Commonwealth of Pennsylvania
Environmental Resources
September 13, 1988

Subject: Source Test Review

To: Data File

From: John N. Mitchell
Air Pollution Control Engineer
Division of Technical Services and Monitoring
Bureau of Air Quality Control

Through: Chief, Source Testing and Monitoring Section

On June 17, 1988, Clean Air Engineering, Inc. conducted particulate testing at Marsolino Asphalt, Inc. located in Carmichaels, Pennsylvania. The source tested is a natural gas fired, three ton batch-asphalt plant manufactured by Cedarapids Manufacturing Company, with a maximum rated production capacity of 250 ton/hr. Emissions are controlled by a Cedarapids Model No. CH-88 cyclone followed by a baghouse manufactured by Aztech Baghouse Company. The effluent exits to the atmosphere through a 24 in. by 48 in. stack at a point approximately 18 feet above grade.

Three particulate tests were conducted in the stack servicing the Aztech baghouse. The baghouse was operating at an average pressure drop of 3.5 in. water during the testing. ID-2 Wearing was manufactured during run 1, while ID-3 Wearing was manufactured during runs 2 and 3. A sieve analysis of the aggregate mixtures are given below.

	ID-2W % Passing	ID-3W % Passing
1 in.	100	100
3/4 in.	100	95
3/8 in.	93	72
4 mesh	63	53
8 mesh	42	40
16 mesh	32	28
30 mesh	26	20
50 mesh	16	16
100 mesh	10	10
200 mesh	6	6

The tests were conducted in accordance with Chapter 139 of the Department of Environmental Resources' Rules and Regulations and are acceptable to the Department.

The following information was extracted from the test report and additional process data supplied by the company:

Run No.	1	2	3
Asphalt Production Rate, tons/hr	174.3	191.0	163.4
% Asphaltic Oil in Mix	6.3	5.0	5.0
Particulate Concentration, gr/DSCF	0.0104	0.0179	0.0128
Volumetric Flowrate, DSCFM	21,580	19,160	21,160
Particulate Emission Rate, lbs/hr	1.9	2.9	2.3
Allowable Emission Rate, lbs/hr	13.7	14.3	13.4

*The allowable emission rates are determined according to Chapter 123, Section 123.13(b) based upon aggregate feed rates (aggregate feed rate calculated from the asphalt production rate and the % asphaltic oil in the asphalt) of 163.3, 181.5, and 155.2 tons/hr for runs 1, 2, and 3, respectively.

30-363-001

CLEAN AIR ENGINEERING, INC
July 25, 1988

REPORT ON
PARTICULATE EMISSIONS

Performed at:
MARSOLINO ASPHALT, INCORPORATED
CARMICHAELS, PENNSYLVANIA

CAE Project No: 4380

CONTENTS

SUMMARY

INTRODUCTION

Marsolino Asphalt, Incorporated contracted Clean Air Engineering to determine the levels of particulate emissions at their Carmichaels, Pennsylvania facility for compliance purposes.

The testing took place at the batch asphalt plant baghouse outlet on June 17, 1988. Coordinating the field testing were:

F. Mazurek - Marsolino Asphalt, Incorporated
M. Phillips - Clean Air Engineering

SUMMARY OF TEST RESULTS

Particulate Emissions

The particulate concentration at the baghouse outlet averaged 0.0135 gr/dscf over three runs on June 17, 1988.

To the best of our knowledge, the data presented in this report is accurate and complete.

CLEAN AIR ENGINEERING

Tara Duffy
Technical Writer

Steve Nelson
Technical Writer

Robert A. Preksta
Manager Eastern Region

Elizabeth Williams
Manager Technical Communications

Reviewed by William I. Walker, P.E.

DESCRIPTION OF INSTALLATION

Marsolino Asphalt, Incorporated operates a bituminous mix, asphalt batching plant in Carmichaels, Pennsylvania. Aggregate is supplied to the plant by Marsolino Coolspring Quarry with additional fines purchased from Pittsburgh Sand and Gravel. Mix designs have been developed in cooperation with Ashland Oil. who manufactures and supplies the AC (asphalt cement). A typical mix design will include 6 percent fines which are recycled from the baghouse.

Cold aggregate is loaded into a two, three or four compartment hopper belt feeders. These hoppers continuously supply the aggregate in, roughly. the desired proportions to the drier cold elevator.

The cold elevator on the drier carries the material to the drier drum where the material is heated and the moisture removed. The hot dried material is discharged from the lower end of the drier to the mixing plant hot elevator.

A dust collector is provided in the plant setup to pull the necessary volume of exhaust gases through the drier including the released moisture from the aggregate. The dust which is carried with the exhaust gases into the dust collector is collected and returned to the boot of the mixing plant hot elevator.

The average pressure drop on the baghouse is 3.5 inches. The plant normally operates at 175 tons/hour.

The testing reported in this document was conducted at the baghouse outlet.

SUMMARY OF PROCEDURES

SAMPLING PROCEDURES

Particulate Emissions

The sampling for the particulate emissions followed procedures in accordance with the Pennsylvania Department of Environmental Resources (PA DER) and as detailed in U.S. Environmental Protection Agency (EPA) Methods 1, 2, 3, 4 and 5. These methods are titled:

- Method 1---"Sample and Velocity Traverses for Stationary Sources;"
- Method 2---"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube);"
- Method 3---"Gas Analysis for Carbon Dioxide, Oxygen, Excess Air and Dry Molecular Weight;"
- Method 4---"Determination of Moisture Content in Stack Gases;"
- Method 5---"Determination of Particulate Emissions from Stationary Sources."

These methods appear in detail Title 40 of the Code of Federal Regulations (CFR), Part 60, Appendix A.

According to the PA DER method, the back half washes of the sampling apparatus were weighed. The back half acetone and back half soluble weights are not included when determining the particulate concentration. The front half acetone wash, the front half water wash and the filter weights are used to determine total particulate matter.

The sampling apparatus is shown in Fig 1 on page 6-1. The sampling equipment was designed and manufactured by the Research Appliance Co. and Clean Air Engineering to meet U.S. EPA standards. All equipment was calibrated at the Clean Air Engineering laboratory prior to shipment to the job site.

Sampling Locations

The baghouse outlet has four ports. Six points were sample per port. The sampling time per point was four minutes for a total sampling time of 96 minutes. The outlet sampling locations are shown in Fig 2 on page 6-2.

ANALYTICAL PROCEDURES

Particulate Emissions

The particulate emission rate was determined using procedures detailed in EPA Method 5. Particulate samples collected on Whatman 934 AH glass fiber filters were analyzed gravimetrically. The probe and nozzles were washed with acetone. The wash was transferred to tared beakers and evaporated to dryness. These weight differentials were combined to determine the total particulate matter.

QUALITY CONTROL PROCEDURES

Quality control procedures for all aspects of field sampling; sample preservation and holding time; reagent quality; analytical method; analyst training and safety; and instrument cleaning, calibration and safety were followed. These procedures are generally consistent with EPA guidelines documented in "Quality Assurance Manuals for Air Pollution Measurement Systems," Vol 3, "Stationary Source Specific Methods" (EPA-600/4-77-027b).

RESULTS

Particulate Emissions

The test conditions and results of analysis for particulate emissions are presented in Table 1 on page 4-2.

Table 1

Particulate Emissions
Baghouse Outlet
EPA Method 5
June 17, 1988

Run No.	1	2	3
Start Time (approx.)	8:36 am	2:13 pm	4:43 pm
Stop Time (approx.)	1:47 pm	4:07 pm	6:49 pm
Gas Conditions			
Temperature (°F)	200	217	211
Moisture (volume %)	11.0	13.6	13.2
O_2 (dry volume %)	16.5	16.0	16.0
CO_2 (dry volume %)	2.5	2.5	2.5
Volumetric Flow Rate			
acfm	31,240	29,320	31,930
dscfm	21.580	19,160	21.160
Particulate Concentration			
lb/hr	1.9	2.9	2.3
gr/dscf	3b 0.0104	3a 0.0179	3b 0.0128

DISCUSSION

No deviations from standard U.S. EPA testing procedures were noted.

FIGURES

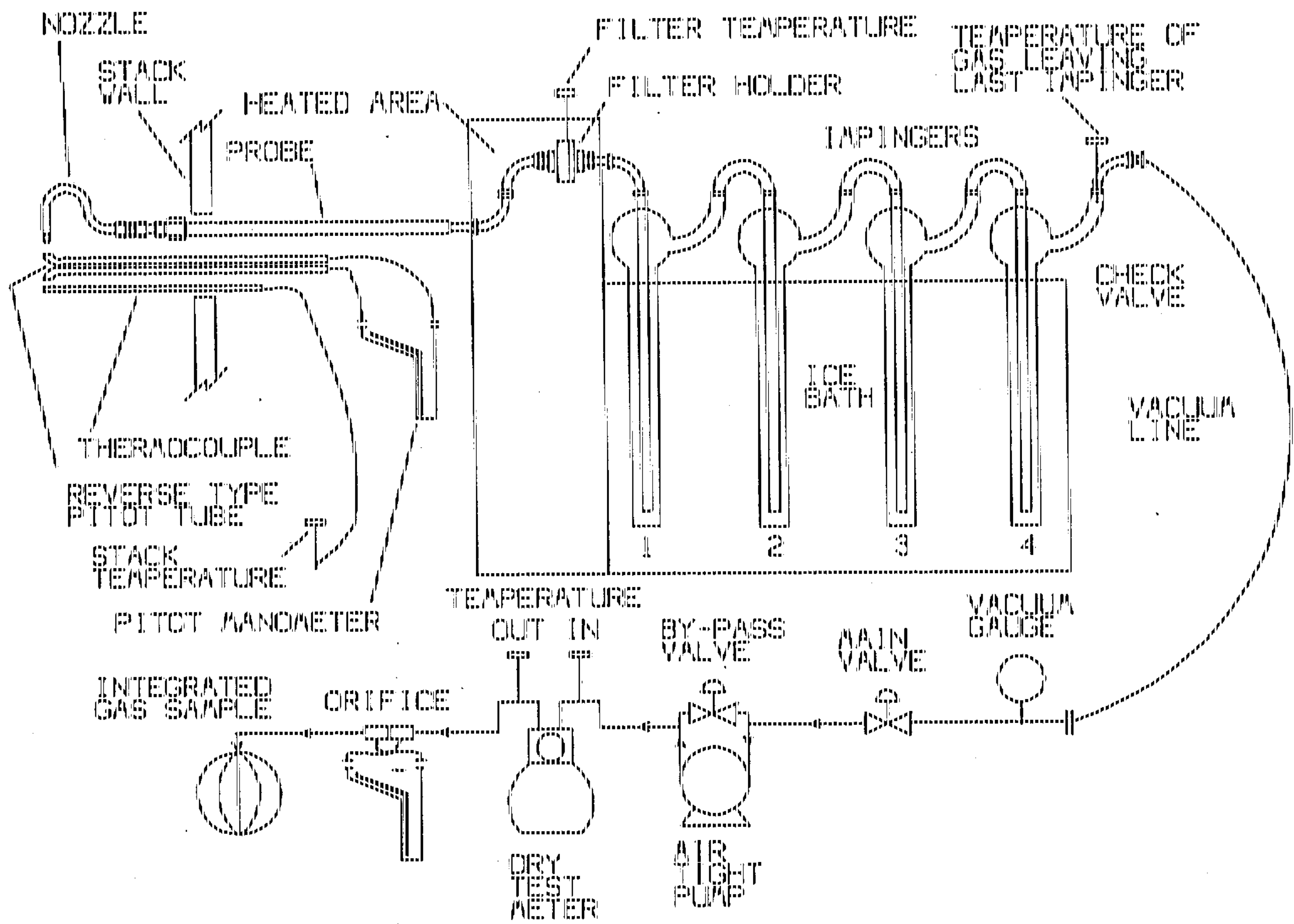
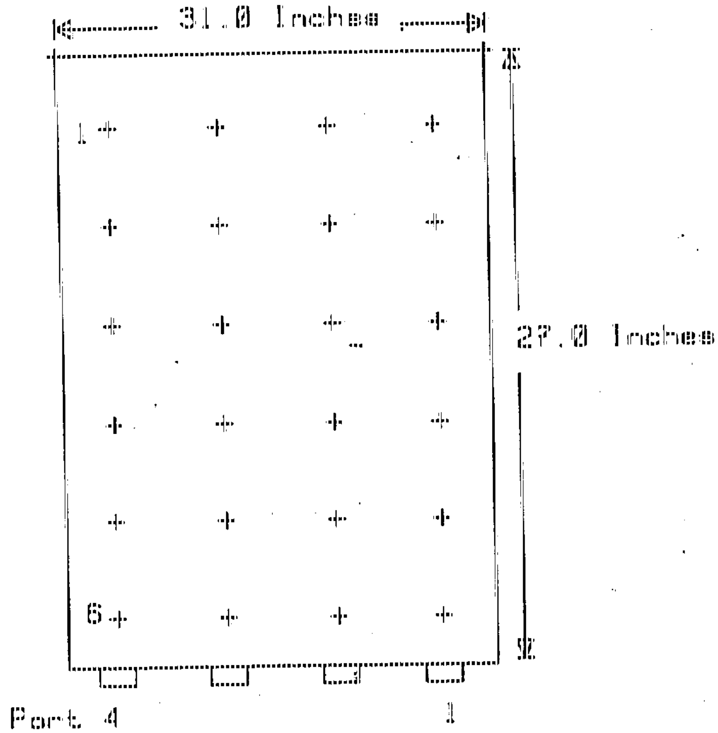


Fig 1. The EPA Method 5 sampling apparatus is shown.



Traverse Point	Distance From Point To Port In Inches
1	25.3
2	20.7
3	16.1
4	11.5
5	6.9
6	2.3

Fig 2. The cross section of the baghouse outlet shows sampling point locations.

APPENDIX

NOMENCLATURE

Nomenclature

A	--	absorbance
An	--	cross sectional area of nozzle (ft^2)
As	--	cross sectional area of stack (ft^2)
Bwo	--	proportion of water vapor in the gas stream by volume (%)
Bws	--	proportion of water vapor in the gas stream by volume (%) at saturated conditions
Cp	--	pitot tube coefficient (dimensionless)
Df	--	dilution factor
Fd	--	ratio of dry gas generated to gross calories (dcfm/MBtu)
Fc	--	ratio of gas generated to gross calories (dscf/MBtu)
GCV	--	gross calorific value of fuel (Btu/lb)
DH	--	average pressure drop across the meter box orifice (in. H_2O)
(DP)½	--	average of square roots of velocity heads of stack gas (in. H_2O)½
DH@	--	meter orifice calibration coefficient (dimensionless)
%I	--	percent of isokinetic sampling (acceptable: 90%<%I<110%)
Kp	--	$\frac{[(lb/lb\text{-}mole)(in.\ Hg)]^{1/2}}{[(^{\circ}R)(in.\ H_2O)]^{1/2}}$
Kc	--	spectrophotometer calibration factor
Md	--	dry molecular weight of stack gas (lb/lb-mole)
Ms	--	molecular weight of stack gas, wet basis (lb/lb-mole)
Mn	--	total amount of particulate matter collected (gm)
N	--	normality of titrant (meq/ml)
Pb	--	barometric pressure (in. Hg)
Pf	--	final absolute pressure of flask (in. Hg)
Pi	--	initial absolute pressure of flask (in. Hg)
Ps	--	absolute stack gas pressure (in. Hg)
Qa	--	volumetric flow rate. actual conditions
Qstd	--	volumetric flow rate. standard conditions, dry basis
std	--	standard conditions, 29.92 in. Hg 68°F
Tf	--	final absolute temperature of flask (°R)
Ti	--	initial absolute temperature of flask (°R)
Tm	--	average dry gas meter temperature (°F)
Ts	--	average stack temperature (°F)
Tstd	--	absolute temperature, standard conditions (528°R)
Θ	--	total sampling time (min)
Va	--	volume of aliquot (ml)
Vf	--	volume of flask (ml)
Vlc	--	total volume of liquid collected in impingers and silica gel (ml)
Vm	--	volume of gas sample through the dry gas meter at meter conditions (ft^3)
Vmstd	--	volume of gas sample through the dry gas meter. standard conditions (ft^3)
Vsc	--	volume of flask sample, standard conditions (ml)
Vsoln	--	total volume of solution (ml)
Vt	--	volume of titrant used to titrate aliquot (ml)
Vtb	--	volume of titrant used to titrate blank (ml)
Vwstd	--	volume of water collected, standard conditions (ft^3)
Vs	--	stack gas velocity (ft/sec)
Yd	--	gas meter correction factor (dimensionless)

SAMPLE CALCULATIONS

MARSOLINO ASPHALT, INCORPORATED
CAE Project No: 4380

SAMPLE CALCULATIONS - RUN #3 Baghouse Outlet

(Note: results are taken from computer analysis.)

1. Volume of water collected

$$V_{wstd} = (0.04707)(V_{lc})$$

$$= (0.04707)(230)$$

$$= 10.83 \text{ wscf}$$

2. Volume of gas metered, standard conditions

$$V_{mstd} = \frac{(17.64)(V_m)\left[P_b + \frac{DH}{13.6}\right]}{(460 + T_m)} (Y_d)$$

$$= \frac{(17.64)(77.78)\left[29.03 + \frac{1.89}{13.6}\right]}{(460 + 104)} (1.0072)$$

$$= 71.47 \text{ dscf}$$

3. Moisture content

$$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}}$$

$$= \frac{10.83}{71.47 + 10.83}$$

$$= 0.1316$$

$$= 13.2\ \%$$

4. Molecular weight of dry gas stream

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%CO + \%N_2)$$

$$= 0.44(2.5) + 0.32(16.0) + 0.28(81.5)$$

$$= 29.04$$

SAMPLE CALCULATIONS (Continued)

5. Molecular weight of stack gas

$$M_s = M_d (1 - B_{wo}) + 18 (B_{wo})$$

$$= 29.04 \; (1 - 0.1316) + 18 (0.1316)$$

$$= 27.59$$

6. Velocity of stack gas

$$V_s = K_p \; C_p \; \overline{(DP)^{1/2}} \; \frac{[\overline{T_s} + 460]^{1/2}}{[(M_s) (P_s)]^{1/2}}$$

$$= 85.49 (0.840) (1.396) \frac{[211 + 460]^{1/2}}{[(27.59) (29.03)]^{1/2}}$$

$$= 91.80 \text{ ft/sec}$$

7. Total flow of stack gas

$$Q_a = (60) (A_s) (V_s)$$

$$= (60) (5.8) (91.80)$$

$$= 31930 \text{ acfm}$$

$$Q_{std} = \frac{Q_a \; P_s \; (17.64) (1 - B_{wo})}{\overline{T_s} + 460}$$

$$= \frac{(31930) (29.03) (17.64) (1 - 0.1316)}{211 + 460}$$

$$= 21160 \text{ dscfm}$$

SAMPLE CALCULATIONS (Continued)

8. Percent isokinetic

$$\%I = \frac{(0.09450)\,(\bar{T}_s + 460)\,V_{mstd}}{P_s\,V_s\,A_n\,\theta\,(1 - B_{wo})}$$

$$= \frac{(0.09450)\,(211 + 460)\,(71.47)}{(29.03)(91.80)(0.000197)(96)(1 - 0.1316)}$$

$$= 103.6\ \%$$

9. Particulate concentration

$$gr/dscf = \frac{(15.43)\,(M_n)}{V_{mstd}}$$

$$= \frac{(15.43)\,(0.0594)}{71.47}$$

$$= 0.0128$$

$$lb/hr = \frac{(gr/dscf)\,(Q_{std})\,(60)}{7000}$$

$$= \frac{(0.0128)\,(21160)\,(60)}{7000}$$

$$= 2.326$$

$$\text{average gr/dscf} = \frac{\sum_{1}^{n} [(gr/dscf)\,(dscfm)]}{\sum_{1}^{n} (dscfm)}$$

$$= \frac{838.244}{61900}$$

$$= 0.0135$$

PARAMETERS

MARSOLINO ASPHALT, INCORPORATED
CAE Project No: 4380

PARAMETERS

Baghouse Outlet

Run No.	1	2	3
A_n	.000197	.000197	.000197
A_s	5.8	5.8	5.8
B_{wo}	.1097	.1359	.1316
$\%CO_2$	2.5	2.5	2.5
C_p	.840	.840	.840
$\overline{DH}$	2.11	1.58	1.89
DH@	1.783	1.783	1.783
$\overline{(DP)^{1/2}}$	1.383	1.275	1.396
%I	108.4	105.6	103.6
M_d	29.06	29.04	29.04
M_n	.0514	.0765	.0594
M_s	27.85	27.54	27.59
$\%O_2$	16.5	16.0	16.0
P_b	29.03	29.03	29.03
P_s	29.03	29.03	29.03
Θ	96.0	96.0	96.0
$\overline{T_m}$	89	102	104
$\overline{T_s}$	200	217	211
V_{lc}	199.5	220.4	230
V_m	80.67	71.58	77.78
V_{mstd}	76.19	65.96	71.47
V_s	89.8	84.2	91.8
V_{wstd}	9.39	10.37	10.83
Y_d	1.0072	1.0072	1.0072

MARSOLINO ASPHALT, INCORPORATED
CAE Project No: 4380

PARAMETERS

Particulate Matter (Mn)

Run No.	1	2	3
Back Half Solubles			
Mn	0.0006	0.0006	0.0003
Back Half Acetone			
Mn	0.0147	0.0087	0.0070

CALIBRATION DATA

METER BOX FULL TEST CALIBRATION

New Calibration

DATE: 5/20/87 METER BOX Yd: .9996 METER BOX: R

OPERATOR: SHW METER BOX ΔH@: 1.811 BAROMETRIC PRESSURE (Pb): 29.12

Q	ΔH	ΔP	Yds	Standard Meter Gas Volume (ft^3) Initial	Final	(Vds) Net	Meter Box Gas Volume (ft^3) Initial	Final	(Vd) Net	Standard Meter Temperature In	Out	Tds Avg	Meter Box Temperature In	Out	Td Avg	Time (Min.) θ	Yd	ΔH@
.56	.50	-.50	.9945	114.75	119.95	5.20	504.00	509.24	5.24	74/74	74/74	74	86/92	86/86	91	13	1.0056	1.780
.92	3.0	-2.2	.9876	165.79	176.38	10.59	554.30	564.75	10.45	76/76	76/76	76	101/102	92/92	99	11	1.0304	1.856
.59	.50	-.59	.9959	191.72	196.[illegible]	5.27	580.50	[illegible]	5.35	74/74	76/76	75	94/96	86/86	91	13	1.0068	1.738
.59	.50	-.59	.9959	196.[illegible]	202.27	5.28	585.85	591.20	5.35	74/74	74/74	74	94/94	88/88	91	13	1.0107	1.725
.59	.50	-.59	.9947	212.74	218.37	5.63	602.00	607.85	5.85	74/74	74/74	74	94/96	86/86	90.5	14	.9884	1.762
.59	.50	-.59	.9946	218.37	224.79	6.42	607.85	614.54	6.69	74/74	74/74	74	96/96	86/86	91	16	.9898	1.769
.71	1.7	-1.4	.9902	246.22	251.36	5.14	626.50	~~[illegible]~~	5.21	74/74	74/74	74	104/104	90/90	97	7	~~[illegible]~~	1.792
.71	1.7	-1.4	.9902	301.65	311.91	10.26	691.80	702.24	10.44	76/76	76/76	76	104/106	88/88	97.5	14	1.0048	1.802
.71	1.7	-1.4	.9902	311.91	322.17	10.26	702.24	712.70	10.46	76/76	76/76	76	106/106	88/88	98	14	1.0037	1.800
.92	3.0	-2.2	.9878	346.91	357.43	10.52	757.70	768.32	10.62	78/78	78/78	78	110/110	92/92	101	11	1.0074	1.848
.92	3.0	-2.2	.9878	357.43	368.02	10.59	768.32	778.94	10.62	78/78	78/78	78	110/110	92/92	101	11	1.0137	1.854

5/21/87 Pb = 29.27

29.156765

Q - Flow Rate (cfm)

ΔH - Orifice Pressure Differential (in. H O)

ΔP - Inlet Pressure Differential Standard Meter (in. H O)

Yds - Standard Meter Correction Factor (Unitless)

Yd - Meter Box Correction Factor (Unitless)

ΔH@ - Orifice Pressure Differential that gives 0.75 cfm of air at 70°F and 29.92" Hg (in. H O)

$$Yd = (Yds)\left(\frac{Vds}{Vd}\right)\left(\frac{Td + 460}{Tds + 460}\right)\left(\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right)$$

$$\Delta H@ = \frac{0.0317\ \Delta H}{Pb\ (T + 460)}\left[\frac{(Tds + 460)\ \theta}{Vds \cdot Yds}\right]^2$$

.9775

.9982

.9870

$$Q = \frac{17.64 \cdot Vds \cdot Pb}{(Tds + 460)\ \theta}$$

1.868

POST TEST CALIBRATION CHECK

Client/Owner: Marsh Asphalt

Operator: SHW

Project Number: 1380-68

Date: 6/18/88

Meter Box No.: R	Meter Box Vacuum: 15"	Meter Box Yd: 1.0078	Barometric Press.: 29.28

				Standard Meter Gas Volume ft^3			Meter Box Gas Volume ft^3			Std. Meter Temperature °F			Meter Box Temperature °F					
Q	ΔH	ΔP	Yds	Initial	Final	Vds Net	Initial	Final	Vd Net	In	Out	Tds Avg	In	Out	Td Avg	Time θ	Yd	ΔH@
.76	2.0	.16	.990	876.78	883.15	6.37	927.80	934.48	6.68	76 76	76 76	76	120 120	100 104	111	8	1.0010	1.758
.76	2.0	.16	.990	883.15	890.30	7.15	934.48	942.03	7.55	76 76	76 76	76	120 120	104 104	112	9	.9958	1.745
.76	2.0	.16	.990	890.30	896.65	6.35	942.03	948.47	6.44	76 76	76 76	76	120 120	104 104	112	8	.9907	1.746

29.42705882

Nomenclature

Pb	Barometric Pressure
Q	Flow Rate (cfm)
ΔH	Orifice Pressure Differential ("H_2O)
ΔP	Inlet Pressure Differential ("H_2O)
Vd	Volume Dry Gas Meter (ft^3)
Vds	Volume Dry Standard (ft^3)
Yd	Meter Correction Factor (unitless)
Yds	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential that gave 0.75 cfm of air at 70° F and 29.92 "Hg ("H_2O)

Calculations

$$Yd = (Yds)\left[\frac{Vds}{Vd}\right]\left[\frac{Td + 460}{Tds + 460}\right]\left[\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right]$$

.9910

$$\Delta H@ = \frac{0.0317\,\Delta H}{Pb\,(Td + 460)}\left[\frac{(Tds + 460)\,\theta}{(Vds)\,(Yds)}\right]^2$$

$$Q = \frac{17.64\,(Vds)\,(Pb)}{(Tds + 460)\,\theta}$$

1.0101

Number #	Pyrometer	Merc. @ Glass Thermo	Pyrometer	Merc. @ Glass Thermo	Pyrometer	Merc. @ Glass Thermo	Pyrometer	Merc. @ Glass Thermo
F-9	34 °F	34 °F	212 °F	212 °F	405 °F	405 °F	82 °F	82 °F
F-10	34 °F	34 °F	212 °F	212 °F	405 °F	405 °F	82 °F	82 °F
F-11	36 °F	36 °F	212 °F	212 °F	405 °F	405 °F	82 °F	82 °F
F-12	36 °F	36 °F	211 °F	212 °F	406 °F	406 °F	83 °F	82 °F
F-14	36 °F	36 °F	212 °F	212 °F	400 °F	400 °F	83 °F	83 °F
K-36	36 °F	35 °F	212 °F	212 °F	405 °F	405 °F	83 °F	83 °F

Date 1-[illegible]-81 [illegible signature] ✓ Page 1 of 1

PROCESS DATA

50-Blow

MASTER DESIGN JOB MIX FORMULA REPORT

District 12-0 County ______
Leg. Rt. ______ Section ______
Station ______ To Station ______

Date 1988 Spec. 132-Wearing 88-10 ______ P.O. ______

Contractor: Name ______ Location ______

Bit. Conc. Producer: Name MARSH ASPHALT, Inc. Location Coolspring, Carmichaels

Bituminous Plant: Type ______ Daily Capacity ______ Mix Time ______ BULK-OR

AGGREGATE AND A.C. PRODUCER	LOCATION		SPEC.	TYPE	%	SP. GR.
Marsolino Coolspring Quarry Co.	MAP	2SA	Coarse	B.S.	46.1	2.668
Marsolino Coolspring Quarry Co.	MAP	2SA	Fine	B.S.	33.4	2.641
Pittsburgh Sand & Gravel	PSG	02A	Fine	Sand	14.2	2.620
Ashland/Boswell/Lake Asphalt	Floreffe/Dravosburg/Springdale		AC	20	6.3	1.02

* Design Developed With Ashland Oil. SRL-H

Type AC-20 Pen. 74/73/67 Visc. @ 140 F 1740/2277/1954 Visc. @ 275 F ______ Mix Temp. 280/295/285 310/320/310

JOB MIX FORMULA AND DESIGN

Bit.	AC	2	1½	1	½	3/8	4	8	16	30	50	100	200
Upper	7.0				100	100	71	48	36	28	19	16	9
Design	6.3				100	93	63	42	30	22	13	10	6
Lower	5.6				100	85	55	35	24	16	7	4	3

MIX CHARACTERISTICS

Theor. Density	Lab. Density	Bitumen % by Wt.	Filler % by Wt.	Pass No. 8	Pass ½"	Stability	Flow	Percent by Volume: Voids	VFA	VMA
2.425	2.350	6.3		42	100	2352	11.7	3.1	81.5	16.4

EFF. 5.8

HOT BINS

Bin	2½	2	1½	1	3/4	½	3/8	4	8	16	30	50	100	200	Hot Blend %
1						100	100	100	93	71	52.4	31.0	23.8	14.3	42.0
2						100	87.9	36.2	5.0						58.0
3															
4															
5															
Comb.						100	93	63	42	30	22	13	10	6	100

* This Design Verified From 1987 Production Test Results.

BATCH COMPOSITION

	Bitumen	Bin No. 1	Bin No. 2	Bin No. 3	Bin No. 4	Bin No. 5
Per Cent	6.3	39.4	54.3			

GRADATION CHART ON BACK IS PART OF THIS JOB MIX FORMULA.

Approved CONTRACTOR'S REP. [signature] Date 3-17-88

Approved P.D.T. INSPECTOR ______ Date ______

Approved MATERIALS ENGR. [signature] Date 3-22-88

Approved DISTRICT ENGR. C. Vance Dei Cas Date RECEIVED JUN 3 0 1988

NOTE: ...

CS-4211A (2-81)

MATERIAL TEST RESULTS

STOCK GRADATIONS CARMICHAELS

Mat'l ____________ Test ____________

SPEC.	COARSE		FINE		FINE											
SIEVE	WGT.	% Passing	WGT.	% Passing	WGT.	% Passing	WGT.	% Passing	WGT.	% Passing	WGT.	% Passing	WGT.	% Passing	WGT.	% Passing
2"																
1½"																
1"																
3/4"																
½"		100		100		100										
3/8"		92		100		100										
#4		25		98		96										
#8		4		78		87										
#16		2.5		56		64										
#30				39		39										
#50				27		11										
#100				17		5										
#200				8.5		1.2										
Wash																
% CR.																
	46.1% OF MIX		33.4% OF MIX		14.2% OF MIX											
REMARKS	MARSOLINO COOLSPRING QUARRY #8's		MARSOLINO COOLSPRING QUARRY #10		PITTS. SAND & GRAVEL SAND											

RECEIVED JUN 3 1988

WEIGHT SHEETS

CAE Project # 43801

ALL WEIGHTS SORTED BY ROS

ROS	RUN	SH #	WT #	IDENTIFIER	FBT	WASH ML.	CORR.	GROSS	TARE	NET
		1	1	BLANK	B	2	0.0000	110.6696	110.6696	0.0000
		3	1	BLANK	B	60	0.0000	69.1236	69.1233	0.0003
		4	1	BLANK	B	200	0.0000	106.7683	106.7683	0.0000
01	1	1	2	58	B	250	0.0000	107.7400	107.7251	0.0149
01	1	2	2	64	B	205	0.0010	101.9858	101.9788	0.0060
01	1	1	5	29	F	-----	-------	0.6395	0.6090	0.0305
				ROS TOTAL						0.0514
02	2	2	3	49	B	200	0.0010	103.2817	103.2768	0.0039
02	2	1	3	9	B	200	0.0000	106.8557	106.8368	0.0189
02	2	1	6	24	F	-----	-------	0.6636	0.6099	0.0537
				ROS TOTAL						0.0765
03	3	2	4	1	B	200	0.0010	95.9558	95.9519	0.0029
03	3	1	4	20	B	200	0.0000	82.9545	82.9367	0.0178
03	3	1	7	27	F	-----	-------	0.6461	0.6074	0.0387
				ROS TOTAL						0.0594
		4	2	25	B	200	0.0000	107.6558	107.6552	0.0006
		3	2	27	B	200	0.0010	106.1185	106.1028	0.0147
		3	4	73	B	200	0.0010	84.0001	83.9921	0.0070
		4	3	91	B	200	0.0000	98.5486	98.5480	0.0006
		4	4	92	B	200	0.0000	101.4114	101.4111	0.0003
		3	3	97	B	200	0.0010	97.0114	97.0017	0.0087

CAE Project # 43801

WEIGH SHEET # 1 AS ENTERED

R O S	R U N	W T #	IDENTIFIER	F B T	WASH ML.	CORR.	GROSS	TARE	NET
		1	BLANK	B	2	0.0000	110.6696	110.6696	0.0000
01	1	2	58	B	250	0.0000	107.7400	107.7251	0.0149
02	2	3	9	B	200	0.0000	106.8557	106.8368	0.0189
03	3	4	20	B	200	0.0000	82.9545	82.9367	0.0178
01	1	5	29	F	-----	-------	0.6395	0.6090	0.0305
02	2	6	24	F	-----	-------	0.6636	0.6099	0.0537
03	3	7	27	F	-----	-------	0.6461	0.6074	0.0387

CAE Project # 43801

WEIGH SHEET # 2 AS ENTERED

R O S	R U N	W T #	IDENTIFIER	F B T	WASH ML.	CORR.	GROSS	TARE	NET
		1	BLANK	B	60	0.0000	69.1236	69.1233	0.0003
01	1	2	64	B	205	0.0010	101.9858	101.9788	0.0060
02	2	3	49	B	200	0.0010	103.2817	103.2768	0.0039
03	3	4	1	B	200	0.0010	95.9558	95.9519	0.0029

CAE Project # 43801

WEIGH SHEET # 3 AS ENTERED

R O S	R U N	W T #	IDENTIFIER	F B T	WASH ML.	CORR.	GROSS	TARE	NET
		1	BLANK	B	60	0.0000	69.1236	69.1233	0.0003
		2	27	B	200	0.0010	106.1185	106.1028	0.0147
		3	97	B	200	0.0010	97.0114	97.0017	0.0087
		4	73	B	200	0.0010	84.0001	83.9921	0.0070

CAE Project # 43801

WEIGH SHEET # 4 AS ENTERED

R O S	R U N	W T #	IDENTIFIER	F B T	WASH ML.	CORR.	GROSS	TARE	NET
		1	BLANK	B	200	0.0000	106.7683	106.7683	0.0000
		2	25	B	200	0.0000	107.6558	107.6552	0.0006
		3	91	B	200	0.0000	98.5486	98.5480	0.0006
		4	92	B	200	0.0000	101.4114	101.4111	0.0003

BALANCE FISHER
OPERATOR DA
DATE
SHEET ____ OF ____

PLANT
UNIT
RUN 1-3

JOB# 4580

F 1/2 WATER

WEIGHT SHEET

RUN #	WT. #	IDENTIFICATION NUMBER	F B	WASH ML	WASH CORR.	GROSS WT.	TARE WT.	NET WT.	FILTER DESCRIPTION
									CORRECTED
R-1	A	58	B	250		109.4404 109.4400	109.4254 109.4251	.0149	(.0148)
R-2	B	9	B	200		106.8552 106.8559	99.0076 99.0076 106.8363	106.8368 .0186	(.0185)
R-3	C	20	B	200		82.9540 82.9535	82.9391 82.9363	.0173 (.0172)	.0172
BLANK		31	B	200		110.6692 110.6696	110.6694 110.6696	.0001	

Clean Air Engineering, Inc.

BALANCE FISHER
OPERATOR DM
DATE 6/29/88
SHEET 1 OF 1

CLIENT [illegible]
PLANT
UNIT
RUN 1, 2, 3

B½, F½ Acetone

WEIGHT SHEET

RUN #	WT. #	IDENTIFICATION NUMBER	F B	WASH ML.	WASH CORR.	GROSS WT.	TARE WT.	NET WT.	FILTER DESCRIPTION
R-1	A	64	B	205	-.0010	101.9860 101.9858	101.9988 .9993	~~.0073~~ .0063	
R-2	B	49	B	200	-.0010	103.2812 103.2813	103.2768 .2763	~~.0044~~ .0039	
R-3	C	1	B	200	-.0010	95.9563 95.9558	95.9515 .9519	~~.0038~~ .0028	
R-1	A	27	B	200	-.0010	106.1190 106.1201 106.1185	106.1028 .1028	~~.0159~~ .0149	
R-2	B	97	B	200	-.0010	97.0114 97.0118	97.0021 .0019	~~.0096~~ .0086	
R-3	C	73	B	200	-.0010	83.9996 84.0001	83.9921 .9918	~~.0099~~ .0089	
~~BLANK~~		~~6~~	~~B~~	~~200~~		~~95.4686~~ ~~95.4874~~	~~95.4844~~ ~~.4840~~	~~.0031~~	
BLANK		22		60		69.1236 .1237	69.1229 .1233	.0003	

Clean Air Engineering, Inc.

BALANCE Fisher
OPERATOR DM
DATE
SHEET 1 OF 1

PLANT Cornwells, PA
UNIT
RUN 1-3

BH SOLUBLES

WEIGHT SHEET

RUN #	WT. #	IDENTIFICATION NUMBER	F B	WASH ML.	WASH CORR.	GROSS WT.	TARE WT.	NET WT.	FILTER DESCRIPTION
1		25	B	200		107.6554 107.6558	107.6550 .6552	.0006	
2		91		200		98.5484 98.5496 98.5486	98.5481 .5480	.0004	
3		92		200		101.4119 101.4136 101.4114	101.4113 .4111	.0004	
BLANK DIST		55		200		106.7665 106.7670	106.7680 .7683	.0000	

Clean Air Engineering, Inc.

00.

BALANCE [illegible]
OPERATOR DM
DATE 6/28/88
SHEET 1 OF 1

PLANT CARMICHEAL, PA
UNIT
RUN 1-3

M-5 Filters

WEIGHT SHEET

RUN #	WT. #	IDENTIFICATION NUMBER	F B	WASH ML.	WASH CORR.	GROSS WT.	TARE WT.	NET WT.	FILTER DESCRIPTION
R-1	A	29				.6396 .6395	.6091 .6090	.0305	
R-2	B	24				.6639 .6636	.6102 .6099	.0537	
R-3	C	27				.6461 .6461	.6075 .6074	.0386	

Clean Air Engineering, Inc.

FIELD DATA

Field Parameter Sheet
Particulate Testing

Client: Marsalino Asphalt

Plant: Carmichaels Pa.

Unit No: Baghouse

Inlet ______ Outlet ______ Stack ✓

Duct Identifier ______

Project Leader: Max Phillips

Meter Operator: Max Phillips

Probe Operator: Pete Prikis

Date: 6-12-88

Run No: 1

Start Time: 826 AM/PM

Finish Time: 1:57 AM/PM

Meter Box No: 8

DH@: 1.783

Internal Use Only	
Raw Data Set No	1
Completeness	
Accuracy	
Neatness	

88
2019

Filter No: 29

Thimble No: ______

Beaker No: 58

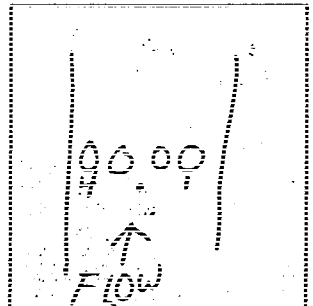
25

	Data				Results		
1	Pb	29.23	"Hg Init.	Vmstd	76.19	dcf	64
2	Static		"wc	Vwstd	9.396	cf	47
3	Vlc	199.5	ml	Bwo	.11		
4	Mn		g	Md	29.06	lb/lb-mole	
5	θ	96	min	Ms	27.85	lb/lb-mole	
6	% O_2	16.5		Vs	102.3	ft/s	
7	% CO_2	2.5		acfm	31400		
8	% N_2			dscfm	21460		
9	DH	2.025	"wc	% I	101.5		
10	Cp	.84	dimensionless				
11	Tm	89	F				
12	$\sqrt{Dp}$	1.3822	$\sqrt{"wc}$	gr/dscf			
13	Ts	200	F	gr/acfw			
14	Vm	80.67	cf	lb/hr			
15	Dn	.190	in	lb/MBtu			
16	As	5.8	sf Init.	lb/kpwg			
17	Yd	1.0072	cf/cf	lb/kpwg			
				@ 50% xs air			

PARTICULATE TESTING
RAW DATA SET

Client/Owner Marsolino Asphalt
Plant Carmichael
Unit# BAG House Inlet/(Outlet)
Operator m. Phillips
Date 6/17/88
Run No. 1
Sample Box No.
Meter Box No. K
Meter DH@ 1.783
K Factor ~~1.0~~ 1.1
Pitot C_p .84 Pitot Leak Ck ✓
Leak Rate Before .002 CFM @ 16 Hg
Leak Rate After .001 CFM @ 12 Hg
Static Press., in. H_2O (+/−)

Start Time 8:36 (AM) PM
Finish Time 1:47 AM (PM)
Meter Yd 1.0072



SCHEMATIC OF TESTING LOCATION

Filter #'s 29
Thimble #
Beaker #

Ambient Temperature, °F
Barometric Pressure, in. Hg 29.03
Assumed Moisture, % 3%
Heater Box Setting 248 ± 25
Probe Length, Ft. No.
Nozzle Diameter, in. .170
Probe Heater Setting 248 ± 25
% O_2
% CO_2
H_2O, ml
Silica Gel, gm
Total V_{lc}
Stack Area, Ft²
Pyrometer No. F10 stack Fig 6A

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min. (MIN/PT 4)	VACUUM in. Hg	STACK TEMPERATURE T_s, °F	VELOCITY HEAD DP_s	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER DH, in. H_2O	GAS SAMPLE VOLUME V_m, Ft³ (Initial Volume: 643.30)	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET T_m in, °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER OUTLET T_m out, °F	TEMP. OF GAS LEAVING CONDENSER OR LAST IMPINGER T_c, °F	SAMPLE BOX TEMPERATURE T_b °F
1-1	4	7	164	2.0	2.0	646.54	74	70	60	256
2	8	7	164	2.0	2.0	649.67	80	70	60	256
3	12	6	179	1.4	1.8	652.76	82	70	60	256
4	16	7	194	1.7	1.9	655.96	84	72	60	254
5	20	7	198	1.6	1.8	658.98	86	74	62	256
6	24	6	202	1.4	1.5	661.87	87	74	62	257
2-1	4	6	205	1.4	1.5	664.67	90	76	62	257
2	8	6	210	1.4	1.5	667.50	92	76	62	258
3	12	6	214	1.4	1.5	670.33	92	76	62	260
4	16	9	190	2.5	2.8	674.19	96	84	62	260
5	20	8	200	2.2	2.4	677.76	96	84	62	254
6	24	7	200	1.7	1.9	681.07	100	88	64	254
TOTAL			2320	15.4390	22.4	37.77	AVG. 87.75	75.2 AVG.		
AVERAGE			193	1.2866	1.87		AVG.			

√ stop at 9:13 am
start at 11:40 AM

Clean Air Engineering, Inc.

PARTICULATE TESTING RAW DATA SET

Client/Owner: MARsolant Asphalt
Plant: CARmichaels
Unit#: Baghouse Inlet/Outlet: Stack
Operator: m. Phillips
Date: 6-17-94
Run No.: 1
Sample Box No.:
Meter Box No.: R
Meter DH@: 1.743
K Factor: 1.1
Pitot C_p: .84 Pitot Leak Ck: ✓
Leak Rate Before: .002 CFM @ 16 Hg
Leak Rate After: .001 CFM @ 17 Hg
Static Press., In. H_2O (+/−):

Start Time: 8:36 AM/PM
Finish Time: 1:47 AM/PM
Meter Y_d: 1.0072

SCHEMATIC OF TESTING LOCATION

Filter #'s: 29
Thimble #:
Beaker #:

Ambient Temperature, °F: 74°
Barometric Pressure, in. Hg: 29.03
Assumed Moisture, %: 3%
Heater Box Setting: 250±25
Probe Length, Ft.: No.:
Nozzle Diameter, in.: .190
Probe Heater Setting: 248±25
% O_2: 16.5 16.0 16.8
% CO_2: 2.5 2.5 2.5
H_2O, ml: 175.5
Silica Gel, gm: 24.0
Total V_{lc}: 199.5
Stack Area, Ft²: 5.4
Pyrometer No.: F-10 stack F-14 Box

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min. (MIN/PT 4)	VACUUM in. Hg	STACK TEMPERATURE T_s, °F	VELOCITY HEAD DP_s	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER DH, in. H_2O	Initial Volume: GAS SAMPLE VOLUME V_m, Ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER: INLET T_m in, °F	OUTLET T_m out, °F	TEMP. OF GAS LEAVING CONDENSER OR LAST IMPINGER T_c, °F	SAMPLE BOX TEMPERATURE T_b °F
3-1	4	7	205	2.3	2.5	685.00	100	90	64	252
2	8	7	207	2.0	2.2	688.26	102	90	64	252
3	12	6	213	1.9	2.1	691.68	102	90	65	253
4	16	6	220	1.9	2.1	695.15	102	90	65	251
5	20	6	220	1.5	1.7	698.30	102	90	64	255
6	24	5	221	1.3	1.4	701.18	102	90	64	256
4-1	4	8	190	2.8	3.1	705.29	94	90	62	257
2	8	8	200	3.0	3.3	709.35	100	92	62	258
3	12	8	200	2.8	3.1	713.27	106	92	62	262
4	16	7	200	2.4	2.6	717.66	106	92	62	262
5	20	6	205	2.0	2.2	720.58	106	92	62	258
6	24	6	209	1.6	1.8	723.97	106	92	62	257
TOTAL			2410	33.4994	50.7	40.67	AVG. 97.41	AVG.		
AVERAGE			200	1.3833	2.1125		AVG. 94			

Stop at: 12:19 pm
Restart at: 1:22 pm

Clean Air Engineering, Inc.

Field Parameter Sheet
Particulate Testing

Client: Canadian Asphalt

Plant: Lacombe

Unit No: Baghouse

Inlet: ____ Outlet: ____ Stack: ✓

Duct Identifier: ____

Project Leader: Max Phipps

Meter Operator: Max Phipps

Probe Operator: Pete [illegible]

Date: 6-17-97

Run No: 2

Start Time: 2:13 AM/PM

Finish Time: 4:07 AM/PM

Meter Box No: 8

DH@: 1.783

Internal Use Only	
Raw Data Set No	2
Completeness	
Accuracy	
Neatness	

84
2034
Filter No: 21

Thimble No: ____

Beaker No: 9

91
49
97

Data

1	Pb	29.27	"Hg Init.____
2	Static		"wc
3	Vlc	220.4	ml
4	Mn		g
5	θ	96	min
6	% O_2	16.0	
7	% CO_2	2.5	
8	% N_2		
9	DH	1.5833	"wc
10	Cp	.84	dimensionless
11	Tm	102	F
12	$\sqrt{Dp}$	.2244	$\sqrt{\text{"wc}}$
13	Ts	227	F
14	Vm	34.58	cf
15	Dn	.190	in
16	As	5.8	sf Init.____
17	Yd	1.0022	cf/cf

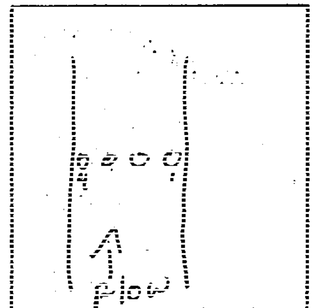
Results

Vmstd	65.96	dcf
Vwstd	10.381	cf
Bwo	.136	
Md	29.04	lb/lb-mole
Ms	27.54	lb/lb-mole
Vs	89.72	ft/s
acfm	25486	
dscfm	15060	
% I	100.7	
gr/dscf		
gr/acfw		
lb/hr		
lb/MBtu		
lb/kpwg		
lb/kpwg @ 50% xs air		

PARTICULATE TESTING
RAW DATA SET

Client/Owner: MARYLAND ASPHALT
Plant: Carmichaels
Unit#: [illegible] Inlet/Outlet: Stack
Operator: m. Bu[illegible]
Date: 6-17-88
Run No.: 2
Sample Box No.:
Meter Box No.: R
Meter DH@: 1.783
K Factor: .97
Pitot C_p: .84 Pitot Leak Ck: ✓
Leak Rate Before: .004 CFM @ 15 Hg
Leak Rate After: .004 CFM @ 15 Hg
Static Press., In. H_2O (+/−):

Start Time: 2:13 AM (PM)
Finish Time: 4:07 AM (PM)
Meter Y_d: 1.0072



SCHEMATIC OF TESTING LOCATION

Filter #'s: 24
Thimble #:
Beaker #:

Ambient Temperature, °F: 79°
Barometric Pressure, In. Hg: 29.03
Assumed Moisture, %: 8%
Heater Box Setting: 248±25
Probe Length, Ft.: No.:
Nozzle Diameter, In.: .190
Probe Heater Setting: 248±25
% O_2: 16.0 16.0 16.5
% CO_2: 2.5 2.5 2.7
H_2O, ml:
Silica Gel, gm:
Total Vic:
Stack Area, Ft²:
Pyrometer No.: E-10-STACK F-12 Box

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min. (MIN/PT 4)	VACUUM In. Hg	STACK TEMPERATURE T_s, °F	VELOCITY HEAD DP_s	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER DH, In. H_2O	GAS SAMPLE VOLUME V_m, Ft³ (Initial Volume: 725.12)	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET T_m in, °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER OUTLET T_m out, °F	TEMP. OF GAS LEAVING CONDENSER OR LAST IMPINGER T_i, °F	SAMPLE BOX TEMPERATURE T_b °F
1-1	4	10	216	2.0	1.9	728.27	100	91	62	256
2	8	10	216	2.0	1.9	731.46	106	94	62	256
3	12	9	214	1.7	1.6	734.58	106	96	62	255
4	16	9	215	1.7	1.6	737.58	106	96	62	254
5	20	9	216	1.7	1.6	740.67	106	96	62	255
6	24	9	215	1.5	1.5	743.58	106	96	64	254
2-1	4	8	216	1.3	1.3	746.33	106	96	64	255
2	8	9	217	1.5	1.5	749.16	106	96	64	256
3	12	8	218	1.3	1.3	751.94	105	96	64	259
4	16	8	219	1.3	1.3	754.60	106	96	63	262
5	20	9	220	1.7	1.6	757.57	106	96	63	260
6	24	8	220	1.3	1.3	760.43	106	96	63	257
TOTAL			2601	16.6394	18.4		AVG. 1265	AVG. 1145		
AVERAGE			217	1.3866	1.533	35.31	AVG. 100			

STOP AT 2:56 PM
START AT 3:00 PM

Clean Air Engineering, Inc.

PARTICULATE TESTING
RAW DATA SET

Client/Owner: Mar Salino Asphalt
Plant: [illegible]
Unit#: [illegible] Inlet/Outlet: Stack
Operator: [illegible]
Date: 6-17-98
Run No.: 2
Sample Box No.:
Meter Box No.: 8
Meter DH@: 1.743
K Factor: .97
Pitot Cp: .84 Pitot Leak Ck: ✓
Leak Rate Before: .004 CFM @ 15 Hg
Leak Rate After: .001 CFM @ 15 Hg
Static Press., in. H_2O (+/-):

Start Time: 2:13 PM
Finish Time: 4:07 PM
Meter Yd: 1.0072

Filter #'s: 24
Thimble #:
Beaker #:

SCHEMATIC OF TESTING LOCATION

Ambient Temperature, °F: 79°
Barometric Pressure, in. Hg: 29.03
Assumed Moisture, %: 11
Heater Box Setting: 248±25
Probe Length, Ft.: No.:
Nozzle Diameter, in.: .190
Probe Heater Setting: 248±25
% O_2:
% CO_2:
H_2O, ml: 200
Silica Gel, gm: 20.4
Total V_{lc}: 220.4
Stack Area, Ft²: 5.8
Pyrometer No.:

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min. (MIN/PT 4)	VACUUM in. Hg	STACK TEMPERATURE T_s, °F	VELOCITY HEAD DP_s	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER DH, in. H_2O	GAS SAMPLE VOLUME V_m, Ft³ (Initial Volume:)	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET T_m in, °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER OUTLET T_m out, °F	TEMP. OF GAS LEAVING CONDENSER OR LAST IMPINGER T_c, °F	SAMPLE BOX TEMPERATURE T_b °F
3-1	4	8	219	1.7	1.6	763.42	108	99	64	260
2	8	8	220	1.7	1.6	766.44	108	99	64	260
3	12	8	223	1.5	1.5	769.26	108	100	64	260
4	16	8	223	1.5	1.5	772.14	108	100	64	259
5	20	8	223	1.5	1.5	775.07	108	100	64	259
6	24	8	223	1.7	1.6	778.04	108	100	64	259
4-1	4	8	220	1.3	1.3	780.80	108	100	65	260
2	8	8	221	1.4	1.4	783.66	108	100	66	259
3	12	15	220	2.6	2.5	787.13	108	100	66	256
4	16	15	213	2.0	1.9	790.40	108	100	66	254
5	20	8	204	1.7	1.6	793.64	108	100	66	254
6	24	8	204	1.7	1.6	796.70	108	100	67	254
TOTAL			5214	30.59749	38	71.58	AVG. 4904	AVG.		
AVERAGE			217	1.27490	1.5833		AVG. 102			

Step to 1st with purge 3:47pm
Start at 3:59pm

Clean Air Engineering, Inc.

Field Parameter Sheet
Particulate Testing

Client: Marshall Asphalt
Plant: Cabbage(?) R.
Unit No: Bag House
Inlet: ____ Outlet: ____ Stack: ✓
Duct Identifier: ____
Project Leader: Max Phillips
Meter Operator: Max Phillips
Probe Operator: Pete Pribik
Date: 6-22-88
Run No: 3
Start Time: 4:43 AM/PM
Finish Time: 6:45 AM/PM
Meter Box No: R
DH@: 1.783

Internal Use Only	
Raw Data Set No	3
Completeness	
Accuracy	
Neatness	

83
87
284
Filter No: 27
Thimble No: ____
Beaker No: 20
92
1

Data

1	Pb	29.23	"Hg Init. ____
2	Static		"wc
3	Vlc	230.0	ml
4	Mn		g
5	θ	96	min
6	% O_2	16.0	
7	% CO_2	2.5	
8	% N_2		
9	DH	1.1535	"wc
10	Cp	.84	dimensionless
11	Tm	109	F
12	$\sqrt{Dp}$	.73592	$\sqrt{\text{"wc}}$
13	Ts	211	F
14	Vm	7778	cf
15	Dn	.156	in
16	As	5.8	sf Init. ____
17	Yd	1.0072	cf/cf

Results

Vmstd	74.77	dcf
Vwstd	10.835	cf
Bwo	.132	
Md	29.04	lb/lb-mole
Ms	27.54	lb/lb-mole
Vs	92.27	ft/s
acfm	32110	
dscfm	21050	
% I	104.7	
gr/dscf		
gr/acfw		
lb/hr		
lb/MBtu		
lb/kpwg		
lb/kpwg		
@ 50% xs air		

73

PARTICULATE TESTING
RAW DATA SET

Client/Owner marshall asphalt
Plant Garm...
Unit# Baghouse Inlet/Outlet Stack
Operator M. Phillips
Date 6-17-98
Run No. 3
Sample Box No.
Meter Box No. K
Meter DH@
K Factor .94
Pitot C_p .84 Pitot Leak Ck ✓
Leak Rate Before .001 CFM @ 16 Hg
Leak Rate After .000 CFM @ 15 Hg
Static Press., in. H_2O (+/-)

Start Time 4:43 PM
Finish Time 6:49 PM
Meter Y_d 1.0072

SCHEMATIC OF TESTING LOCATION

Filter #'s 27
Thimble #
Beaker #

Ambient Temperature, °F 80°
Barometric Pressure, In. Hg 29.63
Assumed Moisture, % 9
Heater Box Setting 248±25
Probe Length, Ft. No.
Nozzle Diameter, in. .190
Probe Heater Setting 248±25
% O_2 16.0
% CO_2 2.5
H_2O, ml 200.0
Silica Gel, gm 30.3
Total V_{lc} 230
Stack Area, Ft²
Pyrometer No.

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min. (MIN/PT 4)	VACUUM in. Hg	STACK TEMPERATURE T_s, °F	VELOCITY HEAD DP_s	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER DH, in. H_2O	GAS SAMPLE VOLUME V_m, Ft³ (Initial Volume: 797.08)	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET T_m in, °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER OUTLET T_m out, °F	TEMP. OF GAS LEAVING CONDENSER OR LAST IMPINGER T_c, °F	SAMPLE BOX TEMPERATURE T_b °F
	4	7	218	2.0	1.9	800.33	112	100	61	249
	8	7	218	2.0	1.9	803.54	112	100	61	248
	12	7	220	1.8	1.7	806.60	112	100	62	248
	16	6	222	1.3	1.3	809.30	112	100	62	250
	20	6	220	1.5	1.4	812.27	112	100	62	252
	24	4	220	1.2	1.1	814.95	113	100	62	252
	4	8	215	2.0	1.9	817.63	112	100	62	252
	8	7	216	1.8	1.7	820.92	112	100	62	252
	12	5	216	1.6	1.5	823.75	112	100	64	255
	16	6	221	1.5	1.4	826.70	112	100	64	254
	20	5	222	1.3	1.3	829.41	113	100	64	260
	24	5	223	1.3	1.3	832.15	113	100	64	260
TOTAL			2630	15.6 SQR	18.4	35.07	AVG. 2649	AVG.		
AVERAGE							AVG.			

stop at 5:20 pm
for wait for trucks
start at 5:.. pm

Clean Air Engineering, Inc.

PARTICULATE TESTING RAW DATA SET

Client/Owner marsellao Asphalt
Plant ~~[illegible]~~ CAB minch ABES Pa.
Unit# [illegible] Inlet/Outlet STACK
Operator M. Peters
Date 6-17-98
Run No. 3
Sample Box No.
Meter Box No. R
Meter DH@ 1.743
K Factor .94
Pitot Cp .841 Pitot Leak Ok ✓
Leak Rate Before .001 CFM @ 16 Hg
Leak Rate After .000 CFM @ 15 Hg
Static Press., in. H_2O (+/−)

Start Time 4:43 PM

Finish Time 6:49 PM

Meter Yd 1.0072

SCHEMATIC OF TESTING LOCATION

Filter #'s 27

Thimble #

Beaker #

Ambient Temperature, °F 90°
Barometric Pressure, in. Hg 29.03
Assumed Moisture, % 4
Heater Box Setting 248 ± 25
Probe Length, Ft. No.
Nozzle Diameter, in. .190
Probe Heater Setting 248 ± 25
% O_2 16.4
% CO_2 2.5
H_2O, ml 200
Silica Gel, gm 40
Total Vlc 240.0
Stack Area, Ft² 5.8
Pyrometer No.

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min. (MIN/PT 4)	VACUUM in. Hg	STACK TEMPERATURE T_s, °F	VELOCITY HEAD DP,	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER DH, in. H_2O	Initial Volume: GAS SAMPLE VOLUME V_m, Ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER: INLET T_m in, °F	GAS SAMPLE TEMPERATURE AT DRY GAS METER: OUTLET T_m out, °F	TEMP. OF GAS LEAVING CONDENSER OR LAST IMPINGER T_c, °F	SAMPLE BOX TEMPERATURE T_b °F
3-1	4	10	220	2.2	2.1	835.64	110	100	64	245
2	8	10	220	2.2	2.1	839.06	110	100	64	245
3	12	8	220	1.8	1.7	842.19	110	100	64	246
4	16	11	219	2.4	2.3	845.86	110	100	64	246
5	20	11	219	2.4	2.3	849.51	100	98	64	246
6	24	10	221	2.3	2.2	852.95	100	98	64	245
4-1	4	11	175	2.4	2.3	856.55	103	98	65	250
2	8	11	175	2.5	2.4	860.21	104	98	65	252
3	12	11	185	2.4	2.3	863.88	104	98	55	252
4	16	11	190	2.5	2.4	867.55	104	98	66	252
5	20	11	190	2.5	2.4	871.[illegible]	104	98	66	254
6	24	11	194	2.5	2.4	874.86	104	98	66	255
TOTAL			5058	33.50233	45.3	37.78	AVG. 1994	AVG.		
AVERAGE			211	1.35592	1.8875		AVG. 104			

STOP AT 6:52 to wait for [illegible]
Restart at 6:06

Clean Air Engineering, Inc.

No Trucks
Not [illegible] Product

Stop at [illegible]
[illegible]

Page 2 of 2

FIELD DATA PRINTOUTS

RAW DATA SET # 1

1) Plant	Marsolino Asphalt	17) Heater Box Setting	
2) Location	Stack	18) Probe Length',' Ft.	
3) Operator	P. Pribila	19) Nozzle Diameter','In.	0.190
4) Date	6/17/88	20) Probe Heater Setting	
5) Run No.	1	21) % O2	16.5
6) Sample Box No.		22) % CO2	2.5
7) Meter Box No.	R	23) Ml. H2O	175.5
8) Meter H@	1.783	24) GM. Silica Gel	24.0
9) K Factor	1.1	25) Total	199.5
10) Pitot Factor	0.84	26) Start Time	8:36 AM
11) Leak Rate Before	0.002016	27) Finish Time	1:47 PM
12) Leak Rate After	0.001012	28) Yd.	1.0072
13) Static Pres., in H2O	0.0	29) Stack Area	5.8
14) Ambient Temperature		30) Sampling Time (MIN/PT)	4
15) Barometric Pressure	29.03	31) Initial Volume	643.30
16) Assumed Moisture, %		32) FILTER & BEAKER #'S	29F
		58B 64B	

Pt. #	Θ	Vac.	Ts	DPs	DH	Vm	Tm in	Tmout	Tc	Tb	%I
0 - 0						643.30					P. Pribila
1 - 1	4	7	164	2.0	2.0	646.58	74	70	60	256	103.3
1 - 2	4	7	164	2.0	2.0	649.67	80	70	60	256	96.7
1 - 3	4	6	179	1.8	1.8	652.76	82	70	60	256	102.9
1 - 4	4	7	194	1.7	1.9	655.86	84	72	60	254	107.1
1 - 5	4	7	198	1.6	1.8	658.98	86	74	62	256	111.0 *
1 - 6	4	6	202	1.4	1.5	661.87	87	74	62	257	110.1 *
2 - 1	4	6	205	1.4	1.5	664.67	90	76	62	257	106.4
2 - 2	4	6	210	1.4	1.5	667.50	92	76	62	258	107.8
2 - 3	4	6	214	1.4	1.5	670.33	92	76	62	260	108.1
2 - 4	4	9	190	2.5	2.8	674.19	96	84	62	250	107.5
2 - 5	4	8	200	2.2	2.4	677.76	96	84	62	254	106.7
2 - 6	4	7	200	1.7	1.9	681.07	100	88	64	254	111.6 *
3 - 1	4	7	205	2.3	2.5	685.00	100	90	64	252	114.3 *
3 - 2	4	7	207	2.0	2.2	688.26	102	90	64	252	101.6
3 - 3	4	6	213	1.9	2.1	691.68	102	90	65	253	109.8
3 - 4	4	6	220	1.9	2.1	695.15	102	90	65	251	112.0 *
3 - 5	4	6	220	1.5	1.7	698.30	102	90	64	255	114.3 *
3 - 6	4	5	221	1.3	1.4	701.18	102	90	64	256	112.2 *
4 - 1	4	8	190	2.8	3.1	705.29	94	90	62	257	107.9
4 - 2	4	8	200	3.0	3.3	709.35	100	92	62	258	103.0
4 - 3	4	8	200	2.8	3.1	713.27	106	92	62	262	102.4
4 - 4	4	7	200	2.4	2.6	717.06	106	92	62	262	106.8
4 - 5	4	6	205	2.0	2.2	720.58	106	92	62	258	108.9
4 - 6	4	6	209	1.6	1.8	723.97	106	92	62	257	117.5 *
	96 Total		200 Avg.	1.383 Root	2.11 Avg.	80.67 Volume		89 Avg.			

RAW DATA SET # 2

1)	Plant	Marsolino Asphalt	17)	Heater Box Setting	
2)	Location	Stack	18)	Probe Length', ' Ft.	
3)	Operator	P. Pribila	19)	Nozzle Diameter', 'In.	0.190
4)	Date	6/17/88	20)	Probe Heater Setting	
5)	Run No.	2	21)	% O2	16.0
6)	Sample Box No.		22)	% CO2	2.5
7)	Meter Box No.	R	23)	Ml. H2O	200
8)	Meter H@	1.783	24)	GM. Silica Gel	20.4
9)	K Factor	0.97	25)	Total	220.4
10)	Pitot Factor	0.84	26)	Start Time	2:13 PM
11)	Leak Rate Before	0.004015	27)	Finish Time	4:07 PM
12)	Leak Rate After	0.004015	28)	Yd.	1.0072
13)	Static Pres., in H2O	0.0	29)	Stack Area	5.8
14)	Ambient Temperature		30)	Sampling Time (MIN/PT)	4
15)	Barometric Pressure	29.03	31)	Initial Volume	725.12
16)	Assumed Moisture, %		32)	FILTER & BEAKER #'S	24F
				98 498	

Pt. #	0	Vac.	Ts	DPs	DH	Vm	Tm in	Tmout	Tc	Tb	%I
0 - 0						725.12					P. Pribila
1 - 1	4	10	216	2.0	1.9	728.27	100	91	62	256	100.9
1 - 2	4	10	216	2.0	1.9	731.46	106	94	62	256	101.3
1 - 3	4	9	214	1.7	1.6	734.58	106	96	62	255	107.1
1 - 4	4	9	215	1.7	1.6	737.58	106	96	62	254	103.0
1 - 5	4	9	216	1.7	1.6	740.67	106	96	62	255	106.2
1 - 6	4	9	215	1.5	1.5	743.58	106	96	64	254	106.3
2 - 1	4	8	216	1.3	1.3	746.33	106	96	64	255	108.0
2 - 2	4	9	217	1.5	1.5	749.16	106	96	64	256	103.6
2 - 3	4	8	218	1.3	1.3	751.94	105	96	64	259	109.4
2 - 4	4	8	219	1.3	1.3	754.60	106	96	63	262	104.7
2 - 5	4	9	220	1.7	1.6	757.57	106	96	63	260	102.4
2 - 6	4	8	220	1.3	1.3	760.43	106	96	63	257	112.6 *
3 - 1	4	8	219	1.7	1.6	763.42	108	99	64	260	102.5
3 - 2	4	8	220	1.7	1.6	766.44	108	99	64	260	103.6
3 - 3	4	8	223	1.5	1.5	769.26	108	100	64	260	103.1
3 - 4	4	8	223	1.5	1.5	772.14	108	100	64	259	105.3
3 - 5	4	8	223	1.5	1.5	775.07	108	100	64	259	107.1
3 - 6	4	8	223	1.7	1.6	778.04	108	100	64	259	102.0
4 - 1	4	8	220	1.3	1.3	780.80	108	100	65	260	108.1
4 - 2	4	8	221	1.4	1.4	783.66	108	100	66	259	108.1
4 - 3	4	15	220	2.6	2.5	787.13	108	100	66	256	96.4
4 - 4	4	15	213	2.0	1.9	790.40	108	100	66	254	102.9
4 - 5	4	8	204	1.7	1.6	793.64	108	100	66	254	109.8
4 - 6	4	8	204	1.7	1.6	796.70	108	100	67	254	103.7
	96 Total		217 Avg.	1.275 Root	1.58 Avg.	71.58 Volume	102 Avg.				

RAW DATA SET # 3

1) Plant — Marsolino Asphalt
2) Location — Stack
3) Operator — P. Pribila
4) Date — 6/17/88
5) Run No. — 3
6) Sample Box No.
7) Meter Box No. — R
8) Meter H@ — 1.783
9) K Factor — 0.94
10) Pitot Factor — 0.84
11) Leak Rate Before — 0.001016
12) Leak Rate After — 0.000815
13) Static Pres., in H2O — 0.0
14) Ambient Temperature
15) Barometric Pressure — 29.03
16) Assumed Moisture, %
17) Heater Box Setting
18) Probe Length',' Ft.
19) Nozzle Diameter','In. — 0.190
20) Probe Heater Setting
21) % O2 — 16.0
22) % CO2 — 2.5
23) Ml. H2O — 200
24) GM. Silica Gel — 30
25) Total — 230
26) Start Time — 4:43 PM
27) Finish Time — 6:49 PM
28) Yd. — 1.0072
29) Stack Area — 5.8
30) Sampling Time (MIN/PT) — 4
31) Initial Volume — 797.08
32) FILTER & BEAKER #'S — 27F
208 18

Pt. #	θ	Vac.	Ts	DPs	DH	Vm	Tm in	Tmout	Tc	Tb	%I
0 - 0						797.08					P. Pribila
1 - 1	4	7	218	2.0	1.9	800.33	112	100	61	248	101.9
1 - 2	4	7	218	2.0	1.9	803.54	112	100	61	248	100.6
1 - 3	4	7	220	1.8	1.7	806.60	112	100	62	248	101.2
1 - 4	4	5	222	1.3	1.3	809.30	112	100	62	250	105.1
1 - 5	4	6	220	1.5	1.4	812.27	112	100	62	252	107.5
1 - 6	4	4	220	1.2	1.1	814.95	113	100	62	252	108.3
2 - 1	4	8	215	2.0	1.9	817.63	112	100	62	252	83.8 *
2 - 2	4	7	216	1.8	1.7	820.92	112	100	62	252	108.5
2 - 3	4	5	216	1.6	1.5	823.75	112	100	64	254	98.9
2 - 4	4	6	221	1.5	1.4	826.70	112	100	64	259	106.9
2 - 5	4	5	222	1.3	1.3	829.41	113	100	64	260	105.4
2 - 6	4	5	222	1.3	1.3	832.15	113	100	64	260	106.6
3 - 1	4	10	220	2.2	2.1	835.64	110	100	64	245	104.7
3 - 2	4	10	220	2.2	2.1	839.06	110	100	64	245	102.6
3 - 3	4	8	220	1.8	1.7	842.19	110	100	64	246	103.7
3 - 4	4	11	219	2.4	2.3	845.86	110	100	64	246	105.4
3 - 5	4	11	219	2.4	2.3	849.51	100	98	64	246	105.9
3 - 6	4	10	221	2.3	2.2	852.95	100	98	64	245	102.1
4 - 1	4	11	175	2.4	2.3	856.55	103	98	65	250	100.8
4 - 2	4	11	175	2.5	2.4	860.21	104	98	65	252	100.3
4 - 3	4	11	185	2.4	2.3	863.88	104	98	55	252	103.4
4 - 4	4	11	190	2.5	2.4	867.55	104	98	66	252	101.8
4 - 5	4	11	190	2.5	2.4	871.19	104	98	66	254	100.9
4 - 6	4	11	194	2.5	2.4	874.86	104	98	66	255	102.1
		96 Total	211 Avg.	1.396 Root	1.89 Avg.	77.78 Volume		104 Avg.			