONT HALF

39)	mn (front)		0.02492 g
40)	Cs (front) =15.43*mn(front)/Vm std	0.0080	0.008 grains/dscf
41)	E (front) = (0.00857)*(Qstd)*Cs (front)		0.92 lbs/hr

BACK HALF

42)	mn (back)		0.08385 g
43)	Cs (back) =15.43*mn(back)/Vm std	0.0270	0.027 grains/dscf
44)	E (back) = (0.00857)*(Qstd)*Cs (back)		3.11 lbs/hr

TOTAL

45)	mn (total) = mn(front)+mn(back)		0.10877 g
46)	Cs (total) =15.43*mn(total)/Vm std	0.0350	0.035 grains/dscf
47)	E (total) = (0.00857)*(Qstd)*Cs (total)		4.03 lbs/hr

ISOKINETICS:

48)	An=3.14*[(Dn)^2/4]		0.0755 in^2
49)	I=.09450(Ts*Vm std)/Ps*vsAnØ(1-Bws)	107.83 %=	108 %

?? SITE NAME?? on ??TEST DAT P.O.#?????? TEST#??????

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

LABORATORY ANALYSIS OF PARTICULATE TEST

TEST SITE: Calmat Pala

TEST # 91301.0	P.O.# 117	TEST DATE: 10/28/91
LAB ANALYSIS BY:	D. Shina	DATE: 11/6/91
LAB REPORT BY:	D. Shina	DATE: 11/6/91
REVIEWED BY:	L. Twaddle	DATE: 11/20/91

(1) IMPINGER VOLUMES

	FINAL WEIGHT		INITIAL WEIGHT		NET WEIGHT	
#1	807.96 g	-	552.38 g	=	255.58 g	
#2	720.19 g	-	540.67 g	=	179.52 g	
#3	469.17 g	-	458.16 g	=	11.01 g	
#4	450.59 g	-	447.45 g	=	3.14 g	
SILICA GEL CONTAINER:						
#5	828.87 g	-	816.43 g	=	12.44 g	

Tot. Vol.= 461.69 g

(2) BLANKS

STD = Net Wgt(solv) / Tot. Vol(solv. used)

ACETONE:	WATER:	ORGANIC:
VOLUMES:	*VOLUMES:*	*VOLUMES:*
BKR ID = 91101	BKR ID = 91127	BKR ID =
Initial= 200.00 ml	Initial= 200.00 ml	Initial= ml
tot. Rinses= 30.00 ml	tot. Rinses= 30.00 ml	tot. Rinses= ml
Tot. Vol= 230.00 ml	Tot. Vol= 230.00 ml	Tot. Vol= 0.00 ml
WEIGHTS:	*WEIGHTS:*	*WEIGHTS:*
final= 29.1612 g	final= 29.9974 g	final= g
initial= 29.1599 g	initial= 29.9968 g	initial= g
net= 0.0013 g	net= 0.0006 g	net= 0.0000 g
LIMIT: 0.001% = 10 ppm = 0.000010g/ml	LIMIT: 4ppm = 4mg/L = 0.000004g/ml	LIMIT: 0.001% = 10 ppm = 0.000010g/ml
STD = 5.65217E-06 g/ml	STD = 2.60870E-06 g/ml	STD = N/A g/ml
0.000565 %	0.000261 %	N/A %
= 5.65 ppm	2.61 ppm	N/A ppm
The Blank PASSED	The Blank PASSED	The Blank N/A