Commonwealth of Pennsylvania
Environmental Resources
September 25, 1990

Subject: Stack Test Review

To: Data File
Glasgow, Inc.
Catanach Plant
East Whiteland Township, Chester 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

Glasgow, Inc. operates a 350 ton per hour, batch asphalt plant fired with either natural gas or waste delivered No. 5 fuel oil in East Whiteland Township, Chester County. The plant produced an average of 328 tons per hour of asphalt and was fired with natural gas during the observed period.

Cold aggregate feed is transported by a conveyor to a rotary dryer. After passing through the rotary dryer, the heated aggregate is transported 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.

Heated air passes through the rotary dryer and is directed to a knockout box, a McCarter fabric collector and finally discharged to the atmosphere by an exhaust fan through a 54 inch diameter stack that extends to a point approximately 33 feet above grade. Fugitive emissions from the stackup tower are also collected and directed to the fabric collector along with the effluent from the rotary dryer.

The fabric collector, a McCarter Model McC-864-8, contains 864 felted Nomex bags and utilizes a reverse jet pulse to clean the bags periodically. The collector is designed to handle 72,000 ACFM at 250° fahrenheit with a pressure drop of 2-4 inches W.G. Particulate matter collected is stored into a silo and eventually injected into the mixer bin.

Three Method 5 particulate tests were performed by personnel from Gilbert Commonwealth, Inc. to demonstrate NSPS compliance. The tests were conducted with a preapproved 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)	2,142,660	2,134,320	2,206,500
Rated Capacity (T/hr)		350	
Tested Rate (T/hr)	340	332	311
Actual Concentration (gr/DSCF)	0.014	0.011	0.013
Actual Emission Rate (lbs/hr)	4.14	3.49	4.05
Allowable Concentration (gr/DSCF)*		0.04	

* Per New Source Performance Standards, Suppart I, 40CFR 60.90-60.93

cc: Roger A. Fitterling, Norristown Regional Office
File 15-303-015
Reading File
Doug Lesher

RBstaw

STD-551, 9-86

COMMONWEALTH OF PENNSYLVANIA
Environmental Resources
8-468-4175

DATE: September 6, 1990

SUBJECT: Glasgow, Inc.
Asphalt Concrete Plant
Catanash Plant
West Whiteland Township
Chester County

TO: L. BLAINE DeHAVEN, Chief
Source Testing & Monitoring Section
Division of Technical Services & Monitoring

FROM: Roger A. Fitterling
Air Pollution Control Engineer

Technical Services personnel are requested to review the attached stack test report to determine compliance with the requirements of Chapter 139. Sampling for particulate and visible emissions from the company's concrete asphalt plant was conducted on August 18, 1990 by representatives of Gilbert/Commonwealth. The source is covered by Plan Approval No. 15-303-015. This plant is subject to the standards of 40 CFR part 60, subchapter I.

Attachments

cc: ASC
Norristown Region
Re30 EE6.2

An Equal
Opportunity Employer

215/884-8800
215/927-4600

GLASGOW
INC.

WILLOW GROVE AVE & JIMERILN PK
P.O. BOX 248
GLENSIDE, PA 19038-0248

September 5, 1990

Commonwealth of Pennsylvania
Department of Environmental Resources
Bureau of Air Quality Control
625 Cherry Street
Reading, PA 19602-1188

Attention: Mr. Roger Fitterling
Air Pollution Control Engineer

Reference: Stack Test Results
Catanach Asphalt Plant
Application No. 15-303-015

Gentlemen:

Please find enclosed two copies of the Source Sampling Report for Measurement of Particulate Emissions prepared by Gilbert Commonwealth, Inc. for our Catanach Asphalt Plant. This report indicates that the emissions from the plant are well below the allowable rates. Also enclosed are the results from the sieve analysis performed on the raw aggregate fed into the plant during the testing.

Please note that the starting gas reading for test run No. 3 is listed as not available in appendix III of the report. This reading should have been entered as 9,975,000, making the net gas consumed during the third run 70,000 cubic feet.

If you have any questions, please contact me.

Very truly yours,

GLASGOW, INC.

Edward C. Smith

ECS:rsb
Enclosures

RECEIVED
SEP 6 1990
RDG. DISTRICT OFFICE
DEPT. OF ENV. RES.

SOURCE SAMPLING REPORT FOR MEASUREMENT OF PARTICULATE EMISSIONS

CLARKCOW, INC.
CATANACH FACILITY
BATCH ASPHALT PLANT

G/C, INC., REPORT E-04-6187-000
AUGUST, 1990

SOURCE SAMPLING REPORT FOR MEASUREMENT OF PARTICULATE EMISSIONS

GLASGOW, INC.
CATANACH FACILITY
BATCH ASPHALT PLANT

G/C, INC., REPORT E-04-6187-000
AUGUST, 1990

PREPARED BY

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

STEVEN G. POLE
MANAGER
TESTING SERVICES GROUP

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

August 15, 1990

Mr. Ted Smith
Glasgow, Inc.
Willow Grove Ave. & Limekiln Pk
P.O. Box 248
Glenside, PA 19038-0248

Re: Submittal of Source Sampling Report for Measurement of Particulate Emissions and Determination of Visible Emissions Asphalt Facility
G/C, Inc., Report R-04-6187-000

Dear Mr. Smith:

We are pleased to submit six copies of our Report R-04-6187-000, dated August 1990. This report contains results of source sampling for particulate and visible emissions for the asphalt facility exhaust stack located at your Catanach Plant, as conducted on July 18, 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 Glasgow, Inc. and trusts that this report will meet your complete acceptance.

Very truly yours,

Steven G. Folk

Steven G. Folk
Manger
Testing Services Group

SGF/llch

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 I - 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 0.013 gr/dscf using PADER Method 5 procedures. The average visible emissions were 0% opacity. Both the average particulate emission rate and average opacity emission rate are well below the allowable emission rates of 0.04 gr/dscf and 20% respectively.

TABLE 1

SUMMARY OF TEST RESULTS
GLASGOW, INC.
CATANACH FACILITY
GLENSIDE, PA

04-6187-000

DATE	7/18/90	7/18/90	7/18/90
LOCATION		Stack	
RUN NO.	G-1	G-2	G-3
TIME	0835	1056	1349
OPERATING DATA			
	See Appendix 3		
FLUE GAS CHARACTERISTICS			
DSCFM	35,711	35,572	36,775
ACFM	54,264	54,208	54,372
Temperature, °F	200	202	251
Moisture, %	17.1	17.2	15.1
PARTICULATE EMISSIONS			
Gr/DSCF	0.014	0.011	0.013
Lbs/Hr	4.14	3.49	4.05
Gr/DSCF, Average		0.013	
Gr/DSCF, Allowable		0.04	
VISIBLE EMISSIONS			
Opacity, %	0	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 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 18, 1990, by the Gilbert field test crew, with the assistance of personnel assigned by Glasgow, 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 each 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 Glasgow, Inc. 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

P_b = 29.74 in Hg $\quad P_b + \frac{.5}{13.6} = 29.70$

P_g = static = $\frac{\text{in } H_2O}{13.6} = \frac{-.5}{13.6}$

$P_s = P_b + P_g$ = [illegible] in Hg = 29.70

P_{STD} = 29.92 in Hg

T_{STD} = 528

V_{wc} = 216 ml

V_{wg} = 29 g

Y = 1.01

ΔH = $\frac{2.22}{13.6}$ = .163 in Hg

C_p = .84

$(\sqrt{\Delta P})_{ave}$ = .870

T_s = 202 + 460 =

T_m = 102 + 460 =

A_s = 15.9 ft²

A_N = ft² .000325

Θ = 72 min

V_m = 57.339

CO_2 = 2.7

O_2 = 16.1

N_2 = 81.2

M_d = 29.0 g/mg

(5-1) $V_{m(STD)}$ (DSCF) $= K_1 V_m Y \frac{P_b + \frac{\Delta H}{13.6}}{T_m} = \frac{17.64(57.339)(1.01)(29.70)}{562} = 54.35$ ft³

$V_{w(STD)} = 0.04707 \, V_{wc} + 0.04715 \, V_{wg} = 11.2$ ft³ (216, 22)

$B_{ws} = \frac{V_{w(STD)}}{V_{m(STD)} + V_{w(STD)}} = \frac{11.2}{54.35 + 11.2} = .171 \qquad (1 - B_{ws}) = .829$

$M_d = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$ (2.7, 16.1, 81.2)
$= 29.076$

$M_s = M_d(1 - B_{ws}) + 18(B_{ws}) = 27.18$
$29.076(.829) + 18(.171)$

(2-9) $v_s = K_p C_p (\sqrt{\Delta P})_{ave} \sqrt{\frac{T_{s(ave)}}{P_s M_s}}$ = ft/sec $\quad$ 56.58 ft/sec, 3395 ft/min, 3396 ft/min

$= 85.49(.84)(.870)\sqrt{\frac{662}{29.70(27.18)}}$ static

(2-10) $Q_{sd} = 3600(1 - B_{ws}) \, v_s \, A_s \left(\frac{T_{STD}}{T_{s(ave)}}\right)\left(\frac{P_s}{P_{STD}}\right)$ = DSCF/hr $\quad$ 2145631

$= 3600(.829)(56.58)(15.9)\left(\frac{528}{662}\right)\left(\frac{29.70}{29.92}\right)$ = [illegible] 85,407 $\quad$ 2067 DSCF/min

(5-7) $I = \frac{100 \, T_s \left[K_3 V_{lc} + \left(\frac{V_m}{T_m}\right)\left(P_b + \frac{\Delta H}{13.6}\right)\right]}{60 \, \Theta \, v_s \, P_s \, A_n}$ (662, .002669, 238, 57.4, 29.9) $\quad K_3$ = .002669

$(72)(566)(29.70)(.000325)$

$\frac{(.123)(3396)(15.9)(29.07)(29.70)}{662}$ $\quad$ 8662 DSCFM

$\frac{29.4}{27.8}$

TABLE 1

SUMMARY OF TEST RESULTS
GLASGOW, INC.
CATANACH FACILITY
GLENSIDE, PA.

04-6187-000

DATE	7/18/90	7/18/90	7/18/90
LOCATION		Stack	
RUN NO.	G-1	G-2	G-3
TIME	0835	1056	1349
OPERATING DATA			
	See Appendix 3		
FLUE GAS CHARACTERISTICS			
DSCFM	35,711	35,572	36,775
ACFM	54,264	54,208	54,372
Temperature, °F	200	202	251
Moisture, %	17.1	17.2	15.1
PARTICULATE EMISSIONS			
Gr/DSCF	0.014	0.011	0.013
Lbs/Hr	4.14	3.49	4.05
Gr/DSCF, Average		0.013	
Gr/DSCF, Allowable		0.04	
VISIBLE EMISSIONS			
Opacity, %	0	0	0

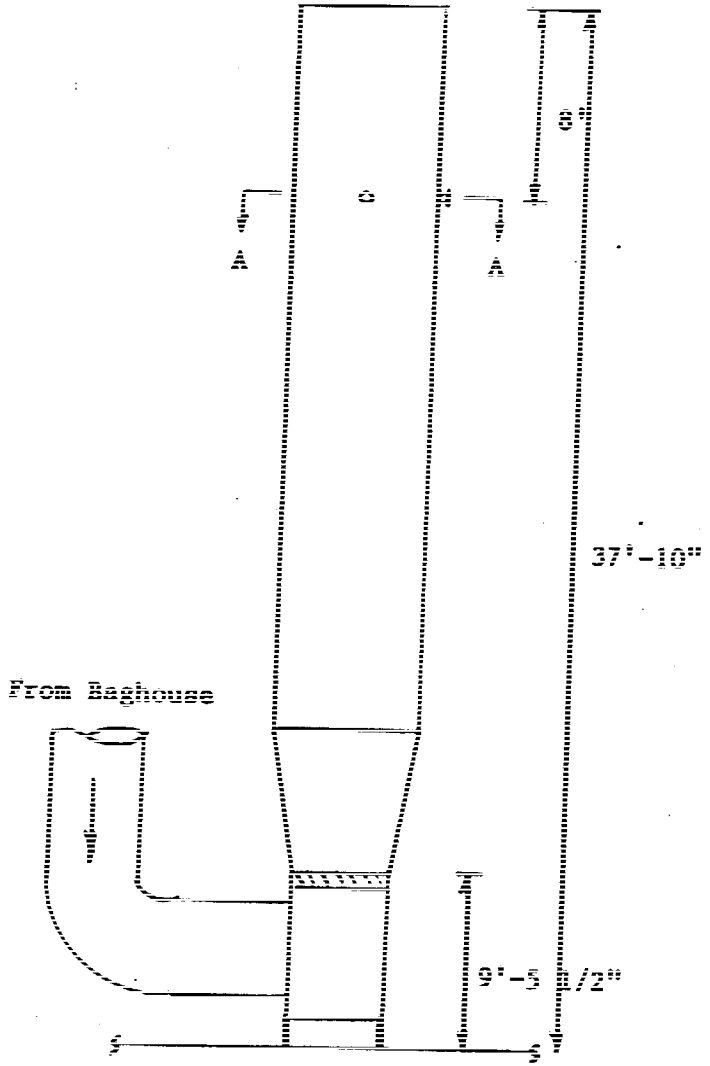
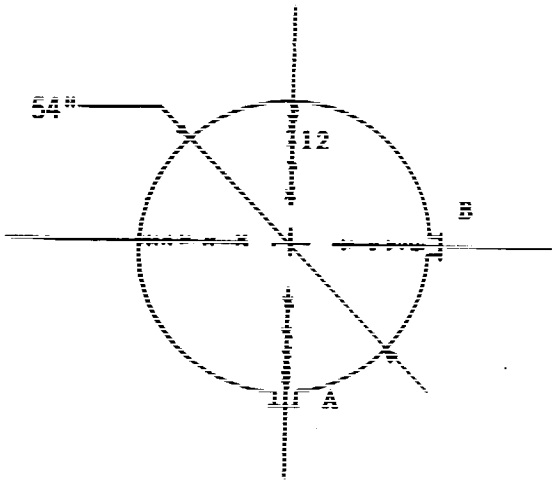


FIGURE 1
SAMPLE PORT AND TRAVERSE POINT LOCATIONS
BAGHOUSE OUTLET STACK
CATANACH ASPHALT PLANT
GLASGOW, INC.



DETAIL A-A

SAMPLE POINT	DISTANCE FROM PORT, INCHES
1	1.13
2	3.62
3	6.26
4	9.56
5	13.50
6	19.22
7	34.78
8	40.50
9	44.44
10	46.55
11	50.38
12	52.87

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
Mike Young	Engineering Technician
Gary Helm	Engineering Technician

Laboratory Participants:

Vaughan O'Neill	Chemist

All field tests were completed with the assistance of technical personnel from Glasgow, Inc.

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 the 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 the 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 3.0 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 2

TESTING AND ANALYTICAL PROCEDURES

2.3 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 and 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 the particulate samples collected during the test run proceeded according to EPA Method 5 (Appendix 2.1).

APPENDIX 3

OPERATING DATA

APPENDIX 3

OPERATING DATA

FUEL CONSUMED

Date	Start Time	Stop Time	Gas Reading (Cu. Ft.) Start	Stop	Net	Corresponding Particulate Run
7-18-90	0832	0952	9,684,000	9,766,000	82,000	1
7-18-90	1053	1212	9,830,000	9,908,000	78,000	2
7-18-90	1346	1502	NA	10,045,000	NA	3

ASPHALT PRODUCTION

Date	Start Time	Stop Time	Tons (Cumulative)		Corresponding Particulate Run
7-18-90	0835	0951	430.02	340	1
7-18-90	1055	1213	426.06	332	2
7-18-90	1350	1504	383.08	31	3
				358 av	

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:	9040493
P.O. NO.:	52692
DATE REPORTED:	August 8, 1990
DATE RECEIVED:	July 20, 1990
WORK ORDER NO.:	

SAMPLING DATE: JULY 18, 1990 BY: CLIENT

SAMPLE DESCRIPTION: STACK

SAMPLE IDENTIFICATION: GLASGOW Glasgow
W.O. 04-6187-000

LAB NO.	RUN	PARTICULATE SOURCE	PARTICULATE WT (mg)
9040493-1	G-1	Impinger Water	7.9
9040493-1	G-1	Impinger Water (0.22 um Filter)	0.9
9040493-1	G-1	Impinger Acetone	6.1
9040493-1	G-1	Probe Acetone	8.4
9040493-1	G-1	Probe Water	30.7
9040493-1	G-1	Filter	7.8
9040493-2	G-2	Impinger Water	5.0
9040493-2	G-2	Impinger Water (0.22 um Filter)	3.6
9040493-2	G-2	Impinger Acetone	6.7
9040493-2	G-2	Probe Acetone	7.2
9040493-2	G-2	Probe Water	21.6
9040493-2	G-2	Filter	8.0
9040493-3	G-3	Impinger Water	5.2
9040493-3	G-3	Impinger Water (0.22 um Filter)	1.8
9040493-3	G-3	Impinger Acetone	4.8
9040493-3	G-3	Probe Acetone	14.0
9040493-3	G-3	Probe Water	16.9
9040493-3	G-3	Filter	10.2

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) 376-6581 Fax (215) 376-6650
Other offices in Baltimore, Lehigh Valley and Trenton.

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

Run Date:	2/18/90	Client:	Glasgow Inc
Run No.:	G-1	W. O. No.:	
Sample Box No.:		Plant:	Glasside
Operator:	MEM	Sampling Location:	Baghouse Outlet

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

Filter No.	Lab No.	Weight Results
		mg
		mg
		mg
		mg

Filter particulate weight ________ mg

Beaker No.	Lab No.	Weight Results
S-52		mg
		mg
		mg
		mg

Filter particulate weight ________ mg

FRONT HALF Lab 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 Lab Total ________ mg

TOTAL WEIGHT ________ mg

MOISTURE

Impingers: 404

176

196

Final Volume 576

Initial Volume 300

Net Volume 216

Silica Gel

Weight after test	254			
Weight before test	232			
Net Weight	22			
Container No.:	1.	2.	3.	4.

TOTAL WEIGHT-Silica Gel 22 g

TOTAL VOLUME Impingers 216 ml

TOTAL MOISTURE 238 g

Comments: ________

Date: DATE RECEIVED ________

DATE REPORTED ________

____
ANALYTICAL CHEMIST

APC/APC 11/76

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

Run Date: [illegible]
Run No.: [illegible]
Sample Box No.:
Operator: [illegible]

Client: [illegible]
W. O. No.:
Plant: [illegible]
Sampling Location: [illegible]

FRONT HALF

Acetone-Probe Wash
Probe, Filter 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

Filter particulate weight ________ mg

Filter No.	Lab No.	Final Weight
		mg
		mg
		mg
		mg

Filter particulate weight ________ mg

FRONT HALF Lab 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 0.22u Filter ________ mg
Aqueous Residue ________ mg

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

Lab No. ________ Residue ________ mg

BACK HALF Lab Total ________ mg
TOTAL WEIGHT ________ mg

MOISTURE

Impingers: 216
225
64

Final Volume 505
Initial Volume 300 Or
Net Volume 205

SILICA GEL

Weight after test 266
Weight before test 232
Net Weight 34
Container No.s 1.____ 2.____ 3.____ 4.____

TOTAL WEIGHT-Silica Gel 34 ml
TOTAL WATER-Impinger 205 ml
TOTAL MOISTURE 239 ml

Comments: ________

Lab: DATE RECEIVED ________
DATE REPORTED ________

____
ANALYTICAL CHEMIST

[illegible]

[illegible] ASSOCIATES, INC.
AIR POLLUTION CONTROL DEPT.
PARTICULATE CLEAN UP AND REPORT FORM

Run Date: 7-1[illegible]-90

Run No.: 6-3

Sample Box No.:

Operator: [illegible]

Client: [illegible]

P. O. No.:

Plant: [illegible]

Building Location: [illegible]

FRONT HALF

Probe-Acetone Wash
Probe, Thimble Holder, Cyclone (Bypass), Flask, Front Half Filter Holder-Acetone Wash

Thimble No.	Lab No.	Weight Results
		g
		g
		g
		g

Filter No.	Lab No.	Weight Results
[illegible]		g
		g
		g
		g

Laboratory Results

Lab No. ________ Acetone ________ g

Lab No. ________ Acetone ________ g

Thimble particulate weight ________ g

Filter particulate weight ________ g

FRONT HALF Sub Total ________ g

BACK HALF

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

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

Lab No. ________ Ether-Chloroform Extract ________ g

Collected on Glass Filter ________ g

Aqueous Residue ________ g

Lab No. ________ Acetone ________ g

BACK HALF Sub Total ________ g

TOTAL WEIGHT ________ g

MOISTURE

Impingers: [illegible]

Final Volume: [illegible]

Initial Volume: [illegible]

Net Volume: [illegible]

SILICA GEL

Weight after test: 250

Weight before test: 232

Net Weight: 18

Container No.: 1. ____ 2. ____ 3. ____ 4. ____

TOTAL WEIGHT-Silica Gel: 18 g

TOTAL VOLUME, Impingers: [illegible] ml

TOTAL MOISTURE: [illegible] g

Comments:

Lab: DATE RECEIVED ________

DATE REPORTED ________

____
ANALYTICAL CHEMIST

[illegible]

APPENDIX 5

RAW FIELD DATA

Sheet 1 of 2

PARTICULATE FIELD DATA

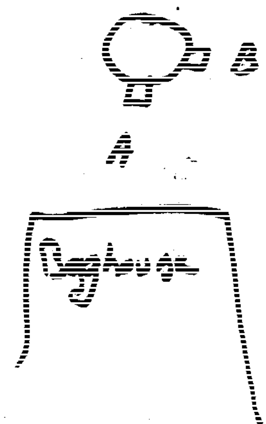
VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

Client	GLASGOW
W. O. No.	
Plant	
Run No.	G-1
Location	Baghouse Outlet
Date	7/18/90
Operator	Helm
Sample Box No.	1
Meter Box No.	1693
Meter ΔH	2.07
C Factor	0.935

K = 0.65

SKETCH



PB

Pitot Calibration	0.84
Thimble No.	
Filter No.	5-52
Ambient Temp. °F	85
Bar. Press. "Hg	29.21
Assumed Moisture %	12
Heater Box Setting, °F	250
Probe Tip Dia., In.	0.244
Probe Length	6'
Probe Heater Setting	
Avg. ΔP	
Avg. ΔH	

54" dia. stack

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H2O ΔP	ORIFICE Δ H IN. H2O DESIRED	ORIFICE Δ H 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		[illegible]	0.0	107.852	0.78		2.20	84.	85.	0.5	250.	51.		197.
2			3.0	110.1	0.85		2.45	85.	86.	0.5	260.			198.
3			6.0	113.4	0.94		2.55	95.	87.	0.5	270.			199.
4			9.0	115.1	0.80		2.25	98.	88.	0.5	275.			201.
5			12.0	117.3	0.84		2.32	103.	90.	2.2	275		3.0	201.
6			15.0	120.0	0.89		2.44	108.	90.	4.0	275.			204.
7			18.0	121.9	0.83		2.43	110.	92.	4.0	276			199.
8			21.0	125.5	0.80		2.35	113.	93.	3.5	270.		3.6	199.
9			24.0	127.1	0.80		2.35	117.	95.	3.5	265.			198.
10			27.0	131.7	0.81		2.39	118.	97.	3.3	260.			199.
11			30.0	133.2	0.72		2.18	117.	98.	3.4	270.			197.
12			33.0	136.5	0.68		1.98	119.	99.	3.0	275.			197.
STOP			36.0	139.947										

leak test start 15" - good   static -0.52 O_2 16.1

Client Glasgow

PARTICULATE FIELD DATA
(continued)

W.O. No.

Plant Glenside

Location Baghouse Outlet

Run No. G-1

Date 7/16/90

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	[illegible]	STACK TEMP. °F
A-1		0916	0.0	136.046	0.54		1.57	109.	101.	2.4	235.	52.		196.
2			3.0	138.9	0.54		1.58	111.	102.	3.2	245.			195.
3			6.0	141.0	0.56		1.62	113.	103.	3.0	260.			198.
4			9.0	143.1	0.58		1.70	115.	103.	3.0	250.		2.5	201.
5			12.0	145.2	0.63		1.94	117.	104.	3.3	250.			203.
6			15.0	147.3	0.67		1.96	117.	104.	4.0	255.		2.8	204.
7			18.0	149.7	0.77		2.27	115.	104.	5.2	250.			204.
8			21.0	152.1	0.79		2.31	115.	104.	7.0	250.			204.
9			24.0	154.7	0.90		2.60	116.	103.	7.2	245.			204.
10			27.0	157.4	0.86		2.51	117.	103.	6.9	240.			205.
11			30.0	160.1	0.97		2.81	117.	103.	8.2	245.			205.
12			33.0	162.7	0.92		2.68	117.	103.	9.0	240.			203.
END		0952	36.0	165.443										

COMMENTS:

leak test end 15" - 0.00

Static -0.32
-0.44
/ 7.6

216 ml
22 gm

165.443
107.852
57.6

Sheet 1 of 6

Client Glasgow

W. O. No.

Plant Glenside

Run No. 6-2

Location Baghouse Outlet

Date 7-18-96

Operator Hal

Sample Box No. 2

Meter Box No. 1693

Meter ΔH

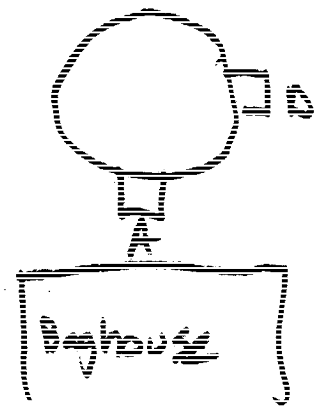
C Factor

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

SKETCH



Pitot Calibration #1

Thimble No.

Filter No. S-20

Ambient Temp. °F 95°

Bar. Press. "Hg 29.74

Assumed Moisture % 17

Heater Box Setting, °F 250

Probe Tip Dia., In. 0.244

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. 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		1056	0.0	166.633	0.65		1.70	93.	95.	0.3	250.	56.		195.
2			3.0	168.9	0.74		2.10	97.	95.	0.5	250			200.
3			6.0	171.6	0.76		2.41	101.	96.	0.5	250			202.
4			9.0	173.9	0.86		2.36	105.	96.	2.1	250.		3.7	203.
5			12.0	175.9	0.91		2.35	107.	97.	2.5	250.			204.
6			15.0	178.5	0.93		2.40	109.	97.	2.5	250.			203.
7			18.0	180.9	0.77		2.25	109.	98.	2.1	250.		3.6	203.
8			21.0	183.7	0.90		2.30	111.	98.	2.3	250.			204.
9			24.0	185.7	0.93		2.45	111.	99.	2.1	250.			203.
10			27.0	188.2	0.78		2.30	109.	99.	2.0	250.			202.
11			30.0	190.7	0.74		2.15	109.	98.	1.9	250.			202.
12			33.0	193.2	0.64		1.95	107.	99.	1.3	250.			201.
Stop			36.0	195.454										

Leak test good (15"-Hg)   Static -0.47 -0.55 O_2 - 16.1   GEL 34

Client Glasgow

PARTICULATE FIELD DATA
(continued)

W.O. No.

Plant Glenside

Location Baghouse Outlet

Run No. 6-2

Date 7/18/90

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
A-1		1135	0.0	195.434	0.47		1.35	101.	97.	6.5	250.	57.		193
2			3.0	197.3	0.56		1.61	100.	97.	1.0	250.			196.
3			6.0	199.3	0.56		1.61	103.	97.	1.0	250.		5.8	200.
4			9.0	201.4	0.57		1.65	107.	97.	1.0	250.			203.
5			12.0	203.3	0.59		1.70	105.	97.	1.0	250.			204.
6			15.0	205.3	0.59		1.70	107.	99.	1.0	250.			205.
7			18.0	207.6	0.80		2.30	107.	99.	1.9	245.			205.
8			21.0	210.2	0.85		2.49	109.	99.	1.9	245.		5.6	209.
9			24.0	212.6	1.05		3.01	109.	99.	3.6	245.			204
10			27.0	215.5	1.05		3.05	111.	99.	2.9	245.			205.
11			30.0	218.2	1.10		3.20	114.	98.	3.0	245.			204.
12			33.0	221.2	1.05		3.05	114.	100.	2.9	245.			204.
[illegible]		1211	36.0	224.72										

COMMENTS:

leak test end 15" — 0.002

static -0.42
-0.57

Sheet 1 of 12

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

SKETCH

#1

Client: Glasgow

W. O. No.:

Plant: Glenside

Run No.: 6-3

Location: Baghouse Outlet

Date: 7-19-90

Operator: [illegible]

Sample Box No.:

Meter Box No.: 1643

Meter ΔH:

C Factor:

Pitot Calibration:

Thimble No.:

Filter No.: 5-886

Ambient Temp. °F: 95

Bar. Press. "Hg: 29.72

Assumed Moisture %: 17

Heater Box Setting, °F:

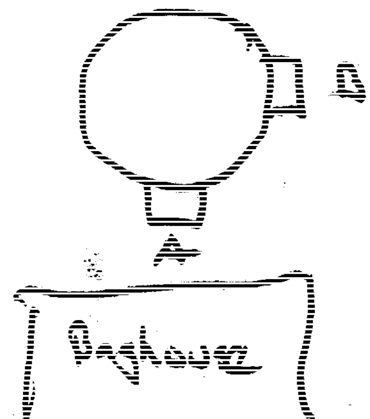
Probe Tip Dia., In.: 0.244

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		1349	6.0	224.220	0.15		0.435	93.	94.	6.5	225.	58.		160.
2			6.0	225.9	0.70		3.04	93.	94.	[illegible]	240.			201.
3			4.0	227.5	0.77		3.29	92.	94.	2.3	240.			205.
4			9.0	230.2	0.80		3.26	100.	94.	2.4	240.		3.8	202.
5			12.0	232.2	0.88		2.45	103.	95.	2.3	240.			206.
6			15.0	234.3	0.85		3.52	105.	95.	2.5	240.			206.
7			18.0	237.5	0.78		3.30	110.	96.	2.1	240			207.
8			21.0	240.0	0.75		3.21	111.	96.	1.9	240			[illegible]
9			24.0	242.3	0.76		3.25	112.	97.	2.6	250.			205.
10			25.0	244.9	0.79		3.31	111.	98.	2.5	250.		3.6	205.
11			30.6	247.2	0.83		3.45	112.	98.	2.5	250.			207.
12			33.0	249.7	0.81		3.40	112.	99.	2.2	245.			206.
Final			36.0	252.386										

leak test start 15" - 0.00

Static -0.40 -0.54

O_2 17.2

Client Glasgow   **PARTICULATE FIELD DATA (continued)**

W.O. No.

Plant Glenside   Location Baghouse Outlet

Run No. 6-3   Date 7/18/90

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		1425	0.0	252.106	0.58		1.61	97.	95.	1.0	256.	57.		207.
2			3.0	254.4	0.55		1.61	102.	100.	1.0	245.			203.
3			6.0	256.5	0.58		1.70	107.	100.	1.0	245.			198.
4			9.0	258.5	0.64		1.90	109.	100.	1.0	250.		6.0	197.
5			12.0	261.6	0.68		1.99	107.	100.	1.0	240.		6.0	197.
6			15.0	263.5	0.71		2.11	109.	100.	1.3	235.			199.
7			18.0	265.5	0.91		2.70	111.	101.	2.2	250.		6.0	197.
8			21.0	268.3	1.05		3.10	111.	101.	2.4	265.		6.0	193.
9			24.0	271.0	1.10		3.22	115.	101.	2.8	236.			192.
10			27.0	273.9	1.15		3.40	116.	102.	2.9	262.			193.
11			30.0	276.1	1.15		3.40	116.	102.	2.9	263.			192.
12			33.0	279.1	1.10		3.22	116.	102.	2.9	260.			192.
[illegible]		1501	36.0	282.777										194.
END														

COMMENTS:

leak test end 15" - 0.001

Static -0.39
-0.36
-0.41

APPENDIX G

CALIBRATION DATA

DRY GAS METER CALIBRATION DATA

Meter box number: 1693 | Calibrated by: HELM | Date: 7/9/98

	1	2	3	4	5			
Critical Orifice ID	15/4	14/2	13/3	13/1	12/4			
Critical Orifice K'factor	0.2669	0.4585	0.5855	0.6470	0.8072			
Dry Gas Meter								
Final reading,ft	362.935	366.591	371.643	0.000	0.000			
Initial reading,ft	361.175	363.504	367.812	0.000	0.000			
Difference,Vm,ft	1.76	3.087	3.831	0	0			
Temperatures								
	INLET OUTLET	INLET OUTLET	INLET OUTLET	INLET OUTLET	INLET OUTLET			
Initial Inlet/outlet, F	105 89	104 90	109 91	0 0	0 0			
Final Inlet/outlet,F	104 90	107 91	115 93	0 0	0 0			
Avg.Inlet/outlet temp td,F	97	96	102	0	0			
Avg,outlet temp tdo,F	89.5	90.5	92	0	0			
Time,D,min/sec	300.03	306.75	305.84	0	0			
min	5.001	5.113	5.097	0.000	0.000			
Orifice man.rdg./\H,in.H2O	0.37	1.2	1.9	0	0			
Bar.pressure.Pb,in.Hg	30.28	30.28	30.28	0	0			
Ambient temperature,ti,F	87	87	87	0	0			
Pump Vacuum,in,Hg	20	18	16.5	0	0			
Vm(std),ft	1.689	2.964	3.658	0.000	0.000			
Vcr(std),ft	1.728	3.022	3.731	0.000	0.000	Avg.	LOW	HIGH
DGM cal,factor,Y	1.023	1.020	1.020	ERR	ERR	1.021	1.000	1.041
Orifice factor,/\H@	1.765	1.949	2.015	ERR	ERR	1.910	1.710	2.110
	1582.344	924.1253	747.7685	ERR	ERR			

Gilbert/Commonwealth Inc.
Testing Services Group
METER BOX CALIBRATION

DATE: 7/23/90

METER BOX NUMBER: 1695

BAROMETRIC PRESS. (Pb) = 29.41 in. Hg

CALIBRATED BY: MELH

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	Qm
0.5	5.000	4.931	75.5	81	77	79.0	12.43	1.02	1.86	0.395
1.0	5.000	5.057	75.5	100	86	93.0	9.12	1.02	1.97	0.548
1.5	10.000	10.105	75.5	106	90.5	98.3	15.18	1.02	2.03	0.662
2.0	10.000	10.311	75.5	111.5	94.5	103.0	13.33	1.01	2.06	0.762
3.0	10.000	10.416	75.5	116	97.5	106.8	11.05	1.01	2.10	0.927
4.0	10.000	10.174	75.5	96	81.5	88.8	9.57	1.00	2.12	1.049
							AVERAGE Yi	1.01		

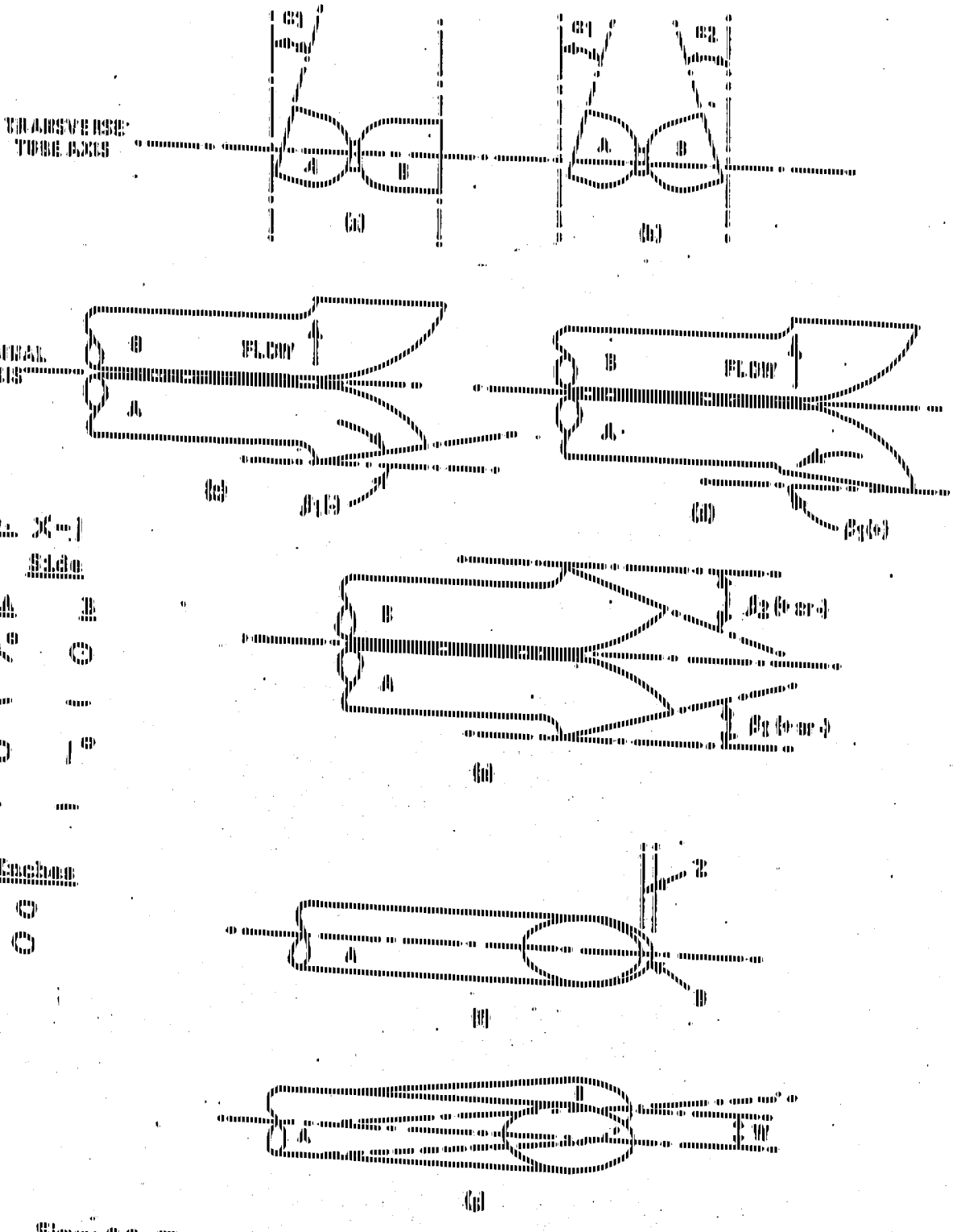
FORMULAS

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

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

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

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



Piece No. 3(-)

Reference	Side A	Side B
A_1	2°	0
A_2	—	—
B_1	0	1°
B_2	—	—

Reference	Inches
z	0
w	0

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 $\beta_2 < 5°$, $z < 0.032$ 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 OF

SYSTEM

DOCUMENT 4447427

DATE 3/7/90

SUBDOCUMENT

REVIEWED BY

DATE

Pot Meter-Thermocouple Calibration

Pot Meter #	2
Thermocouple Type	K
Ice Bath Temperature °F	32
Certified Mercury Bulb °F	32
Ambient Temperature °F	70
Certified Mercury Bulb °F	70
Boiling H_2O °F	212
Certified Mercury Bulb °F	212
Hot Synthetic Oil °F	366
Certified Mercury Bulb °F	365

Remarks:

APPENDIX 7

COMPUTER PRINTOUT

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

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

Client: SLASCOW — Plant: Glenside, PA

Unit Tested: Baghouse Outlet — Pollutant: Particulate

Sampling Location: OUTLET

Run No: 6-1 — Date: 7/18/90 — Start: 835 End: 952

DATA

DN:	0.244	PB:	29.71	PST:	-0.43	AS:	2290.2
O2%:	16.1	CO2%:	2.8	N2%:	80.1	VM:	258
GAS METER Y-FACTOR:			1.01	E.A.%:	303.2		

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SQE	O2	CO	VEL
B-1	3.0	107.852	0.780	188	84	85	2.200	22.48	16.1		3610
2	3.0		0.870	195	89	86	2.450	23.87			3567
3	3.0		0.780	199	95	87	2.200	22.67			3439
4	3.0		0.800	201	98	88	2.250	23.00			3468
5	3.0		0.840	201	105	90	2.360	23.56			3574
6	3.0		0.880	200	108	90	2.600	24.10			3655
7	3.0		0.830	199	110	92	2.430	23.39			3547
8	3.0		0.900	199	112	93	2.350	22.96			3483
9	3.0		0.800	198	117	95	2.350	22.94			3480
10	3.0		0.810	197	118	97	2.390	23.07			3451
11	3.0		0.720	197	119	98	2.100	21.75			3317
12	3.0		0.680	197	119	99	1.980	21.14			3220
A-1	3.0		0.540	196	109	101	1.580	18.62			2865
2	3.0		0.540	195	111	102	1.580	18.61			2853
3	3.0		0.560	198	113	103	1.620	19.25			2912
4	3.0		0.580	201	115	103	1.700	19.58			2970
5	3.0		0.630	203	117	104	1.840	20.44			3100
6	3.0		0.670	204	117	104	1.960	21.09			3199
7	3.0		0.770	204	115	104	2.270	22.61			3430
8	3.0		0.860	204	115	104	2.510	23.90			3625
9	3.0		0.900	204	116	103	2.600	24.45			3708
10	3.0		0.850	205	117	103	2.510	23.92			3627
11	3.0		0.870	205	117	103	2.810	25.40			3852
12	3.0		0.920	205	117	103	2.680	24.73			3752
		165.443									

RESULTS

	TT	VM	PIT	TS		TM	PM	SQE	O2	CO	VEL
	72.0	57.59%	0.766	200		104	2.222	22.41	16.1	ERR	3399
	net	net	avg	avg		avg	avg	avg	avg	avg	avg
	PSM=	29.87	VMSTD=	54.382	VMGAS=	11.210	ZN=	17.1	RMS OF VELOCITIES =		7.6
	MD=	0.83	MMD=	29.59	MM=	27.20	PS=	29.68			

STACK GAS VELOCITY = 3,399 AFPM
STACK GAS VOLUME = 35,711 DSCFM
STACK GAS VOLUME = 54,264 ACFM
STACK GAS VOLUME = 1.84E+05 LBS/HR
ISOKINETIC RATIO = 103.3

PARTICULATE EMISSIONS

Weight, mg =	47.8
GR/DSCF =	0.014
LBS/HR =	4.14

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

Client: GLASSDOM Plant: GLENSIDE, PA

Unit Tested: BAGHOUSE OUTLET Pollutant:

Sampling Location: OUTLET

Run No: G-2 Date: 7/18/90 Start: 1056 End: 1251

DATA

DN:	0.246	PB:	29.74	PST:	-0.50	AS:	2290.2
O2%:	16.1	CO2%:	3.7	N2%:	81.2	Vm:	239
GAS METER Y-FACTOR:			1.01	H.A.%:	301.3		

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SQE	O2	CO	VEL
B-1	3.0	166.653	0.650	195	93	55	1.900	20.63	16.1		3130
2	3.0		0.740	200	97	95	2.160	22.10			3384
3	3.0		0.760	202	101	96	2.210	22.43			3440
4	3.0		0.800	203	105	96	2.300	23.03			3493
5	3.0		0.810	204	107	97	2.350	23.16			3516
6	3.0		0.830	203	109	97	2.430	23.46			3558
7	3.0		0.770	203	109	98	2.250	22.59			3427
8	3.0		0.800	203	111	98	2.300	23.03			3493
9	3.0		0.830	203	111	99	2.450	23.46			3558
10	3.0		0.780	202	109	99	2.300	22.72			3447
11	3.0		0.740	202	109	99	2.180	22.13			3357
12	3.0		0.640	201	107	99	1.850	20.57			3120
A-1	3.0		0.470	185	101	97	1.350	17.41			2641
2	3.0		0.560	196	100	97	1.630	19.17			2907
3	3.0		0.560	200	103	97	1.620	19.22			2916
4	3.0		0.570	203	107	98	1.650	19.44			2949
5	3.0		0.590	204	108	98	1.700	19.79			3002
6	3.0		0.590	205	108	99	1.700	19.81			3004
7	3.0		0.600	205	107	99	1.730	20.07			3044
8	3.0		0.650	205	109	99	2.490	23.77			3606
9	3.0		1.050	204	109	99	3.010	25.40			4005
10	3.0		1.050	205	111	99	3.050	26.42			4008
11	3.0		1.100	204	114	99	3.200	27.03			4099
12	3.0		1.050	204	114	100	3.050	26.40			4005
		223.972									

RESULTS

	TT	VM	PST	TS		TM	PM	SQE	O2	CO	VEL
	72.0	57.338	0.766	202		102	2.223	22.39	16.1	ERR	3396
	net	net	avg	avg		avg	avg	avg	avg	avg	avg
	PSM=	29.90	VMSTD=	54.364	VWBAS=	11.257	TM=	17.2	RMS OF VELOCITIES =		8.0
	MW=	0.83	MWD=	29.07	MW=	27.17	PS=	29.70			

STACK GAS VELOCITY =	3,396	AFPM
STACK GAS VOLUME =	35,572	DSCFM
STACK GAS VOLUME =	54,206	ACFM
STACK GAS VOLUME =	1.83E+05	LBS/HR
ISOKINETIC RATIO =	103.6	

PARTICULATE EMISSIONS

Weight, mg =	40.4	
GR/DSCF =	0.011	
LBS/HR =	3.43	

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

Client: GLASSCOM — Plant: GLENSIDE, PA

Unit Tested: BAGHOUSE OUTLET — Pollutant:

Sampling Location: OUTLET

Run No: G-3 — Date: 7/18/90 — Start: 1349 End: 1501

DATA

DN=	0.244	PB=	29.72	PST=	-0.50	AS=	2290.2
O2%=	17.2	CO2%=	1.5	N2%=	79.1	VW=	209
GAS METER Y-FACTOR:			1.01	E.A.%=	1219.7		

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SDE	O2	CO	VEL
G-1	3.0	224.220	0.150	180	95	94	0.435	9.80	17.2		1481
2	3.0		0.700	201	95	94	2.040	21.61			3252
3	3.0		0.770	205	97	94	2.290	22.63			3421
4	3.0		0.800	204	100	94	2.360	23.08			3490
5	3.0		0.830	206	103	95	2.450	23.51			3555
6	3.0		0.850	206	105	95	2.520	23.79			3597
7	3.0		0.780	207	110	96	2.300	22.81			3449
8	3.0		0.750	208	111	96	2.210	22.38			3384
9	3.0		0.760	208	112	97	2.250	22.53			3407
10	3.0		0.790	208	111	98	2.310	22.97			3473
11	3.0		0.830	207	112	98	2.450	23.53			3558
12	3.0		0.810	205	112	99	2.400	23.21			3509
G-1	3.0		0.550	203	107	99	1.630	19.10			2887
2	3.0		0.550	203	108	100	1.620	19.10			2887
3	3.0		0.580	198	107	100	1.700	19.64			2954
4	3.0		0.640	195	109	100	1.900	20.47			3096
5	3.0		0.680	189	108	100	1.980	21.01			3176
6	3.0		0.710	187	109	100	2.110	21.43			3241
7	3.0		0.910	187	111	101	2.200	24.26			3669
8	3.0		1.050	187	111	101	3.100	26.06			3945
9	3.0		1.100	187	115	101	3.220	26.68			4034
10	3.0		1.150	187	116	102	3.400	27.28			4124
11	3.0		1.150	187	116	102	3.400	27.28			4124
12	3.0		1.100	186	116	102	3.220	26.66			4030
		282.797									

RESULTS

TT	VM	PST	TS		TM	PM	SDE	O2	CO	VEL
72.0	58.577	0.79%	199		103	2.313	22.53	17.2		3406
met	met	avg	avg		avg	avg	avg	avg	avg	avg

PSM=	29.69	VMSTD=	55.436	VMBAS=	9.844	XM=	15.1	RMS OF VELOCITIES =	15.3
MD=	0.85	MMD=	29.03	MM=	27.36	PS=	29.68		

STACK GAS VELOCITY =	3,406	AFPM
STACK GAS VOLUME =	34,775	DSCFM
STACK GAS VOLUME =	54,372	ACFM
STACK GAS VOLUME =	1.88E+05	LBS/HR
ISOKINETIC RATIO =	102.2	

PARTICULATE EMISSIONS

Weight, mg =	42.7	
GR/DSCF =	0.013	
LBS/HR =	4.05	

APPENDIX B

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS

Particulate Isokinetic Sampling

1. Calculation for stack volume and Isokinetic Ratio

Time	Dry Gas Meter Ft^3	Press ΔP_h 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. BW = Beaker Balance, Inches

2. PB = Barometric Pressure, Inches Hg

3. T = Net 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*, 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*, 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

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

13. EA = % Excess Air $= \frac{[(\%\ O_2) - 0.5\ (\%CO)]}{0.264\ (\%N_2) - [(\%O_2) + 0.33\ (\%S)]} \times 100$

14. Molecular weight of wet stack gas

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

15. AS = Stack Area, square inches

16. PS = Stack Pressure, inches Hg

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

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

17. TS = Average Stack Temperature, °F

TS = Average TS

18. SVE = Average $\sqrt{\text{Velocity Head (DP)} \times (\text{Stack Temperature} + 460)}$

(Calculated each time)

$$SVE = Avg\ \sqrt{DP \times (TS + 460)}$$

19. Stack gas velocity at stack conditions, fps

$$VS = 9130 \times Cp \times Avg(SVE) \times \left[\frac{1}{PS \times MW}\right]^{1/2} = FPS$$

Cp = pitot tube coefficient

20. Stack gas volumetric flow rate at standard conditions, DSCFM

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

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

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

22. Percent Isokinetic

$$\%I = \frac{1.032 \times (TS + 460) \times VMSTP}{VS \times TT \times PS \times MD \times (DN)^2}$$

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

[b]Standard conditions at 68°F, 29.92 in. Hg.

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

II. Calculations for gaseous loading and emission rates

22. Particulate, gr/DSCF

$$gr/DSCF = 0.0154 \times \frac{PR}{VMSTD}$$

23. Particulate at stack condition, 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 = $0.192 \times \frac{800 \text{ particulate} \times AS}{\left(\frac{DN^2}{4}\right) \times TT}$

26. Particulate, combustion

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

27. Particulate, pounds lb/ton

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

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

Using O_2 =

$$\frac{0.0194 \times MR \times F\text{-Factor} \times 20.9}{7000 \times VMSTD \times (20.9 - \%O_2)}$$

Using CO_2 :

$$\frac{0.0194 \times MR \times F\text{-Factor} \times 100}{7000 \times VMSTD \times \%\ CO_2}$$

29. F-Factor, dscf/mmbtu

O_2 Factor:

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

CO_2 Factor:

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

CATANACH ASPHALT PLANT - DRY SIEVE ANALYSIS

PENN DOT ID-2 BINDER (HEAVY DUTY) - 100% VIRGIN

SIZE	PRODUCT JMF	ADJ. FOR BH FINES REMOVED	DRY GRADINGS-RAW MATERIAL FEED #1	#2	#3	AVERAGE
1 1/2	100.0	100.0	99.1	99.5	99.4	99.3
1	90.8	93.5	91.8	90.6	90.1	90.8
1/2	62.0	64.7	63.2	59.5	58.2	60.3
3/8	52.9	55.6				
4	44.0	46.7	46.7	36.3	34.6	39.2
8	35.0	37.7	42.4	29.9	31.0	34.4
16	25.0	27.7	32.3	21.6	25.4	26.4
30	19.0	21.7	21.1	13.6	17.9	17.5
50	11.0	13.7	10.1	7.7	8.9	8.9
100	6.0	8.7	4.3	3.7	3.5	3.8
200	3.5	5.5	1.6	1.4	1.4	1.5