Commonwealth of Pennsylvania
Environmental Resources
September 6, 1990

Subject: Stack Test Review

To: Data File
Latrobe Construction Company
Legionier Township, Westmoreland County

From: Timothy R. Brooks TRB
Air Quality Program Specialist
Division of Technical Services and Monitoring
Bureau of Air Quality Control

Through: Chief, Source Testing and Monitoring Section

The Latrobe Construction Company operates their No. 3 Barber-Green Batch Asphalt Plant at the above location. The plant is rated at 300 tons per hour and emissions are controlled by a Griffin Environmental BE-101X Fabric Filter.

Hemion Associates, Inc. conducted three particulate tests in the baghouse outlet. The tests were conducted in accordance with Chapter 139 of the Commonwealth of Pennsylvania, Department of Environmental Resources' Rules and Regulations and are acceptable to the Department.

The following information was extracted from the test report:

Test Date	04/25/90	04/25/90	04/26/90
Run No.	1	2	3
Volumetric Flow Rate (dscfm)	26,000	26,400	25,000
Average Production Rate (T/hr)+	264	264	264
Particulate Concentration (g/dscf)	0.004	0.003	0.005
Allowable Concentration (g/dscf)*	0.04	0.04	0.04
Particulate Emission Rate (lbs/hr)	0.94	0.71	1.01

\+ Combination of ID#2 Binder and ID #2 Top
* NSPS Allowable

cc: File No. 65-303-012
Keith Gratzmiller, Greensburg District Office
EPA/RSL
Doug Lesher
Reading File

TRB:taw

HEMEON ASSOCIATES INC.

Air Pollution Consulting Engineers
125 Thirty-Ninth Street
Pittsburgh, PA 15201

(412) 683-2100

FAX (412) 683-4188

PARTICULATE EMISSION TESTING
LATROBE CONSTRUCTION COMPANY
ASPHALT PLANT
LIGONIER, PA

Report to:
Mr. Merle Rahl
Latrobe Construction Co.
P.O. Box 150
Latrobe, PA 15650

Report by:
Mr. Christopher J. Michael
Project Manager
Hemeon Associates, Inc.
125 Thirty-ninth Street
Pittsburgh, PA 15201

May 3, 1990

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

On April 25, and 26, 1990, particulate emission testing was conducted on the asphalt plant baghouse at Latrobe Construction Company's plant in Ligonier, PA. The test program was authorized by Mr. Merle Rahl Latrobe Construction Company. Testing was performed by Mr. John C. Parry and Mr. Russell Lantz of Hemeon Associates, Inc. Process Coordination was provided by Latrobe Construction Company's personnel. Testing was observed by the P.A. D.E.R. Bureau of Air Pollution Control.

PURPOSE

The purpose of this test program was to determine whether particulate matter emissions from the baghouse exit were in compliance with the Environmental Protection Agency and Department of Environmental Resources emission regulations during normal operation.

2.0 SUMMARY OF RESULTS

TABLE NO. 1 below presents the particulate emission results from testing the baghouse outlet at Latrobe Construction Company's plant in Ligonier, PA.

TABLE NO. 1

Particulate Emission Results

Date 1989	Sample Location	Test No.	Particulate Emissions		
			a gr/dscf	measured lb/hr b	allowable lb/hr b
4/25	Baghouse Outlet	1	0.004	0.936	16.776
4/25	Baghouse Outlet	2	0.003	0.712	16.776
4/26	Baghouse Outlet	3	0.005	1.013	16.776

a - grains per dry standard cubic feet
b - pounds per hour

According to regulations of the P.A.D.E.R., the allowable emission rate is based on [redacted]. Based on the test results, the baghouse is in compliance with DER regulations for particulate emissions.

TABLE NO. 2 is a summary of the flue gas parameters and particulate results.

TABLE NO. 3 is a summary of allowable emission rate calculations.

Table No. 2
SUMMARY OF FLUE GAS PARAMETERS

LATCOFLO

TEST NO.	1	2	3
TEST DATA			
Test Date	4/25/90	4/25/90	4/26/90
Static Pres.,in.WC	-.21	-.21	-.26
Pitot Readings, rms	.734	.759	.673
Gas Temp., deg.F	191	192	191
Flowmeter Ave.,"WC	2.45	2.75	2.34
Gasmeter Av. Temp., deg. F	87	95	99
Sampling Time, min.	72	72	72
Sample Vol., acf	59.962	61.497	59.64
Barom. Pres., in. Hg	28.91	28.87	28.76
Condensate, ml	86	96	72
Desica. Gain, g	14.7	12.5	14.8
GAS COMPOSITION			
CO2, mole fraction	.015	.015	.015
O2, mole fraction	.19	.19	.19
N2, mole fraction	.795	.795	.795
AREAS			
Stack Area, sq.ft.	10.875	10.875	10.875
Nozzle Diameter, in.	.25	.25	.25
Nozz. Area, sq.ft.	.0003409	.0003409	.0003409
CALCULATED RESULTS			
Gas, Dry mol. wt.	29.01	29	29
Gas Dens.,lb/cu ft	.075	.075	.075
Sample vol., dry scf	56.2	56.7	54.4
Gas samp., dry lbs	4.22	4.25	4.08
Water in Samp.,lbs	.222	.239	.191
Water Cont. lbs/lb	.053	.056	.047
Water, volume %	7.8	8.3	7
Water, weight %	5	5.3	4.5
Gas Mol. Wt., Actual	28.15	28.09	28.23
Gas Dens. in stack	.0572	.057	.0571
Stack Gas, acfm	35900	36600	34400
Stack Gas, lbs/hr	123200	125200	117900
St. Gas, lbs/hr dry	117000	118600	112600
St. Gas, scfm,dry	26000	26360	25020
Percent Isokinetic	95.8	95.3	94.3

3.0 TEST PROGRAM & PROCESS DESCRIPTION

Test Program & Process Description

The plant is a bituminous Barber Green batch plant. The exhaust gases from the dryer are passed through a model JA 960 DA continous duty jet-aire pulse jet baghouse dust collector, consisting of the following: 960 bags 4 inch diameter by 99 inches long, made of 16 oz. polyester felt with galvanized cages. Cloth area 8,768 square feet. The rated capacity of the plant is [illegible] ton per hour. The actual operating rate is not expected to exceed 264 T.P.H. The operating rate during stack test was 264 T.P.H. The two types of aggregate mixes were dried during the emission test. [illegible] with #57 stone 37.2%, #8 stone 29.3%, shot stone 4.6%, with sand 24.3%. ID [illegible] with #8 stone 31.8%, shot stone 15.3%, sand 46.5%, oil 6.5%. Cold feed settings: sand 50%, #8 1B 40%, #57 2B 70% and during tests the magnehelic pressure was 3[illegible]6".

Sampling was conducted at the baghouse outlet as shown in Figure No. 1. A total of 24 sample points were used to traverse the rectangular exit duct. There were three sample ports located equidistant on one side. Eight points were sampled in each port for 3 minutes a point for a total test time of [illegible] minutes for all tests.

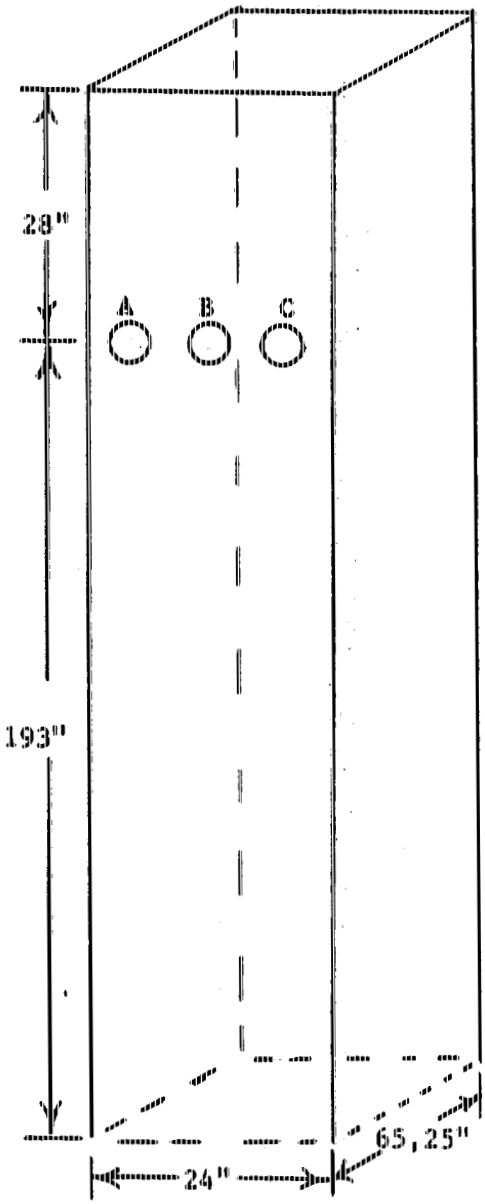
Sampling Procedure

After selecting the sampling site and the minimum number of traverse points, the stack pressure, temperature, moisture and range of velocity head were measured according to the procedures described in the Federal Register.*

Approximately 200 grams of silica gel were weighed in a sealed impinger prior to each test. Glass fiber filters (4 inch diameter) were desiccated for at least 24 hours and weighed to the nearest 0.1 mg on an analytical balance. One-hundred ml of distilled water was placed in each of the first two impingers; the third impinger was initially empty; and the impinger containing the silica gel was placed next in series. The sampling train was leak-checked at the sampling site prior to each test run by plugging the inlet to the nozzle and pulling a 15 inch Hg vacuum, and at the conclusion of the test by plugging the inlet to the nozzle and pulling a vacuum equal to the highest vacuum reached during the test run.

A more detailed description of sampling and analytical procedure is given in Appendix B.

*Federal Register, Part 60, App. A, July 1, 1986
**Gelman Glass Fibers, Type 934 AH



3 Sample Ports

8 Points Per Port

24 Total Points

Point Number	Point Location
1	4-1/8"
2	12-1/4"
3	20-3/8"
4	28-1/2"
5	36-3/4"
6	44-7/8"
7	53"
8	61-1/8"

Figure No. 1
Asphalt Plant No. 3 Stack
Latrobe Construction Co.
Ligonier, PA

A. Formulas and Calculations

NOMENCLATURE

A_s = Cross-sectional area of stack, (ft^2).

An = Cross-sectional area of nozzle, (ft^2).

c_s = Concentration of particulate matter in stack gas, dry basis corrected to standard conditions, (g/dscf).

C_p = Pitot tube coefficient.

Dg = Flue gas density (lbs. per acf).

Dgs = Flue gas density at stack conditions (lbs/ft^3).

Er = Emission rate (lbs/hr).

GVw = Gas sample volume weight (lbs).

Hfg = Humidity of flue gas (lbs of H_2O/lb. dry gas).

I = Percent of isokinetic sampling (%).

m_m = Total amount of particulate matter collected, g.

P_{bar} = Barometric pressure at the sampling site, (in. Hg).

P_s = Absolute stack gas pressure, (in. Hg).

P_{std} = Standard absolute pressure, (29.92 in. Hg).

Ps = Static pressure of stack.

Sf = Stack volumetric flow (ACFM).

Swf = Stack weight flow at stack conditions (lbs./hr).

Swfd = Stack weight flow dry basis (lbs./hr).

T_m = Absolute average dry gas meter temperature (^oR).

T_s = Absolute average stack gas temperature (^oR).

std = Standard absolute temperature, (528^oR).

V_m = Volume of gas sample as measured by dry gas meter, (dcf).

$V_{m(std)}$ Volume of gas sample measured by the dry gas meter, corrected to standard conditions, (dscf).

W_{fg} = Water in flue gas sample (lbs. of H_2O).

W_p = Weight of particulate (10^{-3} lbs.).

W_p/g = Pounds of particulate per 1000 lbs. of gas (lbs. particulate/1000 lbs. gas).

Y = Dry gas meter calibration factor.

ΔH = Average pressure differential across the orifice meter (in. H_2O).

θ = Total sampling time, min.

Hemeon Associates, Inc.

Example Calculations for Particulate Emissions

1. Volume of dry gas sampled corrected to standard conditions. Note: V_m must be corrected for leakage if any leakage rates exceed L_a.

$$V_{m_{std}} = 17.65 \times V_m \times Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{Tm} \right]$$

2. Weight of water in flue gas sample (lbs.).

$$Wfg = \frac{(\text{ml condensate} + \text{grams desic. gain})}{(453.6)}$$

3. Water vapor concentration (%).

$$Wvc = \frac{(21.5 \times Wfg \times 100)}{(21.5 \times Wfg + Vmstd)}$$

4. Dry molecular weight of stack gas.

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

5. Stack gas density (lbs./dscf).

$$Dg = \left(\frac{Md}{29}\right) \times .0753$$

6. Stack gas density at stack conditions (lbs./ft.^{3}).

$$Dgs = .0753 \times \left(\frac{Md}{29}\right) \times \frac{Pb + \frac{Ps}{13.6}}{29.92\ in.Hg} \times \left(\frac{528}{Ts^{\circ}R}\right)$$

7. Molecular weight of stack gas.

$$M_s = M_d\ (1-Wvc) + 18\ Wvc$$

8. Stack velocity at stack conditions, fps.

$$V_s = 85.49\ Cp \sqrt{\Delta p}\ \text{avg.} \sqrt{\frac{Ts}{P_s M_s}}$$

9. Actual volumetric flow rate (ACFM).

$$Sf = \frac{1096.7 \times Cp \times \sqrt{\Delta P(RMS)} \times As}{\sqrt{Dgs}}$$

10. Stack weight flow at stack conditions (lbs./hr.).

$$Swf = Sf \times Dgs \times 60$$

11. Gas sample weight (lbs.).

$$Gsw = Vmstd \times Dg$$

12. Humidity of flue gas (lbs. of H_2O/lbs. dry gas).

$$Hfg = \left(\frac{Wfg}{Gsw}\right)$$

13. Stack weight flow on dry basis (lbs./hr).

$$Swfd = \left(\frac{SWf}{1 + Hfg}\right)$$

14. Stack volumetric flow at standard conditions (SCFM).

$$Sfs = \left(\frac{SWfd}{60 \times Dg}\right)$$

15. Isokinetic sampling rate (%).

$$I = \left(\frac{Vmstd \times As \times 100}{Sfs \times An \times 0}\right)$$

16. Weight of particulate (10^{-3} lbs.).

Wp = (M_m wt. grams) x 2.2046

17. Pounds of particulate per 1000 lbs. of gas (lbs. part./1000 lbs. gas).

$$(Wp/g) = \left(\frac{Wp}{GVw}\right)$$

18. Concentration of particulate in stack, dry basis corrected to standard conditions (g/dscf).

$$Co = \left(\frac{7}{Vm\ std}\right) x\ Wp$$

19. Particulate emission rate (lbs./hr.)

$$Er = Swfd \times \left(Wp/g\right) \times 10^{-3}$$

Hemeon Associates, Inc. report of 5/3/90
to Latrobe Construction Co., Inc., Latrobe, PA

TABLE NO. 3

CALCULATION OF ALLOWABLE EMISSION RATE

Allowable Emission Formula

A = $0.76E^{0.42}$, where:
A = Allowable emissions in pounds per hour
E = Emission index = F x W tons per hour
F = Process factor in pounds per unit, and
W = Production or charging rate in units per hour

Allowable Emission Rate, A = .76 $(W \times F)^{0.42}$

Not Feed ? - should be aggregate feed

Test No.1 & No.2

Date: April 26, 1990
Average [redacted] Rate: 264 tons/hr.

Allowable Emission Rate, A = .76 $(W \times F)^{0.42}$
A = .76 $(264 \times 6)^{0.42}$
A = 16.776 lbs/hr

Test No.3

Date: April 27, 1990
Average Production Rate: 264 tons/hr.

Allowable Emission Rate, A = .76 $(W \times F)^{0.42}$
A = .76 $(264 \times 6)^{0.42}$
A = 16.776 lbs/hr

STACK GAS FLOW AND PARTICULATE EMISSIONS

Test No.	1	2	3
Date	4/25/90	4/25/90	4/26/90
Overall sampling period	7:22 AM 8:54 AM	9:57 AM 11:21 AM	9:59 AM 11:45 AM
Net sampling time, min.	72	72	72
STACK GAS			
Temperature, deg. F	191	192	191
Flow rate:			
Actual lbs/hr	123200	125200	117900
Dry basis lbs/hr	117000	118600	112600
Acfm	35900	36600	34400
Scfm, dry	26000	26360	25020
PARTICULATE MATTER			
Concentration			
Dry Basis:			
Lbs dust per 1000 lb gas	.008	.006	.009
Grains per scf	.004	.003	.005
DUST EMISSION RATE, lbs/hr	.936	.712	1.013

B. Test Methodology

DETERMINATION OF PARTICULATE EMISSIONS
EPA METHOD 5

The following method was used in this test program. Sampling procedures follow those described in Method 5 of the Federal Register* and Department of Environmental Resources**.

SAMPLING APPARATUS

The particulate sampling train used in these tests at the exit stack met certain design specifications established by the Federal EPA and was assembled by Hemeon personnel. It consisted of:

Nozzle - Stainless steel (316) with sharp, tapered leading edge and accurately measured round opening.

Probe - Glass lined with a heating system capable of maintaining a minimum gas temperature of 250°F at the exit end during sampling.

Pitot Tube - Type S pitot tube that met all geometry standards was used to monitor stack gas velocity.

Filter Holder - Pyrex glass with heating system capable of maintaining a filter temperature of approximately 250°F.

Draft Gauge - An inclined manometer made by Dwyer with a readability of 0.01 inches H_2O in the 0-1 inch range was used.

Impingers - Four impingers connected in series with glass ball joints. The first, third and fourth impingers were of the Greensburg-Smith design, modified by replacing the tip with a 1/2 inch I.D. glass tube extending to 1/2 inch from the bottom of the flask.

Metering System - Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, calibrated dry gas meter, and related equipment, to maintain an isokinetic sampling rate and to determine sample volume. The dry gas meter is made by Rockwell and the fiber vane pump is made by Gast.

Barometer - Aneroid type to measure atmospheric pressures to ±0.1 inch Hg.

*Federal Register, CFR 40, Part 60, July 1, 1987
**D.E.R. Source Testing Manual, January 1983

SAMPLING PROCEDURE - PARTICULATE

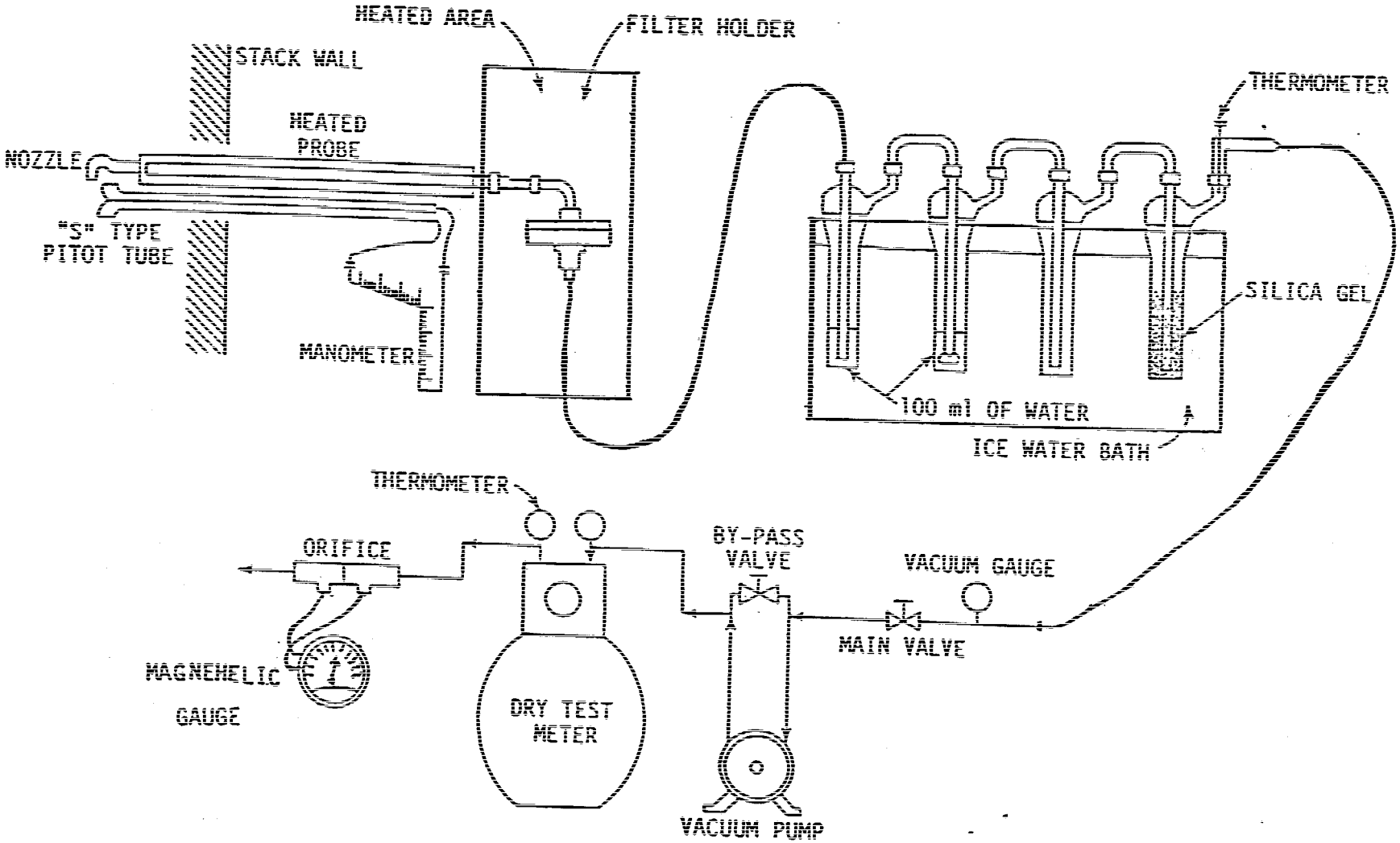
After selecting the sampling site and the minimum number of traverse points, the stack pressure, temperature, moisture and range of velocity head were measured according to the procedures described in the Federal Register.

Approximately 200 grams of silica gel were weighed in a sealed impinger prior to each test. Glass fiber filters* (4 inch diameter) were desiccated for at least 24 hours dried at 105°C for two hours and weighed to the nearest 0.1 mg on an analytical balance. One-hundred ml of distilled water was placed in each of the first two impingers; the third impinger was initially empty; and the impinger containing the silica gel was placed next in series. The train was set up with the probe as shown in Figure A-1. The sampling train was leak-checked at the sampling site prior to each test run by plugging the inlet to the nozzle and pulling a 15 inch Hg vacuum, and at the conclusion of the test by plugging the inlet to the nozzle and pulling a vacuum equal to the highest vacuum reached during the test run.

The pitot tube and lines were leak-checked at the test site prior to and following the initial velocity traverse. The check is made by blowing into the impact opening of the pitot tube until 3 or more inches of water are recorded on the manometer and then capping the impact opening and holding it for 15 seconds to assure it was lake free. The static pressure side of the pitot tube was leak-checked using the same procedure, except suction was used to obtain the 3 inch H_2O manometer reading. Crushed ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at 68°F or less.

During sampling, stack gas and sampling train data were recorded at each sampling point and when significant changes in stack flow conditions occurred. Isokinetic sampling rates were set throughout the sampling period with the aid of isokinetic sampling equations. All sampling data was recorded on the Particulate Field Data Sheet.

*Federal Register, CFR 40, Part 60, July 1, 1986
**Glass fiber filters, Type 934 AH



Particulate sampling train

SAMPLE RECOVERY PROCEDURE

The sampling train was moved carefully from the test site to the cleanup area. Samples of the acetone and distilled water used in the sample recovery were taken for use as blanks. The volume of water from the first three impingers were measured. Sample fractions were recovered as follows:

Container No. 1 - The filter was removed from its holder and placed in a petri dish and sealed.

Container No. 2 - Loose particulate and water washings from all sample-exposed surface prior to the filter were placed in a sample container, sealed and labeled. Particulate was removed from the probe with the aid of a brush and water rinsing. The liquid level was marked after the container was sealed.

Container No. 3 - Loose particulate and acetone washings from all sample-exposed surface prior to the filter were placed in a glass jar, labeled and sealed. Particulate was removed from the probe with the aid of a brush and acetone rinsing. The liquid level was marked after the container was sealed.

Container No. 4 - A minumum of 200 ml of acetone was taken for the blank analysis. The blank was obtained and treated in a similar manner as the acetone washing.

Container No. 5 - Distilled water in the impinger section of the sampling train was placed in a sample container. The impingers and connecting glassware were rinsed with distilled H_2O and this rinse added to the container for shipment to the laboratory.

Container No. 6 - Acetone washings from all sample-exposed surfaces in the impingers were placed in a sample container, labeled and sealed. The liquid level was marked after the container was sealed.

Container No. 7 - A minimum of 200 ml of distilled water was taken for the blank analysis. The blank was obtained and treated in a similar manner as the water rinse.

The silica gel from the fourth impinger was weighed and the gain recorded on the Sample Recovery Data Sheet with other pertinent data.

ANALYTICAL PROCEDURES

The following procedures were used and follow the methods prescribed by the Department of Environmental Resources.*

Container No. 1 - The filter and any loose particulate matter from this sample container were placed into a tared glass weighing dish, dried at 105°C, desiccated for 24 hours to a constant weight and weighed to the nearest 0.1 mg.

Container No. 2 - The distilled water washings were transferred to a tared beaker and evaporated to dryness at 105°C temperature and pressure, desiccated for 24 hours to a constant weight and weighed to the nearest 0.1 mg.

Container No. 3 - The acetone washings was transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure, desiccated for 24 hours to a constant weight and weighed to the nearest 0.1 mg.

Container No. 4 - The acetone blank was transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure. The blank was then desiccated 24 hours to a contant weight and weighed to the nearest 0.1 mg.

Container No. 5 - The contents of this container were filtered through tared (0.8u - 0.22u) filters to remove insouluble particulate. The filters and filtrates were put in tared beakers, evaporated to dryness at 105°C, desiccated to constant weight and weighed on an analytical balance to nearest 0.1 mg.

Container No. 6 - The contents of this container were evaporated to dryness at ambient temperature and pressure, desiccated to constant weight and weighed on an analytical balance to the nearest 0.1 mg.

Container No. 7 - The distilled water blank was transferred to a tared beaker and evaporated to dryness at 105°C. The blank was then desiccated to a constant weight and weighed on an analytical balance to the nearest 0.1 mg.

The term "constant weight" means a difference of no more than 0.5 mg or 1% of total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

*D.E.R. Source Testing Manual, January, 1983

C. Field Data Sheets

HEMEON ASSOCIATES, INC.
Particulate Field Data Sheet

Plant Sample Case City Grand Rapids Operator Bill Phillips
Location Manhole 2 Test no. 4
Stack diam. 48" Desiccant no. 0415 Filter no. 4455
Pitot coeff. .84 Pitot number 3 Meterbox number 1.5F Meterbox Cal(Y) 1.02 Nozz. Dia .42" Nozz. I.D. .425

Trav. point no.	Velocity Head (ΔP) in. H_2O	Stack temp. degrees F	Orifice ΔH Uncorr. in. (H_2O)	Orifice ΔH Corr. for moist. in.(H_2O)	Clock time	Sample time min	Vacuum "Hg	Meter reading cu. ft.	Meter temperature degrees F In	Meter temperature degrees F Out	Temperature Probe	Temperature Filter box	
Init	xx		xx	Factor (.75)	2:22	0	xx	598.350	xx	xx	0.0	0.0	
1	.55	152		.2	2:25	3	40	601.5	72	69	73	150	
2	.64	162		0.2	2:28	6	40	604.5	74	68	80	152	
3	.64	165		0.2	2:31	9	40	607.5	82	68	84	154	
4	.60	170		2.0	2:34	12	40	610.5	83	68	86	154	
5	.66	168		2.2	2:37	15	40	613.5	82	70	90	156	
6	.65	165		2.2	2:40	18	40	616.5	80	70	92	156	
7	.65	167		0.2	2:43	21	40	619.5	82	70	95	158	
8	.63	162		0.0	2:46	24	40	622.5	82	72	93	158	
9	.63	161		2.1	2:49	27	40	625.5	82	72	94	160	
10	.59	159		2.0	2:52	30	40	628.5	82	74	94	160	
11	.59	159		0.2	2:55	33	40	631.5	82	72	95	160	
12	.59	159		2.0	2:58	36	40	634.5	82	74	95	160	
Summary	0.734	191		2.45		72	40	655.5	87				

Ambient temp. 52 °F
Bar. Pres. 29.92 in. Hg
Stac. Pres -.02 in. Hg

IMPINGER WATER
Final 482 ml
Init. 400 ml
Cond. 82 ml

DESICCANT
Final 420.9 gms
Init. 406.2 gms
Gain 14.7 gms

ORSAT ANALYSER

	Trip		
CO_2	5.5	5.5	5.5
O_2	12.2	12.2	12.2
CO			

Final leak rate .02 cfm at 12.2 in. Hg

Observations

HEMEON ASSOCIATES, INC.
Particulate Field Data Sheet

Plant [illegible] City [illegible] Operator [illegible]
Location ____________________ Test No. [illegible] Date [illegible]
Stack dimen. [illegible] Desiccant no. [illegible] Filter no. [illegible]
Pitot coeff. [illegible] Pitot no. 2 Meterbox number [illegible] Meterbox (Cal.(Y)) [illegible] Nozz. Diam. 1/4" Nozz. I.D. [illegible]

Trav. point no.	Velocity Head (ΔP) (in.) H_2O	Gas temp. °F	Orifice ΔH Uncorr. in. (H_2O)	Orifice ΔH Corr. for moist. in(H_2O)	Clock time	Sample time, mins	Vacuum, " Hg	Meter reading cu. ft.	Meter Temperature Degrees F In	Meter Temperature Degrees F Out	Temperatures °F Probe	Filter box	Last impinger
Init.	xx	xx	xx	Factor (.75)	8:15	36	xx		xx	xx			
[illegible]	1.15	188		3.5	8:18	39	1.1	918.182	104	75	159	158	48
6	1.15	194		3.8	8:21	42	1.4	921.220	111	76	157	158	48
7	1.35	111		4.0	8:24	45	1.1	924.240	112	78	154	157	48
8	1.45	183		4.5	8:27 / [illegible]	48	1.8	927.261	111	80	152	157	48
C1	.45	192		1.3	[illegible] / 8:31	51	1.0	929.225	114	80	159	151	48
2	.44	110		1.4	8:34	54	1.0	931.230	114	81	151	152	48
3	.25	115		1.1	8:37	57	1.0	934.35	118	81	150	152	48
4	.92	111		1.7	8:40	60	1.0	[illegible]	109	83	154	159	48
5	1.15	183		3.5	8:43 / 8:44	63	1.1	939.22	110	84	157	150	48
6	1.25	184		3.8	8:49	66	1.3	[illegible]	114	85	155	150	48
7	1.50	186		4.7	8:51	69	2.1	[illegible]	117	86	152	147	48
8	1.45	181		5.1	8:54 / [illegible]	72	2.5	950.144	118	87	151	149	48

HEMEON ASSOCIATES, INC.
Particulate Field Data Sheet

Plant [illegible] City [illegible] Operator [illegible]
Location [illegible] Test no. [illegible] Date [illegible]
Stack dimen. [illegible] Desiccant no. [illegible] Filter no. [illegible]
Pitot coeff. [illegible] Pitot number [illegible] Meterbox number [illegible] Meterbox Cal(Y) [illegible] Nozz. Dia. [illegible] Nozz. I.D. [illegible]

Trav. point no.	Velocity Head (ΔP) (In.) H_2O	Gas Temp. Degrees F	Orifice ΔH Uncorr. In. (H_2O)	Orifice ΔH Corr. for moist. In.(H_2O)	Clock time	Sample time min.	Vacuum "Hg	Meter reading cu. ft.	Meter temperature degree F In	Meter temperature degree F Out	Temperature Probe	Temperature Filter box	Temperature Le ine
Init	xx		xx	Factor (.22)	2:50	0	xx	250.	xx	xx			
1	.45	94		.2	2:55	5	4.0	255.	90	90	260	259	260
2	.47	94		.2	3:00	5	4.0	260.	90	90	260	260	260
3	.44	93		.2	3:05	5	4.0	265.	90	90	259	260	260
4	.45	93		.2	3:10	5	4.0	270.	90	90	259	259	260
5	.420	92		.3	3:15	5	4.0	275.	90	90	259	259	260
6	.45	90		.2	3:20	5	4.0	280.	90	90	259	259	260
7	.42	91		.2	3:25	5	4.0	285.	90	90	259	259	260
8	.43	92		.2	3:30	5	4.0	290.	90	90	259	259	260
9	.39	92		.2	3:35	5	4.0	295.	90	90	259	259	260
10	.44	93		.2	3:40	5	4.0	300.	90	90	259	259	260
11	.44	93		.2	3:45	5	4.0	305.	90	90	259	259	260
12	.39	92		.2	3:50	5	4.0	310.	90	90	259	259	260
Summary	0.759	192		2.75		72	48.0	252.	95	95			

Ambient temp. [illegible] °F
Bar. Pres. [illegible] In. HG
Stat. Pres. [illegible] In. WG

IMPINGER WATER
Final [illegible] ml
Init. [illegible] ml
Cond. [illegible] ml

DESICCANT
Final [illegible] gms
Init. 104.8 gms
Gain [illegible] gms

ORSAT ANALYSES

Time			
CO_2	[illegible]	[illegible]	[illegible]
O_2	[illegible]	[illegible]	[illegible]
CO			

Final leak rate [illegible] cfm at [illegible] in. Hg

[illegible]

HEMEON ASSOCIATES, INC.
Particulate Field Data Sheet

Plant _____ City _____ Operator _____
Location _____ Test No. _____ Date _____
Stack dimen. _____ Desiccant no. _____ Filter no. _____
Pitot coeff. _____ Pitot no. _____ Meterbox number _____ Meterbox (Cal.(Y) _____ Nozz. Dim. _____ Nozz. I.D. _____

Trav. point no.	Velocity Head (ΔP) in. H_2O	Gas temp. °F	Orifice Uncorr. in. (H_2O)	Orifice ΔH Corr. for moist. in(H_2O) Factor (.62)	Clock time	Sample time, min	Vacuum, " Hg	Meter reading cu. ft.	Meter Temperature Degrees F In	Meter Temperature Degrees F Out	Temperature °F Probe	Temperature °F Filter box	Temperature °F Last impinger
Indic.	xx	xx	xx				xx		xx	xx			
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													

HEMEON ASSOCIATES, INC.
Particulate Field Data Sheet

Plant Lake Side Gen. City Spring Lake Operator [illegible]
Location [illegible] Test no. 4 Date [illegible]
Stack dimen. 24 x 15.5 Desiccant no. 225 Filter no. 2252
Pitot coeff. .84 Pitot number 5 Meterbox number 5BC Meterbox Cal(Y) 1.002 Nozz. Dim .4 Nozz. I.D. .405

Trav. point no.	Velocity Head (ΔP) (in.) H_2O	Gas temp. degrees F	Orifice ΔH Uncorr. in. (H_2O)	Orifice ΔH Corr. for moist. in.(H_2O)	Clock time	Sample time min	Vacuum "Hg	Meter reading cu.ft.	Meter temperature degrees F In	Meter temperature degrees F Out	Temperatures C Probe	Temperatures C Filter box	Temperatures C Impinger exit
Init	xx		xx	Factor (ΔH@)	2:59	0	xx	52.[illegible]	xx	xx			
1	.65	64		.50	4:04	5	2	57.[illegible]	71	72	130	130	76
2	.65	68		.45	4:09	5	2	62.[illegible]	74	80	134	134	76
3	.65	69		.35	4:14	5	2	67.[illegible]	76	80	130	129	69
4	.68	69		.25	4:19	5	2	72.[illegible]	76	81	132	128	69
5	.64	65		.20	4:24	5	2	77.[illegible]	76	83	134	130	69
6	.62	72		.20	4:29	5	2	82.[illegible]	75	84	143	142	69
7	.62	72		.25	4:34	5	2	87.[illegible]	74	82	134	130	69
8	.65	70		.30	4:39	5	3	92.[illegible]	77	85	134	130	69
9	.65	70		.40	4:44	5	2	97.[illegible]	77	85	135	132	69
10	.65	70		.40	4:49	5	2	102.[illegible]	77	85	135	132	69
11	.65	70		.40	4:54	5	2	107.[illegible]	77	85	135	132	69
12	.65	70		.40	4:59	5	2	112.[illegible]	77	85	135	132	69
Summary	0.673	191		2.34		72	2.03	125.[illegible]	75.99				

Ambient temp. 72 °F
Bar. Press. 29.21 in.Hg
Stat. Press -.05 in.WC

IMPINGER WATER
Final 222 ml
Init. 200 ml
Cond. 22 ml

DESICCANT
Final 418.9 gms
Init. 404.1 gms
Gain 14.8 gms

ORSAT ANALYSES

Time			
CO_2	0.0	0.0	0.0
O_2	20.2	20.2	20.2
CO			

Final leak rate .000 cfm at 4.0 in. Hg

Equipment problems

HEMEON ASSOCIATES, INC.
Particulate Field Data Sheet

Plant [illegible] Co. City [illegible] Operator [illegible]
Location [illegible] Test No. [illegible] Date [illegible]
Stack diam. [illegible] Deiccant no. [illegible] Filter no. [illegible]
Pitot coeff. .84 Pitot no. [illegible] Meterbox number [illegible] Meterbox (Cal.(Y) .982 Nozz. Diam. .24" Nozz. I.D. .245"

Trav. point no.	Velocity Head (ΔP) (in.) H_2O	Gas temp. °F	Orifice ΔH Uncorr. in.(H_2O)	Orifice ΔH Corr. for moist. in.(H_2O) Factor (.98)	Clock time	Sample time, min	Vacuum, " Hg	Meter reading cu.ft.	Meter Temperature Degrees F In	Meter Temperature Degrees F Out	Temperatures °F Probe	Temperatures °F Filter box	Temperatures °F Impinger
Init.	xx	xx	xx				xx		xx	xx			
1	.32	65		.3	[illegible]	3		[illegible]	[illegible]	81	[illegible]	[illegible]	[illegible]
2	.32	65		.4	[illegible]	6		[illegible]	[illegible]	81	[illegible]	[illegible]	[illegible]
3	.34	64		.2	[illegible]	9		[illegible]	[illegible]	80	[illegible]	[illegible]	[illegible]
4	.35	64		.4	[illegible]	12		[illegible]	[illegible]	79	[illegible]	[illegible]	[illegible]
5	.36	64		.3	[illegible]	15		[illegible]	[illegible]	79	[illegible]	[illegible]	[illegible]
6	.34	64		.3	[illegible]	18		[illegible]	[illegible]	79	[illegible]	[illegible]	[illegible]
7	.32	63		.3	[illegible]	21		[illegible]	[illegible]	79	[illegible]	[illegible]	[illegible]
8	.32	63		.3	[illegible]	24		[illegible]	[illegible]	79	[illegible]	[illegible]	[illegible]
9	.33	63		.3	[illegible]	27		[illegible]	[illegible]	79	[illegible]	[illegible]	[illegible]
10	.33	63		.3	[illegible]	30		[illegible]	[illegible]	79	[illegible]	[illegible]	[illegible]
11	.33	63		.3	[illegible]	33		[illegible]	[illegible]	79	[illegible]	[illegible]	[illegible]
12	.33	63		.3	[illegible]	36		[illegible]	[illegible]	79	[illegible]	[illegible]	[illegible]

Keith Gastwirth

DRY GAS METER CALIBRATION DATA FORM

Test numbers _____ Date 15 March 90 Meter box number PAC 2518 Plant _____

Barometric pressure, P_b = 29.27 in. Hg Dry gas meter number 2211009 Pretest Y 1.009

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$
4.0	10.020	10.555	74	92	94	110.5	32. 499	4.4	1.009	
4.0	10.020	10.554	74	94	98	112	33. 320	4.4	1.007	
4.0	10.020	10.549	74	97	100	113.5	34. 992	4.4	1.008	
									Y = 1.007	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ±0.05Y

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Hemeon Associates, Inc.
125 Thirty-Ninth Street
Pittsburgh, PA 15201

PITOT TUBE CALIBRATION DATA

Calibration pitot tube: type S size (OD) 3/8" ID number Cadger

Type S pitot tube ID number ____ $C_{p(std)}$ = 0.84

Calibration: date 10/20/82 performed by RCO/REA

A - Side Calibration

Δp_{std} cm H_2O (in. H_2O)	Δp_s cm H_2O (in. H_2O)	a $C_{p(s)}$	b DEV.
2.50	2.48	2.82	1.02
2.20	2.20	2.85	0
2.40	2.38	2.82	1.02
	Average	2.83	0.005

B - Side Calibration

Δp_{std} cm H_2O (in. H_2O)	Δp_s cm H_2O (in. H_2O)	$C_{p(s)}$	DEV.
2.40	2.42	2.82	1.02
2.20	2.20	2.85	0
2.40	2.38	2.82	1.02
	Average	2.83	0.03

[a] $C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta p_{std}}{\Delta p_s}}$ = 0.84

[b] DEV = $C_{p(s)} - \bar{C}_p$ (must be ≤0.01)

$C_p(A) - C_p(B)$ = 0 (must be ≤0.01)

Ransom Associates, Inc.
125 Thirty-Ninth Street
Pittsburgh, PA 15201

Hemeon Associates, Inc. report of 5/3/90
to Latrobe Construction Co., Inc., Latrobe, PA

D. Laboratory Data

SAMPLE WEIGHTS AND DUST CONCENTRATION

Test No.	1	2	3
Test Date	4/25/90	4/25/90	4/26/90
Filter No.	120503	120504	120506
*Impinger Solut'n Sol.,mg	.39	.4	7.09
Impinger Solut'n, Insol.,mg	1.82	2.62	2.38
Probe Rinse, Acetone, mg	7	4.4	8.5
Probe Rinse, Water, mg	3.1	1.5	2.7
Filter Tare, mg	651.5	660.1	681.6
Filter + Sample, mg	655.7	663.7	685.4
Filterable sample, mg	4.2	3.6	3.8
Total Sample, mg	16.12	12.12	17.38
Sample Gas Volume scf	56.2	56.7	54.4
Sample Gas Weight, lbs	4.22	4.25	4.08
PM Conc., #/1000 #gas	.009	.007	.01
PM Conc., gr/dry scf	.004	.003	.005

* DATA NOT USED IN CALCULATIONS

TABLE I
TOTAL SOLIDS ANALYSIS
HEMEON ASSOCIATES, INC.
125 THIRTY-NINTH STREET
PITTSBURGH, PA 15201
PURCHASE ORDER # 3390 LATROBE CONSTRUCTION
SAMPLES RECEIVED: APRIL 27, 1990

HEMEON SAMPLE NUMBER	AQS LABORATORY NUMBER	SAMPLE TYPE	SAMPLE VOLUME MILLILITER	TOTAL SOLIDS MILLIGRAMS
7286	53924	ACETONE	77	7.0
7287	53925	ACETONE	57	4.4
7288	53926	ACETONE	80	8.5
7298	53927	ACETONE	98	2.0
7289	53928	WATER	96	3.1
7290	53929	WATER	89	1.5
7291	53930	WATER	94	2.7
7299	53931	WATER	103	1.0

THE SAMPLES WERE WEIGHED ON A BALANCE CALIBRATED WITH WEIGHTS TRACEABLE TO THE NATIONAL BUREAU OF STANDARDS.
THE DATA HAS NOT BEEN CORRECTED FOR THE BLANK.

AMR QUALITY SERVICES, INC.

JOB 2344

TABLE II
ANALYSIS OF SAMPLES FOR SOLUBLE-INSOLUBLE SOLIDS
HEMBON ASSOCIATES, INC.
125 THIRTY-NINTH STREET
PITTSBURGH, PA 15201
PURCHASE ORDER # 3390 LATROBE CONSTRUCTION
SAMPLES RECEIVED: APRIL 27, 1990

HEMBON SAMPLE NUMBER	AQS LABORATORY NUMBER	SAMPLE VOLUME MILLILITERS	INSOLUBLE SOLIDS MILLIGRAMS	SOLUBLE SOLIDS MILLIGRAMS
7292	53932	330	1.62	0.39
7293	53933	340	2.62	0.40
7294	53934	335	2.36	7.09

THE FILTERS WERE WEIGHED ON A MICRO BALANCE CALIBRATED WITH WEIGHTS TRACEABLE TO THE NATIONAL BUREAU OF STANDARDS.
THE DATA HAS NOT BEEN CORRECTED FOR A BLANK.

MGR QUALITY SERVICES, INC.

JOB 2344

E. Process Data

May, 3 1990

To: John C. Perry

Kamcon Associates Inc.

125 39th St.

Pittsburgh, Pa. 15201

The plant is a Mitsubishi Barber Green batch plant.

The exhaust gases from the dryer are passed through a model JA 960 RA continous duty jet-aire pulse jet baghouse dust collector, consisting of the following: 960 bags 4inch diameter x 99 inches long, made of 16oz polyester felt with galvanized cages.

Cloth area 8768 square foot.

The rated capacity of the plant is 300 ton per hour. The actual operating rate is not expected to exceed 264 T.P.H. The operating rate during stack test was 264 T.P.H.

The two types of aggregate mixes were dried during the emission test. ID#2 Binder with #57 stone 37.2%, #8 stone 29.3 % , shot stone 4.6 %, with sand 24.3 %.

ID#2 Top with #8 stone 31.8 %, shot stone 15.3 %, sand 46.5 %, oil 6.5 % .

Cold feed settings : sand 50 %, #8 13 40 %, #57 29 70%.

During tests the magnahelic pressure was 3 % to 3.5 %.