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

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

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

February 10, 1992

Mr. Rick St Louis
PADER - Bureau of Air Quality
P.O. Box 2053
Harrisburg, PA 17120

Re: Haines & Kibblehouse

Dear Mr. St. Louis:

Please find enclosed a basic sketch of the Haines & Kibblehouse Chalfont, PA Asphalt Batch Plant process. During the testing program, the Aggregate Dryer was being heated with propane gas.

We are sorry for any inconvenience this may have caused the State. Future reports will include a more in-depth discussion about the process being tested.

If you have any questions, please feel free to contact me at (215) 775-2600.

Very truly yours,

Eric S. Roland
Environmental Specialist

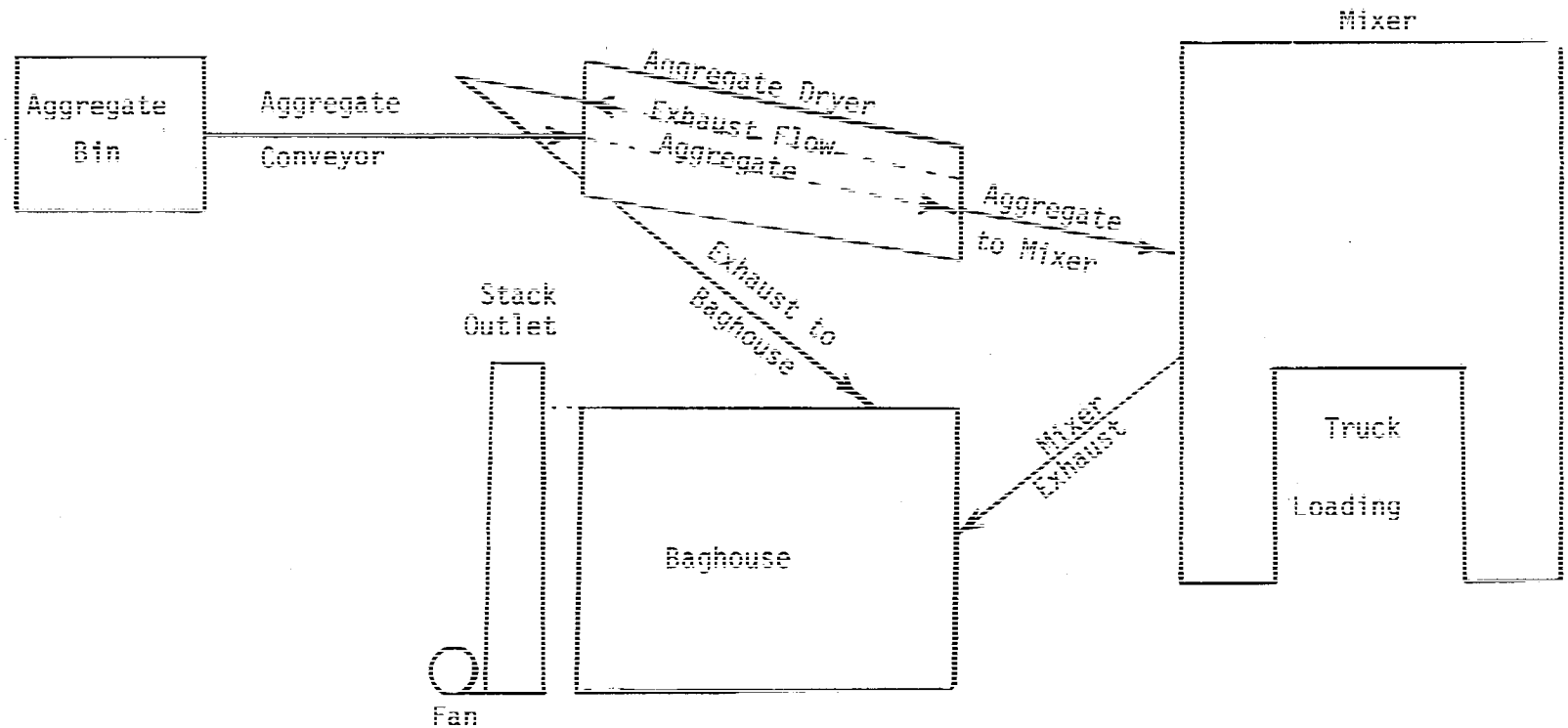
ESR/sds

Enclosure

RECEIVED
FEB 20 1992
DER AIR QUALITY CONTROL
DIV. OF TECH. SERVICES

HAINES & KIBBLEHOUSE CHALFONT ASPHALT BATCH PLANT

Figure 1



NOT TO SCALE

Commonwealth of Pennsylvania
Environmental Resources
March 6, 1992

Subject: Source Test Review

To: Haines & Kibblehouse, Inc.
Hilltown Township

From: William Schneider
Air Pollution Control Engineer
Division of Technical Services and Monitoring
Bureau of Air Quality Control

Through: Chief, Source Testing and Monitoring Unit

Haines & Kibblehouse, Inc., operates a batch asphalt plant in Hilltown Township. Aggregate is fed to a rotary drum dryer where surface moisture is removed by heated air generated by a propane burner. The dried aggregate is mixed with hot asphalt oil.

Emissions from the dryer are controlled by a knock out box cyclone and a baghouse. Gilbert/Commonwealth, Inc., conducted a source testing program on December 20 and 23, 1991, in the baghouse stack outlet. PA DER modified Method 5 was used to test particulate emissions and Method 9 was used to test opacity emissions. All tests are acceptable to the Department, with the following comment:

1. The computer sheets show the absolute stack gas pressure was calculated by adding a positive stack pressure to the atmospheric pressure. The field sheets show the static pressure was negative. This error had an insignificant effort on the calculations.

2. A very large moisture plume made it impossible to read opacity during the first test run. The opacity data taken during the second and third runs is in question because opacity readings were being interfered with heat vapors exiting the stack. The consultant noted that there appeared to be no visible emissions exiting the stack.

The following results were extracted from the test report:

Run No.	GR/DSCF	Lbs/Hr	Opacity (%)	Process Rate (TPH)
1	0.009	2.7	N/A	191
2	0.004	1.2	0*	247
3	0.005	1.4	0*	209
Allowable	0.04		20	

*data is in question - see text

Maximum capacity=350 TPH

Gilbert/Commonwealth, Inc. engineers and consultants

P.O. Box 1498, Reading, PA 19603-1498/Telephone 215-775-2600,Cable Gilsonco/Telex 838-431

04-395-0259

January 6, 1992

Mr. Harry R. Budenz,Jr.
Haines and Kibblehouse
P.O. Box 196
Skippack, PA. 19474

Re: Submittal of Source Sampling Report for Measurement of Particulate Emissions and Determination of Visible Emissions, Asphalt Plant, Chalfont, Pa. G/C, Inc., Report R-04-6317-007

Dear Mr. Budenz:

We are pleased to submit five (5) copies of our Report R-04-6317-007, dated January, 1992. This report contains results of source sampling for particulate emissions, determination of visible emissions and the determination of flue gas characteristics at the Baghouse Stack Outlet conducted on December 20-23, 1991.

The compliance source sampling program defined by this report incorporates standard sampling procedures. The results of the sampling program are representative of flue gas emissions at the Baghouse Stack Outlet under normal operating conditions.

Information contained in this report and the accompanying appendices includes field data, laboratory analyses, 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 Haines and Kibblehouse and trusts that this report will meet your acceptance.

Very truly yours,

Eric S. Roland
Environmental Specialist
Testing Services Group

ESR:esr

Enclosures

SOURCE SAMPLING REPORT FOR MEASUREMENT OF PARTICULATE EMISSIONS

HAINES AND KIBBLEHOUSE
ASPHALT BATCH PLANT
CHALFONT, PA
BAGHOUSE OUTLET

G/C, INC., REPORT R-04-6317-007
JANUARY, 1992

PREPARED BY

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

ERIC S. ROLAND
ENVIRONMENTAL SPECIALIST
TESTING SERVICES GROUP

SOURCE SAMPLING REPORT FOR MEASUREMENT OF PARTICULATE EMISSIONS

HARNES AND KIBBLEHOUSE
ASPHALT BATCH PLANT
CHALFONT, PA
BAGHOUSE OUTLET

G/C, INC., REPORT R-04-6317-007
JANUARY, 1992

FOREWORD

The compliance source sampling program as defined by this report was confined to the measurement of particulate emissions, opacity, and pertinent flue gas characteristics at the Baghouse Stack Outlet during normal operating conditions.

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FOREWORD		
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SUMMARY OF TEST RESULTS

A summary of test results developed by the compliance source sampling program are presented in Table 1. As such, the results are considered representative of the emissions from the Baghouse Stack Outlet under normal operating conditions.

The results show that the Baghouse Stack Outlet had an average particulate concentration of 0.006 gr/dscf, which is below the allowable rate of 0.04 gr/dscf.

TABLE 1

SUMMARY OF TEST RESULTS
HAINES AND KIBBLEHOUSE - CHALFONT, PA.
PARTICULATE
G/C, INC. REPORT R-04-6317-007

DATE	12/20/91	12/23/91	12/23/91
LOCATION	BAGHOUSE STACK OUTLET		
RUN NO.	1	2	3
TIME	0932-1159	0718-0918	0952-1218
FLOW (DSCFM)	35,954	32,083	31,485
MOISTURE (%)	11.9	15.8	17.7
PARTICULATE EMISSIONS			
GR/DSCF	0.009	0.004	0.005
AVERAGE (GR/DSCF)		0.006	
VISIBLE EMISSIONS			
PERCENT OPACITY	N/A	0.0%	0.0%

SECTION II - ANALYSIS

1. Introduction

The data presented in this report represents the results of a compliance source sampling program for the determination of particulate emissions, and flue gas characteristics at the Baghouse Stack Outlet during referenced operating conditions.

Specific requirements of this source sampling program include the following:

a. Identification of particulate emissions expressed as a concentration (gr/dscf).

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

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

d. Determination of percent opacity.

The sampling program was completed on December 23, 1991, by the G/C, Inc. field test crew, with the assistance of personnel assigned by Haines and Kibblehouse.

2. Sampling Program Procedures

To satisfy the objectives established for the Baghouse Stack Outlet , the sampling program was set-up on a basis of using one test train positioned at the test location and completing three test runs. A test run consisted of a particulate test using EPA Method 5 modified to meet PADER requirements.

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 operate at near normal conditons for the plant.

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

Most of the field sampling work was completed out of doors and subject to prevailing weather conditions. During the first test run there were numerous delays as a result of the sub-freezing temperatures. Moisture in the sample line was freezing and inhibiting sampling, thus it was necessary to thaw out the sample line periodically .

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 during 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 Baghouse Stack Outlet at normal capacity. In the execution of this program, all applicable operating conditions are referenced in Appendix 3.

Operating conditions were monitored throughout the duration of the sampling program by Haines and Kibblehouse personnel.

5.4 Particulate Emissions

The reported particulate emissions as summarized in Table 1 are expressed as a concentration (gr/dscf) as measured.

5.5 Visible Emisssions

Attempts were made to read visible emissions (opacity) during the first test run which occurred on 12/20/91. A very large attached moisture plume made it impossible to read opacity. Both G/C, Inc. and PADER personnel agreed opacity was impossible to read. Opacity was read on 12/23/91 during the second and third runs, however it was noted that opacity readings were being interfered with by heat vapors exiting the stack. There appeared to be no visible emissions exiting the stack; however, due to the conditions, the visual data may be in question.

TABLES AND FIGURES

Tables

1. Summary of Test Results - Particulate

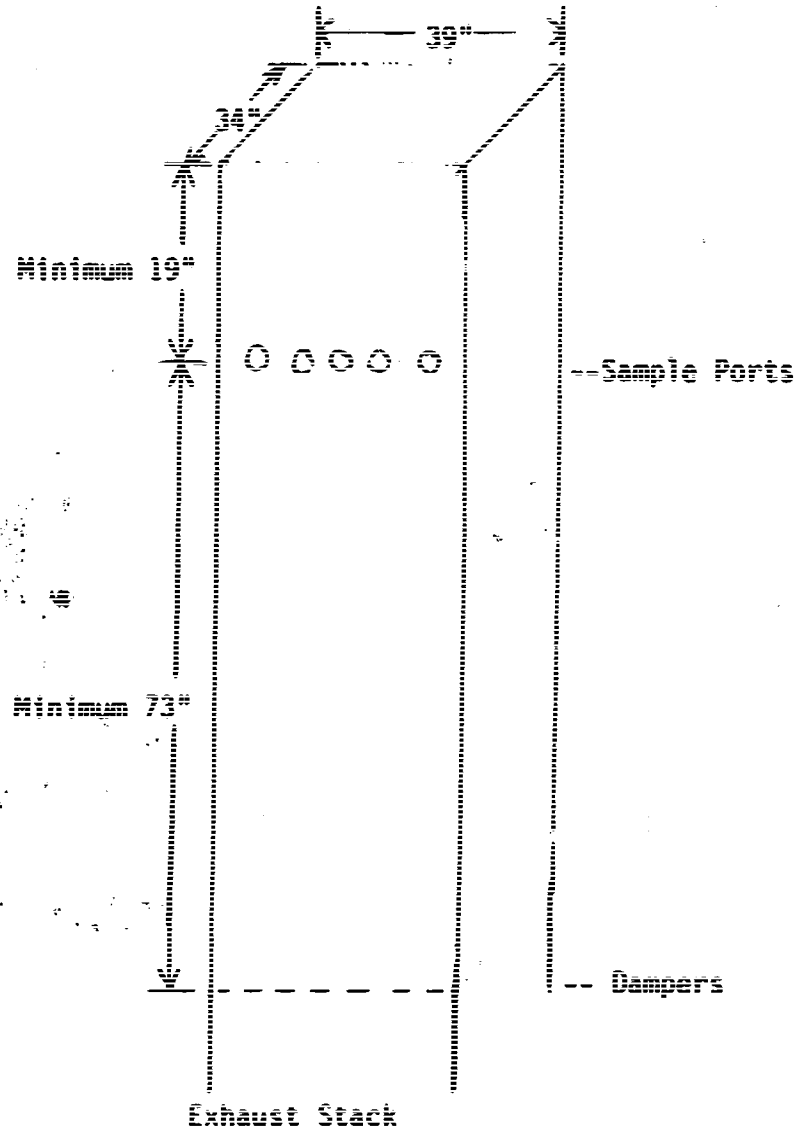
Figures

1. Location of Sample Ports and Traverse Points - Baghouse Outlet

TABLE 1

SUMMARY OF TEST RESULTS
HAINES AND KIBBLEHOUSE - CHALFONT, PA
PARTICULATE
G/C, INC. REPORT R-04-6317-007

DATE	12/20/91	12/23/91	12/23/91
LOCATION		BAGHOUSE STACK OUTLET	
RUN NO.	1	2	3
TIME	0932-1159	0718-0918	0952-1218
FLOW (DSCFM)	35,954	32,083	31,485
MOISTURE (%)	11.9	15.8	17.7
PARTICULATE EMISSIONS			
GR/DSCF	0.009	0.004	0.005
AVERAGE (GR/DSCF)		0.006	
VISIBLE EMISSIONS			
PERCENT OPACITY	N/A	0.0%	0.0%



Point	Distance from Port, Inches
1	3.4
2	10.2
3	17.0
4	23.8
5	30.6

FIGURE 1

Haines & Kibblehouse
Sample Port and Traverse Points
Asphalt Plant - Chalfont, PA

SECTION III

APPENDICES

SECTION III - APPENDICES

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5. Raw Field Data

   5.1 Particulate
   5.2 Visible Emissions

6. Calibration Data

7. Computer Printout
   Flue Gas Characteristics, Isokinetic Calculations, and Particulate Test Results for Emissions

8. Sample Calculations

APPENDIX 1

PROJECT PARTICIPANTS

APPENDIX 1

PROJECT PARTICIPANTS

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

Field Sampling Crew:

George Albright	Senior Engineering Technician
Eric Roland	Environmental Specialist
Steve Schell	Environmental Specialist

Laboratory Participants:

Vaughan O'Neill	SSM/Laboratories

All field tests were completed with the assistance of technical personnel from Haines and Kibblehouse.

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

Summary of Method 5

Determination of Particulate Emissions from Stationary Sources

The following is a summary of EPA Method 5 which is used for the measurement of particulate emissions from stationary sources. This method can be found in its entirety in 40CFR Part 60, Appendix A.

Particulate matter is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 248 $\pm$ 25° F. The particulate mass, which includes any material that condenses at or above the filtration temperature is determined gravimetrically after removal of uncombined water.

The set-up for the sampling train used in this method is shown in Figure 5-1 (Appendix A). The following components are used in the sampling train: a probe nozzle with a range of nozzle sizes suitable for isokinetic sampling (1/8 to 1/2 in.); a probe liner made of borosilicate or quartz glass tubing with a heating system capable of maintaining a gas temperature of 248 $\pm$ 25° F; a Type S Pitot tube; a differential pressure gauge; a filter holder; a filter heating system; a condenser; a metering system including a vacuum gauge, a leak-free pump, thermometers, and a dry gas meter; a barometer; and gas density determination equipment.

The following items are needed for sample recovery: a nylon bristle brush to brush out the probe-liner and probe nozzle; wash bottles; glass sample storage containers; petri dishes, a graduated cylinder used to measure the condensed water; air-tight, plastic storage containers to store silica gel; a rubber policeman to aid in the transfer of silica gel; and a funnel to aid in sample recovery.

The following reagents are used in sampling: glass fiber filters; 6 to 16 mesh silica gel; water and crushed ice; stopcock grease; and acetone for sample recovery.

There are several pretest procedures that must be performed. First, several 232g portions of silica gel in air-tight containers are weighed. The total weight of the silica gel plus container is marked on each container. The filters are then desiccated at room temperature and pressure, and weighed to a constant weight. The filters are checked visually for irregularities, flaws, or pinhole leaks. The sampling site and number of sampling points are determined according to Method 1.

There are several determinations made in conjunction with the particulate sampling run. The stack pressure, temperature, and the range of velocity heads are determined using Method 2. Method 2 is also used to determine the stack gas dry molecular weight. The moisture content is measured using Method 4.

During the preparation and assembly of the sampling train, all openings where contamination could occur should be kept covered. 150 ml of water is placed in the first two impingers, the third impinger is empty, and the silica gel is transferred into the fourth impinger. Next, the weighed filter is placed in the filter holder. The train is connected using a very light coat of grease on all ground glass joints. Crushed ice is placed around the impingers.

Prior to beginning the test a leak-check is performed. The manometer is leveled and zeroed. Prior to the test run, the portholes should be cleaned to minimize the chance of sampling deposited material. To begin sampling, the nozzle is positioned at the first traverse point with the tip pointing directly into the gas stream. When the probe is in position the openings around the probe and porthole are blocked off to prevent dilution of the gas stream. The stack is traversed. Care is taken not to bump the probe nozzle into the stack walls or when removing or inserting the probe through the porthole, to minimize the chance of extracting deposited material. At the end of the sampling run a post-test leak check is perforemd. The percent isokinetic is calculated to determine whether the run was valid using the following equation:

$$I = \frac{100\, T_s[((K_3 VkY)/Tm)(Pbar + \Delta H/13.6)]}{60\, \theta_{ts}\, P_s A_n}$$

where: T_s = Absolute average stack gas temperature, ^oR

K_s = 0.002669 in. Hg - ft^3/ml -^oR

V_{lc} = Total volume of liquid collected in impingers and silica gel, ml

V_m = Volume of gas sample as measured by dry gas meter, dscf

Y = Dry gas meter calibration factor

T_m = Absolute average dry gas meter temperature, ^oR

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

ΔH = Average pressure differnetial across the orifice meter, in H_20

P_s = Absolute stack gas pressure, in Hg.

A_n = Cross-sectional ara of nozzle, ft^2

θ_{ts} = Total sampling time

For results to be acceptable, the I value should be between 90 and 110 percent

After completing the test run, sample recovery begins. When the probe can be safely handled, all external particulate matter near the tip of the probe nozzle should be wiped off. The sample train assembly is transferred to a cleanup area. First, the filter is removed from the filter holder and placed in a petri dish. The container is then sealed. Particulate matter is recovered from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. The probe liner should also be cleaned with a probe brush. The silica gel is then weighed along with determining the volume of water in the impingers All samples are then sent to a lab for weighing and analysis.

Particulate concentration is calculated as follows:

$$C_s = 0.001\ g/mg\ (M_n/V_{mcstd})$$

where: C_s = Concentration of particulate matter in stack gas, g/dscf

M_n = Total amount of particulate matter colelcted, mg

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, dscf

Summary of Method 9

Determination of Opacity from Stationary Sources

The following is a summary of EPA Method 9 Opacity Measurement. This Method appears in its entirety in Title 40 of the Code of Federal Regulations (CFR), Part 60, Appendix A.

This method involves the visible determination of plume opacity by qualified observers on stationary sources. The appearance of a plume depends upon a number of variables some of which are controllable and some of which are not controllable. The qualified observer alleviates any controllable variables by following a detailed list of procedures cited in the Code of Federal Regulations.

The observer makes his observations from a distance sufficient to provide a clear view of the stack emissions. Consistent with maintaining the above requirements, the observer makes his observations from a position where his line of vision is perpendicular to the plume direction whenever possible. Opacity observations are made at the point of greatest opacity in that portion of the plume where condensed water vapor is not present. These opacity observations are ultimately averaged to compute an average percent opacity.

APPENDIX 3

PRODUCTION DATA

12/10

H + K QUARRY

JOB	NAME	TRUCK	TONS	MIX	TIME	TOTAL
M114	HKB	H43	17	58	7:57	17
M114	HKB	H34	17	58	8:01	34
M114	HKB	C91	17	58	8:05	51
022	HKB	D54	22	45	8:10	73
M114	HKB	L93	17	58	8:14	90
022		D53	22	45	8:22	112
022		D57	22	45	8:29	134
022		D54	22	45	8:38	156
MS0115	SAUBERTON	SB2	10	58	8:47	166
MH0190	Mge. R.	MR2	22	2.68	9:14	188
MH0190	Mge. R.	MR2	23	2.68	9:02	210
022	HKB	D50	21	45	9:21	232
	Qlma. Bac	PB	3	45	9:30	235
MS0115	SAUBERTON	SB2	8	58	9:33	243
	Qlma.	OH2	15	58	9:40	261
M114	HKB	H33	17	58	9:48	278
022	HKB	D56	22	45	9:45	300
022	HKB	D53	22	45	9:56	322
	Qlma.	OH4	16	58	9:49	338
022	HKB	D57	22	45	9:52	360
0	HKB	D54	22	45	10:19	382
M114	HKB	H34	17	58	—	399
M114	HKB	C91	17	58	10:23	416
M114	HKB	L94	17	58		433
	Qlma.	OH3	17	58	10:33	450
M109	HKB	H2[illegible]	21	58	10:51	471
M109	HKB	T[illegible]	21	58		492

Sheet 2
Rev 4

12/20

H + K QUARRY

JOB	NAME	TRUCK	TONS	MIX	TIME	TOTAL
022	4KB	SAB	21	45	1:04	513
M109	4KB	4KB	22	58	1:05	535
	Olsen	OH7	18	58	1:08	571
M109	4KB	W16	18	58	1:11	593
022	4KB	D56	22	45	1:21	615
Ramsey	MPU100	MZ	3	90	1:24	623
	SOUDERTON	SB2	10	45		633
022		D59	22	45	1:35	655
	SOUDERTON	SB2	8	45	1:42	663
	Olsen	OH7	15	58	1:45	678
	Olsen	OH3	17	58	1:51	695
M0190	Capers	C6	17	58	1:55	712
022	4KB	D57	22	45	2:09	734
J11	4KB	BB2	6	45	2:20	740
022	4KB	D57	10	45	2:58	750
	Olsen	OH7	18	58	1:02	768
M109	4KB	D56	22	58	1:07	790
M0190	Mayer	MR2	12	2PD	1:10	802
	SOUDERTON	SB2	4	45	1:14	806
M109	4KB	D59	23	58	1:20	829
M109	4KB	Ken	21	58	1:26	850
M109	4KB	D57	22	45	1:30	872
M109	4KB	T07	22	58	1:35	894
M109	4KB	W25	22	58	1:41	916
	Ramsey	MZ	7	90	1:44	923
M109	4KB	4KB	22	58	1:45	945
M109	4KB	W16	22	58	1:57	967

END Run 4

41.9

8.8 day

16

12/20

H + K QUARRY

JOB	NAME	TRUCK	TONS	MIX	TIME	TOTAL
M6A140	CAPELE	26	5	5B	2:07	972
	Allen	DA3	8	5B	2:10	980
	Myers	MR2	3	22FB	3:06	983
	Capela	26	1	5B	3:07	981
M109		DISA	22	5B	3:05	1006
M114	HKB	DISB	22	5B	3:13	1029
M114	HKB	KEN	21	5B	3:17	1051
"	"	DISA	22	5B		1073

8/23

H + K QUARRY

JOB	NAME	TRUCK	TONS	MIX	TIME	TOTAL	
M109	HKB	D56	22	58	7:45	22	Start Row #1
M109	HKB	D57	22	58	7:49	44	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
M109	HKB	B89	22	45	7:55	66	
M109	HKB	D53	22	45	7:59	88	
M109	HKB	D51	22	45	7:54	110	
MMA130	Manna	M4W42	22	58	7:58	132	
MMA130	Manna	M2RT95	22	58	8:03	154	
P340	HK	HK74	22	98C	8:08	176	
B449	HK	HK25	22	58	8:12	198	
M109	HKB	S480	21	45	8:18	219	
P340	HK	HK69	22	98C	8:23	241	
M109	HKB	D54	22	45	8:27	263	
B449	HK	HK66	22	58	8:33	285	
P340	HK	64	22	98C	8:37	307	
P340	HK	65	22	98C	8:45	329	
M109	HKB	D56	22	58	8:50	351	
B449	HK	69	22	58	8:55	373	
B449	HK	61	22	58	9:00	395	
P340	HK	70	22	98C	9:04	417	
B449	HK	71	22	58	9:10	439	
	Jones	PD	3	45	9:1	442	End Row #2
	Jones	PD	3	45	9:13	445	
M109	HKB	D57	22	58	9:28	467	
M109	HKB	53	22	45	9:35	491	Start Row #3
P340	HK	HK79	23	98C	9:51	514	
MW4100	Jones	W42	0046	58	9:58	535	

12/23

H + K QUARRY

JOB	NAME	TRUCK	TONS	MIX	TIME	TOTAL
M109	HKB	F89	22	15	10:04	547
	Capacc	C6	10	8.5B	10:07	557
MA110		C6	17	8.5B	10:10	574
MSU110	SUNSHINE	HK33	17	9BC	10:14	591
M109	HKB	D150	22	15	10:19	613
M109	HKB	D151	22	15	10:25	635
B340		HK49				
P340		HK68				
M109	HKB	SA80	21	15	10:30	656
B449	HK	75	22	15	10:39	675
MSU110	SUNSHINE	FM2	16	9BC	10:42	694
MMA130	Manco	MA	23	5B	10:46	717
M109	HKB	D154	22	15	10:51	739
P340	HK	HK68	30			
B449	HK	66	22	15		761
MMA110	Maz	M87	21	5B	11:00	782
"	"	M88	22	5B	11:09	804
B449		69	22	15	11:15	826
M109		D56	22	15	11:19	848
B449	HK	61	22	15	11:41	870
MMA130	Manco	MA	22	5B	11:46	892
MSU110	SUN	HK33	17	9BC	11:51	909
B449	HK	HK71	22	15	12:30	931
	HKB	D59	22	5B		

201

Eno 3-43

APPENDIX 4

ANALYTICAL RESULTS

DSM Laboratories

ANALYTICAL REPORT

CLIENT: Steve Folk
Gilbert/Commonwealth, Inc.
P. O. Box 1498
Reading PA 19603

PROJECT: 110163
PO NO: 52850
REPORTED: 07-JAN-92
RECEIVED: 23-DEC-91
WORK ORDER:

PROJECT DESCRIPTION: Stack-Haines & Kiblehouse

SAMPLING DATE: 23-DEC-91 BY: Client

	UNITS	RESULT
SAMPLE: 1039811		
HK-S-1		
Particulate Weight - Wash Solutions		
Wt - Wash Soln' (0.22u filter)	mg	4.0
Wt - Acetone Impinger	mg	9.1
Wt - Acetone Probe	mg	9.7
Wt - Water Probe	mg	19.2
Wt - Water Impinger	mg	10.4
Particulate Weight - Filter	mg	0.0
SAMPLE: 1039812		
HK-S-2		
Particulate Weight - Wash Solutions		
Wt - Wash Soln' (0.22u filter)	mg	1.5
Wt - Acetone Impinger	mg	8.8
Wt - Acetone Probe	mg	10.0
Wt - Water Probe	mg	3.6
Wt - Water Impinger	mg	26.5
Particulate Weight - Filter	mg	0.0
SAMPLE: 1039813		
HK-S-3		
Particulate Weight - Wash Solutions		
Wt - Wash Soln' (0.22u filter)	mg	0.5
Wt - Acetone Impinger	mg	13.1
Wt - Acetone Probe	mg	9.3
Wt - Water Probe	mg	8.1
Wt - Water Impinger	mg	52.7
Particulate Weight - Filter	mg	0.8

Respectfully submitted,

Vaughan J. O'Neill

Vaughan J. O'Neill,
Group Leader, Physical Testing

30 Noble Street ■ P.O. Box 6527 ■ Reading, PA 19611-0527 ■ 215/376-4595 or 215/376-6581 ■ Fax: 215/376-8522
Engineering Offices in Baltimore, Lehigh Valley, Reading and Trenton

Client H+K

W.O. No.

Plant Chalfont

Run No. HK-S-1

PARTICULATE FIELD DATA
(continued)

Sheet 2 of 3

Location Baghouse

Date 12/20/91

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	¢/4	STACK TEMP. °F
0-1		10:13	0.0	758.554	0.24		0.08	60	50	1				
2	Stop		4.5	759.1	0.43		0.165	57	50	1				226
3	Move to next		9.0	760.5	1.50		0.57	58	50	1				191
4			13.5	762.4	3.80		1.65	62	52	1				228
5			18.0	765.4	5.30		2.00	66	52	1				245
Stop		10:35	22.5	768.154										257
Plant down		10:38												
on pack + get														
A-5 + B-5														
A-5		11:00	0.0	766.754	5.3		2.05	49	50	2				
Stop			4.5	770.159									n/a	227
B-5		11:05	0.0	772.159	6.2		2.4	56	50	2				
Stop			4.5	775.922										216
D-1		11:11	0.0	775.922	0.55		0.21	56	50	1				
2			4.5	777.3	0.66		0.26	58	54	1				225
3			9.0	778.7	1.70		0.66	60	52	1			n/a	240
4			13.5	780.7	3.50		1.35	64	53	1				232
5			18.0	783.5	6.30		2.40	70	54	1				208
Stop			22.5	787.248										181

COMMENTS:

Stack
1.2
1.65
1.89
1.88

Client H+K

PARTICULATE FIELD DATA
(continued)

Sheet 3 of 3

W.O. No.

Plant Chalfant

Location Baghouse

Run No. HK-S-3

Date 10/10/91

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		STACK TEMP. °F
B-1		11:30	0.0	787.248	1.10		0.44	66	55	1				183
2			4.5	789.1	1.70		0.67	65	56	1				190
3			9.0	791.1	2.90		1.15	66	56	1				196
4			13.5	793.7	5.10		2.05	70	56	1				225
5			18.0	796.8	6.00		2.40	74	56	2				216
End		11:59	22.5	800.022										

COMMENTS:

End Water test
Dust

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

Run Date: 12/20/91

Run No.: P-1

Sample Box No.:

Operator:

Client: [illegible]

W. O. No.:

Plant:

Sampling Location:

PROBE WASH

Acetone-Acetone Wash
Probe, Nozzle Holder, Gooseneck Orifice),
Flask, Front Half Filter Holder-Acetone Wash

Sample No.	Lab No.	Volume Recovered
		ml
		ml
		ml
		ml

Laboratory Results

Lab No. Residue ml

Lab No. Residue ml

Nozzle porcelanface weight ml

Sample No.	Lab No.	Volume Recovered
		ml
		ml
		ml
		ml

Filter particulate weight ml

FRONT HALF Sub Total ml

BACK HALF

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

Lab No. Silica-Chloroform Extract ml

Collected on 0.45u Filter ml

Aqueous Residue ml

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

Lab No. Residue ml

BACK HALF Sub Total ml

TOTAL WEIGHT ml

SILICA GEL

Contents:

250 ml

Final Volume

Initial Volume

Net Volume 145

SILICA GEL

Weight after test: 250

Weight before test: 230.9

Net Weight 19.1

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

TOTAL WEIGHT-Silica Gel 19.1 gm

TOTAL VOLUME Impinger 145 ml

TOTAL MOISTURE 164.1 gm

Comments:

LAB: DATE RECEIVED

DATE REPORTED

HPB/APC 12/76

SIGNATURE SCRIBE

Sheet 1 of 2

Client U+K

W. O. No.

Plant Chalfont

Run No. U K-S-2

Location Chalfont

Date 12/23/91

Operator ALBAUGH

Sample Box No.

Meter Box No. 2934

MeterΔH

C Factor 0.93

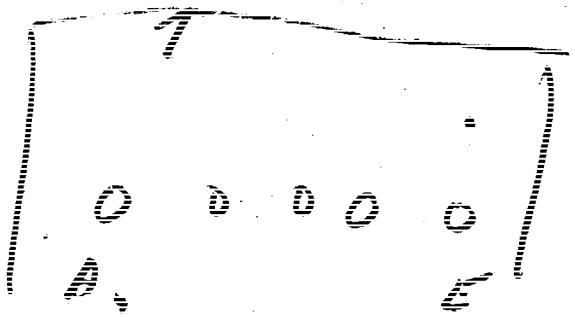
K=4.0

FARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

SKETCH



Pitot Calibration

Thimble No.

Filter No.

Ambient Temp. °F

Bar. Press. "Hg 29.80

Assumed Moisture % 15

Heater Box Setting, °F :

Probe Tip Dia., in. 0.155

Probe Length

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	Pg,02	STACK TEMP. °F
A-1		0848	0	803.132	0.44		0.46	91	90	9	245	38		242
2			4.5	805.4	0.39		0.35	90	90	7				250
3			9.0	808.0	2.7		1.02	88	92					246
4			13.5	809.8	3.25		1.45	89	93	8				255
5			18.0	810.7	3.75		1.45	94	92					248
STOP			22.5	813.220										
B-1		0943	0	813.220	0.24		0.09	88	50	7				210
2			4.5	814.4	0.68		0.29	70	54	7	250	37		256
3			9.0	816.7	1.60		0.69	74	56	2				247
4			13.5	817.6	3.5		1.30	87	59	2				250
5			18.0	820.4	5.15		1.95	89	60	3				247
STOP			22.5	823.825										

COMMENTS:

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

Run Date: 12/2/77

Run No.: M1-2

Sample Box No.: ....

Operators: ....

Client: Atlantic Richfield

W. O. No.: ....

Plant: Carlisle

Sampling Location: Baghouse Outlet

PROBE WASH

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

Nozzle No.	Lab No.	Nozzle Residue
....	....	....mg
....	....	....mg
....	....	....mg
....	....	....mg

Filter No.	Lab No.	Nozzle Residue
....	....	....mg
....	....	....mg
....	....	....mg
....	....	....mg

Laboratory Results

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

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

Nozzle particulate weight ....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. .... Methyl-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

SUMMARY

Summary:

	252
	322
	....
	....
	....
	....

Stack Volume 941

Material Volume 300

Box Volume 192

Silica Gel

Weight after test: 254

Weight before test: 231

Net Weight 23

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

TOTAL WEIGHT-Silica Gel 23 mg

TOTAL WEIGHT-Impingers 252 mg

TOTAL MOISTURE 275 mg

Comments: ....

LAB: DATE RECEIVED ....

DATE RECORDED ....

ANALYTICAL CHEMIST ....

RPB/APC 12/76

Sheet 1 of 2

Client UDK

W. O. No.

Plant CHALFONT

Run No. UK-5-3

Location Baghouse

Date 12/23/91

Operator ALDRICH

Sample Box No.

Meter Box No. 2823

Meter ΔH@ 2.45

C Factor 0.92

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

SKETCH

Pitot Calibration

Thimble No.

Filter No.

Ambient Temp. °F

Bar. Press. "Hg 28.98

Assumed Moisture % 15

Heater Box Setting, °F

Probe Tip Dia., in. 0.155

Probe Length

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	%	STACK TEMP. °F
A-1		0952	0	857.178	0.48		0.85	65	67	1	245	38	1	170
2			1.5	859.3	.420		0.97	67	66					268
3			3.0	861.0	.280		0.97	73	66				Yo Rd	263
4			4.5	862.0	.70		1.90	76	66	2				272
5			6.0	863.9	.37		2.0	77	69	2	250	STAK		271
STOP			7.5	865.452								- 2.4		
B-1			0	869.352	0.32		0.192	82	69	1				259
2			1.5	870.5	1.60		0.58	83	69	1	255			265
3			3.0	—	2.4		1.40	89	70	2		FD	35 n.d	271
4			4.5	873.1	6.5		2.0	94	71	3				273
5			6.0	—	2.0		2.0	94	73	3				269
STOP			7.5	874.953										

COMMENTS:

Client HK

W.O. No.

Plant Chalfont

Run No. HK-5-3

PARTICULATE FIELD DATA
(continued)

Sheet 2 of 2

Location [illegible] Bayshore

Date 12/23/91

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	STACK PRESS IN. Hg	STACK TEMP. °F
C-1			0	891.953	0.10		0.04	88	74	1	250	74	-.1	232
2			5.5	894.5	0.20		0.08	76	76					
3			9.0	—	0.30		0.32	87	76	1				238
4			13.5	899.7	0.4		0.41	90	76	1		STATIC	1	237
5			17.0	902.4	4.7		1.18	90	76	1		-0.65	0.0/0.02	234
STOP			22.5	850.720				91	76	1			1	250
D-1			0	850.220	0.36		0.05	90	76	1		-0.55		240
2			4.5	850.4	0.28		0.11	75	77	1		STATIC		245
3			9.0	—	0.36		0.38	84	77	1				249
4	STV	1125	13.5	853.170	3.0		1.22	73	75	2				247
5	STOP	1141	18.0	—	4.7		1.9	78	70	3				247
STOP			22.5	900.009										
							0.28							
E-1		1156	0	900.002	0.48		0.28	69	69	1				245
2			4.5	904.4	1.35		0.55	70	69	1				200
3			9.0	908.2	2.3		0.99	74	70	2				218
4			13.5	905.7	3.8		1.4	90	70	3				252
5			18.0	908.5	5.2		2.15	94	72	3				265
STOP			22.5	912.516										
END														

COMMENTS:

LEAK TEST
0.01 AT 15"

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

Run Date: 12/23/91

Run No.: AC-5-3

Sample Run No.:

Operator:

Client: Asphalt Paving Co.

W. O. No.:

Plant:

Sampling Location: Asphalt Outlet

RINSE HOLE

Rinse-Acetone Wash
Probe, Thimble Holder, Gooseneck (Approx.), Plenum, Front Half Filter Holder-Acetone Wash

Thimble No.	Lab No.	Weight Increase
		mg
		mg
		mg
		mg

Filter No.	Lab No.	Weight Increase
		mg
		mg
		mg
		mg

Laboratory Results

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

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

Thimble particulate weight ..... 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

VOLUME

Impinger: 230
244

Final Volume 524

Initial Volume 300

Net Volume 224

Silica Gel

Weight after cone: 252

Weight before cone: 238

Net Weight 14

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

TOTAL WEIGHT-Silica Gel 14 mg

TOTAL VOLUME, Impingers 224 ml

TOTAL MOISTURE 3.24 gm

Comments:

LAB: DATE RECEIVED .....
DATE REPORTED .....

MANAGER SIGNATURE

GBI/APC 12/90

APPENDIX 5

RAW FIELD DATA

5.2 VISIBLE EMISSIONS

VISIBLE EMISSION OBSERVATION FORM
(CONTINUED)

COMPANY NAME: Hess & Eddy Corp

CITY: Cadiz

TEST NO.: HE-S-2

PAGE 2 OF 3

TYPE OF FACILITY: Asphalt Batch Plant

EMISSION POINT: Baghouse stack exhaust

OBSERVER: Eric Cook

OBSERVATION DATE			START TIME		END TIME
MIN \ SEC	0	15	30	45	COMMENTS
1	0	0	0	0	plant shutting
2	0	0	0	0	
3	0	0	0	0	plant stop
4	0	0	0	0	plant shutdown
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	plant stop
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	plant shut
13	0	0	0	0	End of Run #2
14					0130
15					Process Down
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVATION DATE			START TIME		END TIME
MIN \ SEC	0	15	30	45	COMMENTS
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

VISIBLE EMISSION OBSERVATION FORM

No. Page 1

COMPANY NAME: Asphalt Paving

STREET ADDRESS:

CITY: Chelsea | STATE: MA | ZIP:

PHONE (KEY CONTACT):

SOURCE ID NUMBER:

PROCESS EQUIPMENT: Asphalt Batch Plant | OPERATING MODE:

CONTROL EQUIPMENT: Baghouse | OPERATING MODE:

DESCRIBE EMISSION POINT: Top of baghouse stack center

HEIGHT ABOVE GROUND LEVEL: 50 ft

HEIGHT RELATIVE TO OBSERVER: Start 0 End Same

DISTANCE FROM OBSERVER: Start 75 End Same

DIRECTION FROM OBSERVER: Start West End Same

DESCRIBE EMISSIONS: Start None End Same

EMISSION COLOR: Start N/A End N/A

IF WATER DROPLET PLUME: Attached ☐ Detached ☒

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: Start Top of stack End Top of stack

DESCRIBE PLUME BACKGROUND: Start Roof End Same

BACKGROUND COLOR: Start Brown End Brown

SKY CONDITIONS: Start Cloudy End Same

WIND SPEED: Start 5-10 End Same

WIND DIRECTION: Start S/SW End Same

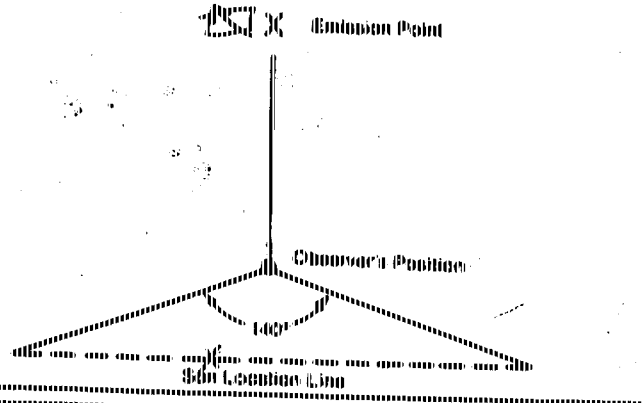
AMBIENT TEMP: Start 45° End 45°

WET BULB TEMP:

RH, Dew Point:

Stack with Plume ☐ | Sun ✢ | Wind ←

SOURCE LAYOUT SKETCH — Draw North Arrow



ADDITIONAL INFORMATION: Keep Sun behind observer by use of compass

OBSERVATION DATE	START TIME	END TIME
8/13/99	1015	1115

MIN	0	15	30	45	COMMENTS
1	0	0	0	0	Moved due to shade
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

OBSERVER'S NAME (PRINT): Eric Kenna

OBSERVER'S SIGNATURE: [signature] | DATE: 8/13/99

ORGANIZATION: Gilbert Consulting Inc

CERTIFIED BY: Eastern Technical Associates | DATE: 4/97

CONTINUED ON VEO FORM NUMBER:

VISIBLE EMISSION OBSERVATION FORM
(CONTINUED)

COMPANY NAME: [illegible]

CITY: Chalfont

TEST NO.: 44-3

PAGE 2 OF 2

TYPE OF FACILITY: Asphalt Prod

EMISSION POINT: [illegible] Baghouse stack

OBSERVER: [illegible]

OBSERVATION DATE			START TIME		END TIME
MIN \ SEC	0	15	30	45	COMMENTS
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

OBSERVATION DATE			START TIME		END TIME
MIN \ SEC	0	15	30	45	COMMENTS
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
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28					
29					
30					

APPENDIX 6

CALIBRATION DATA

Gilbert/Commonwealth Inc.
Testing Services Group
METER BOX CALIBRATION

DATE: 12/11/91 METER BOX NUMBER: 3838

BAROMETRIC PRESS. (Pb) = 29.35 in. Hg CALIBRATED BY: OBERTO

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
0.5	5.000	5.009	68	86	80	83.0	13.33	1.03	2.09
1.0	5.500	5.568	68	90	82.5	86.3	10.66	1.02	2.35
1.5	10.500	10.910	68	95.5	83	89.3	16.51	1.00	2.07
2.0	10.500	10.938	68	100.5	85	92.8	14.47	1.00	2.14
3.0	10.500	10.990	68	101	86	93.5	12.02	0.99	2.18
4.0	10.000	10.500	68	102.5	87	94.8	10.05	0.99	2.23
							AVERAGE	1.01	2.15

FORMULAS

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

$$delta\ H@i = \frac{0.321}{(Yi)(Qm)}$$

$$Pm = Pb + \frac{(H)}{13.6}$$

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

DIFF 0.01 @ 15 sec. / 1 min.

** NOTE FOR PARTICULATE ONLY

Gilbert/Commonwealth Inc.
Testing Services Group
METER BOX CALIBRATION

DATE: 12/30/91 METER BOX NUMBER: 2038

BAROMETRIC PRESS. (Pb) = 29.61 in. Hg CALIBRATED BY: JUNIOR

	GAS VOLUME		TEMPERATURES						
				Dry Gas Meter					
Orifice Manometer Setting (delta H) in. H2O	Wet Test Meter (Vw) cu. ft.	Dry Gas Meter (Vd) cu. ft.	Wet Test Meter (Tw) deg. F	Inlet (Tdi) deg. F	Outlet (Tdo) deg. F	Average (Td) deg. F	Time min.	Yi	delta Hai
0.5	5.002	5.121	66.5	76	70.5	73.3	12.27	0.95	1.85
1.0	6.996	5.132	66	95.5	81.5	88.5	9.17	1.01	1.90
1.5	10.000	10.594	66	95.5	85.5	90.5	15.57	0.98	1.96
2.0	10.001	10.728	66	101.5	88.5	95.0	13.75	0.98	1.98
3.0	10.000	10.799	66	106	91	98.5	11.42	0.98	2.04
4.0	10.500	11.062	66.5	92	76.5	84.3	10.17	0.97	2.00
							AVERAGE Y:	0.99	1.92

FORMULAS

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

$$delta\ Hai = \frac{0.921}{(Qn)(Kn)}$$

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

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

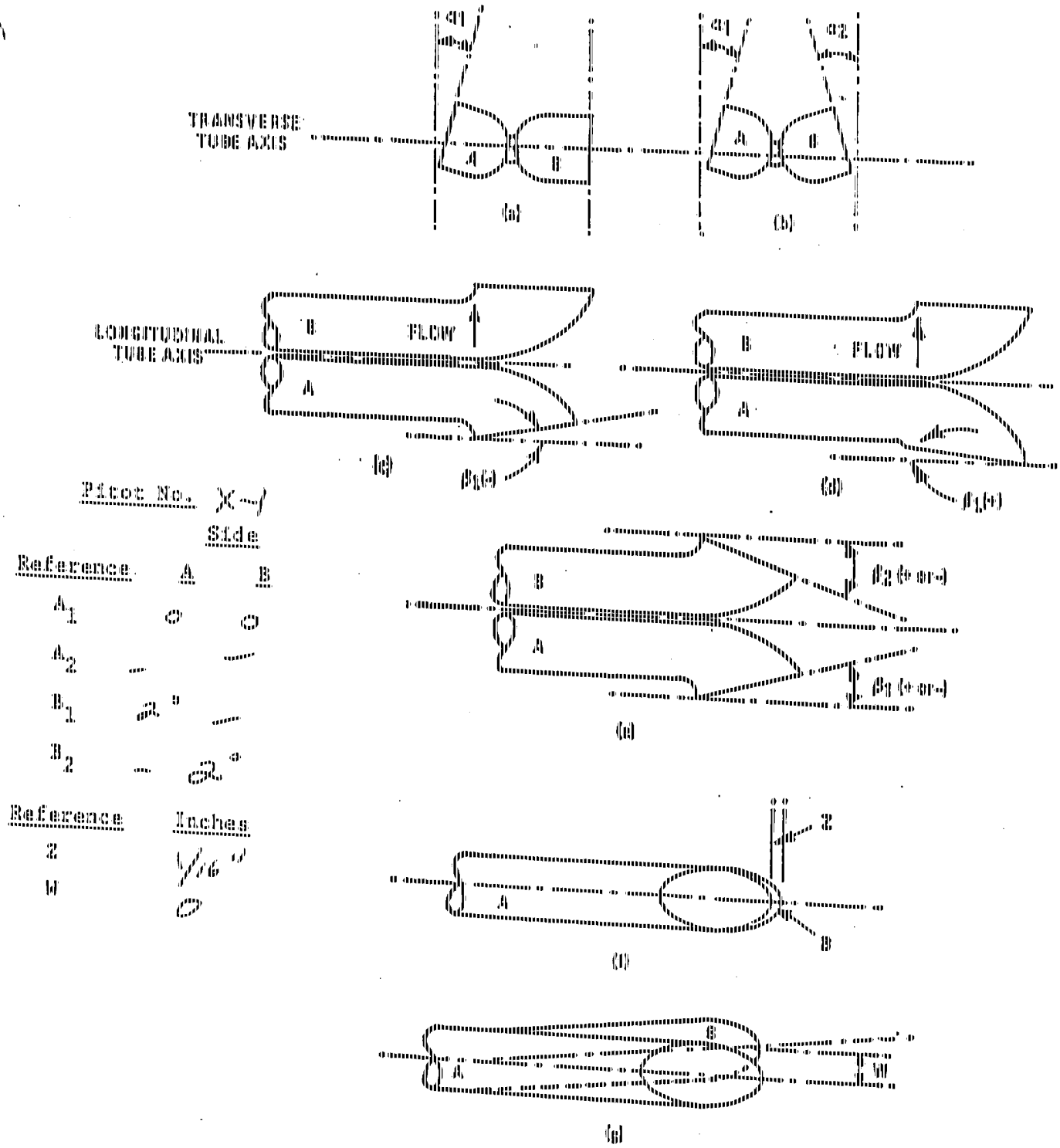

Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of Cp(s) so long as α1 and α2 < 10°, β1 and β2 < 5°, z < 0.32 cm (1/8 in.) and w < 0.08 cm (1/32 in.) (citation 11 in Section 6).

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

CLIENT

PROJECT

FILING CODE

W.O. | PAGE of

SYSTEM

ENGINEER A. BRYANT

DATE 10/27/87

CALCULATION FOR

Pot Meter-Thermocouple Calibration

REVIEWED BY

DATE

Pot Meter #	7
Thermocouple Type	K
Ice Bath Temperature °F	32
Certified Mercury Bulb °F	32
Ambient Temperature °F	70
Certified Mercury Bulb °F	71
Boiling H_2O °F	212
Certified Mercury Bulb °F	211
Hot Synthetic Oil °F	350
Certified Mercury Bulb °F	350

Remarks:

APPENDIX 7

COMPUTER PRINTOUT

FLUE GAS CHARACTERISTICS, ISOKINETICS CALCULATIONS AND PARTICULATE TEST RESULTS

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

Client: BAINES & KIBBLEHOUSE Plant: CHALFONT, PA

Sampling Location: BAGHOUSE Test: PARTICULATE

Run No: HK-S-1 Date: 12/20/91 Start: 932 End: 1159

DATA

DN:	0.155	PB:	29.80	PST:	0.84	AS:	1326.0
O2%:	3.6	CO2%:	12.4	N2%:	86.0	VW:	166.1
GAS METER Y-FACTOR:			1.00	E.A.%:	19.2		

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SQE	O2	CO2	VEL
A-1	4.5	744.248	0.330	209	40	40	0.125	14.86	3.1	13.5	2108
2	4.5		0.900	208	45	40	0.365	24.52			3610
3	4.5		2.260	191	50	42	0.880	38.36			5668
4	4.5		4.000	236	56	43	1.550	52.76	4.0	12.7	7769
B-1	4.5	751.458	0.250	255	54	44	0.080	13.37			1969
2	4.5		0.550	266	54	44	0.210	19.98			2942
3	4.5		2.400	241	58	45	0.910	41.02	3.6	11.0	6060
4	4.5		3.700	229	64	49	1.450	50.49			7635
C-1	4.5	758.556	0.240	226	60	50	0.080	12.83			1889
2	4.5		0.430	191	57	50	0.165	16.75			2664
3	4.5		1.500	228	58	50	0.570	32.12			4730
4	4.5		3.800	245	62	52	1.650	51.76			7621
5	4.5		5.300	257	66	52	2.000	61.64			9077
A-5	4.5	768.754	5.300	227	49	50	2.050	60.34			8885
B-5	4.5	772.159	6.200	216	56	50	2.400	66.74			9533
D-1	4.5	775.922	0.550	225	56	50	0.210	19.41			2058
2	4.5		0.660	240	58	54	0.260	21.49			3165
3	4.5		1.700	232	60	52	0.660	34.30			5050
4	4.5		3.500	208	64	53	1.350	48.35			7120
5	4.5		6.300	181	70	54	2.600	63.55			9357
E-1	4.5	787.218	1.100	183	66	55	0.440	26.60			3916
2	4.5		1.700	190	65	56	0.670	33.24			4895
3	4.5		2.900	196	66	56	1.150	43.62			6422
4	4.5		5.100	225	70	56	2.050	59.11			8703
5	4.5		6.000	216	74	56	2.600	63.69			9378
		800.622									

RESULTS	TT	VM	PIT	TS	TM	PM	SQE	O2	CO2	VEL
	112.5	56.374	2.667	221	54	1.042	38.76	3.6	12.4	5707 5702
	net	net	avg	avg	avg	avg	avg	avg	avg	avg
								14.9	3.6	
	PSM=	29.88	VMSTD=	57.788	VMGAS=	7.823	SM=	11.9		
	MD=	0.88	MWD=	30.13	MG=	28.68	PS=	29.86		

29.75

STACK GAS VELOCITY = 5707 AFPM 5702
STACK GAS VOLUME = 35,054 DSCFM 36,553
STACK GAS VOLUME = 52,244 ACFM
STACK GAS VOLUME = 1.83E+05 LBS/HR 53,614
ISOKINETIC RATIO = 0100.1
91.4

for Fog Blank

PARTICULATE EMISSIONS

Weight, mg	=	32.9
GR/DSCF	=	0.009
LBS/HR	=	2.7

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

Client: HAINES & KIBBLEHOUSE Plant: CHALFONT, PA

Sampling Location: BAGHOUSE Test: PARTICULATE

Run No: HK-S-2 Date: 12/23/91 Start: 718 End: 918

DATA

DH:	0.155	PB:	29.80	PST:	1.57	AS:	1326.0
O2%:	12.9	CO2%:	3.7	N2%:	83.4	VM:	214

GAS METER Y-FACTOR: 1.00 E.A.%: 141.6

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PH ORIFICE	SDE	O2	CO2	VEL
A-1	4.5	803.132	0.440	242	41	40	0.16	17.57			2648
2	4.5		0.870	251	50	40	0.37	24.87	14.2	2.8	3747
3	4.5		2.700	246	58	42	1.07	43.66			6577
4	4.5		3.750	255	69	45	1.45	51.78			7800
5	4.5		3.750	268	74	48	1.45	51.53			7762
B-1	4.5	813.660	0.240	260	68	50	0.09	12.96			1953
2	4.5		0.680	256	70	54	0.27	22.07			3326
3	4.5		1.600	271	74	56	0.64	34.20			5152
4	4.5		3.300	280	81	59	1.30	49.42			7444
5	4.5		5.150	291	87	60	1.95	62.19			9369
C-1	4.5	823.825	0.200	285	80	64	0.08	12.21	11.1	4.8	1839
2	4.5		0.370	290	81	66	0.14	16.66			2509
3	4.5		1.100	288	82	66	0.43	28.68			4321
4	4.5		2.600	272	84	69	1.02	43.63			6572
5	4.5		4.800	259	90	69	1.90	58.75			8850
D-1	4.5	833.145	0.500	228	80	69	0.19	18.55	13.4	3.6	2794
2	4.5		0.580	251	80	69	0.22	20.31			3059
3	4.5		1.500	260	83	70	0.58	32.86			4951
4	4.5		3.200	276	89	70	1.28	48.53			7311
5	4.5		5.000	281	94	71	1.95	60.87			9170
E-1	4.5	843.973	1.020	241	89	73	0.40	26.74			4028
2	4.5		1.500	255	89	74	0.59	32.75			4933
3	4.5		2.500	263	90	75	0.96	42.51			6405
4	4.5		4.800	254	94	75	1.90	58.54			8819
5	4.5		5.700	263	97	75	2.20	64.20			9671
		856.991									

RESULTS	TT	VM	PIT	TS	TM	PM	SDE	O2	CO2	VEL
	112.5	53.859	2.314	262	70	0.904	37.44	12.9	3.7	5640
	net	net	avg	avg	avg	avg	avg	avg	avg	avg

PSM=	29.87	VMSTD=	53.522	VWGAS=	10.079	3M=	15.8
MD=	0.84	MWD=	29.11	DW=	27.35	PS=	29.92

STACK GAS VELOCITY =	5,640	AFPM
STACK GAS VOLUME =	32,083	DSCFM
STACK GAS VOLUME =	52,132	ACFM
STACK GAS VOLUME =	1.63E+05	LBS/HR
ISOKINETIC RATIO =	103.9	

PARTICULATE EMISSIONS

Weight, mg =	15.1	
GR/DSCF =	0.004	
LBS/HR =	1.2	

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

Client: HAINES & KIBBLEHOUSE Plant: CHALFONT, PA

Sampling Location: BAGHOUSE Test: PARTICULATE

Run No: HK-S-3 Date: 12/23/91 Start: 952 End: 1210

DATA

DN:	0.155	PB:	29.78	PST:	1.20	AS:	1326.0
O2%:	3.5	CO2%:	12.6	N2%:	83.9	VW:	246
GAS METER Y-FACTOR:			1.00	E.A.%:	18.8		

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SDE	O2	CO2	VEL
A-1	4.5	857.288	0.400	170	65	67	0.155	15.87	4.0	12.1	2565
2	4.5		1.200	208	67	66	0.490	28.31			4218
3	4.5		2.400	213	73	66	0.970	40.19			5987
4	4.5		4.700	218	80	66	1.900	56.45			8410
5	4.5		5.100	241	88	67	2.000	59.79			8908
B-1	4.5	869.452	0.380	259	82	69	0.162	16.53			2662
2	4.5		1.500	265	83	69	0.580	32.98			4913
3	4.5		3.400	276	89	70	1.400	50.02			7452
4	4.5		5.300	273	94	71	2.100	62.33			9285
5	4.5		5.000	268	98	73	2.000	60.33	3.5	12.6	8988
C-1	4.5	881.953	0.100	238	88	74	0.040	8.35			1245
2	4.5		0.200	238	86	75	0.080	11.82			1760
3	4.5		0.800	239	87	76	0.320	23.65			3523
4	4.5		2.400	234	90	76	0.960	40.81			6080
5	4.5		4.700	250	96	76	1.950	57.77			8606
D-1	4.5	850.720	0.160	260	90	76	0.050	10.73			1599
2	4.5		0.280	275	85	77	0.110	14.35	3.0	13.2	2137
3	4.5		0.960	279	88	77	0.380	26.64			3968
4	4.5		3.000	224	73	70	1.220	45.30			6748
5	4.5		4.700	249	78	70	1.900	57.73			8600
E-1	4.5	900.007	0.680	215	79	69	0.280	21.42			3192
2	4.5		1.350	203	80	69	0.550	29.92			4457
3	4.5		2.300	238	84	70	0.970	40.07			5969
4	4.5		3.800	249	90	70	1.600	51.91			7733
5	4.5		5.200	268	94	72	2.150	61.53			9166
		912.396									

RESULTS	TT	VM	PST	TS	TM	PM	SDE	O2	CO2	VEL
	112.5	55.108	2.400	242	78	0.972	36.99	3.5	12.6	5511
	net	net	avg	avg	avg	avg	avg	avg	avg	avg
	PSM=	29.85	MOSTD=	53.993	VMGAS=	11.587	%M=	17.7		
	MW=	0.82	MWD=	30.16	MW=	28.01	PS=	29.87		

STACK GAS VELOCITY = 5,511 AFPM
STACK GAS VOLUME = 31,485 DSCFM
STACK GAS VOLUME = 50,935 ACFM
STACK GAS VOLUME = 1.69E+05 LBS/HR
ISOKINETIC RATIO = 106.8
105.1

Use Fan for that Count value

PARTICULATE EMISSIONS

Weight, mg	=	18.7
GR/DSCF	=	0.005
LBS/HR	=	3.45

APPENDIX B

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS

Particulate Isokinetic Sampling

I. Calculations for stack volume and Isokinetic Ratio.

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

1. DN = Nozzle Diameter, inches
2. PB = Barometric Pressure, inches Hg
3. TT = Net Sampling Time, minutes
4. VM = VM final − VM initial = Sample Gas Volume; ft^3
5. TM = Average Dry Gas Temperature at Meter, °F

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

6. PM = Average Orifice Pressure Drop, inches H_2O

PM = Avg. ΔH

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

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

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

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

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 $\sqrt{\text{Velocity Head (AP)} \times (\text{Stack Temperature} + 460)}$

(Calculated each time)

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

18. Stack gas velocity at stack conditions, fpm

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

Cp = pitot tube coefficient

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

$$Q_s = \frac{0.123 \times VS \times AS \times MD \times PS}{(TS + 460)} = DSCFM$$

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

$$Q_a = \frac{.05667 \times QS\ (TS + 460)}{PS \times MD} = ACFM$$

21. Percent Isokinetic

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

NOTES: [a]Dry standard cubic feet at 69°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 grain loading and emission rates

22. Particulate, gr/DSCF

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

23. Particulate at stack conditions, gr/ACF

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

24. Particulate, lb/hr conc. method

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

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

26. Particulate, combustion

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

27. Particulate, process lb/ton

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

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

Using O_2 =

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

Using CO_2:

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

29. F-Factor, dscf/mmBtu

O_2 Format:

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

CO_2 Format:

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