PARTICULATE AND VISIBLE EMISSION TESTS FOR RICHARDSON & BASS CONSTRUCTION CO.

GENCOR DRUM MIX PLANT MODEL 400 ULTRADRUM

COLUMBIA, MISSOURI

OCTOBER 1993

APCP COPY

AEROMET ENGINEERING

1325 AEROTEC DRIVE JEFFERSON CITY, MISSOURI 65109 Phone (314) 636-6393 Fax (314) 636-9767

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MEMORANDUM

DATE: January 6, 1994

TO: Boone County File, SWRO

FROM: Peter Yronwode P.Y.

SUBJECT: Richarson & Bass asphalt plant stack test
Permit # 0593-011

Aeromet Engineering tested this facility on October 12, 1993 near Columbia. Due to insufficient demand for asphalt, only two runs were performed, and production was well below the normal rate. Emissions averaged 0.035 gr/DSCF and opacity was reported to be less than 5%. The plant was found at the time of the test to be in compliance with permit # 0593-011 and Federal NSPS standards of 0.040 gr/DSCF and 20% opacity. Production rate during testing averaged 273 tons/hour. Baghouse pressure drop during the test averaged 2.5 inches of water. No more than 300,000 tons of asphalt may be produced at this facility during any twelve month period.

In a letter dated December 7, 1993, Richardson & Bass agreed to retest the facility in the spring of 1994 in order to increase the permitted production rate. Until that time production exceeding 273 tons per hour by more than 10% is a violation of the permit.

STATE OF MISSOURI Mel Carnahan, Governor • David A. Shorr, Director
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102-0176

January 6, 1994

Re: permit # 0593-011

Mr. Frank A. Estabrooks, President
Richardson & Bass Construction Co.
5320 Highway 63 North
P. O. Box 913
Columbia, MO 65205

Dear Mr. Estabrooks:

My staff has reviewed the report of testing conducted by Aeromet Engineering on the Gencor Model 400 drum-mix asphalt plant (400-UDO-13913-93-3A) and baghouse (BR120-13913-93-3A) located at your facility near Columbia on October 12, 1993. Particulate emissions over two runs averaged 0.035 grains per dry standard cubic foot (gr/DSCF) and opacity approached 0%. This emission level meets the limit of 0.04 gr/DSCF established by New Source Performance Standards (NSPS), Subpart I (40 CFR 60.90), established by your permit, # 0593-011.

No more than 300,000 tons of asphalt may be produced at this facility during any twelve month period. Average production during the test was 273 tons/hour. This level is well below the anticipated rate of 335 tons/hour. Production at this plant which exceeds 273 tons/hour by more than ten percent will be a violation of your permit until a re-test is performed as agreed in your letter of December 7, 1993. If compliance with applicable emissions limits can be demonstrated at a higher production rate, the higher rate will become the maximum production level permitted. Pressure drop across the baghouse averaged 2.5 inches of water. A comparable level of control device function must be maintained during operations.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Steven Feeler
Acting Chief of Enforcement

SF/py
cc: JCRO

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RICHARDSON & BASS CONSTRUCTION CO.
5320 Hwy. 63 North
P.O. Box 913
Columbia, Missouri 65205

Phone: 314-442-0146
Fax: 314-442-0824

December 7, 1993

Dept. of Natural Resources--APCP
Attn.: Peter Yronwode
P.O. Box 176
Jefferson City, MO 65102

Re: Particulate / Opacity Emissions Tests
Columbia, Missouri 10/12/93

Mr. Yronwood:

Enclosed please find a report compiled by AeroMet Engineering describing the emissions tests done at our asphalt plant. The results do demonstrate compliance with the Missouri State regulation and the USEPA New Source Performance Standards regarding Asphalt Production up to the production rate during the test. As stated at the time of the test, we agree to a retest next spring at a higher production rate.

Sincerely,

Frank H. Estabrooks
President

TEST CERTIFICATION

I certify that the enclosed test results are true, accurate, and authentic. I was personally responsible for all phases of the testing to determine the particulate and visible emissions from the Gencor Drum Mix Model 400 Ultradrum Asphalt Plant at the Richardson & Bass, Columbia, Mo. location.

The sampling equipment and procedures conformed to USEPA Method 1,2,3,5, and 9 for particulate and visible emissions from stationary sources. The results of this testing are the basis for this report.

AEROMET ENGINEERING, INC.

Tom Scheppers, P.E.
President

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I. INTRODUCTION

Aeromet Engineering, Inc., located in Jefferson City, Missouri, has been retained by Richardson & Bass Construction Co., Columbia, Missouri, to determine the particulate and visible emissions from a new Model 400 Ultradrum asphalt plant installed at the Richardson & Bass Construction Co. site, near Columbia, Missouri. Performance testing is required under the condition of a construction permit (# 0593-011) which was issued to Richardson & Bass by the Missouri Department of Natural Resources. The asphalt plant is also subject to the Code of Federal Regulation (CFR) Title 40 Part 60 New Source Performance Standards (NSPS) Subpart I - Standards of Performance for Hot Mix Asphalt Facilities. USEPA Methods 5 and 9 were used for the testing with no deviations from the standard procedures. The asphalt plant was permitted to operate at a production rate of 400 tons/hr (not to exceed 300,000 tons per year), emission rate of no greater than 0.04 grains/dry standard cubic foot, and less than 20 percent visible emissions.

Source testing took place on October 12, 1993. Pre-test planning was accomplished by phone conversations with the following individuals; Peter Yronwode of Missouri Department of Natural Resources, Frank Enloe, P.E., President and D.J., Plant Operator of the Columbia Plant, and Tom Scheppers, P.E., of Aeromet Engineering.

The project engineer and test team crew chief during the test for Aeromet Engineering was Tom Scheppers, P.E. Two other members of the test team were Mr. Dale Schmitz and Mr. Darryl Meister. Mr. Meister is an EPA certified visible emissions reader in Missouri and performed the Method 9 Visible Emissions Readings. Mr. Peter Yronwode observed the tests representing the Air Pollution Control Program, Missouri Department of Natural Resources. All aspects of the test program were coordinated with D.J., Plant Operator. The plant operating data was collected by the operator at 15 minute intervals. The data is presented in Appendix K.

Weather was not a major factor during the testing program, as clear skies predominated. The temperatures were around the mid 60's.

II. SUMMARY OF RESULTS

The results are summarized in Table I. Actual emissions data is listed for particulate. The results of both runs demonstrate compliance with the allowable limit of 0.04 grains per dry standard cubic foot (gr/dscf). The asphalt plant was operated at approximately 273 ton/hr of both aggregate and asphalt. A detailed description of the process is found in the next section of this report. A summary of the production rates can be found in Table II within that same section.

The isokinetic sampling rate is also shown in Table I. This rate compares the stack gas velocity to the nozzle velocity of the sampling probe. A rate of 100% represents a stack gas velocity equal to the nozzle velocity. The acceptable range is 90% to 110%. EPA has determined that sampling outside this range may cause a bias in the results based on the particle size and aerodynamic properties.

Only two runs were performed due to limited need for the asphalt mix at the time of the test. During this test, the plant was unable to operate at a maximum achievable production rate but well below the permitted 400 tph. Although the asphalt production season has nearly ended for the year, the aggregate moisture content is near saturation from the wettest year recorded, and the new plant is still in a startup mode, Richardson & Bass has provided a compliance test within the 180 days as specified by the Federal Code of Regulations. Furthermore, they agreed to retest again at a higher permitted level.

The filters from both were coated with a visible particulate material, although appearance does not necessarily indicate weight. Both sets of samples appeared similar in color and medium density. The appearance was a little darker compared with other samples taken from similar asphalt plants.

During the testing period, no abnormalities were discovered to contribute to any errors in the results of the tests.

The particulate emission results should be representative of the actual concentrations within the normal accuracies of Method 5. Although no upper limits of emissions have been established for the test method, an upper limit has not been exceeded based on acceptance of the test method on significantly higher grain loadings. The estimated accuracy of Method 5 is approximately +/- 20% based on results of collaborative tests.

PLANT NAME:Richardson & Bass Construction Co.
LOCATION: Columbia, MO
TEST UNIT: Gencor Model 400 Ultradrum asphalt plant
TEST DATE: 10/12/92 RUN NO: 1
DATE/TIME OF CALCULATIONS: 06-Jan-94 11:08 AM

NUMBER OF POINTS	24	PERCENT OXYGEN	9.80
TIME (minutes/point)	3.00	PERCENT CARBON DIOXIDE	8.00
LEAK RATE (ft3/min)	0.002	PERCENT CARBON MONOXIDE	0.00
STACK DIAMETER (in)	54.00	PITOT COEFFICIENT (Cp)	0.840
BAR PRESS (in Hg)	29.82	NOZZLE DIAMETER (in)	0.~~250~~ .251
STATIC PRESS (in H2O)	-0.25	INITIAL METER VOL (ft3)	914.083
PARTIC COLLECTED (mg)	103.50	FINAL METER VOL (ft3)	958.278
IMPINGER H2O (ml)	500.0	METER CORR FACT (Ym)	0.9960
SILICA GEL H2O (g)	10.3		

POINT NUMBER	STACK TEMP (Ts)	VELOCITY PRESS (dPs)	ORIFICE PRESS (dH)	METER TEMP INLET (Tmi)	METER TEMP OUTLET (Tmo)	STACK VEL ft/sec	"K" "FACTOR" dPs/dH	VELOCITY PRESS SQRT (dPs)^.5
1	159	0.40	0.79	58	58	41.0	1.98	0.632
2	172	0.37	0.72	66	60	39.9	1.95	0.608
3	174	0.41	0.80	69	60	42.0	1.95	0.640
4	209	0.45	0.84	74	62	45.2	1.87	0.671
5	215	0.40	0.74	76	62	42.8	1.85	0.632
6	211	0.45	0.84	80	63	45.3	1.87	0.671
7	214	0.59	1.10	84	65	52.0	1.86	0.768
8	211	0.76	1.44	89	66	58.9	1.89	0.872
9	214	0.83	1.57	93	68	61.6	1.89	0.911
10	215	0.96	1.79	74	74	66.4	1.86	0.980
11	234	1.10	2.01	82	75	72.0	1.83	1.049
12	222	1.10	2.07	92	76	71.4	1.88	1.049
13	218	1.10	2.09	81	79	71.2	1.90	1.049
14	218	0.92	1.76	101	80	65.1	1.91	0.959
15	216	0.87	1.68	106	82	63.2	1.93	0.933
16	214	0.95	1.85	109	83	66.0	1.95	0.975
17	218	0.86	1.67	110	84	62.9	1.94	0.927
18	215	0.86	1.68	112	86	66.0	1.77	0.975
19	218	0.72	1.40	111	88	62.9	1.63	0.927
20	215	0.38	0.74	111	88	62.8	0.86	0.927
21	215	0.27	0.53	108	89	57.5	0.74	0.849
22	215	0.27	0.53	107	90	41.7	1.39	0.616
23	215	0.33	0.64	106	90	35.2	2.37	0.520
24	210	0.37	0.73	105	91	35.1	2.70	0.520
25						32.1	0.00	0.574
AVG	209.9	0.640	1.250	91.83	75.79	56.674		0.843

STACK GAS MOL WEIGHT, WET	25.47	AVG ABS STACK TEMP (deg R)	669.9
STACK VELOCITY (ft/sec)	56.88	AVG ABS METER TEMP (deg R)	543.8
STAND VOL SAMPLED (std ft3)	42.71	METER LEAKAGE RATE (ft3/min)	0.000
AVG GAS METER TEMP (deg F)	83.8	SAMPLE VOL LEAK CORR'D (ft3)	44.20
PERCENT MOISTURE (%)	36.00	AVG ABS STACK PRESS (in Hg)	29.8016
STD STACK FLOW RATE (DSCFM)	27272	VOL H20 IN METER GAS (SCF)	24.02
	100.73	H20 VAPOR IN GAS (vol frac)	0.3600
ISOKINETIC VARIATION (%)	~~101.54~~	NOZZLE AREA (ft2)	0.00034
PARTIC. EMISSION RATE (lb/hr)	8.7420	STACK AREA (ft2)	15.904
PARTICULATE CONC (gr/DSCF)	0.0374	STACK GAS MOL WEIGHT, DRY	29.67
PARTIC CONC @ 7% O2 (gr/DSCF)	0.0468		
FUEL F FACTOR DRY (Fd)			
POUNDS PER MILLION BTU	0		

PLANT NAME:Richardson & Bass Construction Co.
LOCATION: Columbia, MO
TEST UNIT: Gencor Model 400 Ultradrum asphalt plant
TEST DATE: 10/12/92 RUN NO: 2
DATE/TIME OF CALCULATIONS: 06-Jan-94 11:27 AM

NUMBER OF POINTS	24	PERCENT OXYGEN	9.80
TIME (minutes/point)	3.00	PERCENT CARBON DIOXIDE	8.20
LEAK RATE (ft3/min)	0.002	PERCENT CARBON MONOXIDE	0.00
STACK DIAMETER (in)	54.00	PITOT COEFFICIENT (Cp)	0.840
BAR PRESS (in Hg)	29.78	NOZZLE DIAMETER (in)	0.251
STATIC PRESS (in H2O)	-0.25	INITIAL METER VOL (ft3)	958.500
PARTIC COLLECTED (mg)	73.30	FINAL METER VOL (ft3)	995.607
IMPINGER H20 (ml)	410.0	METER CORR FACT (Ym)	0.9960
SILICA GEL H20 (g)	7.6		

POINT NUMBER	STACK TEMP (Ts)	VELOCITY PRESS (dPs)	ORIFICE PRESS (dH)	METER TEMP INLET (Tmi)	METER TEMP OUTLET (Tmo)	STACK VEL ft/sec	"K" "FACTOR" dPs/dH	VELOCITY PRESS SQRT (dPs)^.5
1	182	0.62	1.02	78	79	52.0	1.65	0.787
2	184	0.79	1.31	80	80	58.8	1.66	0.889
3	186	0.82	1.36	85	80	60.0	1.66	0.906
4	187	0.84	1.40	92	81	60.8	1.67	0.917
5	191	0.80	1.33	94	82	59.5	1.66	0.894
6	192	0.63	1.05	97	82	52.8	1.67	0.794
7	190	0.30	0.50	100	84	36.4	1.67	0.548
8	191	0.27	0.45	98	85	34.6	1.67	0.520
9	192	0.27	0.45	98	86	34.6	1.67	0.520
10	194	0.26	0.43	100	88	34.0	1.65	0.510
11	190	0.25	0.42	101	90	33.2	1.68	0.500
12	190	0.23	0.39	101	91	31.9	1.70	0.480
13	185	0.65	1.10	100	91	53.4	1.69	0.806
14	193	0.56	0.95	109	93	49.9	1.70	0.748
15	200	0.53	0.89	111	94	48.8	1.68	0.728
16	200	0.48	0.81	112	96	46.4	1.69	0.693
17	201	0.43	0.72	111	97	44.0	1.67	0.656
18	200	0.28	0.47	111	98	46.4	0.98	0.693
19	200	0.50	0.84	110	99	43.9	1.95	0.656
20	199	0.63	1.06	110	99	35.4	3.79	0.529
21	200	0.44	0.74	113	100	47.4	1.48	0.707
22	199	0.44	0.74	112	100	53.1	1.17	0.794
23	197	0.42	0.71	111	101	44.3	1.61	0.663
24	196	0.42	0.71	111	101	44.3	1.61	0.663
25						36.2	0.00	0.648
AVG	193.3	0.477	0.827	101.88	90.71	47.585		0.719

STACK GAS MOL WEIGHT, WET	25.49	AVG ABS STACK TEMP (deg R)	653.3
STACK VELOCITY (ft/sec)	47.89	AVG ABS METER TEMP (deg R)	556.3
STAND VOL SAMPLED (std ft3)	34.97	METER LEAKAGE RATE (ft3/min)	0.000
AVG GAS METER TEMP (deg F)	96.3	SAMPLE VOL LEAK CORR'D (ft3)	37.11
PERCENT MOISTURE (%)	35.98	AVG ABS STACK PRESS (in Hg)	29.7616
STD STACK FLOW RATE (DSCFM)	23518	VOL H20 IN METER GAS (SCF)	19.66
		H20 VAPOR IN GAS (vol frac)	0.3598
ISOKINETIC VARIATION (%)	95.65	NOZZLE AREA (ft2)	0.00034
PARTIC. EMISSION RATE (lb/hr)	6.5203	STACK AREA (ft2)	15.904
PARTICULATE CONC (gr/DSCF)	0.0323	STACK GAS MOL WEIGHT, DRY	29.70
PARTIC CONC @ 7% O2 (gr/DSCF)	0.0405		
FUEL F FACTOR DRY (Fd)			
POUNDS PER MILLION BTU	0		

TABLE I

Richardson & Bass Construction Co.
Summary of Particulate and Visible Emission Test
Astec Drum Mix Model 400 Ultradrum Asphalt Plant

	Run 1 10/12/93	Run 2 10/12/93	Ave.
Process Conditions			
Production Rate (ton/hr)	309.0	237.6	273.2
Stack Conditions			
Stack Gas Temperature (°F)	210	193	202
Actual Gas Flow (ACFM)	50,823	43,856	47,340
Std. Gas Flow (DSCFM)	25,473	22,517	23,995
Isokinetics (%)	107	99	
Emissions, Actual			
Visible (percent)	0	0	0
Particulate (lb/hr)	8.22	6.29	7.26
Particulate (gr/DSCF)	0.~~0038~~ .037	0.~~0033~~ .033	0.~~0035~~ .035

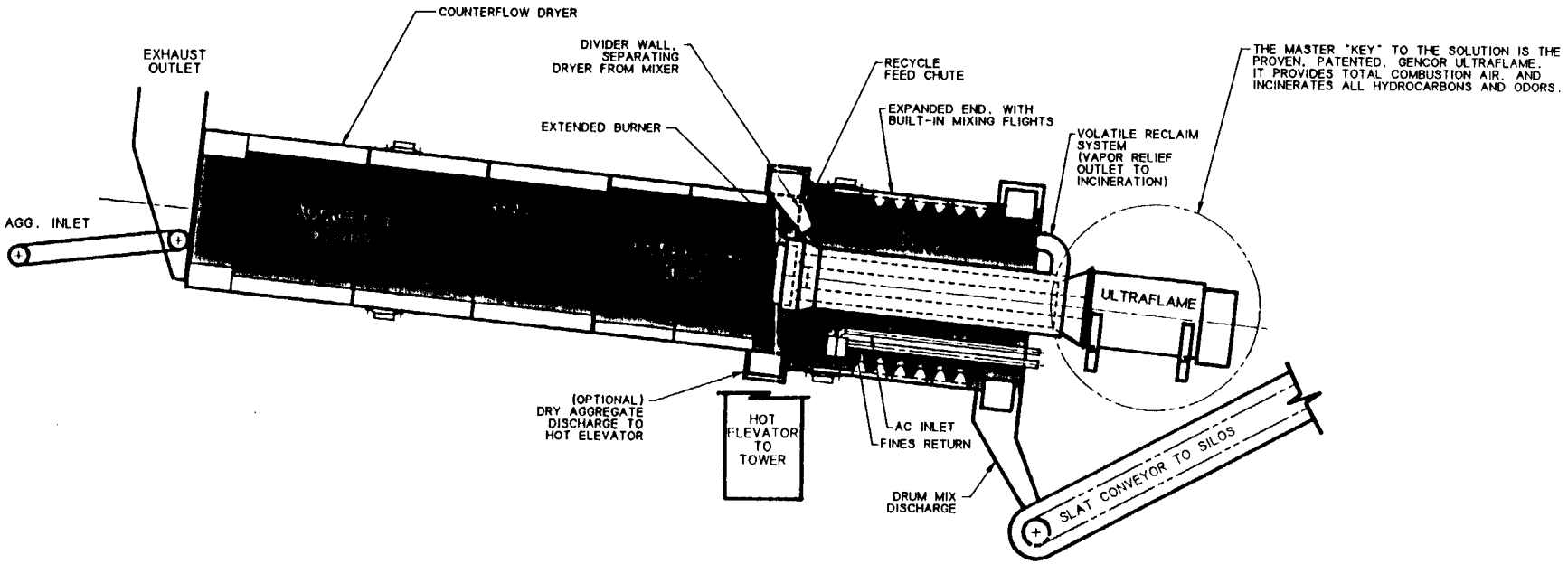
III. DESCRIPTION OF THE PROCESS

Richardson & Bass Construction Co. purchased and installed a new asphalt plant at the Columbia facility near Columbia, Mo. The asphalt plant consists of a new Gencor Industries, Inc. Model 400 Ultradrum. The Model 400 Ultradrum asphalt plant is a fixed plant with portable capability with a design capacity of up to 400 tons/hour. The Drum Mix Asphalt Plant consists of a cold feed system (four bin hopper), conveyors, a dryer drum with an integrated dryer/mixer, asphalt storage, fuel storage, and a final product storage silo.

A process description is as follows: Virgin aggregate is transported from storage piles to four independent bins by front end loader. The bins of specific sized aggregate are fed independently and continuously onto a feed belt. The feed belt supplies the correctly proportioned aggregate to the dryer drum. Feed rates are determined by automated controllers in order to blend a proper mix meeting any required specifications.

The aggregate is dried in a rotating dryer/mixer drum. Combustion of natural gas provides direct heat countercurrent to the aggregate flow. Wet aggregate is introduced at the upper end of the drum (exhaust outlet). The aggregate is dried as it tumbles through Zone 1 (aggregate drying/combustion area). The dried aggregate enters Zone 2 (mixing area) and continues tumbling to the lower side of the drum. In the mixing zone, asphalt cement is added. The asphalt cement and aggregate is mixed thoroughly by paddles attached to the outer wall of the rotating drum. The fumes generated in the mixing area are routed into the combustion area for incineration. This design achieves excellent mixing and long residence time providing direct contact of the wet virgin materials with the hot combustion gases, mixing of asphalt cement away from the combustion gases, combustion of fume generated by mixing, and lower exhaust temperatures.

From the dryer/mixer, the mixed asphalt is transferred to a storage silo. Asphalt can be stored and dispensed to trucks without interruption of the production process.


COUNTERFLOW DRYER
EXHAUST OUTLET
DIVIDER WALL, SEPARATING DRYER FROM MIXER
RECYCLE FEED CHUTE
THE MASTER "KEY" TO THE SOLUTION IS THE PROVEN, PATENTED, GENCOR ULTRAFLAME. IT PROVIDES TOTAL COMBUSTION AIR, AND INCINERATES ALL HYDROCARBONS AND ODORS.
EXTENDED BURNER
EXPANDED END, WITH BUILT-IN MIXING FLIGHTS
VOLATILE RECLAIM SYSTEM (VAPOR RELIEF OUTLET TO INCINERATION)
AGG. INLET
ULTRAFLAME
(OPTIONAL) DRY AGGREGATE DISCHARGE TO HOT ELEVATOR
HOT ELEVATOR TO TOWER
AC INLET
FINES RETURN
DRUM MIX DISCHARGE
SLAT CONVEYOR TO SILOS

Combustion products, moisture, and particulate fines from the process are pulled from the elevator, through and including the dryer drum. Asphalt fumes will undergo combustion in the first drum. All gases and fines from the operation will travel to a baghouse under negative pressure from an induced draft fan located at the outlet of the baghouse. The fan forces the air up a 16 foot stack to discharge to the atmosphere. Test ports are installed in the upper portion of the stack.

The entire facility uses the latest state-of-the-art technology available in controlling all process feeds, temperatures, blending, weighing, data recording, etc. The facility is automated to the extent that production runs are manufactured consistently and to specification.

IV. DESCRIPTION OF THE SOURCE

The asphalt plant exhaust gases are controlled by a baghouse prior to exiting through a rectangular stack. The gases discharge to atmosphere through a 16 foot stack. Stack dimensions inside the wall are 54 inch diameter, as measured at the test ports.

The test ports (two equally spaced 90° apart) are located 29.0 inches (0.5 diameter) from the stack exit, and 162.0 inches (3.0 diameters) from the last disturbance (Louvered damper). The damper is adjustable automatically in order to maintain proper air flow under any condition.

V. PLANT OPERATING CONDITIONS

The asphalt production process was operated in a normal operating manner. The average production rate during the test was approximately 273 tons/hour of finished asphalt product. Raw materials were consistent with normal materials used at this facility. The majority of the aggregate was obtained from the quarry and stored in uncovered piles. Moisture content of the aggregates was very high. Fuel used during the entire test duration was natural gas.

The plant operation data for the period October 12, 1993, is presented in Appendix K. This data has been recorded approximately every 15 minutes during each run. The data includes time, process input weight for both aggregate and total asphalt, and temperatures. The pressure

drop across the baghouse averaged approximately 2.6 inches of water. A summary of the production rates and baghouse pressure drops are presented in Table II.

No asphalt mix was recycled during the tests.

VI. TEST CONDITIONS

The Method 5 test samples were drawn from twelve points on each of two traverses of the stack. The traverse point locations were specified by USEPA Method 1. Samples were collected isokinetically for a total of 72 minutes for each of two runs (3.0 minutes/point).

The only problem encountered during testing was that the plant was unable to achieve 400 tph production and operate at a continuous high level of production for three runs, no other problems of either the asphalt plant operations or the sampling were encountered during the tests. The asphalt plant was charged with typical aggregate mix, asphalt and fuel in a steady state manner.

A cyclonic flow test and preliminary velocity traverse was performed prior to the first Method 5 test. Stack flow conditions were acceptable for testing. No sampling point was found to have a flow angle exceeding 5°. The average angle of rotation of the stack gases for the 24 points in the vertical plane was less than 5°. (Averages up to 20° are acceptable according to the USEPA procedures.)

VII. TEST EQUIPMENT AND METHODS

The test procedures and equipment used to determine the particulate and visible concentrations in the stack gases of the asphalt plant are described in Appendix E of this report. In brief, a Research Appliance Corporation stack sampling train was used to determine the particulate emissions according to USEPA Reference Method 5, and a certified visual emissions observer was used to determine the visible emissions according to USEPA Reference Method 9.

TABLE II

Summary of
Asphalt Plant Daily Operations Reports
Richardson & Bass Construction Co.

Date	Run Number	Asphalt (TPH)	Baghouse Diff. Press. ("H_2O)
10/12/93	1	309.0	3.0
10/12/93	2	237.6	2.3
Averages During Tests		273.2	2.6

APPENDIX - A

PARTICULATE TEST ANALYSIS

Particulate Test Analysis

RICHARDSON & BASS
MAIN STACK
DRYER / MIXER

Run Number		1	2
Data Set		1	2
Date		10-12-93	10-12-93
Location		STACK	STACK
Start Time		10:05	14:35
End Time		12:11	15:50
Barometric Pressure	In. Hg	29.82	29.78
Static Pressure	In H2O	-0.25	-0.25
Volume of Condensate	ML	510.3	417.6
Volume Sampled	DCF	44.195	37.107
Pitot Tube Coeffecient		0.84	0.84
Meter Correction Factor		0.99	0.99
Square Root of Delta P		0.789	0.689
Orifice Pressure	In H2O	1.25	0.83
Meter Temperature	Deg. F	84.0	96.3
Flue Temperature	Deg. F	210	193
Percent CO2	%	8.0	8.2
Percent O2	%	9.8	9.8
Diameter of Nozzle	In.	0.251	0.251
Diameter of Stack	In.	54	54
Area of Flue	Sq Ft	15.90	15.90
Sample Time	Min	72	72
Weight Gain	Grams	0.1035	0.0733
Absolute Flue Pressure	In. Hg	29.80	29.76
Corrected Sample Volume	DSCF	42.41	34.74
Moisture in Flue Gas	%	36.2	36.1
Molecular Weight	Lb/LbMole	25.45	25.47
Velocity of Flue Gas	Fps	53.26	45.96
Volume of Flue Gas	ACFM	50,823	43,856
Volume of Flue Gas	DSCFM	25,473	22,517
Dust Concentration	Lb/DSCF	5.38E-06	4.65E-06
Dust Concentration	Lbs/Hour	8.22	6.29
Dust Concentration	Grs/ACF	1.89E-02	1.67E-02
Dust Concentration	Grs/DSCF	3.77E-02	3.26E-02
Isokinetic Rate	%	107.1	99.2

Averages:				
Stack Temperature	DEGR F :	202		
Flue Gas Volume	ACFM :	47340	DSCFM :	23995
Dust Concentration	Lb/DSCF:	3.34E-06	Lb/Hour:	7.255
	Grs/ACF:	3.51E-02	Grs/DSCF :	3.51E-02

APPENDIX - B

PARTICULATE FIELD DATA SHEETS

Particulate Field Data Sheet

Client: RICHARDSON & BASS CONST.										Date: 10/12/93		Page 1 Of 1	
Project No.: 3123			Operator: TOM SCHEPPERS							Orsat Analysis			
Sampling Location: MAIN STACK						Run No.: 1				CO_2	$+O_2$	O_2	CO
Filter No.: 01		Acetone No.: M3		Condensate: 510.3						8.0	17.8	9.8	0
Barometric Pressure: 29.82			Static Pressure: -.25		Probe Number: P5					8.0	17.8	9.8	0
Nozzle Diameter: .251		Nozzle Number: .2500		Pitot Coefficient: .84		Pitot Number: P5				8.0	17.8	9.8	0
Meter Corr. Factor: .996				Meter-Orifice: .176						8.0	17.8	9.8	0
Sample Pt. Time: 3mn/pt 24pts 72min			Assumed % Moisture: 30%				Leak Test: Before 0.000 @ 17"Hg			After 0.002 @ 5"Hg			

Sample Point	ΔP	$\sqrt{\Delta P}$	ΔH	Temperature °F: Stack	Probe	Imp. Out	Oven	Meter In	Meter Out	Vac. Pr (in. HG)	Dry Gas Meter Reading in Cu. Ft.
EAST	10:05										914.083
1	.40		0.79	159		40	235	58	58	0	915.580
2	.37		0.72	172		40	250	66	60	6	917.092
3	.41		0.80	174		40	235	69	60	0	918.526
4	.45		0.84	209		40	230	74	62	2	919.934
5	.40		0.74	215		41	240	76	62	2	921.437
6	.45		0.84	211		41	235	80	63	2	923.014
7	.59		1.10	214		42	235	84	65	2	924.681
8	.76		1.44	211		42	250	89	66	3	926.617
9	.83		1.57	214		42	250	93	68	4	928.737
10	.96		1.79	215		46	245	74	74	4	930.969
11	1.1		2.01	234		45	260	82	75	4	933.364
12	1.1		2.07	222		44	250	92	76	4	935.718
WEST	11:33										
1	1.1		2.09	218		50	245	91	79	4	938.122
2	.92		1.76	218		48	250	101	80	4	940.433
3	.87		1.68	216		48	250	106	82	4	942.700
4	.95		1.85	214		48	245	109	83	4	945.039
5	.86		1.67	218		48	245	110	84	4	947.281
6	.86		1.68	215		50	250	112	86	4	949.400
7	.72		1.40	218		50	245	111	88	4	951.541
8	.38		0.74	215		50	250	111	88	2	953.072
9	.27		0.53	215		50	245	108	89	2	954.342
10	.27		0.53	215		50	250	107	90	2	955.533
11	.33		0.64	215		50	250	106	90	2	956.850
12	.37		0.73	210		50	245	105	91	2	958.278
	12:11										

Pitot Tube Leak Check: Before OK After OK

Integrated Bag Leak Check: Before OK After OK

Plant Process Data Is Recorded On CST

Particulate Field Data Sheet

Client: RICHARDSON & BASS CONST.				Date: 10/12/93	Page 1 Of 1
Project No.: 3123	Operator: TOM SCHEPPERS			Orsat Analysis	
Sampling Location: MAIN STACK			Run No.: 2	CO_2	$+O_2$ / O_2 / CO
Filter No.: 02	Acetone No.: M3	Condensate: 417.6		8.2	18.0 / 9.8 / 6
Barometric Pressure: 29.78	Static Pressure: -.25	Probe Number: P5		8.2	18.0 / 9.8 / 0
Nozzle Diameter: .251	Nozzle Number: .250D	Pitot Coefficient: 84	Pitot Number: P5	8.2	18.0 / 9.8 / 0
Meter Corr. Factor: .996		Meter-Orifice: 1.76		8.2	18.0 / 9.8 / 0
Sample Pt. Time	Assumed % Moisture: 37		Leak Test	Before: 0.000 @ 15" H_g	After: 0.002 @ 6" H_g

	Sample Point	ΔP	$\sqrt{\Delta P}$	ΔH	Temperature °F: Stack	Probe	Imp. Out	Oven	Meter In	Meter Out	Vac. Pr (in. HG)	Dry Gas Meter Reading in Cu. Ft.
	West	14:35										958.500
3	1	.62		1.02	182		48	245	78	79	2	960.331
6	2	.79		1.31	184		48	250	80	80	2	962.249
9	3	.82		1.36	186		47	250	85	80	2	964.321
12	4	.84		1.40	187		46	255	92	81	2	966.162
15	5	.80		1.33	191		48	245	94	82	2	968.100
18	6	.63		1.05	192		48	245	97	82	2	969.942
21	7	.30		0.50	190		50	250	100	84	1	971.251
24	8	.27		0.45	191		50	250	98	85	1	972.373
27	9	.27		0.45	192		50	245	98	86	1	973.516
30	10	.26		0.43	194		51	245	100	88	1	974.620
33	11	.25		0.42	190		51	250	101	90	1	975.722
36	12	.23		0.39	190		51	250	101	91	1	976.789
	East											
	1	.65		1.10	185		58	250	100	91	5	979.031
	2	.56		0.95	193		53	245	109	93	3	980.602
	3	.53		0.89	200		50	250	111	94	2	982.232
	4	.48		0.81	200		50	245	112	96	2	983.782
	5	.43		0.72	201		50	250	111	97	2	985.251
	6	.28		0.47	200		50	245	111	98	1	986.500
	7	.50		0.84	200		50	245	110	99	2	988.041
	8	.63		1.06	199		51	250	110	99	2	989.762
	9	.44		0.74	200		52	250	113	100	2	991.275
	10	.44		0.74	199		52	250	112	100	2	992.748
	11	.42		0.71	197		53	250	111	101	2	994.173
	12	.42		0.71	196		53	250	111	101	2	995.607
		15:50										

Pitot Tube Leak Check: Before OK After OK

Integrated Bag Leak Check: Before OK After OK

CYCLONIC FLOW Field Data Sheet

Client: RICHARDSON & BASS CONST.				Date: 10/12/93	Page 1 Of)
Project No.: 3123	Operator:			Orsat Analysis	
Sampling Location: MAIN STACK			Run No.: PRELIMINARY	CO_2	$+O_2$ O_2 CO
Filter No.	Acetone No.	Condensate			
Barometric Pressure	Static Pressure	Probe Number			
Nozzle Diameter	Nozzle Number	Pitot Coefficient	Pitot Number		
Meter Corr. Factor	Meter-Orifice				
Sample Pt. Time	Assumed % Moisture	Leak Test	Before	After	

Sample Point	FLOW ANGLE θ	$\sqrt{\Delta P}$	ΔH	Temperature °F: Stack	Probe	Imp. Out	Oven	Meter In	Meter Out	Vac. Pr (in. HG)	Dry Gas Meter Reading in Cu. Ft.
West											
1	10										
2	10										
3	10										
4	10										
5	10										
6	10										
7	0										
8	5										
9	10										
10	15										
11	15										
12	15										
East											
1	15										
2	10										
3	10										
4	10										
5	10										
6	5										
7	5										
8	5										
9	10										
10	10										
11	15										
12	25										

Pitot Tube Leak Check: Before _____ After _____

Integrated Bag Leak Check: Before _____ After _____

Particulate Test
Method 5
Impinger Volumes

Run 1 Date 10/12/93 Facility R & B

Impinger		Final		Initial		Reagent	Liquid Gain
1	MGS	424.0	ml	100	ml	H_2O	324.0
2	GS	276.0	ml	100	ml	H_2O	176.0
3	MGS	0	ml	0	ml	Empty	0
4	MGS	1015.4	g	1005.1	g	Silica Gel	10.3
						Total:	510.3

GS - Greenburg Smith

MGS - Modified Greenburg Smith

Particulate Test
Method 5
Impinger Volumes

Run 2 Date 10/12/93 Facility R & B

Impinger		Final		Initial		Reagent	Liquid Gain
1	MGS	398.0	ml	100	ml	H_2O	298.0
2	GS	212.0	ml	100	ml	H_2O	112.0
3	MGS	0	ml	0	ml	Empty	0
4	MGS	1030.9	g	1023.3	g	Silica Gel	7.6
						Total:	417.6

GS - Greenburg Smith

MGS - Modified Greenburg Smith

APPENDIX - C

ANALYTICAL LABORATORY REPORTS

(Particulate)

Analytical Data Sheet

Client R & B Project No. 3123 Date 10/14/93

Run No. 1
Filter No. 01
Acetone No. M3
Amount liquid lost during transport 0
Acetone blank volume, ml 250
Acetone wash volume, ml 85
Acetone blank concentration, mg/mg (equation 5-4)** 1.5×10^{-6}
Acetone wash blank, mg (equation 5-5)** .0001

Container Number	Weight of Particulate Collected, g		
	Final Weight	Tare Weight	Weight Gain
1	.7128	.6896	.0232
2	95.1806	95.1002	.0804
3			
Less acetone blank			.0001
Weight of particulate matter			.1035

	Volume of Liquid Water Collected	
	Impinger Volume, ml.	Silica Gel Weight, g
Final	700.0	1015.4
Initial	200.0	1005.1
Liquid collected	500.0	10.3
Total Volume Collected	510.3	g* | ml

Run No. 2
Filter No. 02
Acetone No. M3
Amount liquid lost during transport 0
Acetone blank volume, ml 250
Acetone wash volume, ml 90
Acetone blank concentration, mg/mg (equation 5-4)** 1.5×10^{-6}
Acetone wash blank, mg (equation 5-5)** .0001

Container Number	Weight of Particulate Collected, g		
	Final Weight	Tare Weight	Weight Gain
1	.6957	.6920	.0037
2	95.9228	95.8531	.0697
3			
Less acetone blank			.0001
Weight of particulate matter			.0733

	Volume of Liquid Water Collected	
	Impinger Volume, ml.	Silica Gel Weight, g
Final	610.0	1030.9
Initial	200.0	1023.3
Liquid collected	410.0	7.6
Total Volume Collected	417.6	g* | ml

Run No. _____
Filter No. _____
Acetone No. _____
Amount liquid lost during transport _____
Acetone blank volume, ml _____
Acetone wash volume, ml _____
Acetone blank concentration, mg/mg (equation 5-4)** _____
Acetone wash blank, mg (equation 5-5)** _____

Container Number	Weight of Particulate Collected, g		
	Final Weight	Tare Weight	Weight Gain
1			
2			
3			
Less acetone blank			
Weight of particulate matter			

	Volume of Liquid Water Collected	
	Impinger Volume, ml.	Silica Gel Weight, g
Final		
Initial		
Liquid collected		
Total Volume Collected		g* | ml

Run No. _____
Filter No. _____
Acetone No. _____
Amount liquid lost during transport _____
Acetone blank volume, ml _____
Acetone wash volume, ml _____
Acetone blank concentration, mg/mg (equation 5-4)** _____
Acetone wash blank, mg (equation 5-5)** _____

Container Number	Weight of Particulate Collected, g		
	Final Weight	Tare Weight	Weight Gain
1			
2			
3			
Less acetone blank			
Weight of particulate matter			

	Volume of Liquid Water Collected	
	Impinger Volume, ml.	Silica Gel Weight, g
Final		
Initial		
Liquid collected		
Total Volume Collected		g* | ml

*Convert weight of water to volume by dividing total weight increase by density of water (1g/ml): $\frac{\text{Increase, g}}{1\text{g/ml}}$ = Volume Water, ml

**See Federal Register, Method 5, 6.6, & 6.7.

APPENDIX - D

TEST EQUIPMENT CALIBRATIONS

EXPANDED RANGE DIGITAL THERMOMETER INSTRUCTIONS

Specifications

Digital Display: 4 LCD digits

Sampling Time: Less than 1 second

Resolution: 1 Degree

Fahrenheit Model

Accuracy Chart:

Temp. Range	Accuracy (+/-)
32 to 932 °F	0.75% + 2 °F
933 to 1382 °F	1% + 2 °F
1383 to 1832 °F	2% + 2 °F (typical)
1833 to 2000 °F	4% + 2 °F (typical)
31 to -4 °F	4 °F (typical)
-5 to -50 °F	6 °F (typical)

Celsius Model

Accuracy Chart:

Temp. Range	Accuracy (+/-)
0 to 500 °C	0.75% + 1 °C
501 to 750 °C	1% + 1 °C
751 to 1000 °C	2% + 1 °C (typical)
1001 to 1200 °C	4% + 3 °C (typical)
0 to -20 °C	2 °C (typical)
-21 to -40 °C	3 °C (typical)
-41 to -50 °C	4 °C (typical)

Case: ABS plastic

Failsafe: Low battery indicator

Power: 9 Volt alkaline battery

Probe Supplied: Ultra-fast response, naked bead type K thermocouple with operating temperature range to 482 °F or 250 °C, and short term usage to 572 °F or 300 °C, Cat. No. 4028.

Denver Instrument Company

Certificate of Calibration

Model A-250 Date 12-13-91

Serial Number B033665

We hereby certify that the referenced instrument was manufactured in the United States and that it has been calibrated to full capacity using NBS Class S-1 weights. This instrument has been fully inspected and has passed all quality tests as specified by Denver Instrument Company quality control guidelines.

To assure proper operation, it may be necessary to recalibrate the instrument periodically using known weights.

Quality Technician

Quality Control Manager

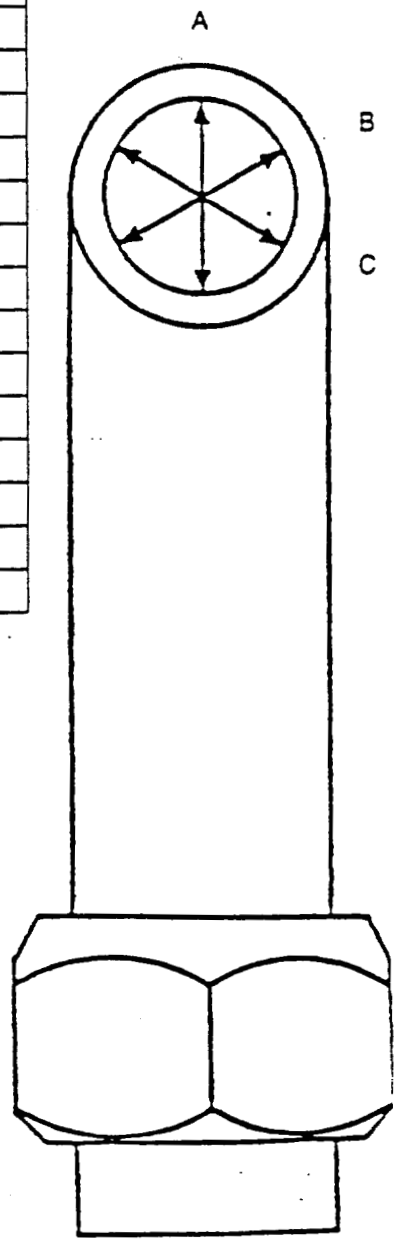
Denver Instrument Company
6542 Fig Street • Arvada, Colorado 80004 • 1-800-321-1135

Nozzie Calibration

Sized By TOM SCHEPPERS

Date	Nozzle	Dimension A	Dimension B	Dimension C	Difference	Avg. Diameter
05/28/92	B375	.377	.378	.376	.002	.377
05/28/92	G350	.353	.353	.353	.000	.353
05/28/92	A125	.124	.124	.125	.001	.124
12/17/92	G275	.272	.272	.272	.000	.272
02/02/93	A250	.251	.250	.250	.001	.250
10/11/93	D.250	.252	.251	.251	.001	.251

All Dimensions are in inches.



Pitot Calibration Form

Client _____

Project No. _____

Test Location _____

Run By TOM SCHEPPENS

Date 5/13/91

Pitot No. SA

	• "A" Side Calibration			
Run No.	Δ P std cm H_2O (in. H_2O)	Δ P (s) cm H_2O (in. H_2O)	$C_p(s)$	Deviation $C_p(s) - \bar{C}_p(A)$
1	1.0	1.41	.84	0
2	1.0	1.41	.84	0
3	1.0	1.41	.84	0
	Average	$\bar{C}_p$ (Side A)	.84	0

	•• "B" Side Calibration			
Run No.	Δ P std cm H_2O (in. H_2O)	Δ P (s) cm H_2O (in. H_2O)	$C_p(s)$	Deviation $C_p(s) - \bar{C}_p(B)$
1	1.0	1.41	.84	0
2	1.0	1.41	.84	0
3	1.0	1.41	.84	0
	Average	$\bar{C}_p$ (Side B)	.84	0

Calculations:

$$C_p(s) = 0.99 \sqrt{\frac{\Delta P \text{ (standard)}}{\Delta P \text{ (s)}}}$$

$$\text{Deviation} = C_{p(s)} = \bar{C}_p(\text{A or B})$$

$$\text{Average Deviation} = \sigma(\text{A or B}) = \frac{\sum_{1}^{3} |C_p(s) - \bar{C}_p(\text{A or B})|}{3}$$

$|\bar{C}_p(\text{Side A}) - \bar{C}_p(\text{Side B})| =$ 0

Nozzle size used for Calibrations (inches) .500

Intercomponent Spacings During Calibrations:

Pitot - Nozzle: > 3/4"

* Pitot - Thermocouple: ≈2" back

Pitot - Probe Sheath: > 3"

* or two inches from end of thermocouple to center line of pitot tube.

Thermocouple Calibrations

(Oven, Probe)

Client AEROMET 2-9-93

Project No. -

Thermocouple Identification	Trendicator	Thermometer	Thermometer Number	Date	
THT-4-780	67	67.4	NIST-C	2-9-93	DIGITAL THERMOM.
THT-4-780	157	157.3	NIST-C	2-9-93	
THT-4-780	212	211.0	NIST-C	2-9-93	
THT-4-740	67	67.4	NIST-C	2-9-93	
THT-4-740	157	157.3	NIST-C	2-9-93	
THT-4-740	211	211.0	NIST-C	2-9-93	
G8A	67	67.4	NIST-C	2-9-93	PROBES
G8A	211	211.4	NIST-C	2-9-93	
G8B	67	67.4	NIST-C	2-9-93	
G8B	211	211.2	NIST-C	2-9-93	
L-1 OVEN	250	248	THT-4-780	2-9-93	L-1 METER BOX
L-1 DGM IN	67	67.4	NIST-C	2-9-93	
L-1 DGM OUT	68	67.4	NIST-C	2-9-93	
L-1 IMP OUT	67	67.4	NIST-C	2-9-93	
D-1 OVEN	255	253	THT-4-780	2-9-93	D1 METER BOX
D-1 DGM IN	67	67.4	NIST-C	2-9-93	
D-1 DGM OUT	67	67.4	NIST-C	2-9-93	
D-1 IMP OUT	67	67.4	NIST-C	2-9-93	

AEROMET ENGINEERING

ANEROID BAROMETER CALIBRATION

Instrument Number BM-60

Calibrated By Tom Scheppers

Date 5/11/92-

Date	Aneroid Barometer Reading ("Hg)	Mercury Barometer Reading ("Hg)	Deviation ("Hg)
5/11/92	29.48	29.48	0.00
7/14/92	29.45	29.45	0.00
9/14/92	30.07	30.07	0.00
2/1/93	30.12	30.12	0.00
6/19/93	29.82	29.83	0.01

Dry Gas Meter Calibration Sheet

Client AEROMET
Project No. -
Module L-1
Orifice 176

Run By TS
Date 6/19/93
Barometric Press 29.83

ΔH in. H_2O	Vw initial	Vw final	Vw $ft.^3$	Vd initial	Vd final	Vd $ft.^3$	tw °F	tdi °F	tdo °F	Pw in. H_2O	Time θ min.
.5	54.977	59.973	4.996	509.556	514.796	5.240	80	104/109	94/98	0	13
1.0	59.973	65.665	5.692	514.796	520.783	5.987	80	109/118	98/100	0	10
2.0	65.665	71.508	5.843	520.783	526.928	6.145	80	120/118	100/103	0	7.5
4.0	71.508	76.796	5.288	526.928	532.486	5.558	80	125/118	104/103	0	5
6.0	76.796	82.197	5.401	532.486	538.162	5.676	80	125/127	104/105	0	4

ΔH	$\frac{\Delta H}{13.6}$	Mc (Y) $\frac{Vw\ Pb\ (td + 460)}{Vd\ (Pb + \Delta H/13.6)\ (tw + 460)}$	ΔHa (For Small Orifice Only) $\frac{0.0317\ \Delta H}{Pb\ (td + 460)} \cdot \left[\frac{(tw + 460)\ \theta}{Vw}\right]^2$
.5	.0368	.989	1.870
1.0	.0737	.994	1.690
2.0	.147	.999	1.791
4.0	.294	.999	1.936
6.0	.441	.999	1.774
Average		.996	1.812

- ΔH = Orifice Setting
- Vw = Volume of Gas of Wet Test Meter
- Vd = Volume of Gas of Dry Gas Meter
- Pw = Pressure of Wet Test Meter
- tw = Temperature of Fluid in Wet Test Meter
- tdi = Inlet Temperature of Dry Gas Meter
- tdo = Outlet Temperature of Dry Gas Meter
- td = Average Temperature of Dry Gas Meter
- θ = Time required to pull specified cubic feet
- Mc = Dry Gas Meter Correction Factor
- ΔHa = Orifice setting that would pull .75 cfm of air at standard conditions

APPENDIX - E

TEST EQUIPMENT DESCRIPTION

(Particulate)

TESTING EQUIPMENT - EPA METHOD 5 SAMPLING TRAIN

A RAC Corporation Stack Sampler was used at the sampling location(s). The particulate sampling train consisted basically of a glass or stainless steel probe; a variable-heat-controlled filter oven with a calibrated thermometer located at the impinger outlet; a 1/2-hp shaft sealed carbon vane vacuum pump assembly with a vacuum gauge; a control unit with an elapse time indicator, a temperature indicator (potentiometer), temperature controllers, gauges, a calibrated dry gas meter, and an umbilical and various interconnecting hoses, fitting and valves. An appropriately sized glass or stainless-steel nozzle, a calibrated Type K temperature sensor, a static pressure tube, a calibrated S type pitot tube and a variable-heat-controlled stainless-steel liner are integral parts of the probe assembly.

The vacuum pump was used to control gas sampling rates. The control unit was used to control probe and oven temperatures. The control unit was also used to monitor elapsed sampling times, temperatures, velocities, static pressure, gas sampling rates and sampled gas volume.

Analyzer (Orsat)

Flue gas concentrations were determined with a Gas Analyzer (Orsat) which measures the percentage of carbon dioxide, percentage of oxygen and percentage of carbon monoxide to the nearest tenth of a percent.

Programmable Calculator

A Hewlett Packard, Model HP41CX, programmable calculator was used to determine the isokinetic sampling rate at each sampling point.

Prior to the field testing, the following procedures were performed: All instruments were checked and calibrated. Gelman Spectro Grade, glass-fiber-mat filters with 99.95 percent retention of 0.3-micron particles were individually numbered, placed in similarly numbered glass petri dishes, desiccated for 24 hours and weighed on a Denver Instruments analytical balance to the nearest 0.1-milligram, and weighed a minimum of every six hours until two consecutive weights within +0.5 milligram were obtained, or heated for two to three hours at 220 degrees F, cooled in a desiccator and weighed. Several 250 milliliter crucibles were desiccated for a minimum of 24 hours and weighed in the same manner as the filters and petri dishes. Also, several 200-gram quantities of Type 6-16 mesh indicating silica gel were weighed on an beam balance and placed into separate airtight storage containers.

The number of sampling points and positions of the points in the flue at the sampling location(s), and the sampling time at each point were determined prior to the particulate testing. The sampling procedures were performed in accordance with the Environmental Protection Agency's Reference Method 5, "Determination of Particulate Emissions from Stationary Sources" in the July 1, 1989 Federal Register, "Standards of Performance for New Stationary Sources" and subsequent revisions.

Before each test run a particulate sampling train was prepared in part at the sampling location(s) in the following manner: An appropriately sized sampling nozzle was installed onto the inlet of the sampling probe and capped. The probe was then dimensioned and marked at increments that corresponded with the predetermined sampling positions in the flue. A standard impinger assembly was prepared by adding 100 milliliters of distilled water to each of the first two impingers. The third impinger was left dry and the fourth was filled with approximately 200 grams of type 6-16 mesh indicating silica gel. The entire impinger assembly was then placed in an ice bath. A disc filter was removed from its petri dish and placed inside of a filter holder. The filter holder was then placed inside of a filter oven and assembled to the sampling probe outlet and the impinger unit inlet. Next, an umbilical and sampling hoses were connected to the sampling probe, filter oven, impinger unit, a vacuum pump and the control unit, accordingly. The probe and oven were then heated to and held at 248 degrees plus or minus 25 degrees.

As soon as the probe and oven temperatures had stabilized the entire sampling train assembly was leak-checked at a minimum of 15 inches of mercury vacuum for one minute and the leakage rate recorded. A leakage rate of less than .02 cfm and no vacuum loss was considered acceptable.

After the particulate sampling train had been assembled, the probe and oven heated, and the entire system leak-checked, as previously described, the particulate sampling was performed.

Three test runs were performed at the sampling location(s). The sampling data for each test run was recorded on a field test form during each of the sampling periods.

After the completion of a test run, the following procedures were performed: A final leak-check was performed at maximum vacuum or greater incurred during the test for one minute and the leakage rate recorded. The flue gas moisture collected in the first three impingers was measured and recorded. The moisture laden silica gel in the fourth impinger was weighed on site. The weight gain of the silica gel

moisture collection was added to the measured moisture condensed for that test run. The sample nozzle, probe and filter holder were capped and taken to a clean area for sample recovery. At the recovery area, the disc filter was carefully removed from the filter holder and transferred to its petri dish for later weighing.

The sampling nozzle, probe and filter holder were washed with nanograde acetone, glass components were washed three times, stainless steel components were washed six times and visually inspected for cleanliness. The acetone washing and acetone blank were collected and labeled polypropylene sample bottles and retained for later evaporation, desiccation and weighing.

Flue gas concentrations (percentage of CO_2, percentage of O_2, and percentage of CO) were determined by taking several Orsat samples of the gas collected, simultaneously with the particulate sampling, throughout the test run, by an integrated gas sampling train. The integrated gas sample was collected from the discharge of the particulate control unit. The sampling train was set at a predetermined constant flow rate to obtain an adequate sample or by taking direct readings from the sampling points. The concentrations for each test run were recorded on a field test form.

APPENDIX - F

USEPA REFERENCE METHOD 5

APPENDIX - 6

VISIBLE FIELD DATA SHEETS

Visible Emission Observation Form

SOURCE NAME: RICHARDSON & BASS CONST.	OBSERVATION DATE: 10/12/93
ADDRESS: STADIUM - ½ mi. North of I-70	START TIME: 10:05 A.M.
CITY: Columbia / STATE: MO / ZIP: 65203	STOP TIME: 12:02 P.M.
PHONE: 442-0146	SOURCE ID NUMBER: PERMIT 0593-011
PROCESS EQUIPMENT: MIXER/DRYER	OPERATING MODE: NORMAL
CONTROL EQUIPMENT: BAGHOUSE	OPERATING MODE: NORMAL
DESCRIBE EMISSION POINT START: Main Stack STOP	
HEIGHT ABOVE GROUND LEVEL: 40'	HEIGHT RELATIVE TO OBSERVER: ~~100~~ 35'
DISTANCE FROM OBSERVER: 150'	DIRECTION FROM OBSERVER: WNW
DESCRIBE EMISSIONS START: No VE STOP	
EMISSION COLOR START: Clr STOP	PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: NO ☐ YES ☒	IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☒
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START: ½ D at Stack STOP	
DESCRIBE BACKGROUND START: Mostly Clear Sky STOP	
BACKGROUND COLOR START: Blue/White STOP	SKY CONDITIONS START: Clear STOP Pt cloudy
WIND SPEED START: 15 mph STOP	WIND DIRECTION START: South STOP
AMBIENT TEMP. START: 58° STOP	WET BULB TEMP.: / RH, percent: 83%

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

AVERAGE OPACITY FOR HIGHEST PERIOD: 0 — NUMBER OF READINGS ABOVE: 0 % WERE 0

RANGE OF OPACITY READINGS: 0 MINIMUM — 0 MAXIMUM

OBSERVER'S NAME (PRINT): Darryl Meister

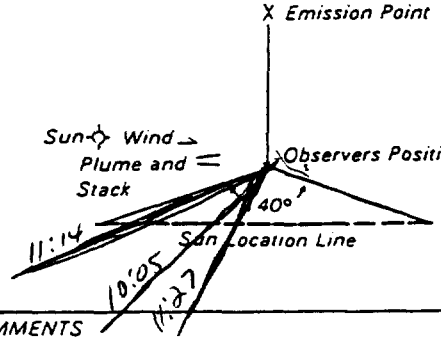
OBSERVER'S SIGNATURE: Darryl Meister — DATE: 10/12/93

ORGANIZATION: AeroMet Eng.

CERTIFIED BY: KCHA — DATE: 10/93

VERIFIED BY: Mo DNR — DATE: 10/93

Source Layout Sketch — *Draw North Arrow*



COMMENTS:

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE:

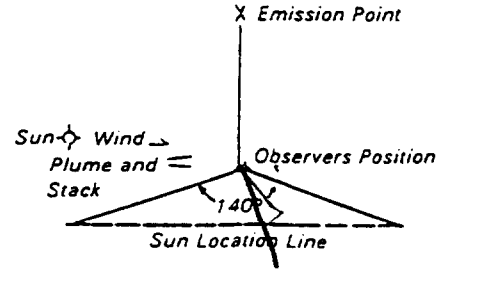
TITLE: N/A — DATE:

Visible Emission Observation Form

SOURCE NAME: RICHARDSON & BASS CONST.	OBSERVATION DATE: 10/12/93
ADDRESS: STADIUM – ½ mi North of I-70	START TIME: 2:32 pm
CITY: Columbia / STATE: MO / ZIP: 65203	STOP TIME: 3:37 p.m.
PHONE: 442-0146	SOURCE ID NUMBER: PERMIT 0593-011
PROCESS EQUIPMENT: MIXER/DRYER	OPERATING MODE: NORMAL
CONTROL EQUIPMENT: BAGHOUSE	OPERATING MODE: NORMAL
DESCRIBE EMISSION POINT: START Main Stack STOP	
HEIGHT ABOVE GROUND LEVEL: 40'	HEIGHT RELATIVE TO OBSERVER: 35'
DISTANCE FROM OBSERVER: 120'	DIRECTION FROM OBSERVER: NW
DESCRIBE EMISSIONS: START NONE STOP	
EMISSION COLOR: START CL STOP	PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: NO ☐ YES ☒	IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☒
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START ½ D at Stack STOP	
DESCRIBE BACKGROUND: Some clouds / Blue Sky START [redacted] STOP	
BACKGROUND COLOR: START Blue STOP	SKY CONDITIONS: START Partly cloudy STOP
WIND SPEED: START 15 mph STOP	WIND DIRECTION: START South STOP
AMBIENT TEMP. START 62 STOP	WET BULB TEMP. / RH.percent: 58

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0 – 3:07
6	0	0	0	0	3:32	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

Source Layout Sketch — *Draw North Arrow*



AVERAGE OPACITY FOR HIGHEST PERIOD: 0	NUMBER OF READINGS ABOVE: 0 % WERE 0
RANGE OF OPACITY READINGS: MINIMUM 0	MAXIMUM 0
OBSERVER'S NAME (PRINT): Darryl Meister	
COMMENTS	OBSERVER'S SIGNATURE: Darryl Meister — DATE: 10/12/93
	ORGANIZATION: AeroMet Eng.
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	CERTIFIED BY: KCLA — DATE: 10/93
TITLE: N/A — DATE	VERIFIED BY: Mo DNR — DATE: 10/93

APPENDIX - H

VISIBLE EMISSIONS CERTIFICATION

Health Department
Air Quality Section

City of Kansas City, Missouri
Heart of America

21st Floor, City Hall
Kansas City, Missouri 64106

816-274-2501

October 15, 1993

Mr. Tom Scheppers
Manager
AeroMet Engineering
1325 AeroTech Drive
Jefferson City, MO 65109

Re: Certification of Visible Emission Training

Dear Mr. Scheppers:

This letter is to confirm your employees sucessful participation in the Kansas City Missouri Health Department's Visible Emission Observer Training, held October 6-7, 1993 at the U.S. EPA Region VII Laboratory, and the Platte County Treatment Plant, 6615 Northwest Eastside Drive.

The following list of persons from your organization successfully completed training:

Tom Scheppers
Darryl Meister
Karen Scheppers

Congratulations! The above list of employees are fully qualified as visible emission observers, capable of observing and quantifying visible emissions according to guidelines accepted by the Air Quality Section, the Missouri Air Pollution Control Program, and the U.S. Environmental Protection Agency.

This qualification will remain valid until April 1994. The next Visible Emission Observer Training session is scheduled for April 1994, on days to be announced later. If you have any questions, please call me at 474-0858.

Sincerely,

Gina Kim

Gina Kim
Laboratory Supervisor
Air Quality Section

APPENDIX - I

USEPA REFERENCE METHOD 9

APPENDIX - J

40 CFR PART 60 SUBPART I

(Standards of Performance for Hot Mix Asphalt Facilities)

APPENDIX - K

ASPHALT PRODUCTION RECORDS

(October 12, 1993)

RICHARDSON & BASS CONSTRUCTION Co.
5320 HWY. 763N
COLUMBIA, MO 65202

STACK TEST OPERATING DATA

AC% 0.00

AC TOTAL% (actual) 0.00 %

AC TOTAL% (required) 5.40 %

==========

RECORDATION

10:41:37 10/12/93 P.D. 3.6

F B MIX40 225TPH 282F 205TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
PH RATE	210	0	12.3	0	79	78	0	62	1.9	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	99.4	0.0	5.40	0.0	35.8	35.2	0.0	28.4	0.8	
AT TOTAL	209.2	0.0	10.86	0.0	77.0	76.2	0.0	60.0	1.4	0.0

AC STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 297 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

C% 5.49

AC TOTAL% (actual) 5.49 %

C TOTAL% (required) 5.40 %

PD 2.1

B MIX40 226TPH 318F 233TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
ISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
H RATE	211	0	12.3	0	79	77	0	61	0.0	0
REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	99.6	0.0	5.40	0.0	36.0	35.3	0.0	28.1	0.0	
AT TOTAL	236.0	0.0	12.39	0.0	86.8	85.9	0.0	67.7	1.6	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 298 FAHRENHEIT

YCLE AC CONTENT (%):

METERED

5.45

TOTAL% (actual) 5.45 %

TOTAL% (required) 5.40 %

CORDATION 10:04 CDT

11:04:07 10/12/93 PD. 2.6

B MIX40 261TPH 326F 293TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
) STURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
'H RATE	246	0	14.2	0	91	90	0	71	1.3	0
EQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	99.6	0.0	5.40	0.0	35.8	35.5	0.0	28.1	0.5	
;. TOTAL	294.9	0.0	15.63	0.0	108.7	107.6	0.0	84.8	2.1	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 299 FAHRENHEIT

ECYCLE AC CONTENT (%):

METERED

5.44

TOTAL% (actual) 5.44 %

TOTAL% (required) 5.40 %

ORDATION 10:19 11:19:09 10/12/93 PD 3.1

B MIX40 268TPH 321F 360TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
ISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
RATE	266	0	14.2	0	92	90	0	72	6.6	0
REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
ATE	99.5	0.0	5.40	0.0	35.9	35.4	0.0	28.1	2.4	
TOTAL	357.4	0.0	19.20	0.0	131.7	130.4	0.0	102.8	2.6	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 299 FAHRENHEIT

CLE AC CONTENT (%):

METERED

% 5.30

OTAL% (actual) 5.30 %

TOTAL% (required) 5.40 %

CORDATION

11:34:18 10/12/93 Pol 3/

B MIX40 270TPH 336F 427TONS 5.17%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
ISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
RATE	251	0	14.2	0	91	91	0	68	3.3	0
"ED	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	99.5	0.0	5.17	0.0	36.1	36.1	0.0	27.2	1.2	
TOTAL	420.4	0.0	22.82	0.0	154.8	153.4	0.0	121.0	3.0	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 299 FAHRENHEIT

CYCLE AC CONTENT (%):

	METERED
%	5.25

TOTAL% (actual) 5.25 %

TOTAL% (required) 5.40 %

AC TOTAL% (required) 5.40 %

==========

RECORDATION Shutdown
11:34:35 10/12/93

F I B MIX40 0TPH 329F 427TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	0	0	14.5	0	0	0	0	0	0.0	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
MAT TOTAL	420.8	0.0	22.84	0.0	155.0	153.6	0.0	121.1	3.0	0.0

AC STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 299 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

AC% 0.00

AC TOTAL% (actual) 0.00 %

AC TOTAL% (required) 5.40 %

TOTAL% (required) 5.40 %

CORDATION 11:49:22 10/12/93 Shutdown

I B MIX40 0TPH 235F 427TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
STURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
PH RATE	5	0	14.6	0	0	0	0	0	0.0	0
REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
TOTAL	420.8	0.0	22.84	0.0	155.0	153.6	0.0	121.1	3.0	0.0

C STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 300 FAHRENHEIT

ECYCLE AC CONTENT (%):

	METERED
%	0.00

C TOTAL% (actual) 0.00 %

TOTAL% (required) 5.40 %

:CORDATION

12:04:25 10/12/93

Shutdown

[B MIX40 0TPH 87F 427TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
ISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
H RATE	0	0	14.4	0	0	0	0	0	0.0	0
REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
AT TOTAL	420.8	0.0	22.84	0.0	155.0	153.6	0.0	121.1	3.0	0.0

STATISTICS:

C 1b/GAL @ 60F 8.64 AC TEMPERATURE 300 FAHRENHEIT

CYCLE AC CONTENT (%):

	METERED
%	0.00

TOTAL% (actual) 0.00 %

C TOTAL% (required) 5.40 %

=ORDATION

12:14:11 10/12/93

B MIX40 0TPH 164F 428TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
ISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
PH RATE	0	0	14.4	0	0	0	0	0	8.6	0
REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
AT TOTAL	421.4	0.0	22.86	0.0	155.0	153.6	0.0	121.1	3.0	0.0

C STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 300 FAHRENHEIT

CYCLE AC CONTENT (%):

	METERED
%	0.00

C TOTAL% (actual) 0.00 %

TOTAL% (required) 5.40 %

CORDATION Shutdown

12:14:23 10/12/93

B MIX40 0TPH 172F 428TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
STURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
H RATE	0	0	14.4	0	0	0	0	0	0.0	0
REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
ATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
T TOTAL	421.4	0.0	22.86	0.0	155.0	153.6	0.0	121.1	3.0	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 300 FAHRENHEIT

YCLE AC CONTENT (%):

METERED

0.00

TOTAL% (actual) 0.00 %

TOTAL% (required) 5.40 %

OTAL% (required) 5.40 %

ORDATION 12:16:02 10/12/93 3.0 PD

B MIX40 268TPH 279F 432TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
TURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
RATE	253	0	14.1	0	92	91	0	72	0.6	0
EQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
TE	99.5	0.0	5.40	0.0	35.9	35.4	0.0	28.1	0.2	
TOTAL	425.1	0.0	23.09	0.0	156.4	155.0	0.0	122.2	3.1	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 300 FAHRENHEIT

CLE AC CONTENT (%):

METERED

5.26

TOTAL% (actual) 5.26 %

OTAL% (required) 5.40 %

CORDATION

12:19:34 10/12/93

Pd 31

B MIX40 477TPH 299F 448TONS 3.06%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
STURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
H RATE	250	0	15.1	0	93	91	0	72	2.6	0
EQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
ATE	99.5	0.0	3.06	0.0	36.1	35.4	0.0	27.9	0.5	
T TOTAL	440.1	0.0	23.93	0.0	161.9	160.4	0.0	126.5	3.2	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 299 FAHRENHEIT

YCLE AC CONTENT (%):

METERED

3.16

TOTAL% (actual) 3.16 %

TOTAL% (required) 5.40 %

CORDATION

12:34:36 10/12/93 Pd 3.3

B MIX40 268TPH 320F 515TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
STURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
H RATE	250	0	14.4	0	91	91	0	71	0.6	0
EQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	99.5	0.0	5.40	0.0	35.7	35.8	0.0	28.0	0.2	
TOTAL	503.2	0.0	27.58	0.0	185.0	183.2	0.0	144.5	3.6	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 299 FAHRENHEIT

CYCLE AC CONTENT (%):

METERED

5.37

TOTAL% (actual) 5.37 % Pd

TOTAL% (required) 5.40 % 3.3

AC TOTAL% (required) 5.40 % 3.3

==========

RECORDATION

12:49:38 10/12/93

F B MIX40 263TPH 325F 582TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	250	0	14.3	0	92	91	0	72	0.0	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	99.5	0.0	5.40	0.0	35.9	35.5	0.0	28.0	0.0	
MAT TOTAL	565.8	0.0	31.17	0.0	207.9	206.0	0.0	162.5	4.0	0.0

AC STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 300 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

AC% 5.42

AC TOTAL% (actual) 5.42 %

AC TOTAL% (required) 5.40 %

RDATION

Pd 2.8

13:04:40 10/12/93

MIX40 272TPH 319F 649TONS 5.26%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
JRE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
RATE	247	0	14.3	0	92	91	0	71	5.3	0
L	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
E	99.6	0.0	5.26	0.0	35.9	35.6	0.0	28.0	1.9	
TOTAL	628.6	0.0	34.77	0.0	230.9	228.8	0.0	180.5	4.4	0.0

STATISTICS:

/GAL @ 60F 8.64 AC TEMPERATURE 300 FAHRENHEIT

CLE AC CONTENT (%):

METERED

5.26

OTAL% (actual) 5.26 %

TAL% (required) 5.40 %

LORDATION

13:10:27 10/12/93

Shutdown

I B MIX40 0TPH 321F 674TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
ISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
RATE	95	0	14.6	0	0	0	0	0	0.0	0
EQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
TOTAL	652.5	0.0	36.13	0.0	239.7	237.5	0.0	187.4	4.6	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 300 FAHRENHEIT

CYCLE AC CONTENT (%):

	METERED
%	0.00

TOTAL% (actual) 0.00 %

TOTAL% (required) 5.40 %

CORDATION 13:19:44 10/12/93 Shutdown

I B MIX40 0TPH 109F 674TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
ISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
.. RATE	0	0	14.5	0	0	0	0	0	0.0	0
EQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
TOTAL	652.5	0.0	36.13	0.0	239.7	237.5	0.0	187.4	4.6	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 301 FAHRENHEIT

CYCLE AC CONTENT (%):

	METERED
%	0.00

TOTAL% (actual) 0.00 %

TOTAL% (required) 5.40 %

==========

EC RDATION 3.3 PD Between Test

13:26:51 10/12/93

B MIX40 358TPH 318F 695TONS 3.91%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
DIsTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
PH RATE	224	0	14.2	0	82	81	0	63	0.6	0
REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
R TE	99.5	0.0	3.91	0.0	36.0	35.4	0.0	28.0	0.1	
NT TOTAL	670.2	0.0	37.24	0.0	246.0	243.8	0.0	192.4	4.7	0.0

TATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 300 FAHRENHEIT

EC CLE AC CONTENT (%):

	METERED
%	3.96

TOTAL% (actual) 3.96 %

TOTAL% (required) 5.40 %

OI)ATION

13:34:48 10/12/93

2.9 Between Test

B MIX40 233TPH 325F 727TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
(STURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
H (ATE	219	0	12.7	0	81	82	0	63	1.3	0
RFQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	99.5	0.0	5.40	0.0	35.7	35.8	0.0	27.9	0.5	
T TOTAL	699.9	0.0	38.97	0.0	256.9	254.5	0.0	200.9	4.9	0.0

) TATISTICS:

) lb/GAL @ 60F 8.64 AC TEMPERATURE 300 FAHRENHEIT

ECYCLE AC CONTENT (%):

METERED

C% 5.45

C TOTAL% (actual) 5.45 %

R[illegible]CORDATION 13:49:51 10/12/93 2.1 Between Test

F B MIX40 238TPH 327F 787TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
M ISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
T[illegible]H RATE	230	0	12.8	0	81	81	0	64	2.6	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	99.6	0.0	5.40	0.0	35.6	35.7	0.0	28.1	1.1	
MAT TOTAL	756.2	0.0	42.20	0.0	277.4	274.8	0.0	216.9	5.3	0.0

[illegible] STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 301 FAHRENHEIT

[illegible]CYCLE AC CONTENT (%):

	METERED
[illegible]%	5.39

[illegible] TOTAL% (actual) 5.39 %

[illegible] TOTAL% (required) 5.40 %

RECORDATION

13:57:35 10/12/93 Shutdown

F I B MIX40 0TPH 329F 817TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	20	0	13.8	0	0	0	0	0	0.0	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
MAT TOTAL	784.8	0.0	43.83	0.0	287.9	285.1	0.0	225.0	5.5	0.0

AC STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 301 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

RAC% 0.00

AC TOTAL% (actual) 0.00 %

AC TOTAL% (required) 5.40 %

ECORDATION

Shut down

14:04:55 10/12/93

I B MIX40 0TPH 113F 817TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
OISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
F RATE	0	0	13.7	0	0	0	0	0	0.0	0
% EQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
M TOTAL	784.8	0.0	43.83	0.0	287.9	285.1	0.0	225.0	5.5	0.0

AL STATISTICS:

A lb/GAL @ 60F 8.64 AC TEMPERATURE 301 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

AC% 0.00

A TOTAL% (actual) 0.00 %

A TOTAL% (required) 5.40 %

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2.3 P.D

2.3-PD Just Started

R CORDATION

14:07:54 10/12/93

F B MIX40 241TPH 110F 818TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	320	0	12.9	0	62	59	0	42	5.3	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	100.0	0.0	5.40	0.0	38.0	36.1	0.0	25.8	2.1	
MAT TOTAL	785.2	0.0	43.86	0.0	287.9	285.2	0.0	225.1	5.6	0.0

C STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 301 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

RAC% 5.35

AC TOTAL% (actual) 5.35 %

AC TOTAL% (required) 5.40 %

RE ORDATION

2'/PD Between Test

14:20:00 10/12/93

B MIX40 237TPH 314F 866TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
IOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
P RATE	224	0	12.7	0	80	80	0	63	3.3	0
TEQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	99.4	0.0	5.40	0.0	35.6	35.6	0.0	28.1	1.3	
A TOTAL	830.4	0.0	46.46	0.0	304.5	301.6	0.0	238.1	5.9	0.0

C STATISTICS:

C lb/GAL @ 60F 8.64 AC TEMPERATURE 302 FAHRENHEIT

ECYCLE AC CONTENT (%):

METERED

C% 5.36

C OTAL% (actual) 5.36 %

C TOTAL% (required) 5.40 %

Between Test 2.1

RECORDATION

14:35:02 10/12/93

F B MIX40 230TPH 318F 926TONS 5.52%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	219	0	12.5	0	81	80	0	64	0.6	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	99.5	0.0	5.52	0.0	35.8	35.4	0.0	28.2	0.2	
M T TOTAL	886.2	0.0	49.66	0.0	325.1	321.9	0.0	254.1	6.3	0.0

AC STATISTICS:

A lb/GAL @ 60F 8.64 AC TEMPERATURE 302 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

PC% 5.44

AC TOTAL% (actual) 5.44 %

F TOTAL% (required) 5.40 %

RECORDATION

Between test Shutdown

14:42:26 10/12/93

F I B MIX40 0TPH 320F 955TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	136	0	12.8	0	0	0	0	0	0.0	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
MAT TOTAL	913.5	0.0	51.22	0.0	335.1	331.8	0.0	261.9	6.5	0.0

AC STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 303 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

AC % 0.00

AC TOTAL% (actual) 0.00 %

AC TOTAL% (required) 5.40 %

RECORDATION

14:50:06 10/12/93 Shut down

F I B MIX40 0TPH 134F 955TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
"OISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	0	0	12.7	0	0	0	0	0	0.6	0
REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
AT TOTAL	913.5	0.0	51.22	0.0	335.1	331.8	0.0	261.9	6.5	0.0

AC STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 302 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

RAC% 0.00

AC TOTAL% (actual) 0.00 %

AC TOTAL% (required) 5.40 %

AC 0.00

AC TOTAL% (actual) 0.00 %

AC TOTAL% (required) 5.40 %

==========

RE ORDATION 15:05:08 10/12/93 Shutdown

B MIX40 0TPH 98F 955TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MO STURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TP RATE	0	0	12.8	0	0	0	0	0	0.0	0
REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
ATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
AT TOTAL	913.5	0.0	51.22	0.0	335.1	331.8	0.0	261.9	6.5	0.0

C STATISTICS:

C lb/GAL @ 60F 8.64 AC TEMPERATURE 302 FAHRENHEIT

E YCLE AC CONTENT (%):

METERED

C 0.00

ECORDATION

tid 2.1 Start Up

15:20:10 10/12/93

I I B MIX40 0TPH 90F 955TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
PH RATE	4	0	12.8	0	0	0	0	0	0.0	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
MAT TOTAL	913.5	0.0	51.22	0.0	335.1	331.8	0.0	261.9	6.6	0.0

STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 303 FAHRENHEIT

CYCLE AC CONTENT (%):

	METERED
AC%	0.00

AC TOTAL% (actual) 0.00 %

AC TOTAL% (required) 5.40 %

==========

RECORDATION

15:35:12 10/12/93 Pd 2.0

B MIX40 239TPH 310F 967TONS 5.64%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
PH RATE	222	0	13.1	0	82	80	0	63	4.6	0
I EQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	99.5	0.0	5.64	0.0	36.0	35.3	0.0	28.0	1.9	
AT TOTAL	924.6	0.0	51.86	0.0	339.1	335.7	0.0	265.1	6.7	0.0

STATISTICS:

lb/GAL @ 60F 8.64 AC TEMPERATURE 302 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

5.48

TOTAL% (actual) 5.48 %

TOTAL% (required) 5.40 %

15:41:51 10/12/93 Ex 2.1

B MIX40 237TPH 315F 993TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
IO STURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
PH RATE	225	0	12.8	0	81	80	0	64	1.3	0
I IO	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	99.5	0.0	5.40	0.0	35.8	35.5	0.0	28.1	0.5	
A TOTAL	949.3	0.0	53.28	0.0	348.2	344.7	0.0	272.2	6.9	0.0

C STATISTICS:

C lb/GAL @ 60F 8.64 AC TEMPERATURE 303 FAHRENHEIT

ECYCLE AC CONTENT (%):

METERED

C% 5.41

C TOTAL% (actual) 5.41 %

C OTAL% (required) 5.40 %

CORDATION

15:50:17 10/12/93 DI 7 7

R CORDATION

15:50:17 10/12/93 Pd 2,2

F B MIX40 235TPH 319F 1026TONS 5.73%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
T H RATE	249	0	13.0	0	81	80	0	64	0.0	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	99.5	0.0	5.73	0.0	35.9	35.4	0.0	28.1	0.0	
M T TOTAL	980.8	0.0	55.08	0.0	359.7	356.0	0.0	281.2	7.2	0.0

A STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 299 FAHRENHEIT

RECYCLE AC CONTENT (%):

METERED

AC% 5.53

A TOTAL% (actual) 5.53 %

AC TOTAL% (required) 5.40 %

==========

RECORDATION

16:05:19 10/12/93

Pd 2.0

F B MIX40 239TPH 318F 1086TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
M ISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	224	0	12.7	0	81	81	0	63	0.6	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	99.5	0.0	5.40	0.0	35.6	35.7	0.0	28.1	0.2	
MAT TOTAL	1036.7	0.0	58.28	0.0	380.2	376.3	0.0	297.2	7.5	0.0

AC STATISTICS:

( ) lb/GAL @ 60F 8.64 AC TEMPERATURE 299 FAHRENHEIT

RECYCLE AC CONTENT (%):

	METERED
) %	5.33

AC TOTAL% (actual) 5.33 %

C TOTAL% (required) 5.40 %

Pd 2.4

RECORDATION 16:20:21 10/12/93

B MIX40 234TPH 318F 1145TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	228	0	12.6	0	80	81	0	64	0.0	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	99.6	0.0	5.40	0.0	35.6	35.8	0.0	28.2	0.0	
MAT TOTAL	1092.6	0.0	61.49	0.0	400.7	396.6	0.0	313.3	7.9	0.0

AC STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 297 FAHRENHEIT

RECYCLE AC CONTENT (%):

	METERED
AC	5.39

AC TOTAL% (actual) 5.39 %

AC TOTAL% (required) 5.40 %

AC TOTAL% (required) 5.40 %

==========

RECORDATION 16:35:23 10/12/93 Pd 3.0

B MIX40 235TPH 221F 1205TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MC STURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	221	0	12.7	0	82	81	0	64	0.0	0
% EQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	99.7	0.0	5.40	0.0	35.9	35.5	0.0	28.2	0.0	
MAT TOTAL	1148.9	0.0	64.71	0.0	421.2	416.9	0.0	329.3	8.3	0.0

AC STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 295 FAHRENHEIT

RECYCLE AC CONTENT (%):

	METERED
AC %	5.43

AC TOTAL% (actual) 5.43 %

AC TOTAL% (required) 5.40 %

AC TOTAL% (required) 5.40 %

2.7 Pd

R CORDATION

16:50:25 10/12/93

F B MIX40 237TPH 218F 1264TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
PH RATE	219	0	12.8	0	82	80	0	64	0.0	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	100.0	0.0	5.40	0.0	36.2	35.4	0.0	28.3	0.0	
MAT TOTAL	1204.5	0.0	67.90	0.0	441.6	437.2	0.0	345.4	8.6	0.0

C STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 295 FAHRENHEIT

ECYCLE AC CONTENT (%):

	METERED
AC%	5.43

AC TOTAL% (actual) 5.43 %

5.40 %

RE :ORDATION

17:05:27 10/12/93 complete

F B MIX40 236TPH 226F 1324TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
T H RATE	221	0	12.7	0	81	80	0	63	0.6	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	100.0	0.0	5.40	0.0	36.1	35.6	0.0	28.2	0.2	
N IT TOTAL	1260.4	0.0	71.09	0.0	462.1	457.5	0.0	361.4	8.7	0.0

F : STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 295 FAHRENHEIT

ECYCLE AC CONTENT (%):

	METERED
AC%	5.40

C TOTAL% (actual) 5.40 %

AC TOTAL% (required) 5.40 %

RECORDATION

17:06:30 10/12/93 Complete

F I B MIX40 0TPH 245F 1327TONS 0.00%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
MOISTURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
TPH RATE	10	0	12.7	0	0	0	0	0	0.0	0
% REQ	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
% RATE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	
MAT TOTAL	1263.9	0.0	71.29	0.0	463.4	458.7	0.0	362.5	8.7	0.0

AC STATISTICS:

AC lb/GAL @ 60F 8.64 AC TEMPERATURE 295 FAHRENHEIT

RECYCLE AC CONTENT (%):

	METERED
AC	0.00

AC TOTAL% (actual) 0.00 %

AC TOTAL% (required) 5.40 %

RECORDATION

17:20:32 10/12/93 Complete

I B MIX40 238TPH 147F 1328TONS 5.40%mac

	VIR	RAP	+AC	BIN1	BIN2	BIN3	BIN4	BIN5	MFL1	DUST
JI TURE	5.7	0.0		0.0	5.1	5.1	0.0	7.0		
'H RATE	209	0	12.6	0	81	78	0	59	4.6	0
R J	99.5	0.0	5.40	0.0	36.0	35.5	0.0	28.0	0.5	
RATE	100.0	0.0	5.40	0.0	37.1	35.8	0.0	27.0	1.9	
T TOTAL	1264.5	0.0	71.32	0.0	463.5	458.8	0.0	362.5	8.7	0.0

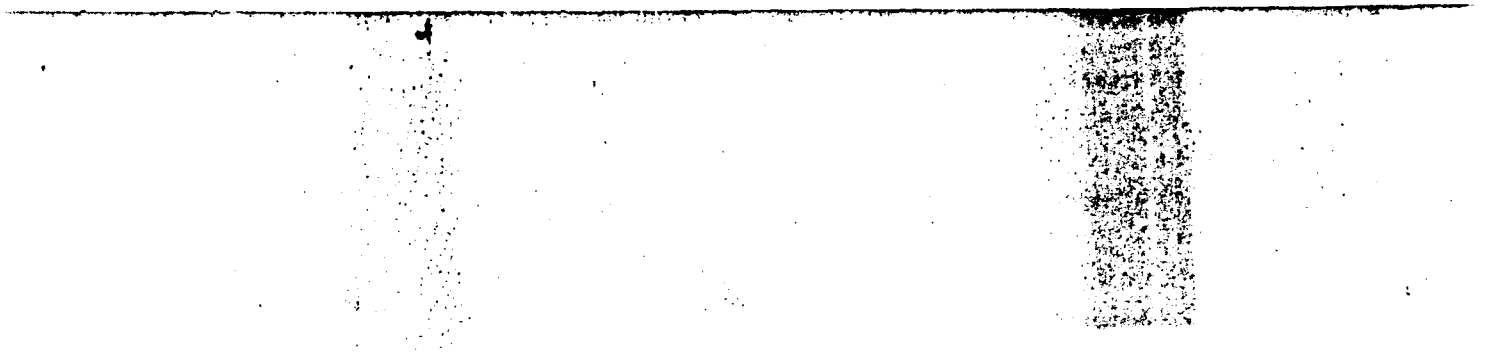
STATISTICS:

J)/GAL @ 60F 8.64 AC TEMPERATURE 296 FAHRENHEIT

CYCLE AC CONTENT (%):

METERED

TF 99.6 0.0 5.26 0.0 35.9 35.6 0.0 28.0 1.9



APPENDIX - L

SAMPLE CALCULATIONS

NOMENCLATURE

- acf = actual cubic feet
- acfm = actual cubic feet per minute
- A = effective area of flue in square feet
- acm = actual cubic meters
- acmm = actual cubic meters per minute
- A_n = inside area of sampling nozzle in square feet
- B_{ws} = water vapor in gas stream, proportion by volume
- %C = percent carbon by weight, dry basis
- %CO = percent carbon monoxide by volume, dry basis
- $\%CO_2$ = percent carbon dioxide by volume, dry basis
- C_p = pitot tube coefficient
- D_I = dust loading per heat input in pounds (grams) per million Btu (calories) per Fr constant
- D_I' = dust loading per heat input in pounds (grams) per million Btu (calories) per Fr calculated
- dscf = dry standard cubic feet
- dscfh = dry standard cubic feet per hour
- dscm = dry standard cubic meters
- dscmh = dry standard cubic meters per hour
- fps = feet per second
- F_r = ratio factor of dry flue gas volume to heat value of combusted fuel in dry standard cubic feet (meters) per million Btu (calories)
- gms = grams
- gm-mole = gram-mole
- grs = grains
- ΔH = orifice pressure drop in inches water, average
- %H = percent hydrogen by weight, dry basis
- H_c = heat of combustion in Btu per pound, dry basis
- hr = hour
- %I = percent isokinetic
- in. Hg = inches mercury
- lbs = pounds
- lb-mole = pound-mole
- %M = percent moisture by volume
- mmBtu = million Btu
- mmcal = million calories
- mm Hg = millimeters mercury
- mps = meters per second
- M_s = molecular weight in pound (gram) per pound (gram) mole (wet basis)
- %N = percent nitrogen by weight, dry basis
- $\%N_2$ = percent nitrogen by difference, dry basis
- %O = percent oxygen by difference, dry basis
- $\%O_2$ = percent oxygen by volume, dry basis
- P_b = barometric pressure in inches mercury
- P_{std} = standard absolute pressure (29.92 in Hg)
- P_s = absolute pressure in flue in inches (millimeters) mercury
- P_f = static pressure in flue in inches water, average
- $\sqrt{\Delta P}$ = square root of velocity head in inches water, average
- %S = percent sulfur by weight, dry basis
- scf = standard cubic feet
- scm = standard cubic meters
- T_{std} = absolute temperature of air in degrees Rankine at standard conditions (528 degrees)
- T_s = absolute temperature of flue gas in degrees Rankine, average
- T_m = absolute temperature at meter in degrees Rankine, average
- V_s = velocity of flue gas in feet (meters) per second
- V_l = volume of condensate through the impingers in milliliters
- V_{lc} = volume of liquid collected in condenser in milliliters plus weight of liquid absorbed in silica gel in grams indicated as milliliters
- V_m = volume of metered gas measured at meter conditions in cubic feet
- V_{ms} = volume of metered gas corrected to dry standard conditions in cubic feet (meters)
- V_o = volume of flue gas at actual conditions in cubic feet (meters) per minute
- Q_{sd} = volume of flue gas corrected to dry standard conditions in cubic feet (meters) per hour
- V_t = total volume of flue gas sampled at actual conditions in cubic feet (meters)
- V_w = volume of water vapor in metered gas corrected to standard conditions in cubic feet (meters)
- V_{wc} = volume of water condensed in impingers corrected to standard conditions
- V_{wsg} = volume of water collected in silica gel corrected to standard conditions
- W_a = total weight of dust collected per unit volume in grains (grams) per actual cubic feet (meters)
- W_d = total weight of dust collected per unit volume in pounds (grams) per dry standard cubic feet (meters)
- W_g = total weight of dust collected in grams
- W_h = total weight of dust collected per unit volume in pounds (grams) per hour, dry basis
- W_p = total weight of dust collected in pounds
- W_s = total weight of dust collected per unit volume in grains (grams) per dry standard cubic feet (meters)
- W_{sg} = impinger silica gel weight gain in grams
- Y = metered gas volume correction factor
- Θ = total elapsed sampling time in minutes

EPA DUST LOADING FORMULAS

(1) ABSOLUTE FLUE PRESSURE (in. Hg)

$$P_s = (\pm P_f \div 13.6) + P_b$$

(2) WATER VAPOR VOLUME IN METERED GAS CORRECTED TO STANDARD CONDITIONS (scf)

$$V_{wc} = .04707 \times V_l \qquad V_{wsg} = .04715 \times W_{sg}$$

$$V_w = V_{wc} + V_{wsg}$$

(3) METERED GAS VOLUME CORRECTED TO STANDARD CONDITIONS (scf)

$$V_{ms} = 17.64 \times Y \times V_m \frac{P_b + (\Delta H/13.6)}{T_m}$$

(4) PERCENT MOISTURE IN FLUE GAS

$$B_{ws} = \frac{V_w}{(V_{ms} + V_w)} \qquad \%M = B_{ws} \times 100$$

(5) AVERAGE RESULTS OF FLUE GAS ANALYSIS

$$\%N_2 \text{ dry} = 100 - (\%CO_2 + \%O_2 + \%CO)$$

(6) APPROXIMATE MOLECULAR WEIGHT OF FLUE GAS (WET BASIS) (lb/lb-mole)

$$M_s = (18 \times B_{ws}) + \left(.440\,(\%CO_2) + .320\,(\%O_2) + .280\,(\%N_2 + \%CO)\right) \times (1 - B_{ws})$$

(7) GAS VELOCITY IN FLUE (fps)

$$V_s = 85.49 \times C_p \times (\sqrt{\Delta P}\ )_{avg.} \sqrt{\frac{T_s}{P_s \times M_s}}$$

(8) FLUE GAS VOLUME AT ACTUAL CONDITIONS (acfm)

$$V_o = V_s \times A \times 60$$

(9) FLUE GAS VOLUME CORRECTED TO DRY STANDARD CONDITIONS (dscfh)

$$Q_{sd} = \frac{T_{std}}{29.92} \times \frac{P_s}{T_s} \times V_o \times (1 - B_{ws}) \times 60$$

(10) TOTAL FLUE GAS VOLUME SAMPLED AT ACTUAL CONDITIONS (acf)

$$V_t = \left[V_m \times Y \times \frac{T_s}{T_m} \times \left(\frac{P_b + (\Delta H/13.6)}{P_s}\right)\right] + \left(0.00267 \times V_{lc} \times \frac{T_s}{P_s}\right)$$

EPA DUST LOADING FORMULAS (Continued)

(11) DUST CONCENTRATION FOR INDIRECT HEATING UNIT AT ACTUAL CONDITIONS AND STANDARD CONDITIONS

W_g = gms

$W_p = 0.002205 \times W_g$ (lb)

$W_d = \frac{W_p}{V_{ms}}$ (lb/dscf)

$W_h = W_d \times Q_{sd}$ (lb/hr dry)

$W_a = \frac{7000 \times W_p}{V_t}$ (gr/acf)

$W_s = 7000 \times W_d$ (gr/dscf)

$D_l = \frac{9820 \times 20.9 \times W_d}{(20.9 - \%O_2)}$ (lb/mmBtu with constant 9820 F_r)

$F_r = \frac{10^6 \times [(3.64 \times \%H) + (1.53 \times \%C) + (0.57 \times \%S) + (0.14 \times \%N) - (0.46 \times \%O)]}{H_c}$ (dscf/mmBtu)

$D_l' = \frac{20.9 \times W_d \times F_r}{(20.9 - \%O_2)}$ (lb/mmBtu with calculated F_r)

(12) PERCENT OF ISOKINETIC SAMPLING

$$\%I = \frac{1.667 \times T_s \times \left\{0.00267 \times V_{lc} + \left[\frac{V_m \times Y}{T_m} \times \left(P_b + \Delta H/13.6\right)\right]\right\}}{\Theta \times V_s \times P_s \times A_n}$$

APPENDIX - M

CONSTRUCTION PERMIT

Jew PLANT
3

MEL CARNAHAN
Governor

DAVID A. SHORR
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102

May 26, 1993

Mr. Frank A. Enloe
Richardson & Bass Construction Co.
5320 Highway 763 North
Columbia, MO 65202

RE: Air Permit Application
Facility Number PORT-0094-005

Dear Mr. Enloe:

Enclosed with this letter is your permit to construct. Please note the special conditions on the accompanying pages. Operation in accordance with these conditions and your permit application is necessary for continued compliance. The document entitled "Review of Application for Authority to Construct" is part of the permit as well and should be kept with the permit in your files.

The reverse side of your permit certificate has important information concerning your rights and obligations.

If you have any questions or need additional information regarding this permit, you can contact me by phone at (314) 751-4817 or you may write to me at Department of Natural Resources, Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102.

Very truly yours,

AIR POLLUTION CONTROL PROGRAM

Michael J. Stansfield, P. E.
Environmental Engineer

MJS:sa

Enclosures

c: Jefferson City Regional Office
APCP Technical Support
File: PORT-0094-005

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

OPERATING CONDITIONS:

1. This facility shall produce no more than 300,000 tons of asphaltic concrete during any 12-month period.

2. This facility shall use a baghouse, as specified in its permit application, in order to control the particulate emissions from the asphalt plant. This baghouse shall be in use at all times that the asphalt plant is in production, and shall be operated and maintained in accordance with the manufacturer's specifications. The baghouse shall be equipped with a gauge or meter which indicates the pressure drop across the baghouse. The pressure drop shall be indicated in the same units as reported in the test report required below. This device shall be located such that it can be easily read by Department of Natural Resources' personnel.

3. A minimum of wet system controls including water application is required to be implemented on all dust sources including, but not limited to, haul roads, vehicular traffic areas, and aggregate storage piles when conditions exist which would otherwise cause a violation of Missouri Rule 10 CSR 10-6.170, "Restriction of Particulate Matter from Becoming Airborne" or Missouri Rule 10 CSR 10-3.080, "Restriction of Emission of Visible Air Contaminants."

RECORDKEEPING

4. Records of monthly and annual tonnages of asphaltic concrete shall be kept on-site for at least two (2) consecutive years. These records shall be made available immediately upon verbal request to Department of Natural Resources' personnel.

EMISSION LIMITS

5. The exhaust gas stream from this asphalt plant shall not contain particulate matter in excess of 0.04 GR/DSCF and shall not exhibit an opacity of 20 percent, as set forth in Missouri Rule 10 CSR 10-6.070, "New Source Performance Standards," Subpart I (40 CFR 60.92).

PERFORMANCE TESTING CONDITIONS

In order to quantify air pollutant emissions, performance testing shall be required in accordance with the following procedures:

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

6. This facility shall conduct a performance test, in accordance with the test methods and procedures outlined below, in order to demonstrate compliance with Missouri Rule 10 CSR 10-6.090, "New Source Performance Standards," Subpart I (40 CFR 60.92). The applicant shall determine compliance with the particulate matter standards contained in Subpart I by using the following reference methods:

   a) Method 5 for the concentration of particulate matter,
   b) Method 1 for sample and velocity traverses,
   c) Method 2 for velocity and volumetric flow rate,
   d) Method 3 for gas analysis,
   e) Method 4 for moisture content of stack gases, and
   f) Method 9 for plume opacity.

7. Within sixty (60) days of achieving the maximum production rate of the process, but in no case not later than one hundred eighty (180) days after initial startup, the owner/operator shall have conducted the required performance testing and submitted the results of said testing.

8. The date on which performance tests are conducted must be pre-arranged with the Air Pollution Control Program (APCP) a minimum of thirty (30) days prior to the proposed test date such that the APCP may arrange a pretest meeting, if necessary, and assure that the test date is acceptable for an observer to be present. The enclosed Proposed Test Plan form will serve the purpose of notification and must be approved by the APCP prior to conducting the required emission testing.

9. Two copies of a written report of the performance test results shall be submitted to the Director of the APCP within thirty (30) days of completion of any required testing. The report must include legible copies of the raw data sheets, analytical instrument laboratory data, and complete sample calculations from the required U.S. Environmental Protection Agency (EPA) Method for at least one sample run:

   The test report is to fully account for all operational and emission parameters addressed in the permit conditions as well as in any other applicable state or federal rules or regulations.

10. Performance testing shall be conducted under the condition of maximum process/production rate, or within ten per cent (10%) of this rated capacity. The process/production rate at which performance testing is conducted shall become the maximum process/production rate at which this source of emissions is permitted to operate, under the authority granted by this permit.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

11. Actual conditions under which performance testing is conducted shall be recorded every fifteen (15) minutes throughout each of the test runs. These conditions are to include all relevant process/production parameters as well as all parameters relating to the status of emission controls such as the pressure drop across the baghouse. This data is to be included in the emissions test report.

12. Testing shall be conducted during periods of representative conditions at the maximum process/production rates, not to include periods of startup, shutdown, or malfunction.

13. The fuel used during performance testing shall be the worst polluting fuel that is intended to be used at this facility. If a worse fuel substitute is desired in the future, a new performance test shall be conducted.

14. The owner or operator shall provide performance testing facilities as follows:

    a) Safe sampling platform(s).
    b) Safe access to sampling platform(s).
    c) Utilities for sampling and testing equipment.
    d) Sampling ports adequate for test methods applicable to this facility. This includes:
        (1) Constructing the air pollution control system such that volumetric flow rates and pollutant emission rates can be accurately determined by applicable test methods and procedures;
        (2) Providing a stack or duct free of cyclonic flow during performance tests; and
        (3) Removal of the port caps 24 hours prior to testing to verify both their removability as well as full-diameter clearance to the stack; caps may be retained hand tight.

15. Performance tests shall be conducted, and data reduced, in accordance with specified EPA Test Methods unless an equivalent or alternative test method is otherwise approved by the Director.

16. Unless otherwise specified, each performance test shall consist of three (3) separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified in the applicable standard.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

17. For the purpose of determining compliance with applicable standards, the arithmetic mean of results of the three (3) runs shall apply. Only under rare circumstances and upon approval by the Director, may compliance be determined by the arithmetic mean of two (2) runs.

REPORTING

18. The source shall report to the Air Pollution Control Program Enforcement Section, no later than ten (10) days after the end of each month, if the 12-month cumulative total in condition number 4 shows that the source exceeded the limitations of condition number 1 (300,000 tons).

19. Richardson & Bass Construction Company shall affix permanent and observable identifiers on all equipment associated with this permit within thirty (30) days of obtaining each piece of equipment. The company shall provide the Air Pollution Control Program with a list of equipment and the associated identifiers within thirty (30) days of the issuance of this permit, or receipt of each piece of equipment, whichever occurs later.

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI AIR CONSERVATION COMMISSION

PERMIT TO CONSTRUCT

Under the authority of RSMo 643 and the Federal Clean Air Act the applicant is authorized to construct the facility described below, in accordance with the laws, rules, and conditions as set forth herein:

Permit Number: 0593-011 Facility I.D. Number: PORT-0094-005

Owner: Richardson & Bass Construction Company

Owner's Address: 5320 Highway 763 North; Columbia; MO 65202

Facility Name: Richardson & Bass Construction Company

Facility Address: 3 Miles North of I-70 on Hwy 54 (west side of road)

Legal Description: Callaway County; SE ¼; NE¼;S34; T59N; R9W

Application for Authority to Construct was made for:

**** A new asphaltic concrete production plant; which will be used for commercial and highway construction. This review was conducted in accordance with section (3); of 10 CSR 10-6.060; "Permits Required." ****

☐ Special Conditions are not applicable to this permit.

☒ Special Conditions do apply to this permit and are listed as attachments starting on page 2.

May 26, 1993
EFFECTIVE DATE

John A. Young
DIRECTOR
DIVISION OF ENVIRONMENTAL QUALITY

AQ 780 1204 (10 90)

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT A SYNTHETIC MINOR SOURCE OPERATION

Permit Number (0593-011)

Richardson & Bass Construction Company
Plant 3

Project ID: PORT - 0094 - 005

SE ¼, NE¼, Section 34, Township 49N, Range 9W
Callaway County

Complete: March 12, 1993
Reviewed: April 12, 1993

SUMMARY

- This review is conducted under Section (3) of 10 CSR 10-6.060, *Permits Required.*
- Subpart I of the New Source Performance Standards, *Standards of Performance for Asphalt Concrete Plants,* is applicable to this source. This subpart requires a performance test of the asphalt plant to demonstrate compliance with emission limits.
- The equipment at this location is considered to be portable.
- This facility is considered to be a minor source operation.
- No adverse ambient air quality impact is expected to occur as a result of the operation of the proposed equipment.
- Approval of this permit application is recommended; subject to conditions.

GENERAL DESCRIPTION

R & B

~~Masters-Jackson Paving~~ Company has made application for authority to install and operate a new asphaltic concrete production plant, which will be used for commercial and highway construction. This plant will produce a maximum of 400 tons of asphalt per hour, and will be limited by permit condition to an annual production rate of 300,000 tons of asphalt. A baghouse will be used to control emissions of particulate matter from the asphalt plant.

EMISSIONS/CONTROLS EVALUATION

The emission factors used in this review are obtained from the EPA document AP-42 *Compilation of Air Pollutant Emission Factors,* Section 8.1, *Asphaltic Concrete Plants,* Section 8.19.1, *Sand and Gravel Processing,* Section 8.19.2, *Crushed Stone Processing,* Section 11.2.3, *Aggregate Handling and Storage Piles,* Section 11.2.6,

Unpaved Roads, and *Fugitive Dust Control Technology*, Noyes Data Corporation, Ohlemann et.al., 1983. Conditioned potential emissions (CPE) are based on a production rate of 300,000 tons of asphaltic concrete per year with the pollution controls in place and operational. Unconditioned potential emissions (UPE) are based on a maximum hourly production rate of 335 tons of asphalt and crushed rock for 8760 hours per year, with the pollution controls in place and operational.

The total emissions from the asphalt plant, when operated at a production limit of 300,000 tons asphalt per year, are estimated to be 23 tons PM_{10}. If this asphalt plant were operated for 8760 hours per year, emissions are then estimated to be 268 tons PM_{10}.

The emissions in tons per year are broken down as follows:

Process	PM_{10}		SO_2		NO_x		CO		VOC		Aldehydes	
	CPE	UPE	CPE	UPE	CPE	UPE	CPE	UPE	CPE	UPE	CPE	UPE
Dryer Drum	3	35	18	210	5.4	63	5.7	66.6	4.2	49	3	35
Conveying	0.03	0.35	-	-	-	-	-	-	-	-	-	-
Bin Loading	0.02	0.23	-	-	-	-	-	-	-	-	-	-
Storage Piles	5.4	63	-	-	-	-	-	-	-	-	-	-
Haul Road	14.5	169	-	-	-	-	-	-	-	-	-	-
TOTALS	23	268	18	210	5.4	63	5.7	66.6	4.2	49	3	35

PERMIT RULE APPLICABILITY

This review is conducted under Section (3) of 10 CSR 10-6.060, *Permits Required*. Compliance with this section of the rule means that the proposed source will not interfere with the attainment or maintenance of ambient air quality standards, will not cause or contribute to ambient air concentrations in excess of any applicable maximum allowable increase as listed in 10 CSR 10-6.060 subsection (7)(D) Table 4 over the baseline concentration in any attainment or unclassified area, will not violate any applicable emission control regulations or the Air Conservation Law, and will not cause an adverse impact on visibility in any Class 1 area.

APPLICABLE EMISSIONS REGULATIONS

The following list briefly describes the rules that restrict emissions from facilities of this nature. Other rules not listed may apply to this facility and can be found in the Missouri Code of State Regulations, Title 10, Division 10.

Missouri State Regulation 10 CSR 10-3.050 *Restriction of Emission of Particulate Matter from Industrial Processes* will apply to the dryer drum plant. This regulation restricts the emission of particulate matter in the source gas of an operation. The maximum allowable emission rate from this process is 66.3 pounds per hour. The

dryer drum is expected to emit approximately 8 pounds of particulate matter per hour, which is in compliance with this regulation.

Missouri State Regulation 10 CSR 10-3.080, *Restriction of Emission of Visible Air Contaminants*, specifies the maximum allowable shade or opacity of visible air contaminant emissions.

Missouri State Regulation 10 CSR 10-3.090, *Restriction of Emission of Odors*, restricts the emission of excessively odorous matter.

Missouri State Regulation 10 CSR 10-6.110, *Submission of Emission Data and Process Information*, requires sources to submit emissions data to this program in a timely and accurate manner.

Missouri State Regulation 10 CSR 10-6.170, *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*, restricts the emission of particulate matter to the ambient air beyond the premises of origin.

Subpart I of the New Source Performance Standards, *Standards of Performance for Asphalt Concrete Plants* is applicable to this source. This subpart requires a performance test of the asphalt plant to demonstrate compliance with emission limits. This subpart also limits the particulate emission rate from the operation of the asphalt plant to a rate not to exceed 0.04 grains per dry standard cubic foot (0.04 gr/dscf).

The location of this facility in Pulaski County is an "attainment area" for all criteria pollutants. None of the Prevention of Significant Deterioration (PSD) regulations will apply, nor will any of the National Emission Standards for Hazardous Air Pollutants (NESHAP).

AMBIENT AIR QUALITY IMPACT ANALYSIS

The ambient air quality impact due to the operation of this facility is estimated using EPA's SCREEN model to estimate the impact from the asphalt plant. The ambient air quality impact from the plant is estimated to be 56 $\mu g/m^3$ on a 24-hour basis; the National Ambient Air Quality Standard (NAAQS) for particulate matter 10 microns or smaller (PM_{10}) is 150 $\mu g/m^3$ 24-hour basis. The operation of this plant should therefore not cause any violations of the NAAQS standards for particulate matter 10 microns or smaller.

STAFF RECOMMENDATION

On the basis of this review in accordance with Section (3) of Permits Required, I recommend this permit be granted with conditions.

Michael J. Stansfield, P.E.
Environmental Engineer

April 12, 1993
Date

APPENDIX A

EMISSIONS CALCULATIONS - ASPHALT BATCH PLANT

The emission factors used are obtained from the EPA document AP-42 *Compilation of Air Pollutant Emission Factors*, Section 8.1, *Asphaltic Concrete Plants*, Section 8.19.1 *Sand and Gravel Processing*, Section 8.19.2 *Crushed Stone Processing*, Section 11.2.3 *Aggregate Handling and Storage Piles*, Section 11.2.6 *Unpaved Roads*, and *Fugitive Dust Control Technology*, Noyes Data Corporation, 1983. Conditioned potential emissions (CPE) are based on a production rate of 300,000 tons of asphaltic concrete per year with the pollution controls in place and operational. Unconditioned potential emissions (UPE) are based on a maximum hourly production rate of 400 tons of asphalt for 8760 hours per year, with the pollution controls in place and operational.

DRYER/DRUM MIXER EMISSIONS

A baghouse is used to control the emissions of particulate matter from the operation of this asphalt plant. The annual emissions are expressed as "conditioned potential" emissions, and are estimated to be:

Particulate Matter = (0.02 lbs/ton)(400 tons/hr) = 8 lbs/hr = 3 tons per year
Sulfur Dioxide = (0.12 lbs/ton)(400 tons/hr) = 48 lbs/hr = 18 tons per year
Nitrogen Oxides = (0.036 lbs/ton)(400 tons/hr) = 14.4 lbs/hr = 5.4 tons per year
Carbon Monoxide = (0.038 lbs/ton)(400 tons/hr) = 15.2 lbs/hr = 5.7 tons per year
Volatile Organic Compounds = (0.028 lbs/ton)(400 tons/hr) = 11.2 lbs/hr = 4.2 tons per year
Polycyclic Organic Material = (0.000026 lbs/ton)(400 tons/hr) = 0.01 lbs/hr = 0.004 tons/yr
Aldehydes = (0.02 lbs/ton)(400 tons/hr) = 8 lbs/hr = 3 tons per year
Formaldehyde = (0.00015 lbs/ton)(400 tons/hr) = 0.06 lbs/hr = 0.02 tons per year
2-Methylpropanal = (0.0013 lbs/ton)(400 tons/hr) = 0.52 lbs/hr = 0.2 tons per year
1-Butanol = (0.0024 lbs/ton)(400 tons/hr) = 1 lb/hr = 0.4 tons per year
3-Methylbutanol = (0.016 lbs/ton)(400 tons/hr) = 6.4 lbs/hr = 2.4 tons per year

CONVEYING

Annual Throughput = 300,000 tons per year
Maximum Design Rate = 400 tons per hour
Emission Factor (PM_{10}) = 0.0002 pounds per ton
Emission Rate (PM_{10}) = 0.08 lbs/hr
Emission Rate (PM_{10}) = 0.03 tons per year

BIN LOADING

Annual Throughput = 300,000 tons per year
Emission Factor = 0.0001 pounds per ton
Emission Rate = 0.02 tons per year

STORAGE PILES

Storage of crushed rock in piles results in fugitive particulate emissions from loading the rock onto the pile, wind erosion, and removing rock from the pile. Equipment traffic in the storage area also creates fugitive emissions, though these emissions will be included in the calculation of emissions from unpaved haul roads. Empirical formulae for storage pile emissions are from Section 11.2.3 of AP-42 *Aggregate Handling and Storage Piles*.

Loading Onto The Pile:

$$E_f = k\,[0.0032]\,\frac{\left[\frac{U}{5}\right]^{1.3}}{\left[\frac{M}{2}\right]^{1.4}}$$

where E_f = emission factor in pounds per ton
k = particle size multiplier = 0.35 for PM_{10}
U = mean wind speed = 12 mph
M = moisture content of material = 0.7%
so: E_f = 0.015 pounds per ton
Emission Rate (PM_{10}) = (300,000 tons/yr)(0.015 lbs/ton)(0.0005 tons/lb) = 2.3 tons per year

Wind Erosion

$$E_f = 1.7\left[\frac{s}{1.5}\right]\left[\frac{365-p}{235}\right]\left[\frac{f}{15}\right]$$

where s = silt content = 1.6%
p = number of days without at least 0.01 inches of precipitation per year = 110
f = percent of time wind speed exceeds 12 mph at mean pile height = 32%

so E_f = 4.2 pounds per acre per day

Emissions = (4.2 lb/acre/day)(1 acre)(365 days/yr)(0.0005 ton/lb) = 0.8 tons per year

Loading Out of the Piles
From the standpoint of emissions generation, the loading out of material from storage piles is similar to loading onto the piles. The emissions calculations are the same. The annual emissions from loading out from the piles is then 2.3 tons PM_{10} per year.

HAUL ROAD FUGITIVE EMISSIONS

$$E_f = k\,[5.9]\left[\frac{s}{12}\right]\left[\frac{S}{30}\right]\left[\frac{W}{3}\right]^{0.7}\left[\frac{w}{4}\right]^{0.5}\left[\frac{365-p}{365}\right]$$

where: k = particle size multiplier = 0.36 PM_{10}
s = silt content = 12%
S = mean vehicle speed = < 15 mph
W = mean vehicle weight = 10 tons (empty) and 32 tons (full)
w = mean number of wheels = 12
p = number of days with at least 0.01 inches of precipitation per year = 110

E_f (empty)(PM_{10}) = 3.0 pounds per vehicle mile travelled.
E_f (full)(PM_{10}) = 6.7 pounds per vehicle mile travelled.

Number of truck trips per year is equal to the annual production divided by truck capacity. With a truck capacity of 15 to 22 tons of rock, 20,000 round trips per year will be required. The haul road length is estimated to be 0.3 mile.

Particulate Emissions Rate, Empty Trucks, PM_{10} Emissions = 4.5 tons per year
Particulate Emissions Rate, Loaded Trucks, PM_{10} Emissions = 10 tons per year

Aggregate PM_{10} Emission Rate (loaded trucks plus empty trucks) = 14.5 tons per year.

TOTAL EMISSIONS FROM ASPHALT PLANT

The total emissions from the processes being permitted, when operated at a production limit of 300,000 tons asphalt per year, are estimated to be 23 tons PM_{10}. If this asphalt plant were operated for 8760 hours per year, the emissions are then estimated to be 268 tons PM_{10}.