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

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

Washington Department of Ecology

Summary & Description Pages _____

SOURCE TEST
SUMMARY OF EMISSIONS TO ATMOSPHERE

Report No. 87-07
Report Date _____
Test Date 4/7/87

Name of plant: ACME Concrete Co., Inc.
Location of plant: Richland, Washington
Person contacted: _____
Type of operation: Asphalt Batch Plant
Source tested: Main Stack
Requesting Agency: Benton-Franklin-Walla Walla Air Pollution Control Authority
Purpose: Measure particulate for compliance
Applicable Standard: BFWWAPACA Regs.

SUMMARY OF MEASUREMENTS

Pollutant	Measured Emission	Allowable Emission	Emission/Process Factor	Methods
Particulate	0.639 gr/DSCF	0.04 gr/DSCF	0.59 lb/ton	Ecology Method 5
	106.4 lb/hr			

TEST ENGINEER: Alan T. Butler, P.E.

FIELD PERSONNEL
Alan T. Butler
Tom Harris

LAB ANALYSIS
Susan Davis
Keith Solberg

Test Witnessed by:

ECY 020-1-62
Rev. 1/79

I. Purpose

This test was performed at the request of the Benton-Franklin-Walla Walla Air Pollution Control Authority for the purpose of measuring particulate emissions from the main stack of the ACME Concrete, Richland asphalt batch plant during normal operation. Results will be used in the determination of compliance with Benton-Franklin-Walla Walla Air Pollution Control Authority regulations.

II. Description of the Unit Tested

The ACME Concrete, Richland asphalt batch plant is located near the I-82/I-182 interchange just outside of Richland, Washington. The unit tested is a Cedar Rapids model number 8830 ADMPR, serial number 39323.

Aggregate is heated in a no.2 diesel-fired rotary drum, which measures approximately 30 feet long by 88 inches in diameter. Asphalt is added at a point approximately midway along the length of the drum. A slat conveyor transports the asphalt mix to a hopper, where it is loaded into trucks for transportation to the job site.

The plant capacity is 300 tons of asphalt hot-mix per hour. On the day of our test the facility was being operated at a rate of 180 tons per hour, with occasional periods of downtime due to the number of available trucks and conditions at the paving site. The aggregate used during our test contained approximately 4.0 percent moisture and 5.0 percent silt (material passing a 200 mesh sieve), with 5.2 percent asphalt added to the dried aggregate. Temperature of the hotmix was 290 degrees F at the drum outlet chute. Fan speed was a nominal 1257 rpm, as calculated from the sheave diameters and a fan amperage of 76.0. The fan value was taken from instruments in the control room.

The scrubber is a variable-throat venturi type, with a cyclonic demister/particle separator before the stack fan. The scrubber was using once-through, non-recycled water at the time of our test, with no settling pond. ACME personnel had rinsed out the scrubber after the

facility was shut down on the previous day. They also moved the venturi throat walls inward so as to increase the venturi pressure drop. Position of the inner venturi throat is set manually, usually only when the process is down. This is done by turning the adjustment nuts on threaded struts which pass through sealed openings in the rectangular scrubber duct to the movable venturi throat walls.

III. Test Procedure

Three Washington State Department of Ecology Method 5 particulate samples were collected, using a 12-point, two port traverse. Concurrent with each particulate sample, a Method 3 gas sample was collected, for quantification of stack O_2, CO_2, and dry gas molecular weight. Phil Cooke took visual plume readings during test run 2.

Pressure and temperature readings were taken just upstream and downstream of the scrubber venturi:

	Pressure, in. H_2O	Temperature, deg F
Upstream	- 1.8	325
Downstream	-19.0	115
Difference	17.2	

Throughout the test we noted presence of a mud fallout from the stack plume.

IV. Results

Test results are detailed in Table 1. Particulate emissions averaged 0.639 grains per dry standard cubic foot of stack effluent, or 106.4 pounds of particulate per hour of operation.

High stack particulate concentrations were shown by mud fall-out in the general vicinity downwind of the stack, as well as test results that are significantly over the emission standard of 0.04 gr/dscf. Effluent moisture content is normally calculated by two independent means in scrubber-controlled stack tests: by moisture condensed in the sampling train back half, and by assuming saturation at the average stack temperature.

Whenever the condensation technique gives a higher number than the saturation technique, entrained water in the gas stream is indicated. It is possible that the demister/particle separator section of the control device is not functioning adequately, thereby allowing collected particulates to become reentrained into the gas stream.

TABLE 1
METHOD 5 RESULTS SUMMARY

Plant Name *ACME Concrete Co.* NEDS
Address *513 N. Thierman* City *Richland*
County *Benton* State *WASH* Zip code

Industry Type *Asphalt Batch Plant*
Process Tested SCC
Unit Capacity *300 ton/hr* Fuel Type
Type of Control Equipment Vent/scru Tested at Inlet Outlet X

Reason Tested: Spec. Study____Compliance w/ Fed. _ State _ Local X Other _
Personnel Present *Alan T. Butler, Tom Harris*

Pollutant Measured *PARTICULATE* Method 5
Stack Height, ft *30.00* Area, sq ft 13.10
Diameters Downstream *Approx. 1* Upstream *5+*

Test No. *87-07*

Run Number	1	2	3	4	Average
Date: Mo-Day-Yr.	07-Apr-87	07-Apr-87	07-Apr-87		
Operating Rate, ton/hr ashpalt	180	180	180		180
Gas Composition % CO2	4.50	4.20	4.20		4.30
% O2	15.30	15.40	15.40		15.37
% N2	80.20	80.40	80.40		80.33
% Other	0.00	0.00	0.00		
% H2O	13.94	13.45	13.30		13.56
Estimated Mole Wt., Wet	27.89	27.91	27.93		27.91
Execess Air, %	260.52	264.35	264.35		263.07
Gas Flow Data					
Gas Pressure, in. Hg.	29.83	29.83	29.83		29.83
Gas Temperature, F	126.92	125.58	125.17		125.89
Ave. Stack Vel, AFPS	30.10	34.13	33.01		32.41
Flow Rate, SCFM Dry	17,979	20,386	19,718		19,361
Sample Information					
Volume Sampled, SDCF	44.75	48.15	47.85		
Sample Duration, Min.	60.0	60.0	60.0		
Nozzle Dia., in.	0.313	0.313	0.313		
Isokinetic Rate, %	100.4	94.8	97.2		
Results PARTICULATE Front Half					
Conc., Gr/SDCF	0.531	0.553	0.833		0.639
Conc., Gr/SDCF 7% O2	1.327	1.407	2.121		1.618
Conc., Gr/SDCF 12% CO2	1.415	1.579	2.380		1.792
Emission Rate, lb/Hr	81.8	96.6	140.8		106.4
Emission Factor, lb/ton	0.45	0.54	0.78		0.59

State of Washington Department of Ecology

TEST NO. _____
DATE 4/7/87

METHOD 5—
PARTICULATE SAMPLING WITH A HEATED FILTER WITH IMPINGER

PLANT ACME Cement Co.
SAMPLING LOCATION Main Stack
SAMPLE TYPE Part.
RUN NUMBER 1 OPERATOR AB
AMBIENT TEMPERATURE 51 °F
BAROMETRIC PRESSURE 29.83
STATIC PRESSURE Atm.
STACK DIAMETER 49" Area _____ ft²

PROBE LENGTH, TYPE, FACTOR 3', SS, .784
NOZZLE I.D. ~~.375~~ .3125
ASSUMED MOISTURE, % Sat'd at Ts.
SAMPLE BOX NUMBER 1 METER 2
WATER VOLUME COLLECTED 180.0 (Impingers) + 12.0 (Silica Gel) = 192.0 ml
ORSAT CO_2 4.5 O_2 15.3 CO _____

Dn. : Up
08:18 : 09:00

PARTICULATE WEIGHT	WASH	FILTER	IMPINGERS
I.D. NO.		D-129	
FINAL			
TARE			
GAIN			

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr. clock) / SAMPLING TIME, min.	GAS METER READING (V_m), ft³	VELOCITY HEAD (P_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O DESIRED	ACTUAL	STACK TEMP (T_s), °F	PROBE TEMP °F	SAMPLE BOX TEMP °F	IMPINGER TEMP °F OUT	IMPINGER TEMP °F IN	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	PUMP VACUUM in. Hg
			8.7										
1	07:06	2177.31	~~35.5~~		~~35.5~~	125	227	269	44	79	66	55	5.5
2	+5	2181.38	5.0		15	125	253	284	44	185	69	61	3.0
3	10	84.35	3.5		10.5	126	269	292	47	198	71	64	
4	15	86.96	10.5		31.5	126	272	267	47	200	70	68	5.5
5	20	91.15	14.0		44.2	127	274	286	49	210	72	74	8.0
6	25	96.10	14.0		44.1	127	270	269	50	220	75	78	8.0
7	30	2201.14	3.5		11.1	129	285	238	50	151	76	78	3.0
8	35	2204.03	4.5		14.2	130	282	243	52	184	72	63	3.5
9	40	06.80	3.5		11.1	130	265	258	51	172	74	67	3.0
10	45	08.95	8.0		25.3	128	271	253	49	187	73	77	5.0
11	50	12.48	14.0		44.3	126	272	257	53	194	77	79	8.0
12	55	17.52	16.0		50.6	124	264	250	56	215	79	84	9.0
	60	2222.99											

Point 1

ECL-943

Add-2 Venturi Plates adjusted prior to test.

METHOD 5 CALCULATIONS
Data Input

Plant	ACME Concrete Co.	Pitot Fact	0.7840
Sampling Location	Main Stack	Nozzle ID	0.3125 inches
Sample Type	Particulate	H2O Weight	197.00
Run Number	1	Orsat CO2	4.50 O2 15.30
Bar Pressure	29.83	Particulate Weight	
Static Pressure	0.0		Wash / Filter / Impingers
Stack Dia 49.00	Area 13.10	I.D. NO.	D-129
Length	Width	Final	0.0000 0.8527
		Tare	0.0000 0.7400
Operating Rate	180 ton/hr	Gain	1.4266 0.1127
Sample Time	60.00 Min		

Point	Del P	Del H	Temperature Stack	Temperature Meter			sqrt[dp]	Vel
1	8.7	26.1	125	55	Start Vol	2,177.31	0.59	32.89
2	5.0	15.0	125	61	Final Vol	2,222.99	0.45	24.93
3	3.5	10.5	126	64	Moisture Fraction	0.1394	0.37	20.88
4	10.5	31.5	126	68	Mole Weight	29.4924	0.65	36.16
5	14.0	44.2	127	74	Fo	1.24	0.75	41.79
6	14.0	44.2	127	78	Stack Flow Wet, acfm	23,651	0.75	41.79
7	3.5	11.1	129	78			0.37	20.93
8	4.5	14.2	130	63			0.42	23.75
9	3.5	11.1	130	67			0.37	20.95
10	8.0	25.3	128	77			0.37	20.95
11	14.0	44.3	126	79			0.56	31.62
12	16.0	50.6	124	84			0.80	44.56
13								
14								
15								
16								
17								
18								
19								
20								
Average		27.3	126.9	70.67			0.54	30.10

State of Washington Department of Ecology

TEST NO. _____

DATE 4/7/87

METHOD 5—
PARTICULATE SAMPLING WITH A HEATED FILTER WITH IMPINGER

PLANT ACME

SAMPLING LOCATION Main Stack

SAMPLE TYPE Part.

RUN NUMBER 2 OPERATOR [illegible]

AMBIENT TEMPERATURE 62°F

BAROMETRIC PRESSURE 29.83

STATIC PRESSURE 7.4 in.

STACK DIAMETER _____ Area _____ ft²

PROBE LENGTH, TYPE, FACTOR 3' SS .784

NOZZLE I.D. .3125

ASSUMED MOISTURE, % Sat.

SAMPLE BOX NUMBER 2 METER 2

WATER VOLUME COLLECTED 208.7 (Impingers) + 15.5 (Silica Gel) = 224.2 ml

ORSAT CO_2 4.2 O_2 15.4 CO _____

PARTICULATE WEIGHT

	WASH	FILTER	IMPINGERS
I.D. NO.		D-13	
FINAL			
TARE			
GAIN			

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr. clock) / SAMPLING TIME, min.	GAS METER READING (V_m), ft³	VELOCITY HEAD (P_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O ACTUAL	STACK TEMP (T_s), °F	PROBE TEMP °F	SAMPLE BOX TEMP °F	IMPINGER TEMP °F OUT	IMPINGER TEMP °F IN	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	PUMP VACUUM in. Hg
1	10:13	2223.20	7.5		24.2	125	243	240	63	199	82	69	3.5
2	+5	26.53	5.0		16.1	126	261	239	60	213	79	72	2.5
3	10	29.55	5.0		16.1	125	270	247	59	214	83	76	3.0
4	15	32.60	13.0		41.9	126	250	240	60	221	85	81	7.5
5	20	37.62	15.0		48.4	126	251	239	63	223	85	88	7.0
6	25	43.00	16.0		51.6	125	256	237	63	225	94	91	7.5
7	30	48.70	5.0		16.1	123	268	256	54	163	93	80	
8	35		5.0		16.1	126							
9	40	54.70	5.5		17.9	127	265	242	51	200	90	85	3.0
10	45	57.90	9.5		31.0	126	272	239	51	207	91	87	
11	50	62.25	16.0		52.2	126	272	241	55	213	92	92	7.0
12	55	67.53	17.0		55.5	126	269	246	57	223	94	97	8.0
	60	2273.49											

ECL-943-

Add-2

METHOD 5 CALCULATIONS
Data Input

Plant	ACME Concrete Co.	Pitot Fact	0.7840
Sampling Location	Main Stack	Nozzle ID	0.3125 inches
Sample Type	Particulate	H2O Weight	224.20
Run Number	2	Orsat CO2	4.20 O2 15.40
Bar Pressure	29.83	Particulate Weight	
Static Pressure		Wash / Filter / Impingers	
Stack Dia 49.00	Area 13.10		D-13
Length	Width 0.00	Final	0.0000 0.9933
		Tare	0.0000 0.7468
Operating Rate	180 ton/hr	Gain	1.4778 0.2465
Sample Time	60.00 Min		

Point	Del P	Del H	Temperature Stack	Temperature Meter			sqrt[dp]	Vel
					Start Vol	2,223.20		
1	7.5	24.2	125	69	Final Vol	2,273.49	0.55	30.54
2	5.0	16.1	126	72			0.45	24.95
3	5.0	16.1	125	76	Moisture Fraction	0.1345	0.45	24.93
4	13.0	41.9	126	81	Mole Weight	29.4488	0.72	40.24
5	15.0	48.4	126	88	Fo	1.31	0.77	43.22
6	16.0	51.6	125	91	Stack Flow Wet, acfm	26,818	0.80	44.60
7	5.0	16.1	123	80			0.45	24.89
8	5.0	16.1	126	80			0.45	24.95
9	5.5	17.9	127	85			0.47	26.19
10	9.5	31.0	126	87			0.61	34.40
11	16.0	52.2	126	92			0.80	44.64
12	17.0	55.5	126	97			0.82	46.01
13								
14								
15								
16								
17								
18								
19								
20								
Average		32.3	125.6	83.17			0.61	34.13

State of Washington Department of Ecology

TEST NO. _____

DATE 4/7/87

METHOD 5—
PARTICULATE SAMPLING WITH A HEATED FILTER WITH IMPINGER

PLANT ACME

SAMPLING LOCATION _____

SAMPLE TYPE Part

RUN NUMBER 3 OPERATOR ~~AB~~

AMBIENT TEMPERATURE ~~X~~ 65°F

BAROMETRIC PRESSURE 29.83

STATIC PRESSURE ~~X~~ At

STACK DIAMETER 49" I.D. Area _____ ft²

PROBE LENGTH, TYPE, FACTOR 3' SS .784

NOZZLE I.D. .3125

ASSUMED MOISTURE, % Sat

SAMPLE BOX NUMBER 3 METER 2

WATER VOLUME COLLECTED 244.8 (Impingers) + 15.4 (Silica Gel) = 260.2 ml

ORSAT CO_2 ~~4.6~~ 4.2 O_2 ~~4.2~~ 15.4 CO _____

PARTICULATE WEIGHT

	WASH	FILTER	IMPINGERS
I.D. NO.		D-12	
FINAL			
TARE			
GAIN			

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr. clock) / SAMPLING TIME, min.	GAS METER READING (V_m), ft³	VELOCITY HEAD (P_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O DESIRED	ACTUAL	STACK TEMP (T_s), °F	PROBE TEMP °F	SAMPLE BOX TEMP °F	IMPINGER TEMP °F OUT	IN	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	INLET ($T_{m\,in}$), °F	PUMP VACUUM in. Hg
1	12:10	2273.75	9.0		29.4	125	268	324	74	203	86	74	
2	+5	77.40	5.0		15.7	130	230	307	53	241	87	80	3.0
3	10	81.10	5.0		16.4	124	235	280	64	266	88	83	
4	15	84.20	7.5		24.7	125	236	284	64	228	89	87	
5	20	88.10	16.5		54.3	123	223	266	65	250	91	93	2.0
6	25	93.62	13.5		46.2	124	250	263	66	233	94	97	
7	30	98.95	5.0		17.1	120	280	266	55	170	91	79	3.0
8	35	2302.25	5.0		17.1	126	258	270	50	215	91	82	
9	40	05.50	5.0		17.1	127	243	284	50	220	91	86	3.0
10	45	08.72	9.0		30.8	126	266	289	52	215	93	90	
11	50	12.93	14.5		48.4	126	255	284	53	213	94	94	
12	55	18.30	16.5		55.1	126	249	283	54	208	96	99	
	60	2324.09											

ECL-943-

METHOD 5 CALCULATIONS
Data Input

Plant	ACME Concrete Co.	Pitot Fact	0.7840
Sampling Location	Main Stack	Nozzle ID	0.3125 inches
Sample Type	Particulate	H2O Weight	260.20
Run Number	3	Orsat CO2	4.20 D2 15.40
Bar Pressure	29.83	Particulate Weight	
Static Pressure		Wash	Filter Impingers
Stack Dia 49.00	Area 13.10		D-12
Length	Width	Final	0.0000 0.9879
		Tare	0.0000 0.7445
Operating Rate	180 ton/hr	Gain	2.3404 0.2434
Sample Time	60.00 Min		

Point	Del P	Del H	Temperature Stack	Temperature Meter			sqrt[dp]	Vel
					Start Vol	2,273.75		
1	9.0	29.4	125	74	Final Vol	2,324.09	0.60	33.45
2	5.0	15.7	130	80			0.45	25.04
3	5.0	16.4	124	83	Moisture Fraction	0.1330	0.45	24.91
4	7.5	24.7	125	87	Mole Weight	29.4488	0.55	30.54
5	16.5	54.3	123	93	Fo	1.31	0.81	45.22
6	13.5	46.2	124	97	Stack Flow Wet, acfm	25,939	0.73	40.93
7	5.0	17.1	120	79			0.45	24.83
8	5.0	17.1	126	82			0.45	24.95
9	5.0	17.1	127	86			0.45	24.98
10	9.0	30.8	126	90			0.60	33.48
11	14.5	48.4	126	94			0.76	42.50
12	16.5	55.1	126	99			0.81	45.33
13								
14								
15								
16								
17								
18								
19								
20								
Average		31.0	125.2	87.00			0.59	33.01

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY May 1, 1977

SOURCE TEST CALCULATIONS

APPENDIX-B CALCULATIONS
Test 87-07 Run 1

Volume Sampled

The volume sampled is normally expressed in standard dry cubic feet (sometimes in standard dry liters), and is determined by correction of the meter volume to standard conditions.

$$Vs = \overset{45.68}{Vm} \frac{520}{460 + \underset{70.67}{Tm}} \frac{\overset{29.83 + (27.3 mm / (13.5 \times 25.4))}{Pm + (\Delta H)}}{29.92} = 44.75$$

Particulate Concentration

The concentration of particulate is determined by dividing the weight of particulate collected by the volume sample and expressed in grains per standard cubic foot.

$$C_p = \frac{(.01543 \text{ gr/mg})(\overset{1,539.3}{M_p})}{Vs} = 0.5308$$

Gas Pollutant

To determine the volumetric concentration of gaseous pollutants, find the number of moles of pollutants per 10^6 moles of gas. The result is expressed in parts per million, ppm.

$$Cgas = \frac{Mp}{MWp} \frac{MV}{Vs} \times 10^6$$

Excess Air

The excess air is determined by the concentration of O_2 in the gas stream at the sample point, divided by the concentration of O_2 used for combustion, with adjustments for carbon monoxide.

$$EA = \frac{\overset{15.3}{\%O_2} - 0.5\% \text{ CO}}{0.264 (\%N_2) - \underset{15.3}{\%O_2} + 0.5 (\%CO)} \times 100 = 260.52$$

O_2 Correction

To adjust the pollutant concentration to a 7% O_2 standard, the concentration is multiplied by the O_2 in the air, minus 7% O_2, and divided by the O_2 in the air minus the O_2 in the gas stream.

$$C_7 = \frac{(21.0 - 7.0)}{(21.0 - \%O_2)} C = \frac{14.0 \text{ C}}{21.0 - \%O_2}$$

Moisture Mole Fraction

Condensation Method -

The moisture mole fraction is determined by dividing the volume of the water vapor collected by the total volume of the sample, including water vapor.

$$Fm = \frac{0.0465\ \overset{197.00}{Ww}}{0.0465\ Ww + Vs} = 0.1699$$

Saturation Method -

By the saturation assumption method, the moisture mole fraction is dividing the vapor pressure of water at the stack temperature by the absolute pressure of the stack gas.

$$* \ Fm = \frac{Pwv}{Ps} = \frac{10^{[6.9111 - \{3144.01/(390.86 + \overset{126.9}{Ts})\}]}}{\underset{29.83}{Ps}} = 0.1394$$

Molecular Weight

The molecular weight of the stack gas is determined by summing the mole fraction and the molecular weight of each constituent.

Dry Gas Basis -

$$MWd = 44.0\ (FCO_2) + 32.0\ (FO_2) + 28.0\ (FCO) +$$
$$+ 28.2\ (1.00 - FCO_2 - FO_2 - FCO) = 29.4924$$

Wet Basis -

$$MW = MWd\ (1.00 - Fm) + 18.0\ (Fm) = 27.8909$$

Average Stack Gas Velocity

The average stack gas velocity expressed in actual feet per second is determined by:

$$Vave = \frac{85.48\ \overset{.84}{Fv}}{\sqrt{Ps\ MW}} \frac{1}{n} \sum_{n}^{i=1} \sqrt{(460 + Ts_i)(\Delta h_i)} = 30.10$$

where n = number of traverse points

Stack Gas Flow Rate, Actual

The average stack gas flow rate is expressed in actual cubic feet per minute and found by multiplying the average stack gas velocity by the stack area and 60.0.

$$Qd = Vave(\overset{13.0954}{Ad})60 = 23,651$$

Stack Gas Flow Rate, Standard

The stack gas flow rate under standard conditions is expressed as standard dry cubic feet per minute, and obtained by adjusting the stack gas flow rate to standard temperature and pressure and subtracting the volume of the water vapor.

$$Qs = \frac{520}{460 + Ts} \frac{(Ps)}{(29.92)} (1 - Fm)Qd = 17,979$$

Emission Rate

Emission rate is calculated from the product of the concentration and the flow rate, and normally expressed in pounds per hour.

Particulate -

$$Rp = \frac{CP\ (Qstd.)(60\ Min/Hr)}{7000\ Gr./Lb.} = 81.80\ lb/hr$$

$$Rgas = Cgas \frac{(Qstd)(MWp)}{(MVe)} \frac{(60\ Min.)}{(Hr.)}$$

Isokinetic Rate

The isokinetic rate ratio of the velocity of gas through the nozzle to the velocity of gas passed the nozzle and normally expressed as percent.

$$I = \frac{0.[redacted]0\ Vs\ (460 + Ts)}{AnPs\ (1 - Fm)\ Vave\ \theta} \times 100 = 101.92\%$$

NOMENCLATURE FOR CALCULATIONS

May 1, 1977

Symbol	Description	Units
Ad	Duct area	Sq. Ft.
An	Nozzle Area, $\frac{1}{4} \pi Dn^2$	Sq. In.
C	Concentration of Pollutant	ppm or gr/SDCF
C_7	Correction factor 7% O_2	ppm or gr/SDCF
Cgas	Concentration of gaseous pollutant	ppm, Vol.
$CVSO_2$	Volume concentration of SO_2	ppm
Dd	Duct diameter	ft.
Dn	Nozzle diameter	In.
EA	Excess Air	%
FCO, FCO_2	Mole or volume fraction of the particular gas	
FO_2, FN_2	CO, CO_2 O_2 N_2	
Fgd	Dry stack gas density with air equal to 1.0	
Fm	Mole fraction of water vapor in stack stack gas	
Fv	Pitot correction factor	
Hs	Stack height above grade	Ft.
Δh	Differential pressure on pitot	In. H_2O
$\sqrt{\Delta ha}$	Average of $\sqrt{\Delta h}$	(in $H_2O)^{\frac{1}{2}}$
I	Isokinetic Rage	%
Mg	Mass of gaseous pollutant	gm
Mp	Mass of particulate	mg
MSO_2	Mass of SO_2 Collected	mg
MV_e	Molar volume at standard conditions; English Units = 379 ft^3/lb-mole	
MVm	Molar volume at standard conditions: Metric Units = 23.69 ℓ/g-mole	

Edit SAS data set: SAS.AETEST

] Screen 1
| New 93

mmand ===>

DSNO: ____ COMPANY NAME: ACME Concrete
DRESS: P.O. Box 417, 955 W Lacey
TY, STATE & ZIP: Richland, WA 99352
ANT NAME: ACME Portable REGISTRATION NO: _____
CATION: Richland - Pit No. 202
RYER SERIAL NO: 39323, Mod no. 8830 ADM PR
ONTROL SERIAL NO: 244 PROD.CAPACITY: 300
RYER LENGTH: 30' DRYER DIAM: 88" FAN AMPS: 122+122 FAN VOLTS: 480

OURCE TEST ~~CYCLONE INPUT~~ P: ____ ~~CYCLONE INPUT~~ T: OUTLET
~~CYCLONE OUTPUT~~ P: 325 T ~~CYCLONE OUTPUT~~ T: 115 T
INLET SCRUB/BAGHOUSE P: -1.8 P SCRUB/BAGHOUSE T: -19 TYPE: D #2
SCRUB WATER GAL/MIN: 200 POND/TANK VOL (GAL): One Through
STACK: TEMP: ____ % OPACITY: ____ GRAIN/FT3: ____
DRY AGGR: % H2O: 4.0 % <200 MESH: 5.0 TEMP: 290 hot mix in chute
HOT MIX: T/HR: 180 % ASPH: 5.2 DATE: _____
FAN RPM: 1257 FAN AMPS: 76.0 FUEL TYPE: D#2

REMARKS: _____ DATE: _____

Motor RPM x Shieve Factor

Edit SAS data set: SAS.AETEST

] Screen 2
| New 93

Command ===>

COMPLIANCE INSPECTION DATA
CYCLONE INPUT P: ____ CYCLONE INPUT T: ____
CYCLONE OUTPUT P: ____ CYCLONE OUTPUT T: ____
SCRUB/BAGHOUSE P: ____ SCRUB/BAGHOUSE T: ____ TYPE: ____
SCRUB WATER GAL/MIN: ____ POND/TANK VOL (GAL): ____
STACK: TEMP: ____ % OPACITY: ____ GRAIN/FT3: ____
DRY AGGR: %H2O: ____ % <200 MESH: ____ TEMP: ____
HOT MIX: T/HR: ____ %ASPH: ____ DATE: _____
FAN RPM: ____ FAN AMPS: ____ FUEL TYPE: _

REMARKS: _____ DATE: _____

Hot Mix:
Drum-Mixer, Asphalt added in Drum., Slat conveyor to Hopper, then trucks

Poll. Control: venturi-scrubber to cyclonic demistor/part. seperator, no settling basin, once through.
61 - 8-1-

Jobll tno

.n1 Limit → 0.04 Gr/DSCF

Washington Department of Ecology

VISIBLE EMISSION OBSERVATION FORM

OBSERVATION DATE	START TIME	STOP TIME
Apr 7 1987		

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	3				31				
2	3				32				
3	5				33				
4	5				34				
5	3				35				
6	5				36				
7	5				37				
8	5				38				
9	5				39				
10	5				40				
11	5				41				
12	5				42				
13	6				43				
14	5				44				
15	5				45				
16	7				46				
17	5				47				
18	6				48				
19	4				49				
20	6				50				
21	5				51				
22	5				52				
23	5				53				
24	4				54				
25	4				55				
26	4				56				
27	5				57				
28	6				58				
29	5				59				
30	7				60				

AVERAGE OPACITY DURING THE PERIOD OF

_____ THROUGH _____ WAS _____ %

OBSERVER'S NAME (PRINT)

OBSERVER'S SIGNATURE | DATE

COMPANY Ames Concrete - Asphalt Div

ADDRESS

LOCATION Richland Quarry

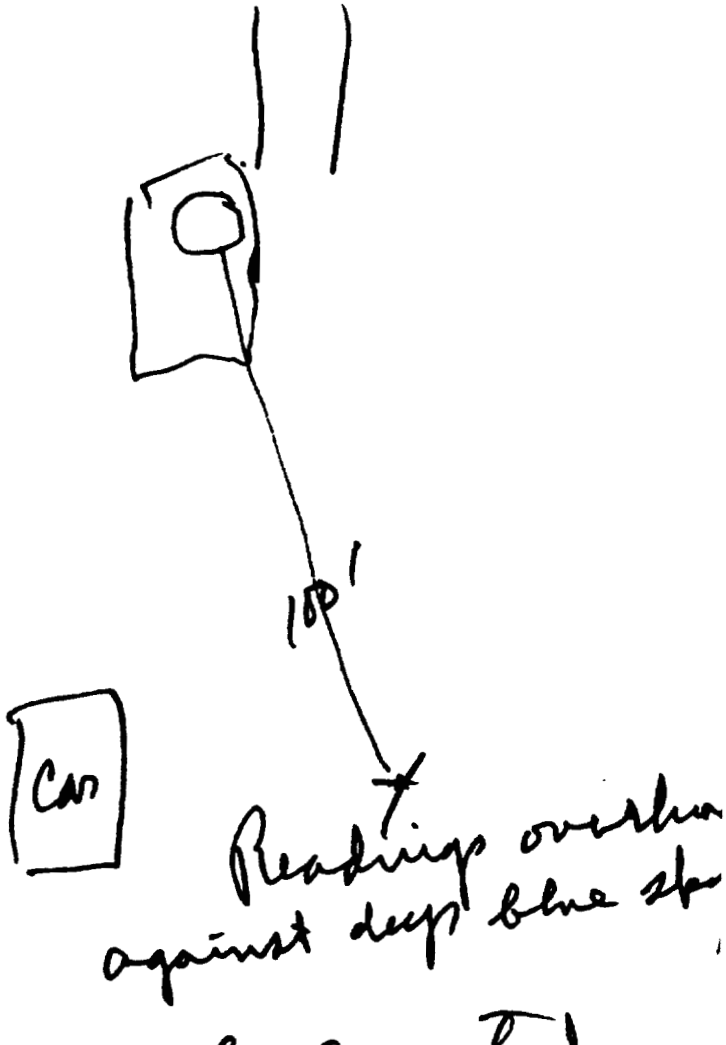
WIND DIRECTION SW

CLOUD COVER Clear overhead

925 completed.

DIAGRAM:

EMISSION POINT



Most fall noted on car windows & on top

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATI

SIGNATURE

TITLE | DATE

USER: Alan Butler

DATE: Postweights 4-20, 22-87 Susan Davis

Identification of Sample	Post Weight	Pre-Weight	Difference
D12	0.9879	0.7445	0.2434
D13	.9933	.7468	.2465
D129	.8527	.7400	.1127
Run 1			1.4266
Run 2			1.4778
Run 3			2.3404
Keith did probe rinses			

24-APR-87 EPA Region X Lab Management System Page 1
*** Lab Analysis Report ***

RECEIVED APR 29 1987 DEPARTMENT OF ECOLOGY NORTHWEST REGION

Alan Butler

Transaction #: 04221409 Seq #: 01 (15) Solids - Specified
(WE) DOE, Manchester Was
Prj: ACME CONCRETE, RICHLAND (DOE-532A) 212
Par: Solids Total mg (Par# 500 S)

Instrument: GRAV Gravimetric Measurement
Method: EP1-160.3 Residue, Total, Gravimetric, Dried at 103-105 Deg-C
Chemist: (DKS) Solberg, Keith DOE Hours Worked:
Lab Prep:( ) Unspecifed Date Preprd: Date Anlyzd: 870413

Matrix: (10) Water-Total Units: (52) mg

Line	Sample #	Result	Sample Location/Description	Volume ml.	#Days to Anl
1	87 157244	1426.6	PROBE RINSE, RUN 1	600	870408 (5)
2	87 157245	1477.8	PROBE RINSE, RUN 2	875	870408 (5)
3	87 157246	2340.4	PROBE RINSE, RUN 3	650	870408 (5)

Record Type: TRNIN2 Date Verified: 4/27/87 By: W Kolff
Transaction Status: Edited Transaction...First Printing...Unverified.
Processed: 24-APR-87 16:10:43 Status: E Batch: (In CUR DB)