Commonwealth of Pennsylvania
Environmental Resources
September 25, 1990

Subject: Stack Test Review

To: Data File
McMinn's Asphalt Products, Inc.
Lancaster County

From: Rick Begley
Air Pollution Control Engineer
Division of Technical Services and Monitoring
Bureau of Air Quality Control

Through: Chief, Source Testing and Monitoring Section

McMinn's Asphalt Products, Inc. operates a 300 tons per hour, gas or oil fired, batch type asphalt plant at the above location. The plant produced an average of 190 tons per hour of asphalt and was fired with No. 2 fuel oil during the observed period.

Cold aggregate feed is transported by a conveyor to a rotary dryer that is nine feet in diameter and 34 feet long. The aggregate is then transported by an elevator to the stackup tower where it passes through screens, an upper hot bin, a lower hot bin, a weigh hopper, a mixer where the oil is injected, and finally to an asphalt truck.

Air flow at 56,000 ACFM and 250 degrees fahrenheit passes through the rotary dryer and is directed to a knock out box, a MeCarter fabric collector, and finally discharged to the atmosphere by an exhaust fan through a 48 inch diameter stack that extends to a point approximately 33 feet above grade. Fugitive emissions from the stackup tower are collected and directed through the baghouse with the rotary dryer effluent.

The MeCarter fabric collector, Model MeC-648-8, has one compartment that contains 648 felted, 14 ounces per square yard, Nomex bags for an air-to-cloth ratio of 6.54.

The bags are cleaned with a reverse pulse jet activated by a timer and the design pressure drop is 4 to 5 inches WG. Particulate matter collected is stored in a silo and eventually injected into the mixer.

Three method five particulate tests were performed by personnel from Gilbert/Commonwealth Inc. on the stack serving the fabric collector to demonstrate NSPS compliance. The tests were conducted with a pre-approved protocol and found to be acceptable to the Department.

The following test results were extracted from the test report:

Run	1	2	3
Volumetric flow rate (DSCF/hr)	978,820	1,098,360	1,051,560
Rated Capacity (T/hr)		300	
Tested Rate (T/hr)	193	195	192
Actual Concentration gr/DSCF	0.014	0.009	0.006
Actual Emission Rate (lb/hr)	1.79	1.47	0.89
Allowable Concentration (gr/DSCF)*	0.04		

*Per New Source Performance Stands, Subpart I, 40 CFR 60.90-60.93

ccs Kanubhai Patel - Hbg. Regional Office
File 36-303-0024
Reading File

RBstaw

September 4, 1990

Subject: Stack Test Review
Bituminous Concrete Plant
McMinn's Asphalt Products, Inc.
Paradise Township, Lancaster County

To: L. Blaine DeHaven, Chief
Source Testing & Monitoring Section
Division of Technical Services & Monitoring

RECEIVED
SEP 6 1990
BUR AIR QUALITY CONTROL
DIV OF TECH SERVICES

From: Kanubhai K. Patel
Air Pollution Control Engineer

Please review the attached test report submitted by Gilbert/Commonwealth for stack test performed on July 17, 1990 for the measurement of particulate matter emissions generated from the bituminous concrete plant. The construction of the plant was approved under the plan approval #36-303-024. A copy of plan approval and a review memo was sent on June 12, 1990. The source is subject to NSPS as per §60.90, Part 60, Subpart I - Standards of Performance for Asphalt Concrete Plants.

If you need any additional information, please contact me.

RLD
9/26

SOURCE SAMPLING REPORT FOR MEASUREMENT OF PARTICULATE EMISSIONS

MCMINN'S ASPHALT PRODUCTS, INC.
PARADISE FACILITY
BATCH ASPHALT PLANT

G/C, INC., REPORT E-04-6196-000
AUGUST, 1990

SOURCE SAMPLING REPORT FOR MEASUREMENT OF PARTICULATE EMISSIONS

MCMINN'S ASPHALT PRODUCTS, INC.
PARADISE FACILITY
BATCH ASPHALT PLANT

G/C, INC., REPORT R-04-6196-000
AUGUST, 1990

PREPARED BY

GILBERT/COMMONWEALTH, INC.
P.O. BOX 1498
READING, PENNSYLVANIA 19603

STEVEN C. POLK
MANAGER
TESTING SERVICES GROUP

Gilbert/Commonwealth, Inc. engineers and consultants
P.O. Box 1498, Reading, PA 19603-1498/Telephone 215-775-2600 Cable Gilasoc/Telex 836-431

August 15, 1990

Mr. Marvin Lowmaberry
McMinn's Asphalt Products, Inc.
P.O. Box 4666
Lancaster, PA 17604

Attention: Mr. Marvin Lowmsberry

Re: Submittal of Source Sampling Report for
Measurement of ParticulateEmissions and
Determination of Visible Emissions
Asphalt Facility
G/C, Inc., Report R-04-6196-000

Dear Mr. Lowmsberry:

We are pleased to submit six copies of our Report R-04-6196-000, dated August 1990. This report contains results of source sampling for particulate and visible emissions for the asphalt facility exhaust stack located at your Paradise Plant, as conducted on July 17, 1990.

The source sampling program defined by this report incorporates standard sampling procedures. The results of the sampling program are representative of particulate and visible emissions at the stack outlet of the asphalt facility under referenced normal operating conditions.

Information contained in this report and the accompanying Appendices includes field data, and a computer printout of all results developed by the testing program. We have attempted to present this information in a form that is readily discernible and suitable for your continued use.

Gilbert/Commonwealth, Inc., is pleased to have been of service to McMinn's Asphalt Products, Inc. and trusts that this report will meet your complete acceptance.

Very truly yours,

Steven G. Folk
Manager
Testing Services Group

SGF/wjr

FOREWORD

The source sampling program as defined by this report was confined to measurement of particulate emissions and pertinent flue gas characteristics at referenced operating conditions and the visual determination of opacity.

TABLE OF CONTENTS

SECTION 1 - SUMMARY OF TEST RESULTS

A summary of test results from the source sampling program is presented in Table 1. As such, the results are considered representative of emission characteristics from the Asphalt Batch Plant. The results show the Asphalt Batch Plant has an average emission rate of 0.01 Gr/DSCF using PADER Method 5 procedures. The average visible emissions were 1.4% opacity. As such, both the particulate and opacity emission rates are well below the allowable levels of 0.04 Gr/DSCF and 20% respectively.

TABLE 1

SUMMARY OF TEST RESULTS
MCMINN'S ASPHALT PRODUCTS, INC.
PARADISE FACILITY
PARADISE, PA

04-6196-000

DATE			
LOCATION		Stack	
RUN NO.	M-1	M-2	M-3
TIME	0850	1110	1405
OPERATING DATA			
		See Appendix 3	
FLUE GAS CHARACTERISTICS			
DSCFM	14,647	18,306	17,526
ACFM	27,036	34,197	27,298
Temperature, °F	254	282	240
Moisture, %	26.1	24.2	14.2
PARTICULATE EMISSIONS			
Gr/DSCF	0.014	0.009	0.006
Lbs/Hr	1.79	1.47	0.89
Gr/DSCF, Average		0.01	
Gr/DSCF, Allowable		0.04	
VISIBLE EMISSIONS			
Opacity, %	3.6	0.5	0.0

SECTION II - ANALYSIS

1. Introduction

The data presented in this report represents the results of source sampling exhaust emissions at the baghouse location of the Asphalt Batch Plant during referenced operating conditions.

Specific requirements of this source sampling program include the following:

a. Identification of final particulate emissions from the Asphalt Batch Plant.

b. Average flue gas temperature, moisture, and volume of flow at the sampling location.

c. Orsat analysis of flue gas conditions at each point of sampling.

d. Record of pertinent operating conditions during period of the test run.

e. Visible Emission test during the particulate tests.

The sampling program was completed on July 17, 1990, by the Gilbert field test crew, with the assistance of personnel assigned by McMinn's Asphalt Products, Inc.

2. Sampling Program Procedures

To satisfy the objectives established for this project, the sampling program was set-up on a basis of using one test train positioned at the test location and completing three test runs at this location. A test run consisted of a particulate test using PADER approved EPA Method 5, and a visible emissions test using EPA Method 9.

The location and number of sampling ports and traverse points are detailed in Figure 1.

3. Operating Conditions

In the execution of this sampling program, an attempt was made to achieve near normal load for the plant. The amount of product generated was recorded by the operator. This record is included in Appendix 3.

4. Results

Test data developed by each test run, together with analytical results from laboratory analysis of samples generated by the field sampling program, are reproduced in the Appendices included with this report. Information on basic gas characteristics developed by each test run is contained in the printout of the computer program included as Appendix 7.

A summary of pertinent test results and essential information to evaluate test results developed for each test run is included with this report as Table 1.

5. Discussion

5.1 Sampling Conditions

All field sampling work was completed out of doors and subject to prevailing weather conditions; however, there were no interruptions in the operation of individual test trains due to equipment or weather problems.

During the completion of this test program, the plant was maintained near the normal load condition.

5.2 Exhaust Flue Gas Volume and Composition

Test data for measurement of exhaust flue gas volume and related velocities developed by traversing of the stack show that the measured gas volumes between tests were consistent with expected values. For purposes of this report, indicated emissions are based on these measured gas volumes.

5.3 Unit Operating Conditions

This sampling program was undertaken as a compliance test program for the asphalt batch plant under representative load operating conditions. In the execution of this program, all applicable operation conditions were referenced.

Operating conditions were monitored throughout the duration of the sampling program by McMinn's personnel.

5.4 Emissions

5.4.1 Particulate

The reported particulate emissions as summarized in Table 1, are expressed as a concentration (grains/DSCF) and emission rate (lbs/hour) as measured.

5.4.2 Visible

The reported visible emissions as summarized in Table 1, are expressed as a percent.

TABLES AND FIGURES

Tables

Figures

TABLE 1

SUMMARY OF TEST RESULTS
MCMINN'S ASPHALT PRODUCTS, INC.
PARADISE FACILITY
PARADISE, PA

04-0196-000

DATE			
LOCATION		Stack	
RUN NO.	M-1	M-2	M-3
TIME	0850	1110	1405
OPERATING DATA			
		See Appendix 3	
FLUE GAS CHARACTERISTICS			
DSCFM	14,647	18,306	17,626
ACFM	27,036	34,197	27,298
Temperature, °F	254	282	240
Moisture, %	26.1	24.2	14.2
PARTICULATE EMISSIONS			
Gr/DSCF	0.014	0.009	0.006
Lbs/Hr	1.79	1.47	0.89
Gr/DSCF, Average		0.01	
Gr/DSCF, Allowable		0.04	
VISIBLE EMISSIONS			
Opacity, %	3.6	0.5	0.0

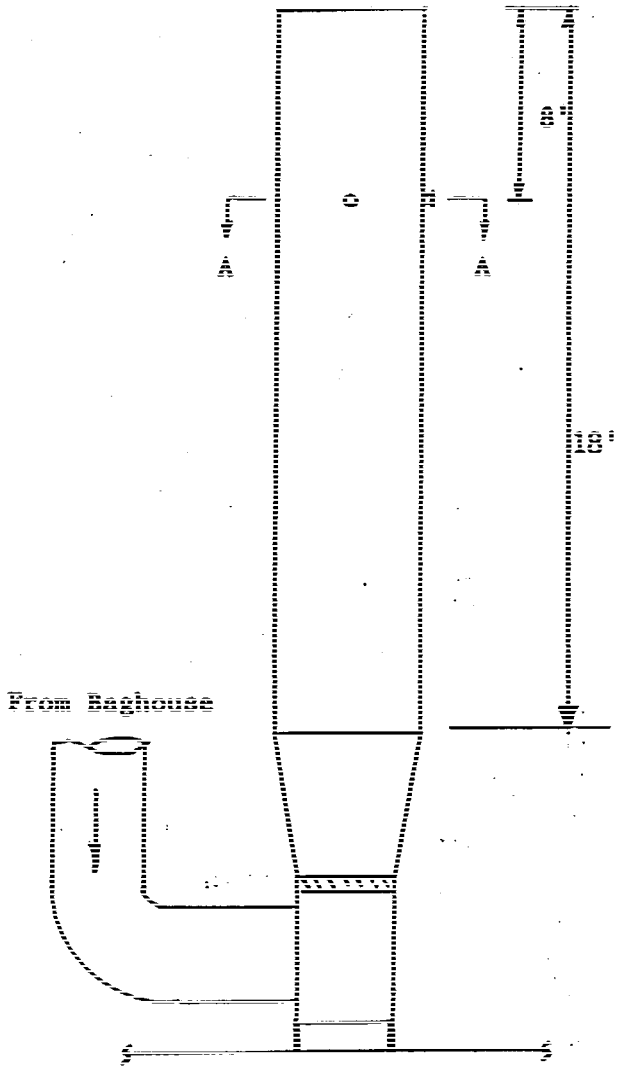
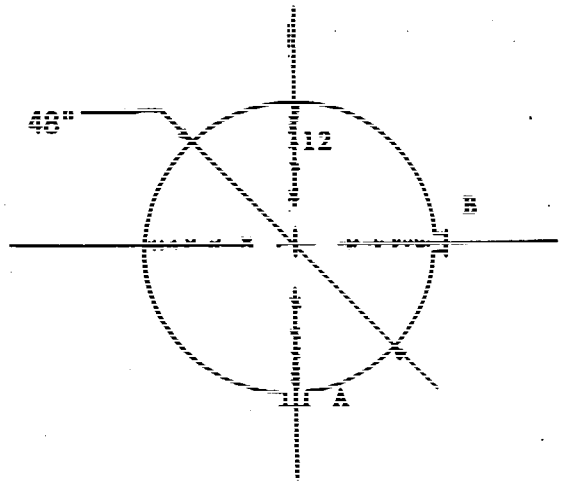


FIGURE 1
SAMPLE PORT AND TRAVERSE POINT LOCATIONS
BAGHOUSE OUTLET STACK
PARADISE ASPHALT PLANT
McMINN'S ASPHALT PRODUCTS, INC.



DETAIL A-A

SAMPLE POINT	DISTANCE FROM PORT, INCHES
1	1.01
2	3.22
3	5.57
4	8.50
5	12.00
6	17.09
7	30.91
8	36.00
9	39.50
10	41.38
11	44.78
12	46.99

SECTION III

APPENDICES

SECTION III - APPENDICES

TABLE OF CONTENTS

APPENDIX 1

PROJECT PARTICIPANTS

APPENDIX I
PROJECT PARTICIPANTS

The following members of Gilbert/Commonwealth's staff participated in the planning and execution of this project and preparation of this report.

Field Sampling Crews

George Albright	Project Coordinator
Gary Helm	Engineering Technician
Jim Conley	Engineering Technician

Laboratory Participants

Vaughan O'Neill	Chemist

All field tests were completed with the assistance of technical personnel from McMinn's.

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.1 STANDARD EPA TEST METHODS

2.2 ACTUAL SAMPLING PROCEDURES/PARTICULATE

2.3 ANALYTICAL METHODS/PARTICULATE

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.1 STANDARD EPA TEST METHODS

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.2 ACTUAL SAMPLING PROCEDURES/PARTICULATE

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.2 ACTUAL SAMPLING PROCEDURES/PARTICULATE

Particulate matter in the exhaust gas stream at both stack sampling locations was sampled according to procedures and type of equipment as basically described in EPA Method 5 (see Appendix 2.1 for a complete description).

In place of the fragile glass material, the in-stack probe liner was constructed of high corrosion resistant Inconel stainless steel, which was enclosed in an outer protective sheath and heat traced to minimize condensation within the probe.

The basic test train consisted of a stainless steel nozzle followed by a heated probe liner, glass fiber filter, and glass impingers with all glass connectors.

The required sampling time for the compliance test, in terms of time per traverse point and overall sampling time per individual test run, was selected on the basis of maintaining a minimum sampling time of 3.5 minutes at each of the traverse points.

The test program was completed with one test train located at the stack. All sampling activities were halted in the event of any test equipment malfunction or at the report of any operational problem.

APPENDIX B

TESTING AND ANALYTICAL PROCEDURES

B.3 ANALYTICAL METHODS/PARTICULATE

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.3 ANALYTICAL METHODS/PARTICULATE

The reported particulate emissions included the total particulate catch from the probe and nozzle water wash, the probe and nozzle acetone wash, the particulate accumulation on the glass fiber filter plus a .22 micron filtration of the impinger water.

The impinger water filtrate and the impinger acetone wash were dried down and weighed. These weights are reported on the laboratory certificate of analysis but are not used to determine particulate emissions.

In the clean-up of the front half of the sampling equipment, the nozzle from the front of the probe was removed, brushed out, and washed with water then acetone. The probe liner was also brushed out and washed with water then acetone. The glass fiber filter was removed from the fritted disc of the filter holder an replaced in its petri dish. All adhering filter particles were removed from the silicone rubber gasket and placed in the same petri dish prior to sealing for transport back to the Gilbert assigned laboratory for final analysis. The filter holder was then washed with water then acetone and combined with the probe and nozzle wash.

The clean-up procedure for the back half of the sampling train initially involved removal of the silica gel from the last impinger and replacement in its original container for final weighing to determine moisture pickup. Water collected in the impingers was measured and placed in a sample bottle. The impingers and glass connectors were rinsed with water. The water rinse was added to the bottle containing the impinger contents. The impingers and glassware were then rinsed with acetone. This rinse was placed in a separate bottle.

Laboratory analysis of samples collected during the test run proceeded according to EPA Method 5 (Appendix 2.1).

APPENDIX B

OPERATING DATA

APPENDIX 3

OPERATING DATA

DATE	TIME	FUEL LEVEL (GALLONS) START	STOP	NET	TONNAGE PRODUCED MIXED	DRAINED (RICE)	TOTAL	CORRESPONDING PARTICULATE RUN
7/17/90	0852-1031	10,100	9,690	410	279	40	319	1
7/17/90	1112-1308	9,281	8,670	611	327	50	377	2
7/17/90	1358-1540	8,461	8,062	399	270	40	310	3

APPENDIX 4

ANALYTICAL RESULTS FOR PARTICULATES

(CLEAN-UP SHEETS)

SSM /Laboratories

SPOTTS, STEVENS and McCOY, INC.
ENGINEERS • PLANNERS • SCIENTISTS

CERTIFICATE OF ANALYSIS

CLIENT: GILBERT/COMMONWEALTH INC
P O BOX 1498
READING PA 19603

REPORT NO: 9040494
P.O. NO.: 52692
DATE REPORTED: August 8, 1990
DATE RECEIVED: July 20, 1990
WORK ORDER NO.:

SAMPLING DATE: BY: CLIENT

SAMPLE DESCRIPTION: STACK

SAMPLE IDENTIFICATION: McMinns
W.O. #04-6196-000

LAB NO.	RUN	PARTICULATE SOURCE	PARTICULATE WT (mg)
9040494-1	M-1	Impinger Water	10.1
9040494-1	M-1	Impinger Water (0.22 um Filter)	0.9
9040494-1	M-1	Impinger Acetone	5.5
9040494-1	M-1	Probe Acetone	7.7
9040494-1	M-1	Probe Water	39.2
9040494-1	M-1	Filter	< 0.1
9040494-2	M-2	Impinger Water	5.7
9040494-2	M-2	Impinger Water (0.22 um Filter)	1.7
9040494-2	M-2	Impinger Acetone	2.4
9040494-2	M-2	Probe Acetone	7.6
9040494-2	M-2	Probe Water	29.0
9040494-2	M-2	Filter	0.3
9040494-3	M-3	Impinger Water	4.1
9040494-3	M-3	Impinger Water (0.22 um Filter)	1.0
9040494-3	M-3	Impinger Acetone	4.3
9040494-3	M-3	Probe Acetone	12.7
9040494-3	M-3	Probe Water	12.7
9040494-3	M-3	Filter	< 0.1

Respectfully submitted,

Vaughan O'Neill

VAUGHAN O'NEILL -CHEMIST
LABORATORY SERVICES

cc: Steve Folk

345 North Wyomissing Boulevard P.O. Box 6307 Reading PA 19610-0307 (215) 376-8581 Fax (215) 376-6650
Other offices in Baltimore, Lehigh Valley and Trenton.

LABORATORY REQUEST FORM

CLIENT NAME: GC

BILLING ADDRESS:

REPORT ADDRESS:

REPORT TO PERSON (S): Steve Falk

TELEPHONE NO.:

P.O. NO.:

W.O. NO.:

2497

REQUESTED REPORTING DATE:
- Pending lab approval

SAMPLE DESCRIPTION: Soil - Methods

SAMPLED BY: DATE: 2/28 TIME:

SAMPLE ID.	ANALYSIS REQUESTED
M-1	BTX or Semi, 8260
M-2	
M-3	

CHAIN OF CUSTODY

DELIVERY TO LABORATORY
Custody relinquished by: Douglas Wade
To: Date: Time:

INTRALABORATORY TRANSFER
Custody relinquished by:
To: Date: Time:
Custody relinquished by:
To: Date: Time:

Custody relinquished by:
To: Date: Time:

COMMENTS:

GILBERT ASSOCIATES, INC.
AIR POLLUTION CONTROL DEPT.
PARTICULATE CLEAN UP AND REPORT SHEET

Run Date: 7/11/90 — Client: [illegible]

Run No.: M-1 — C.O. No.:

Sample Box No.: — Plant: [illegible]

Operator: [illegible] — Sampling Location: Bypass Stack

FRONT HALF

Laboratory Results

Acetone-Methanol Wash — Lab No. ____ Residue ____ mg
Probe, Nozzle Holder, Cyclone (bypass), Flask, Front Half Filter Holder-Acetone Wash — Lab No. ____ Residue ____ mg

Sample No.	Lab No.	Gross Weight
		mg
		mg
		mg
		mg

Sample particulate weight ____ mg

Filter No.	Lab No.	Gross Weight
S-68		mg
		mg
		mg
		mg

Filter particulate weight ____ mg

FRONT HALF Sub Total ____ mg

BACK HALF

Impinger Contents and Water Wash of Impingers, Connectors and Back Half of Filter Holder — Lab No. ____ Ether-Chloroform Extract ____ mg

Collected on 0.22u Filter ____ mg

Aqueous Residue ____ mg

Impinger, Connectors and Back Half of Filter Holder - Acetone Wash — Lab No. ____ Residue ____ mg

BACK HALF Sub Total ____ mg

TOTAL WEIGHT ____ mg

MOISTURE

Impingers: 106, 175, 106, 205, 54

Final Volume 649

Initial Volume 300 ml

Net Volume 349

Silica Gel

Weight after test	270			
Weight before test	232			
Net Weight	38			
Container No.:	1.	2.	3.	4.

TOTAL WEIGHT-Silica Gel 38 g

TOTAL VOLUME, Impingers 349 ml

TOTAL MOISTURE 387 g

Comments:

Lab: DATE RECEIVED ____

DATE REPORTED ____

ANALYTICAL CHEMIST ____

GAI/APC 12/74

GILBERT ASSOCIATES, INC.
AIR POLLUTION CONTROL DEPT.
PARTICULATE CLEAN UP AND REPORT SHEET

Run Date: 2/13/90 | Client: [illegible]
Run No.: [illegible] | W. O. No.:
Sample Box No.: | Plant: [illegible]
Operator: [illegible] | Sampling Location: Baghouse Stack

FRONT HALF

Acetone-Acetone Wash
Probe, Nozzle Holder, Cyclone (bypass), Flask, Front Half Filter Holder-Acetone Wash

Laboratory Results

Lab No. ______ Residue ______ mg
Lab No. ______ Residue ______ mg

Beaker No.	Lab No.	Final Weight
		mg
		mg
		mg
		mg

Sample particulate weight ______ mg

Filter No.	Lab No.	Tared Weight
S-64		mg
		mg
		mg
		mg

Filter particulate weight ______ mg

FRONT HALF Sub Total ______ mg

BACK HALF

Impinger Contents and Water Wash of Impinger Connectors and Back Half of Filter Holder

Lab No. ______ Ether-Chloroform Extract ______ mg
Collected on 0.45u Filter ______ mg
Aqueous Residue ______ mg

Impinger, Connectors and Back Half of Filter Holder - Acetone Wash

Lab No. ______ Residue ______ mg

BACK HALF Sub Total ______ mg

TOTAL WEIGHT ______ mg

MOISTURE

Impingers
250
340
211

Final Volume 701
Initial Volume 580 [illegible]
Net Volume [illegible]

Silica Gel

Weight after test	270			
Weight before test	232			
Net Weight	38			
Container No.:	1.	2.	3.	4.

TOTAL WEIGHT-Silica Gel 38 gm
TOTAL WEIGHT, Impingers [illegible] gm
TOTAL MOISTURE [illegible] gm

Comments:

Lab: DATE RECEIVED
DATE REPORTED

ANALYTICAL CHEMIST

[illegible]

ENTROPY ASSOCIATES, INC.
AIR POLLUTION CONTROL DEPT.
PARTICULATE CLEAN UP AND REPORT SHEET

Run Date: 2/2/78 | Client: Babcock
Run No.: P-3 | W. O. No.:
Sample Box No.: | Plant: Pacific
Operator: W.G. | Sampling Location: Baghouse Stack

FRONT HALF

Laboratory Results

Nonaqueous Wash
Probe, Nozzle Holder, Cyclone (Acetone),
Flask, Front Half Filter Holder-Acetone Wash

Lab No. ______ Residue ______ mg
Lab No. ______ Residue ______ mg

Thimble No.	Lab No.	Thimble Results
		mg
		mg
		mg
		mg

Thimble particulate weight ______ mg

Filter No.	Lab No.	Filter Results
8-65		mg
		mg
		mg
		mg

Filter particulate weight ______ mg

FRONT HALF Sub Total ______ mg

BACK HALF

Impinger Contents and Water Wash of Impinger Connectors and Back Half of Filter Holder

Lab No. ______ Ether-Chloroform Extract ______ mg
Collected on 0.45μ Filter ______ mg
Aqueous Residue ______ mg

Impinger, Connectors and Back Half of Filter Holder - Acetone Wash

Lab No. ______ Residue ______ mg

BACK HALF Sub Total ______ mg

TOTAL WEIGHT ______ mg

MOISTURE

Impingers:
232
162
102

Final Volume 521
Initial Volume 300 ml
Net Volume 221

SILICA GEL

Weight after test: 272
Weight before test: 232
Net Weight: 40
Container No.: 1. ____ 2. ____ 3. ____ 4. ____

TOTAL WEIGHT-Silica Gel 40 gm
TOTAL WATER- Impingers 221 ml
TOTAL MOISTURE 261 gm

Comments: ______

LAB: DATE RECEIVED ______
DATE REPORTED ______

______
ANALYTICAL CHEMIST

EPA/APC 12/74

APPENDIX 5

RAW FIELD DATA

Sheet 1 of 2

PARTICULATE FIELD DATA

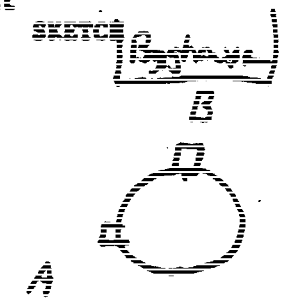
D2

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

Client	McMinns Asphalt
W. O. No.	
Plant	Paradise
Run No.	M-1
Location	Baghouse Stack
Date	7/17/90
Operator	Helm
Sample Box No.	1
Meter Box No.	1923
Meter ΔH	
C Factor	

SKETCH



Pitot Calibration	
Thimble No.	
Filter No.	5-68
Ambient Temp. °F	80.
Bar. Press. "Hg	29.70
Assumed Moisture %	30
Heater Box Setting, °F	250
Probe Tip Dia., In.	0.310
Probe Length	6FT
Probe Heater Setting	
Avg. ΔP	
Avg. ΔH	

1009.6

Stack dia. 48"

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H2O ΔP	ORIFICE ΔH IN. H2O DESIRED	ORIFICE ΔH IN. H2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	CO_2	STACK TEMP. °F
A-1		0850	0.0	288.482	0.23		1.15	80.	78.	0.5	270.	56.		211.
2			3.5	290.4	0.23		1.15	82.	78.	0.5	250.			224.
3			7.0	292.5	0.21		1.00	83.	79.	0.5	235.			237.
4			10.5	294.3	0.20		0.95	85.	76.	0.5	230.		9.5	242.
5			14.0	296.4	0.16		0.74	87.	77.	0.5	240.			246.
6			17.5	298.3	0.16		0.74	89.	81.	0.5	250.			244.
7			21.0	299.8	0.32		1.55	91.	81.	0.5	265.			250.
8			24.5	302.5	0.40		1.95	95.	83.	0.5	275.		6.8	255.
9			28.0	305.1	0.43		2.10	97.	85.	0.5	275.			252.
10			31.5	307.8	0.45		2.20	99.	87.	0.5	260.			256.
11			35.0	310.6	0.45		2.20	100.	88.	0.5	260.			253.
12			38.5	313.3	0.44		2.15	103.	89.	0.5	255.			256.
STOP			42.0	316.222										

COMMENTS:

Static -0.39 O_2 9.0

leak test start 15" 0.000

Client McMinns

PARTICULATE FIELD DATA
(continued)

W.O. No. ______

Plant Paradise

Location Baghouse Stack

Run No. M-1

Date 7/17/90

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H_2O ΔP	ORIFICE ΔH IN. H_2O DESIRED	ORIFICE ΔH IN. H_2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP °F	CO_2 ~~STACK PRESS IN. Hg~~	STACK TEMP. °F
B-1		0942	0.0	316.222	0.11		0.52	94.	90.	0.5	235.	58.		220.
2			3.5	318.0	0.17		0.82	95.	91.	0.5	255.			257.
3			7.0	319.4	0.11		0.53	96.	91.	0.5	250.		8.5	262.
4			10.5	320.9	0.14		0.67	97.	92.	0.5	245.			264.
5			14.0	322.5	0.16		0.76	99.	92.	0.5	275.			267.
6			17.5	324.3	0.16		0.76	100.	93.	0.5	270.			268.
7			21.0	326.0	0.26		1.28	101.	93.	0.5	250.			269
8			24.5	328.2	0.30		1.49	102.	94.	0.5	240.		8.6	270.
9			28.0	330.6	0.37		1.82	104.	95.	0.5	255.			271.
10			31.5	333.3	0.44		2.18	105.	96.	0.5	270.			270.
11			35.0	336.1	0.49		2.42	107.	97.	0.5	265.			270.
12			38.5	339.1	0.56		2.79	107.	97.	0.5	255.			271.
H_2O EOR		1024	42.0	342.062										

COMMENTS:

O_2 8.0
8.2

leak test end 15" 0.008

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

Sheet 1 of 2

Client McMinas

W. O. No. ______

Plant Paradise

Run No. A-2

Location Baghouse Stack

Date 7/17/80

Operator Hal

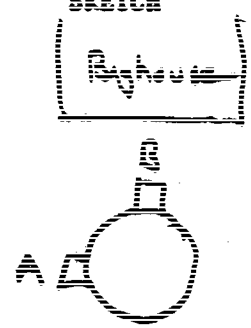
Sample Box No. ______

Meter Box No. 1023

Meter ΔH ______

C Factor ______

SKETCH



Pitot Calibration #2

Thimble No. ______

Filter No. 564

Ambient Temp. °F 83

Bar. Press. "Hg 29.73

Assumed Moisture % 2.5

Heater Box Setting, °F 250

Probe Tip Dia., In. 0.310

Probe Length 6'

Probe Heater Setting ______

Avg. ΔP ______ Avg. ΔH ______

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H2O ΔP	ORIFICE ΔH IN. H2O DESIRED	ORIFICE ΔH IN. H2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	CO_2	STACK TEMP. °F
B-1		1110	0.0	342.392	0.105		0.57	93.	93.	0.5	225.	57.		222
2			3.5	343.9	0.10		0.55	95.	93.	0.5	250.			201
3			7.0	345.4	0.22		1.21	97.	94.	0.5	270.			275.
4			10.5	347.3	0.33		1.88	97.	95.	0.5	275.			277
5			14.0	350.0	0.31		1.75	101.	95.	0.5	275.		6.8	283.
6			17.5	352.3	0.34		1.92	104.	96.	0.5	270.		6.8	287.
7			21.0	355.0	0.45		2.55	104.	97.	1.5	255.			285.
8			24.5	358.2	0.52		2.95	110.	99.	2.0	270.			275.
9			28.0	361.1	0.64		3.65	113.	100.	3.0	275.			282.
10			31.5	364.9	0.95		5.50	115.	103.	5.0	260.			285.
11			35.0	369.5	1.05		6.00	120.	105.	4.0	245.		6.9	286.
12			38.5	373.7	1.05		6.00	124.	110.	6.5	250.			291.
Stop			42.0	377.392										

COMMENTS:

Stop 11:20 346.144

Start 11:36 346.668

leak test start 15" Dead

Static −0.39

O_2 11.0 10.9

PARTICULATE FIELD DATA
(continued)

Client: DeMine

W.O. No.:

Plant: Paradise

Location: Baghouse Stack

Run No.: M-2

Date: 7/17/90

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H_2O ΔP	ORIFICE ΔH IN. H_2O DESIRED	ORIFICE ΔH IN. H_2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP °F	CO_2	STACK TEMP. °F
A-1		1220	0.0	377.782	0.12		0.67	109.	107.	0.5	230.	60.		—
2			3.5	379.4	0.37		2.11	109.	107.	2.8	225.			277.
3			7.0	381.7	0.42		2.22	110.	106.	1.9	195.			275.
4			10.5	384.5	0.35		1.87	110.	105.	1.4	255.		5.0	264.
5			14.0	387.2	0.43		1.91	109.	105.	1.0	275.		5.0	283.
6			17.5	389.5	0.19		1.00	108.	104.	0.9	250.			278.
7			21.0	391.5	0.47		2.50	109.	104.	2.0	270.			281.
8			24.5	394.3	0.56		3.00	111.	105.	2.6	275.			286.
9			28.0	397.9	0.53		2.81	113.	105.	2.9	265.			288.
10			31.5	401.1	0.60		3.17	115.	106.	3.8	245.		6.6	280.
11			35.0	404.5	0.57		3.06	117.	107.	3.6	255.			290.
12			38.5	407.7	0.55		2.93	117.	106.	3.0	245.			285.
Stop		1302	42.0	411.099										
END														

COMMENTS:

O_2 12.6
114

leak test and 15" -0.006

Sheet 1 of 2

PARTICULATE FIELD DATA

#1

Client McMinn's Asphalt

W. O. No. ______

Plant Paradise

Run No. M-3

Location Baghouse Stack

Date 7/17/90

Operator Albright / Helm

Sample Box No. 1

Meter Box No. 1973

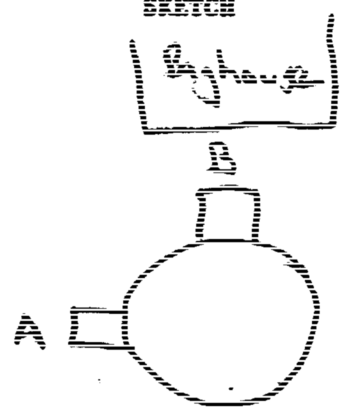
Meter ΔH 1.98

C Factor ______

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

SKETCH



Pitot Calibration ______

Thimble No. ______

Filter No. S-65

Ambient Temp. °F 90

Bar. Press. "Hg 29.92

Assumed Moisture % 25

Heater Box Setting, °F 250

Probe Tip Dia., In. 0.310

Probe Length 6'

Probe Heater Setting ______

Avg. ΔP ______ Avg. ΔH ______

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H2O ΔP	ORIFICE ΔH IN. H2O DESIRED	ORIFICE ΔH IN. H2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	CO_2	STACK TEMP. °F
1		1400	0.0	411.507	0.10		0.54	104.	103.	0.5	250.	59.		—
2			3.5	413.0	0.35		1.55	105	103.	0.5	275.			201.
3			7.0	415.7	0.28		1.40	107.	104.	0.5	270.			213.
4			10.5	417.9	0.35		1.38	105.	104.	0.5	260.			226.
5			14.0	420.1	0.37		1.53	109.	102	0.5	250.			235.
6			17.5	422.6	0.38		1.60	107.	99.	0.5	245.			241.
7			21.0	424.9	0.41		2.35	107.	97.	0.5	265.			249.
8			24.5	428.1	0.37		2.20	107.	78.	0.5	266		6.8	263.
9			28.0	431.7	0.54		3.10	107.	77.	0.5	235.			264.
10			31.5	433.1	0.49		2.75	107.	77.	0.5	240.			251.
11			35.0	438.2	0.47		2.70	105.	77.	0.5	205.			240.
12			38.5	441.5	0.45		2.66	107.	78.	0.5	270			231.
STOP			42.0	444.518										

COMMENTS:

leak test start 15" - 0.000

Client McWilliams

PARTICULATE FIELD DATA
(continued)

Sheet 2 of 2

W.O. No.

Plant Paradise

Location Baghouse Stack

Run No. M-3

Date 7/17/80

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H_2O ΔP	ORIFICE ΔH IN. H_2O DESIRED	ORIFICE ΔH IN. H_2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP °F	K-O (~~STACK PRESS IN. Hg~~)	STACK TEMP. °F
9-1		1452	0.0	444.516	0.26		1.65	100.	96.	0.5	225.	60.		231.
2			3.5	447.0	0.33		1.91	100.	97.	0.5	230.			234.
3			7.0	449.7	0.32		1.85	101.	97.	0.5	260.			237.
4			10.5	452.9	0.31		1.86	103.	97.	0.5	270.		3.1	246.
5			14.0	454.9	0.30		1.72	103.	97.	0.5	260.		3.2	242.
6			17.5	457.5	0.32		1.89	104.	97.	0.5	250.			243.
7			21.0	460.1	0.43		2.50	104.	97.	0.5	280.			244.
8			24.5	463.2	0.55		3.20	105.	98.	0.5	255			245.
9			28.0	466.6	0.67		3.85	107.	98.	0.5	270.			243.
10			31.5	470.4	0.80		4.60	111.	99.	0.5	275.			254.
11			35.0	474.3	1.05		6.10	112.	101.	0.0	270.		3.0	261.
12			38.5	478.2	1.10		6.15	112.	101.	1.0	265.			264.
H_2O END		1534	42.0	493.614										

COMMENTS:

Static = 0.35
= 0.43

Leak test end - 0.018

O_2 13.9

APPENDIX G

CALIBRATION DATA

Gilbert/Commonwealth Inc.
Testing Services Group
METER BOX CALIBRATION

DATE: 7/16/99 METER BOX NUMBER: 1923

BAROMETRIC PRESS. (Pb) = 29.78 in. Hg CALIBRATED BY: MELM

Orifice Manometer Setting (delta H) in. H2O	GAS VOLUME: Wet Test Meter (Vw) cu. ft.	GAS VOLUME: Dry Gas Meter (Vd) cu. ft.	TEMPERATURES: Wet Test Meter (Tw) deg. F	TEMPERATURES: Dry Gas Meter Inlet (Tdi) deg. F	TEMPERATURES: Dry Gas Meter Outlet (Tdo) deg. F	TEMPERATURES: Dry Gas Meter Average (Td) deg. F	Time min.	Yi	delta H@i	dm	Km
0.5	5.000	5.030	73.5	80.0	76.0	78.0	12.50	1.00	1.78	0.401	0.720
1.0	5.000	5.118	73.5	91.0	83.0	87.0	9.20	1.00	1.90	0.552	0.696
1.5	10.000	10.317	73.5	95.0	87.0	91.0	15.33	1.00	1.96	0.668	0.685
2.0	10.250	10.687	73.5	98.5	89.5	94.0	13.72	0.99	1.96	0.773	0.685
3.0	10.000	10.512	73.5	100.0	92.0	96.0	11.13	0.98	2.01	0.937	0.677
4.0	10.000	10.312	73.5	89.0	79.5	84.3	9.68	0.98	2.07	1.056	0.668
							AVERAGE Yi	0.99			

FORMULAS

$$Yi = \frac{(Vw)(Pb)(Td+460)}{(Vd)(Pb+(\Delta/13.6))(Tw+460)}$$

$$delta\ H@i = \frac{0.921}{(Qm)(Km)}$$

$$Km = Qm \sqrt{\frac{(Pb)(29)}{(Tdo+460)(delta\ H)}}$$

$$Qm = \frac{(Vd)(Td+460)}{(Time)(Td+460)}$$

Gilbert/Commonwealth Inc.
Testing Services Group
METER BOX CALIBRATION

DATE: 7/23/99 METER BOX NUMBER: 1923

BAROMETRIC PRESS. (Pb) = 29.41 in. Hg CALIBRATED BY: MELM

Orifice Manometer Setting (delta H) in. H2O	GAS VOLUME: Wet Test Meter (Vw) cu. ft.	GAS VOLUME: Dry Gas Meter (Vd) cu. ft.	TEMPERATURES: Wet Test Meter (Tw) deg. F	TEMPERATURES: Dry Gas Meter Inlet (Tdi) deg. F	TEMPERATURES: Dry Gas Meter Outlet (Tdo) deg. F	TEMPERATURES: Dry Gas Meter Average (Td) deg. F	Time min.	Yi	delta Hi	Qm	Km
0.5	5.000	4.985	75.0	80.0	76.0	78.0	12.20	1.01	1.75	0.407	0.726
1.0	5.250	5.320	75.0	85.0	81.0	83.0	9.55	1.00	1.90	0.555	0.697
1.5	10.250	10.484	75.0	90.5	84.0	87.3	15.47	1.00	1.94	0.674	0.689
2.0	10.000	10.357	75.0	97.0	88.0	92.5	13.25	0.99	1.97	0.775	0.684
3.0	10.000	10.489	75.0	101.5	91.0	96.3	11.03	0.98	2.01	0.942	0.676
4.0	10.500	10.759	75.0	88.0	79.0	83.5	10.12	0.98	2.09	1.055	0.663
							AVERAGE Yi	0.99			

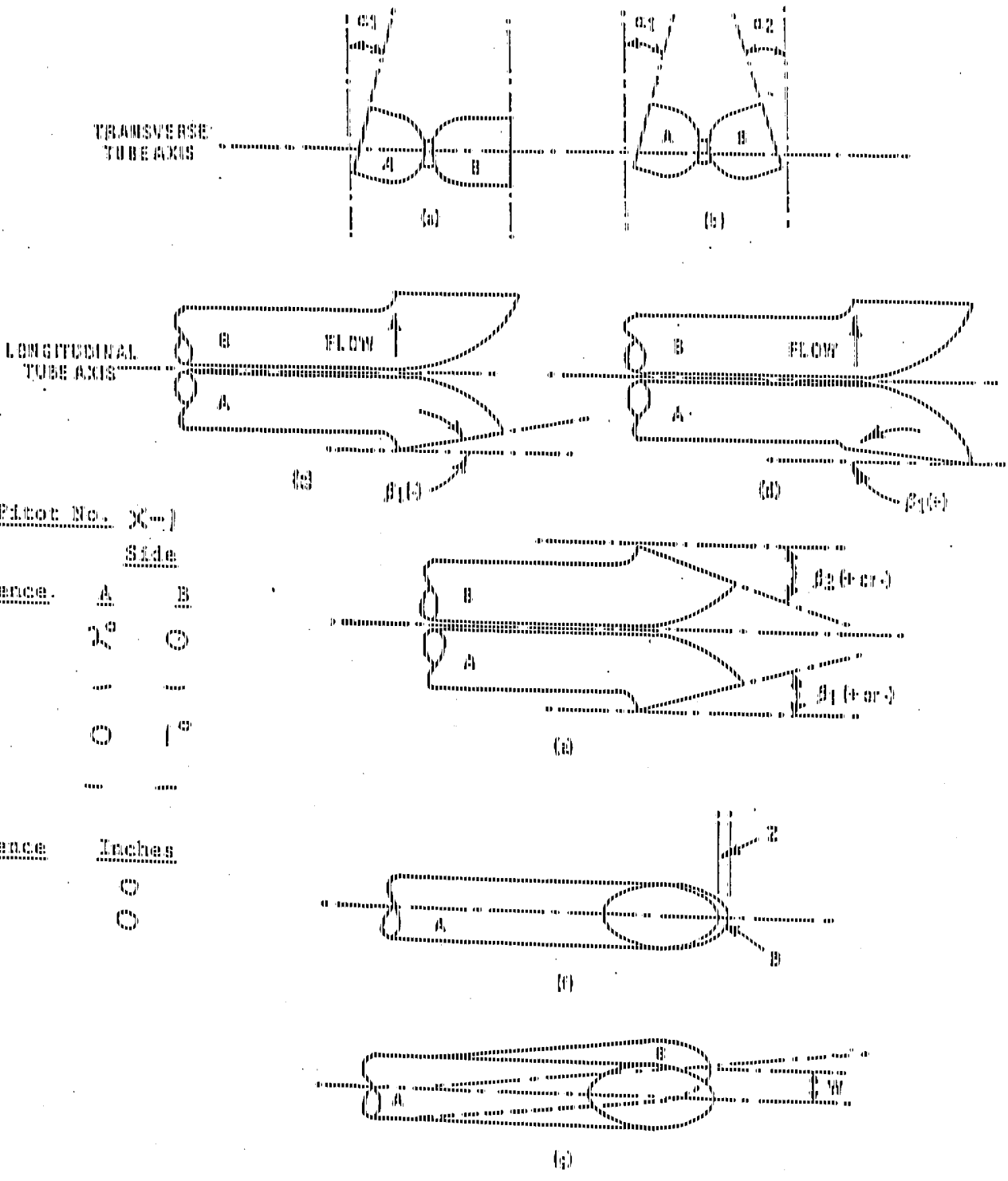
FORMULAS

$$Yi = \frac{(Vw)(Pb)(Td+460)}{(Vd)(Pb+(H/13.6))(Tw+460)}$$

$$delta\ Hi = \frac{0.921}{(Km)(Km)}$$

$$Km = Qm \sqrt{\frac{(Pb)(29)}{(Tdo+460)(delta\ H)}}$$

$$Qm = \frac{(Vd)(Tdo+460)}{(Time)(Td+460)}$$



Pitot No. X(--)

Reference	Side A	Side B
A_1	X	O
A_2	—	—
B_1	O	X
B_2	—	—

Reference	Inches
z	O
w	O

Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of $C_p(s)$ so long as α_1 and $\alpha_2 < 10°$, β_1 and $\beta_2 < 5°$, $z < 0.32$ cm (1/8 in.) and $w < 0.08$ cm (1/32 in.) (citation 11 in Section 6).

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PA.

CLIENT

PROJECT

FILING CODE

W.O. | PAGE 9F

SYSTEM

ENGINEER

DATE 3/1/90

DESCRIPTION

Pot Meter-Thermocouple Calibration

REVIEWED BY

DATE

Pot Meter #		3
Thermocouple Type		K
Ice Bath Temperature	°F	32
Certified Mercury Bulb	°F	32
Ambient Temperature	°F	68
Certified Mercury Bulb	°F	68
Boiling H_2O	°F	212
Certified Mercury Bulb	°F	212
Hot Synthetic Oil	°F	371
Certified Mercury Bulb	°F	370

Remarks:

FORM 0962

APPENDIX 7

COMPUTER PRINTOUT

(Flue Gas Characteristics, Isokinetic Calculations, and Test Results for Particulate Emissions)

GILBERT/COMMONWEALTH, INC.
TESTING SERVICES GROUP
ISOKINETIC SAMPLING ANALYSIS

Client: Nu Mixes Asphalt Plant: Paradise, PA

Unit Tested: Baghouse Stack Pollutants:

Sampling Location: OUTLET

Run No: R-1 Date: 7/17/90 Start: 850 End: 1024

DATA

DH:	0.310	PB:	29.70	PST:	-0.39	AS:	1809.6
O2%:	8.4	CO2%:	8.6	N2%:	83.0	Vs:	387
GAS METER Y-FACTOR:			1.01	E.A.%:	62.2		

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PH ORIFICE	SQE	O2	CO	VEL.
A-1	3.5	288.682	0.230	211	80	78	1.150	12.42	8.4		1904
2	3.5		0.230	226	82	78	1.150	12.54			1922
3	3.5		0.210	237	83	79	1.000	12.10			1854
4	3.5		0.200	243	85	78	0.980	11.86			1817
5	3.5		0.160	248	87	79	0.760	10.66			1631
6	3.5		0.160	249	89	81	0.760	10.65			1632
7	3.5		0.320	250	91	81	1.550	15.07			2310
8	3.5		0.400	255	95	83	1.950	16.91			2591
9	3.5		0.430	257	97	85	2.100	17.56			2691
10	3.5		0.450	256	99	87	2.200	17.95			2750
11	3.5		0.450	255	100	88	2.200	17.94			2749
12	3.5		0.440	255	103	89	2.150	17.74			2718
B-1	3.5		0.110	220	94	90	0.520	8.65			1325
2	3.5		0.170	257	95	91	0.820	11.04			1692
3	3.5		0.110	262	96	91	0.530	8.91			1366
4	3.5		0.160	264	97	92	0.670	10.07			1543
5	3.5		0.160	267	99	92	0.760	10.79			1653
6	3.5		0.160	268	100	93	0.760	10.79			1654
7	3.5		0.260	269	101	93	1.280	13.77			2110
8	3.5		0.300	270	102	96	1.490	14.80			2268
9	3.5		0.370	271	104	95	1.820	16.45			2520
10	3.5		0.440	270	105	96	2.180	17.92			2766
11	3.5		0.490	270	107	97	2.420	18.91			2898
12	3.5		0.560	271	107	97	2.790	20.23			3100
		362.062									

RESULTS	TT	VM	PIT	TS	TM	PM	SQE	O2	CO	VEL.
	84.0	53.580	0.290	254	92	1.415	13.99	8.4	ERR	2143
	not	not	avg	avg	avg	avg	avg	avg	avg	avg
	PSM=	29.80	VMSTD=	51.592	VMGAS=	18.228	%M=	26.1	RDS OF VELOCITIES =	23.5
	DH=	0.74	DHD=	29.71	PHI=	26.65	PS=	29.67		

PARTICULATE EMISSIONS

STACK GAS VELOCITY =	2,143	AFPM	
STACK GAS VOLUME =	14,647	DSCFM	
STACK GAS VOLUME =	27,036	ACFM	
STACK GAS VOLUME =	8.30E+06	LBS/HR	
ISOKINETIC RATIO =	100.2		

Weight, mg =	47.8	
GR/DSCF =	0.014	
LBS/HR =	1.79	

GILBERT/COMMONWEALTH, INC.
TESTING SERVICES GROUP
ISOKINETIC SAMPLING ANALYSIS

Client: Mc Minn Asphalt - Plant: Paradise, PA

Unit Tested: Baghouse Stack Pollutants:

Sampling Location: OUTLET

Run No: R-2 Date: 7/17/90 Start: 1110 End: 1302

DATA

DH:	0.3410	PB:	29.73	PST:	-0.39	AS:	1809.6
O2%:	11.5	CO2%:	6.2	N2%:	82.29	MW:	29

GAS METER Y-FACTOR: 1.01 E.A.%: 112.76

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SQE	O2	CO	VEL
B-1	3.5	362.392	0.105	282	93	93	0.570	8.46	11.5		1296
2	3.5		0.100	281	95	93	0.550	8.49			1300
3	3.5		0.220	275	97	94	1.210	12.72			1947
4	3.5		0.330	283	97	95	1.880	15.66			2397
5	3.5		0.310	283	101	95	1.750	15.18			2324
6	3.5		0.340	283	104	96	1.920	15.89			2433
7	3.5		0.490	285	106	97	2.550	18.31			2803
8	3.5		0.520	283	110	99	2.950	19.66			3009
9	3.5		0.640	282	113	100	3.650	21.79			3336
10	3.5		0.950	285	118	103	5.500	26.60			4073
11	3.5		1.050	280	126	105	6.000	28.02			4291
12	3.5		1.050	291	124	110	6.000	28.08			4299
A-1	3.5		0.120	297	108	107	0.670	9.53			1459
2	3.5		0.370	297	109	107	2.110	16.74			2562
3	3.5		0.420	295	110	106	2.320	17.81			2726
4	3.5		0.350	288	110	105	1.870	16.18			2477
5	3.5		0.230	283	109	105	1.210	13.07			2001
6	3.5		0.190	278	108	104	1.000	11.84			1813
7	3.5		0.470	281	109	104	2.500	18.66			2857
8	3.5		0.560	286	111	105	3.000	20.44			3129
9	3.5		0.530	288	113	105	2.810	19.91			3048
10	3.5		0.600	290	115	106	3.170	21.07			3226
11	3.5		0.570	293	117	107	3.060	20.58			3151
12	3.5		0.550	288	117	108	2.950	20.28			3105
		411.099									

RESULTS	TT	VM	PIT	TS	TM	PM	SQE	O2	CO	VEL
	84.0	60.707	0.459	282	106	2.546	17.71	11.5	ERR	2711
	min	min	avg	avg	avg	avg	avg	avg	avg	avg
	PSM=	29.91	VMSTD=	64.763	VWGAS=	20.677	QM=	24.2	RMS OF VELOCITIES =	35.4
	HM=	0.76	QMD=	29.45	MW=	26.60	PS=	29.69		

STACK GAS VELOCITY = 2,711 AFPM
STACK GAS VOLUME = 18,306 DSCFM
STACK GAS VOLUME = 34,197 ACFM
STACK GAS VOLUME = 1.01E+05 LBS/HR
ISOKINETIC RATIO = 100.7

PARTICULATE EMISSIONS

Weight, mg = 38.6
GR/DSCF = 0.009
LBS/HR = 1.441

GILBERT/COMMONWEALTH, INC.
TESTING SERVICES GROUP
ISOKINETIC SAMPLING ANALYSIS

Client: Dellinois Asphalt Plant: Paradise, PA

Unit Tested: Baghouse Stack Pollutants:

Sampling Location: OUTLET

Run No: M-3 Date: 7/17/90 Start: 1405 End: 1536

DATA

CO:	0.310	PB:	29.72	PST:	-0.39	AS:	1520.5
O2%:	13.9	CO2%:	6.4	N2%:	79.7	MW:	261
GAS METER Y-FACTOR:			1.01	E.A.%:	196.7		

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SQE	O2	CO	VEL
A-1	3.5	411.507	0.100	200	104	103	0.540	8.12	13.9		1216
2	3.5		0.350	201	108	103	1.950	15.21			2276
3	3.5		0.220	213	109	104	1.200	12.17			1821
4	3.5		0.250	226	108	104	1.380	13.10			1960
5	3.5		0.270	235	108	102	1.530	13.70			2050
6	3.5		0.280	241	107	99	1.600	14.01			2096
7	3.5		0.410	249	107	98	2.350	17.05			2551
8	3.5		0.570	263	107	97	3.300	20.30			3038
9	3.5		0.560	264	107	97	3.100	19.77			2959
10	3.5		0.480	251	107	97	2.750	18.47			2764
11	3.5		0.470	240	108	98	2.700	18.14			2714
12	3.5		0.450	231	107	96	2.600	17.83			2639
B-1	3.5		0.290	231	100	97	1.650	14.16			2118
2	3.5		0.330	234	100	97	1.910	15.13			2265
3	3.5		0.320	237	101	97	1.850	14.93			2235
4	3.5		0.310	240	103	97	1.800	14.73			2204
5	3.5		0.300	242	103	97	1.720	14.51			2172
6	3.5		0.320	243	104	97	1.850	15.00			2244
7	3.5		0.400	244	104	97	2.500	16.78			2511
8	3.5		0.500	245	105	98	3.200	18.77			2809
9	3.5		0.670	247	107	98	5.050	21.76			3257
10	3.5		0.800	254	111	99	4.600	23.90			3576
11	3.5		1.050	261	112	101	6.100	27.51			4117
12	3.5		1.100	264	112	101	6.150	28.22			4223
		483.619									

RESULTS	TT	VM	PTT	TS		TM	PM	SQE	O2	CO	VEL
	84.0	72.112	0.449	240		103	2.591	17.21	13.9	ERR	2576
	net	net	avg	avg		avg	avg	avg	avg	avg	avg
	PBM=	29.91	VMSTD=	68.348	VMSAB=	71.351	SM=	14.2	RMS OF VELOCITIES =		17.9
	DD=	0.86	MMD=	29.58	MM=	27.93	PS=	29.69			

STACK GAS VELOCITY = 2,575 AFPM
STACK GAS VOLUME = 17,525 DSCFM
STACK GAS VOLUME = 27,298 ACFM
STACK GAS VOLUME = 8.96E+06 LBS/HR
ISOKINETIC RATIO = 93.2

PARTICULATE EMISSIONS

Weight, mg = 26.4
GR/DSCF = 0.006
LBS/HR = 0.89

AVERAGE PARTICULATE EMISSIONS

Weight, mg = 37.6

APPENDIX B

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS

Particulate Isokinetic Sampling

1. Calculations for stack volume and isokinetic ratio

Time	Dry Gas Meter Ft^3	Meter ΔP, In. H_2O	Orifice ΔH, In. H_2O	Dry Gas Temp °F In Out	Stack Static Pressure In. H_2O	Stack Temp °F
T	VM	ΔP	PM	TMI TMO	PST	TS

1. RM = Meter Reference, Inches

2. PB = Barometric Pressure, Inches Hg

3. T = Gas Sampling Time, minutes

4. VM = VM final − VM initial = Sample Gas Volume, Ft^3

5. TM = Average Dry Gas Temperature at Meter, °F

$$TM = \frac{Avg.\ TMI + Avg.\ TMO}{2}$$

6. PM = Average Orifice Pressure Drop, Inches H_2O

PM = Avg. ΔH

7. Volume of dry gas sampled at standard conditions[a], DSCF

$$VMSTD = \frac{17.65 \times VM \times Y \left(BP + \frac{PM}{13.6}\right)}{(TM + 460)}$$

8. VW = Total Water Collected = gm H_2O Silica gel + ml Imp. H_2O = ml

9. Volume of water vapor at standard conditions[b], SCF

VW gas = 0.0471 x VW = SCF

10. Percent moisture in stack gas

$$\%\ M = \frac{100 \times VW\ gas}{VM\ STD + VW\ gas}$$

11. Mole fraction of dry gas

$$MD = \frac{100 - \%M}{100}$$

12. Molecular weight of dry stack gas

$$MWD = (\%CO_2 \times \frac{44}{100}) + (\%O_2 \times \frac{32}{100}) + \left[(\%CO + \%N_2) \times \frac{28}{100} \right]$$

12A. %EA = % Excess Air $= \frac{[(\%\ O_2) - 0.5\ (\%CO)]}{0.264\ (\%N_2) - [(\%O_2) + 0.5\%\ (CO)]} \times 100$

13. Molecular weight of wet stack gas

$$MS = MWD \times MD + 18\ (1 - MD)$$

14. AS = Stack Area, square inches

15. PS = Stack Pressure, inches Hg

$$PS = PB \pm Avg.\ PST$$

$$NOTE:\ PST\ in.\ Hg. = \frac{PST\ in.\ H_2O}{13.6}$$

16. TS = Average Stack Temperature, °F

TS = Average TS

17. SDE = Average $\sqrt{\text{Velocity Head (}\Delta P\text{)} \times (\text{Stack Temperature} + 460)}$

(Calculated each time)

$$SDE = Avg\ \sqrt{\Delta P \times (TS + 460)}$$

18. Stack gas velocity at stack conditions, fpm

$$VS = 5130 \times Cp \times Avg(SDE) \times \left[\frac{1}{PS \times MS} \right]^{1/2} = FPM$$

Cp = pitot tube coefficient

19. Stack gas volumetric flow rate at standard conditions[5], DSCFM

$$Q_S = \frac{0.129 \times VS \times AS \times MD \times PS}{(TS + 460)} = DSCFM$$

20. Stack gas volumetric flow rate at stack conditions, ACFM

$$Q_A = \frac{.09667 \times VS\ (TS + 460)}{PS \times MS} = ACFM$$

21. Percent Isokinetic

$$\%I = \frac{1.911 \times (TS + 460) \times VMSTD}{VS \times TT \times PS \times MD \times (DN)^2}$$

NOTES: [4]Dry standard cubic foot at 68°F, 29.92 in. Hg.

[5]Standard condition at 68°F, 29.92 in. Hg.

[6]Dry standard cubic foot per minute at 68°F, 29.92 in. Hg.

II. Calculations for grain loading and emission rates

22. Particulate, gr/DSCF

$$gr/DSCF = 0.0154 \times \frac{mg}{VBSTD}$$

23. Particulate at stack conditions, gr/ACF

$$gr/ACF = \frac{17.65 \text{ gr/DSCF} \times PS \times MD}{(TS + 460)}$$

24. Particulate, lb/hr conc. method

$$lb/hr = 0.00857 \times gr/DSCF \times QS$$

25. Particulate lb/hr area method = $0.132 \times \frac{\text{emp particulate} \times AS}{\left(\frac{DN^2}{2}\right) \times \pi}$

26. Particulate, combustion

$$\frac{lb/hr}{10^6 \text{ BTU/hr}}$$

27. Particulate, process lb/ton

$$lb/ton = \frac{lb/hr}{tons/hr}$$

28. Particulate, lb/MMBTU, F-Factor Method =

Using O_2 =

$$\frac{0.0154 \times mg \times F\text{-Factor} \times 20.9}{7000 \times VBSTD \times (20.9 - \%O_2)}$$

Using CO_2 =

$$\frac{0.0154 \times mg \times F\text{-Factor} \times 100}{7000 \times VBSTD \times \%\ CO_2}$$

29. F-Factor, dscf/mmBtu

O_2 Formula:

$$F\text{-Factor} = \frac{10^6(3.64(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O_2))}{GCV}$$

CO_2 Formula:

$$\frac{10^6(0.321)(\%C)}{GCV}$$