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AP42 Section:

11.2

Reference:

6

**Title:
Alabama,**

Air Pollution Emission Test, Celotex Corporation, Fairfield,

NC,

**EMB Report No. 76-ARM-13,
U. S. Environmental Protection Agency, Research Triangle Park,**

October 1976.

A

FINAL

AIR POLLUTION EMISSION TEST

FINAL REPORT
CELOTEX CORPORATION
FAIRFIELD, ALABAMA

Source Analysis Section, AMTB (MD-14)
Research Triangle Park, N. C. 27711



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Emission Measurement Branch
Research Triangle Park, North Carolina

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Research Triangle Park, North Carolina 27711

SUBJECT: Source Test Report 76-ARM-13

DATE: Oct. 22, 1976

FROM: J. E. McCarley, Chief, Field Testing Section
Emission Standards and Engineering Division (MD 13) *JME*

TO: See Below

The enclosed final source test report is submitted for your information. Any questions regarding the test should be directed to the Project Officer (FTS 8/629-5548). Additional copies of this report are available from the Air Pollution Technical Information Center, Research Triangle Park, North Carolina 27711.

Industry: Asphalt Roofing

Process: Saturator

Company: Celotex Corporation

Location: Fairfield, Alabama

Project Report Number: 76-ARM-13

Project Officer: Clyde E. Riley

Enclosure

Addressees:

John Nader (MD 59)

Tom Lahre (MD 14)

Director, Air & Water Programs Division, Region IV
(copy enclosed for State Agency)

APTIC (MD 18)

ERRATA SHEET

Page 1, Par. 3, Sentences 4 & 5 Change to read:

Sampling was conducted on the No. 1 saturator line emissions only while 235-240 pound asphalt shingles were being processed. It is estimated that the processing of this product, a popular 3 tab self-seal shingle, produces the highest concentrations of atmospheric emissions of any common roofing line product.

Page 44, Par. 2 Change to read:

Emissions from the three sources cited above and the coater hood, which is ducted to the saturator enclosure, are controlled by 2 modular electrostatic precipitators (MESP). The MESP ducting arrangement and the locations of the sampling points are shown in Figure 3.

Page 44, Par. 3 Change to read:

The operation of a Smog HogTM MESP is similar to that of a conventional two-stage, low voltage ESP, except that the ionizers and collectors are contained in removable modules and can be arranged in 1, 2, or 3 pass configurations. Figure 4 shows the operation of a single pass unit. It also contains an outline drawing of a 2-pass unit such as is used at this location.

Page 47, Par. 3, Sentence 2 Change as follows:

An automatic . . . obtained from weighing 3 bundles at random each half hour during the test.

Page 48, Par. 1, Sentences 4-6. Change as follows:

Data on storage temperatures and tank levels, asphalt deliveries and transfers and asphalt usage . . . officer. These . . . Section I-2. Since no flowmeters were available and manual outage measurements are inherently inaccurate for small changes in liquid level, usage was calculated

over periods ranging from 6 to 14 hours. As it could not . . . times,
plant production records were used. Usage rates . . . caution.

Appendix I-3 Add: Enclosed Tables

COATING ASPHALT DELIVERIES-TO HUNT TANKS
Fairfield, Ala.

Date	Truck No.	Truck Ticket		Hunt Tanks (1)		Softening Point (S.P.) & Flash Point (F.P.)	Density (LBS/GAL)
		BBL	Wt(LBS)	Δ Height	GAL		
10/8/75	2030	N.A.	(5544)	48,400	7-8 6-3 1-5	S.P. 222 F.P. 560	N.A. (use 8.7298)
10/9/75	2030	136.37	5727.5	50,000	6-2 4-5 1-9	N.A.	8.7297
10/9/75	2029	123.17	5173.1	45,160	11-7 10-0 1-7	S.P. 221 F.P. 565	8.7298
10/10/75	2029	127.53	5356.3	46,760	12-0 N.A.	N.A.	8.72997

	Variance (3) (4)	
	Gal.	%
10/8	345	+6.6
10/9	694	-10.8
10/9	635	-10.9
10/10	-	-
Avg.	8.7298	~ 8.73

- Notes: (1) Tank Height Conversion = 3669 Gal./Ft
(2) N.A. - Not Available
(3) Difference in Volume of Asphalt Delivered & That Received
(4) + Indicates truck volume greater, - indicates that it is less
(5) Brackets () indicate estimate

SATURANT ASPHALT DELIVERIES-TO CELOTEX TANKS

Fairfield, Alabama

Date & Time	Truck No.	Truck Ticket		Weight (LBS)	Records Weight (LBS)	Softening Point	Flash Point
		Barrels (BBL)	Gallons				
10/7/75 4:10 pm	2028	132.59	5568.78	48,400	48,700	147	560
10/8/75 6:30 pm	2028	N.A.	N.A.	48,140	47,900	147	550
10/9/75 6:45 am	2029	N.A.	N.A.	48,160	48,300	N.A.	N.A.
10:40 am	2030	N.A.	N.A.	48,100	48,420	N.A.	N.A.
10/10/75	None	-	-	-	-	-	-
				Totals	192,800	193,320	
				Variance	Δ 520 #	< 1%	

Notes:

- N.A. - Not Available
- Calculated saturant asphalt density = $48,400 = 8.6913 \text{ \#/gal} \approx 8.69 \text{ \#/gal}$ at delivery temperature.
- Delivery temperature reported to be $\frac{5,569}{}$ about 400°F.

10/8/75
Celotex
Fairfield, Ala.

ASPHALT TANK CONVERSIONS

Tank No.	Tank Capacity	1 Ft.	1 Inch	3 In.	6 In.	9 In.
2	156,305 gal. 3,000 bbl	5,287.8 gal.	440.64 gal.	1321.9 gal.	2643.8 gal.	3965.8 gal.
3	15,118 gal.	840.2 gal.	70.02 gal.	210.06 gal.	420.12 gal.	630.18 gal.
6	15,118 gal.	840.2 gal.	70.02 gal.	210.06 gal.	420.12 gal.	630.18 gal.
7	15,118 gal.	840.2 gal.	70.02 gal.	210.06 gal.	420.12 gal.	630.18 gal.
HUNT	N.A.	3,669 gal.	306 gal.	917 gal.	1834 gal.	2752 gal.

ASPHALT STORAGE TANK LEVELS AND TEMPERATURES

DATE	TIME	TANK OUTAGE LEVELS (FT)			TANK TEMPERATURES (°F)			TRUCKS	TEMP. WT.	REMARKS/OPERATION					
		SAT. ASPHALT 2	SAT. ASPHALT 3	COATING ASPHALT 6	SAT. ASPHALT 2*	SAT. ASPHALT 3	COATING ASPHALT 6				COATING ASPHALT 7	TO MXR	HUNT*		
10/7/5	6:00 AM	15'-11"	2'-9"	8'-7"	2"-7"	--	270	474	--	460	484	--		440	
	7:45 AM	--	--	8-7	5-4	477	270		496	450				440	Transfer Hunt→T6 & T7
	8:40 AM	--	--	1-0	1-0	11-0	270		497	440				440	Transfer T2→T3
	8:30 AM	15-11	5-1			500	270	440	497	440				440	Transfer T2→T3
	9:50 AM		2-0			480	270		487	440				440	
	12:45 PM		5-5			490	270	470	500	440				440	
	2:00 PM		3-0			482	270	450	497	440				440	
	2:42 PM		3-0	10-1	1-0	484	270	450	495	440	464			440	Started Part. test at 2:16 PM
	3:30 PM NA			11-8 1-6		494	270		475	440	475			440	Transfer Hunt→T6
	4:10 PM NA		4-0 2-0			493	270	490	480	440				440	Transfer Truck→T3
	4:50 PM					490	270	468	475	440	456			440	
	6:15 PM					492	270	492	475	440	452			440	
	7:15 PM					487	270	484	475	440	468			440	
	7:55 PM	16-8	5-6	6-2	1-0	490	270	485	475	440	446			440	Ended Part. test at 7:47 PM

* Temperature estimated

ASPHALT STORAGE TANK LEVELS AND TEMPERATURES

DATE	TIME	TANK OUTAGE LEVELS (FT)						TANK TEMPERATURES (°F)						TRUCKS	REMARKS	OPERATION	
		SAT. ASPHALT 2	SAT. ASPHALT 3	COATING ASPHALT 6	COATING ASPHALT 7	HUNT	SAT. ASPHALT 2	SAT. ASPHALT 3	COATING ASPHALT 2	COATING ASPHALT 3	TO MXR	HUNT	TEMP				WT.
10/9/5	6:00 AM	16-5	3-7	10-0	5-4		270	455	464	472		440	420	48,160	Transfer Truck → T2	SP 147, FP 550 Truck 2029	
	6:45 AM						270				440						
	7:30 AM	16-5					270				440						
	7:15 AM			10-0	7-0	6-3	270		460	488	440				Transfer Hunt → T6&T7	T7 in use	
	8:40 AM			1-0	1-0	9-6	270		450	470	440						
	10:00 AM		8-0				270	470			440				Transfer T2 → T3	T3 in use	
	10:40 AM						270				440						
	10:40 AM		2-0				270	420			440				Transfer Truck → T2&T3	SP 147, FP 550 Truck 2030 T3 in use	
	11:30 AM						270				440						
	11:50 AM	16-1	2-6	8-0	1-5		270	417	482	463	460	440	420	48,100		Started Part. test at 12:00 noon	
	1:50 PM		5-9				270				440				Transfer T2 → T3		
3:00 PM	16-2	2-1	13-6	1-5		270	432	489	454	509	440				Ended Part. test at 2:52 PM		
10/10/5	6:00 AM	15-1	5-0	6-5	11-8		270	460	480	476	440						
	7:00 AM		6-5				270	470			440						
	8:50 AM	16-6	2-2				270	430	476	450	440				Transfer T2 → T3	T3 in use	
	7:30 AM		2-2	9-2	11-8		270	430	490	470	440				Transfer Hunt → T6&T7	T6 in use	
	8:50 AM	16-6	2-2	2-0	0-6		270	464	476	450	440					Started Part. test at 8:45 AM	
	11:10						270	470	480	440	440				Transfer T2 → T3	T3 in use	
	11:30		5-6		0-6		270	470			440						
	12:00 N	16-7	4-7	6-1	0-6		270	455	488	436	504	440				Ended Part. test at 11:40 AM	

ROOFING PRODUCTION DATA

Celotex, Fairfield 10/7-10/10/5

DATE	SHIFT	LINE #1				LINE #2						
		RUN TIME	SQUARES	240# STD REJECTS	TOTAL	RUN TIME	VAPOR BAR SQ.	ASBESTOS BASE SHEET SQ.	#33 COATED ROLLS			
						REQ.	TOTAL	REQ.	TOTAL	REQ.	TOTAL	
10/7/5	7AM-3PM	8	953	1/3	3493	8	2744	58	2082	--	--	
	3PM-11PM	8	1279			--	--	--	--	--	--	--
	11PM-7AM	8	1180	2/3		2744	58	2802	--	0	--	0
10/8/5	7AM-3PM	1 1/2	252		780	2	546	0	546	1774	62	
	3PM-11PM	6 1/2				6	--	--	--	1836	--	--
	11PM-7AM	8	140			1240	--	--	--	--	--	--
10/9/5	7AM-3PM	8	750		2020	8	546	0	546	1774	62	
	3PM-11PM	8	1142			120	2140	--	--	1836	--	0
	11PM-7AM	8	1670			2020	120	2140	--	--	2136	104
10/10/5	7AM-3PM	8	1630		62	8	1200	4500	4562	--	--	
	3PM-11PM	8	1200			62	4562	NA	NA	2136	104	2240
	11PM-7AM	8	4500			NA	NA	NA	NA	--	--	--

PREFACE

The work reported herein was conducted by personnel from Battelle Columbus Laboratories, Midwest Research Institute, Monsanto Research Corporation and the Environmental Protection Agency.

Battelle Lab's personnel were responsible for cleanup of the field-collected samples, monitoring of the gaseous hydrocarbon concentrations and performing the sampling analyses at the Battelle Labs located in Columbus, Ohio, for which a report was submitted to EPA summarizing these data.

Midwest Research personnel were responsible for monitoring the process operations during the testing program and writing the Process Description and Operations Section along with Appendix I of this report.

Monsanto Research personnel were responsible for collecting and analyzing particle size samples. These samples were weighed at the Monsanto Research Lab located in Dayton, Ohio, and a report was submitted to EPA summarizing the testing and analytical data.

Mr. Clyde E. Riley, Office of Air Quality Planning and Standards, Emission Measurement Branch, served as Test Project Officer and was responsible for coordinating the performance testing program.

Mr. Eric A. Noble, Office of Air Quality Planning and Standards, Industrial Studies Branch, served as Test Process Project Engineer and was responsible for coordinating the process operations.

Note: Mention of trade names or commercial products in this publication does not constitute endorsement or recommendation for use by the Environmental Protection Agency.

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- APPENDIX B - Particle Size Results
- APPENDIX C - Visible Emission Results
- APPENDIX D - EPA Methods 1, 2, 3, and 20 Field Data Sheets
- APPENDIX E - Gaseous Hydrocarbons Data
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- APPENDIX G - High-Volume Sampling Data
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I. INTRODUCTION

Section 111 of the Clean Air Act of 1970 charges the Administrator of the Environmental Protection Agency (EPA) with the responsibility of establishing Federal standards of performance for new stationary sources which may significantly contribute to air pollution. These promulgated standards of performance for new stationary sources (SPNSS) will reflect the degree of emission limitation achievable through application of the best demonstrated control technology, taking into account cost considerations. To assemble this background information, EPA utilizes emission data obtained from pollutant sources involved in the particular industries being studied.

In the asphalt roofing industry, emission control systems at the Celotex, Fairfield, Alabama, Asphalt Roofing Manufacturing Plant, was selected by EPA for an emission monitoring test program. This test program was designed to provide a portion of the emission data base used for determining "best control technology" and for developing new source atmospheric emission standards for the processes involved in the manufacturing of asphalt roofing products. This report presents the results of this test program performed during the week of October 6, 1975.

The Celotex asphalt roofing manufacturing plant produces saturated felt, shingles, and roll goods. Two separate product manufacturing lines operate 24 hours a day, five days a week. Line No. 2 produces only saturated felt. Sampling was conducted on the No. 1 saturator line emissions only while 57-pound felt asphalt shingles were being processed. It had been predetermined that processing this product produced the highest concentration of atmospheric emissions. The combined fume emissions from the No. 1 line are removed via a manifold duct to two modular electrostatic precipitators (MESP) and then discharged into the atmosphere through two exit stacks (See Figure 1).

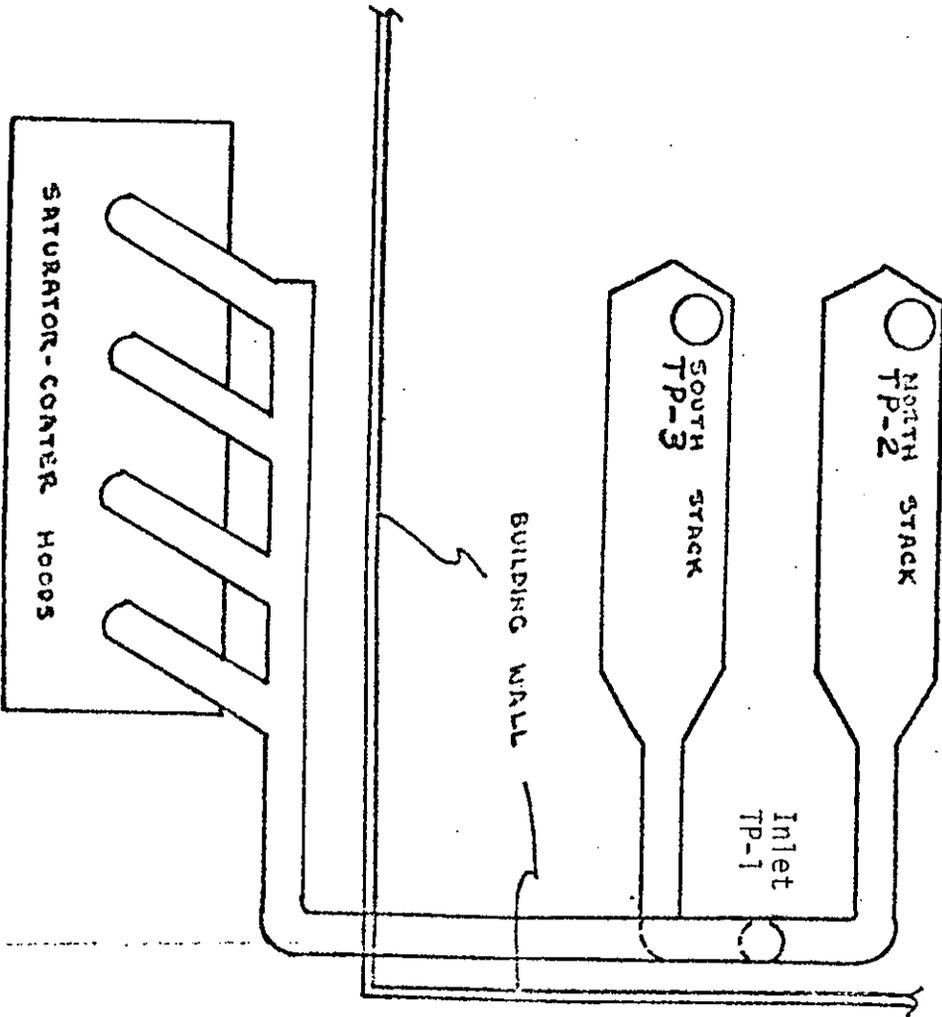


Figure 1. Schematic of Ducting Arrangement, Modular Electrostatic Precipitators, and Test Locations

EPA jointly engaged with Battelle-Columbus Labs and Monsanto Research Corporation to measure the process emissions at the inlet and outlet locations to and from the MESP emission control systems. Battelle-Columbus was responsible for the cleanup and analysis of the EPA-20 particulate samples, the polycyclic organic matter (POM) samples, the monitoring of gaseous emissions by two flame-ionization detectors (FID), and the acquisition and analysis of process samples. Monsanto Research was responsible for collecting and analyzing particle size samples. Simultaneously, Midwest Research was responsible for monitoring and recording necessary process parameters.

EPA personnel conducted a total of twelve EPA-20 particulate test runs at three (3) test locations. These consisted of four test runs at the inlet to the MESP (TP-1), four test runs at the No. 1 MESP outlet (TP-2), and four test runs at the No. 2 MESP outlet (TP-3). (See Figure 1.) Simultaneous sampling was conducted at each of the three test locations during the four test runs for velocity, moisture, and particulate using EPA Method 20. (See Sampling and Analytical Procedures Section.) Three integrated orsat samples and three evacuated flask samples were collected at TP-3 and analyzed for gas composition using EPA Method 3 for the orsat analysis and gas chromatography for a single evacuated flask analysis. Additional measurements were made at the inlet and outlet locations for gaseous hydrocarbons by FID detectors. Three particle size determinations were performed at TP-1 and three at TP-2. All tests were conducted using a Brinks* Cascade Impactor modified for this particular type of sample collection.

Two simultaneous particulate polycyclic organic matter runs were conducted during the test program. One run was performed at the inlet, TP-1 and the other on the outlet location TP-3.

*Mention of a specific company or product does not constitute endorsement by EPA.

Visible emission readings were recorded at the exhaust of each of the two MESP stacks. In addition, visible fugitive fume emission observations were conducted at the dipping and spraying sections of the saturator line, at the strike-in drum section, and at the coating area section in accordance with procedures detailed in EPA Method 9 opacity guidelines (see Appendix C).

Two test runs using an experimental high-volume particulate sampling instrument were conducted at test point TP-3. The operational and emission data gathered during these runs were to determine the comparability of the instrument to EPA Method 20 sampling equipment. The experimental data are treated as research and development efforts and are not to be used as background support for new source standards of performance.

Process samples collected during the sampling program included: bulk or unblown asphalt, recovery oil from the MESP units, saturant, coating (without filler), coating with filler, sand, felt (57 gauge), sealant, zinc powder, and granules used on the shingles produced on October 8, 1975. In addition a toluene-detergent-water wash solution used for cleaning the MESP screens was collected from a large vat. A blank or unused sample of the same cleaning solution was also collected for background analysis.

The EPA and contractor personnel arrived at the plant on October 6, 1975. Preliminary tests and measurements along with preparations for testing the following day were completed by the October 6 date. Formal test runs were conducted on October 7, 8, 9, and 10.

Most of the runs were discontinuous due to process interrupts and slowdowns encountered throughout the test program. As indicated in Tables 1 through 4 (Summary Logs for Process and Sampling Times), a four or five hour sampling period was usually required to collect a two and one-half hour sample.

Volume I of this report contains the following sections:

The Summary of Results

Process Description and Operation

Sampling Point Locations; and

Sampling and Analytical Test Procedures.

Volume II contains Appendices detailing descriptions of procedures used during sampling and analytical operations along with example calculations and copies of field and laboratory data sheets.

TABLE 1. SUMMARY LOG FOR PROCESS AND SAMPLING TIMES FOR OCTOBER 7, 1975

Mean Time	Line Speed (ft/min)	Particulate			Gaseous Hydrocarbons			Visible Emissions			Particle Size		Integrated Orsat	High Volume Sampler TP-3
		Inlet TP-1	Outlet TP-2	Outlet TP-3	Inlet TP-1	Outlet TP-2	Outlet TP-3	Outlet TP-2	Outlet TP-3	Hood Fumes	Inlet TP-1	Outlet TP-2		
09:05	No line							Started						
10:41	speeds							Stopped						
12:15	recorded													Started
12:33	during													Stopped
12:45	these													Continued
12:03	times.													Completed
14:07	350													
14:15	300													
14:16			Started											
14:17			↓											
14:18			Stopped											
14:30	350							Started	Started					
14:32		Started						↓	↓					
14:33		↓	Continued					Stopped	Stopped					
14:34			↓	Started										
14:40				↓			Started							
14:44							↓							
14:45	350													
14:46														
14:47														
15:00	350													
15:04	(Felt break)													
15:06														
15:07														
15:08														
15:09														
15:15		Stopped												
15:27	Line on													
15:41		Continued												
15:55	310	↓												
15:57			Cont'd.	Cont'd.										
16:00	350		↓	↓										
16:05														
16:08														
16:10		Stopped												
16:15	360	Port change												
16:21		Cont'd.												
16:27		Stopped												
16:29														
16:30	360		Stopped											
16:33			Port change											
16:34				Stopped										Started
														Stopped

TABLE 2. SUMMARY LOG FOR PROCESS AND SAMPLING TIMES FOR OCTOBER 8, 1975

Mean Time	Line Speed (ft/min)	Particulate			Gaseous Hydrocarbons			Visible Emissions			Particle Size		Integrated Orsat	High Volume Sampler TP-3	Process Samples
		Inlet TP-1	Outlet TP-2	Outlet TP-3	Inlet TP-1	Outlet TP-2	Outlet TP-3	Outlet TP-2	Outlet TP-3	Hood Fumes	Inlet TP-1	Outlet TP-2			
09:24															
09:25	320														
09:28	250														
09:30															
10:15	320														
10:18															
10:20	360														
10:21		Started	Started	Started											
10:24		Run 2	Run 2	Run 2	Started										
10:25					Run 2										
10:34															
10:35	360														
10:50	360														
10:59															
11:05	360														
11:19															
11:20	360														
11:24															
11:29															
11:31															
11:33		Stopped	Stopped	Stopped	Stopped										
11:35	360														
11:42			Cont'd.												
11:43				Cont'd.											
11:44		Cont'd.													
11:49	Felt Break	Stopped	Stopped	Stopped											
11:50			Stopped	Stopped											
12:05															
12:06		Cont'd.	Cont'd.												
12:07				Cont'd.											
12:09					Cont'd.										
12:10	300														
12:11	280														
12:13															
12:14	330														
12:15	330														
12:29															
12:30	330														
12:33															
12:45	270														
12:48	310														
12:49															
12:51			Stopped												
12:52		Stopped		Stopped	Stopped										
12:53															
13:11															
13:12	360	Cont'd.	Cont'd.	Cont'd.											
13:13	300														
13:15															
13:17	330														
13:21															
13:25		Stopped	Stopped	Stopped											
13:25		Due to subsequent felt breaks further sampling of particulates was terminated and the 2nd test runs were considered to be completed.													

TABLE 2. SUMMARY LOG FOR PROCESS AND SAMPLING TIMES FOR OCTOBER 8, 1975 (Continued)

Scan Time	Line Speed (ft/min)	Particulate			Gaseous Hydrocarbons			Visible Emissions			Particle Size		Integrated Orsat	Evacuated Flask TP-3
		Inlet TP-1	Outlet TP-2	Outlet TP-3	Inlet TP-1	Outlet TP-2	Outlet TP-3	Outlet TP-2	Outlet TP-3	Hood Fumes	Inlet TP-1	Outlet TP-2		
5:34														Cont'd.
5:35	320													↓
15:50	360							Cont'd.	Cont'd.					↓
16:05	360							↓	↓					↓
6:11								Stopped	Stopped					Completed
6:18	320							Cont'd.	Cont'd.					
16:35	370							↓	↓					
6:45	370	Started	Started											
6:46		↓	↓	Started										
16:54		↓	↓	↓			Started							
7:00	370													Started
7:07							Started							↓
7:10							↓							Flask #1
17:15	370													Flask #2
7:19														Flask #3
7:25														Started
17:30	370													↓
7:45	370													Stopped
7:54														Stopped
17:55			Stopped											Stopped
17:56			↓	Stopped										
7:57		Stopped		Stopped										
18:00	370							Stopped	Stopped					
18:10		Cont'd.												
8:11		↓		Cont'd.	Cont'd.									
8:12			Cont'd.											
18:14			↓											Cont'd.
8:15	370													↓
8:19														Cont'd.
18:20							Cont'd.							↓
18:27	370						↓							Stopped
8:43	370													Stopped
8:49														Stopped
18:50			Stopped	Stopped										Stopped
8:51		Stopped		Stopped										
8:53														
19:11	350		Cont'd.	Cont'd.										Cont'd.
19:12		Cont'd.	↓	↓										↓
19:13		↓					Cont'd.							Cont'd.
19:22							↓	Cont'd.						Completed
19:24			Stopped	Stopped			Stopped	Stopped						Completed
19:25	360	Stopped	Stopped				Stopped	Stopped						
19:48														Cont'd.
19:50	400		Cont'd.	Cont'd.										↓
19:51		Cont'd.	↓	↓										↓
19:54	260						Cont'd.							
19:55	360													
20:00	350							Cont'd.						Completed
20:05								↓						Completed
20:08			Completed	Completed				Completed						
20:09		Completed		Completed										
20:13	360													

TABLE 3. SUMMARY LOG FOR PROCESS AND SAMPLING TIMES FOR OCTOBER 9, 1975

Mean Time	Line Speed (ft/min)	Hood		Visible Emissions			Particle Size	
		Inlet TP-1	Outlet TP-3	Outlet TP-2	Outlet TP-3	Hood Fumes	Inlet TP-1	Outlet TP-2
08:35	300							Started
08:45						Started		↓
08:50	340					↓		↓
09:00				Started	Started			↓
09:05	290			↓	↓	↓		↓
09:07				Stopped	Stopped	Stopped		Stopped
09:15				Cont'd.	Cont'd.	Cont'd.		↓
09:18	310			↓	↓	↓		Cont'd.
09:35	340			↓	↓	↓		↓
09:50	340			↓	↓	↓		↓
10:05	340			↓	↓	↓		↓
10:25	340			↓	↓	↓		↓
10:40	350			↓	↓	↓		Completed
10:46				↓	↓	↓		
11:00	350			↓	↓	↓		
11:15	350			↓	↓	↓		
11:30	350			↓	↓	↓		
11:41				Stopped	Stopped	Stopped		
11:50				Cont'd.	Cont'd.	Cont'd.		
11:53	340			↓	↓	↓		
12:00	350	Started		↓	↓	↓		
12:01		↓	Started	↓	↓	↓		
12:15	350		↓	↓	↓	↓		
12:40	350		↓	↓	↓	↓		
12:55	350		↓	↓	↓	↓		
12:56	300		↓	↓	↓	↓		
13:00			↓	↓	↓	↓		
13:06			↓	↓	↓	↓		
13:10	300		↓	↓	↓	↓		
13:11			↓	↓	↓	↓		
13:12		Stopped	↓	↓	↓	↓		
13:25	360		↓	↓	↓	↓		
13:27		Cont'd.	↓	↓	↓	↓		
13:40	360		↓	↓	↓	↓		
13:54		↓	↓	↓	↓	↓		
13:55		Stopped	↓	↓	↓	↓		Started
13:59	320		↓	↓	↓	↓		Stopped
14:00		Cont'd.	↓	↓	↓	↓		Cont'd.
14:02		↓	↓	↓	↓	↓		↓
14:15	320		↓	↓	↓	↓		Completed
14:20		↓	↓	↓	↓	↓		
14:34		↓	↓	↓	↓	↓		
14:35		↓	↓	↓	↓	↓		
14:38		Stopped	↓	↓	↓	↓		
14:41			↓	↓	↓	↓		
14:42			↓	↓	↓	↓		
14:43	340		↓	↓	↓	↓		
14:45		Cont'd.	↓	↓	↓	↓		
14:51		Cont'd.	↓	↓	↓	↓		
14:52		Completed	↓	↓	↓	↓		
14:54	370		↓	↓	↓	↓		
15:06			↓	↓	↓	↓		
15:07			↓	↓	↓	↓		
15:20			↓	↓	↓	↓		
15:22	320		↓	↓	↓	↓		
15:35	370		↓	↓	↓	↓		
15:50	370		↓	↓	↓	↓		
16:05	320		↓	↓	↓	↓		
16:20	320		↓	↓	↓	↓		
16:33			↓	↓	↓	↓		
16:35	320		↓	↓	↓	↓		
16:40			↓	↓	↓	↓		
16:42	320		↓	↓	↓	↓		

TABLE 4. SUMMARY LOG FOR PROCESS AND SAMPLING TIMES FOR OCTOBER 10, 1975

Mean Time	Line Speed (ft/min)	Particulate			Gaseous Hydrocarbons			Process Samples
		Inlet TP-1	Outlet TP-2	Outlet TP-3	Inlet TP-1	Outlet TP-2	Outlet TP-3	
08:45	320	Started						
08:46		↓		Started				
08:48			Started	↓				
08:52		Stopped	↓					
08:53	(Blower turned off)		Stopped	↓				
08:54				Stopped				
08:57		Cont'd.	Cont'd.					
08:58		↓	↓	Cont'd.	Started			
09:00	320			↓	↓			
09:07	300							
09:14						Started		
09:15	300				↓	↓		
09:30	300							
09:45	360							
10:00	360			Stopped				
10:02		Stopped	Stopped		Stopped	Stopped		Felt, sealant, samples collected
10:06		Cont'd.						
10:08		↓			Cont'd.			
10:09				Cont'd.	↓			
10:10			Cont'd.					
10:15	360		↓					
10:16			Stopped				Started	
10:19		Stopped	Stopped	Stopped	Stopped		Stopped	
10:20	320							
10:21				Cont'd.				
10:22		Cont'd.	Cont'd.	↓	Cont'd.			
10:26		↓	↓		↓		Cont'd.	
10:30	350						↓	
10:44		Stopped	Stopped	Stopped	Stopped		Stopped	
11:00	320							
11:01			Cont'd.					
11:02			↓		Cont'd.			
11:03		Cont'd.			↓			
11:05		↓			Cont'd.			
11:08							Cont'd.	
11:15	350						↓	
11:30	350							
11:38	350							
11:39				Completed			Completed	
11:40		Completed	Completed		Completed			

II. SUMMARY OF RESULTS

A summary of the particulate and gaseous hydrocarbon concentration and emission data for the test program is presented in Table 5. These data represent the front half portion of the sampling train results from which the blank values have been subtracted. Individual summary results for the four particulate and gaseous hydrocarbon runs conducted at the inlet (TP-1) are presented in Table 6. Tables 7 and 8 summarize the particulate and gaseous hydrocarbon runs conducted at the two outlet locations, TP-2 and TP-3.

Emissions were sampled simultaneously at the inlet and outlet of the MESP used for control of the asphalt saturator pollutant concentrations. Average sampling time covered a period of 2 hours and 20 minutes and in all instances sampling times were conducted during specific process conditions which were considered to be similar to those used during normal plant operation. Process parameters were carefully observed and the emission tests performed only when the process appeared to be operating normally.

PARTICULATES

Results of the particulate emission tests at the MESP inlet and outlets have been averaged as shown in Table 5. Inlet sampling was conducted 46 inches upstream of a forked "Y" that branched off to two separate MESP units (see Figure 5). The inlet location was only 188 inches downstream of a 90° right angle bend. The variations between the inlet and outlet volumetric flows can be attributed to the inaccuracies that accompany the measurement of the residual angular flow profiles. The temperature of the gas streams were consistently higher at the outlet, due to the kinetic energy created by the centrifugal fans. For each test the calculated isokinetic sampling rate was well within the define limits of 90 to 110 percent.

TABLE 5. PARTICULATE AND GASEOUS HYDROCARBON CONCENTRATION AND EMISSION DATA SUMMARY

Location	Run 1		Run 2		Run 3		Run 4		Average	
	Inlet	Outlet ^(f)	Inlet	Outlet ^(f)	Inlet	Outlet ^(f)	Inlet	Outlet ^(f)	Inlet	Outlet ^(f)
Date	10/7/75	10/7/75	10/8/75	10/8/75	10/8/75	10/8/75	10/10/75	10/10/75	10/10/75	10/10/75
Volume of Gas Sampled--DSCF ^(a)	100.92	211.03	102.54	199.74	110.76	203.29	111.83	205.39	106.51	204.87
Percent Moisture by Volume	2.8	3.1	2.4	2.7	2.2	2.7	2.2	2.7	2.4	2.8
Average Stack Temperature--°F	125.	130.	124.	133.	135.	148.	119.	130.	126.	136.
Stack Volumetric Flow Rate--DSCFM ^(b)	25,389.	25,615.	26,255.	24,990.	26,438.	24,679.	26,422.	25,073.	26,131	25,089.
Stack Volumetric Flow Rate--ACFM ^(c)	29,248.	29,644.	30,070	28,959.	30,683.	29,290.	29,840.	28,881.	29,959.	29,194.
Percent Isokinetic	97.2	100.3	101.2	100.4	102.5	100.3	103.5	99.7	101.1	100.2
Percent Opacity Average ^(d)	---	3.6	---	0	---	0	---	0(10/9/75)	---	1.0
Feed Rate--ton/hr	---	---	---	---	---	---	---	---	---	---
Particulates--probe, cyclone, and filter catch	---	---	---	---	---	---	---	---	---	---
mg	530.30	127.8	423.30	29.4	489.60	61.8	352.70	22.1	449.00	60.28
gr/DSCF	0.0809	0.00931	0.0635	0.00227	0.0681	0.00469	0.0486	0.00166	0.0653	0.00448
gr/ACF	0.0702	0.00804	0.0555	0.00196	0.0586	0.00395	0.0430	0.00144	0.0568	0.00385
lb/hr	17.61	2.06	14.31	0.48	15.43	0.99	11.00	0.35	14.59	0.97
lb/ton feed	---	---	---	---	---	---	---	---	---	---
Collection Efficiency, Percent	88.3	96.6	93.6	96.8	93.8	96.8	93.8	93.8	93.8	93.8
Gaseous Hydrocarbons										
Average Results										
Weighted Average Value, ppmv as CH ₄	42.8	50.6	43.7	50.3	38.1	43.2	39.3	42.7	41.0	46.7
gr/DSCF	0.0127	0.0151	0.0130	0.0150	0.0113	0.0129	0.0116	0.0127	0.0122	0.0139
lb/hr	2.77	3.32	2.93	3.20	2.56	2.71	2.63	2.72	2.73	2.99
Collection Efficiency, Percent (based on weighted DSCFM average)	0	0	0	0	0	0	0	0	0	0

(a) Dry standard cubic feet at 70°F, 29.92 in. Hg.
 (b) Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.
 (c) Actual cubic feet per minute.
 (d) Average of 6-minute interval averages per date; opacity reading times do not coincide with particulate test times.
 (e) Parts per million, by volume.
 (f) Includes data from both outlet stacks (TP-2 and TP-3).

Table 6. Particulate and Gaseous Hydrocarbon Results for Inlet TP-1

<u>Run Number</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Average</u>
Date	10/7/75	10/8/75	10/8/75	10/10/75	
Volume of Gas Sampled--DSCF ^a	100.92	102.54	110.76	111.83	106.51
Percent Moisture by Volume	2.8	2.4	2.2	2.2	2.4
Average Stack Temperature--°F	125.	124.	135.	119.	126.
Stack Volumetric Flow Rate--DSCFM ^b	25389.	26255.	26438.	26422.	26131.
Stack Volumetric Flow Rate--ACFM ^c	29248.	30070.	30683.	29840.	29959.
Percent Isokinetic	97.2	101.2	102.5	103.5	101.1
Feed Rate--Ton/hr	--	--	--	--	--
<u>Particulates--probe, cyclone, and filter catch</u>					
mg	530.30	423.30	489.60	352.70	449.00
gr/DSCF	0.08092	0.06358	0.06807	0.04857	0.06529
gr/ACF	0.07021	0.05548	0.05862	0.04298	0.05682
lb/hr	17.61	14.31	15.43	11.00	14.59
lb/ton feed	--	--	--	--	--
<u>Gaseous Hydrocarbon Average Results</u>					
Minimum value, ppmv ^d	41.5	42.8	37.2	38.6	40.0
Maximum value, ppmv ^d	44.0	44.6	38.9	40.1	41.9
Weighted average value, ppmv ^d	42.8	43.7	38.1	39.3	41.0
gr/DSCF	0.0127	0.0130	0.0113	0.0116	0.0122
lb/hr	2.77	2.93	2.56	2.63	2.73

^aDry standard cubic feet at 70°F, 29.92 in. Hg.

^bDry standard cubic feet per minute at 70°F, 29.92 in. Hg.

^cActual cubic feet per minute

^dParts per million, by volume measured as CH₄

Table 7. Particulate and Gaseous Hydrocarbon
Results For Outlet TP-2

<u>Run Number</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Average</u>
Date	10/7/75	10/8/75	10/8/75	10/10/75	
Volume of Gas Sampled--DSCF ^a	107.04	99.93	101.42	103.48	102.97
Percent Moisture by Volume	3.1	2.9	2.7	2.7	2.9
Average Stack Temperature--°F	133.	134.	145.	130.	136.
Stack Volumetric Flow Rate--DSCFM ^b	13,412.	12,698.	12,769.	13,022.	12,975.
Stack Volumetric Flow Rate--ACFM ^c	15,604.	14,769.	15,095.	15,012.	15,120.
Percent Isokinetic	97.8	99.3	97.4	97.4	98.0
Percent Opacity Average ^d	3.3	0	0	0	1.0
Feed Rate--ton/hr	--	--	--	--	--
<u>Particulates--probe, cyclone, and filter catch</u>					
mg	73.00	15.60	38.80	10.30	34.43
gr/DSCF	0.01050	0.00240	0.00589	0.00153	0.00508
gr/ACF	0.00902	0.00207	0.00498	0.00133	0.00435
lb/hr	1.21	0.26	0.64	0.17	0.57
lb/ton feed	--	--	--	--	--
<u>Gaseous Hydrocarbon Average Results</u>					
Minimum value, ppmv ^e	51.5	48.6	39.0	35.5	43.7
Maximum value, ppmv ^e	53.8	49.9	40.8	37.2	45.4
Weighted average value, ppmv ^e	52.5	49.3	39.9	36.3	44.5
gr/DSCF	0.0157	0.0147	0.0119	0.0108	0.0133
lb/hr	1.80	1.60	1.30	1.21	1.48

^a Dry standard cubic feet at 70°F, 29.92 in. Hg.

^b Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

^c Actual cubic feet per minute

^d Average of 6-minute interval averages per date; opacity reading times do not coincide with particulate test times

^e Parts per million, by volume measured as CH₄

Table 8. Particulate and Gaseous Hydrocarbon
Results For Outlet TP-3

<u>Run Number</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Average</u>
Date	10/7/75	10/8/75	10/8/75	10/10/75	
Volume of Gas Sampled--DSCF ^a	103.99	99.81	101.87	101.91	101.90
Percent Moisture by Volume	3.0	2.5	2.7	2.7	2.7
Average Stack Temperature--°F	127.	132.	150.	129.	135.
Stack Volumetric Flow Rate--DSCFM ^b	12,203.	12,292.	11,910.	12,051.	12,114.
Stack Volumetric Flow Rate--ACFM ^c	14,040.	14,190.	14,195.	13,869.	14,074.
Percent Isokinetic	102.8	101.5	103.1	102.0	102.4
Percent Opacity Average ^d	5.0	0	0	0	1.0
Feed Rate--ton/hr	--	--	--	--	--
<u>Particulates--probe, cyclone, and filter catch</u>					
mg	54.80	13.80	23.00	11.80	25.85
gr/DSCF	0.00812	0.00213	0.00348	0.00178	0.00388
gr/ACF	0.00705	0.00184	0.00292	0.00155	0.00334
lb/hr	0.85	0.22	0.35	0.18	0.40
lb/ton feed	--	--	--	--	--
<u>Gaseous Hydrocarbon Average Results</u>					
Minimum value, ppmv ^e	47.5	49.7	45.5	48.5	47.8
Maximum value, ppmv ^e	50.4	52.4	47.2	49.7	49.9
Weighted average value, ppmv ^e	48.7	51.2	46.4	49.0	48.8
gr/DSCF	0.0145	0.0152	0.0138	0.0146	0.0145
lb/hr	1.52	1.60	1.41	1.51	1.51

^aDry standard cubic feet at 70°F, 29.92 in. Hg.

^bDry standard cubic feet per minute at 70°F, 29.92 in. Hg.

^cActual cubic feet per minute

^dAverage of 6-minute interval averages per date; opacity reading times do not coincide with particulate test times

^eParts per million, by volume measured as CH₄

Average inlet and outlet particulate concentrations based on the front half (probe, prefilter, and filter) of the sampling train were 0.0653 grains per dry standard foot (gr/DSCF) and 0.00448 gr/DSCF, respectively. The average emission rates were 14.59 pounds per hour (lbs/hr) for the inlet and 0.97 lbs/hr for the two outlets. Based on these data, the average collection efficiency for particulate matter was 93.8 percent.

Orsat analyses of the outlet gases showed them to contain essentially the same degree of components as air. Average volumetric flow rate for the inlet was 26,131 dry standard cubic feet per minute (DSCFM). The combined average volumetric flow rates for the two outlet stacks was 25,089 DSCFM.

Additional information concerning the particulate testing is contained in Section V, "Sampling and Analytical Test Procedures." Computer print-outs of the test results are contained in Appendix A, Tables A-I through A-VI together with example calculations for Run 1 at the inlet location. All particulate field test data sheets are contained in Appendix D. Particulate sampling logs are located in Appendix H.

TOTAL HYDROCARBONS

MESP inlet and outlet gas streams were simultaneously sampled for total gaseous hydrocarbon concentration. The hydrocarbon sampling systems were operated in conjunction with the particulate runs. However, only one FID was used on the outlet stacks and was alternated from one stack to the other (see Appendix H for location and sampling times). Tables 5 through 8 summarize the measured hydrocarbon concentration and calculated emission rate averages for each of the test runs.

Continuous total hydrocarbon monitoring of gas passing through the glass fiber filter of the particulate sampling train by a FID instrument showed an average

concentration range of 41.0 parts per million by volume (PPMV) for the inlet and a combined average concentration of 46.7 PPMV for the two outlet stacks. The average total hydrocarbon emission rates for the four runs was 2.73 lbs/hr at the inlet and 2.99 lbs/hr for the two outlet stacks. Based on these data, the average collection efficiency for total hydrocarbons was 0 percent. Because hydrocarbon measurements were not always performed at the exact same time as the particulate runs some of the particulate sampling points have no corresponding hydrocarbon data. Therefore, the number of valid hydrocarbon sampling points are indicated for each run in the summary data sheets presented in Appendix E.

Additional information concerning the total hydrocarbon testing is contained in Section V, "Sampling and Analytical Procedures."

Specially evacuated bulb flasks were used to withdraw gas samples from the tee connection used to exhaust the FID sample from the particulate sampling train located at the TP-3 outlet. Three of these flask samples were collected during testing on October 8, 1975. However, only one of the three samples obtained was subsequently analyzed for gaseous components by a gas chromatograph (GC) instrument at the Battelle Labs in Columbus, Ohio. The various components detected in the analysis are presented in Table 9 of this section. An additional discussion relating to this analysis is presented in Section V, "Sampling and Analytical Procedures."

VISIBLE EMISSIONS

The results of the EPA Method 9 visible emissions evaluations for the dual MESP outlet stacks and for the fugitive visible emissions at the No. 1 saturator-coater hoods controlled by these control devices are summarized in Tables 10 through 12. A sketch diagramming the plant layout and outlining the observation sites in relation to the two exhaust stacks is presented as Figure 2. All opacities are

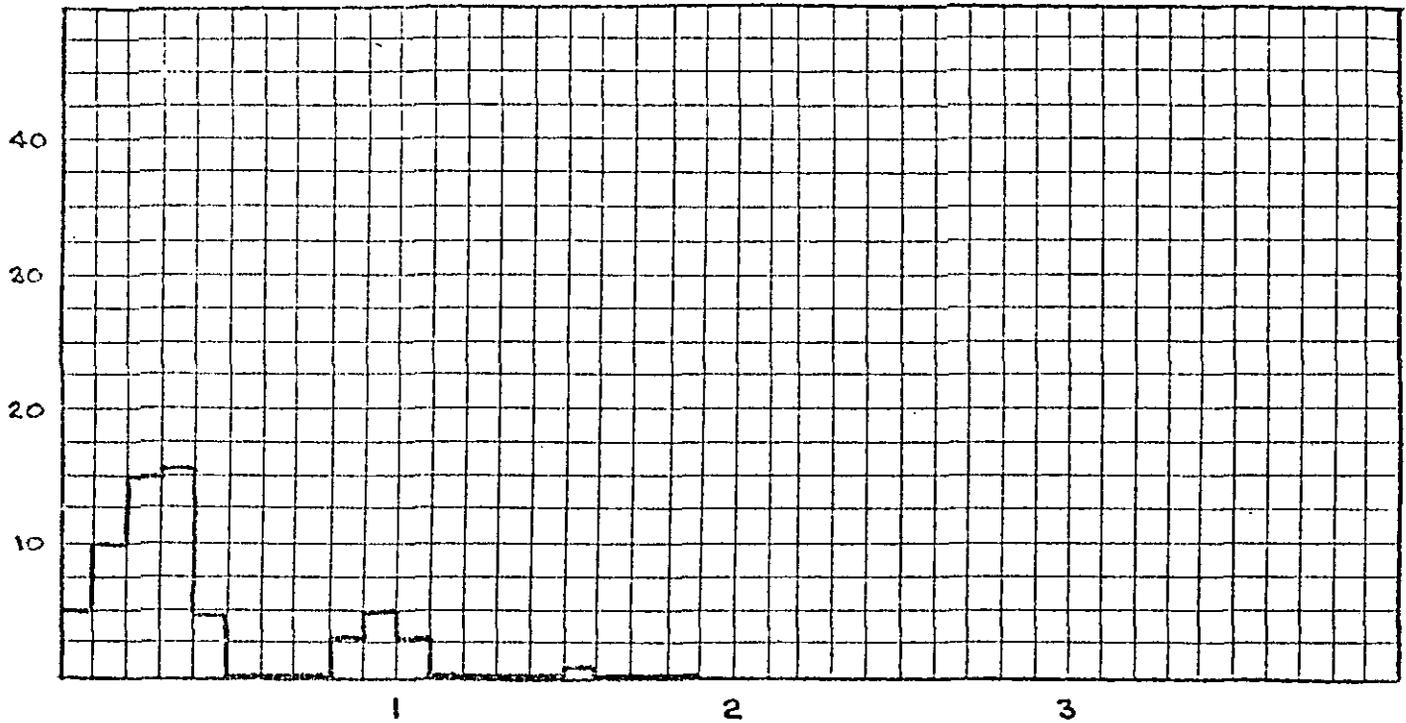
TABLE 9. ANALYSIS OF FLASK SAMPLE OF GASES DOWNSTREAM OF CONTROL DEVICE

Plant..... Celtox
 Location..... Fairfield, Ala.
 Sample No. ... S75-006-464

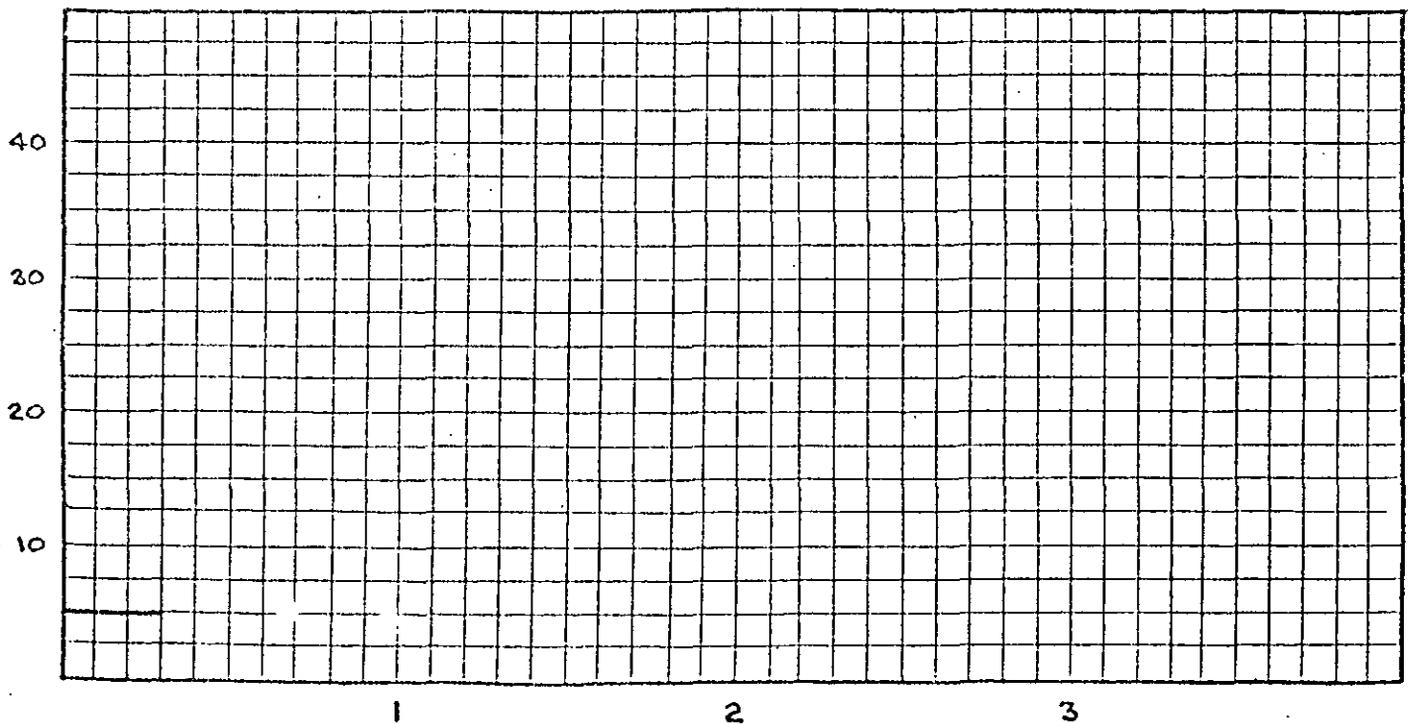
Components	Percent
O ₂	21.0
CO ₂	0.05
N ₂	77.9
A	0.99
CO	<0.0015
H ₂	0.06
	<u>PPMV*</u>
SO ₂	<0.02
H ₂ S	0.7
NO _x	<0.5
COS	0.06
CH ₃ OH	0.1
C ₂ H ₅ OH	<0.1
HCHO	<0.5
CH ₃ COCH ₃	1.0
CH ₄	4
C ₂ H ₆	1
C ₃ H ₈	1
C ₄ H ₁₀	0.2
C ₅ H ₁₂	0.2
C ₆ H ₁₄	0.2
C ₂ H ₄	0.2
C ₃ H ₆	<0.1
C ₄ H ₈	0.1
C ₅ H ₁₀	<0.1
C ₂ H ₂	<0.1
C ₆ H ₆	0.06
C ₆ H ₅ Cl ₃	0.02

*Parts Per Million by Volume

TABLE 10. VISIBLE EMISSIONS COMPOSITE SUMMARIES FOR OCTOBER 7, 1975

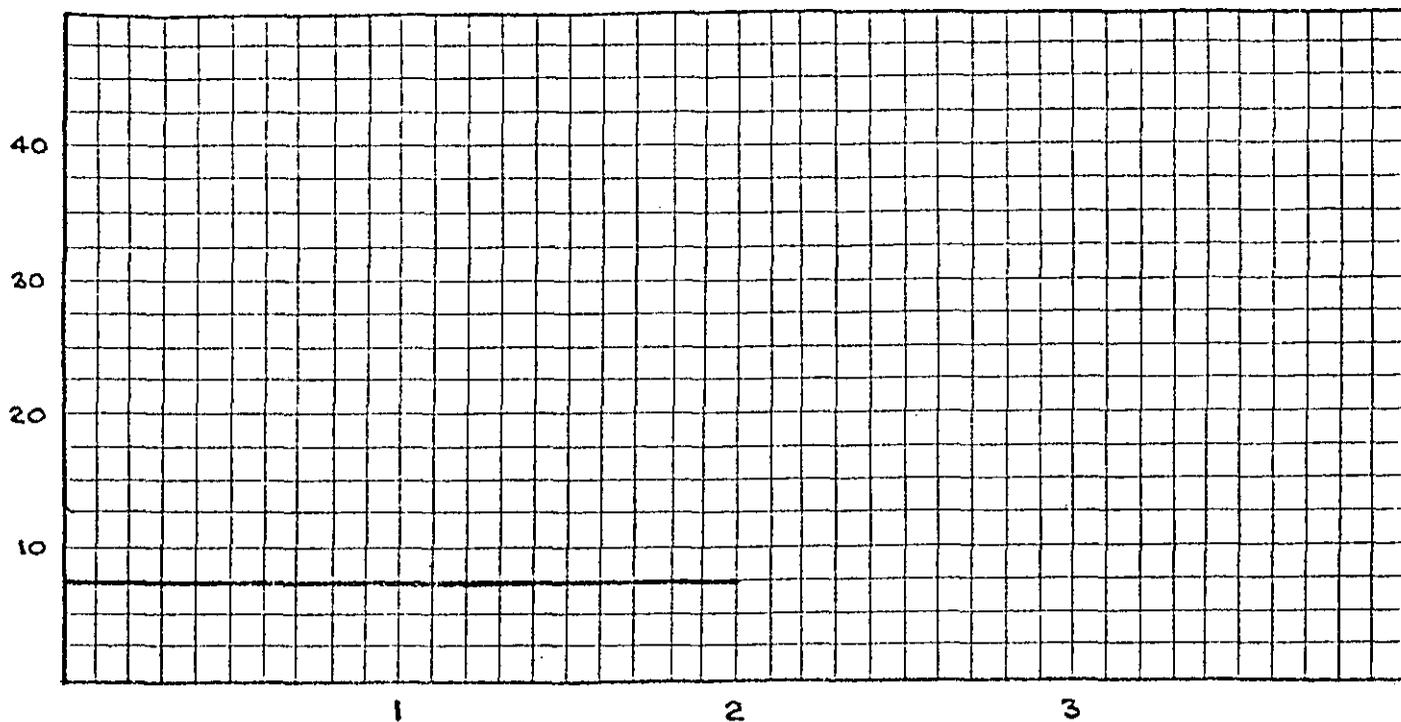


TIME - HOURS
OUTLET STACK TP-2, OBSERVERS 1 and 2



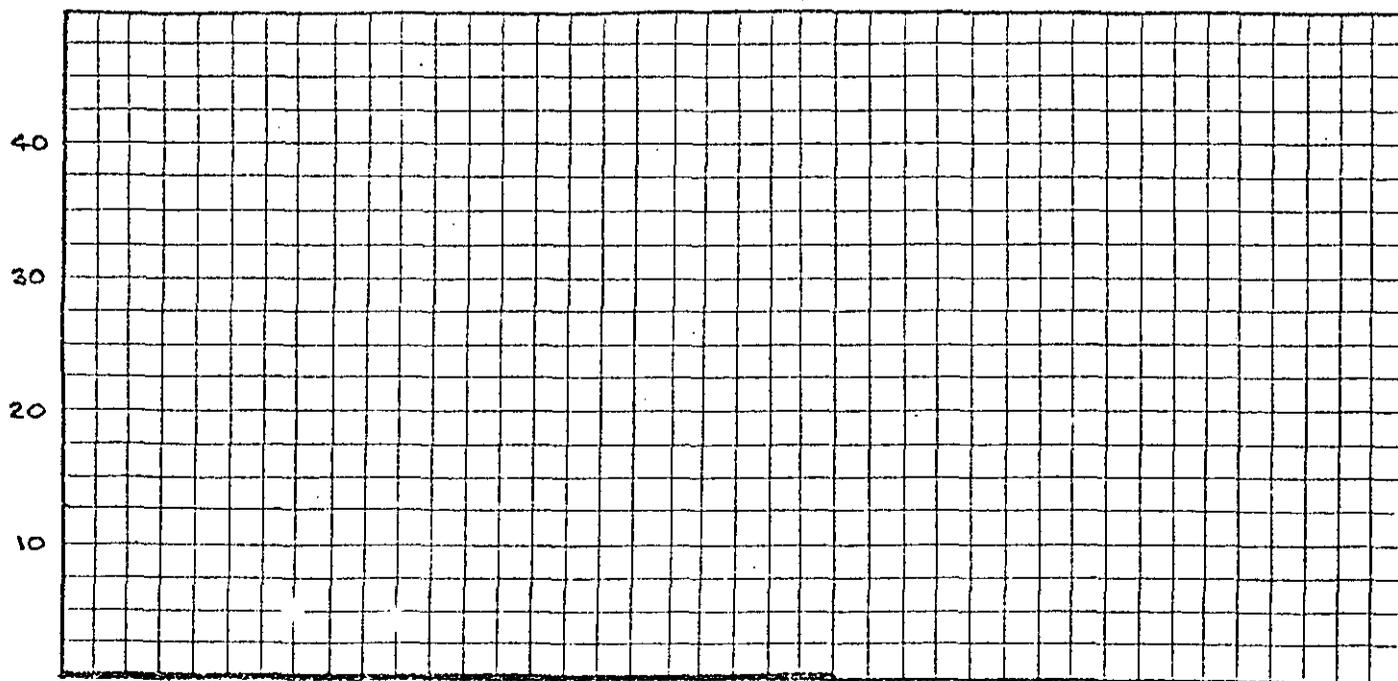
TIME - HOURS
OUTLET STACK TP-3, OBSERVERS 1 and 2

TABLE 11. VISIBLE EMISSIONS COMPOSITE SUMMARIES FOR OCTOBER 8, 1975



TIME - HOURS

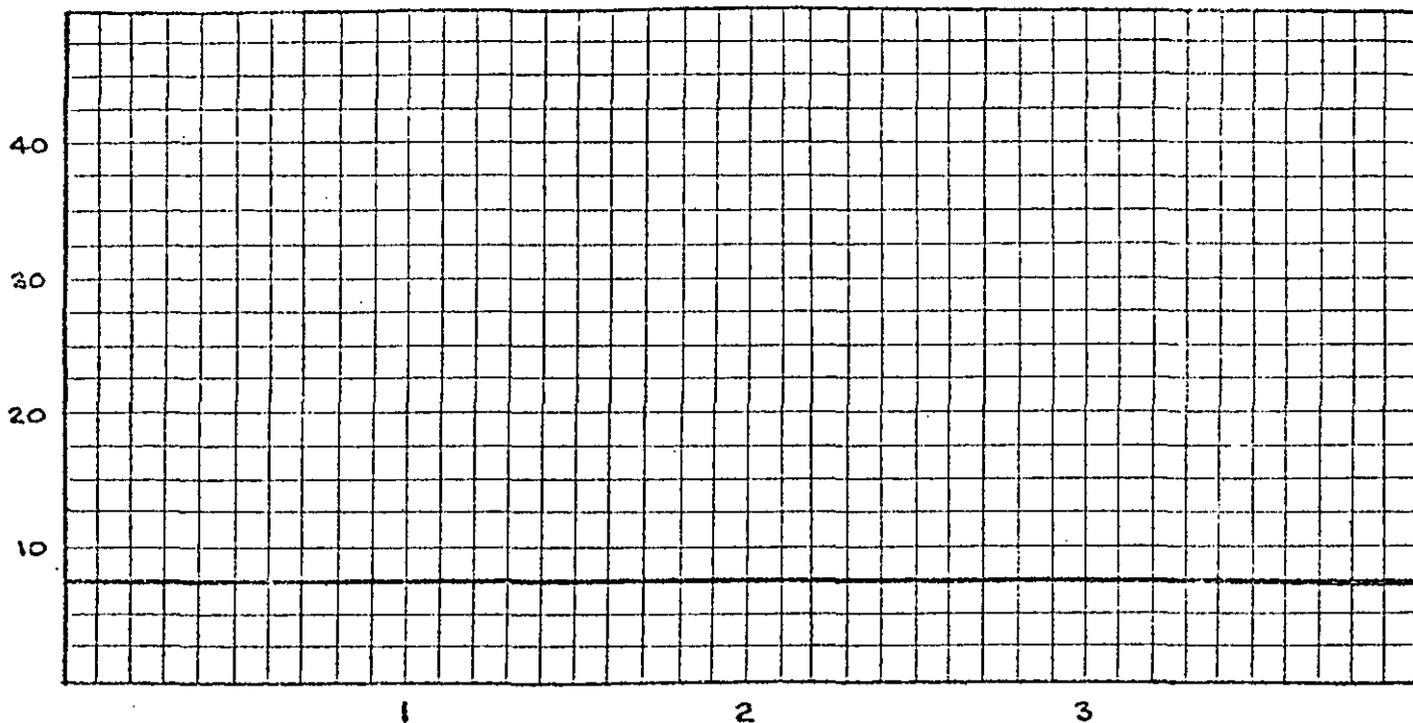
SATURATOR/COATER HOOD, OBSERVERS 1 and 2



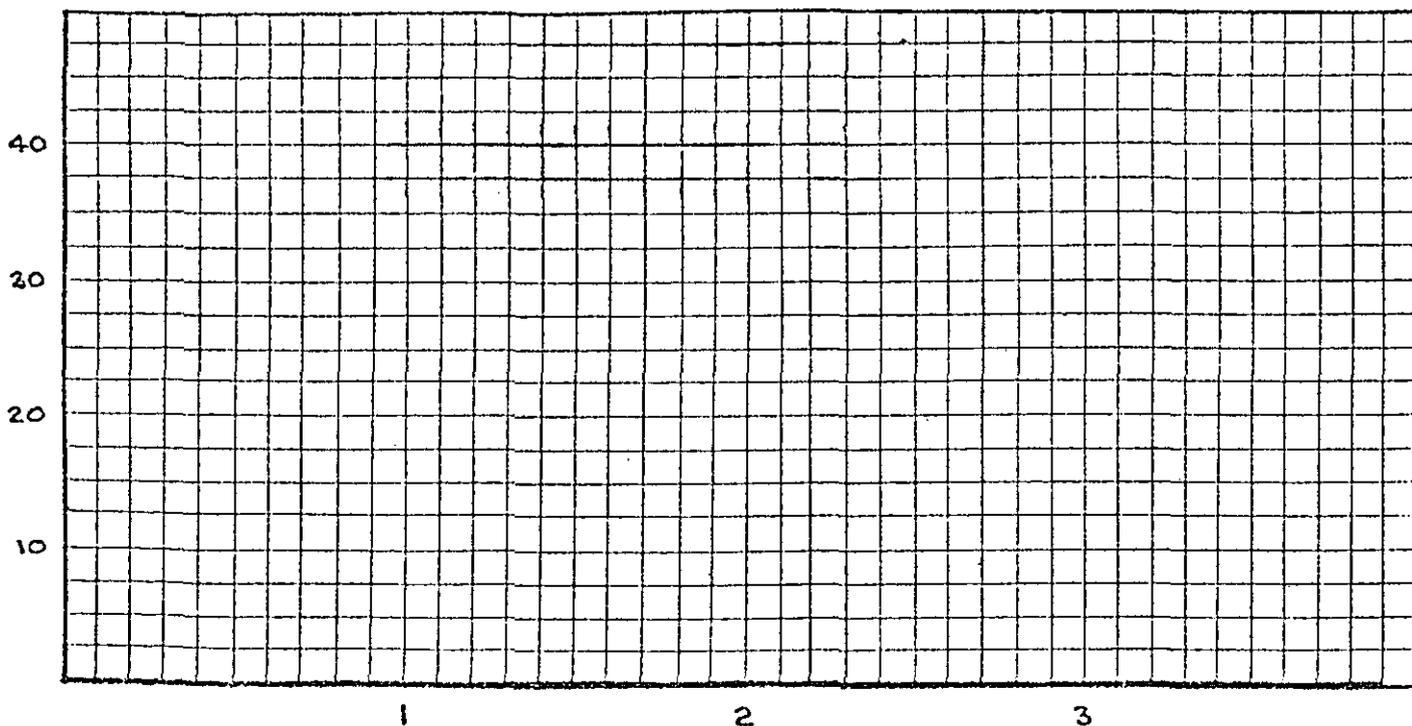
TIME - HOURS

OUTLET STACKS TP-2 AND TP-3, OBSERVERS 1, 2, and 3

TABLE 12. VISIBLE EMISSIONS COMPOSITE SUMMARIES FOR OCTOBER 9, 1975

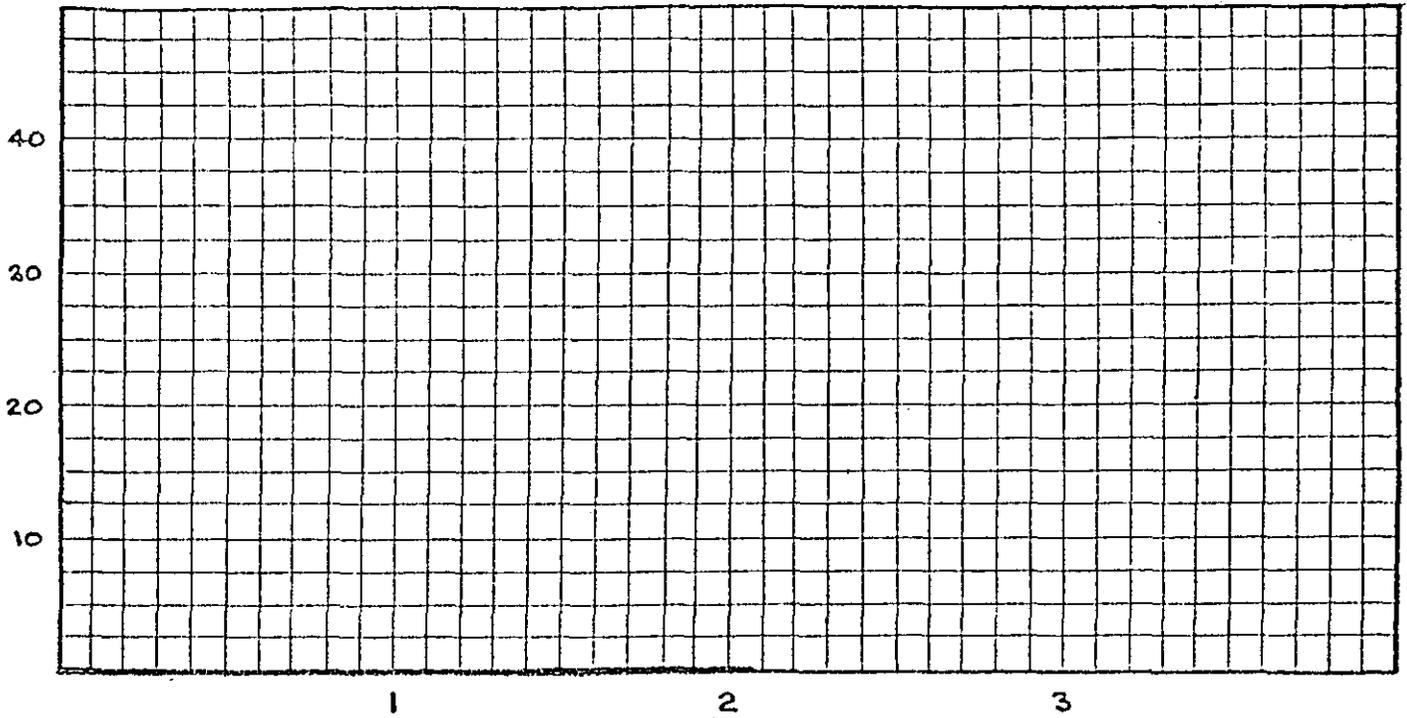


TIME - HOURS
SATURATOR/COATER HOOD, OBSERVERS 1 and 2



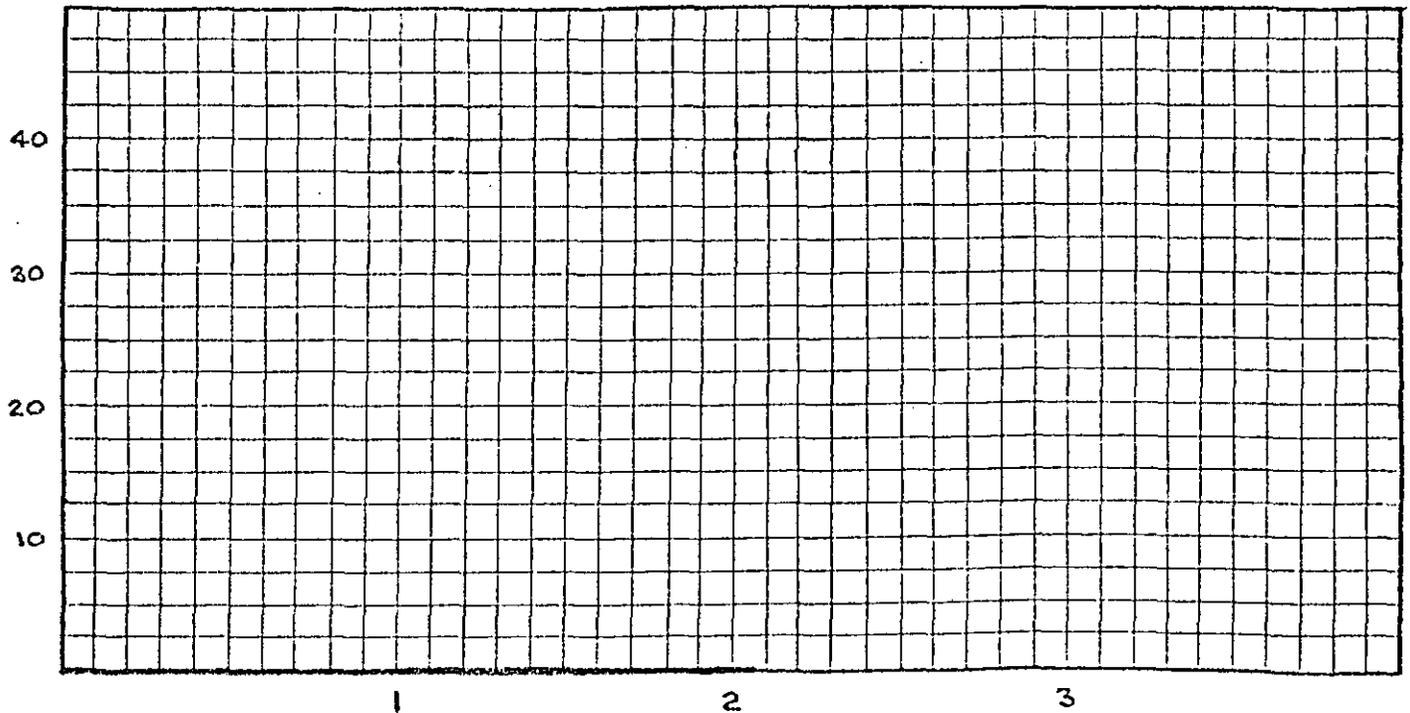
TIME - HOURS
OUTLET STACKS TP-2 AND TP-3, OBSERVERS 3 and 4

TABLE 12. VISIBLE EMISSIONS COMPOSITE SUMMARIES FOR OCTOBER 9, 1975 (CONTINUED)



TIME - HOURS

OUTLET STACK TP-3, OBSERVERS 1 and 3



TIME - HOURS

OUTLET STACK TP-2, OBSERVERS 2 and 4

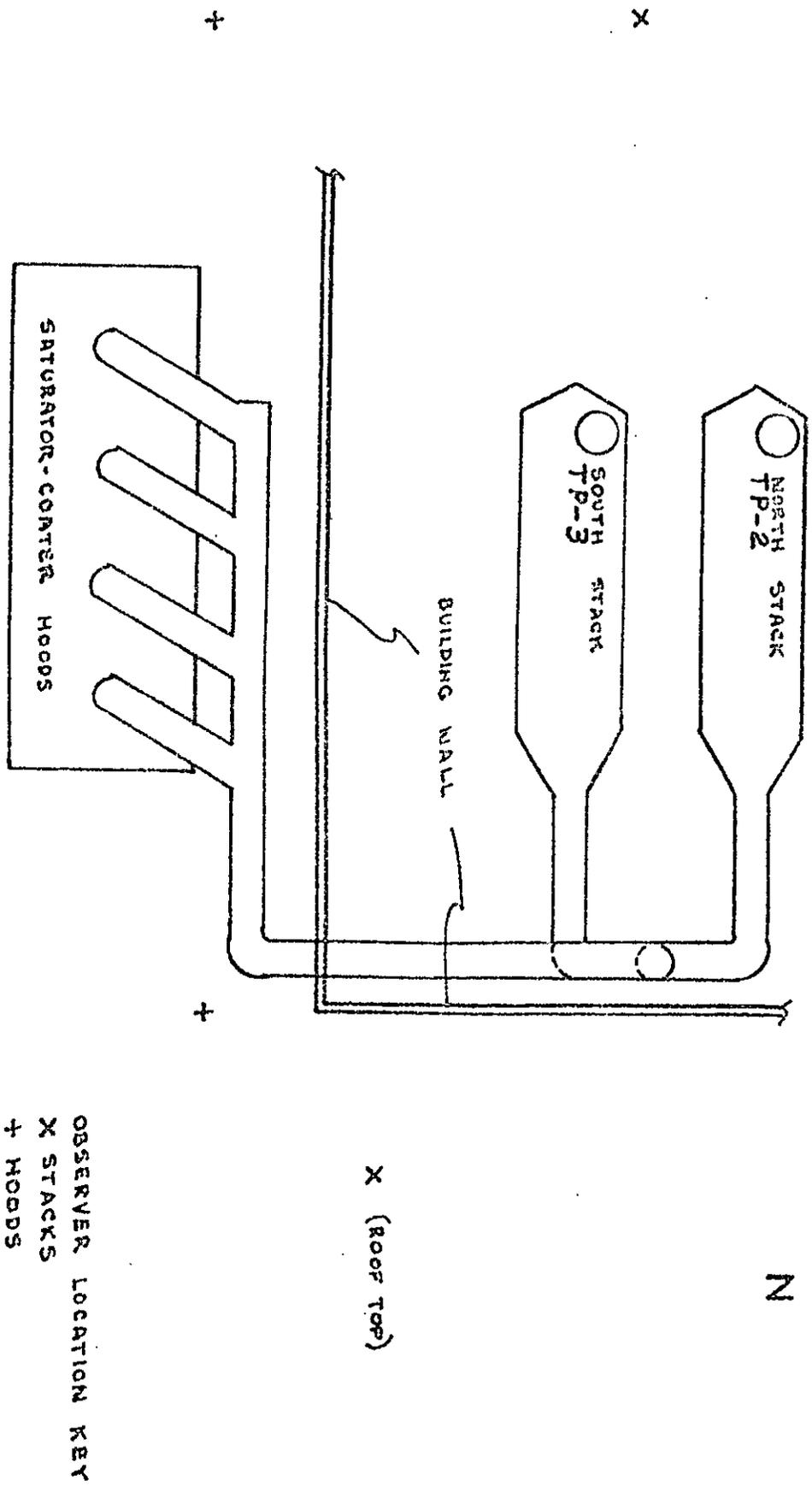


Figure 2. Plant Layout and Visible Emissions Observation Locations

presented as consecutive set numbers of six-minute averages over the length of the observation period. A composite of each observer's recordings for the six-minute average opacities has been plotted versus hours of time at each observation site.

The outlet stacks were observed for emissions opacity levels for approximately twelve hours intermittently by two to four observers. Also the No. 1 line hooded areas were observed for escaping fugitive emissions intermittently for approximately six hours by two observers. This is explained by the fact that visible emissions readings were recorded only when the process conditions appeared to be that of normal operation. Thus, when a process interruption occurred, the six-minute interval reading would be curtailed, and the next set of six-minute intervals would begin at the first reading when normal process operation was resumed. On October 7, 1975, the two MESP stack plumes were read for about two hours before rain stopped the opacity measurements. During October 8, 1975, the No. 1 process line hood was observed for two hours. The two outlet stacks were observed for two and one-half hours during the afternoon. On October 9, 1975, emission readings were conducted for four hours at the hooded areas and for about seven hours at the two stacks. Whenever two or more observers were available and the two stack emissions consistently read zero, both stacks were observed simultaneously in order to maximize the acquisition of visible emissions data at these locations. There were a total of approximately nine process interruptions during the visible emissions testing conducted over the three day period.

Except for a brief one hour period on October 7, 1975, where measurements ranged between five and fifteen percent opacity, the two outlet stacks emitted no visible emissions during the testing program. Of the five hood pull-down doors observed at the No. 1 saturator/coater line only one was observed to allow fugitive emissions to escape capture. These emissions were read at a constant ten percent

opacity by one observer and at five percent by a second during the total six hours of observations. These emissions were attributed to poor draft conditions as reported by the observers.

Additional pertinent comments for visible emissions are contained in Section V, "Sampling and Analytical Procedures." Summaries and copies of the field test data sheets are located in Appendix C of this report.

PARTICULATE POLYCYCLIC ORGANIC MATTER (PPOM)

Isokinetic PPOM or POM sampling was conducted simultaneously at locations TP-1 and TP-3 of the MESP control device on October 9, 1975. Sampling was performed using a Battelle POM sampling train which essentially is an EPA Method 5 sampling train utilizing a packed adsorbent column inserted between the glass fiber filter holder and the first water filled impinger (see description of adsorbent column in Section V). Upon completion of the two runs the recovered samples were forwarded to Battelle Labs for analysis by gas chromatography--mass spectrometry (GC-MS).

A summary for the POM testing is presented in Table 13. A total of ten different organic compound groups were detected and are reported individually in concentrations ($\text{gr/DSCF} \times 10^{-6}$) and mass emission rates ($\text{lb/hr} \times 10^{-3}$). The combined PPOM mass emissions rate of 12.9×10^{-3} lb/hr found at the inlet stream was reduced by 54.1 percent to measure $5.92 \text{ lb/hr} \times 10^{-3}$ for the total PPOM mass emission rate from the two outlet streams.

The concentration and emission rates for some of the POM compounds were greater at the outlet than at the inlet. This phenomena could possibly be the results of one or more of the following:

- (1) POM's produced from energy or reactions from the control device.

TABLE 13. PARTICULATE POLYCYCLIC ORGANIC MATTER CONCENTRATION AND EMISSION DATA SUMMARY

Sampling Location	Inlet (TP-1)	(Sampled Stack) Outlet (TP-3)	Outlet (TP-2) (d) Estimated Values	Combined Total Flow Conditions For Outlet Stacks
Date	10/9/75			
Volume of Gas Sampled--DSCF(a)	79.48	99.30	---	
Percent Moisture by Volume	2.1	2.2	2.2	2.2
Average Stack Temperature--°F	137.	138.	138.	138.
Stack Volumetric Flow Rate--DSCFM(b)	26,416.	12,009.	12,858.	24,867.
Stack Volumetric Flow Rate--ACFM(c)	30,625.	13,914	14,945.	28,850.
Percent Isokinetic	106.7	99.7	---	

Particulate-- Polycyclic Organic Matter	Concentration		Emission Rate
Sampling Location	Inlet	Outlet	ib/hr x 10 ⁻³
	ug	gr/DSCF x 10 ⁻⁶	
	Inlet	Outlet	Inlet
	Outlet	Inlet	Outlet (TP-2 + TP-3) (d)

Component	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Anthracene/Phenanthrene	51.2	44.8	9.92	6.95	2.25	1.48		
Methyl anthracenes	181.8	102.2	35.2	15.8	7.97	3.37		
Fluoranthene	0.950	6.25	0.18	0.97	0.04	0.21		
Pyrene	7.40	2.90	1.43	0.45	0.32	0.096		
Methyl Pyrene/Fluoranthene	4.00	20.9	0.78	3.24	0.18	0.69		
Benzo(c)phenanthrene	0.350	Non Detected	0.068	ND	0.015	ND		
Chrysene/Benz(a)anthracene	8.30	0.700	1.61	0.11	0.36	0.023		
Methyl chrysenes	21.8	0.350	4.22	0.054	0.96	0.012		
Benzo fluoranthenes	5.30	0.350	1.03	0.054	0.23	0.012		
Benz(a)pyrene ^e	13.5	0.900	2.62	0.14	0.59	0.030		
Benz(e)pyrene								
Totals	294.6	179.4	5.71x10 ⁻⁶	2.78x10 ⁻⁶	12.9x10 ⁻³	5.92x10 ⁻³		
Collection Efficiency, Percent	-----	-----	-----	-----	-----	54.1		

(a) Dry standard cubic feet at 70°F, 29.92 in. Hg.
 (b) Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.
 (c) Actual cubic feet per minute.
 (d) Average DSCFM at TP-2 outlet stack during 4 (four) particulate tests was 6.6 percent higher than flow from TP-3 stack. ACFM was 6.9 percent higher. These values were used to estimate total outlet flow.
 (e) Benzo(a) and Benzo(e)pyrene analysis combined and reported as one value.

- (2) Inadequate sampling methodology.
- (3) Inadequate cleaning procedures.
- (4) Inadequate analysis methodology.

Concerning Item 1, it is widely known that some POM compounds are produced in combustion processes. However, the technology of POM formations has not been developed to the point that it can be predicted whether or not POM compounds might increase or decrease in a MESP emissions control device such as used at the Celotex plant.

The sampling methodology as well as the cleanup procedures used for this work are considered to be the existing state-of-the-art. As more data are obtained and industrial program studies are fielded perhaps the validation, accuracy, and reliability of this data can be determined. The adsorbent column, the crucial component of the Battelle POM sampling train, has been validated for a limited number of sampling conditions and laboratory sample analyses.*

The GC-MS analysis technique is fairly well proven as discussed in Section V, "Sampling and Analytical Procedures." Battelle analysts claim an accuracy of within ± 12 percent of the true value for sample recovery and analysis procedures relating to laboratory samples.

Therefore, it is difficult to evaluate why the POM values for certain organic compounds increased in the MESP control device. Possible at this time the best accepted method of evaluating the data would be to reflect its order-of-magnitude and estimate its accuracy on that basis.

*Information submitted by Battelle Laboratory analysts who are knowledgeable in PPOM sampling and analyses.

Additional information as well as copies of the field data sheets pertaining to the POM sampling can be found in Appendix F of this report.

PARTICLE SIZE

Particle size distribution tests were conducted on the inlet, TP-1 and outlet, TP-2 ducts of the MESP No. 1 control device.

Three tests, TP 1-1 through TP 1-3, were conducted on the inlet location and three tests, TP 2-1 through TP 2-3, were at the outlet location (see Table 14).

TABLE 14
SUMMARY OF PARTICLE SIZE TESTS
CONDUCTED AT THE CELOTEX PLANT

<u>Run No.</u>	<u>Total Catch</u>	<u>Run Time</u>	<u>Ave. Sampler Temperature</u>	<u>Stack Temp.</u>
TP1-1	19.12 mg	30	115	100
TP1-2	12.21 mg	30	130	120
TP1-3	19.89	45	130	115
TP2-1	14.15	70	135	135
TP2-2	13.42	90	138	135
TP2-3	15.38	120	140	135

The routine test equipment consisted of an eighteen inch stainless steel probe with a 1.5 millimeter nozzle, a Brinks* Model B cascade impactor using preweighed aluminum foil cups to cover the substrate pans, and a backup glass wool fiber filter. A summary of the test data is presented in Tables 15 through 20. The suspected test results are presented in the following three different forms.

1. Cumulative Mass Percent Less Than or Equal to Effective Particle Diameter--
All stages excluding cyclone and probe wash: The data are presented in this manner

*Mention of a specific company or product does not constitute endorsement by EPA.

TABLE 15.
DRY CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-1

INPUT VARIABLE	UNITS	INPUT DATA			
-----	-----	-----	-----	-----	-----
SAMPLING TIME	MIN			30.0	
PRESSURE DROP	IN HG			1.00	
STATIC PRESSURE	IN H2O			-1.85	
PARTICLE DENSITY	G/CC			0.90	
BAROMETRIC PRESSURE	IN HG			29.57	
GAS MOL WT				29.0	
GAS TEMPERATURE	DEG F			115.0	
GAS VISCOSITY	POISE			0.00019	
GAS DENSITY	G/CC			0.00109	

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
-----	-----	---	-----	-----	-----
CYCLONE	0.000		0.00	0.00	100.00
1	0.940	5.02	0.58	14.37	100.00
2	0.000	2.99	0.00	0.00	85.63
3	0.970	2.05	0.60	14.83	85.63
4	1.990	1.10	1.23	30.43	70.80
5	2.340	0.71	1.45	35.78	40.37
FILTER	0.300		0.19	4.59	4.59

TOTAL CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-1

INPUT VARIABLE	UNITS	INPUT DATA			
-----	-----	-----	-----	-----	-----
SAMPLING TIME	MIN			30.0	
PRESSURE DROP	IN HG			1.00	
STATIC PRESSURE	IN H2O			-1.85	
PARTICLE DENSITY	G/CC			0.90	
BAROMETRIC PRESSURE	IN HG			29.57	
GAS MOL WT				29.0	
GAS TEMPERATURE	DEG F			115.0	
GAS VISCOSITY	POISE			0.00019	
GAS DENSITY	G/CC			0.00109	

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
-----	-----	---	-----	-----	-----
CYCLONE	10.800		6.68	56.49	100.00
1	1.660	5.02	1.03	6.68	43.51
2	0.020	2.99	0.01	0.10	34.83
3	0.990	2.05	0.61	5.18	34.73
4	3.010	1.10	1.86	15.74	29.55
5	2.340	0.71	1.45	12.24	13.81
FILTER	0.300		0.19	1.57	1.57

TABLE 16.
DRY CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-2

INPUT VARIABLE	UNITS	INPUT DATA			
-----	-----	-----	-----	-----	-----
SAMPLING TIME	MIN			30.0	
PRESSURE DROP	IN HG			1.00	
STATIC PRESSURE	IN H2O			-2.00	
PARTICLE DENSITY	G/CC			0.90	
BAROMETRIC PRESSURE	IN HG			29.57	
GAS MOL WT				29.0	
GAS TEMPERATURE	DEG F			130.0	
GAS VISCOSITY	POISE			0.00020	
GAS DENSITY	G/CC			0.00106	

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
-----	-----	---	-----	-----	-----
CYCLONE	0.000		0.00	0.00	100.00
1	0.000	5.12	0.00	0.00	100.00
2	0.000	3.04	0.00	0.00	100.00
3	0.000	2.09	0.00	0.00	100.00
4	0.390	1.11	0.24	13.98	100.00
5	1.200	0.71	0.73	43.01	86.02
FILTER	1.200		0.73	43.01	43.01

TOTAL CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-2

INPUT VARIABLE	UNITS	INPUT DATA			
-----	-----	-----	-----	-----	-----
SAMPLING TIME	MIN			30.0	
PRESSURE DROP	IN HG			1.00	
STATIC PRESSURE	IN H2O			-2.00	
PARTICLE DENSITY	G/CC			0.90	
BAROMETRIC PRESSURE	IN HG			29.57	
GAS MOL WT				29.0	
GAS TEMPERATURE	DEG F			130.0	
GAS VISCOSITY	POISE			0.00020	
GAS DENSITY	G/CC			0.00106	

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
-----	-----	---	-----	-----	-----
CYCLONE	2.700		5.32	71.25	100.00
1	0.000	5.12	0.00	0.00	28.75
2	0.000	3.04	0.00	0.00	28.75
3	0.720	2.09	0.44	5.90	28.75
4	0.390	1.11	0.24	3.19	22.85
5	1.200	0.71	0.73	9.83	19.66
FILTER	1.200		0.73	9.83	9.83

TABLE 17.
DRY CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-3

INPUT VARIABLE	UNITS	INPUT DATA			
-----	-----	-----			
SAMPLING TIME	MIN	45.0			
PRESSURE DROP	IN HG	1.00			
STATIC PRESSURE	IN H2O	-2.00			
PARTICLE DENSITY	G/CC	0.90			
BAROMETRIC PRESSURE	IN HG	29.58			
GAS MOL WT		29.0			
GAS TEMPERATURE	DEG F	130.0			
GAS VISCOSITY	POISE	0.00020			
GAS DENSITY	G/CC	0.00106			

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
-----	-----	---	-----	-----	-----
CYCLONE	0.000		0.00	0.00	100.00
1	0.015	5.12	0.01	0.44	100.00
2	0.011	3.04	0.00	0.32	99.56
3	0.008	2.09	0.00	0.23	99.24
4	0.704	1.11	0.29	20.58	99.01
5	1.683	0.71	0.69	49.20	78.43
FILTER	1.000		0.41	29.23	29.23

TOTAL CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-3

INPUT VARIABLE	UNITS	INPUT DATA			
-----	-----	-----			
SAMPLING TIME	MIN	45.0			
PRESSURE DROP	IN HG	1.00			
STATIC PRESSURE	IN H2O	-2.00			
PARTICLE DENSITY	G/CC	0.90			
BAROMETRIC PRESSURE	IN HG	29.58			
GAS MOL WT		29.0			
GAS TEMPERATURE	DEG F	130.0			
GAS VISCOSITY	POISE	0.00020			
GAS DENSITY	G/CC	0.00106			

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
-----	-----	---	-----	-----	-----
CYCLONE	11.730		4.78	58.97	100.00
1	1.140	5.12	0.46	5.73	41.03
2	0.700	3.04	0.29	3.52	35.29
3	1.100	2.09	0.45	5.53	31.77
4	1.720	1.11	0.70	8.65	26.24
5	2.500	0.71	1.02	12.57	17.60
FILTER	1.000		0.41	5.03	5.03

TABLE 18.
DRY CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP2-1

INPUT VARIABLE	UNITS	INPUT DATA			
-----	-----	-----	-----	-----	-----
SAMPLING TIME	MIN			70.0	
PRESSURE DROP	IN HG			1.00	
STATIC PRESSURE	IN H2O			-0.60	
PARTICLE DENSITY	G/CC			0.90	
BAROMETRIC PRESSURE	IN HG			29.58	
GAS MOL WT				29.0	
GAS TEMPERATURE	DEG F			135.0	
GAS VISCOSITY	POISE			0.00020	
GAS DENSITY	G/CC			0.00106	

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
-----	-----	---	-----	-----	-----
CYCLONE	0.000		0.00	0.00	100.00
1	0.005	5.11	0.00	0.99	100.00
2	0.000	3.04	0.00	0.00	99.01
3	0.000	2.09	0.00	0.00	99.01
4	0.001	1.11	0.00	0.20	99.01
5	0.000	0.71	0.00	0.00	98.81
FILTER	0.500		0.13	98.81	98.81

TOTAL CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP2-1

INPUT VARIABLE	UNITS	INPUT DATA			
-----	-----	-----	-----	-----	-----
SAMPLING TIME	MIN			70.0	
PRESSURE DROP	IN HG			1.00	
STATIC PRESSURE	IN H2O			-0.60	
PARTICLE DENSITY	G/CC			0.90	
BAROMETRIC PRESSURE	IN HG			29.58	
GAS MOL WT				29.0	
GAS TEMPERATURE	DEG F			135.0	
GAS VISCOSITY	POISE			0.00020	
GAS DENSITY	G/CC			0.00106	

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
-----	-----	---	-----	-----	-----
CYCLONE	5.730		2.54	68.76	100.00
1	0.760	5.11	0.18	4.95	31.24
2	0.790	3.04	0.21	5.58	26.29
3	0.020	2.09	0.01	0.14	20.71
4	1.390	1.11	0.36	9.82	20.57
5	1.020	0.71	0.27	7.21	10.74
FILTER	0.500		0.13	3.53	3.53

TABLE 19.
DRY CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP2-2

<u>INPUT VARIABLE</u>		<u>UNITS</u>	<u>INPUT DATA</u>		
SAMPLING TIME		MIN	90.0		
PRESSURE DROP		IN HG	1.00		
STATIC PRESSURE		IN H2O	-0.80		
PARTICLE DENSITY		G/CC	0.90		
BAROMETRIC PRESSURE		IN HG	29.58		
GAS MOL WT			29.0		
GAS TEMPERATURE		DEG F	138.0		
GAS VISCOSITY		POISE	0.00020		
GAS DENSITY		G/CC	0.00105		

<u>STATE</u>	<u>WT OF MATERIAL</u>	<u>DPC</u>	<u>MG/ACF</u>	<u>WT PCNT</u>	<u>CUM WT PCNT</u>
CYCLONE	0.000		0.00	0.00	100.00
1	0.000	5.11	0.00	0.00	100.00
2	0.000	3.03	0.00	0.00	100.00
3	0.000	2.08	0.00	0.00	100.00
4	0.000	1.11	0.00	0.00	100.00
5	0.000	0.71	0.00	0.00	100.00
FILTER	0.000		0.00	0.00	100.00

TOTAL CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP2-2

<u>INPUT VARIABLE</u>		<u>UNITS</u>	<u>INPUT DATA</u>		
SAMPLING TIME		MIN	90.0		
PRESSURE DROP		IN HG	1.00		
STATIC PRESSURE		IN H2O	-0.80		
PARTICLE DENSITY		G/CC	0.90		
BAROMETRIC PRESSURE		IN HG	29.58		
GAS MOL WT			29.0		
GAS TEMPERATURE		DEG F	138.0		
GAS VISCOSITY		POISE	0.00020		
GAS DENSITY		G/CC	0.00105		

<u>STATE</u>	<u>WT OF MATERIAL</u>	<u>DPC</u>	<u>MG/ACF</u>	<u>WT PCNT</u>	<u>CUM WT PCNT</u>
CYCLONE	9.930		2.01	73.99	100.00
1	1.390	5.11	0.28	10.36	26.01
2	0.590	3.03	0.08	2.91	15.65
3	0.420	2.08	0.09	3.13	12.74
4	1.290	1.11	0.26	9.61	9.61
5	0.000	0.71	0.00	0.00	-0.00
FILTER	0.000		0.00	0.00	-0.00

TABLE 20.
DRY CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP2-3

INPUT VARIABLE		UNITS	INPUT DATA		
-----		-----	-----		
SAMPLING TIME		MIN	120.0		
PRESSURE DROP		IN HG	1.00		
STATIC PRESSURE		IN H2O	-0.70		
PARTICLE DENSITY		G/CC	0.90		
BAROMETRIC PRESSURE		IN HG	29.70		
GAS MOL WT			29.0		
GAS TEMPERATURE		DEG F	140.0		
GAS VISCOSITY		POISE	0.00020		
GAS DENSITY		G/CC	0.00105		

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
-----	-----	-----	-----	-----	-----
CYCLONE	0.000		0.00	0.00	100.00
1	0.000	5.11	0.00	0.00	100.00
2	0.000	3.03	0.00	0.00	100.00
3	0.000	2.08	0.00	0.00	100.00
4	0.000	1.11	0.00	0.00	100.00
5	0.007	0.71	0.00	100.*	100.00
FILTER	0.000		0.00	0.00	0.00

TOTAL CATCH

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP2-3

INPUT VARIABLE		UNITS	INPUT DATA		
-----		-----	-----		
SAMPLING TIME		MIN	120.0		
PRESSURE DROP		IN HG	1.00		
STATIC PRESSURE		IN H2O	-0.70		
PARTICLE DENSITY		G/CC	0.90		
BAROMETRIC PRESSURE		IN HG	29.70		
GAS MOL WT			29.0		
GAS TEMPERATURE		DEG F	140.0		
GAS VISCOSITY		POISE	0.00020		
GAS DENSITY		G/CC	0.00105		

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
-----	-----	-----	-----	-----	-----
CYCLONE	10.800		1.64	70.22	100.00
1	0.930	5.11	0.14	6.05	29.78
2	0.570	3.03	0.09	3.71	23.73
3	1.070	2.08	0.16	6.96	20.03
4	1.270	1.11	0.19	8.26	13.07
5	0.740	0.71	0.11	4.81	4.81
FILTER	0.000		0.00	0.00	0.00

because the weight percentage collected in the cyclone often varies widely from test to test. This is especially true of data collected at a control device inlet. When working with small amounts of mass collected by the cascade impactor, a few extremely large particles collected in the cyclone may make a large difference in weight percentage. Using a cumulative basis of data presentation, this variance in weight percentage in the cyclone is propagated to the lower stages. Therefore, eliminating the cyclone from the data reduction eliminates any bias introduced during data reduction due to the fact that some extremely large and heavy particles may have collected in the cyclone. A better correlation of the weight percentages on the stages would tend to indicate that some of the variance indicated when all five stages and the cyclone are plotted is due to the bias introduced by abnormally large particles impacting in the cyclone. Therefore, the data is presented in this manner only to indicate whether or not a large amount of bias has been introduced due to abnormally large particles collecting in the cyclone.

2. Cumulative Mass Percent Less Than or Equal to Effective Particle Diameter--
All stages with cyclone: This is the most widely used method for presenting particle size data. They are based on the mass percentage of total particulate collected on each stage.

3. Mass Loading as a Function of Effective Particle Size: Although particle size distribution data are usually presented in a cumulative percent form, in some cases this presents a biased view. This is because any error introduced either during sampling or analytical procedures on any single collection stage is propagated to the other stages by the nature of the data reduction. This is due to the fact that each data point is based on the total mass and consequently introduces error to every other data point. Presenting the data in the form of mass loading as a function of particle size permits the results of each size range to be computed

independently of the other size ranges.

Runs TP1-1 and TP1-2 were conducted for 30 minutes each at the inlet of the control device on October 7, 1975, and Run TP1-3 for 45 minutes, on October 8, 1975. On the first two runs, the upper pans appeared to have very small amounts of collected material. The third stage had more material and the deposit in the center of the pan had started to spread to the sides in tiny droplets. The fourth stage had a large puddle of clear oil in the center of the pan and the last stage had the entire bottom covered with oil. A yellow-green tint was detected at the bottom edges of the pans indicating some buildup had occurred in the 90° corner. Run TP1-3 was extended to 45 minutes in an attempt to collect more material on the upper stages; but during the clean-up, no obvious gain was observed. It is now believed that the original sampling time was sufficient and that the mass loading of the fourth stage was a function of effective particle size and/or excessive sampling time.

Run TP2-1 on the outlet was conducted on October 8, 1975, for 70 minutes. None of the pans appeared to be loaded to any extent and it was estimated that there was only a marginally weighable amount in any pan. Run TP2-2, also conducted on October 8, 1975, was extended to 90 minutes. Upon observation of the pans during clean-up, there appeared to be less material collected on this run than the previous run regardless of the fact that the flow rate remained the same and the time was extended. The third run, TP2-3, was conducted October 9, 1975, and extended to 120 minutes in an attempt to obtain sufficient sample so that an accurate analysis could be done. No appreciable increase in sample size was noticed.

It was concluded at this point, that further routine sampling using the Brink sampler on the outlet would not produce any more useful data.

The routine operation of the Brinks particle size unit attempts to maintain an 0.05 cfm flow rate through the impactor. Thus, with other factors being equal, the

longer sampling times should deposit more material in the impactor. The data shown above, tends to indicate that the amount of material collected is independent of sampling time, particularly for the TP2 outlet runs, where the sampling time varies from 70 to 120 minutes. This would be possible if some material was deposited on each stage of the sampler, and then from that point on an equilibrium condition exists where the amount condensing and the amount volatilizing is approximately the same. The amount of material collected, therefore, is not a function of time but rather of the composition and volatility of the material. The initial deposit would be influenced by the initial droplet size, but as soon as some material is collected, it would coalesce and may then be evaporated by the effect of the impactor jet and thus leave the system as a vapor. Therefore, based upon the results of the particle size analysis, it is not possible to draw any definite conclusions about the reliability and accuracy of the data.

After cleanup the exposed pans were hand carried back to the laboratory and reweighed. It is possible that a loss of organic material occurred during the interval between the collection of the sample fractions and the reweighing of the desiccated sample pans in the laboratory. It is possible that some of the volatile materials were lost due to evaporation. Because of possible weight losses the particle size distribution data presented in Tables 14 through 20 may be questionable.

Additional information pertaining to the particle size testing is presented in Section V, "Sampling and Analytical Test Procedures," and in Appendix B of this report.

HIGH-VOLUME SAMPLING

The Rader^{*} automatic-isokinetic high-volume particulate sampling train used in these tests was only operated at the outlet test point TP-3. The main objectives

*Mention of a specific company or product does not constitute endorsement by EPA.

of these tests were: (1) to evaluate the performance of the electronic components of the high-volume sampler; (2) to provide comparison emissions data between the EPA Method 20 particulate train and the experimental high-volume sampler; and (3) to establish the precision and accuracy in relation to the manufacturer's specifications and current instructional manual.

A data summary of the particulate tests for the two sampling trains is presented in Table 21.

It is evident from these results that the volumetric flow values based on the output of the high-volume flow totalizer were consistently about 13 percent lower than the values obtained manually with EPA 20. The manufacturer has suggested that possible reasons for this discrepancy are: (1) that the calibration of the high-volume unit was not checked immediately prior to sampling; and (2) that the transducers may not have been properly warmed up before testing. It should be noted that while both of these factors can affect the performance of the sampler; neither is stressed in the current instructional manual.

Therefore, based upon the results of the Fairfield test, it is not possible to draw any definite conclusions about the reliability of the high-volume sampler's electronic components. Further field testing (with proper calibration and warm-up time prior to sampling, of course) is still needed to properly evaluate the train. Additional information concerning the high-volume train can be found in Appendix G.

RECOVERY OIL

Recovery oil (EPA Sample No. S75-006-458), was analyzed by ASTM procedures for proximate and ultimate analyses. Table 22 summarizes the data derived from the recovery oil analyses conducted by Mr. Darwin Nevey of the Nalin Laboratories for Battelle Labs. Copies of the laboratory reports for these analyses are included in Appendix K.

Table 21. Summary of Comparison Data Between High Volume
And Method 20 Sampling Test

Dates	Run No.		Percent Isokinetic		Particulate Concentration*		Volumetric Flow (DSCFM)	
	EPA 20	Hi-vol	EPA 20	Hi-vol	EPA 20	Hi-vol	EPA 20	Hi-vol
10/7/75	1	1	102.8	100.0	0.00812	0.00055	12,203	10,735
							<u>12 percent</u>	
10/8/75	2	2	101.5	100.0	0.00213	0.00059	12,292	10,530
							<u>14 percent</u>	

*Comparison between front half of EPA Method 20 and high-volume sampler results; units are grains/dscf.

TABLE 22. PROXIMATE AND ULTIMATE ANALYSIS FOR RECOVERY OIL COLLECTED FROM MESP

Sample Sample No.	Recovery Oil S75-006-458
Volatile Matter, percent	98.02
Fixed Carbon, percent	0.10
Ash, percent	0.20
Moisture, percent	1.68
Carbon, percent	75.99
Hydrogen, percent	5.28
Sulfur, percent	3.84
Nitrogen, percent	0.22
Oxygen, percent	12.79
Heating Value, Btu/lb, as received	18,729

ASTM Procedures Used For Above Analyses:

A. Proximate Analysis	D3172-73
Volatile Matter (VM)	D3175
Moisture (M)	D3173
Ash (A)	D3174
Fixed Carbon	By Difference (100-VM-M-A)
B. Ultimate Analysis	D3176-74
Carbon (C) & Hydrogen(H)	D3178
Sulfur (S)	D3177
Nitrogen (N)	D3179
Oxygen (O)	By Difference (100-C-H-S-N-M-A)

The quantity of Fixed Carbon was calculated as the difference between 100 percent and the sum of the percentage values for moisture, ash, and volatile matter.

Oxygen content was calculated by the difference between 100 percent and the sum of the ash, moisture, carbon, hydrogen, sulfur, and nitrogen percent values.

Due to the volatility of the process samples, some uncertainty existed concerning the effect of evaporative loss during sample analysis. As part of a research program designed to aid in determining this evaporative loss, a sample of recovery oil was exposed in a laboratory environment under atmospheric room conditions (approximately 75°F) for 87 hours. The weight loss by evaporation was 2.2 percent as indicated in Appendix K, Table K-2. Also included on the same page in Table K-4 are data presenting long-term weight losses for the glass fiber filter catches. The remaining process samples collected during the testing program have not been analyzed at this time, however, they have been placed in storage for future use, if the need occurs. Additional information relating to the process samples is contained in Appendix J, in the section labeled "Process Samples Identification Log."

III. PROCESS DESCRIPTION AND OPERATION

This asphalt roofing manufacturing plant is 23 years old and has two roofing manufacturing lines. One of the lines is used for making saturated felt and the other for producing shingles and rolls. The line producing shingles/rolls, designated as Line 1, is the one that was tested. Even though the plant is 23 years old, the main emission control systems (i.e., Smog-HogsTM) used at the plant are less than 1 year old.

PROCESS DESCRIPTION

The shingle line, designated as Line 1, consist of an asphalt saturator, a strike-in drum section, a hot looper, coating section, and a surface application section. Beyond this point the usual operations of cooling, cutting, and packaging are undertaken. The combined emissions sources monitored on Line 1 during the emissions tests include the saturator, strike-in drum section, hot looper, and the coater. All of these sources are ducted via a manifold to two modular electrostatic precipitators (Smog-HogsTM) which are discussed in the next section.

The first step in the shingle manufacturing process is saturation of felt with asphalt. The felt used on the shingle line is organic felt and is 3 ft wide. The saturation of felt can be accomplished either by spraying the felt with hot asphalt followed by dipping or by dipping alone. The Celotex plant uses dipping alone and has 13 dips and one dancer* in its saturator. The saturator itself is 14 ft deep and contains 10 ft of hot asphalt at about 450°F. The lower rollers are 6 to 8 ft above the tank bottom. After saturation, the felt goes through the strike-in drum section where excess asphalt is removed. The felt then passes through the hot looper before it enters the coating section. In the coating section, coating asphalt is applied onto the saturated felt. The coating asphalt differs from saturating asphalt in that it has a softening point range of about 225 to 235°F compared to 120 to 145°F for saturant. Another major difference is that coating asphalt contains about 50% filler (limestone) by weight. The purpose of the coating asphalt is to strengthen the final product (i.e., shingles) to withstand the elements. After the application of coating asphalt, granules and backing agent (sand) are applied onto the felt. Granules are imbedded on the top surface and sand on the other. The product is then cooled, cut, and packaged.

EMISSION CONTROL SYSTEM

The saturator, striking-in drum, and hot looper are enclosed in a box-type enclosure with removal doors from 2 to 7 ft above ground level. The saturator doors were kept closed during the emissions tests but the doors

* A dancer is a shallow dip which serves as a floating looper.

TM--Trade Mark--Mention of trade names, products, or specific companies does not constitute endorsement by EPA.

in front of the strike-in section and the hot looper were kept open. Apparently, this is the usual practice of the plant. However, there was adequate suction preventing the escape of fumes from the enclosure into the room.

Emissions from the three sources cited above and the coater, which is ducted to the saturator hood, are all controlled by two Smog-Hogs™. The ducting arrangement and the Smog-Hogs™ including the sampling points are shown in Figure 3.

The operation of a Smog-Hog™ is similar to that of a conventional electrostatic precipitator. Figure 4 shows the operation of a Smog-Hog™. The main difference between a conventional unit and a Smog-Hog™ is the fact that the latter is a modular unit. In a Smog-Hog™ the ionizer and collector are in modular form and can be arranged in tandem.

The two Smog-Hogs™ used for controlling emission from the shingle line saturator each have a capacity of 16,000 cfm and are 2-pass systems. Each unit has 16 ionizers and 16 collector modules, eight on each side. The total ionization and collection voltages for each unit are 11 and 6 KV, respectively. Model numbers, serial numbers, and other details for the two units are shown below.

No. 1 Smog-Hog™ (i.e., unit on north side of plant)

Manufacturer: United Air Systems, Cincinnati, Ohio
Model and Serial No.: MS-16-AT, 9701
Input power supply: 115/1/60
ΔP Across prefilter: 0.88 to 0.9 in. H₂O
Blower: Serial No.: 613-F74-1
Size: 330-BBM Vent Pak, 15 HP
Manufacturer: Champion Blower and Forge, Inc.
Roselle, Illinois

No. 2 Smog-Hog™ (i.e., unit on south side of plant)

Manufacturer: United Air Systems, Cincinnati, Ohio
Model and Serial No.: MS-16-AT, 9702
Input power supply: 115/1/60
ΔP Across prefilter: 0.88 to 0.9 in. H₂O
Blower: Serial No.: 613-F74-2
Size: 330-BBM Vent Pak, 15 HP
Manufacturer: Champion Blower and Forge, Inc.
Roselle, Illinois

TM--Trade Mark--Mention of trade names, products, or specific companies does not constitute endorsement by EPA.

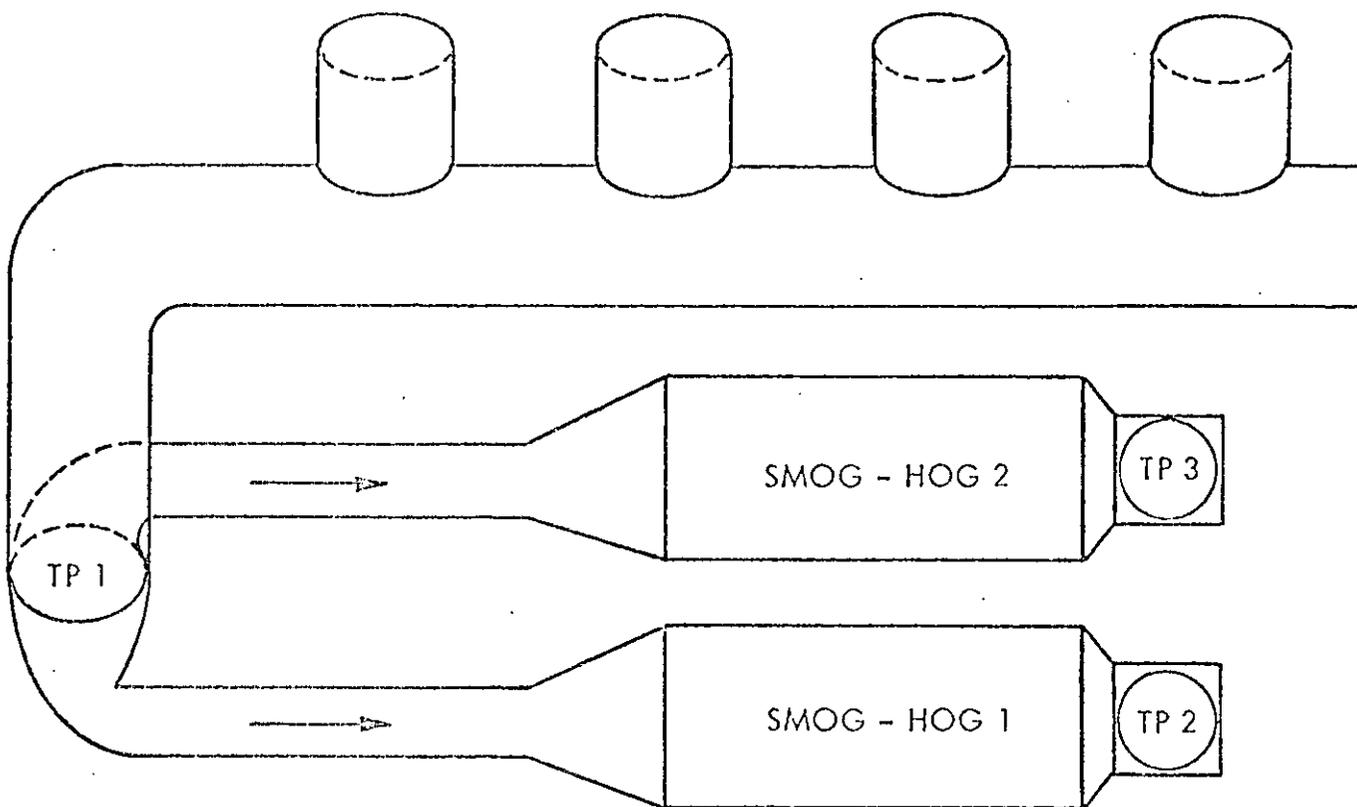


Figure 3. Schematic of ducting arrangement, Smog-HogsTM and test points (TP) at Celotex's Fairfield Plant

MODULAR ELECTROSTATIC PRECIPITATOR

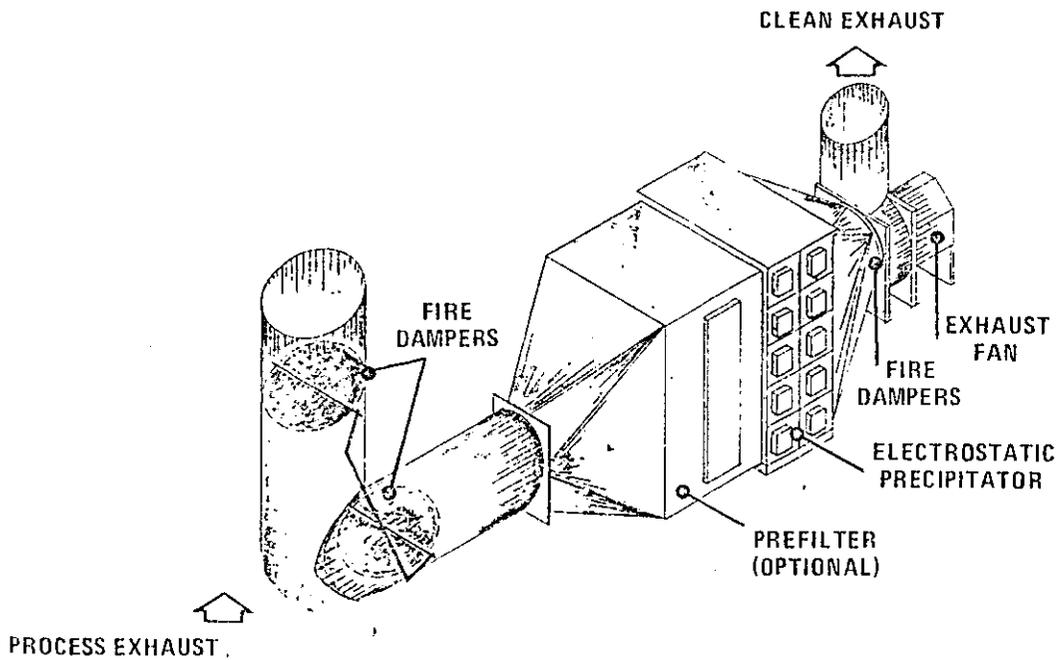
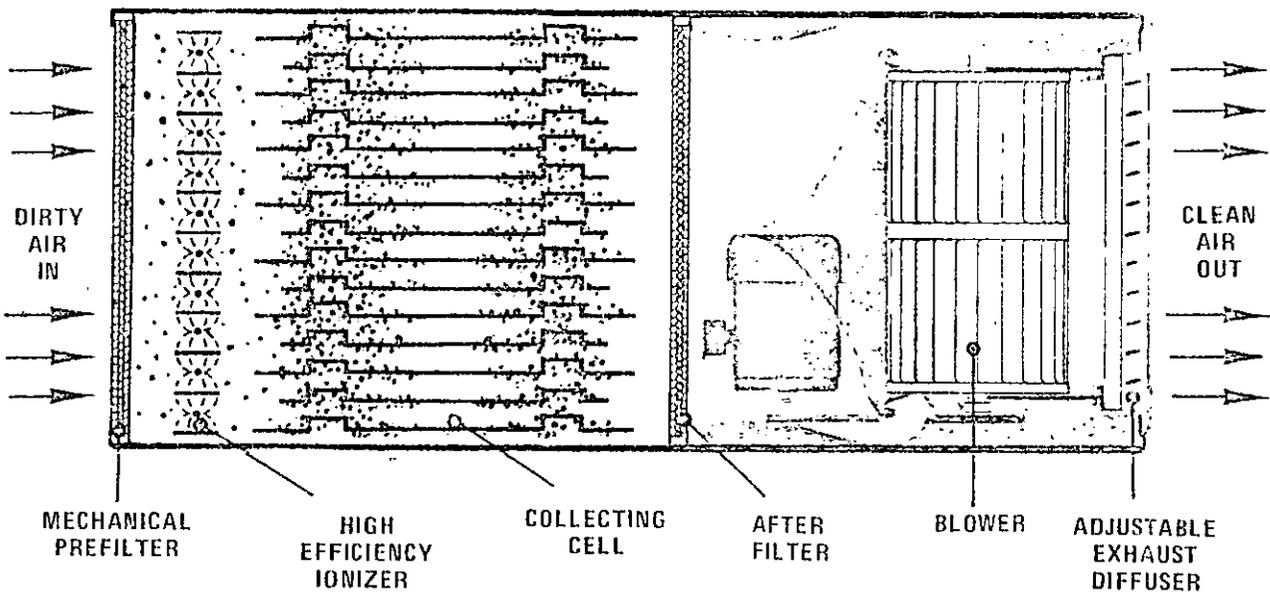


Figure 4. Diagrams of electrostatic precipitator and of installation of device in process duct-work.

PROCESS OPERATION

Emission tests were conducted to determine particulate and hydrocarbon levels including POM, gas composition, and the efficiency of the two Smog-HogTM units. In addition, particle sizing measurements were conducted at the inlet and outlet of the Smog-HogsTM; visible emission readings were also taken at the Smog-HogTM stacks and at the saturator enclosure. All of the above tests were undertaken during normal plant operation.

Plant operation was considered to be normal when the manufacturing line was operating and the line speed was ≥ 300 ft/min or at least 80% of the maximum operating speed for the day tests were conducted. At speeds lower than this value, sampling was usually stopped unless it was only for an extremely short time. For durations of 2 to 3 min it was presumed inadvisable to stop and resume sampling since errors introduced by doing so would probably be more serious than those introduced by continuing the sampling at reduced line speed. Sampling was also conducted only when shingles were being manufactured.

The production rate of the manufacturing line was determined from the number of shingle bundles produced during the test, the average weight of the bundle and the total test time. An automatic counter recorded the number of bundles passing a certain point on the conveyor and the average weight of the bundle was obtained from three random half-hourly weights measured during the test. The length of felt used during the test was also monitored with the help of a counter. From the weight and length of five randomly selected felt rolls used during the test the weight per unit length was computed. This value which ranged from 0.32 to 0.35 lb/ft was then used in conjunction with the total length of felt used during the test to determine the tonnage of felt utilized. Other parameters such as line speed, saturant temperature, filled coating temperature, pressure drop across the prefilter of each Smog-HogTM, etc., were obtained from charts and gauges that were already installed. The line speed was also verified at random with the help of a tachometer. All of the process conditions including production rates that were recorded during the emissions tests are presented in Appendix I.

Characteristics of raw materials, primarily felt and asphalt used in producing shingles during the tests, were obtained from plant personnel and are also included in Appendix I in Tables I-1 through I-9. Felt characteristics include felt width, moisture content, kerosene value, etc., and asphalt characteristics include softening point, penetration, flash point, etc. The percent saturation of felt (with asphalt) and a breakdown of the product components by weight are also shown in Table I-9. According to plant personnel, variations observed in the characteristics are normal and within their specifications.

The line speeds, shingle production rates, felt usage rates, asphalt usage rates, etc., are summarized from data contained in Appendix I, Sections I, I-1 and I-2. The summarized data are presented in Table 23. Similarly, Table 24 is a summary of raw material and product characteristics. Data on asphalt usage (i.e., Appendix I) were collected by the EPA project officer. These are presented separately in Section I-2 since they were obtained for periods ranging from 6 to 14 hours and could not be tied in with production data obtained during actual sampling times. However, usage rates reported in Table 23 were estimated from these data and therefore should be used with caution.

Table 23. SUMMARY OF LINE SPEEDS, SHINGLE PRODUCTION AND FELT AND ASPHALT USAGE RATES

Date and sampling time	Pollutants sampled	Actual sampling time (min)	Number of interruptions to sampling ^{c/}	Process parameters observed during sampling period ^{b/}				Felt usage rate (tons/hr)		
				Line speed (ft/min)		Shingle production rate (tons/hr)	Estimated asphalt usage rate ^{d/} (tons/hr)			
				Min.	Max.				Weighted average ^{c/}	Unfilled saturant coating
October 7, 1975 2:30 p.m.-7:46 p.m.	Particulates and gaseous HC	157	6	310	360	350.7	29.4	3.7	3.4	3.5
October 8, 1975 10:20 a.m.-1:25 p.m.	Particulates and gaseous HC	145	3	270	360	345	31.4	4.4	3.8	3.6
October 8, 1975 4:45 p.m.-8:13 p.m.	Particulates and gaseous HC	162	2	260	370	364.4	32.7	4.4	3.8	3.7
October 9, 1975 12 noon-2:54 p.m.	PM ₁₀ 's	163	2	300	370	335.5	29.0	4.1	4.2	3.2
October 10, 1975 8:45 a.m.-11:38 a.m.	Particulates and gaseous HC	152	3	300	360	331.1	29.4	5.5	Not available	3.4

a/ Either due to felt breaks or speed being too low for sampling.

b/ Excluding period when sampling was interrupted.

c/ Based on time intervals and line speed readings shown in Appendix A.

d/ Based on period when tank levels were obtained. This could not be restricted to actual sampling time.

Table 24. RAW MATERIAL AND PRODUCT CHARACTERISTICS/ OBSERVED DURING SAMPLING PERIODS

Date and sampling time	Felt ^b / (% moisture)		Asphalt										
	Min.	Max.	Saturant				Unfilled coating				Min.	Max.	Overall average
			Softening point (°F)	Penetration	Flash point (°F)	Softening point (°F)	Penetration	Flash point (°F)	Softening point (°F)	Penetration			
October 7, 1975 2:30 p.m.-7:46 p.m.	1.5	4.5	3.2	140.6	NA	437+	212-214	14	437+	76	85	80	
October 8, 1975 10:20 a.m.-1:25 p.m.	2	5.5	3.4	140.6	NA	437+	212-214	14	437+	75	84	79.1	
October 8, 1975 4:45 p.m.-8:13 p.m.	2	7.0	3.9	140.6	NA	437+	212-214	14	437+	78	87	81	
October 9, 1975 12 noon-2:54 p.m.	4.9	7.0	6.2	140.6	NA	437+	212-214	14	437+	76	80	78.6	
October 10, 1975 8:45 a.m.-11:38 a.m.	6.0	9.9	7.7	140.6	NA	437+	212-214	14	437+	76	80	78.1	

a/ Information provided by plant personnel.
 b/ For other characteristics of felt see Appendix A.
 NA = Not available.

IV. LOCATION OF SAMPLING POINTS

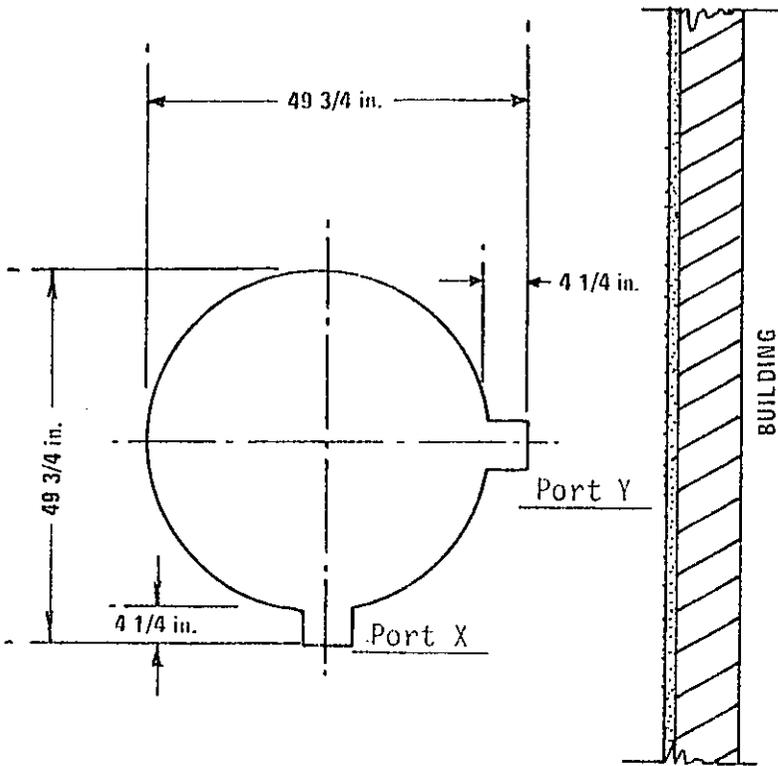
MESP INLET (TP-1)

The MESP inlet sampling site was located in a 45-1/2 inch I.D. vertical section of a 16 gauge steel duct. The steel sampling platform was placed above a roof that covered the two MESP emission control systems. A schematic of the sampling site including the traverse point sampling locations and in-duct dimensions is presented in Figure 5. Two 3-inch I.D. pipe-nipple sampling ports were positioned 46 inches (1 stack diameter) upstream of a forked "Y" that branched off to the two separate MESP units. These two ports were only 188 inches (4.1 stack diameters) downstream of a short-radius, 90° bend. The inlet sampling location did not meet the "eight diameters" criteria as outlined in EPA Method 1; consequently, 18 sampling points were chosen for each axis traverse for a total of 36 sampling points (i.e., EPA Method 1). These points were located as specified in Figure 5. This figure shows the cross sectional view of the duct at the sampling location and lists the exact distance each traverse point is located from outside the nipple. The location of traverse points 1 and 18 at ports X and Y were calculated to be less than 1 inch from the duct wall. Sampling within 1 inch of the duct wall is considered to produce a biased " ΔP " or velocity head, therefore, each of these four points were sampled at a distance of 1 inch from the inside wall. The same point numbering sequence and point locations were used for all particulate testing conducted at the inlet location.

MESP OUTLETS

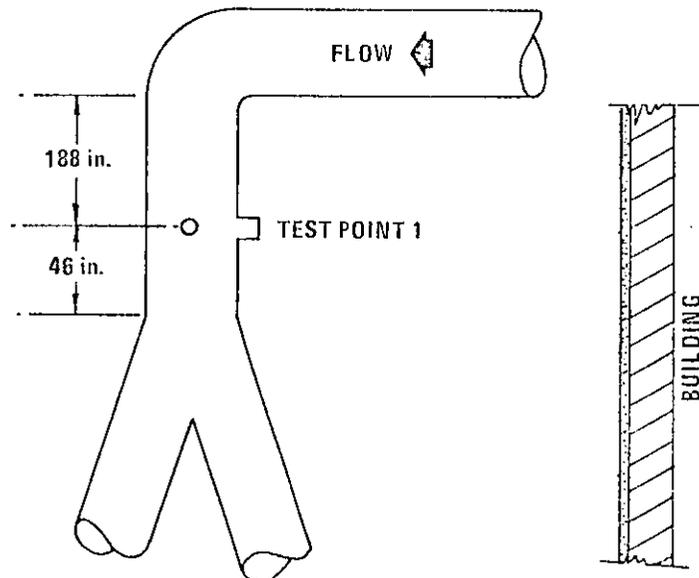
The cleaned gases exiting each MESP unit were ducted to an induced draft fan which was adjacent to the control device. The gases discharged from the fan, traveled vertically through a 16 gauge steel stack, and were exhausted to the atmosphere. Both outlet stacks were somewhat elliptical in shape, therefore, the

TRAVERSE POINT LOCATION
CELOTEX CORPORATION
INLET TEST POINT 1



TRAVERSE POINT NUMBER	SAMPLING DISTANCE, inches
1	5 1/4
2	6 1/4
3	7 5/8
4	9 1/4
5	10 7/8
6	12 7/8
7	15
8	17 3/4
9	21 5/8
10	32 3/8
11	36 1/4
12	37
13	41 1/4
14	43 1/8
15	44 3/4
16	46 3/8
17	47 3/4
18	48 3/4

SCHEMATIC OF SAMPLING LOCATION



SCHEMATIC OF ELECTROSTATIC
PRECIPITATOR INLET

Figure 5. Traverse point sampling location and in-duct distances from Celotex Corporation, Fairfield, Al., test (Test point 1).

dimensions referred to below represent an average measurement for the two traversed axes, X and Y (see Figures 6 and 7). The two stacks were fitted with raincaps which were removed during the testing program; primarily for the visible emissions testing.

TP-2

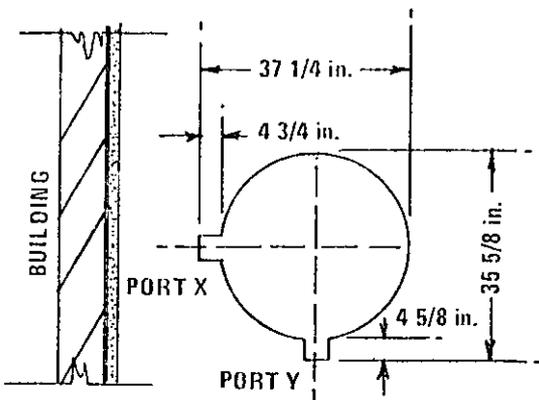
Testing was conducted on the 31-3/4 inch I.D. No. 1 MESP outlet stack. Two 3-inch I.D. sampling ports were located 189 inches (6 stack diameters) downstream from the fan outlet, and 64 inches (2 stack diameters) upstream of the vertex. The port locations did not meet the "eight diameters" criteria as outlined in EPA Method 1. Consequently, 14 sampling points were chosen for each traverse axis according to method instructions which indicated a total of 28 sampling points for the 6 downstream diameters. Figure 6 shows the sampling port locations and traverse dimensions for the TP-2 outlet stack. The location of traverse points 1 and 14 at ports X and Y were moved to the 1 inch position for the same reason as reported in the TP-1 sampling location section.

TP-3

The No. 2 MESP 32.5 inch I.D. outlet duct was fitted with two 3-inch I.D. sampling ports in a manner similar to the TP-2 site. The downstream distance to the ports was 190 inches and the upstream distance to the vertex was 64 inches. Again these dimensions did not meet the Method 1 criteria, therefore, based on the 5.8 downstream diameters a total of 28 sampling points was selected to satisfy the minimum number of traverse points. Again the two outer traverse points at each port were moved to the 1-inch position as reported in the TP-2.

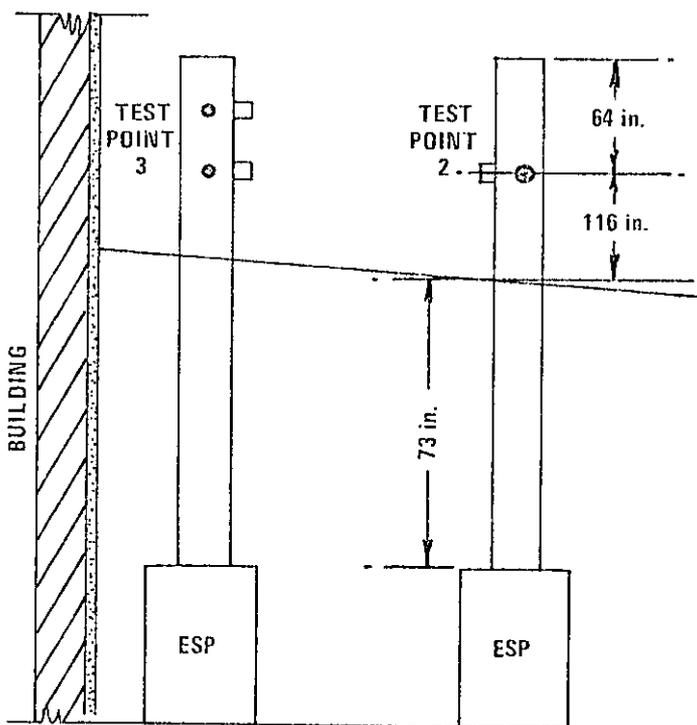
Two high-volume sampling port holes were cut into the steel duct and were located 40 inches downstream of the above referenced test ports. Figure 7 shows the sampling port locations and traverse dimensions for the TP-3 outlet stack.

TRAVERSE POINT LOCATIONS
CELOTEX CORPORATION
OUTLET TEST POINT 2



SCHEMATIC OF SAMPLING LOCATION

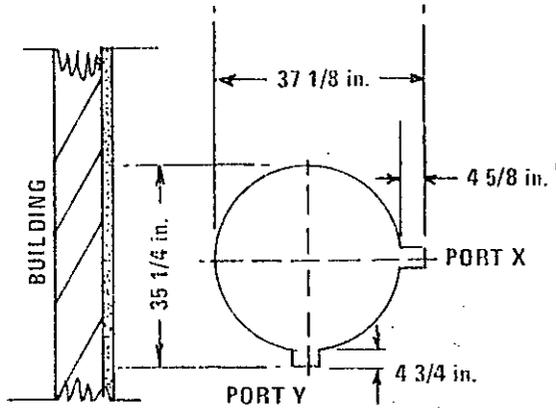
TRAVERSE POINT NUMBER	SAMPLING DISTANCE, inches
PORT X	
X 1	5 3/4
X 2	6 5/8
X 3	8
X 4	9 1/2
X 5	11 1/4
X 6	13 1/2
X 7	16 5/8
X 8	25 3/8
X 9	28 1/2
X 10	30 3/4
X 11	32 1/2
X 12	34
X 13	35 3/8
X 14	36 1/4
PORT Y	
Y 1	5 3/8
Y 2	6 3/8
Y 3	7 5/8
Y 4	9 1/8
Y 5	10 7/8
Y 6	13
Y 7	16
Y 8	24 1/4
Y 9	27 1/4
Y 10	29 3/8
Y 11	31
Y 12	32 1/2
Y 13	33 7/8
Y 14	34 5/8



SCHEMATIC OF ELECTROSTATIC PRECIPITATOR
OUTLETS

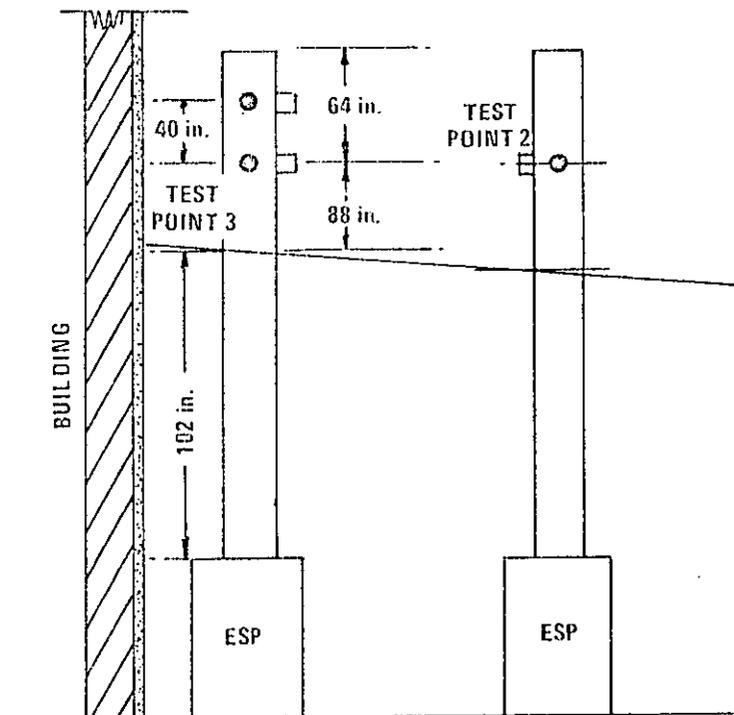
Figure 6. Traverse point sampling locations and in-stack distances from Celotex Corporation, Fairfield, Al., test (Test point 2).

TRAVERSE POINT LOCATIONS
 CELOTEX CORPORATION
 OUTLET TEST POINT 3



SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	SAMPLING DISTANCE, inches
PORT X	
X 1	5 5/8
X 2	6 1/2
X 3	7 7/8
X 4	9 3/8
X 5	11 1/8
X 6	13 3/8
X 7	16 1/2
X 8	25 1/4
X 9	28 3/8
X 10	30 1/2
X 11	32 3/8
X 12	34
X 13	35 1/4
X 14	36 1/4
PORT Y	
Y 1	5 3/4
Y 2	6 1/2
Y 3	7 3/4
Y 4	9 1/4
Y 5	10 7/8
Y 6	13
Y 7	16
Y 8	24
Y 9	27
X 10	29 1/8
Y 11	30 7/8
Y 12	32 1/4
Y 13	33 1/2
Y 14	34 1/4



SCHEMATIC OF ELECTROSTATIC PRECIPITATOR OUTLETS

Figure 7. Traverse point sampling locations and in-stack distances from Celotex Corporation, Fairfield, Al., test (Test point 3).

VISIBLE EMISSIONS OBSERVATIONS

Outlet Stacks

Figure 2 indicates the relative positions of the four different observation sites employed to observe the two outlet stacks effluent. These locations were chosen to conform to EPA Method 9 guidelines and specifications. The stacks vertex was located approximately 22 feet above ground level. Observers were positioned at distances of 60-120 feet from the stacks. Heights of the observation points ranged from ground level to 35 feet above ground level.

Saturator/Coater Fugitive Emissions

The observation sites used in evaluating the saturator/coater hood emissions are shown in Figure 2. Examinations of emissions emitted from the spraying/dipping section, from the striking-in section, and from the coater area were performed from points located at each end of the No. 1 saturator/coater process line. The sparsely occurring fugitive emissions were detected approximately 2-10 feet above the floor at distances of 10-50 feet from the observer. Consistent fugitive emissions were detected escaping capture at the No. 5 door which was located near the coater area. These emissions were observed at approximately 5-10 feet above floor level and at distances of 5-20 feet from the No. 1 and No. 2 observers.

PROCESS SAMPLES COLLECTION LOCATIONS

Throughout the testing period various process samples were collected directly from their applicable locations in the process operations. A list of all collected process samples is included in the Sample Identification Log contained in Section H-VII of Appendix H.

V. SAMPLING AND ANALYTICAL TEST PROCEDURES

Stack gas sampling equipment designed by EPA's Office of Air Programs and Battelle Laboratories was used during this testing program. A schematic of the Method 20 particulate and gaseous hydrocarbon sampling equipment is presented in Appendix L, and a schematic of the POM sampling equipment designed by Battelle Labs is presented in Appendix F.

Sampling was performed according to the following: Sampling port locations were selected and the number of sampling points were determined by calculating the number of duct diameters between obstructions in the upstream and downstream distances of the sampling ports. Stack pressure, temperature, moisture content and velocity head readings were measured. EPA designed nomographs were set up using the above data and the correct nozzle diameter was selected.

Many of the runs were discontinuous due to process upsets and/or shutdowns. The discontinuities are detailed in Appendix H and in the process data sheets. The sample times were quite long because of process delays, line speed reductions, and process equipment malfunctions which often affected the continuity of sample collection. When a process upset occurred, the sampling train was stopped and the probe removed from the sampling duct.

Published average C_p factors of 0.857 to 0.847 were used for calculations of air flow and percent isokinetic for this testing program. EPA's pitobes were calibrated with and without their nozzles in a 12 inch diameter wind tunnel. Calibration of pitobes without nozzles in the 12 inch diameter conforms to published EPA Method 2 procedures. A February 1974 EPA Quality Assurance document on velocity measurements¹ states that a wind tunnel of 12" diameter or greater should be used for the calibration of pitot tubes. EPA data shows that the pitobes should be calibrated with the nozzles in place and operating at isokinetic velocities during

¹U.S. Environmental Protection Agency, Office of Research and Development, EPA-650/4-74-005a.

calibration. Due to the above considerations, measured Cp factors of 0.86 to 0.84 have been used for calculations and reporting of data.

A leak test was performed on the assembled sampling trains. The leak rate did not exceed 0.025 cfm at a vacuum of 22.5 inches Hg. The probe and filter were heated only slightly as this was an ambient air source with very low humidity. Crushed ice was placed around the impingers at the beginning of the test with new ice being added as required to keep the gases leaving the sampling train as much as possible below 70°F.

The train was operated as follows: The probe was inserted into the stack to the first traverse point with the nozzle tip pointing directly into the gas stream. The pump was started and immediately adjusted to sample at isokinetic conditions. Equal time was spent at selected points of each of the equal elemental areas of the duct with the pertinent data being recorded for each time interval. Nomographs were used to maintain isokinetic sampling conditions throughout the testing periods. At the conclusion of the test run, the pump was turned off, the probe removed, and the final readings were recorded. For detailed particulate clean-up procedures, please refer to Appendix L, "EPA Method 20." For detailed POM clean-up procedures, please refer to Appendix F, "POM Sampling and Analysis Using the Battelle POM Sampling Train."

Total hydrocarbon (THC) measurements were performed during that testing program using continuous monitoring FID instruments.

EMISSION MEASUREMENT METHODS

Organic pollutants generated in the manufacture of asphalt roofing products were divided into 2 categories--particulates (oil droplets) and gaseous hydrocarbons (organics in the vapor state at filtration temperature).

Method development tests were conducted at two asphalt roofing plants to evaluate the proposed sampling trains to collect these pollutants. These prior

studies resulted in the use of a modified EPA Method 5 system to isokinetically sample the gas stream. The modifications to Method 5 include the following:

1. Change of filtration temperature from 120°C to 50°C: The physical state of the organic matter is a function of temperature. Therefore, it was necessary to select a filtration temperature to provide a basis for evaluating the different control systems and the emissions from the different plants. The 50°C upper limit was selected to be consistent with the optimum operating temperature of 40°C for the collection systems, i.e., filtration and electrostatic precipitation.

2. Use of a precollector filter to reduce the oil droplet loading on the primary filter: This change was necessary to prevent oil from seeping through the glass fiber filter mat during periods of high oil droplet concentrations. A procedure to avoid having to quantitatively remove the oil from the precollector was added to the method. This involves weighing the precollector system before and after sampling to obtain the mass collected by difference.

3. Extraction of a small gas sample portion (1-lpm) after the gas had passed through the glass fiber filter: This gas sample was then fed to a continuous flame ionization detector (FID) analyzer to measure the gaseous hydrocarbon (HC) content.

The sample gas to the FID analyzer is transported through heated lines to prevent condensation. The FID analyzer monitors the level of total gaseous hydrocarbons (THC) by ionizing the hydrocarbons in a hydrogen rich flame and measuring the current produced. This type measurement system has been used by EPA as a reference method for other emission sources and is reasonably accurate over a wide range of the concentrations.

To develop background information on the chemical composition of the emitted organics, specific hydrocarbons were identified using techniques which included infrared analysis, gas chromatography (GC), and GC mass spectroscopy (GCMS). The oil droplet fractions were semi-quantitatively analyzed and found to contain almost

every category of hydrocarbons, e.g., ringed, straight chained, partially oxidized, etc. However, the gaseous portion which was defined using quantitative GCMS analyses showed that the hydrocarbons were primarily 1- through 3-carbon chains for noncombustion control devices, and methane for after-burners. Therefore, the FID measurements of the low concentration gaseous hydrocarbons were determined to be satisfactory. These data are described in Appendix E.

4. Change in cleanup reagent from acetone to 1,1,1-trichloroethane: Sample cleanup and recovery procedures were also developed and tested during the method development program. Various solvents were used, e.g., acetone, chloroform, hexane, 1,1,1-trichloroethane, diethyl ether, methylene chloride, and trichloroethylene. The chlorinated hydrocarbons proved to be the most effective solvents. Chloroform and methylene chloride were rejected as unsafe due to the toxic chemical exposure criteria established by OSHA. The solvent, 1,1,1-trichloroethane (TCE) was decided upon because it was most effective in dissolving the baked on oil and tars and was less toxic due to its lower vapor pressure.

5. Change in analysis procedure to minimize sample loss through evaporation: In the laboratory the cleanup reagent presented some problems. The low vapor pressure of TCE caused an increase in the time necessary to evaporate the samples at ambient temperature to a final weight. Experiments were conducted to quantify the loss of light hydrocarbons by condensing the vapors from the evaporation process and analyzing them by gas chromatography. Results showed that the hydrocarbon loss for outlet sample fractions was minimal.

A continuous weight loss was recorded for the samples over a period of several weeks after removal of the condenser. The weight loss was most significant for inlet samples. The outlet samples also continued to lose weight, but to a lesser degree. Consequently, the criterion of "constant weight" was defined as "a less than 10 percent weight change between two sequential weighings twenty-four hours

apart." These two sequential weighings were to be added together and then divided by 2 to determine an average final weight. Most samples weighed in this manner reached a constant weight between the 24 to 48 hour weighings.

Previous investigators used test methods which differed from the EPA approach. These methods, e.g., LAAPCD and conventional Method 5 including impinger analysis, measured both filterable and condensable hydrocarbons as particulate. The gaseous hydrocarbons were measured by flame ionization analysis; the sample gas, however, was collected directly from the stack. The gases were neither filtered nor cooled to 50°C. In some cases the data gave similar emission rates. In other cases, large differences occurred. Since EPA did not conduct comparative tests, it cannot be determined if these differences were due to process operating conditions or to differences in the test methods.

PERFORMANCE TEST METHODS

Performance Test Method 20, which is recommended for the measurement of asphalt roofing emissions, was based on the EPA definitions of particulate and gaseous hydrocarbons. The sample train is essentially a modification of the Method 5 sampling equipment. Changes were made in the sample filtration temperature and in the cleanup and analysis. The test procedure is sufficiently similar to Method 5 and test personnel experienced with Method 5 should have no difficulty with Method 20. Gaseous hydrocarbons are measured after the sample train filter using a flame ionization detector analyzer. This instrument is relatively simple to calibrate and operate. It requires some special protection for field use as it is basically a laboratory device.

The asphalt roofing industry has two major processes, each with peculiar problems which hamper the performance of the emission test. The asphalt saturator

line is a continuous process. However, it is subject to numerous line speed fluctuations and stoppages, making coordination of testing with the process essential. The sampling equipment must be stopped and removed from the stack whenever the process is not at steady state. Extra care must be used to maintain the sample integrity during these times.

Quantitative analyses for particulate matter and for polycyclic organic materials (POM) collected from the flue gases were subsequently performed by Battelle-Columbus Laboratories under a separate contract with EPA. In general, the analytical procedures employed were those prescribed by EPA Reference Methods for the specific emission or were techniques previously recommended by Battelle and authorized by EPA.

Total particulate catches in milligrams (mg) were calculated by adding the trichloroethane (TCE) and acetone rinse residues of the probe and prefilter portions of the sampling train to the fiber glass filter catch.

Minimum, maximum, and average THC concentrations were tabulated for each traverse point by using the same time interval as was used for the particulate sampling. Only data recorded during the actual particulate run times were reported in this manner.

Visible emissions were measured by EPA Method 9 and observations were scheduled to coincide with the particulate sampling test runs, however, due to scheduling some of the visible emission times do not coincide with the particulate sampling. Opacity readings were recorded simultaneously by two certified observers. Opacity observations were made at the two outlets from the MESP control systems and at the saturator/coater hood. The procedures adhered to EPA Method 9. Data sheets are presented in Appendix C.

PRELIMINARY VELOCITY TRAVERSE

A series of velocity traverses were conducted on October 6, 1975, in accordance with procedures detailed in EPA Method 1¹. Two testing teams, using "S" type pitot tubes and inclined manometers, performed velocity measurements at the inlet (TP-1) and two outlet (TP-2 and TP-3) stacks. A static pressure for each stack was obtained, and stack gas temperature confirmed by utilizing a thermocouple and potentiometer. Stack gas moisture content was measured by wet and dry bulk thermometers.

PARTICULATES

Particulate sampling was conducted simultaneously at the inlet and two outlet stacks of the MESP units using similar sampling trains. The trains consisted of Reference Method 20 equipment, modified to accommodate concurrent Total Hydrocarbon monitoring (see Appendix L). The sampling train used at the MESP inlet included prefilters constructed of a glass wool plug inserted in the cyclone between the probe and glass fiber filter holder. In previous inlet tests, it was discovered that oil droplets were passing through the cyclone and filter and on into the first impinger. Subsequent tests conducted at the inlet were performed with a glass wool plug inserted into the cyclone exit. Inclusion of the glass wool plug was intended to eliminate mist carryover through the filter. No cyclone prefilter was used with the train sampling the MESP outlet.

A modification to the normal Method 2 arrangement consisted of a "T" inserted at the exit of the filter in order to allow THC sampling. A dial thermometer was inserted through this "T" into the back half of the filter holder for monitoring of gas temperature at this point. The prefilter and filter were slightly heated above stack temperature in order to prevent water and/or hydrocarbon condensation

¹Standards of Performance for New Stationary Sources, Federal Register, Volume 36, No. 247, December 23, 1971.

in the front half of the sampling train. MSA glass fiber filters (Cat. #CT-75428) were used for all runs.

Pretest preparation and all sampling procedures described in Reference Method 5 were used with minor modifications. When assembling the sampling train, no silicone or other sealant was used on any ground glass joints upstream of the silica gel impinger. Leak checks were performed before and after each test using standard EPA procedures.

Additional information concerning the particulate testing and sample analyses is contained in Appendices A, D, H, J, and L.

TOTAL HYDROCARBONS (THC)

Total hydrocarbon concentrations were monitored concurrently with all particulate test runs. A description of the sampling train is described in Appendix F.

The THC samples were collected by withdrawing a portion of the gas stream being sampled under normal Method 2 conditions immediately after it passed through the glass fiber filter. Samples were drawn from the "T" through heated ($\approx 210^{\circ}\text{F}$) Teflon lines. Each sample then passed through a pump and to a four-way gas manifold (1 sample, 2 zero gas, 3 span gas 4 THC analyzer inlet). The FID instruments used were a Beckman Model 109 and a model 402. Analyses results were calibrated using methane. The heated sampling lines of the model 402 analyzer were maintained at 205°F to 210°F (96°C to 99°C) during sampling.

Table 5 contains results of the gaseous hydrocarbon measurements. Complete gaseous hydrocarbon results and calculated emissions at each sampling point are given in Appendix E. The molecular weight of methane (16) was used when converting gaseous hydrocarbon data from volume to mass. It is believed that the increase of the THC between the inlet and outlet sampling locations was due to the higher

temperatures at the outlet. This was caused by the kinetic energy created by the centrifugal fans located after the MESP outlets.

GAS COMPOSITION FLASK SAMPLING AND ANALYSIS

Three evacuated flasks were obtained from the FID sample line at test site TP-3 while sampling outlet emissions. One of the flask samples, S75-006-464, was analyzed at Battelle using gas chromatography techniques. Table 9 reports the analysis of this flask.

POM SAMPLING AND ANALYSIS

POM sampling was conducted at locations TP-1 and TP-3 (inlet and outlet) on October 9, 1975. Sampling was conducted using a Battelle POM sampling train which essentially is an EPA Method 5 sampling train with an adsorbent column located between the filter and the impingers. Analysis was by gas chromatography-mass spectrometry (GC-MS). Details of the sampling train, its operation, sample recovery, and analysis are included in Appendicies F and L. Table 13 summarizes POM emissions results.

For some POM compounds, the concentration at the MESP outlets was greater than at the inlet. This phenomena might be the result of:

1. POM produced in the MESP control device.
2. Inadequate sampling methodology.
3. Inadequate analysis methodology.

Concerning Item 1, it is known that POM is produced in combustion processes. However, the state of the art in the mechanism of POM formation is not such that it can be predicted whether or not POM might form in an emission control device such as used at the Celotex plant.

The sampling methodology used for this work is state of the art. However, it is still undergoing validation studies and its accuracy and reliability for all sampling conditions is not proven at this time.

PARTICLE SIZE

It is apparent from the interpretation of the particle size results that the cascade impactor was not completely at stack temperature when the sampling was started. Consistent with this conclusion are the indications that some vapor condensation may have formed on the impactor walls and/or substrate pans immediately after sampling had commenced. As time progressed, the heat from the stack gases was quickly absorbed by the pans and eventually was absorbed by the impactor walls. The pan and wall for each stage progressively reached stack gas temperature as a function of time. Any material which condensed on the substrate pans was probably reevaporated as the pan reached stack gas temperature and probably recondensed on the cooler walls.

In conclusion, it seems sufficient to say that the data are probably in error and vapor condensation in the probe, cyclone and impactor is a possible reason although not conclusive at this time. It is difficult to say what value the data have but if they are suspect, it is suggested that they not be included in any report. Perhaps mention could be made that an attempt to measure size distribution was tried.

Additional particle size information and interpretation is presented in Appendix B.

APPENDICES

APPENDIX A
COMPLETE PARTICULATE RESULTS
WITH
SAMPLE EQUATIONS AND EXAMPLE CALCULATIONS

Includes English and Metric Data

For

Inlet to Electrostatic Precipitator (TP-1)
Outlet from Electrostatic Precipitator (TP-2)
Outlet from Electrostatic Precipitator (TP-3)

Table A-I

Plant: Celotex Corporation
 Location: Fairfield, Alabama
 Tester: EMB
 Test Location: Inlet TP-1

PARTICULATE SUMMARY IN ENGLISH UNITS

DESCRIPTION	UNITS			
	1	2	3	4
DATE OF RUN	10-7-75	10-8-75	10-8-75	10-10-75
STACK AREA	11.290	11.290	11.290	11.290
NET TIME OF RUN	144.0	136.0	144.0	144.0
BAROMETRIC PRESSURE	29.60	29.60	29.70	29.70
AVG ORIFICE PRES DROP	1.560	1.660	1.700	1.620
VOL DRY GAS-METER COND	107.28	110.45	117.01	116.89
AVG GAS METER TEMP	92.0	107.0	98.0	92.0
VOL DRY GAS-STD COND	100.92	102.54	110.76	111.83
TOTAL H2O COLLECTED	.0	.0	.0	.0
VOL H2O VAPOR-STD COND	.00	.00	.00	.00
PERCENT MOISTURE BY VOL	2.8	2.4	2.2	2.2
MOLF FRACTION DRY GAS	.972	.976	.978	.978
PERCENT CO2 BY VOL, DRY	.0	.0	.0	.0
PERCENT O2 BY VOL, DRY	.0	.0	.0	.0
PERCENT CO BY VOL, DRY	.0	.0	.0	.0
PERCENT N2 BY VOL, DRY	.0	.0	.0	.0
MOLECULAR WT-DRY SIK GAS	100.0	100.0	100.0	100.0
MOLECULAR WT-SIK GAS	28.90	28.90	28.90	28.90
AVG STACK TEMPERATURE	28.59	28.64	28.66	28.66
NET SAMPLING POINTS	125.0	124.0	135.0	119.0
STACK PRESSURE, ABSOLUTE	1	1	1	1
AVG STACK GAS VELOCITY	29.50	29.50	29.60	29.60
STK FLOWRATE, DRY, STD CN	43.177	44.391	45.295	44.050
ACTUAL STACK FLOWRATE	25389.	26255.	26438.	26422.
PERCENT ISOKINETIC	29248.	30070.	30683.	29840.
PARTICULATE WT-PARTIAL	97.2	101.2	102.5	103.5
PARTICULATE WT-TOTAL	530.30	423.30	489.60	448.98
PERCENT EXCES: AIR	530.30	423.30	489.60	448.98
PART. LOAD-PTL, STD CN	.0	.0	.0	.0
PART. LOAD-TTL, STD CN	.08092	.06358	.06807	.04857
PART. LOAD-PTL, STD CN @ 12% CO2	.08092	.06358	.06807	.04857
PART. LOAD-TTL, STD CN @ 12% CO2	*****	*****	*****	*****
PART. LOAD-PTL, STD CN @ 12% CO2	*****	*****	*****	*****
PART. LOAD-TTL, STD CN @ 12% CO2	*****	*****	*****	*****
PART. LOAD-PTL, SIK CN	.07021	.05548	.05862	.04298
PART. LOAD-TTL, SIK CN	.07021	.05548	.05862	.04298
PARTIC FMIS-PARTIAL	17.61	14.31	15.43	11.00
PARTIC FMIS-TOTAL	17.61	14.31	15.43	11.00
PART FMIS/WT PRD FD PTL	*****	*****	*****	*****
PART FMIS/WT PRD FD TTL	*****	*****	*****	*****
PERCENT EXCES: AIR	*****	*****	*****	*****

Dry Standard Conditions presented as 70°, 29.92 in. Hg.

Table A-II

Plant: Celotex Corporation
 Location: Fairfield, Alabama
 Tester: EMB
 Test Location: Inlet TP-1

PARTICULATE SUMMARY IN METRIC UNITS	DATE OF RUN			
	1	2	3	4
STACK AREA	1.049	1.049	1.049	1.049
NFT TIME OF RUN	146.0	136.0	146.0	146.0
BAROMETRIC PRESSURE	751.84	751.84	754.38	752.38
AVG ORIFICE PRESS DROP	39.624	42.164	43.180	41.148
VOL DRY GAS-METER COND	3.04	3.13	3.31	3.31
AVG GAS METER TEMP	37.2	41.7	36.7	35.3
VOL DRY GAS-STD COND	2.86	2.90	3.14	3.17
TOTAL H2O COLLECTED	.0	.0	.0	.0
VOL H2O VAPOR-STD COND	.00	.00	.00	.00
PERCENT MOISTURE BY VOL	2.8	2.4	2.2	2.2
MOLE FRACTION DRY GAS	.972	.976	.978	.978
PERCENT CO2 BY VOL, DRY	.0	.0	.0	.0
PERCENT O2 BY VOL, DRY	.0	.0	.0	.0
PERCENT CO BY VOL, DRY	.0	.0	.0	.0
PERCENT N2 BY VOL, DRY	100.0	100.0	100.0	100.0
MOLECULAR WT-DRY STK GAS	28.90	28.90	28.90	28.90
MOLECULAR WT-STK GAS	28.59	28.64	28.66	28.66
AVG STACK TEMPERATURE	51.7	51.1	57.2	48.3
NFT SAMPLING POINTS	1	1	1	1
STACK PRESSURE, ABSOLUTE	749.30	749.30	751.84	751.84
AVG STACK GAS VELOCITY	13.160	13.530	13.806	13.427
STK FLOWRATE, DRY, STD CN	719.	743.	749.	748.
ACTUAL STACK FLOWRATE	828.	852.	869.	845.
PERCENT ISOKINETIC	97.2	101.2	102.5	103.5
PARTICULATE WT-PARTIAL	530.30	423.30	489.60	352.70
PARTICULATE WT-TOTAL	530.30	423.30	489.60	352.70
PERC. IMPINGER CATCH	.0	.0	.0	.0
PART. LOAD-PTL-STD CN	185.18	145.48	155.78	111.15
PART. LOAD-TIL-STD CN	185.18	145.48	155.78	111.15
PART. LOAD-PTL-STD CN	126.95	126.95	134.15	98.36
PART. LOAD-TIL-STD CN	160.66	126.95	134.15	98.36
PART. LOAD-PTL-STK CN	7.99	6.49	7.00	4.99
PARTIC. FMIS-PARTIAL	7.99	6.49	7.00	4.99
PARTIC. FMIS-TOTAL	7.99	6.49	7.00	4.99
PART FMIS/WT PRD FD PTL				130.03
PART FMIS/WT PRD FD TIL				130.03
PERCENT FXCFSN AIR				6.62

Dry-Standard-Conditions presented as 70°F 20.92 kg.

Table A-III

Plant: Celotex Corporation
 Location: Fairfield, Alabama
 Tester: EMB
 Test Location: Outlet TP-2

PARTICULATE SUMMARY IN ENGLISH UNITS

DESCRIPTION	UNITS				AVERAGE
	10-7-75	10-8-75	10-8-75	10-10-75	
STACK AREA	5,500	5,500	5,500	5,500	
NET TIME OF RUN	140.0	136.0	140.0	140.0	
BAROMETRIC PRESSURE	29.70	29.70	29.70	29.70	
AVG ORIFICE PRES DROP	2.060	1.980	1.980	2.000	
VOL DRY GAS METER COND	111.54	107.20	108.22	109.04	
AVG GAS METER TEMP	91.0	107.0	104.0	97.0	
VOL DRY GAS STD COND	107.04	99.95	101.62	103.68	
TOTAL H2O COLLECTED	.0	.0	.0	.0	
VOL H2O VAPOR STD COND	.0	.0	.0	.0	
PERCENT MOISTURE BY VOL	3.1	2.9	2.7	2.7	
MOLE FRACTION DRY GAS	.969	.971	.973	.973	
PERCENT CO2 BY VOL, DRY	.0	.0	.0	.0	
PERCENT O2 BY VOL, DRY	.0	.0	.0	.0	
PERCENT CO BY VOL, DRY	.0	.0	.0	.0	
PERCENT N2 BY VOL, DRY	100.0	100.0	100.0	100.0	
MOLECULAR WT DRY STK GAS	28.90	28.90	28.90	28.90	
MOLECULAR WT STK GAS	28.56	28.58	28.61	28.61	
AVG STACK TEMPERATURE	133.0	134.0	145.0	130.0	
NET SAMPLING POINTS	29.70	29.70	29.70	29.70	
STACK PRESSURE, ABSOLUTE	IN, HG	29.70	29.70	29.70	
AVG STACK GAS VELOCITY	FTS	47.286	44.753	45.767	45.818
STK FLOWRATE, DRY, STD CN	DSCFM	13412.	12698.	12769.	12975.
ACTUAL STACK FLOWRATE	ACFM	15604.	14769.	15095.	15120.
PERCENT ISOKINETIC		97.8	97.3	97.4	98.0
PARTICULATE WT-PARTIAL	MG	73.00	15.60	38.80	34.43
PARTICULATE WT-TOTAL	MG	73.00	15.60	38.80	34.43
PERC IMPINGER CATCH		.0	.0	.0	.0
PART. LOAD-PTL, STD CN	GR/DSCF	.01050	.00240	.00589	.00508
PART. LOAD-TTL, STD CN	GR/DSCF	.01050	.00240	.00589	.00508
PART. LOAD-PTL, STD CN @ 17X	CU2				
PART. LOAD-TTL, STD CN @ 17X	CU2				
PART. LOAD-PTL, STK CN	GR/ACF	.00902	.00207	.00498	.00435
PART. LOAD-TTL, STK CN	GR/ACF	.00902	.00207	.00498	.00435
PARTIC FMIS-PARTIAL	LB/HR	1.21	.26	.64	.57
PARTIC FMIS-TOTAL	LB/HR	1.21	.26	.64	.57
PART FMIS/WT PRD FD PTL	LB/TON				
PART FMIS/WT PRD FD TTL	LB/TON				
PERCENT EXCESS AIR					

Standard conditions as 2 in.

Table A-IV

Plant: Celotex Corporation
 Location: Fairfield, Alabama
 Tester: ENB
 Test Location: Outlet TP-2

PARTICULATE SUMMARY IN METRIC UNITS

DESCRIPTION	UNITS	AVERAGE			
		10-7-75	10-8-75	10-8-75	10-10-75
STACK AREA	M ²	511	511	511	511
NET TIME OF RUN	MIN	140.0	136.0	140.0	140.0
BAROMETRIC PRESSURE	MM HG	754.38	754.38	754.38	754.38
AVG ORIFICE PRESS	MM H ₂ O	52.324	50.292	50.292	50.801
VOL DRY GAS-METER-GOWND	M ³	3.16	3.04	3.06	3.09
AVG GAS NET-R TEMP	DEG. C	32.8	41.7	40.0	36.1
VOL DRY GAS-STD-GOWND	M ³	3.07	2.83	2.97	2.93
TOTAL H ₂ O COLLECTED	ML	.0	.0	.0	.0
VOL H ₂ O-VAPOR-STD-COND	MM ³	.0	.0	.0	.0
PERCENT MOISTURE BY VOL		3.1	2.9	2.7	2.7
MOLE FRACTION DRY GAS		.969	.974	.973	.973
PERCENT CO ₂ BY VOL, DRY		.0	.0	.0	.0
PERCENT O ₂ BY VOL, DRY		.0	.0	.0	.0
PERCENT CO BY VOL, DRY		.0	.0	.0	.0
MOLECULAR WT-DRY STK GAS		28.90	28.90	28.90	28.90
MOLECULAR WT-STK GAS		28.56	28.58	28.61	28.61
AVG STACK TEMPERATURE	DEG. C	56.1	56.7	62.8	56.6
NET SAMPLING POINTS		1	1	1	1
STACK PRESSURE, ABSOLUTE	M4, HG	754.38	754.38	754.38	754.38
AVG STACK GAS VELOCITY	M/S	14.615	15.621	15.922	17.865
STK FLOWRATE, DRY, STD CN DM ³ /M		380.	360.	362.	369.
ACTUAL STACK FLOWRATE	AM ³ /M	462.	418.	427.	425.
PERCENT ISOKINETIC		97.8	92.3	97.4	97.4
PARTICULATE WT-PARTIAL	MG	73.00	15.60	38.80	10.30
PARTICULATE WT-TOTAL	MG	73.00	15.60	38.80	10.30
PERC TAPPING FACTOR		.0	.0	.0	.0
PART. LOAD-PIL, STD CN	MG/M ³	24.03	5.50	13.48	3.51
PART. LOAD-TTL, STD CN	MG/M ³	24.03	5.50	13.48	3.51
PART. LOAD-PIL, STD CN @ 12% CO ₂		20.65	4.73	11.40	3.04
PART. LOAD-TTL, STD CN @ 12% CO ₂		20.65	4.73	11.40	3.04
PART. LOAD-PIL, STK CN	MG/AM ³	70.65	7.73	11.40	3.04
PART. LOAD-TTL, STK CN	MG/AM ³	70.65	7.73	11.40	3.04
PARTIC EMIS-PARTIAL	KG/HR	.55	.12	.29	.08
PARTIC EMIS-TOTAL	KG/HR	.55	.12	.29	.08
PART EMIS/WT PRD PD PTL	KG/MION	5.5	1.2	2.9	0.8
PART EMIS/WT PRD PD TTL	KG/MION	5.5	1.2	2.9	0.8
PERCENT EXCESS AIR		13.965	368.	428.	98.0

Condensation 70° F. 92 Hg.

Table A-V

Plant: Celotex Corporation
 Location: Fairfield, Alabama
 Tester: EMB
 Test Location: Outlet TP-3

PARTICULATE SUMMARY IN ENGLISH UNITS

DESCRIPTION	UNITS				AVERAGE
	1	2	3	4	
DATE OF RUN	10-7-75	10-8-75	10-8-75	10-10-75	
STACK AREA	5,410	5,410	5,410	5,410	
NET TIME OF RUN	140.0	135.0	140.0	140.0	
BAROMETRIC PRESSURE	29.70	29.70	29.70	29.70	
AVG ORIFICE PRES DROP	1.940	1.940	1.880	1.880	
VOL DRY GAS-METER COND	109.01	106.31	108.34	106.65	
AVG GAS METER TEMP	94.0	103.0	102.0	93.0	
VOL DRY GAS-STD COND	103.99	99.81	101.87	101.91	
TOTAL H2O COLLECTED	.0	.0	.0	.0	
VOL H2O VAPOR-STD COND	.00	.00	.00	.00	
PERCENT MOISTURE BY VOL	3.0	2.5	2.7	2.7	
MOLE FRACTION DRY GAS	.970	.975	.973	.973	
PERCENT O2 BY VOL, DRY	.0	.0	.0	.0	
PERCENT O2 BY VOL, DRY	.0	.0	.0	.0	
PERCENT CO BY VOL, DRY	.0	.0	.0	.0	
PERCENT H2 BY VOL, DRY	100.0	100.0	100.0	100.0	
MOLECULAR WT-DRY STK GAS	28.90	28.90	28.90	28.90	
MOLECULAR WT-STK GAS	28.57	28.63	28.61	28.61	
AVG STACK TEMPERATURE	127.0	132.0	150.0	129.0	
NET SAMPLING POINTS	1	1	1	1	
STACK PRESSURE, ABSOLUTE	29.70	29.70	29.70	29.70	
AVG STACK GAS VELOCITY	63.253	63.714	63.724	63.226	43.356
STK FLOWRATE, DRY-STD CN	12703	12702	11910	12051	12114
ACTUAL STACK FLOWRATE	14000	14490	14495	13869	14074
PERCENT ISOKINETIC	102.8	101.5	103.1	102.0	102.4
PARTICULATE WT-PARTIAL	54.80	13.80	23.00	11.80	25.85
PARTICULATE WT-TOTAL	54.80	13.80	23.00	11.80	25.85
PERC IMZINGER CATCH	.0	.0	.0	.0	.0
PART. LOAD-PIL,STD CN	.00812	.00213	.00348	.00178	.00388
PART. LOAD-TEL,STD CN	.00812	.00213	.00348	.00178	.00388
PART. LOAD-PIL,STD CN @ 12% CO2	*****	*****	*****	*****	*****
PART. LOAD-TEL,STD CN @ 12% CO2	*****	*****	*****	*****	*****
PART. LOAD-PIL,STD CN	.00705	.00184	.00292	.00155	.00334
PART. LOAD-TEL,STD CN	.00705	.00184	.00292	.00155	.00334
PARTIC. EMIS-PARTIAL	.85	.22	.35	.18	.40
PARTIC. EMIS-TOTAL	.85	.22	.35	.18	.40
PART. EMIS/WT PRD, FD PTL	*****	*****	*****	*****	*****
PART. EMIS/WT PRD, FD TEL	*****	*****	*****	*****	*****
PERCENT EXCESS AIR	*****	*****	*****	*****	*****

Dry Standard conditions presented as 20 in. Hg

Table A-VI

Plant: Celotex Corporation
 Location: Fairfield, Alabama
 Tester: EMB
 Test Location: Outlet TP-3

PARTICULATE SUMMARY IN METRIC UNITS

DESCRIPTION	UNITS	DATE OF RUN				AVERAGE
		10-7-75	10-8-75	10-8-75	10-10-75	
STACK AREA	M2	503	503	503	503	
NET TIME OF RUN	MIN	140.0	135.0	140.0	140.0	
BAROMETRIC PRESSURE	MM HG	754.38	754.38	756.38	754.38	
AVG ORIFICE PRES DROP	MM H2O	49.274	49.784	47.752	47.752	
VOL DRY GAS-METER CORRD	M3	3.09	3.01	3.02	3.02	
AVR GAS METER READ	DEG.C	34.6	30.4	38.9	34.9	
VOL DRY GAS-STD COND	M3	2.94	2.83	2.81	2.89	
TOTAL H2O COLLECTED	ML	.0	.0	.0	.0	
VOL H2O VAPOR-STD COND	M3	.00	.01	.00	.00	
PERCENT MOISTURE BY VOL	%	3.0	2.5	2.7	2.7	
MOLE FRACTION DRY GAS		.970	.975	.973	.973	
PERCENT CO2 BY VOL, DRY	%	.0	.0	.0	.0	
PERCENT O2 BY VOL, DRY	%	.0	.0	.0	.0	
PERCENT CO BY VOL, DRY	%	100.0	100.0	100.0	100.0	
PERCENT H2 BY VOL, DRY	%	28.90	28.90	28.90	28.90	
MOLECULAR WT-DRY STX GAS		28.57	28.63	28.61	28.61	
MOLECULAR WT-STX GAS		52.8	51.6	65.6	53.9	
AVG STACK TEMPERATURE	DEG.C					
NET SAWDUST POINTS		1	1	1	1	
NET STACK WGT, ABSOLUTE	MG	754.38	754.38	754.38	754.38	13.215
AVG STACK GAS VELOCITY	M/S	13.184	13.324	13.329	13.023	343.
STX FLOWRATE, DRY, STD CN DMM3/1		346.	348.	377.	341.	399.
ACTUAL STACK FLOWRATE	AM3/1	398.	402.	402.	393.	102.4
PERCENT ISOXINETIC	%	102.8	101.5	103.1	102.0	25.85
PARTICULATE WEIGHT-FACIAL	MG	56.80	13.80	23.00	11.80	25.85
PARTICULATE WEIGHT-TOTAL	MG	56.80	13.80	23.00	11.80	25.85
PARTICULATE WGT-CATCH	MG	.0	.0	.0	.0	8.87
PART. LOAD-PTL, STD CN	MG/HR	18.57	4.87	7.96	4.08	8.87
PART. LOAD-FILL, STD CN	MG/HR	48.57	4.87	7.96	4.08	
PART. LOAD-PTL, STD CN @ 12% CO2	MG/HR	16.13	4.22	6.67	3.54	7.64
PART. LOAD-PTL, STX CN	MG/HR	46.13	4.22	6.67	3.54	7.64
PART. LOAD-FILL, STX CN	MG/HR	30	10	16	0.8	.18
PARTIC FMS-PARTIAL	KG/HR	39	10	16	0.8	.18
PARTIC FMS-TOTAL	KG/HR	39	10	16	0.8	.18
PART FMS/WF PRO FD PTL KG/MFON						
PART FMS/WF PRO ED TEL KG/MFON						
PERCENT EXCESS AIR						

Dry condition conditions presented of 2 ft

PARTICULATE CALCULATION TERMINOLOGY AND NOMENCLATURE

Sampling Time, 24 hour clock	N_p	Net Sampling Points
D_n Sampling Nozzle Diameter, in.	P_{st}	Static Pressure of Stack Gas, in. Hg.
T_t Net Time of Test, Min.	P_s	Stack Gas Pressure, in. Hg Absolute
P_b Barometric Pressure, in. Hg Absolute	V_s	Stack Gas Velocity at Stack Conditions, fpm
P_m Average Orifice Pressure Drop, in. H ₂ O	A_s	Stack Area, in. ²
V_m Volume of Dry Gas Sampled at Meter Conditions, DCF	Q_s	Dry Stack Gas Volumetric Flow Rate at Standard Conditions, ^c DSCFM
T_m Average Gas Meter Temperature, °F	Q_a	Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM
$V_{m_{std}}$ Volume of Dry Gas Sampled at Standard Conditions ^a , DSCF	% I	Percent Isokinetic
V_w Total H ₂ O Collected in Impingers and Silica Gel, ml	% O	Percent Opacity
$V_{w_{gas}}$ Volume of Water Vapor Collected at Standard Conditions ^b , SCF	T_c	Unit Feed Rate-ton/hr
% M % Moisture in Stack Gas, by Volume	m_f	Particulate - Probe, Cyclone, and Filter, mg
M_d Mole Fraction of Dry Gas	m_t	Particulate - Total, mg
% CO ₂ Volume % Dry	I_c	% Impinger Catch
% O ₂ Volume % Dry	C_{an}	Particulate - Probe, Cyclone, and Filter, gr/SCF
% CO Volume % Dry	C_{ao}	Particulate - Total, gr/SCF
% N ₂ Volume % Dry	C_{at}	Particulate - Probe, Cyclone, and Filter, gr/ACF
% EA Percent Excess Air	C_{au}	Particulate - Total, gr/ACF
MW_d Molecular Weight of Stack Gas, Dry Basis	C_{aw}	Particulate - Probe, Cyclone, and Filter, lb/hr.
MW Molecular Weight of Stack Gas, Wet Basis	C_{ax}	Particulate - Total, lb/hr.
C_p Pitot Tube Coefficient	P_{tf}	Particulate - Probe, Cyclone, and Filter, lb/ton feed
T_s Average Stack Temperature °F	P_{tt}	Particulate - Total, lb/ton feed

^a Dry standard cubic feet at 70°F, 29.92 in. Hg.

^b Standard conditions at 70°F, 29.92 in. Hg.

^c Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

Sample Equations and Example Calculations¹

Example: Inlet (TPI) Run 1

1. Volume of dry gas sampled at standard conditions^a, DSCF²

$$V_{m_{std}} = \frac{17.7 \times V_m (P_b + P_m)}{(T_m + 460) \times 13.6} = \frac{17.7 \times 107.20 (29.6 + \frac{1.56}{13.6})}{(99+460)} = 100.92 \text{ DSCF}$$

2. Volume of water vapor at standard conditions^b, SCF

$$V_{w_{gas}} = 0.0474 \times V_w = 0.0474 \times 62.4 = 2.96 \text{ SCF}$$

3. Percent moisture in stack gas

$$\%M = \frac{100 \times V_{w_{gas}}}{V_{m_{std}} + V_{w_{gas}}} = \frac{100 \times 2.96}{100.92 + 2.96} = 2.8$$

4. Mole fraction of dry gas

$$M_d = \frac{100 - \%M}{100} = \frac{100 - 2.8}{100} = 0.973$$

5. Molecular weight of dry stack gas

$$MW_d = (\%CO_2 \times \frac{44}{100}) + (\%O_2 \times \frac{32}{100}) + \left[(\%CO + \%H_2) \times \frac{28}{100} \right] \\ (0.03 \times \frac{44}{100}) + (20.9 \times \frac{32}{100}) + (79.1 \times \frac{28}{100}) = 28.9$$

¹Sample results may not correspond to computer calculated data in every case because of intermediate computer roundoff.

²Includes volume of gas passed through FID analyzer (0.108 cubic ft/min).

6. Molecular weight of wet stack gas

$$MW = MW_d \times M_d + 18 (1 - M_d) = 28.9 \times .973 + 18 (1 - .973) = 28.6$$

7. Stack gas velocity at stack conditions, fpm^c

$$V_s = 5128.8 \times C_p \times \sqrt{\frac{\Delta P_s \times (T_s + 460)}{P_s + MW}} \left[\frac{1}{P_s + MW} \right]^{1/2} =$$
$$5128.8 \times 0.848 \times 17.3 \left[\frac{1}{29.5 \times 28.6} \right]^{1/2} = 2590 \text{ fpm}$$

8. Stack gas volumetric flow rate at standard conditions^d, DSCFM

$$Q_s = \frac{0.123 \times V_s \times A_s \times M_d \times P_s}{(T_s + 460)} = \frac{0.123 \times 2590 \times 1626 \times 0.973 \times 29.5}{(125. + 460)} =$$

25,389 DSCFM

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

$$Q_a = \frac{.05645 \times Q_s (T_s + 460)}{P_s \times M_d} = \frac{.05645 \times 25,389 \times (125. + 460)}{(29.5 + 0.973)} =$$

29,242. ACFM

10. Percent isokinetic

$$\% I = \frac{1,032 \times (T_s + 460) \times V_{m \text{ std}}}{V_s \times T_t \times P_s \times M_d \times (D_n)^2} = \frac{1,032 \times (125. + 460) \times 100.92}{2590. \times 144. \times 29.5 \times .973 \times (.242)^2}$$

= 97.2

11. Particulate - probe, cyclone, and filter, gr/DSCF

$$C_{an} = 0.0154 \times \frac{m_f}{V_{m_{std}}} = 0.0154 \times \frac{530.30}{100.92} = 0.0809 \text{ gr/DSCF}$$

12. Particulate - total, gr/DSCF³

$$C_{ao} = 0.0154 \times \frac{m_t}{V_{m_{std}}} = 0.0154 \times \frac{530.30}{100.92} = 0.0809 \text{ gr/DSCF}$$

13. Particulate - probe, cyclone, and filter at stack conditions, gr/ACF

$$C_{at} = \frac{17.7 \times C_{an} \times P_s \times M_d}{(T_s + 460)} = \frac{17.7 \times .0809 \times 29.5 \times .973}{(125. + 460)} = 0.0702 \text{ gr/ACF}$$

14. Particulate - total at stack conditions, gr/ACF

$$C_{au} = \frac{17.7 \times C_{ao} \times P_s \times M_d}{(T_s + 460)} = \frac{17.7 \times .0809 \times 29.5 \times .973}{(125. + 460)} = 0.0702 \text{ gr/ACF}$$

15. Particulate - probe, cyclone, and filter, lb/hr

$$C_{aw} = 0.00857 \times C_{an} \times Q_s = 0.00857 \times .0809 \times 25,389 = 17.61 \text{ lb/hr}$$

16. Particulate - total, lb/hr

$$C_{ax} = 0.00857 \times C_{ao} \times Q_s = 0.00857 \times .0809 \times 25,389 = 17.61 \text{ lb/hr}$$

³Impinger catch not analyzed for mass particulate.

17. Particulate - probe, cyclone, and filter, lb/ton feed

$$P_{tf} = \frac{C_{aw}}{T_c} = \frac{N/A}{\quad} = \quad \text{lb/ton feed}$$

18. Particulate - total, lb/ton feed

$$P_{tt} = \frac{C_{aw}}{T_c} = \frac{N/A}{\quad} = \quad \text{lb/ton feed}$$

^a Dry standard cubic feet at 70°F, 29.92 in. Hg.

^b Standard conditions at 70°F, 29.92 in. Hg.

^c $\sqrt{\Delta P_s \times (T_s + 460)}$ is determined by averaging the square root of the product of the velocity head (ΔP_s) and the absolute stack temperature from each sampling point.

^d Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

APPENDIX B
PARTICLE SIZE RESULTS

Includes:

Discussion of Particle Size Testing
Figure of Model B Cascade Impactor
Particle Size Equations and Sample Calculations
Particle Size Field Data Sheets

APPENDIX B
PARTICLE SIZE DATA

Sampling and Analytical Procedures

At both testing locations the tests were conducted by sampling for a given period of time under isokinetic conditions at a single point in the duct. The sampling point was selected by determining the average velocity of the duct from velocity traverse data and selecting a point in the duct that represented average velocity conditions. This is referred to as "probe immersion depth" on the field data sheets in the field data section of this appendix. Isokinetic sampling rates were established as specified in the instructions provided with the sampling device. This basically is done by selecting a nozzle size that maintained the flow rate through the sampler at approximately .05 cubic feet per minute while the velocity through the nozzle was maintained at the velocity of the stream being sampled. The impactor itself was a calibrated orifice, and after appropriate conversions for the difference in temperature and pressure between the stack gases and the impactor gases, the ΔP (pressure drop across the impactor) was selected from the calibration curve. (See Equation and Sample Calculations Section presented in this Appendix.)

Prior to the start of each sampling test, the sampler was cleaned and assembled. The proper size nozzle was assembled on an appropriate probe length and the probe connected to the inlet of the glass cyclone. The outlet of the cyclone was connected directly to the first stage of the impactor, and

downstream of the last impactor stage, an absolute filter of pyrex wool was installed. The assembly was then connected to the vacuum pump. The sampler was positioned at the sampling location and heated to prevent condensation of moisture in the train. The nozzle was positioned at the sampling point and sampling was started by adjusting the control valve to maintain the proper ΔP on a mercury manometer. After sampling for the predetermined length of time, the flow was stopped, and the probe removed from the stack. The sampler was then removed to the clean-up area.

The sampling time is determined by experience and trial and error. The sampling time on the first run was estimated and when the run was finished the pans were observed for collected material. The sampling time for subsequent runs was then adjusted depending on the amount of material collected on the first run. If too little material was collected on the impactor pans the sampling time was increased, or conversely if too much material was collected, the time was decreased.

Clean-up and sample collection was achieved by cooling and disassembling the impactor, removing the collection plates or substrates, and placing them in plastic containers for shipment back to the laboratory. The impactor was then cleaned thoroughly with methylene chloride solvent. The final filter was removed and placed in its original container for shipment. The nozzle, probe, cyclone, and cyclone catch bottle was washed with methylene chloride and all of the washings were saved for subsequent analysis.

Upon arrival at the laboratory the aluminum collection pans were reweighed to determine the amount of material collected. The final filter was also

weighed and its weight gain determined. The methylene chloride washes from the probe and cyclone and subsequent stages were evaporated in a tared container and the weight of residue was determined.

Following is a figure of the Model B cascade impactor and equations from which the characteristic particle size diameter can be developed. In addition, copies of the field data sheets are presented in the latter section of this Appendix.

A test log displaying the actual particle size sampling times can be found in Appendix H under the Particle Size Testing Log Section.

Figure B1
MODEL B CASCADE IMPACTOR

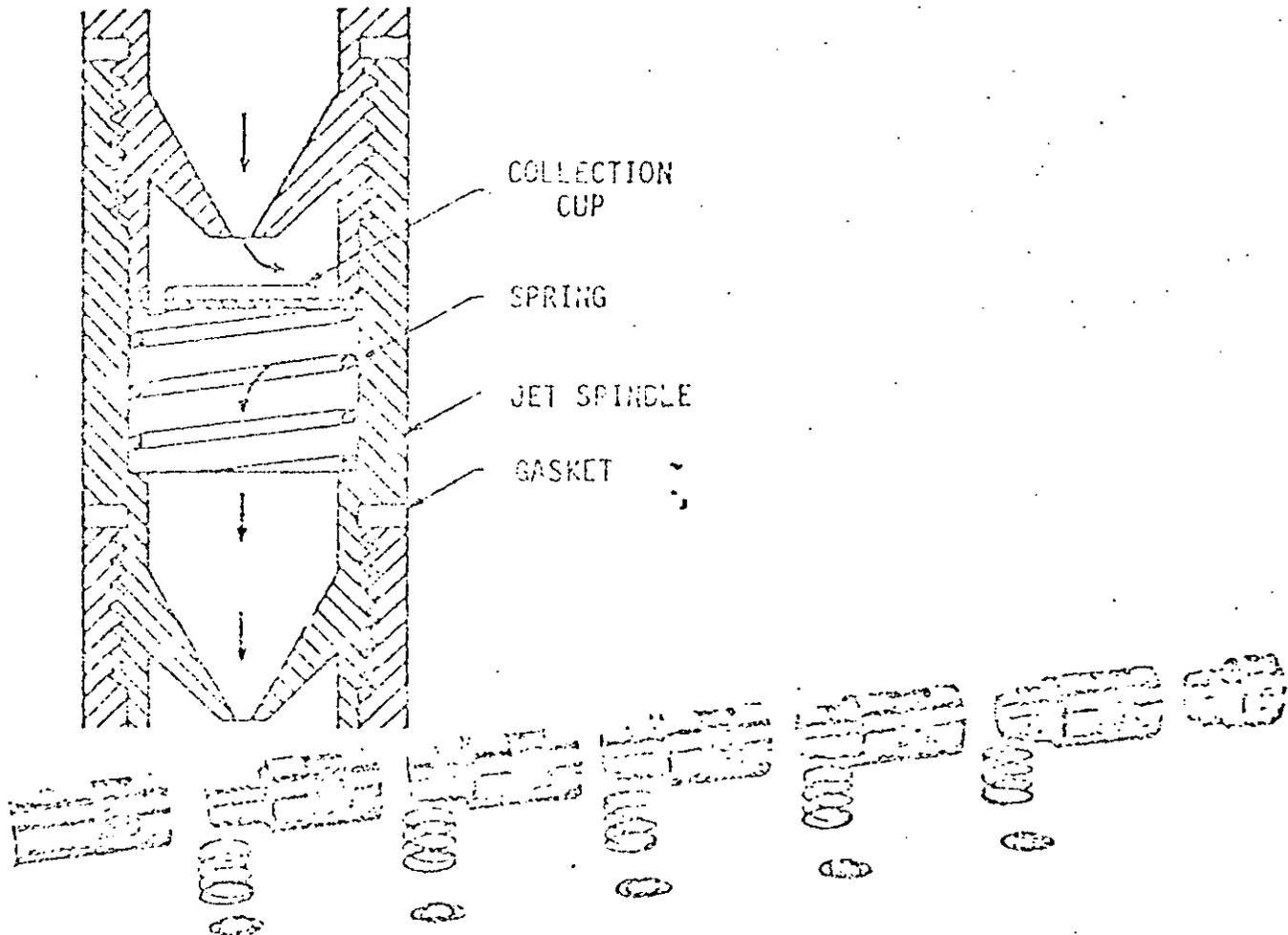


Table B1.

EQUATIONS AND SAMPLE CALCULATIONS

TEST RESULTS

Calculations for these values were done according to the equations of EPA Method 5, Federal Register, December 23, 1971.

PARTICLE SIZE DISTRIBUTION

1) Characteristic Particle Diameter, D_{p50}

Calculation of the characteristic particle diameter was based on the generalized calibration curve determined by Ranz and Wong¹. Ranz and Wong used dimensional analysis techniques to develop a dimensionless inertial impactor parameter, Ψ . From this work, the characteristic particle diameter can be developed:

$$D_{p50} \sqrt{\frac{18 \mu D \Psi_{50}}{C \rho_p V}} \times (10^4) \quad (1)$$

where C, Cunningham Correction Factor, is a function of D_{p50} :

$$C = 1 + \left[\frac{2L}{D_p} \right] \left[1.23 + 0.41e^{-\frac{.44D_p \cdot 10^{-4}}{L}} \right] \left[10^4 \right] \quad (2)$$

A computer program was used to obtain D_p by solving equations (1) and (2) simultaneously by iteration.

- D_p = characteristic particle diameter, microns
- μ = viscosity of gas, poise
- D = diameter of impactor jet, cm
- Ψ_{50} = inertial parameter for 50% stage efficiency
- C = Cunningham Correction Factor
- ρ_p = particle density, g/cc
- V = jet velocity, cm/sec
- L = gas mean free path, cm

¹ Ranz, W. E. and Wong, J. B., AMA Archives of Industrial Hygiene and Occupational Medicine, 5,464-77, 1952.

Table B1. CONTINUED

EQUATIONS AND SAMPLE CALCULATIONS

2) Weight Percent

$$\text{weight \% stage N} = \frac{\text{mass stage N}}{\text{all stages total mass}} \times 100$$

example

$$\begin{aligned} \text{weight \% stage 1} &= \frac{.00343\text{g}}{.22478\text{g}} \times 100 \\ &= 1.53\% \end{aligned}$$

3) Cumulative % $\leq D_{p50}$

$$\text{cum \% } \leq D_{p50}, \text{ stage N} = \text{Total sum of mass percent on stages with } D_{p50} \leq D_{p50}, \text{ stage N}$$

example

<u>Stage</u>	<u>D_{p50}</u>	<u>Mass %</u>
Cyclone	6.8	97.69
1	3.4	1.53
2	2.0	0.47
3	1.4	0.14
4	0.7	0.07
5	0.4	0.00
Filter	0.3	0.10

$$\begin{aligned} \text{cum \% } D_{p50}, \text{ stage 3} &= \text{mass \% stage 4} + \text{mass \% stage 5} + \text{mass \% filter} \\ &= 0.10 + 0.00 + 0.07 \\ &+ 0.17\% \end{aligned}$$

Table B1. Concluded

4) $dM/d \text{ Log } D, \text{ gr/scf}$

$$dM/d \text{ Log } D_{\text{stage } N} = \frac{(\text{gr/scf})_{\text{stage } N}}{\text{Log } D_{p50 \text{ stage } N-1} - \text{Log } D_{p50 \text{ stage } N}}$$

example:

<u>Stage</u>	<u>D_{p50}</u>	<u>gr/scf</u>
Cyclone	6.8	35.81
1	3.4	0.56
2	2.0	0.17
3	1.4	0.05
4	0.7	0.03
5	0.4	0.00
Filter	0.3	0.04

$$dM/d \text{ Log } D_{\text{stage } 3} = \frac{.05}{\text{Log } 2.0 - \text{Log } 1.4}$$

$$= 0.32$$

APPENDIX B-I
PARTICLE SIZE
FIELD DATA SHEETS

Brink BMS-II Calculations

Date 10/7/75 Run # 1 Location TP-1

Plant Collector Lucasfield (Ga)

DATA: about 1" Hg BP = 29.57

Duct press Pd _____ "Hg ^{about} 29.5 Molecular Wt Md 29

Duct Temp Td 100 °F Vel head Δp 0.60 "H₂O

$$\text{Velocity } V_d = 85.48 \times C_p \times \sqrt{\frac{(T_d + 460) \times \Delta p}{M_d \times P_d}}$$

$$V_d (\text{ft/sec.}) = 85.48 (.85) \sqrt{\frac{(100 + 460)(.60)}{(29)(29.5)}} = \underline{45.5 \text{ ft/sec}}$$

Probe nozzle selection for a flow rate of $F_s = \underline{0.52 \text{ ft}^3/\text{min}}$

Nozzle = 1.5 mm

Δp from calibration curve = 1.0 "Hg

Sampling Δp calculation: (Est box temp = 100 °F)

$$\Delta p_s = \Delta p_c \times \frac{M_d}{29} \times \frac{P_d}{29.92} \times \frac{460 + 77}{460 + T_{box}} = \Delta p_c (6189) \frac{M_d P_d}{T_{box}}$$

$$\Delta p_s = (1.0) (6189) \frac{(29)(.75)}{(460 + 100)} = \underline{0.745 \text{ "Hg}}$$

1.000 "Hg

Comments:

Stage Pan Final wt

1 - 60.46

10.9

2 - 60.12

3 - 60.10

4 - 60.09

5 - 60.20

B-1-1

Operator D. S. Starnes

Brink Data Sheet

Date 10/7/75 Run# 1 Location B-1

Plant Cellar

Data: Stack gas molecular wt 29

Stack Temp 217 °F, Stack static press -1.5 "H₂O

Barometric Press 29.67 "Hg, Ambient Temp 70 °F

Probe tip diameter 1.5 mm, Probe immersion 20 in ^{+4 corr.} (total)

Sample box temp:

Start - in 10 °F, out 110 °F; Stop - in 130 °F, out 138 °F

Impactor pressure drop (Aps) - calculated 1.0 "H₂O Real 1.0 "H₂O

Impactor static inlet pressure - Start 1.0 "H₂O, Stop 1.7 "H₂O

Start time 1417 End time 1417

Sample run time 50 min

Comments + sketches :

Brink BMS-II Calculations

Date 10/2/75 Run # 2 Location TP-1

Plant ...

DATA: -1.5 "Hg 29.92

Duct press Pd _____ "Hg Molecular Wt Md 29

Duct Temp Td 120 °F Vel head Δp 0.10 "Hg

$$\text{Velocity } V_d = 85.48 \times C_p \times \sqrt{\frac{(T_d + 460) \times \Delta p}{M_d \times P_d}}$$

$$V_d (\text{ft/sec}) = 85.48 \left(\quad \right) \sqrt{\frac{(\quad + 460) (\quad)}{(\quad) (\quad)}} = \quad$$

Probe nozzle selection for a flow rate of $F_s = \quad \text{ft}^3/\text{min}$

Nozzle = 1.5 mm

Δpc from calibration curve = _____ "Hg

Sampling Δp calculation: (Est box temp = _____ °F)

SAME AS TP-1

$$\Delta p_s = \Delta p_c \times \frac{M_d}{29} \times \frac{P_d}{29.92} \times \frac{460 + 77}{460 + T_{box}} = \Delta p_c (0.6189) \frac{M_d P_d}{T_{box}}$$

$$\Delta p_s = (\quad) 0.6189 \frac{(\quad) (\quad)}{(460 + \quad)} = \quad \text{"Hg}$$

1 "Hg

Comments:

Stage	...	...
1	...	...
2	...	...
3	...	...
4	...	...
5	...	...

B-1-3

Operator ...

Blank Data Sheet

Date 11/1/75 Run# 1 Location T.P. 1

Plant Chlorine Feed Facility

Data: Stack gas molecular wt _____

Stack temp 30 °F, Stack static press - 1.5 "H₂O

Barometric Press 29.57 "Hg, Ambient Temp 61 °F

Probe tip diameter 1.5 mm, Probe immersion 20 in

Sample box temp:

Pos B
71-100000000/A

Start-in 30 °F, cut 135 °F; Stop-in _____ °F, cut _____ °F

Impactor pressure drop (Aps) - calculated 1.0 "H₂O, Real 1.0 "H₂O

Impactor static inlet pressure - Start 2.0 "H₂O, Stop 0.0 "H₂O

Start time 16-13 End time 15-22

Sample run time 30 min

Comments + sketches:

Stack temp 4/1/75, Inlet Temp

Restart 17/1/75 4/1/75

Stop 1/2/75

Brink BMS-II Calculations

Date 10/8/75 Run # 3 Location TP-1

Plant Celotex Fairfield Celco

Data: -1.5" H₂O BP = 29.58

Duct press Pd _____ "Hg Molecular Wt Md 66.2 (0.2% H₂O)

Duct Temp Td 125 °F Vel head Δp 0.0 "H₂O

$$\text{Velocity } V_d = 85.48 \times C_p \times \sqrt{\frac{(T_d + 460) \times \Delta p}{M_d \times P_d}}$$

$$V_d (\text{ft/sec}) = 85.48 \left(\quad \right) \sqrt{\frac{(\quad + 460)(\quad)}{(\quad)(\quad)}} = \underline{\quad}$$

(All Data same as TP-1 Run 1+2)

Probe nozzle selection for a flow rate of $F_3 = \underline{\quad}$ ft³/min

Nozzle = _____ mm

Δpc from calibration curve = _____ "Hg

Sampling Δp calculation: (Est box temp = _____ °F)

$$\Delta p_s = \Delta p_c \times \frac{M_d}{29} \times \frac{P_d}{29.92} \times \frac{460 + 77}{460 + T_{box}} = \Delta p_c (0.6189) \frac{M_d P_d}{T_{box}}$$

$$\Delta p_s = \left(\quad \right) 0.6189 \frac{(\quad)(\quad)}{(460 + \quad)} = \underline{1.0} \text{ "Hg}$$

Comments:

Stage	Pin #	Final #
1	64-1	13
2	64-2	
3	64-3	
4	64-4	
5	64-5	13-1-5

Operator D. H. Haver

Brink Data Sheet

calc'd

Date 10/8/75 Run# 3 Location P. 1 (Ant B)

Plant Colexay Fairfield Ala.

Data: Stack gas molecular wt 215

Stack temp 118 °F, Stack static press. 1.5 "H₂O

Barometric Press 29.58 "Hg, Ambient Temp 71.5 °F

Probe tip diameter 1/16 mm, Probe immersion 20 in. Plated

Sample box temp:

Start-in 130 °F, out 130 °F; Stop - in 130 °F, out 125 °F

Impactor pressure drop (Aps) - calculated 1.0 "H₂O Real 1.0 "H₂O

Impactor static inlet pressure - Start 1.5 "H₂O, Stop 2.5 "H₂O

Start time 9:24 End time 10:09

Sample run time 45 min

Comments + sketches:

shutdown 9:28 (10 min), in 10 min line
rest of 10:18 - line broken -

Brink BMS-II Calculations

Date 10/8/25 Run # 1 Location TP-2 (outlet)
 Plant Cooley Fairfield (la)

Data:

Duct press P_d .02 "Hg

Molecular wt M_d air

Duct Temp T_d 135 °F

Vel head Δp 0.3-d1 "H₂O

Velocity $V_d = 85.48 \times C_p \times \sqrt{\frac{(T_d + 460) \times \Delta p}{M_d \times P_d}}$ Point # 3.
(use point # 6
at 0.61" H₂O)

V_d (ft/sec) = $85.48 (85) \sqrt{\frac{(135 + 460)(.61)}{(29)(29.6)}} = 47.02$

Probe nozzle selection for a flow rate of $F_s = 0.154$ ft³/min

Nozzle = 1.5 mm

Δp_c from calibration curve = 1.1 "Hg.

Sampling Δp calculation: (Est box temp = 140 °F)

$$\Delta p_s = \Delta p_c \times \frac{M_d}{29} \times \frac{P_d}{29.92} \times \frac{460 + 77}{460 + T_{box}} = \Delta p_c (6189) \frac{M_d P_d}{T_{box}}$$

$\Delta p_s = (1.1) (6189) \frac{(29)(.02)}{(460 + 140)} = 0.97$ "Hg
 use 1.0

Comments:

Stage	Point	Final #
1	6-1-6	
2	6-1-6	
3	6-1-7	
4	6-1-10	13-1-7
5	6-1-11	

note: 6-1-7
not used
removed

Operator [Signature]

Brink Data Sheet

Date 10/2/75 Run# 1 Location 1.0 100'

Plant (A-27)

Data: Stack gas molecular wt 60

Stack Temp 55 °F, Stack static press 0 "H₂O

Barometric Press 29.58 "Hg, Ambient Temp 71 °F

Probe tip diameter 1.5 mm, Probe immersion 8 3/4 in

Sample box temp:

$$\begin{matrix} \text{Point B} \\ 8 \frac{3}{4}'' + 4 \frac{5}{8}'' = \end{matrix} \boxed{13 \frac{3}{8}''}$$

Start-in 135 °F, out 135 °F; Stop-in _____ °F, out _____ °F

Impactor pressure drop (Aps) - calculated 1.0 "H₂O Real 1.0 "H₂O

Impactor static inlet pressure - Start 1.0 "H₂O, Stop _____ "H₂O

Start time 13:37 End time 16:11

Sample run time 70 min

Comments + sketches:

Stop 13:52 hrs. 100' to

Start 13:11 hrs.

Duration - 122 min.

Start 15:55 hrs.

Stop 16:11 hrs. (100' to down)

Brink BMS-II Calculations

Date 10/2/07 Run # 2 Location TP-2

Plant C. Century Fairfield Ala.

Data: 370.29.58

Duct press Pd _____ "Hg Molecular wt Md _____

Duct Temp Td _____ °F Vel. head Δp _____ "H₂O

$$\text{Velocity } V_d = 85.48 \times C_p \times \sqrt{\frac{(T_d + 460) \times \Delta p}{M_d \times P_d}}$$

Duct

$$V_d (\text{ft/sec}) = 85.48 \left(\quad \right) \sqrt{\frac{(\quad + 460)(\quad)}{(\quad)(\quad)}} = \underline{\quad}$$

Same as TP-2 #1

Probe nozzle selection for a flow rate of $F_3 = \underline{\quad}$ ft³/min

Nozzle = _____ mm

Δpc from calibration curve = _____ "Hg

Sampling Δp calculation: (Est box temp = _____ °F)

$$\Delta p_s = \Delta p_c \times \frac{M_d}{29} \times \frac{P_d}{29.92} \times \frac{460 + 77}{460 + T_{box}} = \Delta p_c (0.6189) \frac{M_d P_d}{T_{box}}$$

$$\Delta p_s = \left(\quad \right) 0.6189 \frac{(\quad)(\quad)}{(460 + \quad)} = \underline{1.0} \text{ "Hg}$$

Comments:

Stage	Val	Flow
1	0.4-1.2	
2	0.4-1.2	
3	0.4-1.2	
4	0.4-1.2	
5	0.4-1.2	

B-1-9

Operator D. H. H.

Brink Data Sheet

Date 11/15 Run# 7 Location 711 S

Plant Water Treatment

Data: Stack gas molecular wt. 27

Stack temp 135 °F, Stack static press. 0 "H₂O

Barometric Press 29.4 "Hg, Ambient Temp 80 °F

Probe tip diameter 1.5 mm, Probe immersion 3 1/4 in.
 $T_{probe} = 135 \frac{1.5}{3.25}$

Sample box temp:

Start-in 135 °F, cut 110 °F; Stop-in 110 °F, cut 110 °F

Impactor pressure (w/imp) calculated 1.0 "H₂O, Real 1.0 "H₂O

Impactor static inlet pressure - Start 1.0 "H₂O, Stop 1.0 "H₂O

Start time 17:25 End time 18:05

Sample run time 90 min

Comments + sketches:

Started in 711 S (down at 711 S) - all the way in 30 min
 got enough flow to maintain flow rate at 1.0 "H₂O
 still in calibration

Impactor change - 17:45 (3 min into run) - all the same

Probe cut - 18:05

Stack temp - 135 °F

Probe cut - 18:05

Sample down - 18:05

Probe cut - 18:05

Unit down - 18:05 B-1-10 Operator J. N. Smith

Brink BMS-II Calculations

Date 10/9/75 Run # 3 Location TP-2 (outlet)

Plant Delaware Fairfield Alum

Data: BP = ~~28.50~~ 29.70

Duct press P_d 0.2 "Hg Molecular Wt M_d 46

Duct Temp T_d 135 °F Vel head Δp 0.0 "H₂O

$$\text{Velocity } V_d = 85.48 \times C_p \times \sqrt{\frac{(T_d + 460) \times \Delta p}{M_d \times P_d}}$$

$$V_d (\text{ft/sec}) = 85.48 \left(\quad \right) \sqrt{\frac{(\quad + 460)(\quad)}{(\quad)(\quad)}} = \underline{\quad}$$

~~*~~ Same as TP2 #1 ~~*~~
 Probe nozzle selection for a flow rate of $F_s = \underline{\quad}$ ft³/min

Nozzle = mm

Δp_c from calibration curve = "Hg

Sampling Δp calculation: (Est box temp = °F)

$$\Delta p_s = \Delta p_c \times \frac{M_d}{29} \times \frac{P_d}{29.92} \times \frac{460 + 77}{460 + T_{box}} = \Delta p_c (0.6189) \frac{M_d P_d}{T_{box}}$$

$$\Delta p_s = \left(\quad \right) 0.6189 \frac{(\quad)(\quad)}{(460 + \quad)} = \underline{1} \text{ "Hg}$$

Comments:

Stage	Point #	Flow (lb)
1	64-17	11
2	64-18	
3	64-19	
4	64-20	B-1-11
5	64-21	

Operator D. Hill

Brink Data Sheet

Date 10/7/75 Run# 3 Location Palcoalt

Plant Celotex - Fairfield (line)

Data: Stack gas molecular wt air

Stack temp 135 °F, Stack static press. 0.5 "H₂O

Barometric Press 29.80 "Hg, Ambient Temp 70+ °F

Probe tip diameter 1.5 mm, Probe immersion 8 3/4 in
13 3/8 total

Sample box temp:

Start - in 140 °F, out 145 °F; Stop - in 147 °F, out 148 °F

Impactor pressure drop (Aps) - calculated 1.1 "H₂O Real 1.0 "H₂O

Impactor static inlet pressure - Start 0.7 "H₂O, Stop 0.7 "H₂O

Start time 0835 End time 0911

Sample run time 1.20 min

Comments + sketches:

line down - stop 0907 (30 min)

restart - 0918

OK at - 1046

Brink BMS-II Calculations

Date 10/9/75 Run # X-1 Location TP-1

Plant Delaware Fairfield

Data:

Duct press $P_d = 1.5$ "Hg

Molecular wt $M_d = 111$

Duct Temp $T_d = 120$ °F

Vel head $\Delta p = \frac{1.5}{0.67}$ "H₂O

$$\text{Velocity } V_d = 85.48 \times C_p \times \sqrt{\frac{(T_d + 460) \times \Delta p}{M_d \times P_d}}$$

$$V_d (\text{ft/sec}) = 85.48 \left(\quad \right) \sqrt{\frac{(\quad + 460)(\quad)}{(\quad)(\quad)}} = \underline{\quad}$$

Data sources TP-1 #1

Probe nozzle selection for a flow rate of $F_s = \underline{\quad}$ ft³/min

Nozzle = mm

Δp_c from calibration curve = "Hg

Sampling Δp calculation: (EST box temp = °F)

$$\Delta p_s = \Delta p_c \times \frac{M_d}{29} \times \frac{P_d}{29.92} \times \frac{460 + 77}{460 + T_{\text{box}}} = \Delta p_c (0.6189) \frac{M_d P_d}{T_{\text{box}}}$$

$$\Delta p_s = (\quad) 0.6189 \frac{(\quad)(\quad)}{(460 + \quad)} = \underline{1.0} \text{ "Hg}$$

Comments:

Brink Data Sheet

Date 10/9/75 Run# X-1 Location TP-1 Inlet

Plant McCleary, Fairfield (US)

Data: Stack gas molecular wt 100

Stack Temp 120 °F, Stack static press -1.5 "H₂O

Barometric Press 29.70 "Hg, Ambient Temp 80 °F

Probe tip diameter 1.5 mm, Probe immersion 20 in
2.75 in

Sample box temp:

Start-in 120 °F, out 125 °F; Stop-in 121 °F, out 122 °F

Impactor pressure drop (Apo) - calculated 1.0 "H₂O, Real 1.0 "H₂O

Impactor static inlet pressure - Start 1.0 "H₂O, Stop 1.0 "H₂O

Start time 1354 End time 1425

Sample run time 25 min

Comments + sketches:

Stop 1355 (one min) ...

... 1357

Stop 1425

APPENDIX C
VISIBLE EMISSION RESULTS

INCLUDES:

Visible Emissions Summary Tables

For

Outlet Stack Location TP-2

Outlet Stack Location TP-3

Fugitive Emissions Areas (Saturator Hood, etc.)

Visible Emissions Field Data Sheets

SEP 6 1974

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GUIDELINES FOR USE OF METHOD 9
FOR DETERMINATION OF HSPS

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I. Purpose

To establish basic procedures for visually determining the opacity of emissions for the purpose of attaining baseline opacity data for HSPS. These general guidelines are to aid the observer in ensuring representative data is collected.

II. Observer Qualification

Prior to performing work for Emission Standards and Engineering Division, the observer must meet the following qualifications:

1. He must have a current certification from a smoke school conducted by either the Environmental Protection Agency, State air pollution agency or local air pollution agency.

2. He must have attended, at one time, the classroom portion of the smoke school.

Certificates indicating the above requirements have been met, will be submitted to the Emission Measurement Branch and filed.

III. General

1. The procedures set forth in Method 9 shall be followed.

2. The data should be recorded on the attached forms. Note that observations are made and recorded at 15 second intervals. It is suggested a digital clock be used for timekeeping. Use of a stopwatch is helpful for exactly timing short periods of peak emissions such as during rapping, soot-blowing, bag cleaning, etc.

3. Each observer should monitor only one emission source at a time.

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4. Before beginning observations, the observer should determine that the feedstock or fuel is representative of that which would result in the highest level of visible emissions. The facility should be operating at or close to design capacity and the control system should be operating properly.

5. Before beginning observations, the observer should make arrangements with the operator to obtain the necessary process data. The observer should arrange for the process to be monitored and for the data to be recorded for the entire period of observations. Care should be taken to insure that the clocks used by the smoke observers are precisely synchronized with the clock (or chart recorder) used to record process data. Process data obtained should include:

- a. Production rates
 - (1) maximum rated capacity
 - (2) actual operating rate
- b. Production schedule
 - (1) start-ups
 - (2) shutdowns
 - (3) charging, soot-blowing, tapping, etc.
- c. Control device data
 - (1) recent maintenance history
 - (2) cleaning mechanism and cycle information

6. Two qualified observers are required to monitor any source when the data is collected for standard development. During the test, the two observers should:

- a. not take breaks at the same time.
- b. use either the same timepiece or synchronized timepieces for recording observations to avoid confusion during data reduction.
- c. not compare readings until all observations at the source have been completed.

7. The observer should request the appropriate plant personnel to briefly review and comment on the opacity measurements and process data.

8. The observer should comment on:

- a. the basis for choosing the observation periods used.
- b. why it is believed the periods chosen constitute periods of greatest opacity.
- c. why the observations span a time period sufficient to characterize the opacity.

IV. Length of Observation Period

1. When other emission tests (i.e., EPA Methods 5 - 8) are also being conducted, the opacity observations should be made simultaneously. However, it may not be sufficient to make observations only during the actual emission tests (Methods 5 - 8). It is suggested that extended observation periods be used. If properly arranged these extended observation periods will encompass the planned emission test runs. For example: Three tests by EPA Method 5 are required, two ninety-minute tests to be conducted one day, one test conducted the following day. On the first day, rather than just observing the emissions during the actual

ninety-minute tests, an extended observation period of six continuous hours would be used to encompass both emission tests by Method 5. If simultaneous visible emission observations are desired during all the emission test runs, then the following day during the third test by Method 5 an additional observation period of ninety minutes would be conducted.

2. Past data indicate that the type of control device influences the behavior of emissions. For this reason the following minimum observation times are suggested.

a. Baghouse

Observation during six continuous hours of normal operations unless additional time is necessary to encompass:

- (1) at least one complete production cycle in batch type operations.
- (2) at least three periods of peak emissions obviously due to baghouse cleaning (if such peak periods exist).

b. Scrubber

Observation during six continuous hours of normal operation unless additional time is necessary to encompass:

- (1) at least three complete cycles in batch type operations.
- (2) at least three periods of normal process variations (start-up, shutdown, soot-blowing, etc.) where opacity is suspected of being greater than normal.

c. Precipitator

Observation during six continuous hours of normal operation unless additional time is necessary to encompass:

- (1) at least three complete process cycles in batch type operations.
- (2) at least three periods of normal process variations (start-up, shutdown, soot-blowing, etc.) where opacity is suspected of being greater than normal.
- (3) at least three periods of peak emissions due to precipitator rapping (if such peak periods exist).

V. Weather Restrictions

Emission source tests (EPA Methods 5 - 8) are generally not sensitive to weather and will not be cancelled due to the inability to perform concurrent visible emission evaluations. Planned visual observations should normally be attempted during source tests (Methods 5 - 8) conducted in adverse weather. However, the visible emission readings should later be repeated under more favorable weather conditions according to the guidelines below.

1. Black smoke
 - a. Night
 - b. Fog, precipitation
2. White or colored smoke
 - a. Night
 - b. Fog, precipitation

- c. Overcast sky
- d. Greater than 50% cloud covering
- 3. Steam plumes
 - a. Repeat observations at a time when atmospheric conditions allow more rapid evaporation of the steam.

VI. Field Kit

- 1. Digital clock, battery operated
- 2. Stopwatch (2)
- 3. Compass
- 4. Wet bulb - dry bulb thermometer
- 5. Clipboard
- 6. Data sheets
- 7. Sun visor
- 8. Extra batteries, Hg type
- 9. Anemometer

GUIDELINES FOR PREPARING SUMMARY
OF VISIBLE EMISSIONS

1. The attached form is to be used for summarizing visible emissions data obtained for the Emission Measurement Branch for the purpose of developing Standards of Performance for New Sources.
2. When more than one observer takes readings simultaneously, separate summaries shall be prepared for each observer, and the table should include below "Summary of Visible Emissions", "Observer #1" or "Observer #2", etc.
3. When any changes in reading conditions occur during a summary time period, the variations should be noted on the table as space permits, and, in a discussion of the results accompanying the table/s, the time of changes should be documented and what effect, if any, the changes have on the validity of the data. For example:
Description of Sky: Clear to Overcast
Wind Direction: N to NE
4. Each set consists of 24 readings taken at 15-second intervals as specified in Method 9. The 6-minute average opacities shall be rounded off to the nearest 0.1%.
5. The plot at the bottom of the table is 6-minute opacity averages versus time. Unless otherwise specified by an EPA Project Officer, the opacity scale shall be 0-50%. If the capability of reducing the form to 8 1/2" x 11" is not available, this plot should be included on a separate sheet referencing and following the table.

FACILITY
Summary of Visible Emissions

Date: 10-1-65

Type of Plant: ASPHALT REFINERY

Type of Discharge: STACK

Location of Discharge: S.W. 1/4 Sec. (TP-2)

Height of Point of Discharge: ~35'

Description of Background: SKY & RICE COUNTRYSIDE

Description of Sky: OVERCAST

Wind Direction: NONE

Color of Plume:

Duration of Observation: 110 MIN. (READING INTERRUPTED DUE TO RAIN)

Observer: I. (Hanger)

Distance from Observer to Discharge Point: ~1/2 MI

Height of Observation Point:

Direction of Observer from Discharge Point: N

Wind Velocity: 0-2

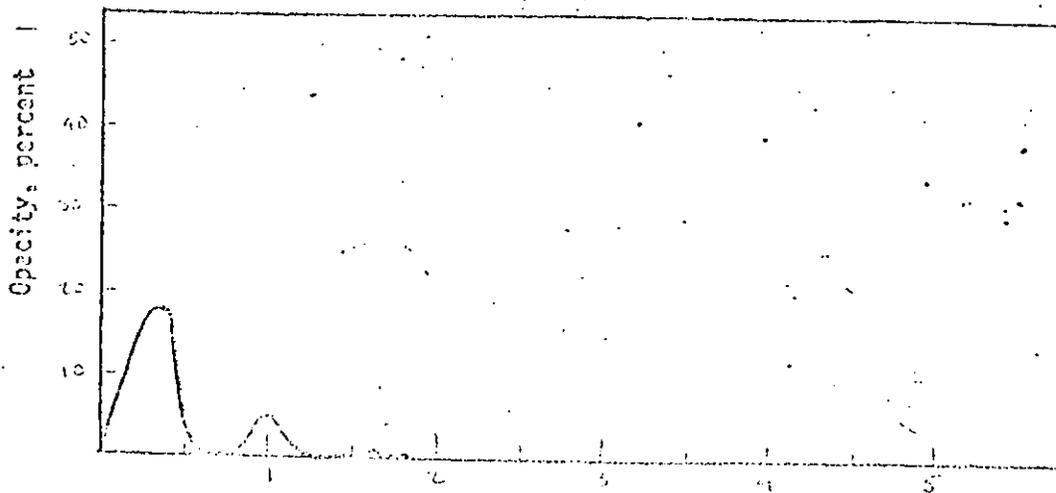
Detached Plume: No

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	9:05	9:11	120	5.0	21				
2	9:11	9:17	265	11.0	22				
3	9:17	9:23	360	15.0	23				
4	9:23	9:29	425	17.7	24				
5	9:29	9:35	110	4.4	25				
6	9:35	9:41	0	0	26				
7	9:41	9:47	0	0	27				
8	9:47	9:53	0	0	28				
9	9:53	9:59	75	3.1	29				
10	9:59	10:05	120	5.0	30				
11	10:05	10:11	75	3.1	31				
12	10:11	10:17	0	0	32				
13	10:17	10:23	0	0	33				
14	10:23	10:29	0	0	34				
15	10:29	10:35	0	0	35				
16	10:35	10:41	35	1.5	36				
17	10:41	10:47	0	0	37				
18	10:47	10:53	0	0	38				
19	10:53	10:59	0	0	39				
20					40				

Sketch Showing How Opacity Varied With Time:



Summary of Visible Emissions

Date: 10-1-58

Type of Plant: Primary Refinery

Observer: R. (Shelby)

Type of Discharge: Steam

Distance from Observer to Discharge Point: ~ 3/4 mi

Location of Discharge: Steam Hdr. (70-2)

Height of Observation Point:

Height of Point of Discharge: ~ 35'

Direction of Observer from Discharge Point:

Description of Background: Sky & Forest covered trees

Description of Sky: Overcast

Wind Direction: None

Wind Velocity: 0-2

Color of Plume:

Detached Plume: No

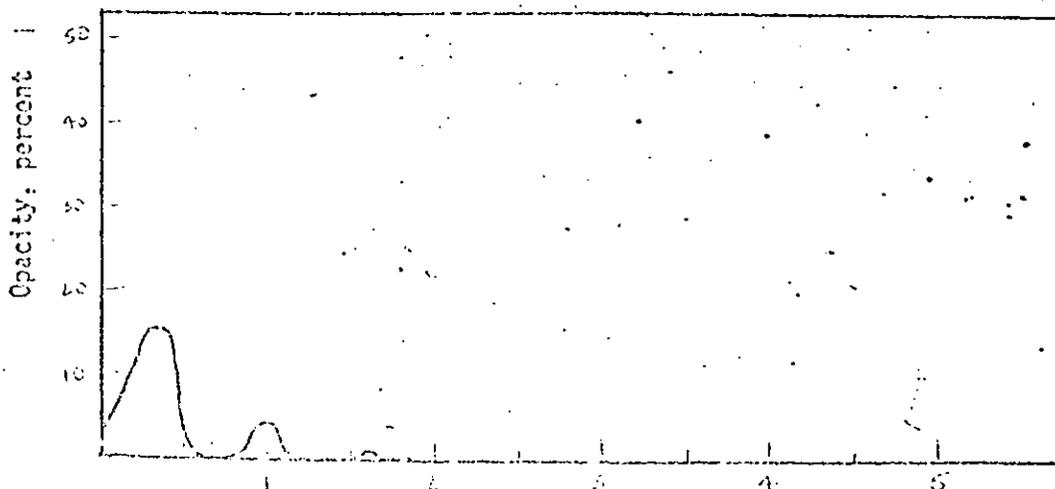
Duration of Observation: 110 min. (RECORDING INTERRUPTED DUE TO RAIN)

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	9:05	9:11	120	5.0	21				
2	9:11	9:17	220	9.2	22				
3	9:17	9:23	360	15.0	23				
4	9:23	9:29	360	15.0	24				
5	9:29	9:35	115	4.8	25				
6	9:35	9:41	0	0	26				
7	9:41	9:47	0	0	27				
8	9:47	9:53	0	0	28				
9	9:53	9:59	65	2.7	29				
10	9:59	10:05	120	5.0	30				
11	10:05	10:11	70	2.9	31				
12	10:11	10:17	0	0	32				
13	10:17	10:23	0	0	33				
14	10:23	10:29	0	0	34				
15	10:29	10:35	0	0	35				
16	10:35	10:41	25	1.0	36				
17	10:41	10:47	0	0	37				
18	10:47	10:53	0	0	38				
19	10:53	10:59	0	0	39				
20					40				

Sketch Showing How Opacity Varied With Time:



Summary of Visible Emissions

Date: 10/7/55

Type of Plant: Aromatic Refinery

Observer: A. (Stranger)

Type of Discharge: Gases

Distance from Observer to Discharge Point: ~ 30'

Location of Discharge: Stack No. (T-3)

Height of Observation Point:

Height of Point of Discharge: ~ 35'

Direction of Observer from Discharge Point: N

Description of Background: Poor - Colored Poor

Description of Sky: Clear

Wind Direction: None

Wind Velocity: 0-2

Color of Plume:

Detached Plume: No

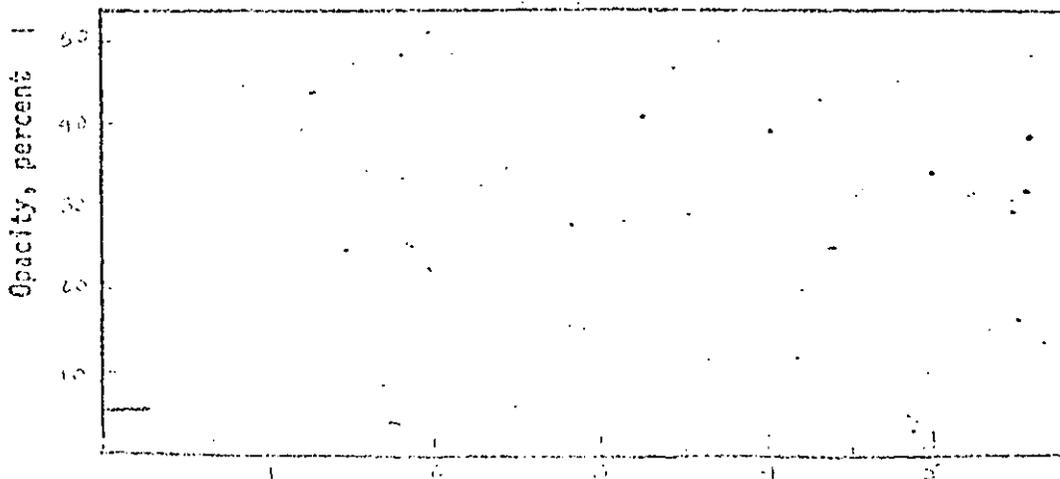
Duration of Observation: 14 min.

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	14:35	14:36	120	5.0	21				
2	14:36	14:42	120	5.0	22				
3	14:42	14:44	40	5.0	23				
4	READING STOPPED DUE TO RAIN				24				
5					25				
6					26				
7					27				
8					28				
9					29				
10					30				
11					31				
12					32				
13					33				
14					34				
15					35				
16					36				
17					37				
18					38				
19					39				
20					40				

Sketch Showing How Opacity Varied With Time:



Summary of Visible Emissions

Date: 10-1-15

Type of Plant: NUCLEAR REPROCESSING

Observer: 2 (Shulby)

Type of Discharge: STEAM

Distance from Observer to Discharge Point: 100

Location of Discharge: TOWER (10-3)

Height of Observation Point: 100

Height of Point of Discharge: 235'

Direction of Observer from Discharge Point: 100

Description of Background: ROOF COVERED DECK

Description of Sky: OVERCAST

Wind Direction: NONE

Wind Velocity: 0-2

Color of Plume:

Detached Plume: NO

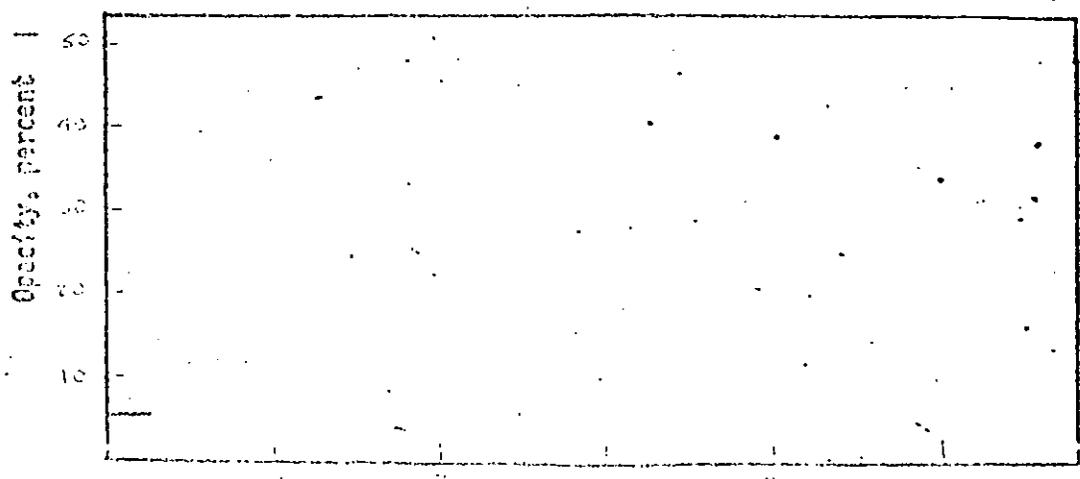
Duration of Observation: 14 min.

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	14:30	14:30	120	5.0	21				
2	14:30	14:32	120	5.0	22				
3	14:32	14:34	40	5.0	23				
4	READING	STOPPED	FOR 75 MIN		24				
5					25				
6					26				
7					27				
8					28				
9					29				
10					30				
11					31				
12					32				
13					33				
14					34				
15					35				
16					36				
17					37				
18					38				
19					39				
20					40				

Sketch Showing How Opacity Varied With Time:



Summary of Visible Emissions

Date: 10-5-15

Type of Plant: Nuclear Reactor

Observer: (Stranger)

Type of Discharge: Radiation Waste

Distance from Observer to Discharge Point: 50'

Location of Discharge: Reactor Unit
Main Bldg

Height of Observation Point:

Height of Point of Discharge:

Direction of Observer from Discharge Point: E

Description of Background: Average Noise

Description of Sky:

Wind Direction:

Wind Velocity:

Color of Plume:

Detached Plume:

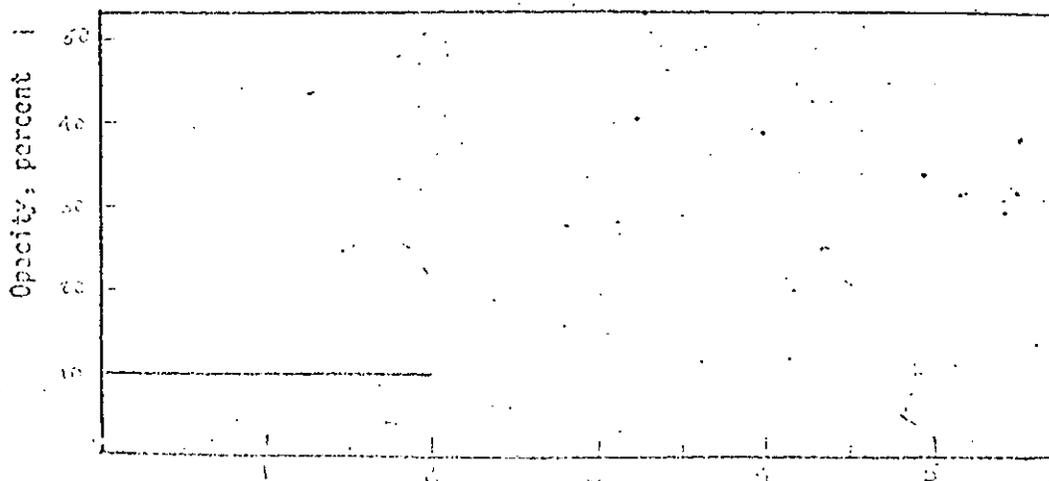
Duration of Observation: 2 Hours

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity		
	Start	End	Sum	Average		Start	End	Sum	Average	
1	10:15	10:21	240	10.0	21					
2	10:21	10:27			22					
3	10:27	10:33			23					
4	10:33	10:39			24					
5	10:39	10:45			25					
6	10:45	10:51			26					
7	10:51	10:57			27					
8	10:57	11:03			28					
9	11:03	11:09			29					
10	11:09	11:15			30					
11	11:15	11:21			31					
12	11:21	11:27			32					
13	11:27	11:33			33					
14	11:33	11:39			34					
15	11:39	11:45			35					
16	11:45	11:51			36					
17	11:51	12:01			37					
18	12:01	12:11			38					
19	12:11	12:23			39					
20	12:23	12:29			40					

Sketch Showing How Opacity Varied With Time:



Summary of Visible Emissions

Date: 10-16-75

Type of Plant: Asphal. Refining

OBSERVER: Z (Shelley)

Type of Discharge: Gaseous Vapors

Distance from Observer to Discharge Point: 100

Location of Discharge: Process Line
Floor 10-5

Height of Observation Point:

Height of Point of Discharge:

Direction of Observer from Discharge Point:

Description of Background: Machine Noise

Description of Sky:

Wind Direction:

Wind Velocity:

Color of Plume:

Detached Plume:

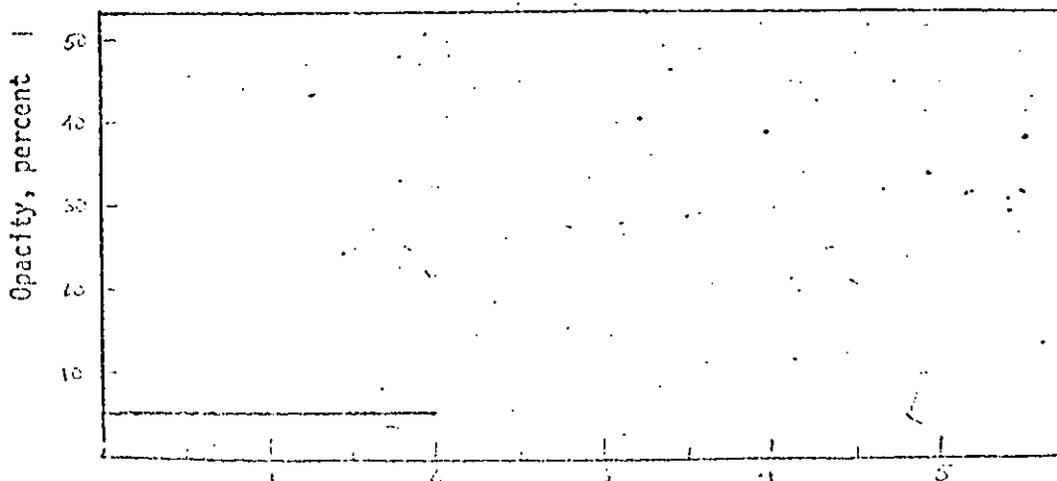
Duration of Observation: 2 Hours

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	10:15	10:21	120	6.0	21				
2	10:21	10:27			22				
3	10:27	10:33			23				
4	10:33	10:39			24				
5	10:39	10:45			25				
6	10:45	10:51			26				
7	10:51	10:57			27				
8	10:57	11:03			28				
9	11:03	11:09			29				
10	11:09	11:15			30				
11	11:15	11:21			31				
12	11:21	11:27			32				
13	11:27	11:33			33				
14	11:33	11:39			34				
15	11:39	11:45			35				
16	11:45	11:51			36				
17	11:51	11:57			37				
18	11:57	12:03			38				
19	12:03	12:09			39				
20	12:09	12:15			40				

Sketch Showing How Opacity Varied With Time:



Summary of Visible Emissions

Date: 10-8-75

Type of Plant: Asphaltery Roadside

Type of Discharge: Stack

Location of Discharge: Base No. 6
CTP-2 (3)

Height of Point of Discharge: 55'

Description of Background: Sky

Description of Sky: Partly Cloudy

Wind Direction: S

Color of Plume:

Duration of Observation: 148 min.

Observer: (Langan)

Distance from Observer to Discharge Point: 50'

Height of Observation Point:

Direction of Observer from Discharge Point: W

Wind Velocity: 5-10

Detached Plume: No

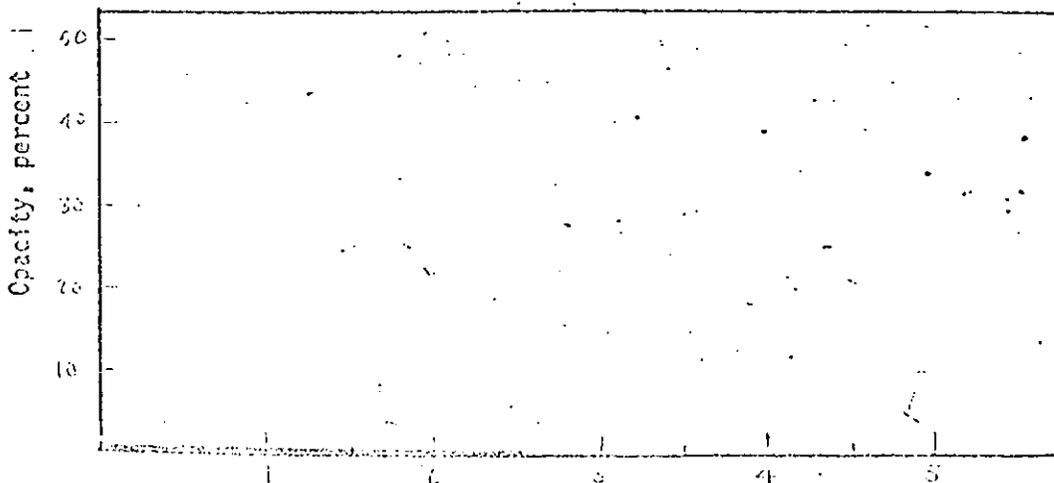
(Readings intermittent due to line breaks)
(* UNDER 6 MIN.)

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	12:45	12:51	0	0	21	17:25	17:31	0	0
2	13:15	13:21	↓	↓	22	17:31	17:37	↓	↓
3	* 13:21	13:25							
4	* 13:50	13:51							
5	15:40	15:46							
6	15:46	15:52							
7	15:52	15:58							
8	15:58	16:04							
9	16:04	16:10							
10	16:10	16:25							
11	16:25	16:31							
12	16:31	16:37							
13	16:37	16:43							
14	16:43	16:49							
15	16:49	16:55							
16	16:55	17:01							
17	17:01	17:07							
18	17:07	17:13							
19	17:13	17:19							
20	17:19	17:25							
							25			17:43	17:49
					26	17:49	18:05		
					27	* 18:55	19:00		
					28				
					29				
					30				
					31				
					32				
					33				
					34				
					35				
					36				
					37				
					38				
					39				
					40				

Sketch Showing How Opacity Varied With Time:



Summary of Visible Emissions

Date: 10/1/58

Type of Plant: Industrial - Refining

Type of Discharge: Stack

Location of Discharge: Street, W. of
City 2 1/2 mi.

Height of Point of Discharge: 255'

Description of Background: Sky

Description of Sky: Partly Cloudy

Wind Direction: SW

Color of Plume:

Duration of Observation: 120 min. (Readings intermittent due to line breaks
(* UNDER 6 MIN)

Observer: 2 (Shulby) 3 (Burbank)

Distance from Observer to Discharge Point:

Height of Observation Point:

Direction of Observer from Discharge Point:

Wind Velocity: 10-15

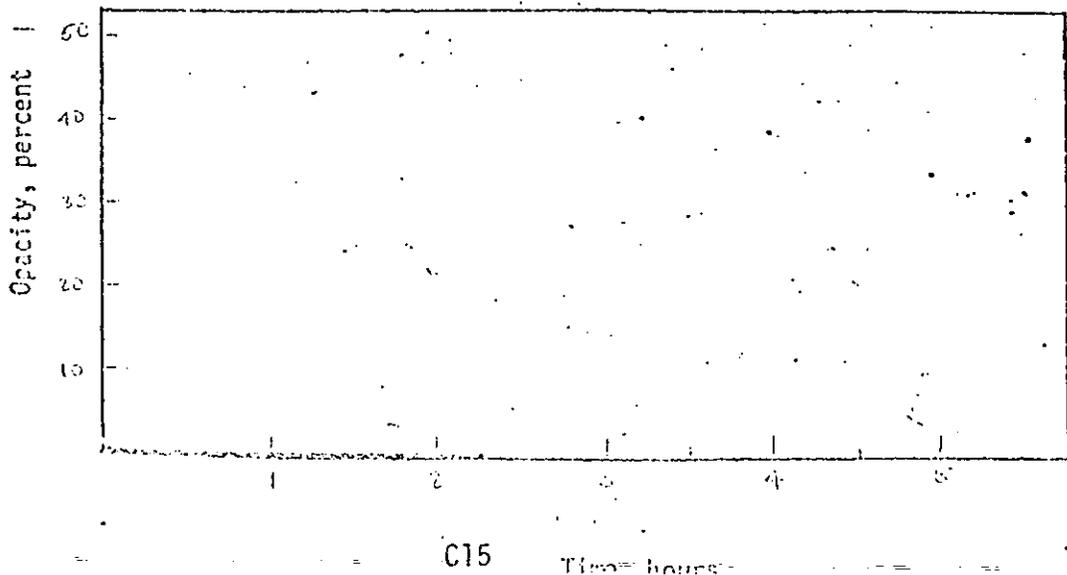
Detached Plume: No

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY					SUMMARY OF AVERAGE OPACITY				
Set Number	Start	End	Sum	Average	Set Number	Start	End	Sum	Average
1	Shulby 12:45	12:51	0	0	21	Burbank 17:44	17:50	0	0
2	13:15	13:21			22	17:50	17:56	↓	↓
3	* 13:21	13:25			23	* 17:56	18:00	↓	↓
4	* 13:50	13:51			24				
5	15:40	15:44			25				
6	15:44	15:52			26				
7	15:52	15:58			27				
8	15:58	16:04			28				
9	16:04	16:10			29				
10	16:10	16:25			30				
11	16:25	16:30			31				
12	Burbank 16:47	16:53			32				
13	16:53	16:59			33				
14	16:59	17:05			34				
15	17:05	17:11			35				
16	17:11	17:17			36				
17	17:17	17:23			37				
18	17:23	17:29			38				
19	17:29	17:35			39				
20	17:35	17:39			40				

Sketch Showing How Opacity Varied With Time:



FACILITY
Summary of Visible Emissions

Date: 10-9-75

Type of Plant: Non-Ferrous Refining

Type of Discharge: Smelter Stack

Location of Discharge: Factory Line
Mass Mt.

Height of Point of Discharge:

Description of Background: Pineapple Ridge

Description of Sky:

Wind Direction:

Color of Plume:

Observer: J. (Shaner)

Distance from Observer to Discharge Point: ~40'

Height of Observation Point:

Direction of Observer from Discharge Point: L

Wind Velocity:

Detached Plume:

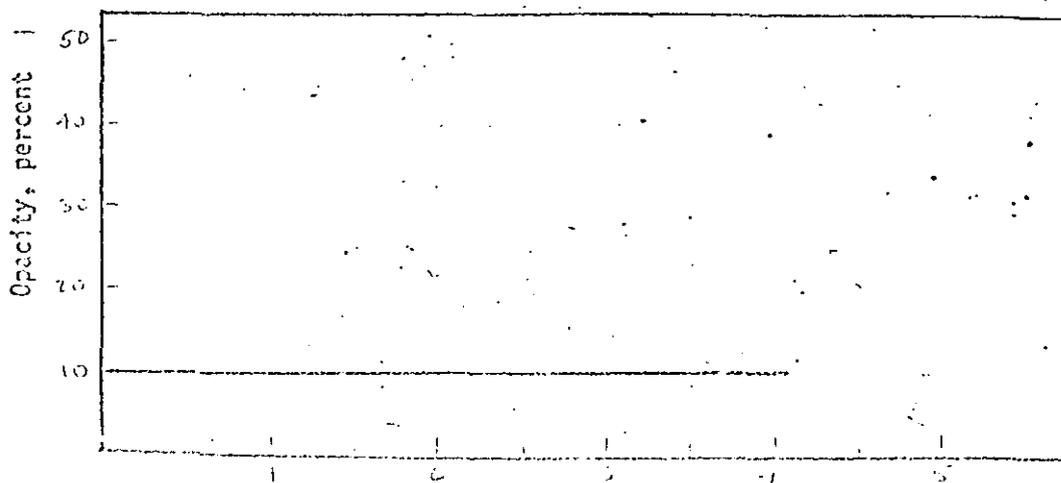
Duration of Observation: 241 min. (RECORDING INTERMITTENT DUE TO LINE BREAKS)
(AVERAGES OF SETS UNDER 6 MINUTES DETERMINED BY PROPORTION) (* UNDER 6 MIN.)

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity			
	Start	End	Sum	Average		Start	End	Sum	Average		
1	8:45	8:51	240	10.0	21	10:51	10:57	240	10.0		
2	8:51	8:57	↓	↓	22	10:57	11:03	↓	↓		
3	8:57	9:03			23	11:03	11:09				
4	* 9:03	9:09			40	24	11:09			11:15	
5	9:15	9:21			240	25	11:15			11:21	
6	9:21	9:27			26	11:21	11:27				
7	9:27	9:33			27	11:27	11:33				
8	9:33	9:39			28	11:33	11:39			↓	
9	9:39	9:45			80	29	* 11:39			11:45	240
10	9:45	9:51			30	11:50	11:56			↓	↓
11	9:51	9:57			31	11:56	12:02				
12	9:57	10:03			32	12:02	12:08				
13	10:03	10:09			33	12:08	12:14				
14	10:09	10:15			34	12:14	12:20				
15	10:15	10:21			35	12:20	12:26				
16	10:21	10:27			36	12:26	12:32				
17	10:27	10:33			37	12:32	12:38				
18	10:33	10:39			38	12:38	12:44				
19	10:39	10:45			39	12:44	12:50				
20	10:45	10:51			40	12:50	12:56				
					41	12:56	13:02				
			42	* 13:02	13:08	160					

Sketch Showing How Opacity Varied With Time:



Summary of Visible Emissions

Date: 10-19-75

Type of Plant: ASPHALT REFINERY

Observer 2 (Shulby)

Type of Discharge: DISTILLATE WOODS

Distance from Observer to Discharge Point:

Location of Discharge: PROCESS LINE WOODS #15

Height of Observation Point:

Height of Point of Discharge:

Direction of Observer from Discharge Point:

Description of Background: WHEATLAND MOON

Description of Sky:

Wind Direction:

Wind Velocity:

Color of Plume:

Detached Plume:

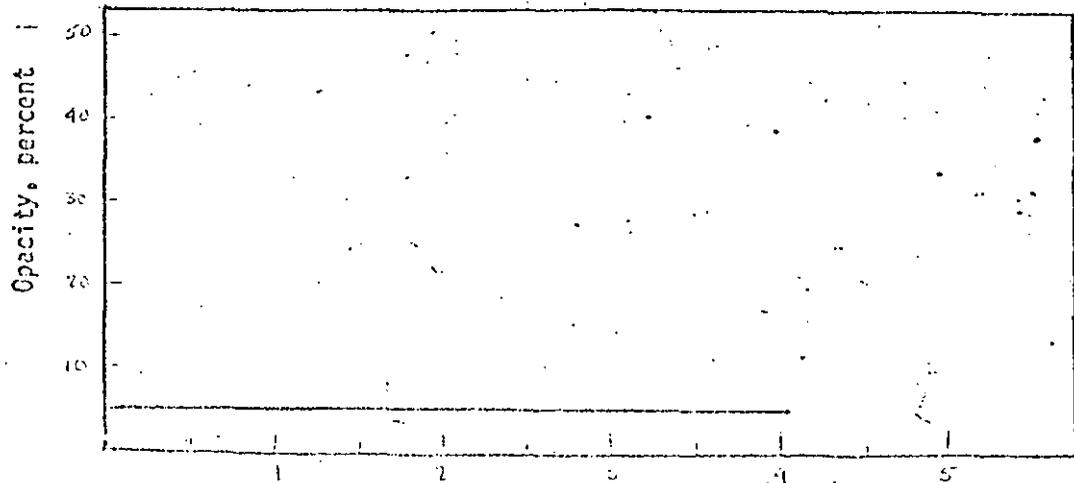
Duration of Observation: 245 MIN. (AVERAGES OF SETS UNDER 6 MINUTES DETERMINED BY OPERATION) (* UNDER 6 MIN.)

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	8:45	8:51	120	5.0	21	10:51	10:57	120	5.0
2	8:51	8:57			22	10:57	11:03		
3	8:57	9:03			23	11:03	11:09		
4	* 9:03	9:09	40		24	11:09	11:15		
5	9:09	9:15	120		25	11:15	11:21		
6	9:15	9:21			26	11:21	11:27		
7	9:21	9:27			27	11:27	11:33		
8	9:27	9:33			28	11:33	11:39		
9	9:33	9:39			29	* 11:39	11:45	60	
10	9:39	9:45			30	11:45	11:51	120	
11	9:45	9:51			31	11:51	11:57		
12	9:51	10:03			32	12:02	12:08		
13	10:03	10:09			33	12:08	12:14		
14	10:09	10:15			34	12:14	12:20		
15	10:15	10:21			35	12:20	12:26		
16	10:21	10:27			36	12:26	12:32		
17	10:27	10:33			37	12:32	12:38		
18	10:33	10:39			38	12:38	12:44		
19	10:39	10:45			39	12:44	12:50		
20	10:45	10:51			40	12:50	12:56		
					41	12:56	13:02		
					42	* 13:02	13:08	80	

Sketch Showing How Opacity Varied With Time:



FACILITY
Summary of Visible Emissions

Date: 10-11-75

Type of Plant: Nuclear Reactor

Observer: V. (Shaner)

Type of Discharge: Stack

Distance from Observer to Discharge Point: 50'

Location of Discharge: Same Loc. (p. 2)

Height of Observation Point:

Height of Point of Discharge: 35'

Direction of Observer from Discharge Point: W

Description of Background: Sky

Description of Sky: Clear

Wind Direction: S

Wind Velocity: 5-10

Color of Plume:

Detached Plume: No

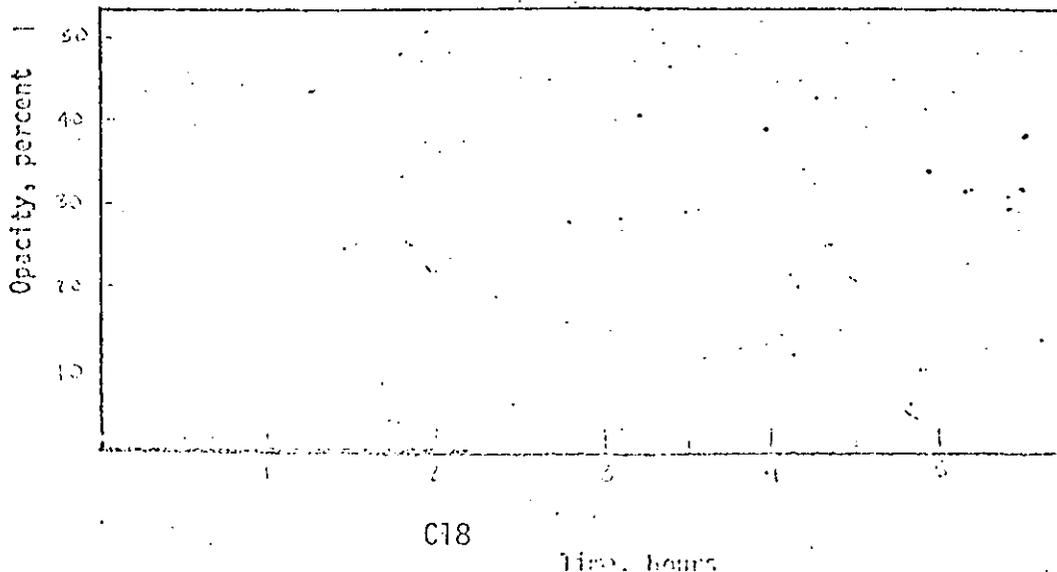
Duration of Observation: 12.4 min. (Averages Intermittent due to Line Breaks)
(Averages of Sets Under 6 Minutes Determined by Proportion) (% Under 6 min.)

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	14:15	14:21	0	0	21	16:26	16:32	0	0
2	14:21	14:27	↓	↓	22	16:32	16:38	↓	↓
3	14:27	14:33			23	* 16:38	16:43		
4	* 14:33	14:39			24				
5	14:41	14:47			25				
6	14:47	14:53			26				
7	14:53	14:59			27				
8	14:59	15:05			28				
9	* 15:05	15:11			29				
10	15:11	15:17			30				
11	15:17	15:23			31				
12	15:23	15:29			32				
13	15:29	15:35			33				
14	15:35	15:41			34				
15	15:41	15:47			35				
16	15:47	15:53			36				
17	15:53	16:00			37				
18	16:00	16:06			38				
19	16:06	16:12			39				
20	16:12	16:18			40				

Sketch Showing How Opacity Varied With Time:



FACILITY
Summary of Visible Emissions

Date: 10/18/75

Type of Plant: Nuclear Reactor

Type of Discharge: Stack

Location of Discharge: Stack No. (1-2)

Height of Point of Discharge: ~36'

Description of Background: Sky

Description of Sky: Clear

Wind Direction:

Color of Plume:

Duration of Observation: 118 min. (READINGS INTERMITTENT DUE TO LINE BREAKS)
(X UNDER 6 m)

Observer: Z (Shulby)

Distance from Observer to Discharge Point:

Height of Observation Point:

Direction of Observer from Discharge Point:

Wind Velocity: 5-10

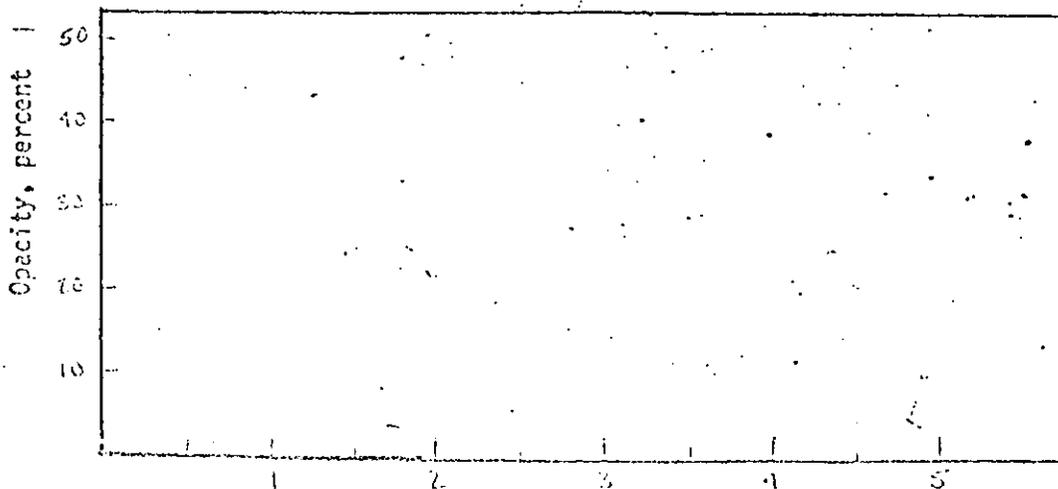
Detached Plume: No

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	14:15	14:21	0	0	21	16:26	16:32	0	0
2	14:21	14:27			22	* 16:32	16:33	↓	↓
3	14:27	14:33			23				
4	* 14:33	14:39			24				
5	14:41	14:47			25				
6	14:47	14:53			26				
7	14:53	14:59			27				
8	14:59	15:05			28				
9	* 15:05	15:07			29				
10	15:20	15:24			30				
11	15:26	15:32			31				
12	15:32	15:38			32				
13	15:38	15:44			33				
14	15:44	15:50			34				
15	15:50	15:56			35				
16	15:56	16:02			36				
17	16:02	16:08			37				
18	16:08	16:14			38				
19	16:14	16:20			39				
20	16:20	16:26			40				

Sketch Showing How Opacity Varied With Time:



FACILITY
Summary of Visible Emissions

Date: 11-9-16

Type of Plant: *Asphalt Refinery*

Capacity: 3 (*Burlant*)

Type of Discharge: *Intermittent*

Distance from Observer to Discharge Point: *100*

Location of Discharge: *Along H.C. (T.P. 24)*

Height of Observation Point:

Height of Point of Discharge: *~ 35'*

Direction of Observer from Discharge Point: *NE*

Description of Background: *Skys*

Description of Sky: *Clear*

Wind Direction: *NE*

Wind Velocity: *0-5*

Color of Plume:

Detached Plume:

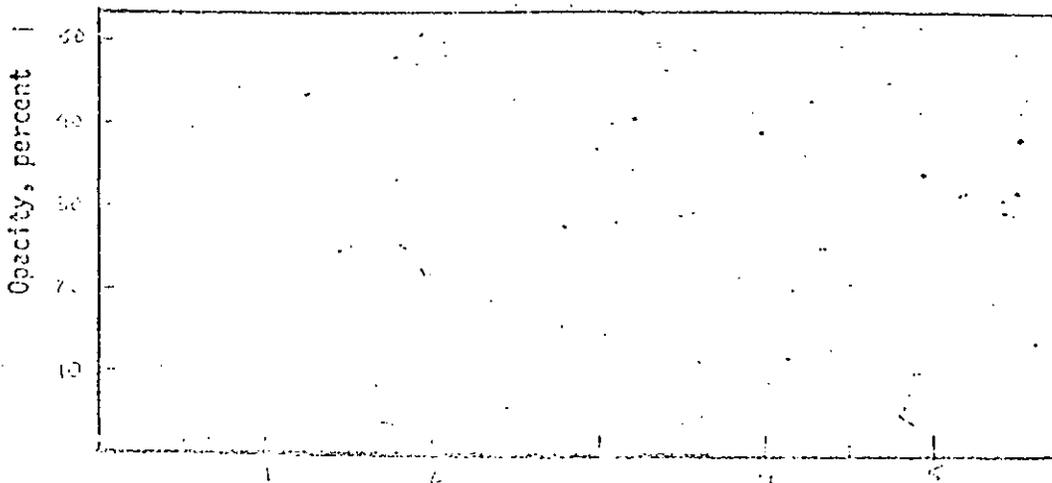
Duration of Observation: *20 min. (RENDERED INTERMITTENT DUE TO LINE BREAKS)*
(** UNREAD & OMISSION*)

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	* 9:50	9:59	0	0	21	11:12	11:19	0	0
2	9:59	9:29	↓	↓	22	11:19	11:24	↓	↓
3	9:29	9:30			23	11:24	11:30		
4	9:30	9:36			24	11:30	11:36		
5	9:36	9:42			25	* 11:36	11:42		
6	9:42	9:48			26	11:42	11:47		
7	9:48	9:54			27	11:47	11:53		
8	9:54	10:00			28	11:53	11:59		
9	10:00	10:06			29	11:59	12:05		
10	10:06	10:12			30	12:05	12:11		
11	10:12	10:18			31	12:11	12:17		
12	10:18	10:24			32	12:17	12:23		
13	* 10:24	10:29			33	12:23	12:29		
14	10:29	10:36			34	12:29	12:35		
15	10:36	10:42			35	12:35	12:41		
16	10:42	10:48			36	12:41	12:47		
17	10:48	10:54			37	12:47	12:53		
18	10:54	11:00			38	12:53	12:59		
19	11:00	11:06			39	* 12:59	13:00		
20	11:06	11:12			40				

Sketch Showing How Opacity Varied With Time:



FACILITY
Summary of Visible Emissions

Date: 10/1/55

Type of Plant: Nuclear Reactor

Type of Discharge: Steam

Location of Discharge: 3500 ft. (71° 3)

Height of Point of Discharge: 435'

Description of Background: SKY

Description of Sky: CLEAR

Wind Direction: NE

Color of Plume:

Duration of Observation: 122 min. (RENDINGS INTERMITTENT DUE TO LINE BREAKS)
(* UNDER 6 min)

Observer: S (Burlank)

Distance from Observer to Discharge Point:

Height of Observation Point:

Direction of Observer from Discharge Point:

Wind Velocity: 0-10

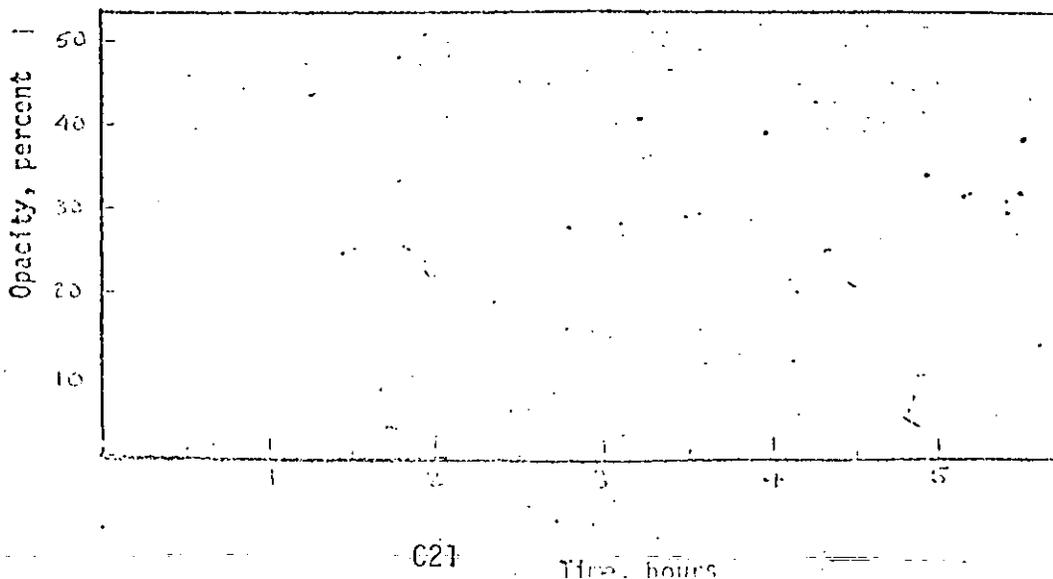
Detached Plume:

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	14:15	14:21	0	0	21	16:30	16:36	0	0
2	14:21	14:27			22	* 16:36	16:40	↓	↓
3	14:27	14:33			23				
4	* 14:33	14:35			24				
5	14:40	14:46			25				
6	14:46	14:52			26				
7	14:52	14:58			27				
8	14:58	15:04			28				
9	* 15:04	15:07			29				
10	15:20	15:26			30				
11	15:26	15:32			31				
12	15:32	15:38			32				
13	15:38	15:44			33				
14	15:44	15:50			34				
15	15:50	15:56			35				
16	15:56	16:02			36				
17	16:02	16:08			37				
18	16:08	16:14			38				
19	16:14	16:20			39				
20	* 16:20	16:25			40				

Sketch Showing How Opacity Varied With Time:



FACILITY
Summary of Visible Emissions

Date: 10-1-75

Type of Plant: NITRATE ROOFING

Type of Discharge: STACK

Location of Discharge: Same. Use. (T-2 & 3)

Height of Point of Discharge: ~ 35'

Description of Background: SKY

Description of Sky: CLEAR

Wind Direction: NE

Color of Plume:

Duration of Observation: 122 MIN. (READINGS INTERMITTENT DUE TO LINE BREAKS)
(* UNDER 6 MIN.)

Observer: A. Harrison

Distance from Observer to Discharge Point: ~ 35'

Height of Observation Point:

Direction of Observer from Discharge Point: SE

Wind Velocity: 0-3

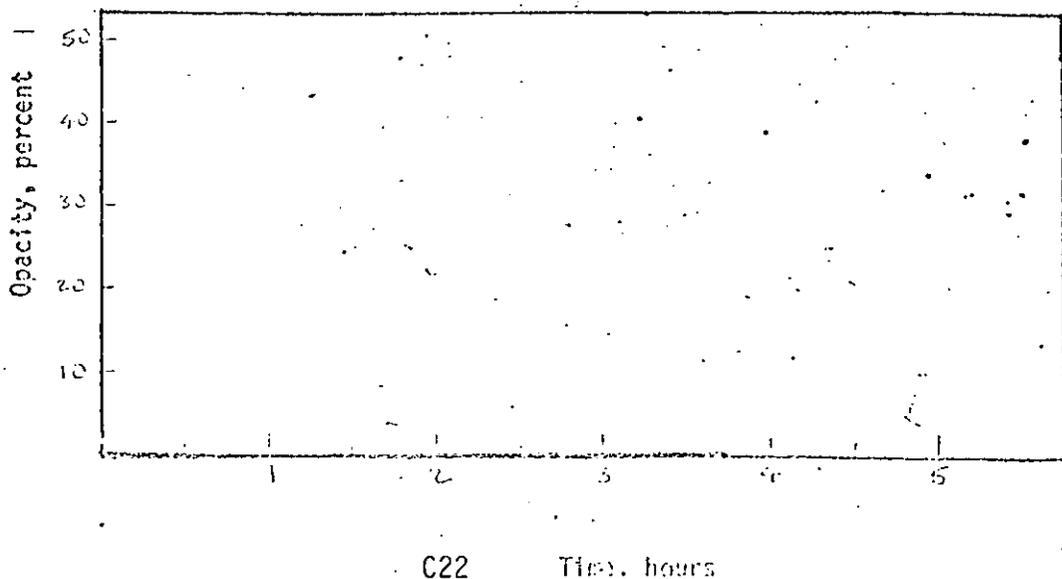
Detached Plume:

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	* 9:00	9:04	0	0	21	11:12	11:18	0	0
2	9:18	9:24	↓	↓	22	11:14	11:24	↓	↓
3	9:24	9:30			23	11:24	11:30		
4	9:30	9:36			24	11:30	11:36		
5	9:36	9:42			25	* 11:36	11:37		
6	9:42	9:48			26	11:41	11:47		
7	9:48	9:54			27	11:51	11:58		
8	9:54	10:00			28	11:58	11:59		
9	10:00	10:06			29	11:59	12:05		
10	10:06	10:12			30	12:05	12:11		
11	10:12	10:18			31	12:11	12:17		
12	10:18	10:24			32	12:17	12:23		
13	10:24	10:30			33	12:23	12:29		
14	10:30	10:36			34	12:29	12:35		
15	10:36	10:42			35	12:35	12:41		
16	10:42	10:48			36	12:41	12:47		
17	10:48	10:54			37	12:47	12:53		
18	10:54	11:00			38	12:53	12:59		
19	11:00	11:06			39	* 12:59	13:05		
20	11:06	11:12			40				

Sketch Showing How Opacity Varied With Time:



FACILITY
Summary of Visible Emissions

Date: 10-1-75

Type of Plant: REFINERY ROSEBUD

Type of Discharge: STACK

Location of Discharge: SMOG Wdg. (T-2)

Height of Point of Discharge: ~35'

Description of Background: SKY

Description of Sky: CLEAR

Wind Direction: NE

Color of Plume:

Duration of Observation: 125 MIN. (READINGS INTERMITTENT DUE TO LINE BREAKS)
(* UNDER 0.10)

Observer: A (Harrison)

Distance from Observer to Discharge Point:

Height of Observation Point:

Direction of Observer from Discharge Point:

Wind Velocity: 0-10

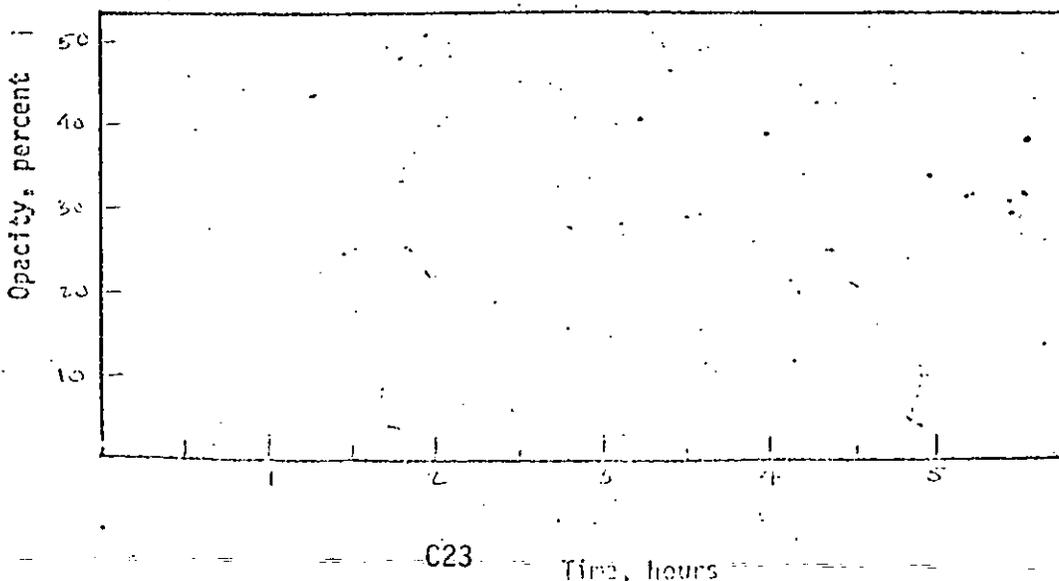
Detached Plume:

SUMMARY OF AVERAGE OPACITY

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity		Set Number	Time		Opacity	
	Start	End	Sum	Average		Start	End	Sum	Average
1	14:15	14:21	0	0	21	16:26	16:32	0	0
2	14:21	14:27	↓	↓	22	16:32	16:38	↓	↓
3	14:27	14:33			23	* 16:38	16:40	↓	↓
4	* 14:33	14:39			24				
5	14:41	14:47			25				
6	14:47	14:53			26				
7	14:53	14:59			27				
8	14:59	15:05			28				
9	* 15:05	15:07			29				
10	15:20	15:26			30				
11	15:26	15:32			31				
12	15:32	15:38			32				
13	15:38	15:44			33				
14	15:44	15:50			34				
15	15:50	15:56			35				
16	15:56	16:02			36				
17	16:02	16:08			37				
18	16:08	16:14			38				
19	16:14	16:20			39				
20	16:20	16:26			40				

Sketch Showing How Opacity Varied With Time:



APPENDIX C-I

VISIBLE EMISSIONS
FIELD DATA SHEETS

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing Manufacture Date 10-7-75
 Company Name Celotex Corp. Hours of Observation 6
 Plant Address Fairfield, Alabama Observer Lance S. Granger
 Type of Discharge STACK OTHER _____
 Discharge Location Smog Hog (TP-2)
 Height of Point of Discharge 30 ft'

U.S.E.P.A.

Observer's Location:

Distance to Discharge Point _____

Height of Observation Point _____

Direction from Discharge Point _____

Background Description Overcast Sky - Rust colored ducts

Weather: Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction NONE Wind Velocity 0-2 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other Other

Estimated Distance Plume Visible 10'

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
	min.	sec.		
0			55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

RECORD OF VISUAL EMISSIONS

Company Name Celotex
 Plant Address FA
 Stack Location TP-2 Smog Hag
 Weather Conditions OVERCAST

Date 10-7-75
 Observer GRANGER - EPA
 Observer's Location N-50' - TP-2

9:05
CST

HR	MIN	TIME				COMMENTS
		01	15	30	45	
	00	5	5	5	5	
	01	5	5	5	5	TP3 - ~20%
	02	5	5	5	5	Wind E 3-5 mph
	03	5	5	5	5	
	04	5	5	5	5	TP3 - 20%
	05	5	5	5	5	
	06	5	5	5	5	
	07	5	5	5	5	TP3 - 20%
	08	5	5	5	15	
	09	15	20	15	20	TP3 - 15%
	10	15	15	15	15	
	11	15	15	20	15	
	12	15	15	15	15	TP3 - 10%
	13	15	15	5	15	
	14	15	15	15	15	TP3 - 10%
	15	15	15	15	15	
	16	15	15	15	15	TP3 - 15%
	17	15	15	15	15	
	18	15	15	15	15	TP3 - 15%
	19	15	15	15	15	
	20	15	20	15	20	TP3 - 15%
	21	20	20	20	20	
	22	20	20	20	20	
	23	20	20	15	20	TP3 - 15%
	24	15	15	15	5	
	25	15	5	5	5	TP3 - 15%
	26	5	5	5	5	
	27	5	5	0	0	TP3 - 10%
	28	0	0	0	0	TP3 - 5%
	29	0	0	0	0	TP3 - 15%

Page 1

RECORD OF VISIBLE EMISSIONS

Company Name _____

Date 10-7-75

Plant Address _____

Observer GRANGER

Stack Location _____

Observer's Location SAME

Weather Conditions Overcast

HR	MIN	TIME				COMMENTS
		00	15	30	45	
9:35	30	0	0	0	0	TP3-15%
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	TP3-15%
	34	0	0	0	0	
	35	0	0	0	0	TP3-15%
	36	0	0	0	0	
	37	0	0	0	0	TP3-15%
	38	0	0	0	0	
	39	0	0	0	0	TP3-15%
	40	0	0	0	0	
	41	0	0	0	0	" 15
	42	0	0	0	0	
	43	0	0	0	0	" 15
	44	0	0	0	0	
	45	0	0	0	0	" 15
	46	0	0	0	0	
	47	0	0	0	0	" 15
	48	0	0	0	0	
	49	0	0	0	0	" 15
	50	0	5	5	5	
	51	5	5	5	5	" 15
	52	5	5	5	5	
	53	5	5	5	5	" 15
	54	5	5	5	5	
	55	5	5	5	5	" 15
	56	5	5	5	5	
	57	5	5	5	5	" 15
	58	5	5	5	5	
	59	5	5	5	5	" 15

Pg 2

RECORD OF VISUAL EMISSIONS

Company Name Celotex
 Plant Address _____
 Stack Location TP-2
 Weather Conditions OVERCAST

Date 10-7-75
 Observer GRANGER
 Observer's Location SAME

TIME	MIN	SPECIES				COMMENTS
		01	10	20	30	
10:05	00	5	5	5	5	TP3 - 15
	01	5	5	5	5	
	02	5	5	5	5	" 15
	03	5	5	5	0	" 5
	04	0	0	0	0	
	05	0	0	0	0	" 5
	06	0	0	0	0	
	07	0	0	0	0	" 5
	08	0	0	0	0	
	09	0	0	0	0	" 5
	10	0	0	0	0	
	11	0	0	0	0	" 5
	12	0	0	0	0	
	13	0	0	0	0	" 5
	14	0	0	0	0	
	15	0	0	0	0	" 5
	16	0	0	0	0	
	17	0	0	0	0	" 5
	18	0	0	0	0	
	19	0	0	0	0	" 5
	20	0	0	0	0	
	21	0	0	0	0	" 5
	22	0	0	0	0	
	23	0	0	0	0	" 5
	24	0	0	0	0	
	25	0	0	0	0	" 10
	26	0	0	0	0	
	27	0	0	0	0	" 10
	28	0	0	0	0	
	29	0	0	0	0	

PG 3

RECORD OF VISIBLE EMISSIONS

Company Name CelbTex
 Plant / Address _____
 Stack Location _____
 Weather Conditions _____

Date 10-7-75
 Observer GRANGER
 Observer's Location SAME

HR	MIN	TIME				COMMENTS
		30	15	30	45	
10:35	30	0	0	0	0	TP3-15
	31	0	0	0	0	
	32	0	0	0	0	TP3-15
	33	0	0	0	0	
	34	0	5	5	5	" 15
	35	5	5	5	5	
	36	0	0	0	0	TP3-5
	37					STOP - NO PROCESS DATA
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50					
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					



RECORD OF VISIBLE EMISSIONS

Company Name Celotex Corp
 Plant Address Fairfield, Alabama
 Stack Location Smog Hog - TP-2
 Weather Conditions Overcast - Rainy

Date 10-7-75
 Observer Lance S. Granger
 Observer's Location North - 50'

TIME	CONCENTRATIONS				TP-3	COMMENTS
	SO ₂	CO	NO _x	PM ₁₀		
1430	0	0	0	0	5 5 5 5	Rust Pipe for background
01	0	0	0	0	5 5 5 5	
02	0	0	0	0	5 5 5 5	
03	0	0	0	0	5 5 5 5	
04	0	0	0	0	5 5 5 5	
05	0	0	0	0	5 5 5 5	
06	0	0	0	0	5 5 5 5	
07	0	0	0	0	5 5 5 5	
08	0	0	0	0	5 5 5 5	
09	0	0	0	0	5 5 5 5	
10	0	0	0	0	5 5 5 5	
11	0	0	0	0	5 5 5 5	
12	0	0	0	0	5 5 5 5	
13	0	0	0	0	5 5 5 5	RAIN
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant ASPHALT ROOFING

Date 10/7/75

Company Name CELOTEX CORP.

Hours of Observation _____

Plant Address FAIRFIELD, ALABAMA

Observer W. A. SHULBY

Type of Discharge STACK OTHER _____

Discharge Location SMOK HOV TD-2

Height of Point of Discharge 30 FT

Observer's Location:

Distance to Discharge Point _____

Height of Observation Point _____

Direction from Discharge Point _____

Background Description OVERCAST - RUST COLORED STACKS

Weather: Clear Overcast Partly Cloudy Other _____ Color GRAY

Wind Direction NONE Wind Velocity 0-2 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning
Lofting Fumigating Other _____

Estimated Distance Plume Visible 10'

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity	
	min.	sec.		min.	sec.
0			55		
5			60		
10			65		
15			70		
20			75		
25			80		
30			85		
35			90		
40			95		
45			100		
50					

RECORD OF VISIBLE EMISSIONS

Company Name CELEX Corp
 Plant Address FIREFIELD, ALABAMA
 Stack Location TP-2 SMOKE HO
 Weather Conditions Overcast - Gray

Date 10-7-75
 Observer W. A. SHELBY
 Observer's Location NORTH OF STACK - 50. ft

HR	MIN	SPEEDS				COMMENTS
		0.1	10	20	25	
9	05					
9	00	5	5	5	5	TP-3 20%
	01	5	5	5	5	
	02	5	5	5	5	
	03	5	5	5	5	
	04	5	5	5	5	Wind EAST
	05	5	5	5	5	TP-3 20%
	06	5	5	5	5	
	07	5	5	5	5	
	08	5	5	5	5	
	09	15	15	15	15	
	10	5	15	15	15	TP-3 10%
	11	15	15	5	15	
	12	15	15	15	15	
	13	15	15	15	15	5 between 130 & 145
	14	15	15	15	15	
	15	15	15	15	15	TP-3 15%
	16	15	15	15	15	
	17	15	15	15	15	
	18	15	15	15	15	
	19	15	15	15	15	
	20	15	15	15	15	TP-3 10%
	21	15	15	15	15	
	22	15	15	15	15	
	23	15	15	15	15	
	24	15	15	15	15	
	25	15	5	5	5	TP-3 10%
	26	5	5	5	5	
	27	5	0	0	0	TP-3 5%
		0	0	0	0	
		0	0	0	0	
		0				

RECORD OF VISIBLE EMISSIONS

Company Name CELOTEX CORP
 Plant Address FAIRFIELD, N.H.
 Stack Location TP-2 SMOG HOS
 Weather Conditions OVERCAST

Date 10-7-75
 Observer M. A. STICKEL
 Observer's Location NORTH - 50 FT.

HR	MIN	TIME				COMMENTS
		10	15	30	45	
	30	0	0	0	0	
	31	0	0	0	0	
	32	0	0	0	0	TP-3 5-10%
	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	TP-3 5-10%
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	TP-3 10%
	39	0	0	0	0	
	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	TP-3 15%
	44	0	0	0	0	
	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	TP-3 15%
	49	0	0	0	0	
	50	0	0	0	5	TP-2 almost nothing
	51	5	5	5	5	"
	52	5	5	5	5	"
	53	5	5	5	5	"
	54	5	5	5	5	" TP-3 15%
	55	5	5	5	5	"
	56	5	5	5	5	" TP-3 15
	57	5	5	5	5	"
	58	5	5	5	5	"
	59	5	5	5	5	" TP-3 15
	60	5	5	5	5	

RECORD OF VISIBLE EMISSIONS

Company Name CELOTEX CORP.
 Plant Address FAIRFIELD, ALABAMA
 Stack Location TP-2
 Weather Conditions OVERCAST

Date 10-7-75
 Observer W. A. SALLEY
 Observer's Location NORTH OF STACK - 50 FT.

HR	MIN	TIME				COMMENTS
		01	15	30	45	
						Pg 3
00	5	5	5	5	TP-2 ALMOST NOTHING	TP-3 10
01	5	5	5	5	"	
02	5	5	5	5	"	
03	5	5	0	0	"	TP-3 - 0-5%
04	0	0	0	0		TP-3 almost nothing
05	0	0	0	0		TP-3 5
06	0	0	0	0		
07	0	0	0	0		TP-3 5
08	0	0	0	0		
09	0	0	0	0		
10	0	0	0	0		TP-3 5
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		TP-3 5
18	0	0	0	0		
19	0	0	0	0		
20	0	0	0	0		TP-3 5
21	0	0	0	0		
22	0	0	0	0		TP-3 - 0
23	0	0	0	0		
24	0	0	0	0		
25	0	0	0	0		TP-3 5
26	0	0	0	0		
27	0	0	0	0		
28	0	0	0	0		
29	0	0	0	0		TP-3 10

RECORD OF VISIBLE EMISSIONS

Company Name CELOTEX CORP.

Date 10-7-75

Plant Address Fairfield Station

Observer W. B. Shulley

Stack Location Area 17 TP-2

Observer's Location _____

Weather Conditions Overcast

HR	MIN	TIME				COMMENTS
		00	15	30	45	
	30	0	0	0	0	TP-3 10%
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	5	TP-3 10 TP-3 15
	35	5	5	5	5	
	36	5	0	0	0	
10:42 AM	37	0				TP-3 5
	38					
1:34 PM	39	5	5	5	5	
	40	5	5	5		TP-3 5
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50					
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					

RECORD OF VEHICLE EMISSIONS

Company Name CECOTEX COOP
 Plant Address FAIRFIELD, ALABAMA
 Stack Location TP-3, SMOG HOD
 Weather Conditions OVERCAST

Date 10-7-75
 Observer W. A. SHULBY
 Observer's Location NORTH - 50 FT

HR	MIN	TIME				COMMENTS	Avg = 1.6			
		00	15	30	45		00	15	30	45
14:30	00	0	0	0	0		5	5	5	5
	01	0	0	0	0		5	5	5	5
	02	0	0	0	0		5	5	5	5
	03	0	0	0	0		5	5	5	5
	04	0	0	0	0		5	5	5	5
	05	0	0	0	0		5	5	5	5
	06	0	0	0	0		5	5	5	5
	07	0	0	0	0		5	5	5	5
	08	0	0	0	0		5	5	5	5
	09	0	0	0	0		5	5	5	5
	10	0	0	0	0		5	5	5	5
	11	0	0	0	0		5	5	5	5
	12	0	0	0	0		5	5	5	5
	13	0	0	0	0		5	5	5	5
	14					RAIN				RAIN
	15									
	16									
	17									
	18									
	19									
	20									
	21									
	22									
	23									
	24									
	25									
	26									
	27									
	28									
	29									

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing

Date 10-9-75

Company Name Celotex Corp

Hours of Observation 2

Plant Address Fairfield, Alabama

Observer Lance S. Granger

Type of Discharge STACK (OTHER) Hooks

Discharge Location Coating Line

Height of Point of Discharge 2'-8"

Observer's Location:

Distance to Discharge Point 20'-60"

Height of Observation Point 5' 8"

Direction from Discharge Point EAST

Background Description MACHINE AISLE

~~Weather:~~ Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction _____ Wind Velocity _____ mi/hr

Plume Description:

Detached: Yes No

Color: Black (White) Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting (Fumigating) Other Billowing

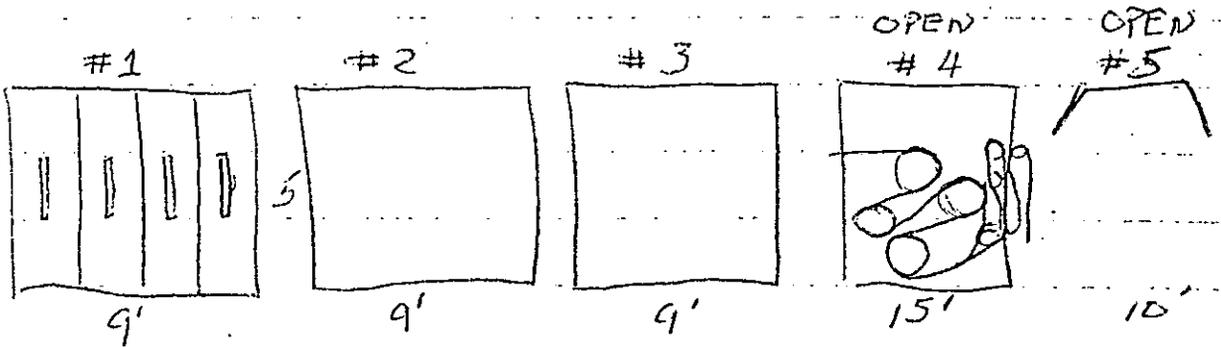
Estimated Distance Plume Visible 2'-10"

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity	
	min.	sec.			
0			55		
5			60		
10			65		
15			70		
20			75		
25			80		
30			85		
35			90		
40			95		
45			100		
50					

10-8-75

Street	Time	Location	Opacity	Duration	Comments
	9:30	East End	_____	_____	L. GRANIER
	9:50	Down			→
Restart	10:15				→
1 hr 35 min	10:15	#5	5-10	CONTINUOUS	
Down	11:50	Down			→
Restart	12:05				
STOP 25 min	12:30				→



RECORD OF VISIBLE EMISSIONS

Company Name Celotex Corp
 Plant Address Fairfield, Alabama
~~Street~~ Location Machine Hoods
 Weather Conditions Indoors - poor light

Date 10-8-75
 Observer Lance S. Granger
 Observer's Location East

HR	MIN	TIME				COMMENTS
		00	15	30	45	
10:15	00	10				Location #5 - Continuous emission
	01					Looks like hood fan has poor draft conditions.
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					All other 4 locations have zero visible emissions
	12					
	13					
	14					
	15					Pieris hoods are numbered 1 to 5 from East to West.
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name _____
 Plant Address _____
 Stack Location _____
 Weather Conditions _____

Date 10-8-75
 Observer Lance S. Granger
 Observer's Location _____

Page 2

HR	MIN	TIME		COMMENTS
		SEC	SEC'S	
10:15	30	10		Location #5 - Continuous Emission
	31			All other 4 locations have zero visible emissions
	32			
	33			
	34			
	35			
	36			
	37			
	38			
	39			
	40			
	41			
	42			
	43			
	44			
	45			
	46			
	47			
	48			
	49			
	50			
	51			
	52			
	53			
	54			
	55			
	56			
	57			
	58			
	59			
	60			

RECORD OF VISIBLE EMISSIONS

Company Name _____
 Plant Address _____
 Stack Location _____
 Weather Conditions _____

Date 10-8-75
 Observer Lance S. Grynager
 Observer's Location _____

HR	MIN	TIME				COMMENTS
		00	15	30	45	
1115	00	10				#5
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

Page 3

RECORD OF VISUAL EMISSIONS

Company Name _____
 Plant Address _____
 Stack location _____
 Weather Conditions _____

Date 10-8-75
 Observer WALDE S. GRANGER
 Observer's Location _____

CONTENTS Page 4

TIME	TYPE	DESCRIPTION	REMARKS
1145	30	10	#5
	31		
	32		
	33		
	34		
1150	35		
11	36	DOWN	
	37		
	38		
	39		
	40		
	41		
	42		
	43		
	44		
	45		
1205	46	10	
	47		
	48		
	49		
	50		
	51		
	52		
	53		
	54		
	55		
	56		
	57		
	58		

RECORD OF VISIBLE EMISSIONS

Company Name _____

Date 10-8-75

Plant Address _____

Observer Lance S. Grainger

Stack Location _____

Observer's Location _____

Weather Conditions _____

HR	MIN	NO. OF PUFFS	TIME			COMMENTS
			01	15	30		45
1215	00	10				# 5 location
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
1230	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

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SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing

Date 10-5-75

Company Name CELOTEX

Hours of Observation 2

Plant Address Fairfield Ave

Observer W. A. Shulby

Type of Discharge STACK OTHER Leaks

Discharge Location Process

Height of Point of Discharge Ground Level

Observer's Location:

Distance to Discharge Point 0'

Height of Observation Point Ground Level

Direction from Discharge Point N

Background Description industrial

Weather: Clear Overcast Partly Cloudy Other artificial light Color _____

Wind Direction —E— Wind Velocity 0 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible 5'

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
	min.	sec.		
0			55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

W. A. Shulley 10/8/75

Time	Quantity	Location	Duration	Comment
9:30 A				Down START
9:30				→ DOWN → 10:15 Start
∞	Continuous	5	#K45	Spreader Small amount in outside rock
11:50				→ Down → 12:05 Start
12:30	Stop			

Company Name Cololex
 Plant Address _____
 Stack Location Process line
 Weather Conditions _____

Date 10-8-75
 Observer W. J. Shultz
 Observer's Location W of Site

HR	TIME	E	S	W	N	COMMENTS
00						
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
10:15	15	5				Location 115 has continuous emission hard for the gas duct
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

Process hoods are numbered 1 to 5 from East to West

Location 115 has continuous emission hard for the gas duct

Other 11 locations have zero emissions

RECORD OF VISIBLE EMISSIONS

Company Name Co. Century
 Plant Address _____
 Stack Location Process Line
 Weather Conditions _____

Date 10-8-75
 Observer W. M. Smith
 Observer's Location _____

HR	MIN	TIME				COMMENTS
		01	15	30	45	
17:00	30	5				#5 continuous
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50					
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					
	60					

Pg 3

RECORD OF VISIBLE EMISSIONS

Company Name Celestis

Date 10-8-75

Plant Address _____

Observer W. A. Shultz

Stack Location _____

Observer's Location UJ

Weather Conditions Partly Cloudy

HR	MIN	TIME				COMMENTS
		00	15	30	45	
11:30	30					#5
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50					Down
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					

RECORD OF VISIBLE EMISSIONS

Company Name Co. Co. Co.
 Plant Address _____
 Stack Location Process Line
 Weather Conditions _____

Date 10 5 73
 Observer J. A. St. Clair
 Observer's Location W. of Area

HR	MIN	TIME				COMMENTS
		00	15	30	45	
17:00	00					
	01					
	02					
	03					
	04					
	05	5				HS CONTINUOUS
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt

Date 10-8-75

Company Name Celotex

Hours of Observation _____

Plant Address Fairfield Alabama

Observer WMC GEEGER

Type of Discharge STACK OTHER _____

Discharge Location TP-2 - Smog Hog

Height of Point of Discharge 35'

Observer's Location:

Distance to Discharge Point 50'

Height of Observation Point 0'

Direction from Discharge Point West

Background Description Blue Sky + Partly Cloudy

Weather: Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction 5 Wind Velocity 5-10 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible 0'

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity	
	min.	sec.			
0			55		
5			60		
10			65		
15			70		
20			75		
25			80		
30			85		
35			90		
40			95		
45			100		
50					

Company Name CelTex

Date 11-8-75

Plant Address _____

Observer L.S. Carriger - EPA

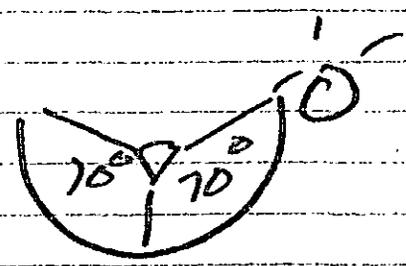
Stack Location TP 2

Observer's Location West - 50'

Weather Conditions Blue - Partly Cloudy

COMMENTS Page 1

HR	MIN	TIME				COMMENTS
		1	2	3	4	
1245	00	0	0	0	0	<u>TP-3</u> 0 0 0 0
	01	0	0	0	0	0 0 0 0
	02	0	0	0	0	0 0 0 0
	03	0	0	0	0	0 0 0 0
	04	0	0	0	0	0 0 0 0
	05	0	0	0	0	0 0 0 0
	06					DOWN
	07					
	08					
	09					0
	10					
	11					
	12					
	13					
	14					<u>TP-3</u>
1315	15	0	0	0	0	0 0 0 0
	16	0	0	0	0	0 0 0 0
	17	0	0	0	0	0 0 0 0
	18	0	0	0	0	0 0 0 0
	19	0	0	0	0	0 0 0 0
	20	0	0	0	0	0 0 0 0
	21	0	0	0	0	0 0 0 0
	22	0	0	0	0	0 0 0 0
	23	0	0	0	0	0 0 0 0
	24	0	0	0	0	0 0 0 0
	25					DOWN
	26					
	27					
	28					
	29					
	30					



RECORD OF VISIBLE EMISSIONS

Company Name Celotex
 Plant Address _____
 Stack Location TP-2
 Weather Conditions Clear

Date 10-8-75
 Observer L. S. GRANGER
 Observer's Location West-50'

HR	MIN	TIME				COMMENTS
		0	15	30	45	
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					TP-3
1350	50	0	0	0	0	0 0 00 DOWN
	51					DOWN
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					

Company No. Celotex

Date 10-8-75

Plant Address _____

Observer L. J. GRANGER

Stack Location TP-2

Observer's Location West - 50'

Weather Conditions Partly Cloudy

FORM NO. PAGE 3

TIME	TEMPERATURE				HUMIDITY			
	DB	WB	WET BULB	WET BULB	RELATIVE	RELATIVE	RELATIVE	RELATIVE
00								
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

1540

TP-3

RECORD OF VISIBILITY OBSERVATIONS

Company Name _____
 Plant Address _____
 Stack Location TP-2
 Weather Conditions CLEAR

Date 10-8-75
 Observer L. GRANGER
 Observer's Location _____

COMMENTS PAGE 4

TIME	W	V	D	W	W	COMMENTS
<u>1600</u>	0	0	0	0	0	<u>TP-3</u> 0 0 0 0
31	0	0	0	0	0	0 0 0 0
32	0	0	0	0	0	0 0 0 0
33	0	0	0	0	0	0 0 0 0
34	0	0	0	0	0	0 0 0 0
35	0	0	0	0	0	0 0 0 0
36	0	0	0	0	0	0 0 0 0
37	0	0	0	0	0	0 0 0 0
38	0	0	0	0	0	0 0 0 0
39	0	0	0	0	0	0 0 0 0
40						<u>DOWN</u>
41						↓
42						
43						
44						
45						
46						
47						
48						<u>TP3</u>
<u>1620</u>	0	0	0	0	0	0 0 0 0
50	0	0	0	0	0	0 0 0 0
51	0	0	0	0	0	0 0 0 0
52	0	0	0	0	0	0 0 0 0
53	0	0	0	0	0	0 0 0 0
54	0	0	0	0	0	0 0 0 0
55	0	0	0	0	0	0 0 0 0
56	0	0	0	0	0	0 0 0 0
57	0	0	0	0	0	0 0 0 0
58	0	0	0	0	0	0 0 0 0
59	0	0	0	0	0	0 0 0 0

Company Name Celotex
Plant Address _____
Stack Location TP-2
Weather Conditions Clear

Date 10-8-75
Observer L. GRANGER
Observer's Location West 50'

COMMENTS PAGE 5

ID	1	2	3	4	5	TP3			
						6	7	8	9
1630	00	0	0	0	0	0	0	0	0
	01	0	0	0	0	0	0	0	0
	02	0	0	0	0	0	0	0	0
	03	0	0	0	0	0	0	0	0
	04	0	0	0	0	0	0	0	0
	05	0	0	0	0	0	0	0	0
	06	0	0	0	0	0	0	0	0
	07	0	0	0	0	0	0	0	0
	08	0	0	0	0	0	0	0	0
	09	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0
	27	0	0	0	0	0	0	0	0
	28	0	0	0	0	0	0	0	0
	29	0	0	0	0	0	0	0	0

LOG OF VISIBLE EMISSIONS

Company Name Celotex Date 10-8-75
 Plant Address _____ Observer L.S. GRANGER
 Stack Location TP-2 Smoelhoe Observer's Location West 50'
 Weather Conditions Clear

CONTINUED PAGE 6

TIME	1	2	3	4	5	6	7	8	9	10
1700	30	0	0	0	0	0	0	0	0	0
	31	0	0	0	0	0	0	0	0	0
	32	0	0	0	0	0	0	0	0	0
	33	0	0	0	0	0	0	0	0	0
	34	0	0	0	0	0	0	0	0	0
	35	0	0	0	0	0	0	0	0	0
	36	0	0	0	0	0	0	0	0	0
	37	0	0	0	0	0	0	0	0	0
	38	0	0	0	0	0	0	0	0	0
	39	0	0	0	0	0	0	0	0	0
	40	0	0	0	0	0	0	0	0	0
	41	0	0	0	0	0	0	0	0	0
	42	0	0	0	0	0	0	0	0	0
	43	0	0	0	0	0	0	0	0	0
	44	0	0	0	0	0	0	0	0	0
	45	0	0	0	0	0	0	0	0	0
	46	0	0	0	0	0	0	0	0	0
	47	0	0	0	0	0	0	0	0	0
	48	0	0	0	0	0	0	0	0	0
	49	0	0	0	0	0	0	0	0	0
	50	0	0	0	0	0	0	0	0	0
	51	0	0	0	0	0	0	0	0	0
	52	0	0	0	0	0	0	0	0	0
	53	0	0	0	0	0	0	0	0	0
	54	0	0	0	0	0	0	0	0	0
	55	0	0	0	0	0	0	0	0	0
	56	0	0	0	0	0	0	0	0	0
	57	0	0	0	0	0	0	0	0	0
	58	0	0	0	0	0	0	0	0	0
	59	0	0	0	0	0	0	0	0	0

Company Name Celotex
Plant Address _____
Stock Location TP-2
Weather Conditions Clear

Date 10-9-75
Observer L. S. GRANGER
Observer's Location West-50'

CONTINUED PAGE 7

HEX	TIME	TP 3							
		1	2	3	4	5	6	7	8
00		0	0	0	0	0	0	0	0
01		0	0	0	0	0	0	0	0
02		0	0	0	0	0	0	0	0
03		0	0	0	0	0	0	0	0
04		0	0	0	0	0	0	0	0
05		0	0	0	0	0	0	0	0
06		0	0	0	0	0	0	0	0
07		0	0	0	0	0	0	0	0
08		0	0	0	0	0	0	0	0
09		0	0	0	0	0	0	0	0
10		0	0	0	0	0	0	0	0
11		0	0	0	0	0	0	0	0
12		0	0	0	0	0	0	0	0
13		0	0	0	0	0	0	0	0
14		0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0
18		0	0	0	0	0	0	0	0
19		0	0	0	0	0	0	0	0
20		0	0	0	0	0	0	0	0
21		0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0
23		0	0	0	0	0	0	0	0
24		0	0	0	0	0	0	0	0
25		0	0	0	0	0	0	0	0
26		0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	0
28		0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing
 Company Name CELOTEX CORP
 Plant Address FAIRFIELD BUSINESS
 Type of Discharge STACK OTHER _____
 Discharge Location TP-2 Smog Way
 Height of Point of Discharge 35 ft

Date 10-8-75
 Hours of Observation _____
 Observer W. A. Shubert
E. Jason Deebank

Observer's Location:

Distance to Discharge Point 50 ft
 Height of Observation Point ground level
 Direction from Discharge Point west

Background Description Partly Cloudy

Weather: Clear Overcast Partly Cloudy Other _____ Color Blue
 Wind Direction SW Wind Velocity 10-15 mi/hr

Plume Description:

Detached: Yes No
 Color: Black White Other _____
 Plume Dispersion Behavior: Looping Coning Fanning
 Lofting Fumigating Other _____
 Estimated Distance Plume Visible 10'

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity	
	min.	sec.		min.	sec.
0			55		
5			60		
10			65		
15			70		
20			75		
25			80		
30			85		
35			90		
40			95		
45			100		
50					

RECORD OF VISUAL OBSERVATIONS

Company Name CENTREX Corp
 Plant Address FARFIELD, ALABAMA
 Stack Location TP-2 Longway
 Weather Conditions Partly Cloudy

Date 11-8-75
 Observer W.A. Shalley
 Observer's Location 50 ft West

TIME	TIME				COMMENTS			
	14	15	16	17	18	19	20	21
12:45					TP-3 00 15 312 75			
01	0	0	0	0	0	0	0	0
02	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	0	0
04	0	0	0	0	0	0	0	0
05	0	0	0	0	0	0	0	0
06					Dawn			
07								
08								
09								
10								
11								
12								
13								
14								
13:15	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25					Dawn			
26								
27								
28								
29								
30								

RECORD OF VISIBLE EMISSIONS

Company Name Pilotes Corp Date 11-8-75
 Plant Address Fairfield, Alabama Observer W. C. Skully
 Stack Location TP-2 Smoke Stack Observer's Location 50 ft. West
 Weather Conditions Partly Cloudy

HR	MIN	TIME				SEC	MINS	30	45	60	75	COMMENTS
		00	15	30	45							
17:50P	30	0	0						0	0		
	31										down	
	32											
	33											
	34											
	35											
	36											
	37											
	38											
	39											
	40											
	41											
	42											
	43											
	44											
	45											
	46											
	47											
	48											
	49											
17:50P	50	0	0	0	0				0	0	0	down
	51											
	52											
	53											
	54											
	55											
	56											
	57											
	58											
	59											

RECORD OF VISIBLE EMISSIONS

Company Name Altop Corp
 Plant Address Greenfield Ala.
 Stack Location 7P-3 Sump Area
 Weather Conditions Partly Cloudy

Date 10-8-75
 Observer W. A. Shulby
 Observer's Location 50 ft west
 AT 3

HR	MIN	SECONDS				TIME				COMMENTS
		00	15	30	45					
	00									
	01									
	02									
	03									
	04									
	05									
	06									
	07									
	08									
	09									
15:40	10	0	0	0	0	0	0	0	0	
	11	0	0	0	0	0	0	0	0	
	12	0	0	0	0	0	0	0	0	
	13	0	0	0	0	0	0	0	0	
	14	0	0	0	0	0	0	0	0	
	15	0	0	0	0	0	0	0	0	
	16	0	0	0	0	0	0	0	0	
	17	0	0	0	0	0	0	0	0	
	18	0	0	0	0	0	0	0	0	
	19	0	0	0	0	0	0	0	0	
	20	0	0	0	0	0	0	0	0	
	21	0	0	0	0	0	0	0	0	
	22	0	0	0	0	0	0	0	0	
	23	0	0	0	0	0	0	0	0	
	24	0	0	0	0	0	0	0	0	
	25	0	0	0	0	0	0	0	0	
	26	0	0	0	0	0	0	0	0	
	27	0	0	0	0	0	0	0	0	
	28	0	0	0	0	0	0	0	0	
	29	0	0	0	0	0	0	0	0	

RECORD OF VISIBLE EMISSIONS

Company Name CELOTEX CORP.
 Plant Address FAIRFIELD ALA.
 Stack Location TP-2 Smog Hog
 Weather Conditions Partly Cloudy

Date 10-8-75
 Observer W.A. Shultz
 Observer's Location Wind 50

pg 4

HR	MIN	TIME								COMMENTS
		SECONDS				TP-3				
		00	15	30	45	00	15	30	45	
1600	30	0	0	0	0	0	0	0	0	
	31	0	0	0	0	0	0	0	0	
	32	0	0	0	0	0	0	0	0	
	33	0	0	0	0	0	0	0	0	
	34	0	0	0	0	0	0	0	0	
	35	0	0	0	0	0	0	0	0	
	36	0	0	0	0	0	0	0	0	
	37	0	0	0	0	0	0	0	0	
	38	0	0	0	0	0	0	0	0	
	39	0	0	0	0	0	0	0	0	
	40									down
	41									
	42									
	43									
	44									
	45									
	46									
	47									
	48									
	49	0	0	0	0	0	0	0	0	
1620	50	0	0	0	0	0	0	0	0	
	51	0	0	0	0	0	0	0	0	
	52	0	0	0	0	0	0	0	0	
	53	0	0	0	0	0	0	0	0	
	54	0	0	0	0	0	0	0	0	
	55	0	0	0	0	0	0	0	0	
	56	0	0	0	0	0	0	0	0	
	57	0	0	0	0	0	0	0	0	
	58	0	0	0	0	0	0	0	0	
	59	0	0	0	0	0	0	0	0	

RECORD OF VISIBILE EMISSIONS

Company Name Calstar
 Plant Address Fairfield, A.C.
 Stack Location TP2, also TP3.
 Weather Conditions scattered clouds

Date 10/8/75
 Observer Jason Burbank
 Observer's Location 50' W

pg 6

HR.	MIN.	TP2 TIME				TP3	COMMENTS
		00	15	30	45		
17	00	0	0	0	0	0000	Background: blue sky
	01	0	0	0	0	0000	
	02	0	0	0	0	0000	Wind: West 5-10
	03	0	0	0	0	0000	
	04	0	0	0	0	0000	
	05	0	0	0	0	0000	
	06	0	0	0	0	0000	
	07	0	0	0	0	0000	
	08	0	0	0	0	0000	
	09	0	0	0	0	0000	
	10	0	0	0	0	0000	
	11	0	0	0	0	0000	
	12	0	0	0	0	0000	
	13	0	0	0	0	0000	
	14	0	0	0	0	0000	
	15	0	0	0	0	0000	
	16	0	0	0	0	0000	
	17	0	0	0	0	0000	
	18	0	0	0	0	0000	
	19	0	0	0	0	0000	
	20	0	0	0	0	0000	
	21	0	0	0	0	0000	
	22	0	0	0	0	0000	
	23	0	0	0	0	0000	
	24	0	0	0	0	0000	
	25	0	0	0	0	0000	
	26	0	0	0	0	0000	
	27	0	0	0	0	0000	
	28	0	0	0	0	0000	
	29	0	0	0	0	0000	

RECORD OF VISIBLE EMISSIONS

Company Name Caltec
 Plant Address Fairfield, AL
 Stack Location TP2, also TP3
 Weather Conditions clear

Date 10/8/75
 Observer Jason Bredemeyer
 Observer's Location 50' W

HR	MIN	TIME				SECONDS	COMMENTS
		00	15	30	45		
17	30	0	0	0	0	0000	Background: Blue sky
	31	0	0	0	0	0000	
	32	0	0	0	0	0000	
	33	0	0	0	0	0000	
	34	0	0	0	0	0000	
	35	0	0	0	0	0000	
	36	0	0	0	0	0000	
	37	0	0	0	0	0000	
	38	0	0	0	0	0000	
	39						
	40						Break
	41						
	42						
	43						
	44	0	0	0	0	0000	
	45	0	0	0	0	0000	
	46	0	0	0	0	0000	There seems to be smoke or vapor at the limit of perceptibility, light colored, less than 5% opacity.
	47	0	0	0	0	0000	
	48	0	0	0	0	0000	
	49	0	0	0	0	0000	
	50	0	0	0	0	0000	
	51	0	0	0	0	0000	
	52	0	0	0	0	0000	
	53	0	0	0	0	0000	
	54	0	0	0	0	0000	
	55	0	0	0	0	0000	
	56	0	0	0	0	0000	
	57	0	0	0	0	0000	
	58	0	0	0	0	0000	
	59	0	0	0	0	0000	

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing

Date 10-9-75

Company Name Celotex Corp

Hours of Observation 4

Plant Address Fairfield, Alabama

Observer Lance S. Granger

Type of Discharge STACK OTHER Hoods

Discharge Location Coating line

Height of Point of Discharge 2'-8"

Observer's Location:

Distance to Discharge Point 20'-60'

Height of Observation Point 5' 8"

Direction from Discharge Point EAST

Background Description Machine aisle

~~Weather:~~ Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction _____ Wind Velocity _____ mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other Billowing

Estimated Distance Plume Visible 2'-10'

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
	min.	sec.		
0			55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

29822

Celotex - Asphalt Line Doors

LANCE GRANGER

10-9-75

	Time	LOCATION	OPACITY	DURATION	Comments
START	8:45 AM				
19 min	8:45	#5	10%	Continuous	looks like hood not ^{working}
STOP	9:04				
START	9:15	#5	10%	Continuous	"
STOP	11:41 ^{2 hr 26 min}				
START	11:50 ^{1 hr 0}				
STOP	1:05 pm	End Test			

RECORD OF VISIBLE EMISSIONS

Company Name _____
 Plant Address _____
 Stack Location _____
 Weather Conditions _____

Date 10-9-75
 Observer Lance S. Geary
 Observer's Location EAST

HR	MIN	TIME				COMMENTS
		00	15	30	45	
8:15	30	10				# 5 Continuous emission
	31					
	32					Process records are number
	33					1 to 5 from East to West
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
9:04	48					
	49					STOP - DOWN
	50					
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					

RECORD OF VISIBLE EMISSIONS

Company Name Celotex
 Plant Address _____
 Stack Location _____
 Weather Conditions _____

Date 10-9-75
 Observer Harvie S. Gumpel
 Observer's Location _____

HR	MIN	SECONDS				TIME	COMMENTS
		00	15	30	45		
915	00	10					10% Continuous Emission on #5 location
	01						
	02						
	03						
	04						
	05					←	
	06						
	07						
	08						
	09						
	10						
	11					←	
	12						
	13						
	14						
	15						
	16						
	17					←	
	18						
	19						
	20						
	21						
	22						
	23					←	
	24						
	25						
	26						
	27						
	28						
	29					←	

PAGE 2

RECORD OF VISIBLE EMISSIONS

Company Name Celstar
 Plant Address _____
 Stack Location _____
 Weather Conditions _____

Date 10-9-75
 Observer L. S. Hanger
 Observer's Location E of line

HR	MIN	TIME				COMMENTS
		00	15	30	45	
945	00	10				#5
	01					
	02					
	03					
	04					
	05					←
	06					
	07					
	08					
	09					
	10					
	11					←
	12					
	13					
	14					
	15					
	16					
	17					←
	18					
	19					
	20					
	21					
	22					
	23					←
	24					
	25					
	26					
	27					
	28					
	29					←

COMMENTS page 3

RECORD OF VISIBLE EMISSIONS

Company Name Celotex
 Plant Address _____
 Stack Location Process line
 Weather Conditions _____

Date 10-9-75
 Observer R-S. George
 Observer's Location E of line

HR	MIN	TIME				COMMENTS
		00	15	30	45	
10	15	00	15			#5 location
	00	15				
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
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	23					
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	25					
	26					
	27					
	28					
	29					

Page 4

RECORD OF VISIBLE EMISSIONS

Company Name Celotex

Date 10-9-75

Plant Address _____

Observer P. S. George

Stack Location Process line barrels

Observer's Location E of line

Weather Conditions _____

HR	MIN	TIME				COMMENTS
		SECONDS	00	15	30	
04	00	10				#5
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
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	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

Page 5

RECORD OF VISIBLE EMISSIONS

Company Name Celintex

Date 10-9-75

Plant Address _____

Observer L.S. Dearyer

Stack Location Pierces Linchwood

Observer's Location E of line

Weather Conditions _____

HR	MIN	TIME				COMMENTS
		SECONDS	00	15	30		45
11:15	00	10				#5 Location
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					Down
	27					
	28					
	29					

Page 6

RECORD OF VISIBLE EMISSIONS

Company Name Celestex
 Plant Address _____
 Stack Location Powers Line
 Weather Conditions _____

Date 10-9-75
 Observer R S Hayer
 Observer's Location E of line

HR	MIN	TIME				COMMENTS
		00	15	30	45	
1145	00					
	01					
	02					
	03					
	04					
	05	10				#5
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
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	24					
	25					
	26					
	27					
	28					
	29					

Page 7

RECORD OF VISIBLE EMISSIONS

Company Name Colony
 Plant Address _____
 Stack Location Pressure line
 Weather Conditions _____

Date 10-9-75
 Observer L. S. Geyer
 Observer's Location E of line

HR	MIN	TIME				COMMENTS
		00	15	30	45	
12	15	00	10			#5
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
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	26					
	27					
	28					
	29					

Page 9

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing

Date 10-9-75

Company Name Catote Corp.

Hours of Observation 4

Plant Address Fairfield, Ala

Observer W. R. Dudley

Type of Discharge STACK OTHER None

Discharge Location indoors at process

Height of Point of Discharge 0'

Observer's Location:

Distance to Discharge Point 0'

Height of Observation Point 0'

Direction from Discharge Point W

Background Description indoors

Weather: Clear Overcast Partly Cloudy Other artificial light Color _____

Wind Direction 0 Wind Velocity 0 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning
Lofting Fumigating Other _____

Estimated Distance Plume Visible 5'

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate time @ Opacity
	min.	sec.		
0			55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

Celotex Corp
 10-9-75
 W. A. Shelby
 Visible Emissions
 of process indicated

Time	Location	Direction	Opacity	Comment
8:45				START OBS.
∞	5	∞	5	coming from coating area small amount gets outside hood
9:04				down
9:15				start (up to speed)
11:41				Down
11:50				start (up to speed)
1:05				FINISHED OBS.

RECORD OF VISIBLE EMISSIONS

Company Name Colortex

Date 10-9-75

Plant Address _____

Observer W. A. Shulby

Stack Location Process Line Hoods

Observer's Location W. of Line

Weather Conditions _____

HR	MIN	TIME				COMMENTS
		SECONDS	00	15	30		45
	00					
	01					
	02					
	03					
	04					Process hoods are numbered from 1 to 5 - East to West
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
8:45	15	5				#5 Location has continuous emissions - poor draft.
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name Cadbury Date 10-9-75
 Plant Address _____ Observer W. A. Shultz
 Stack Location Process line hood Observer's Location W of line
 Weather Conditions _____

HR	MIN	TIME				COMMENTS
		SECONDS	00	15	30		45
9:00	00	5				#5
	01					
	02					
	03					
	04					
	05					Process down
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15	5				#5 location
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name Colortex

Date 10-9-70

Plant Address _____

Observer W. A. Shelly

Stack Location Process line level

Observer's Location W. office

Weather Conditions _____

HR	MIN	TIME				COMMENTS
		00	15	30	45	
9:30	00	5				#5 location
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
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	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name Calotte

Date 10-9-75

Plant Address _____

Observer W. A. Shulby

Stack Location Process line level

Observer's Location W of line

Weather Conditions _____

HR	MIN	TIME				COMMENTS
		SECONDS	00	15	30	
10:00	00	5				H ₂ S formation
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
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	26					
	27					
	28					
	29					

PG 4

RECORD OF VISIBLE EMISSIONS

Company Name Celotex
 Plant Address _____
 Stack Location Pier 5 (C-1000)
 Weather Conditions _____

Date 10-4-75
 Observer W. A. Shuck
 Observer's Location W of pier

HR	MIN	TIME				COMMENTS
		00	15	30	45	
10	50	5				# 5 location
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name Co. Cortez

Date 10-9-75

Plant Address _____

Observer W A Shulby

Stack Location Process line bench

Observer's Location W of line

Weather Conditions _____

HR	MIN	TIME				COMMENTS
		00	15	30	45	
1100	00	5				H 5 - Serratus
	01					
	02					<
	03					
	04					
	05					
	06					
	07					
	08					<
	09					
	10					
	11					
	12					
	13					
	14					<
	15					
	16					
	17					
	18					
	19					
	20					<
	21					
	22					
	23					
	24					
	25					
	26					<
	27					
	28					
	29					↓

RECORD OF VISIBLE EMISSIONS

Company Name Celotex

Date 10-9-75

Plant Address _____

Observer W A Shultz

Stack Location Process Air hood

Observer's Location W of line

Weather Conditions _____

HR	MIN	TIME				COMMENTS
		SECONDS	00	15	30		45
11	30	00	5			#5 location
		01				
		02				
		03				
		04				
		05				
		06				
		07				
		08				
		09				
		10				
		11				
		12				Turns down
		13				
		14				
		15				
		16				
		17				
		18				
		19				
		20	5			#5 location
		21				
		22				
		23				
		24				
		25				
		26				
		27				
		28				
		29				

RECORD OF VISIBLE EMISSIONS

Company Name Celotex
 Plant Address _____
 Stack Location Purifier Hood
 Weather Conditions _____

Date 10-9-75
 Observer W.A. Stubby
 Observer's Location W of line

HR	MIN	TIME				COMMENTS
		00	15	30	45	
12	00	5				#5 location
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
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	18					
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	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name Co. Carter

Date 10-9-75

Plant Address _____

Observer W. A. Shultz

Stack Location Process Line 400

Observer's Location W of line

Weather Conditions _____

HR	MIN	TIME				COMMENTS
		00	15	30	45	
12	30	00	5			#5 location
		01				
		02				
		03				
		04				
		05				
		06				
		07				
		08				
		09				
		10				
		11				
		12				
		13				
		14				
		15				
		16				
		17				
		18				
		19				
		20				
		21				
		22				
		23				
		24				
		25				
		26				
		27				
		28				
		29				

RECORD OF VISIBLE EMISSIONS

Company Name Celotex
 Plant Address _____
 Stack Location Proctor line, woods
 Weather Conditions _____

Date 10-9-25
 Observer W. A. Shulby
 Observer's Location W of line

HR	MIN	TIME				COMMENTS
		SECONDS	00	15	30		45
1:00	00	5				#5 Location
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

PG 10

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing Date 10-9-75

Company Name Celotex Hours of Observation _____

Plant Address Fairfield, Alabama • Observer Lance S. Granger

Type of Discharge STACK ~~OTHER Pipe~~ USEPA

Discharge Location TP-3

Height of Point of Discharge 35'

Observer's Location:

Distance to Discharge Point 50'

Height of Observation Point 0'

Direction from Discharge Point W

Background Description Clear blue sky

Weather: Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction S Wind Velocity 5-10 mi/hr

Plume Description:

Detached: Yes No Not Visible

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
	min.	sec.		
0			55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

RECORD OF VISUAL EMISSIONS

Company Name Celotex
 Plant Address _____
 Stack Location TP-3
 Weather Conditions Clear

Date 10-9-75
 Observer Lance S. Granger
 Observer's Location West-50'

HR	MIN	SPECIES				COMMENTS
		SP	YS	SO	TS	
	00					
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
1415	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	

COMMENTS Page 1

RECORD OF VISIBLE EMISSIONS

Company Name Celotex

Date 10-9-75

Plant Address _____

Observer Lance S. Hansen

Stack Location TP3

Observer's Location West 50'

Weather Conditions CLEAR

HR	MIN	SECONDS				TIME	COMMENTS
		00	10	20	30		
1520	00	0	0	0	0		
	01	0	0	0	0		
	02	0	0	0	0		
	03	0	0	0	0		
	04	0	0	0	0		
	05	0	0	0	0		
	06	DOWN					Process Delay
	07						
	08						
	09						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	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		

Page 3

RECORD OF VISUAL EMISSIONS

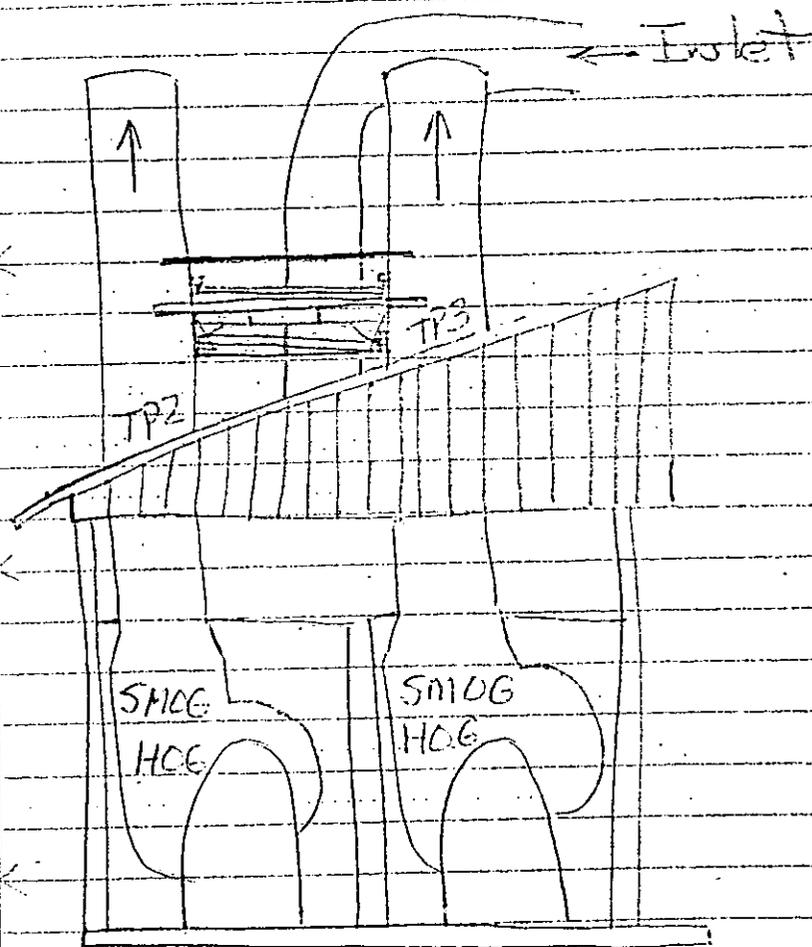
Company Name Celotex
 Plant Address _____
 Stack Location TP-3
 Weather Conditions Clear

Date 10-9-75
 Observer James S. Gensinger
 Observer's Location West 50'

CONTENTS

Page 1

Time	TYPE				
	1	2	3	4	5
1530	0	0	0	0	0
31	0	0	0	0	0
32	0	0	0	0	0
33	0	0	0	0	0
34	0	0	0	0	0
35	0	0	0	0	0
36	0	0	0	0	0
37	0	0	0	0	0
38	0	0	0	0	0
39	0	0	0	0	0
40	0	0	0	0	0
41	0	0	0	0	0
42	0	0	0	0	0
43	0	0	0	0	0
44	0	0	0	0	0
45	0	0	0	0	0
46	0	0	0	0	0
47	0	0	0	0	0
48	0	0	0	0	0
49	0	0	0	0	0
50	0	0	0	0	0
51	0	0	0	0	0
52	0	0	0	0	0
53	0	0	0	0	0
54	0	0	0	0	0
55	0	0	0	0	0
56	0	0	0	0	0
57	0	0	0	0	0
58	0	0	0	0	0
59	0	0	0	0	0



RECORD OF VISIBILITY OBSERVATIONS

Company Name Celotex
 Plant Address _____
 Stack Location # TP-3
 Weather Conditions Clear

Date 10-9-75
 Observer Lance S. Gardner
 Observer's Location West 50'

HV	MIN	SECONDS				TIME	COMMENTS
		01	15	30	45		
1600	00	0	0	0	0		
	01	0	0	0	0		
	02	0	0	0	0		
	03	0	0	0	0		
	04	0	0	0	0		
	05	0	0	0	0		
	06	0	0	0	0		
	07	0	0	0	0		
	08	0	0	0	0		
	09	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	-	-		Steam Interference
	28	-	-	0	0		
	29	0	0	0	0		

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RECORD OF VISIBLE EMISSIONS

Company Name Celotex
 Plant Address _____
 Stack Location TP-3
 Weather Conditions Clear

Date 10-9-75
 Observer Lawrence Crumpler
 Observer's Location West - 50'

HR	MIN	TIME				COMMENTS
		00	15	30	45	
16:30	30	0	0	0	0	Red dust in background from
	31	0	0	0	0	US Steel
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
	40					
	41					
	42					
	43					
	44					
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	53					
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	55					
	56					
	57					
	58					
	59					

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing

Date 10-9-75

Company Name Celotex

Hours of Observation _____

Plant Address Fairfield, Alabama

Observer Wayne Skully

Type of Discharge STACK OTHER _____

Discharge Location TP-2

Height of Point of Discharge 35'

Observer's Location:

Distance to Discharge Point 50'

Height of Observation Point 0

Direction from Discharge Point West

Background Description Clear sky

Weather: Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction S Wind Velocity 5-10 mi/hr

Plume Description:

Detached: Yes No Not Visible

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning
Lofting Fumigating Other _____

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
	min.	sec.		
0			55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

RECORD OF VISUAL OBSERVATIONS

Company Name C-LOSTY CORP
 Plant Address FARRIS AVE
 Stack Location TP-2 Stack Area
 Weather Conditions Clear

Date 10-9-75
 Observer R.D. Shultz
 Observer's Location 50-9 (west)

HR	TIME					COMMENTS
	MM	SS	TT	TT	TT	
14:05	00	00	00	00	00	
	01	00	00	00	00	
	02	00	00	00	00	
	03	00	00	00	00	
	04	00	00	00	00	
	05	00	00	00	00	
	06	00	00	00	00	
	07	00	00	00	00	
	08	00	00	00	00	
	09	00	00	00	00	
	10	00	00	00	00	
	11	00	00	00	00	
	12	00	00	00	00	
	13	00	00	00	00	
	14	00	00	00	00	
	15	00	00	00	00	
	16	00	00	00	00	
	17	00	00	00	00	
	18	00	00	00	00	
	19	00				down
	20					
	21					
	22					
	23					
	24					
14:40	25			00	00	process up to spec
	26	00	00	00	00	
	27	00	00	00	00	
	28	00	00	00	00	
	29	00	00	00	00	

RECORD OF VISUAL EMISSIONS

Company Name CENTEX CORP.
 Plant Address FARFIELD ALABAMA
 Stack Location TP-2 Smog Mtg.
 Weather Conditions Clear - Blue

Date 10-9-75
 Observer W.C. Shullery
 Observer's Location 50 ft W of S

CONTENTS pg 2

HR	MIN	TIME				REMARKS
		01	10	20	30	
14:45	30	0	0	0	5	
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
15:00	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	down
	53					
	54					
	55					
	56					
	57					
	58					
	59					

RECORD OF VISUAL EMISSIONS

Company Name CELESTEX CORP.
 Plant Address FARFIELD AVE.
 Stack Location TP-2 SMOKE LINE
 Weather Conditions Clear - Blue

Date 10-9-75
 Observer W.D. SHUBERT
 Observer's Location WEST - 50'

HR	MIN	TIME				COMMENTS
		HR	MIN	SEC	FR	
	00					
	01					
	02					
	03					
	04					
15200	05	0	0	0	0	Proceeds UP
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	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	

RECORD OF VISUAL OBSERVATIONS

Company Name CELOTEX CORP.
 Plant Address FARFIELD HALL
 Stack Location TP-2 SMOG HALL
 Weather Conditions CLEAR - BLUE

Date 10-7-75
 Observer W. A. Shulley
 Observer's Location 50' W

CONTENTS Pg 4

TIME	TIME				CONTENTS
	1	2	3	4	
15:45	0	0	0	0	
30	0	0	0	0	
31	0	0	0	0	
32	0	0	0	0	
33	0	0	0	0	
34	0	0	0	0	
35	0	0	0	0	
36	0	0	0	0	
37	0	0	0	0	
38	0	0	0	0	
39	0	0	0	0	
40	0	0	0	0	
41	0	0	0	0	
42	0	0	0	0	
43	0	0	0	0	
44	0	0	0	0	
45	0	0	0	0	
46	0	0	0	0	
47	0	0	0	0	
48	0	0	0	0	
49	0	0	0	0	
50	0	0	0	0	
51	0	0	0	0	
52	0	0	0	0	
53	0	0	0	0	
54	0	0	0	0	
55	0	0	0	0	
56	0	0	0	0	
57	0	0	0	0	
58	0	0	0	0	
59	0	0	0	0	
60	0	0	0	0	

RECORD OF VISUAL EMISSIONS

Company Name CELOTEX CORP
 Plant Address FAIRFIELD ALA.
 Stack Location TP-2 SMOG HOD
 Weather Conditions CLEAR - BLUE

Date 10-7-75
 Observer W. A. SNLBY
 Observer's Location 30' W

HR	MIN	TIME				COMMENTS
		LT	TR	HT	TR	
16	15	0	0	0	0	
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	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	
16	30	0	0	0	0	
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing

Date 10/2/75

Company Name Celotex

Hours of Observation 9:00 AM -

Plant Address Fairfield, AL

Observer Jason Burbank

Type of Discharge STACK OTHER _____

Discharge Location ESP Outlet TP2, TP3

Height of Point of Discharge 50

Observer's Location:

Distance to Discharge Point 35

Height of Observation Point 46

Direction from Discharge Point SF

Background Description Sky

Weather: Clear Overcast Partly Cloudy Other _____ Color Blue with haze

Wind Direction NE Wind Velocity 0-5 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other N.A.

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity	
	min.	sec.			
0			55		
5			60		
10			65		
15			70		
20			75		
25			80		
30			85		
35			90		
40			95		
45			100		
50					

RECORD OF VISUAL OBSERVATIONS

(1)

Company Name Relotol
 Plant Address Fairfield AL
 Stack Location TP2, TP3
 Weather Conditions _____

Date 10/9/75
 Observer Jason Beardslee
 Observer's Location 25' SE

TIME	TP 3		TP 2		COMMENTS
	01	02	03	04	
					25' TP 2
9 01	0	0	0	0	0 0 0 0
02	0	0	0	0	0 0 0 0
03	0	0	0	0	0 0 0 0
04					
05					
06					
07					Background: blue sky with smog
08					Wind 0-5 NE
09					
10					
11					
12					
13					
14					
15					
16					
17					
9 18	0	0	0	0	0 0 0 0
19	0	0	0	0	0 0 0 0
20	0	0	0	0	0 0 0 0
21	0	0	0	0	0 0 0 0
22	0	0	0	0	0 0 0 0
23	0	0	0	0	0 0 0 0
24	0	0	0	0	0 0 0 0
25	0	0	0	0	0 0 0 0
26	0	0	0	0	0 0 0 0
27	0	0	0	0	0 0 0 0
28	0	0	0	0	0 0 0 0
29	0	0	0	0	0 0 0 0
30	0	0	0	0	0 0 0 0

7.5 | 22.5 | 37.5 | 52.5

RECORD OF VISIBLE EMISSIONS

Company Name Celotex
 Plant Address Fairfield
 Stack Location TP3, TP2
 Weather Conditions Clear with smog

Date 10/9/75
 Observer Jason Burbank
 Observer's Location 35' SE

(2)

TIME	TP3				TP2			
	1	2	3	4	07.5	22.5	37.5	52.5
9	30	0	0	0	0	0	0	0
	31	0	0	0	0	0	0	0
	32	0	0	0	0	0	0	0
	33	0	0	0	0	0	0	0
	34	0	0	0	0	0	0	0
	35	0	0	0	0	0	0	0
	36	0	0	0	0	0	0	0
	37	0	0	0	0	0	0	0
	38	0	0	0	0	0	0	0
	39	0	0	0	0	0	0	0
	40	0	0	0	0	0	0	0
	41	0	0	0	0	0	0	0
	42	0	0	0	0	0	0	0
	43	0	0	0	0	0	0	0
	44	0	0	0	0	0	0	0
	45	0	0	0	0	0	0	0
	46	0	0	0	0	0	0	0
	47	0	0	0	0	0	0	0
	48	0	0	0	0	0	0	0
	49	0	0	0	0	0	0	0
	50	0	0	0	0	0	0	0
	51	0	0	0	0	0	0	0
	52	0	0	0	0	0	0	0
	53	0	0	0	0	0	0	0
	54	0	0	0	0	0	0	0
	55	0	0	0	0	0	0	0
	56	0	0	0	0	0	0	0
	57	0	0	0	0	0	0	0
	58	0	0	0	0	0	0	0
	59	0	0	0	0	0	0	0

← interference: white smoke bird TP2

RECORD OF VISUAL EMISSIONS

(5)

Company Name Calotel
 Plant Address Prattville AL
 Stack Location TP3, TP2 (ESP Outlet)
 Weather Conditions Clear

Date 10/9/75
 Observer Juan Burbank
 Observer's Location 35' W

HR	TP3				TIME	TP2				COMMENTS
	01	15	30	45		21.5	22.5	23.5	24.5	
10	0	0	0	0		0	0	0	0	
	01	0	0	0		0	0	0	0	Background: blue sky Wind 5-10 NE
	02	0	0	0		0	0	0	0	
	03	0	0	0		0	0	0	0	
	04	0	0	0		0	0	0	0	
	05	0	0	0		0	0	0	0	
	06	0	0	0		0	0	0	0	
	07	0	0	0		0	0	0	0	
	08	0	0	0		0	0	0	0	
	09	0	0	0		0	0	0	0	
	10	0	0	0		0	0	0	0	
	11	0	0	0		0	0	0	0	
	12	0	0	0		0	0	0	0	
	13	0	0	0		0	0	0	0	
	14	0	0	0		0	0	0	0	
	15	0	0	0		0	0	0	0	
	16	0	0	0		0	0	0	0	
	17	0	0	0		0	0	0	0	
	18	0	0	0		0	0	0	0	
	19	0	0	0		0	0	0	0	
	20	0	0	0		0	0	0	0	
	21	0	0	0		0	0	0	0	
	22	0	0	0		0	0	0	0	
	23	0	0	0		0	0	0	0	
	24	0	0	0		0	0	0	0	
	25	0	0	0		0	0	0	0	
	26	0	0	0		0	0	0	0	
	27	0	0	0		0	0	0	0	
	28	0	0	0		0	0	0	0	
	29	0				0				

RECORD OF VISUAL EMISSIONS

Company Name Celotex
 Plant Address Fairfield, AL
 Stack Location TP3, TP2
 Weather Conditions Clear

Date 10/9/75
 Observer Jason Burbank
 Observer's Location 35' W

TIME	HEI	TP3				TP2				COMMENTS
		1	15	30	45	1.5	22.5	37.5	52.5	
10	37	0	0	0	0	0	0	0	0	
	31	0	0	0	0	0	0	0	0	Background: blue sky
	32	0	0	0	0	0	0	0	0	Wind 0-10 N.E.
	33	0	0	0	0	0	0	0	0	
	34	0	0	0	0	0	0	0	0	
	35	0	0	0	0	0	0	0	0	Note: When seen from
	36	0	0	0	0	0	0	0	0	the northeast, against a
	37	0	0	0	0	0	0	0	0	background of dark red
	38	0	0	0	0	0	0	0	0	ductward, both TP3 and
	39	0	0	0	0	0	0	0	0	TP2 show a light colored
	40	0	0	0	0	0	0	0	0	effluent with opacity
	41	0	0	0	0	0	0	0	0	of 0-5%, possibly to 10%.
	42	0	0	0	0	0	0	0	0	opacity . The emissions
	43	0	0	0	0	0	0	0	0	are puffy and the velocity
	44	0	0	0	0	0	0	0	0	is quite high.
	45	0	0	0	0	0	0	0	0	
	46	0	0	0	0	0	0	0	0	
	47	0	0	0	0	0	0	0	0	
	48	0	0	0	0	0	0	0	0	
	49	0	0	0	0	0	0	0	0	
	50	0	0	0	0	0	0	0	0	
	51	0	0	0	0	0	0	0	0	
	52	0	0	0	0	0	0	0	0	
	53	0	0	0	0	0	0	0	0	
	54	0	0	0	0	0	0	0	0	
	55	0	0	0	0	0	0	0	0	
	56	0	0	0	0	0	0	0	0	
	57	0	0	0	0	0	0	0	0	
	58	0	0	0	0	0	0	0	0	
	59	0	0	0	0	0	0	0	0	

RECORD OF VISUAL EMISSIONS

5

Company Name Colated

Date 10/9/75

Plant Address Fairfield, AL

Observer Jason Bealbank

Stack Location TP3, TP2, Esp. out.

Observer's Location 35' SE

Weather Conditions Clear

TIME	TP3				TP2				COMMENTS
	100'	200'	300'	400'	7.5'	12.5'	15.5'	2.5'	
11	0	0	0	0	0	0	0	0	
01	0	0	0	0	0	0	0	0	
02	0	0	0	0	0	0	0	0	
03	0	0	0	0	0	0	0	0	
04	0	0	0	0	0	0	0	0	
05	0	0	0	0	0	0	0	0	
06	0	0	0	0	0	0	0	0	
07	0	0	0	0	0	0	0	0	
08	0	0	0	0	0	0	0	0	
09	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	
11	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	
16	0	0	0	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	
18	0	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	
27	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	

RECORD OF VISUAL EMISSIONS

6

Company Name Colony
 Plant Address Prunfield, AL
 Stack Location TP3, TP2 (Exhaust)
 Weather Conditions Clear

Date 10/9/75
 Observer James Busch
 Observer's Location 35' SE

HR	MIN	TP3				TP2				COMMENTS
		1	2	3	4	1	2	3	4	
11	30	0	0	0	0	0	0	0	0	Background: clear blue sky Wind: 0-10 NE
	31	0	0	0	0	0	0	0	0	
	32	0	0	0	0	0	0	0	0	
	33	0	0	0	0	0	0	0	0	
	34	0	0	0	0	0	0	0	0	
	35	0	0	0	0	0	0	0	0	
	36	0	0	0	0	0	0	0	0	
	37	0				0				— process down — (low line speed)
	38									
	39									
	40									
	41	0	0	0	0	0	0	0	0	making contact
	42	0	0	0	0	0	0	0	0	
	43	0	0	0	0	0	0	0	0	
	44	0	0	0	0	0	0	0	0	
	45	0	0	0	0	0	0	0	0	
	46	0	0	0	0	0	0	0	0	
	47	0	0	0	0	0	0	0	0	
	48	0	0	0	0	0	0	0	0	
	49	0	0	0	0	0	0	0	0	line speed up
	50	0	0	0	0	0	0	0	0	
	51	0	0	0	0	0	0	0	0	
	52	0	0	0	0	0	0	0	0	
	53	0	0	0	0	0	0	0	0	
	54	0	0	0	0	0	0	0	0	
	55	0	0	0	0	0	0	0	0	
	56	0	0	0	0	0	0	0	0	
	57	0	0	0	0	0	0	0	0	
	58	0	0	0	0	0	0	0	0	
	59	0	0	0	0	0	0	0	0	

RECORD OF YIELD MEASUREMENTS

(7)

Company Name Caltech
 Plant Address Thimblefield Ave
 Stark Location TP3, TP2 Export
 Weather Conditions Clear

Date 10/7/75
 Observer Jason Brubaker
 Observer's Location 35' SE

HR	MIN	TP3				TP2				COMMENTS
		1	2	3	4	1	2	3	4	
						25	22.5	37.5	52.5	
12	01	0	0	0	0	0	0	0	0	Pump Run Begins
	01	0	0	0	0	0	0	0	0	
	02	0	0	0	0	0	0	0	0	
	03	0	0	0	0	0	0	0	0	Background: clear blue sky
	04	0	0	0	0	0	0	0	0	
	05	0	0	0	0	0	0	0	0	Wind: 0-10 N.E.
	06	0	0	0	0	0	0	0	0	
	07	0	0	0	0	0	0	0	0	
	08	0	0	0	0	0	0	0	0	
	09	0	0	0	0	0	0	0	0	
	10	0	0	0	0	0	0	0	0	
	11	0	0	0	0	0	0	0	0	
	12	0	0	0	0	0	0	0	0	
	13	0	0	0	0	0	0	0	0	
	14	0	0	0	0	0	0	0	0	
	15	0	0	0	0	0	0	0	0	
	16	0	0	0	0	0	0	0	0	
	17	0	0	0	0	0	0	0	0	
	18	0	0	0	0	0	0	0	0	
	19	0	0	0	0	0	0	0	0	
	20	0	0	0	0	0	0	0	0	
	21	0	0	0	0	0	0	0	0	
	22	0	0	0	0	0	0	0	0	
	23	0	0	0	0	0	0	0	0	
	24	0	0	0	0	0	0	0	0	
	25	0	0	0	0	0	0	0	0	
	26	0	0	0	0	0	0	0	0	
	27	0	0	0	0	0	0	0	0	
	28	0	0	0	0	0	0	0	0	
	29	0	0	0	0	0	0	0	0	

RECORD OF VISUAL EMISSIONS

(2)

Company Name Alcoa
 Plant Address Pearville, AL
 Stack Location TP3, TP2
 Weather Conditions Clear

Date 10/9/75
 Observer Jason Bushbank
 Observer's Location 35' S.E.

LINE	TP3				TP2				COMMENTS
	1	2	3	4	7.5'	22.5'	37.5'	52.5'	
12	0	0	0	0	0	0	0	0	
31	0	0	0	0	0	0	0	0	
32	0	0	0	0	0	0	0	0	
33	0	0	0	0	0	0	0	0	
34	0	0	0	0	0	0	0	0	
35	0	0	0	0	0	0	0	0	
36	0	0	0	0	0	0	0	0	
37	0	0	0	0	0	0	0	0	
38	0	0	0	0	0	0	0	0	
39	0	0	0	0	0	0	0	0	
40	0	0	0	0	0	0	0	0	
41	0	0	0	0	0	0	0	0	
42	0	0	0	0	0	0	0	0	
43	0	0	0	0	0	0	0	0	
44	0	0	0	0	0	0	0	0	
45	0	0	0	0	0	0	0	0	
46	0	0	0	0	0	0	0	0	
47	0	0	0	0	0	0	0	0	
48	0	0	0	0	0	0	0	0	
49	0	0	0	0	0	0	0	0	
50	0	0	0	0	0	0	0	0	
51	0	0	0	0	0	0	0	0	
52	0	0	0	0	0	0	0	0	
53	0	0	0	0	0	0	0	0	
54	0	0	0	0	0	0	0	0	
55	0	0	0	0	0	0	0	0	
56	0	0	0	0	0	0	0	0	
57	0	0	0	0	0	0	0	0	
58	0	0	0	0	0	0	0	0	
59	0	0	0	0	0	0	0	0	

RECORD OF VISUAL EMISSIONS

(9)

Company Name Alotel
 Plant Address Prattville, AL
 Stack Location TP3
 Weather Conditions clear

Date 10/9/75
 Observer Jason Burbank
 Observer's Location 50' W

HR	MIN	TIME				COMMENTS
		01	10	12	15	
	00					Background: Blue sky
	01					
	02					Wind: 0-10 NW?
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
14	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	

RECORD OF VISITOR EMISSIONS

Company Name Celotex Date 10/9/75
 Plant Address Basin Id, AL Observer Jason Burbank
 Stack Location TP 3 1 Exp south out Observer's Location 50' W
 Weather Conditions Clear

LINE	TIME	TIME				COMMENTS
		0	10	20	30	
14	30	0	0	0	0	Background blue sky Wind 0-10 mph U.F.
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	process problem
	35					
	36					
	37					
	38					
	39					
	40	0	0	0	0	process up
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
	55	0	0	0	0	red dust in background
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	blue sky background again
	59	0	0	0	0	

RECORD OF VISUAL EMISSIONS

10

Company Name Celco
 Plant Address Thurston
 Stack Location TP3
 Weather Conditions Clear

Date 10/9/75
 Observer J. Ann Burbank
 Observer's Location 50' W

HR	MIN	TIME				COMMENTS
		HR	MIN	SEC	FR	
15	00	0	0	0	0	Background blue sky
	01	0	0	0	0	W. wind 2-10 mph N.E.
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	process down
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	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	

RECORD OF VISUAL EMISSIONS

12

Company Name Celotex

Date 10/4/71

Plant Address Trinidad

Observer Jason Burkhardt

Stack Location TP3 South EST/2

Observer's Location 5-0 W

Weather Conditions Clear

DATE	TIME	STACKS				COMMENTS
		1	2	3	4	
15	30	0	0	0	0	Background: Blue sky Wind 0-5 mph N
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
	59	0	0	0	0	

RECORD OF VISUAL EMISSIONS

13

Company Name Celanese
 Plant Address Tranfield, AL
 Stack Location TP3
 Weather Conditions clear

Date 10/4/75
 Observer Jason Burbank
 Observer's Location 50 W

HR	MIN	TIME				COMMENTS
		10	15	20	25	
16	00	0	0	0	0	Background Blue sky
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
	10	0	0	0	0	
	11	0	0	0	0	red dust in background
	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	- blue sky " "
	18	0	0	0	0	
	19	0	0	0	0	red dust " "
	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	light dust " "
	23	0	0	0	0	
	24	0	0	0	0	
	25					Break
	26					
	27					
	28					
	29					

RECORD OF VISUAL INSPECTIONS

Company Name Celotex
 Plant / Area Fairfield AL
 Stack Location TP3
 Weather Conditions Clear

Date 10/9/75
 Observer Jason Burkhardt
 Observer's Location 50' W

(14)

ID#	TIME	SPECIES				COMMENTS
		1	2	3	4	
16	30	0	0	0	0	
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50					
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing

Date 10-9-75

Company Name Coltco

Hours of Observation _____

Plant Address Fairfield, Ak

Observer HARRISON

Type of Discharge STACK OTHER _____

Discharge Location ESP OUTLET TP-253

Height of Point of Discharge ~50ft above ground

Observer's Location:

Distance to Discharge Point 35 ft

Height of Observation Point 46 ft

Direction from Discharge Point SE of Stack

Background Description sky

Weather: Clear ^{blue sky} Overcast Partly Cloudy Other with haze Color gray/white ^{blue sky}

Wind Direction NE Wind Velocity 0-3 mi/hr ^{range}

Plume Description:

Detached: Yes No

Color: Black White Other _____

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other N.A.

Estimated Distance Plume Visible _____

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
	min.	sec.		
0			55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

RECORD OF VISIBLE EMISSIONS

Company Name Calorex
 Plant Address Fairfield
 Stack Location TP2 #3
 Weather Conditions b, c, sky with haze

Date 10-9-75
 Observer Harrison
 Observer's Location 35 ft SE of stack

HR	MIN	TP3				TP2				COMMENTS
		1	2	3	4	1	2	3	4	
10:00	00	0	0	0	0	0	0	0	0	
	01	0	0	0	0	0	0	0	0	
	02	0	0	0	0	0	0	0	0	
	03	0	0	0	0	0	0	0	0	
	04	0	0	0	0	0	0	0	0	
	05	0	0	0	0	0	0	0	0	
	06	0	0	0	0	0	0	0	0	
	07	0	0	0	0	0	0	0	0	
	08	0	0	0	0	0	0	0	0	
	09	0	0	0	0	0	0	0	0	
	10	0	0	0	0	0	0	0	0	
	11	0	0	0	0	0	0	0	0	
	12	0	0	0	0	0	0	0	0	
	13	0	0	0	0	0	0	0	0	
	14	0	0	0	0	0	0	0	0	
	15	0	0	0	0	0	0	0	0	
	16	0	0	0	0	0	0	0	0	
	17	0	0	0	0	0	0	0	0	
	18	0	0	0	0	0	0	0	0	
	19	0	0	0	0	0	0	0	0	
	20	0	0	0	0	0	0	0	0	
	21	0	0	0	0	0	0	0	0	
	22	0	0	0	0	0	0	0	0	
	23	0	0	0	0	0	0	0	0	
	24	0	0	0	0	0	0	0	0	
	25	0	0	0	0	0	0	0	0	
	26	0	0	0	0	0	0	0	0	
	27	0	0	0	0	0	0	0	0	
	28	0	0	0	0	0	0	0	0	
	29	0	0	0	0	0	0	0	0	
	30	0	0	0	0	0	0	0	0	

RECORD OF VISUAL EMISSIONS

5

Company Name CalTex
 Plant Address Fairfield Ave
 Stack Location TP2 #3
 Weather Conditions the sky, sunny

Date 10-9-75
 Observer Harrison
 Observer's Location 35 ft SE

HR	MIN	TP-3				TP-2				COMMENTS
		00	15	30	45	00	15	30	45	
11:00	00	0	0	0	0	0	0	0	0	
	01	0	0	0	0	0	0	0	0	
	02	0	0	0	0	0	0	0	0	
	03	0	0	0	0	0	0	0	0	
	04	0	0	0	0	0	0	0	0	
	05	0	0	0	0	0	0	0	0	
	06	0	0	0	0	0	0	0	0	
	07	0	0	0	0	0	0	0	0	
	08	0	0	0	0	0	0	0	0	
	09	0	0	0	0	0	0	0	0	
	10	0	0	0	0	0	0	0	0	
	11	0	0	0	0	0	0	0	0	
	12	0	0	0	0	0	0	0	0	
	13	0	0	0	0	0	0	0	0	
	14	0	0	0	0	0	0	0	0	
	15	0	0	0	0	0	0	0	0	
	16	0	0	0	0	0	0	0	0	
	17	0	0	0	0	0	0	0	0	
	18	0	0	0	0	0	0	0	0	
	19	0	0	0	0	0	0	0	0	
	20	0	0	0	0	0	0	0	0	
	21	0	0	0	0	0	0	0	0	
	22	0	0	0	0	0	0	0	0	
	23	0	0	0	0	0	0	0	0	
	24	0	0	0	0	0	0	0	0	
	25	0	0	0	0	0	0	0	0	
	26	0	0	0	0	0	0	0	0	
	27	0	0	0	0	0	0	0	0	
	28	0	0	0	0	0	0	0	0	
	29	0	0	0	0	0	0	0	0	

RECORD OF VISUAL EMISSIONS

7

Company Name Celotex
 Plant Address Fairfield Ala
 Stack Location TP 2 #3
 Weather Conditions Sunny, blue skies

Date 10-9-75
 Observer Harrison
 Observer's Location 35 ft SE of

MIN	TP-3				TP-2				COMMENTS
	01	02	03	04	01	02	03	04	
1200 n.	00	00	00	00	00	00	00	00	
	01	00	00	00	00	00	00	00	
	02	00	00	00	00	00	00	00	
	03	00	00	00	00	00	00	00	
	04	00	00	00	00	00	00	00	
	05	00	00	00	00	00	00	00	
	06	00	00	00	00	00	00	00	
	07	00	00	00	00	00	00	00	
	08	00	00	00	00	00	00	00	
	09	00	00	00	00	00	00	00	
	10	00	00	00	00	00	00	00	
	11	00	00	00	00	00	00	00	
	12	00	00	00	00	00	00	00	
	13	00	00	00	00	00	00	00	
	14	00	00	00	00	00	00	00	
	15	00	00	00	00	00	00	00	
	16	00	00	00	00	00	00	00	
	17	00	00	00	00	00	00	00	
	18	00	00	00	00	00	00	00	
	19	00	00	00	00	00	00	00	
	20	00	00	00	00	00	00	00	
	21	00	00	00	00	00	00	00	
	22	00	00	00	00	00	00	00	
	23	00	00	00	00	00	00	00	
	24	00	00	00	00	00	00	00	
	25	00	00	00	00	00	00	00	
	26	00	00	00	00	00	00	00	
	27	00	00	00	00	00	00	00	
	28	00	00	00	00	00	00	00	
	29	00	00	00	00	00	00	00	

RECORD OF VESSEL EMISSIONS

9

Company Name Colotox
 Plant Address Fairford
 Stack Location TP-2
 Weather Conditions Blue sky

Date 3-9-75
 Observer Harrison
 Observer's Location soft W

MIN	SEC	TIME				COMMENTS
		CO	TE	NO _x	SO ₂	
14:15	00	0	0	0	0	
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	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	
14:30	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	process delay
	19					
	20					
	21					
	22					
	23					
	24					
14:40	25					
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

RECORD OF VISUAL OBSERVATIONS

10

Company Name Calotex Date 10-9-75
 Plant / Area _____ Observer _____
 Stack Location _____ Observer's Location _____
 Weather Conditions _____

TIME	COMMENTS			
	1	2	3	4
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45	o	o	o	o
46	o	o	o	o
47	o	o	o	o
48	o	o	o	o
49	o	o	o	o
50	o	o	o	o
51	o	o	o	o
52	o	o	o	o
53	o	o	o	o
54	o	o	o	o
55	o	o	o	o
56	o	o	o	o
57	o	o	o	o
58	o	o	o	o
59	o	o	o	o

14

72
14:45

RECORD OF VISIBLE EMISSIONS

11

Company Name Calotek
 Plant Address Wingfield Ave
 Stack Location TD-2
 Weather Conditions Blue sky, shiny

Date 10-9-75
 Observer Harrison
 Observer's Location 50 ft SW

TIME	MIN	STACKS				COMMENTS
		01	02	03	04	
15:00	00	0	0	0	0	
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
15:20	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	

RECORD OF VISUAL EMISSIONS

12

Company Name Calco Tex Date 10-9-75
 Plant / Cross Fairfield Observer Hawman
 Stack Location FP-2 Observer's Location SO W
 Weather Conditions Bleakly + Sunny

TIME	15	TYPE				COMMENTS
		1	2	3	4	
15:30	30	0	0	0	0	
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	
	36	0	0	0	0	
	37	0	0	0	0	
	38	0	0	0	0	
	39	0	0	0	0	
	40	0	0	0	0	
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	0	0	0	0	
	45	0	0	0	0	
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	
	53	0	0	0	0	
	54	0	0	0	0	
	55	0	0	0	0	
	56	0	0	0	0	
	57	0	0	0	0	
	58	0	0	0	0	
	59	0	0	0	0	

RECORD OF VEHICLE EMISSIONS

Company Name Calotex
 Plant Address Fairfield
 Stack Location TP-2
 Weather Conditions Barely sunny

Date 10-9-75
 Observer Harrison
 Observer's Location 50 ft W

(B)

TIME	TEST				COMMENTS
	CO	HC	NO	NO _x	
16:00	0	0	0	0	
01	0	0	0	0	
02	0	0	0	0	
03	0	0	0	0	
04	0	0	0	0	
05	0	0	0	0	
06	0	0	0	0	
07	0	0	0	0	
08	0	0	0	0	
09	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	11
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	plume from stills interfering
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	

14

RECORD OF VISIBLE EMISSIONS

Company Name Colotex Date 10-9-72
 Plant Address Fairfield Observer Hanner
 Stack Location TP-2 Observer's Location SU # 11
 Weather Conditions smog

HR	MIN	TIME				COMMENTS
		33	15	37	45	
16:30	30	○	○	○	○	red dust in background
	31	○	○	○	○	
	32	○	○	○	○	W
	33	○	○	○	○	
	34	○	○	○	○	
	35	○	○	○	○	
	36	○	○	○	○	
	37	○	○	○	○	
	38	○	○	○	○	
	39	○	○	○	○	
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50					
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					

APPENDIX D
EPA METHODS 1, 2, 3, and 20 FIELD DATA SHEETS

INCLUDES:
FIELD DATA SHEETS
FOR

Inlet Sampling Location TP-1
Outlet Sampling Location TP-2
Outlet Sampling Location TP-3

PRELIMINARY SURVEY

Name of Company Celotex Corp. (Fairfield, Ala.) Date of survey 8-14-75

Address 1327 Erie Street City Birmingham State Ala. 35201

Name of Contacts J. D. Wiseman Title Plant Manager

Bob King Title Plant Engineer

Wes Saveland Title Environmental Coordinator

Plant Telephone Number 205-785-1145 FTS Number ~~205~~-229-1000

Description of Process #1 saturator and coater process line. Saturation of felt with asphalt, coating of saturated felt with mineral granules, cutting and wrapping. Produces roll and shingle roofing.

Operating Schedule of Process 3 shifts, 5 days/week (Mon → Fri)

Batch or Continuous Process continuous

Feed Composition and Rates As received saturant and coating asphalt, roll felt and coating and finishing materials.

Type of Fuel N/A Production Rate 385-400 FPM felt speed

Description of Air Pollution Control Equipment and Operation Two dual pass ESP units (Smog Boops) operate in parallel to control saturator and coater emissions. Both are new units installed in January '75. Rated at 16,000 CFM operate at ≈ 12,500 CFM. Collection surfaces are kept clean by a prefilter which is cleaned on Saturdays when the process line is not in operation.

Safety Hazards ESP shock hazard minimized as sites are on roof above. Slight fall hazard due to slightly sloping roof. Oil residue fire hazard.

Page 2 - Preliminary Survey

Assumed Constituents of Stack Gas for Each Sampling Site Air, water vapor, asphalt fumes, low level moisture comes from felt.

- Possible Testing Sites (1) #1 line inlet (TP1) see fig. A
 (2) #1 line north outlet (TP2) "
 (3) #1 line south outlet (TP3) "
 (4) _____

Can Samples be Collected of: YES Solvent & coating asphalt, Recovered oil, Felt, Grease, Tars, Filler and Sand.

a. Raw materials	<u>YES</u>	e. Product	<u>YES</u>
b. Control equipment effluent	<u>YES</u>	f. Fuel	<u>N/A</u>
c. Ash	<u>N/A</u>	g. Other	<u>see above</u>
d. Scrubber water	<u>N/A</u>		

Signature Required on Passes NO, check in with guard Waivers NO, contractors must
vehicle passes not required show certificate of 250m/500m/50.
 Best Time to Test Tentative schedule of week of Sept. 29. OK. insurance.

Are the Following Available at the Plant?

- | | | | |
|-----------------------------|------------|--------------------------|----------------|
| a. Parking Facilities | <u>YES</u> | h. Weighing Balance | <u>NO</u> |
| b. Electric Extension Cords | <u>YES</u> | i. Clean-up Area | <u>YES</u> |
| c. Electrician | <u>YES</u> | j. Laboratory Facilities | <u>YES</u> |
| d. Safety Equipment | <u>NO</u> | k. Sampling Ports | <u>YES</u> |
| e. Ice | <u>NO</u> | l. Scaffolding | <u>PARTIAL</u> |
| f. Acetone | <u>N/A</u> | m. Restroom | <u>YES</u> |
| g. Distilled water | <u>YES</u> | n. Vending Machines | <u>YES</u> |
| | | o. Road | <u>YES</u> |

1. Electricity Source

- a. Amperage per circuit Min. 4 @ 20 A each, 115V, additional available
- b. Location of fuse box in bldg. adjacent to ESP's
- c. Extension cord lengths 50' QUANTITY 10
- d. Adapters needed? NO, standard grounded receptacles

2. Safety Equipment Needed

- | | | | |
|-------------------|-----------|-----------------|-----------|
| a. Hard hats | <u>✓</u> | d. Safety shoes | <u>✓</u> |
| b. Safety glasses | <u>✓</u> | e. Alarms | <u>NO</u> |
| c. Goggles | <u>NO</u> | f. Other | <u>NO</u> |

3. Ice

- a. Vendor Ice house
- b. Location ~ 6 blocks north of plant

4. Acetone

- a. Vendor N/A
- b. Location _____
- c. Telephone _____

5. Sampling Ports

- a. Who will provide existing welder: Company will modify if needed.
- b. Size opening 3" pipe coupling with nipple and cap

6. Scaffolding

- a. Height Inlet - ~20' Outlets - ~21'
- b. Length Inlet - ~8' Outlets - ~7'
- c. Vendor Company will prepare all additional scaffolding needed
Address _____
Telephone _____

Page 4 - Preliminary Survey

7. Hotels:

- a. Guest House 18th St & 10th Ave S B-Ham Phone AC 4205
933-7700 Rate 13.00
- b. Shelton I-65 & 10th Ave N B-Ham Phone 328-8560 Rate 16.90
- c. Kanada dr West I-20, 59 & US 11 Besemer Phone 424-9780 Rate 12.50

8. Restaurants:

- a. Near Plant Cloverleaf (Home style cafeteria), H. Salt, McDonalds and
Welder Skillet Fried Chicken. 36th St & F Ave ~ 1 1/2 miles from plant.
- b. Near Hotel Guest House Restaurant, Steak N Eggs, Pizza Hut - 18th & 10th Ave S,
Baron of Beef - 420 S 20th, Jers Seafood - 401 S 18th, Pies II - 18th & 11th Ave S.

9. Airport Convenient to Plant BHM Distance ~ 12 mi.

Comments: Company cooperation appears to be excellent. They will prepare all scaffolding as requested and will place a jork lift and operator at our disposal for hoisting equipment during the testing. The plant engineer offered to make every effort to maintain a continuous production of standard 3 tab 240 # shingles on line #1 during the testing.

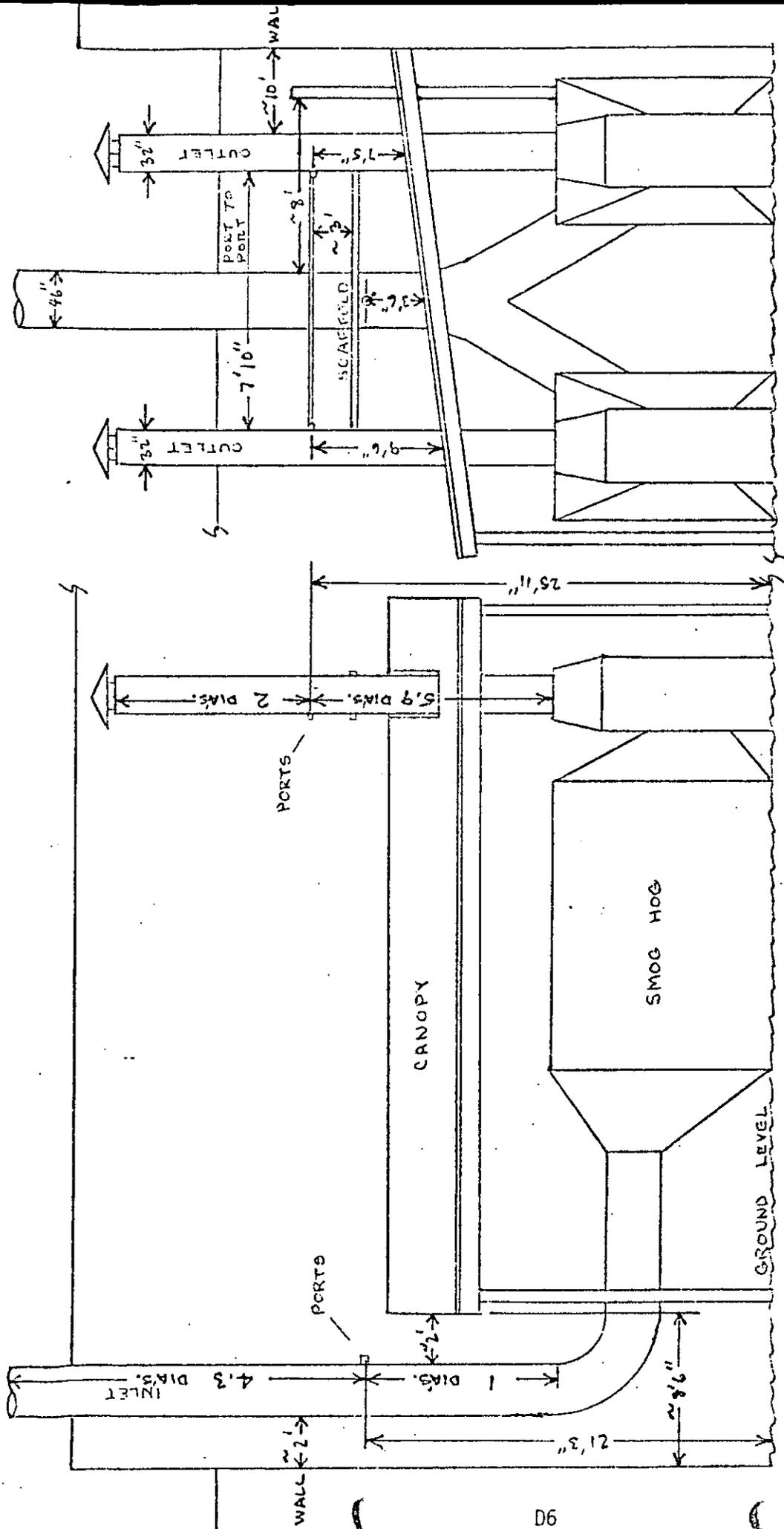
A temperature traverse of the inlet indicates that the water cooled probe won't be needed. A velocity traverse of the outlets indicates that the rain caps won't have to be removed.

There is ample van or truck parking space next to the test site. Job space or a portion of warehouse nearby will be made available for supplies storage and/or cleanup. No visible emissions seen during presurvey.

SURVEY BY J. W. Brown

STACK DATA

Properties of Sampling Locations	Stack #1	Stack #2	Stack #3	Stack #4
Purpose of stack	Common ESP's inlet	North ESP outlet	South ESP outlet	
Height ft.	~40'	~31'	~31'	
Width ft.	—	—	—	
Length ft.	—	—	—	
Diameter ft. I.D.	46"	32"	—	
Wall thickness in.	16 ga.	—	—	
Material of construction	carbon steel	—	—	
Ports: a. Existing	YES	—	—	
b. Size opening	3"	—	—	
c. Distance of Platform	~8'	—	—	
Straight distance before port	16 1/2'	~7'	—	
Type of restriction	elbow	15' 8"	—	
Straight distance after port	50"	transition duct	—	
Type of restriction	elbow	64"	—	
Environment	outside	rain cap	—	
Work space	good	—	—	
Ambient temp. °F	~80° F	—	—	
Avg. pitot reading H ₂ O, in Hg	?	~.35	—	
Stack velocity F/M	~1100	~2100	—	
SCFH ACFM	12-13,000	—	—	
Moisture % by volume	< 5%	—	—	
Stack temperature °F	~110° F	—	—	
Particulate loading gr/SCF	never tested	—	—	
Particle size	never tested	—	—	
Gases present	air and asphalt fumes	—	—	
Stack pressure H ₂ O, in Hg	~atmospheric	—	—	
Dilution air	NO	—	—	
Elevator	NO	—	—	



END

FRONT

WALL THICKNESS - 16 GAUGE

NOTES:

- INLET DUCT I.D. - 46"
- OUTLET STACKS I.D. - 32"
- INLET PORTS I.D. - 3"
- " " HEIGHT - 21'3"
- OUTLET PORTS I.D. - 3"
- " " HEIGHT - 25'11"

CELOTEX - FAIRFIELD, ALA.
NO. 1 SHINGLE LINE
DUAL SMOG HOGS (EOP)

NOT TO SCALE
DATE: 12-75

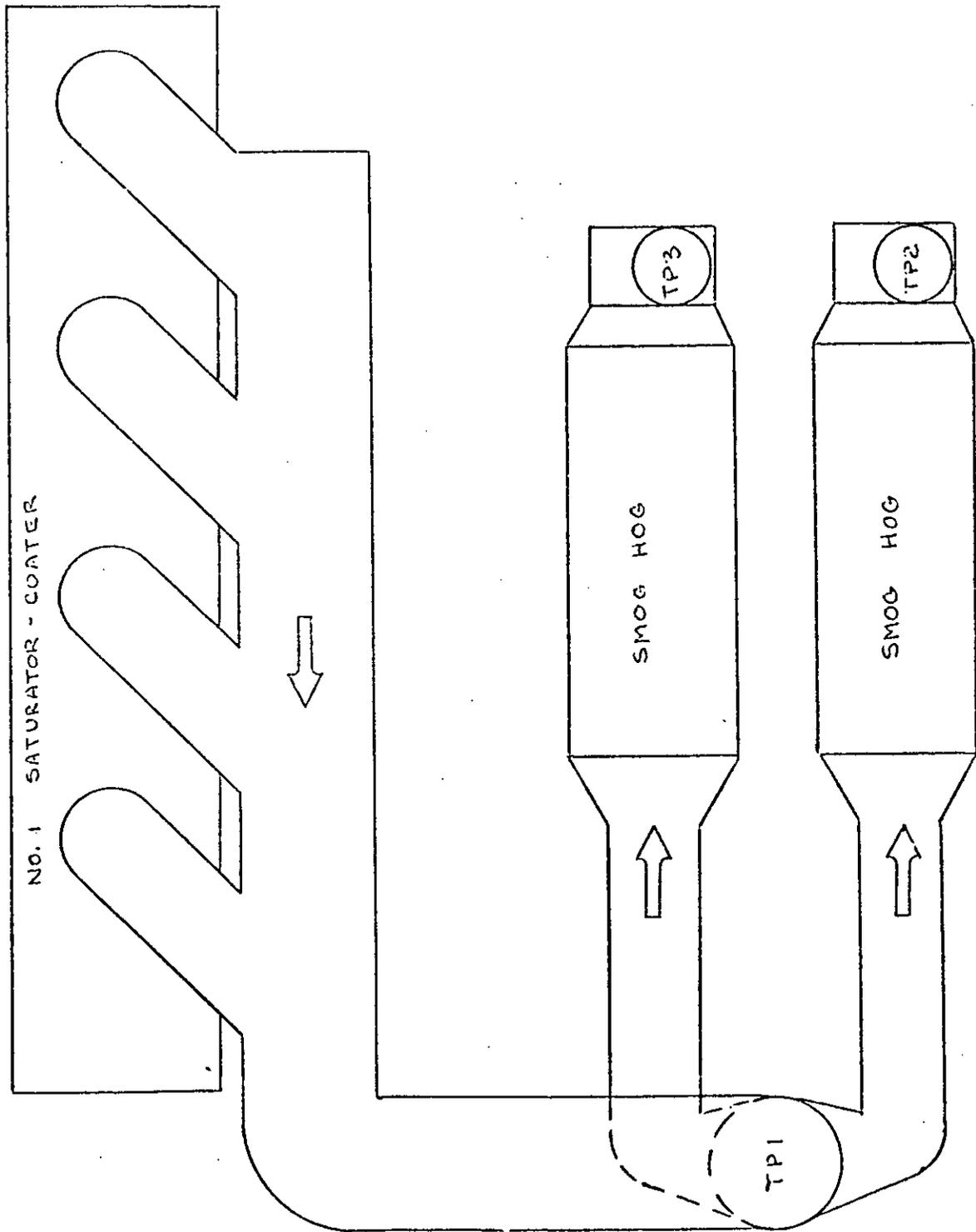
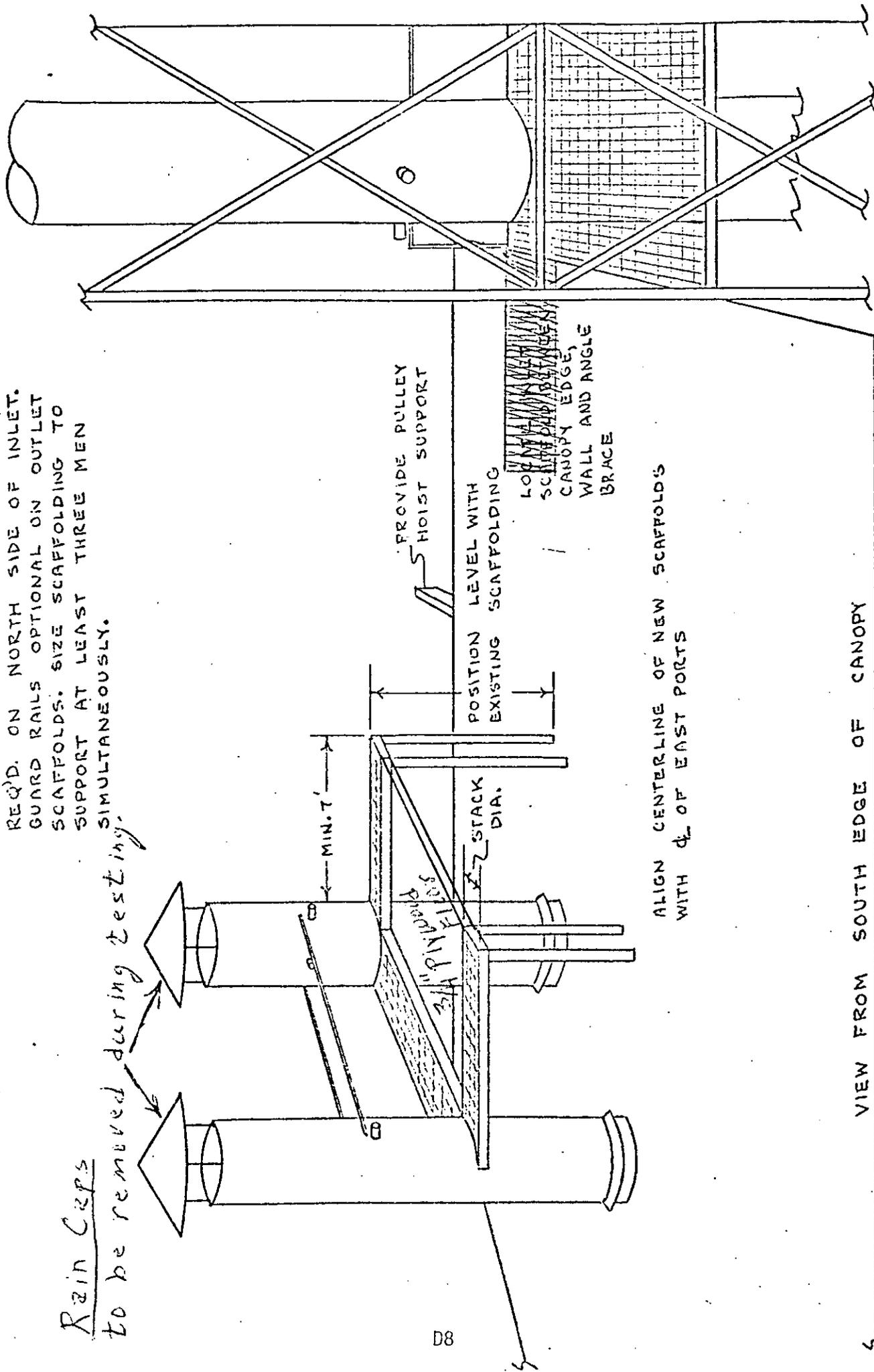


FIG. A - TEST POINT LOCATIONS

EXTEND INLET SCAFFOLD AROUND TO NORTH EDGE OF DUCT. GUARD RAIL REQ'D. ON NORTH SIDE OF INLET. GUARD RAILS OPTIONAL ON OUTLET SCAFFOLDS. SIZE SCAFFOLDING TO SUPPORT AT LEAST THREE MEN SIMULTANEOUSLY.

Rain Caps
to be removed during testing.



ADDITIONAL SCAFFOLDING NECESSARY FOR EMISSIONS TESTING

CELOTEX - FAIRFIELD, AL
NO. 1 LINE SMOG HOGS

CELOTEX CORPORATION--Fairfield, Alabama

The EMB in-house testing scheduled for the Celotex asphalt roofing plant involves some procedures which are not routine EPA testing but are necessitated by the particular nature of emissions peculiar to the industry.

As three popular types of control devices are used by ARM plants, each with its own different operating temperature range it was necessary to specify a sampling temperature of $100^{\circ} \pm 20^{\circ}\text{F}$. At Fairfield the effluent temperatures are $100-110^{\circ}\text{F}$ so the water cooled probes will not be needed. The FID line adaptor connection will be needed so extra care must be exercised to avoid glass breakage and train leaks at that point. There is an oil residue similar to heavy distillate in saturator effluent streams which has been anticipated in the glass wool pre-collector prescribed for the sample train. Spares will be supplied for replacement if needed while sampling. The method used for POM sampling is similar to EPA-5 except that a specific collection device is used in place of a filter and all samples are collected in amber bottles to prevent sunlight induced reactions. All special POM train components and the amber bottles will be supplied by Battelle, the contractor selected to perform all laboratory analysis of field samples secured at the Fairfield test. For specific sampling requirements consult the attached sampling and analysis schedule and the test method instructions.

Asphalt shingle production is essentially a continuous process, however, there are occasional stoppages usually due to felt breaks. Should any breaks occur during the testing it will be necessary to stop all sampling trains as soon as possible. Communication via walkie-talkie will be maintained with personnel at the process line to provide rapid information on line breaks.

A travel and testing schedule for 76-ARM-13 is set up and attached. In order to allow sufficient time for contingency testing in five working days (the plant is down on weekends) it is requested that designated test personnel travel on Sunday, September 28, afternoon or evening. There is one direct flight from Raleigh-Durham to Birmingham at 3:00 p.m. An informal meeting for discussion of tactical problems will be convened sometime as convenient to the group.

Testing point locations and diagrams of the site physical facilities are attached along with test personnel assignments on a daily schedule. Each member of the crew is responsible to see that duties as assigned are completed properly and in a timely manner. Alternate assignments could be made in the field as conditions necessitate. In order to arrive at the best solutions to any problems that arise in the field, daily informal meetings (probably at breakfast) will be held to discuss them and to obtain input from all members of the crew.

Monday will be used exclusively for equipment setup and preparation by the setup crew. No sampling can be done on Monday as the plant will be making roll roofing and not the requested 3 tab standard shingles.

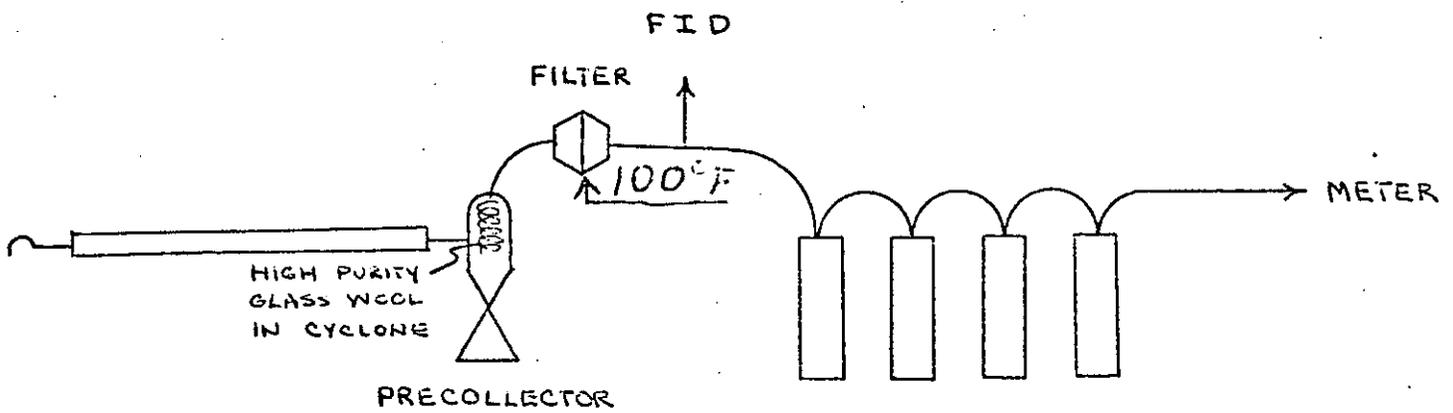
On Tuesday, testing preliminaries will be conducted and any necessary adjustments will be made, then the first set of particulate/hydrocarbon tests are scheduled. In addition Method 5 cleanup evaluation test(s) will be run. A total of six of these (two at each stack) are requested at Fairfield and will be conducted as field conditions permit. Visible emissions testing at one outlet will be conducted.

On Wednesday the second and last particulate/hydrocarbon runs are planned along with visible emissions testing at the indoor saturator enclosure.

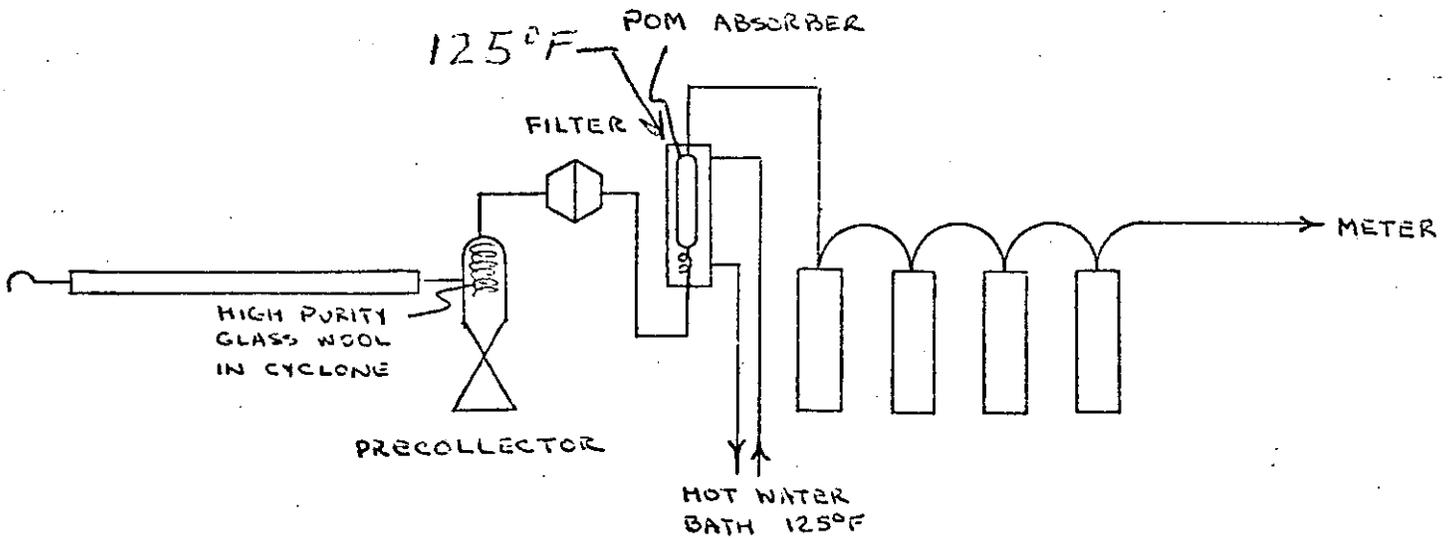
On Thursday two POM runs will be conducted, one at the inlet and one at one of the outlets. Opacity readings are scheduled at one of the outlets also.

Particle size testing is to be conducted at any convenient time during the week that will not interfere with the particulate/hydrocarbon and POM testing.

Friday is set aside for contingency testing and/or equipment and sample packing. If there are no long testing or process delays several of the crew may use Friday as a return travel day.



PARTICULATE-HYDROCARBON



POLYCYCLIC ORGANIC MATERIAL

ARM SAMPLING TRAINS

APPENDIX D-1

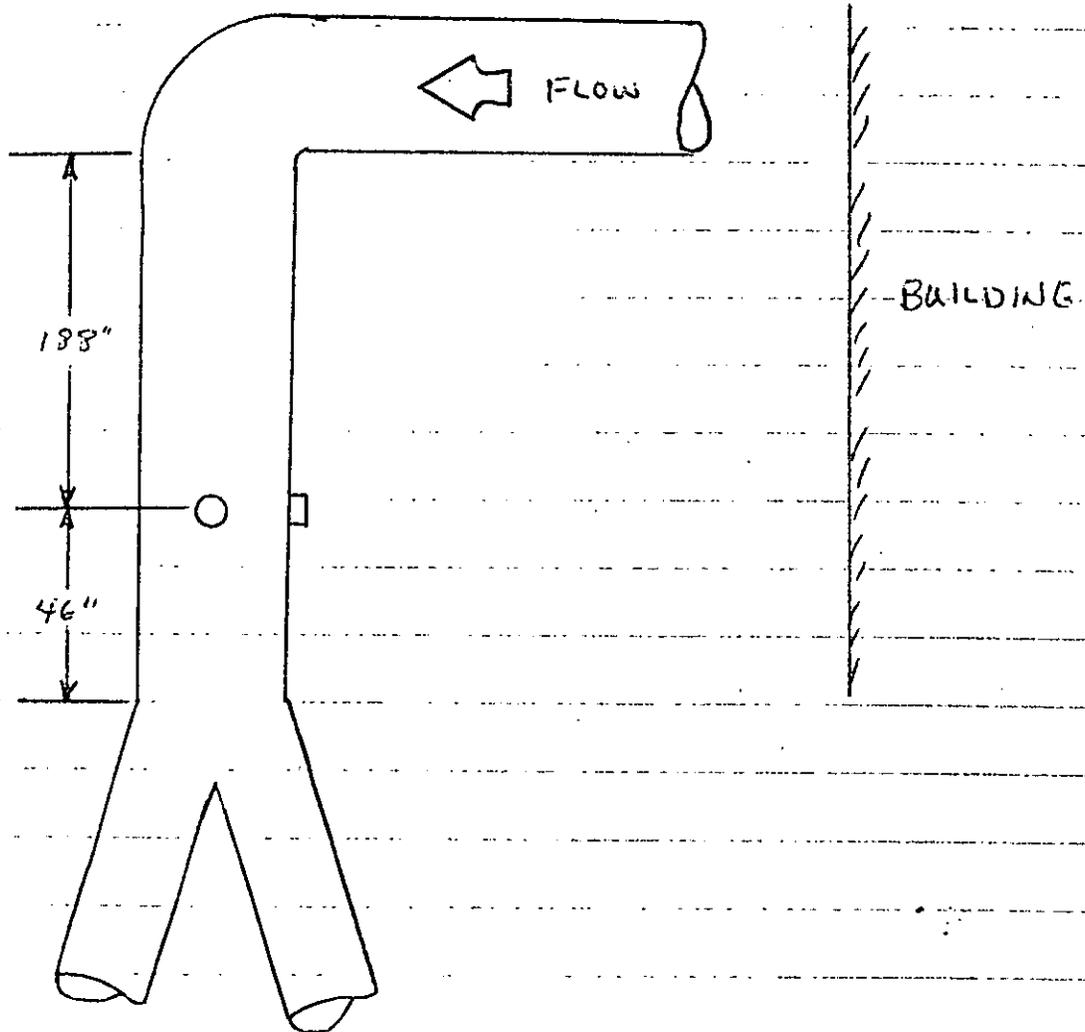
INLET LOCATION TP-1
FIELD DATA SHEETS

Celotex, Fairfield, ALA.

October 6, 1975.

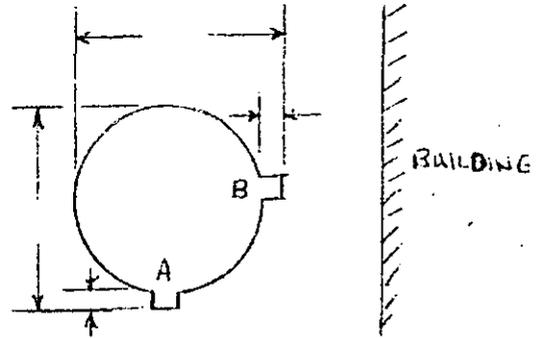
TP-1 (ESP INLET)

WEK



TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Celotex, Fairfield
 DATE October 6, 1975
 SAMPLING LOCATION TP-1 (ESP INLET)
 INSIDE OF FAR WALL TO
 OUTSIDE OF NIPPLE, (DISTANCE A) 49.75
 INSIDE OF NEAR WALL TO
 OUTSIDE OF NIPPLE, (DISTANCE B) 4 1/4
 STACK I.D., (DISTANCE A - DISTANCE B) 45 1/2
 NEAREST UPSTREAM DISTURBANCE 188" - 4.13 dia.
 NEAREST DOWNSTREAM DISTURBANCE 46" - 1.01 dia.
 CALCULATOR KELLY



SCHEMATIC OF SAMPLING LOCATION

Sample time - 36 points x 4 minutes/pt. = 144 min

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)		DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	1.4	45 1/2"	0.64	(1)	4 1/4	5 1/4
2	4.4	↑	2.0	2	↑	6 1/4
3	7.5		3.41	3 3/8		7 5/8
4	10.9		4.96	5		9 1/4
5	14.6		6.64	6 5/8		10 1/8
6	18.8		8.55	8 1/2		12 7/8
7	23.6		10.74	10 3/4		15
8	29.6		13.47	13 1/2		17 3/4
9	38.2		17.38	17 3/8		21 5/8
10	61.8		28.12	28 1/4		32 3/8
11	70.4		32.03	32		36 1/4
12	76.4		34.76	34 3/4		37
13	81.2		36.95	37		41 1/4
14	85.4		38.86	38 5/8		43 1/8
15	89.1		40.54	40 1/2		44 3/4
16	92.5		42.09	42 1/8		46 3/8
17	95.6	↓	43.56	43 1/2	↓	47 3/4
18	98.6	45 1/2"	44.86	(44 1/2)	4 1/4	48 3/4

Pitot Tube Coefficient Chart

	<u>Pitot Tube</u>	<u>A-side coefficient</u>	<u>B-side coefficient</u>
TP2	4-06	0.857	0.853
TP3	4-07	0.857	0.853
	5-01	0.852	0.851
TP1	5-05	0.848	0.847

NOMOGRAPH DATA

FID flow:
 6.5 ft³/hr.
 0.108 ft³/min
 14 in. lower ΔP

PLANT CELOTEX CORP.
 DATE 10/7/75
 SAMPLING LOCATION TP1 Run 1

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	ΔH _o	1.84
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	T _{m avg.}	90
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B _{wo}	2 + 12 = 14
BAROMETRIC PRESSURE AT METER, in. Hg	P _m	29.61
STATIC PRESSURE IN STACK, in. Hg. (P _m ± 0.073 x STACK GAUGE PRESSURE in in. H ₂ O)	P _s	29.72 29.60
RATIO OF STATIC PRESSURE TO METER PRESSURE	P _s /P _m	1.0
AVERAGE STACK TEMPERATURE, °F	T _{s avg.}	125
AVERAGE VELOCITY HEAD, in. H ₂ O	ΔP _{avg.}	.60
MAXIMUM VELOCITY HEAD, in. H ₂ O	ΔP _{max.}	.72
C FACTOR		0.93
CALCULATED NOZZLE DIAMETER, in.		0.245
ACTUAL NOZZLE DIAMETER, in.		0.242
REFERENCE Δp, in. H ₂ O		0.60

FID FIELD DATA

PLANT CELESTEX CORP.
 DATE 10/11/55
 SAMPLING LOCATION TPI
 SAMPLE TYPE METHOD FID
 RUN NUMBER 1
 OPERATOR BIDDY-BURBAKUS
 AMBIENT TEMPERATURE 70
 BAROMETRIC PRESSURE 25.51
 STATIC PRESSURE (P_s) 1.5
 FILTER NUMBER(S) 2341 0-3887

PROBE LENGTH AND TYPE 5'
 NOZZLE I.D. 0.242
 ASSUMED MOISTURE, % 2
 SAMPLE BOX NUMBER 8
 METER BOX NUMBER RAC1
 METER SH. 1.84
 C. FAC. FOR 0.93
 PROBE HEATER SETTING 0
 HEATER BOX SETTING 0
 REFERENCE AT 0.60

FID Gas Flow Rate 1.08 CFM @ 97

SCHEMATIC OF TRAVERSE POINT LAYOUT
 READ AND RECORD ALL DATA EVERY 4 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr CLOCK)	SAMPLING TIME, min	GAS METER READING (V _m ³ , 11 ³)	VELOCITY HEAD (ΔP _s), in. H ₂ O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	FILTER TEMPERATURE, °F	FID GAS TEMPERATURE, °F	FID-HC CONC. PPM Vol.
					DESIRED	ACTUAL		INLET (T _{m in}), °F	OUTLET (T _{m out}), °F				
X 0		0	240.10		1.3	1.3	95	82	81	4	65	64	
2		4	242.70	.53	1.7	1.7	100	85	81	5	65	64	
3		8	245.50	.55	1.7	1.7	125	99	82	5	65	64	
4		12	248.44	.57	1.7	1.7	125	102	82	5	65	64	
5		16	251.32	.59	1.8	1.8	128	105	83	6	65	64	
6		20	254.00	.56	1.7	1.7	127	112	84	4	68	64	
7		24	255.34	.54	1.7	1.7	130	119	84	6	65	64	
8		28	257.11	.57	1.7	1.7	129	119	84	6	65	64	
9		32	259.80	.57	1.7	1.7	130	124	84	6	65	64	
10		36	262.52	.56	1.8	1.8	130	120	84	6	65	64	
11		40	265.33	.59	1.5	1.5	130	120	84	6	65	64	
12		44	268.10	.58	1.9	1.9	127	127	87	5.5	92	55	
13		48	271.60	.61	1.8	1.8	127	101	87	6	95	56	
14		52	274.5	.64	1.9	1.9	127	108	88	6	98	58	
15		56	277.5	.64	1.7	1.7	127	113	90	6.5	101	60	
16		60	280.5	.57	1.7	1.7	127	117	92	6	98	61	
17		64	283.4	.46	1.4	1.4	128	114	92	5	95	61	
18		68	286.1	.35	1.0	1.0	125	118	94	4	91	61	
		72	288.51					34.97					

1432

Collector Tare Weight(s)

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS

PLANT Fairfield, Alabama

DATE OCT 7 1975

SAMPLING LOCATION _____

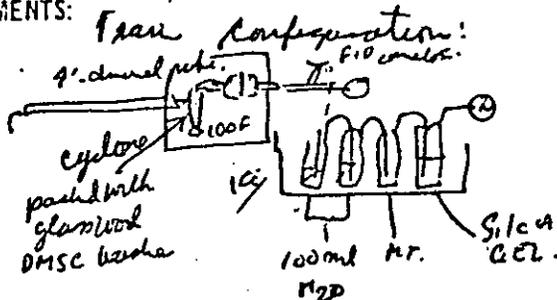
SAMPLE TYPE _____

RUN NUMBER CRP-TP-1-1 - INLET

SAMPLE BOX NUMBER ONE

CLEAN-UP MAN Bayles

COMMENTS:



FRONT HALF

Probe - T_{top} 0.242 ^{m EPA FILTER}
 Replater ^{HOLOETZ}
 D_{width} - note filter on seal
 stuck to both glass
 and silicon rubber seal -

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
 FLASK, FRONT HALF OF FILTER HOLDER
 BAL 1) 3al-4

FILTER NUMBER _____
 tare 0.3897 g 0.393675
 net _____

note: about 90% of the colored catch (oil) was
 collected in the nozzle pot assembly.
 droplet in gas stream

LABORATORY RESULTS

CONTAINER 28.9 / 5.4 mg
457.9
 CONTAINER 38.1 mg

FRONT HALF SUBTOTAL 530.3 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
 IMPINGERS, CONNECTORS, AND BACK
 HALF OF FILTER HOLDER

ACETONE WASH OF IMPINGERS, CONNECTORS,
 AND BACK HALF OF FILTER HOLDER

CONTAINER _____ mg
 ETHER-CHLOROFORM
 EXTRACTION _____ mg
 CONTAINER _____ mg
 BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT _____ mg

	Rinse volumes	ml	ml	ml	ml	ml	ml
MOISTURE							
IMPINGERS							
FINAL VOLUME	1	131	2	105	3	2	4
INITIAL VOLUME		100		100		0	
NET VOLUME		31		5		2	
SILICA GEL							
FINAL WEIGHT		499.4					
INITIAL WEIGHT		475					
NET WEIGHT		24.4					
TOTAL MOISTURE							62.4

38
 24.4
 62.4

Celotex Corp
Fairfield Alabama

TP-1 Inlet Run 1

Traverse Point	$\overline{VPS} \times (CF \times 100)$	V_s	Q_s	
A 1	15.63	2350	23100	
2	18.01	2710	26600	
3	18.97	2850	28000	
4	19.35	2910	28600	
5	18.70	2810	27600	
6	17.19	2580	25300	
7	17.10	2570	25200	
8	16.96	2550	25000	
9	16.62	2500	24500	
10	17.15	2580	25300	
11	16.97	2550	25000	
12	17.10	2570	25200	
13	17.27	2600	25500	
14	17.52	2630	25800	
B 1	15.08	2270	22300	
2	17.23	2590	25400	
3	17.94	2700	26500	
4	18.26	2740	26900	
5	18.63	2800	27500	
6	18.13	2720	26700	
7	18.18	2730	26800	
8	18.34	2760	27100	
9	18.34	2760	27100	
10	18.18	2730	26800	
11	18.66	2800	27500	
12	18.45	2770	27200	
13	18.92	2840	27900	
14	19.38	2910	28600	
15	19.38	2910	28600	
16	18.29	2750	27000	
17	16.45	2470	24300	
18	13.93	2090	20500	
	224.10			
A 15	16.22	2440	23900	
16	15.86	2380	23400	
17	13.62	2050	20100	
18	12.09	1820	17900	
	302.33		25,500	
	17.34	$Q_a -$	29,300	
		Min	Max	Average
PPM (by volume)				
Volumetric flow SCFM	17,900	23,600	25,500	
grams per hour				

NOMOGRAPH DATA

PLANT Celotay Al.
 DATE 10-8-75
 SAMPLING LOCATION TP-1 Inlet Room 2

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	ΔH_{or}	1.84
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m \text{ avg.}}$	100
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{w0}	2.0
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.6
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	.11
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s \text{ avg.}}$	125
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta P_{\text{avg.}}$	.60
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta P_{\text{max.}}$	.72
C FACTOR		0.93
CALCULATED NOZZLE DIAMETER, in.		0.245
ACTUAL NOZZLE DIAMETER, in.		0.242
REFERENCE Δp , in. H ₂ O		0.60

FIELD DATA

Plant C E L E T E X : FAIRFIELD
 Date 10/8/75
 Sampling Location INLET: TPI
 Sample Type XGTHOD 5 + FID
 Run Number 1108
 Operator BURBANK BIDDY
 Ambient Temperature 75°F
 Barometric Pressure 29.58
 Static Pressure (P_s) 1.5 IN. H₂O
 Filter Number(s) 5-0-394135

PROBE LENGTH AND TYPE 5' STAINLESS
 NOZZLE I.D. .242
 ASSUMED MOISTURE, % B
 SAMPLE BOX NUMBER 15
 METER BOX NUMBER BAC 1
 METER ΔH 1.84
 C FACTOR .43
 PROBE HEATER SETTING 0
 HEATER BOX SETTING 150
 REFERENCE ΔP 6.0

Schematic of Traverse Point Layout
 FID Gas Flow Rate 1.08 ACFM
 READ AND RECORD ALL DATA EVERY 4 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _m) ¹²	VELOCITY HEAD (ΔP _s) ¹² , in. H ₂ O	ORIFICE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s) ¹² , °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	FILTER GAS TEMPERATURE, °F	FID GAS TEMPERATURE, °F	FID-HC CONC. PPM VOL.
				DESIRED	ACTUAL		INLET (T _{m in}) ¹² , °F	OUTLET (T _{m out}) ¹² , °F				
X1	0 1021	364.75	.50	1.5	1.5	125	112	92	2.5	78	58	
2	4	367.55	.60	1.8	1.8	125	112	92	3	82	56	
3	8	370.50	.60	1.8	1.8	125	113	94	3	84	58	
4	12	373.18	.70	2.1	2.1	125	115	95	3.5	85	60	
5	16	376.70	.70	2.1	2.1	118	119	96	3.5	93	60	
6	20	379.90	.70	2.1	2.1	118	120	97	3.5	92	60	
7	24	373.0	.70	2.1	2.1	118	122	94	3.5	95	61	
8	28	386.37	.69	2.1	2.1	118	122	94	3.5	94	62	
9	32	389.62	.66	2.0	2.0	118	123	100	3.5	97	62	
10	36	392.80	.56	1.7	1.7	118	123	101	3.0	98	63	
11	40	395.77	.43	1.3	1.3	120	121	101	2.5	100	64	
12	44	398.49	.44	1.3	1.3	120	120	102	2.5	100	64	
13	48	400.99	.45	1.3	1.3	118	119	103	2.5	100	64	
14	52	403.105	.42	1.27	1.27	120	117	103	2.5	101	65	
15	56	406.2	.40	1.20	1.2	120	116	103	2.5	101	65	
16	60	408.79	.35	1.1	1.1	118	115	103	2.5	103	66	
17	64	411.28	.26	.78	.78	118	114	102	2.0	102	65	
18	68	413.40	.18	.56	.56	120	113	102	2.0	101	65	
19	72	415.27				2102						
						10						

COMMENTS:

TPI - RUN 2

TRAVERSE POINT NUMBER	CLOCK TIME 124 hr CLOCK	GAS METER READING (V _m) ³	VELOCITY HEAD (V _m) ³ in. H ₂ O	ORIFICE PRESSURE DIFFERENTIAL (ΔH ₁) in. H ₂ O		STACK TEMPERATURE (T _s) °F	DRY GAS METER TEMPERATURE (T _m) °F		PUMP VACUUM in Hg	FILTER GAS TEMPERATURE °F	FID GAS TEMPERATURE °F	FID-HC CONC. PPM Vol.
				DESIRED	ACTUAL		INLET (T _m) ⁱⁿ °F	OUTLET (T _m) ^{out} °F				
19	72 1144	415.27	.6	1.8	1.5	128	100	98	3.5	93	60	
20	76 1206	418.2	.56	1.78	1.23	128	106	98	3.0	97	60	
21	80 1208	421.2	.57	1.78	1.23	125	98	94	3.0	96	60	
22	84	424.09	.58	1.78	1.28	125	103	94	3.0	96	61	
23	88	426.99	.58	1.78	1.28	128	101	95	3.0	94	63	
24	92	439.97	.55	1.7	1.7	128	103	96	3.5	98	61	
25	96	432.97	.53	1.6	1.6	128	118	97	3.0	98	65	
26	100	435.84	.51	1.5	1.5	132	120	99	3.0	100	66	
27	104	438.56	.51	1.5	1.5	133	121	101	3.0	103	66	
28	108	441.37	.55	1.7	1.7	132	123	102	3.5	100	66	
29	112	444.2	.6	1.8	1.8	128	120	103	3.5	105	67	
30	116	447.33	.63	1.9	1.9	128	124	104	3.5	102	65	
31	120 1251/1312	450.47	.67	2.0	2.0	128	122	105	4.0	104	65	
32	124	453.65	.67	2.0	2.0	129	97	97	4.0	100	62	
33	128	456.8	.65	1.95	1.95	129	107	97	4.0	106	64	
34	132 13825	460.0	.59	1.8	1.8	135	101	98	3.5	106	66	
35	136	463.00										
36	140											
37	144											
NOTE: SAMPLE TRAIN FOR THIS RUN DOES NOT INCLUDE CYCLONE LOSS IN FRONT OF FILTER												
PUMP WAS TERMINATED AT 13:25 WITH 135.57 MINUTES OF SAMPLING TIME												
		18.25										
		T 14.69 FID										
		112.44				125						
		2.50										
		115.44										
		53.2 ml H ₂ O										
		102165 H ₂ O										

SAMPLING TASK LOG

Plant Celotex Corporation
 Date 10-6-66 10-40

Plant Location Fairfield Alabama TP-1
 Recorded by C.E. Riley

Run	Sampling location (Port)	Pollutant	Clock Time Began	Elapsed Time (min)	Sample Nos.
10-8-75					
2	TP-1 Port A	Particulate	1031	1133	72
2			1133	1144	
2	TP-1 Port B	Particulate	1144	1149	5
2			1149	1206	
2	TO-1 Port B	Part.	1206	1252	46
2			1252	1312	
2	TP-1 Port B	Part	1312	1325	13
2			1325		
at 1325 with a total sampling time of 136 min; Decision was made to stop that another run would be started also process down time was expected to be approximately 1/2 hour or more. C.E. Riley					
Total time 136 min					
Note - Cyclone and glass wool removed from train configuration					
FID - 113 min = 12.20 volume of #13					

ANALYTICAL DATA

CELOTEX ROCKETING PRODUCTS
Fairfield, Alabama

PLANT _____
DATE OCT 8 1973 OCT 8 1975
SAMPLING LOCATION _____
SAMPLE TYPE _____
RUN NUMBER CAP-TPI-2 - IN LET
SAMPLE BOX NUMBER glass set #4
CLEAN-UP MAN Bayton

COMMENTS:
pinic on screen near TPI-1, very little catch was collected on the cyclone wool, the cyclone area eliminated on this run

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK, FRONT HALF OF FILTER HOLDER
Bal 5
FILTER NUMBER _____
tare 0.394135g
net _____

CONTAINER _____ 18.2 / 3.4 mg
CONTAINER _____ 401.7 mg

FRONT HALF SUBTOTAL 423.3 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER
ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____ mg
ETHER-CHLOROFORM
EXTRACTION _____ mg
CONTAINER _____ mg
BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT _____ mg

	Rinse						
	volumes	ml	ml	ml	ml	ml	ml
<u>MOISTURE</u>							
		<i>emulsion</i>	<i>no oil</i>				
IMPINGERS							
FINAL VOLUME	<u>1</u>	<u>126</u> ml	<u>2</u>	<u>32</u> ml	<u>454</u> ml	<u>5</u> ml	<u>6</u> ml
INITIAL VOLUME		<u>100</u> ml		<u>0</u> ml			
NET VOLUME		<u>26</u> ml		<u>2</u> ml			

SILICA GEL					
FINAL WEIGHT	<u>498.2</u> g	_____ g	_____ g	<u>23.2</u>	
INITIAL WEIGHT	<u>475.0</u> g	_____ g	_____ g	<u>30</u>	
NET WEIGHT	<u>23.2</u> g	_____ g	_____ g	<u>53.2</u>	TOTAL MOISTURE <u>53.2</u>

Celotex Corp.
Fairfield Alabama

TP-1 Inlet Run 2

Traverse Point	W.P.S. (T.S. 1940)	Vs	Qs
A 1	17.10	2570	25,400
2	18.73	2810	27,700
3	18.23	2810	27,700
4	20.24	3040	30,000
5	20.11	3020	29,800
6	20.11	3020	29,800
7	20.11	3020	29,800
8	19.97	3000	29,600
9	19.53	2930	28,900
10	17.99	2700	26,600
11	15.79	2370	23,400
12	15.97	2400	23,700
13	16.13	2420	23,900
14	15.61	2350	23,200
15	15.23	2290	22,600
16	14.22	2140	21,100
17	11.78	1770	17,500
18	10.22	1540	15,200
	307.37		
B 1	18.78	2820	27,800
2	18.15	2730	26,900
3	18.26	2740	27,000
4	18.43	2770	27,300
5	18.47	2780	27,400
6	17.98	2700	26,600
7	17.65	2650	26,200
8	17.38	2610	25,800
9	17.39	2610	25,800
10	18.04	2710	26,700
11	18.78	2820	27,800
12	19.25	2890	28,500
13	19.85	2980	29,400
14	19.87	2990	29,500
15	19.57	2940	29,000
16	18.74	2820	27,800
17	—	—	—
18	—	—	—
	603.95		26,400
	17.76	Qa	30,200

FIELD DATA

PLANT Velocity Transformer FID 117 min
 DATE 10/5/75
 SAMPLING LOCATION INLET T-1D1
 SAMPLE TYPE MULTI-5 + 10
 RUN NUMBER 3
 OPERATOR B. W. ...
 AMBIENT TEMPERATURE 75
 BAROMETRIC PRESSURE 29.68
 STATIC PRESSURE (PS) 11.0
 FILTER NUMBER (S) 8-0-216214

PROBE LENGTH AND TYPE 5' Inlet - point 5-05
 NOZZLE I.D. 1.212
 ASSUMED MOISTURE, % 2
 SAMPLE BOX NUMBER 5
 METER BOX NUMBER RAS-1
 METER ΔH_g 1.24
 C FACTOR 1.33
 PROBE HEATER SETTING 0
 HEATER BOX SETTING 150
 REFERENCE ΔP 16.0

FID Gas Flow Rate

SCHEMATIC OF TRAVERSE POINT LAYOUT
 READ AND RECORD ALL DATA EVERY 4 MINUTES

Collector Tare Weight(s)

AVERAGE OINT NUMBER	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _m) ³	VELOCITY HEAD (Δp _s), in. H ₂ O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	Filter Gas TEMPERATURE, °F	FID Gas TEMPERATURE, °F	FID-HC CONC. PPM VOL.
				DESIRED	ACTUAL		INLET (T _{m in}), °F	OUTLET (T _{m out}), °F				
<u>0 out 15</u>	<u>0</u>	<u>463.59</u>										
<u>1</u>	<u>4</u>	<u>466.20</u>	<u>1.42</u>	<u>1.3</u>	<u>85</u>	<u>84</u>	<u>3.0</u>	<u>75</u>	<u>69</u>			
<u>2</u>	<u>8</u>	<u>468.90</u>	<u>1.49</u>	<u>1.5</u>	<u>100</u>	<u>85</u>	<u>3.0</u>	<u>78</u>	<u>59</u>			
<u>3</u>	<u>12</u>	<u>471.62</u>	<u>1.48</u>	<u>1.48</u>	<u>100</u>	<u>86</u>	<u>3.5</u>	<u>85</u>	<u>60</u>			
<u>4</u>	<u>16</u>	<u>474.47</u>	<u>1.55</u>	<u>1.69</u>	<u>150</u>	<u>87</u>	<u>4.0</u>	<u>92</u>	<u>62</u>			
<u>5</u>	<u>20</u>	<u>477.34</u>	<u>1.55</u>	<u>1.69</u>	<u>150</u>	<u>88</u>	<u>4.0</u>	<u>95</u>	<u>64</u>			
<u>6</u>	<u>24</u>	<u>480.24</u>	<u>1.55</u>	<u>1.69</u>	<u>151</u>	<u>87</u>	<u>4.0</u>	<u>97</u>	<u>64</u>			
<u>7</u>	<u>28</u>	<u>483.06</u>	<u>1.53</u>	<u>1.60</u>	<u>151</u>	<u>90</u>	<u>4.0</u>	<u>99</u>	<u>63</u>			
<u>8</u>	<u>32</u>	<u>485.90</u>	<u>1.52</u>	<u>1.59</u>	<u>151</u>	<u>91</u>	<u>4.0</u>	<u>100</u>	<u>63</u>			
<u>9</u>	<u>36</u>	<u>488.66</u>	<u>1.51</u>	<u>1.56</u>	<u>151</u>	<u>92</u>	<u>4.0</u>	<u>100</u>	<u>63</u>			
<u>10</u>	<u>40</u>	<u>491.42</u>	<u>1.51</u>	<u>1.56</u>	<u>151</u>	<u>94</u>	<u>4.0</u>	<u>100</u>	<u>63</u>			
<u>11</u>	<u>44</u>	<u>494.35</u>	<u>1.56</u>	<u>1.70</u>	<u>151</u>	<u>95</u>	<u>4.0</u>	<u>100</u>	<u>63</u>			
<u>12</u>	<u>48</u>	<u>497.37</u>	<u>1.60</u>	<u>1.82</u>	<u>151</u>	<u>96</u>	<u>4.2</u>	<u>100</u>	<u>63</u>			
<u>13</u>	<u>52</u>	<u>500.43</u>	<u>1.62</u>	<u>1.89</u>	<u>151</u>	<u>97</u>	<u>4.2</u>	<u>102</u>	<u>65</u>			
<u>14</u>	<u>56</u>	<u>503.60</u>	<u>1.65</u>	<u>1.98</u>	<u>151</u>	<u>98</u>	<u>4.8</u>	<u>102</u>	<u>66</u>			
<u>15</u>	<u>60</u>	<u>506.77</u>	<u>1.67</u>	<u>2.05</u>	<u>151</u>	<u>98</u>	<u>5.0</u>	<u>103</u>	<u>66</u>			
<u>16</u>	<u>64</u>	<u>509.85</u>	<u>1.63</u>	<u>1.90</u>	<u>151</u>	<u>98</u>	<u>4.8</u>	<u>103</u>	<u>66</u>			
<u>17</u>	<u>68</u>	<u>512.72</u>	<u>1.53</u>	<u>1.61</u>	<u>151</u>	<u>98</u>	<u>4.0</u>	<u>103</u>	<u>68</u>			
<u>18</u>	<u>72</u>	<u>515.35</u>	<u>1.43</u>	<u>1.32</u>	<u>151</u>	<u>98</u>	<u>3.2</u>	<u>103</u>	<u>68</u>			

COMMENTS:

29.93

TPI Port A Run 3

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _m , ft ³)	VELOCITY HEAD (Δp, in. H ₂ O)	ORIFICE DIFFERENTIAL (ΔH, in. H ₂ O)		STACK TEMPERATURE (T _s , °F)	DRY GAS METER TEMPERATURE (T _m , °F)		PUMP VACUUM (in. Hg)	SAMPLE BOX TEMPERATURE (°F)	IMPINGER TEMPERATURE (°F)
				DESIRED	ACTUAL		INLET (T _{m in} , °F)	OUTLET (T _{m out} , °F)			
Port A	1810	515.35									
1	4	518.05	.48	1.48	1.48	100	92	93	4.0	94	66
2	8	520.98	.57	1.75	1.75	100	94	93	4.0	91	62
3	12	524.00	.63	1.89	1.89	125	100	92	4.5	90	62
4	16	527.15	.66	2.00	2.00	140	105	92	5.0	88	62
5	20	530.35	.70	2.11	2.11	140	108	94	5.3	90	62
6	24	533.65	.72	2.20	2.20	140	108	94	5.5	89	62
7	28	536.94	.72	2.20	2.20	140	110	93	6.2	99	62
8	32	540.07	.65	1.99	1.99	140	112	94	6.0	106	62
9	36	543.10	.60	1.84	1.84	140	111	94	6.0	107	62
10	40	546.00	.54	1.65	1.65	130	110	94	5.8	106	62
11	44	548.84	.53	1.61	1.61	130	110	95	5.4	106	62
12	48	551.65	.52	1.60	1.60	130	88	88	6.0	108	60
13	52	554.40	.51	1.58	1.58	130	95	87	6.0	102	62
14	56	557.23	.51	1.58	1.58	130	100	88	6.0	105	62
15	60	560.12	.55	1.70	1.70	125	85	84	6.2	108	60
16	64	562.88	.50	1.52	1.52	125	93	85	6.0	102	60
17	68	565.50	.46	1.41	1.41	125	100	86	6.0	104	62
18	72	567.96	.38	1.18	1.18	125	102	86	5.0	106	62
	144 min					10	70	70			
		527.67									
		108.18									
		68.16									
		104.37									
		15.55									
		119.92									
						48.73					
						13.5					
						31.29					
						29.95					

18: Down
1912 about
1925 Down
1951
Nelson

18:50 - down
19:10 - about
19:25 - down
19:40 - about

ANALYTICAL DATA

CELOTEK ROOFING PRODUCTS

Fairfield, Alabama

PLANT _____

DATE OCT 8 1975

SAMPLING LOCATION _____

SAMPLE TYPE _____

RUN NUMBER CRP-TP-1-3

SAMPLE BOX NUMBER _____ *glass set #1*

CLEAN-UP MAN Baylors

COMMENTS:

"U" connector at end of #1 impinger broken too tight

FRONT HALF

FILTER STUCK TO FRIT AND GLASS HOLDER - ALSO - DIL BAKE TRW OTHER SIDE OF FILTER

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER

bal. 8

CONTAINER _____ 22.3 / 3.7 mg

FILTER NUMBER _____

CONTAINER _____ 463.6 mg

tare 0.396214 g

net _____ g

FRONT HALF SUBTOTAL 489.5 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER

CONTAINER _____

ETHER-CHLOROFORM EXTRACTION _____

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER

CONTAINER _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

MOISTURE

Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml

IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	<u>125</u> ml	<u>302</u> ml	<u>30</u> ml	<u>450</u> ml	<u>5</u> ml	_____ ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>0</u> ml	_____ ml	_____ ml	_____ ml
NET VOLUME	<u>25</u> ml	<u>2</u> ml	<u>2</u> ml	_____ ml	_____ ml	_____ ml

SILICA GEL	_____	_____	_____
FINAL WEIGHT	<u>499.2</u> g	_____ g	_____ g
INITIAL WEIGHT	<u>475</u> g	_____ g	_____ g
NET WEIGHT	<u>24.2</u> g	_____ g	_____ g

29
24.2
53.2

TOTAL MOISTURE 53.2

Celotex Corp.
Fairfield Cal

TP-1 Inlet Run
3

Inshore Point	VAT x CT x 2460	Vs	Qs
A 1	16.40	2460	23900
2	17.87	2680	26100
3	19.04	2850	27700
4	19.90	2980	29000
5	20.49	3070	29900
6	20.78	3110	30300
7	20.78	3110	30300
8	19.75	2960	28800
9	18.97	2840	27600
10	17.85	2670	26000
11	17.68	2650	25800
12	17.52	2620	25500
13	17.35	2600	25300
14	17.35	2600	25300
15	17.94	2690	26200
16	17.10	2560	24900
17	16.40	2460	23900
18	14.91	2230	21700
	328.08		
B 1	15.13	2270	22100
2	16.57	2430	24100
3	16.54	2430	24100
4	18.32	2740	26700
5	18.32	2740	26700
6	18.33	2740	26700
7	18.00	2700	26300
8	17.82	2670	26000
9	17.65	2640	25700
10	17.65	2640	25700
11	18.50	2770	27000
12	19.15	2870	27900
13	19.46	2910	28300
14	19.93	2980	29000
15	20.23	3030	29500
16	19.62	2940	28600
17	18.00	2700	26300
18	16.21	2430	23600
	653.51		26,500
	18.15	Qa -	30,700

NOMOGRAPH DATA

PLANT Celotex Al.
 DATE 10-10-75
 SAMPLING LOCATION TP-1 Inlet
Run 4

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	$\Delta H@$	1.54
AVERAGE METER TEMPERATURE (AMBIENT + 20°F). °F	$T_{m\text{ avg.}}$	90
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2.0
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.7
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	.11
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{ avg.}}$	120
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ avg.}}$	.60
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ max.}}$	.72
C FACTOR		0.93
CALCULATED NOZZLE DIAMETER, in.		0.245
ACTUAL NOZZLE DIAMETER, in.		0.242
REFERENCE Δp , in. H ₂ O		0.60

FIELD DATA

PLANT Colony: Fairfield FID 232.000
 DATE 10/10/75 1108
 SAMPLING LOCATION INLET IPI
 SAMPLE TYPE METHOD 5 + FID
 RUN NUMBER 4
 OPERATOR George Baskin
 AMBIENT TEMPERATURE 70
 BAROMETRIC PRESSURE 29.70
 STATIC PRESSURE, (P_s) 1.5-1.56
 FILTER NUMBER(S) BAL 14 0-39-1970

PROBE LENGTH AND TYPE 5' Stainless part 5-05
 NOZZLE I.D. 0.372
 ASSUMED MOISTURE, % 2
 SAMPLE BOX NUMBER 9
 METER BOX NUMBER RAE 1
 METER A.H.P. 1.84
 C FACTOR 1.3
 PROBE HEATER SETTING 0.00000
 HEATER BOX SETTING 100
 REFERENCE A.P. 1.60

Collector Tare Weight(s) _____
 Schematic of Traverse Point Layout _____
 FID Gas Flow Rate 105 ft³/min

READ AND RECORD ALL DATA EVERY _____ MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _{in}) (ft ³)	VELOCITY HEAD (avg.), in. H ₂ O	ORIFICE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	FID GAS TEMPERATURE OF	FID GAS TEMPERATURE OF	FID-HC CONC. PPM VOL.
				DESIRED	ACTUAL		INLET (T _{m in}), °F	OUTLET (T _{m out}), °F				
AX 1	0 8:45	655.63	1.6	1.8	1.8	NO	64	61	2.5	93	45	
2	4 8:57	688.55	1.6	1.8	1.8	110	70	62	2.5	92	45	
3	8	691.5	1.65	1.9	1.9	110	72	64	2.5	104	47	
4	12	694.40	1.7	2.1	2.1	110	80	65	2.5	103	48	
5	16	697.67	1.71	2.1	2.1	110	86	67	2.5	104	50	
6	20	700.75	1.71	2.1	2.1	110	89	70	2.5	104	51	
7	24	703.41	1.68	2.05	2.05	112	94	72	2.5	106	52	
8	28	707.17	1.64	1.9	1.9	115	95	74	2.5	107	52	
9	32	710.15	1.63	1.9	1.9	115	96	77	2.5	108	52	
10	36	713.18	1.61	1.8	1.8	112	96	79	2.5	109	53	
11	40	716.2	1.47	1.6	1.6	112	98	80	3.0	106	56	
12	44	718.92	1.49	1.45	1.45	112	98	82	2.0	102	51	
13	48	721.65	1.48	1.4	1.4	112	100	84	2.0	102	51	
14	52	724.33	1.47	1.4	1.4	122	102	86	1.0	104	53	
15	56	727.0	1.45	1.35	1.35	122	104	87	2.0	104	52	
16	60	729.70	1.36	1.1	1.1	123	108	88	2.0	106	52	
17	64	732.15	1.28	0.85	0.85	123	102	89	1.5	104	52	
18	68	734.38	1.26	0.79	0.79	122	104	90	1.5	101	52	
	72	736.59				16						

COMMENTS:

10:09

TRAVERSE POIN. NUMBER	CLOCK TIME 12-hr CLOCK	GAS METER READING (V _m), in ³	VELOCITY HEAD (ΔP _g), in. H ₂ O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. HG	Filter Gas TEMPERATURE, °F	FID-Gas TEMPERATURE, °F	FID-H ₂ Conc. PPM Vol.
				DESIRED	ACTUAL		INLET (T _{m in}), °F	OUTLET (T _{m out}), °F				
21	10:00	736.59	1.47	1.4	1.1	88	96	90	2.0	96	53	
20	76	739.6	1.48	1.4	1.4	83	100	70	2.0	74	51	
21	80	741.79	1.59	1.25	1.22	125	104	91	2.5	99	52	
22	54 10:19	744.74	1.6	1.28	1.28	122	100	91	2.5	98	55	
23	58	747.73	1.54	1.65	1.65	123	103	92	2.5	99	52	
24	92	750.65	1.55	1.65	1.65	128	105	92	2.5	99	52	
25	96	753.55	1.57	1.7	1.7	133	107	93	2.5	102	53	
26	100	756.50	1.52	1.55	1.55	130	108	94	2.5	100	51	
27	104 10:49	759	1.47	1.4	1.4	130	110	96	2.0	104	51	
28	108	762.04	1.51	1.25	1.25	130	93	94	2.0	102	54	
29	112	764.9	1.53	1.6	1.6	125	99	93	2.5	104	54	
30	116	767.07	1.57	1.7	1.7	125	104	94	2.5	104	54	
31	120	770.50	1.60	1.8	1.8	130	107	95	2.5	107	59	
32	124	772.53	1.62	1.8	1.8	130	108	95	2.5	104	59	
33	128	776.66	1.63	1.8	1.8	133	108	96	2.5	104	59	
34	132	779.60	1.60	1.8	1.8	134	109	96	2.5	109	58	
35	136	782.67	1.52	1.55	1.55	133	108	96	2.5	110	58	
36	140	785.52	1.42	1.25	1.25	132	106	96	2.5	108	58	
	144	788.46										
						10	65	70				

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS
 Fairfield, Alabama

PLANT _____
 DATE OCT 10 1975
 SAMPLING LOCATION _____
 SAMPLE TYPE _____
 RUN NUMBER CRP-7P1-4
 SAMPLE BOX NUMBER 9 *glass set 1*
 CLEAN-UP MAN Bayliss

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
 FLASK, FRONT HALF OF FILTER HOLDER
 FILTER NUMBER BAL 14
 tare 0.391970 g
 net _____

CONTAINER _____ 18.112.6 mg
 CONTAINER _____ 332. mg

FRONT HALF SUBTOTAL 352.7 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
 IMPINGERS, CONNECTORS, AND BACK
 HALF OF FILTER HOLDER

CONTAINER _____
 ETHER-CHLOROFORM
 EXTRACTION _____

ACETONE WASH OF IMPINGERS, CONNECTORS,
 AND BACK HALF OF FILTER HOLDER

CONTAINER _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml

MOISTURE

IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	<u>128</u> ml	<u>102</u> ml	<u>92</u> ml	_____ ml	_____ ml	_____ ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>0</u> ml	_____ ml	_____ ml	_____ ml
NET VOLUME	<u>28</u> ml	<u>2</u> ml	<u>92</u> ml	_____ ml	_____ ml	_____ ml

SILICA GEL	<u>497.2</u>	_____	_____	<u>32</u>	_____
FINAL WEIGHT	g	g	g	g	g
INITIAL WEIGHT	<u>475</u>	_____	_____	<u>22.2</u>	_____
NET WEIGHT	g	g	g	g	g
	<u>22.2</u>	_____	_____	<u>54.2</u>	_____
	g	g	g	TOTAL MOISTURE	<u>54.2</u>

Celotex Corp.
Fairfield Al

TP-1 Inlet Room 4

Traverse Point	Temp (T ₅₁₄₆₀)	V _s	Q _s
A 1	18.49	2770	27700
2	18.49	2770	27700
3	19.25	2880	28300
4	19.97	2990	29900
5	20.12	3010	30100
6	20.12	3010	30100
7	19.87	3000	30000
8	19.18	2870	28700
9	19.03	2850	28500
10	18.68	2800	28000
11	16.40	2460	24600
12	16.74	2510	25100
13	16.57	2480	24800
14	16.53	2480	24300
15	16.18	2420	24200
16	14.49	2170	21700
17	12.78	1910	19100
18	12.31	1840	18400
	31520		
B 1	16.05	2400	24000
2	16.22	2430	24300
3	18.58	2780	27800
4	18.69	2800	28000
5	18.07	2710	27100
6	17.98	2690	26900
7	18.39	2750	27500
8	17.52	2620	26200
9	16.65	2490	24900
10	17.35	2600	26000
11	17.61	2640	26400
12	18.26	2730	27300
13	18.81	2820	28200
14	19.13	2860	28600
15	19.33	2890	28900
16	18.88	2830	28300
17	17.56	2630	26300
18	15.77	2360	23600
	636.05		26,500
	17.67	Q _a	29,900

AS = 1626

SAMPLING SUMMARY SHEET

Plant Celotex Corp. Location Fairfield, Alabama
 Sampled source Inlet TP-1 (Particulate)

1 = 107.20
 2 = 110.45
 3 = 117.09

4-116.87

Run	Date	N _p	P _m	P _b	V _m	V _w	V _{w gas}	%M	M _D
1	10-7-75	36	1.56	29.61	96.72	63.4	2.76	2.85	973
2	10-8-75	34	1.66	29.58	98.25	53.2	2.52	2.45	977
3	10-8-75	36	1.70	29.68	104.37	53.2	2.52	2.47	978
4	10-10-75	36	1.62	29.70	102.63	54.2	2.57	2.25	978

Run	MN _D	MW	P _{st}	P _s	C _p	V _{ΔP}	V _s	T _s	T _t	D _n	%I
1	28.9	28.6	0.10	29.5	0.85	17.34	2500	125	144	0.242	96.9
2	28.9	28.6	0.10	29.5	0.85	17.76	2670	124	136	0.242	100.8
3	28.9	28.7	0.10	29.6	0.85	18.15	2720	135	144	0.242	102.2
4	28.9	28.7	0.10	29.6	0.85	17.67	2650	119	144	0.242	103.8

V _{w gas}	Total No. of Sampling Points	V _{w gas}	Volume of Water Vapor Collected at STP, SCF	P _{st}	Static Pressure of Stack Gas, in. Hg
17.7 x V _m (P _b + P _m) / (T _m + 460)	N _p	100 x V _{w gas} / V _{m std}	V _{w gas}	P _s	P _s
%M = V _{w gas} / V _{m std}	P _m	M _D	% Moisture by Volume	C _p	Pilot Tube Coefficient
M _D = 100 - %M	P _b	% CO ₂	Mole Fraction of Dry Gas	V _s	Stack Gas Velocity at Stack Conditions, fpm
M _D = (xCO ₂ x 44 / 100) + (xO ₂ x 32 / 100) + (xCO + xN ₂) x 28	V _m	% O ₂	Volume % Dry	T _s	Average Stack Temperature
MW = M _D x M _D + 18 (1 - M _D)	T _m	% CO	Volume % Dry	T _t	Net Time of Test, Min.
P _s = P _b ± P _{st}	V _{m std}	% N ₂	Volume % Dry	D _n	Sampling Nozzle Diameter, in.
V _s = 5128.8 x C _p x √ΔP _s x (T _s + 460) [1 / P _s x MW] ^{1/2}	V _w	M _D	Molecular Weight of Stack Gas, Dry Basis	%I	Percent Isokinetic
1.032 x (T _s + 460) x V _{m std}	Total H ₂ O Collected in Impingers and Silica Gel, ml	MW	Molecular Weight of Stack Gas, Wet Basis		
V _s x T _t x P _s x M _D x (0.02) ²					

① 45-25,500
 ② 45-29,300
 ③ 45-26,400

a Dry standard cubic feet at 70°F, 29.92 in. Hg.
 b Standard conditions at 70°F, 29.92 in. Hg.
 c √P_s x (T_s + 460) is determined by averaging the square root of the product of the velocity head (ΔP_s) and the absolute stack temperature from each sampling point.

1048
 1220
 1264
 1426

APPENDIX D-2

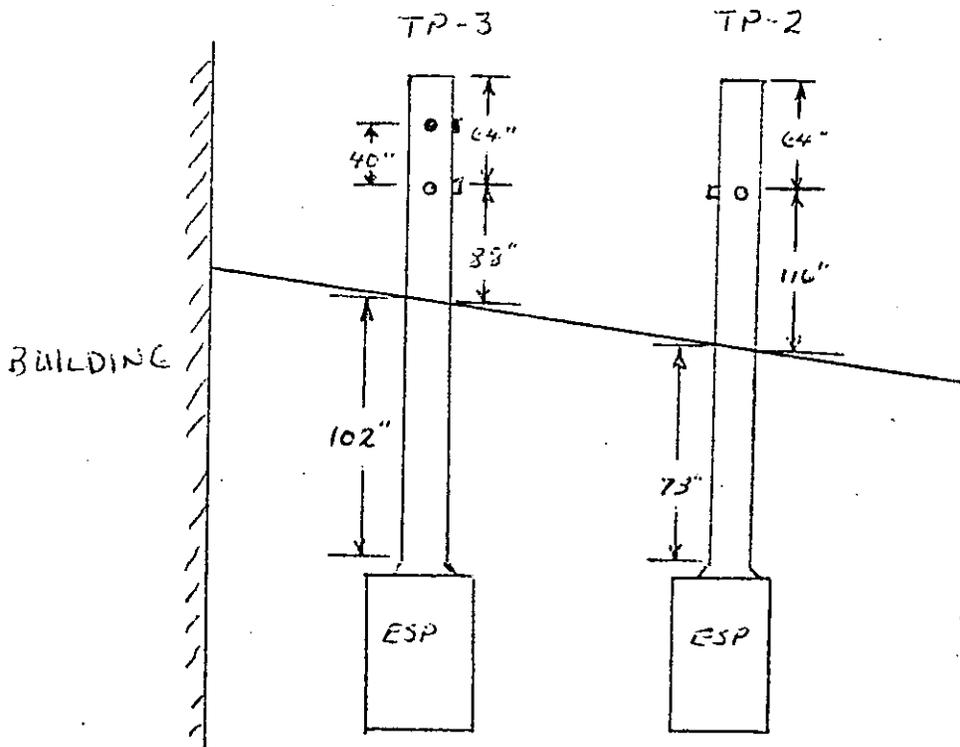
OUTLET LOCATION TP-2
FIELD DATA SHEETS

Celotex, Fairfield, ALA.

October 6, 1975

TP-2, TP-3 (ESP OUTLETS)

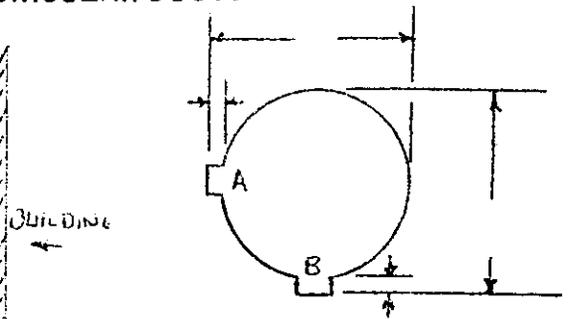
WEK



TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

P 1 of 2

PLANT Cetco Corp.
 DATE 10-6-75
 SAMPLING LOCATION Outlet TP-2 Port A
 INSIDE OF FAR WALL TO
 OUTSIDE OF NIPPLE, (DISTANCE A) 37 1/4"
 INSIDE OF NEAR WALL TO
 OUTSIDE OF NIPPLE, (DISTANCE B) 4 3/4"
 STACK I.D., (DISTANCE A - DISTANCE B) 32 1/2"
 NEAREST UPSTREAM DISTURBANCE 5.85 dia 190"
 NEAREST DOWNSTREAM DISTURBANCE 2.76 dia 64"
 CALCULATOR CEK + W/K



SCHEMATIC OF SAMPLING LOCATION

Sample time: 28pts x 5min/pt = 140 min

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)		DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
A-1	1.8	32 1/2"	0.595	1.0	4 3/4	5 3/4
2	5.7	↑	1.85	1 7/8	↑	6 5/8
3	9.9		3.22	3 1/4		8
4	14.6		4.75	4 3/4		9 1/2
5	20.1		6.53	6 1/2		11 1/4
6	26.9		8.74	8 3/4		13 1/2
7	36.6		11.90	11 7/8		16 5/8
8	63.4		20.60	20 7/8		25 3/8
9	73.1		23.76	23 3/4		28 1/2
10	79.9		25.97	26		30 3/4
11	85.4		27.76	27 3/4		32 1/2
12	90.1		29.28	29 1/4		34
13	94.3	↓	30.65	30 7/8	↓	35 3/8
14	98.2	32 1/2"	31.92	31 1/2	4 3/4	36 1/4
A+B (avg) 31.75						

Pitot Tube Coefficient Chart

	<u>Pitot Tube</u>	<u>A-side coefficient</u>	<u>B-side coefficient</u>
TP2	4-06	0.857	0.853
TP3	4-07	0.857	0.853
	5-01	0.852	0.851
TP1	5-05	0.848	0.847

NOMOGRAPH DATA

PLANT Celotex
 DATE 10-7-75
 SAMPLING LOCATION TP-2 Run 1
 Run: CAF-TP2-1

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	$\Delta H_{@}$	1.88
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m\text{ avg.}}$	95
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.68
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	0.02
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{ avg.}}$	116
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ avg.}}$	0.58
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ max.}}$	0.64
C FACTOR		1.10
CALCULATED NOZZLE DIAMETER, in.		.234
ACTUAL NOZZLE DIAMETER, in.		.242
REFERENCE Δp , in. H ₂ O		.50

FIELD DATA

PLANT Celotex
 DATE 10-7-75
 SAMPLING LOCATION TP-2
 SAMPLE TYPE EPA-5 (Particulate)
 RUN NUMBER CAP-TP-1
 OPERATOR HARRISON - Davis
 AMBIENT TEMPERATURE 74.0 F
 BAROMETRIC PRESSURE 29.68
 STATIC PRESSURE, (P_s) 0.3 inches
 FILTER NUMBER (S) PAF-2

PROBE LENGTH AND TYPE 4' stainless steel
 NOZZLE I.D. 0.252 in.
 ASSUMED MOISTURE, % 2
 SAMPLE BOX NUMBER RAC-3
 METER BOX NUMBER 1.02
 METER AH 1.10
 C FACTOR N.A.
 PROBE HEATER SETTING N.A.
 HEATER BOX SETTING N.A.
 REFERENCE AP 0.5

Run 1

See also 0.007 CAR

Schematic of Traverse Point Layout
 FID Gas Flow Rate

READ AND RECORD ALL DATA EVERY 5 MINUTES

INVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _m) (ft ³)	VELOCITY HEAD (avg), in. H ₂ O	ORIFICE DIFFERENTIAL (ΔH, in. H ₂ O)		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	INLET GAS TEMPERATURE, °F	OUTLET GAS TEMPERATURE, °F	FID GAS TEMPERATURE, °F	FID-HC CONC. PPM VOL.
				DESIRED	ACTUAL		INLET (T _{m in}), °F	OUTLET (T _{m out}), °F					
B-14	2:16	494.858	0.47	1.7	1.7	133	80	80	2.6	78	80		
B-13	10	501.50	0.47	1.7	1.7	131	80	80	2.6	81	84		
B-12	15	505.75	0.49	1.8	1.8	137	80	80	2.6	80	84		
B-11	20	509.34	0.49	1.8	1.8	137	96	80	2.6	80	83		
B-10	25	513.70	0.49	1.8	1.8	131	100	80	2.6	80	84		
B-9	30	516.80	0.50	1.85	1.85	136	103	84	2.6	80	80		
B-8	35	520.73	0.52	1.92	1.92	135	106	84	2.6	80	80		
B-7	40	524.82	0.60	2.20	2.20	132	104	84	2.6	80	80		
B-6	45	529.11	0.61	2.20	2.20	137	103	84	2.5	80	80		
B-5	50	533.30	0.62	2.30	2.30	139	103	84	3.5	80	80		
B-4	55	537.78	0.65	2.40	2.40	133	110	86	3.8	80	80		
B-3	60	541.90	0.63	2.30	2.30	129	116	80	3.0	80	80		
B-2	65	546.12	0.57	2.10	2.10	120	118	80	3.5	80	80		
B-1	70	549.886	0.47	1.78	1.78	110	110	80	3.5	80	80		
			0.4			scrap							
						end of							
						stack							
						run							

COMMENTS:

Run 1 Pass 2

5-23-83

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME 124 hr CLOCK	GAS METER READING (V _m , ft ³)	VELOCITY HEAD (Δp _s , in. H ₂ O)	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in Hg	FILTER-GAS TEMPERATURE, °F	FID-GAS TEMPERATURE, °F	FID-GC CONC. PPM Vol.
					DESIRED	ACTUAL		INLET (T _m in), °F	OUTLET (T _m out), °F				
A-11	20	2:56	549.886	.52	1.90	1.90	140	88	80	2.5	49	85	75
A-11	25	3:01	553.57	.52	2.10	2.10	137	93	80	3.0	50	84	
A-12	85	3:41		.54	2.20	2.20	139	98	80	3.0	53	86	
A-11	90	6:16	563.94	.61	2.30	2.30	140	104	82	3.5	56	87	
A-10	92	6:21	570.10	.62	2.30	2.30	140	108	84	3.5	56	86	
A-9	100	6:26	571.77	.57	2.20	2.20	142	112	86	3.5	57	86	
A-8	105	6:31	570.31	.57	2.11	2.11	141	115	87	3.5	57	88	
A-7	100	6:30	572.49	.56	2.02	2.02	141	118	88	3.5	55	89	
A-6	105	6:41	580.43	.57	2.11	2.11	141	114	90	3.5	54	86	
A-5	120	7:40	590.70	.60	2.25	2.25	138	120	92	3.5	55	86	
A-4	125	7:51	594.68	.59	2.18	2.18	135	122	94	3.5	55	81	
(3)	125	6:54		.58	2.12	2.12	130	120	91	3.5	56	81	
(3)	120	7:34	591.855	.60	2.20	2.20	140	120	96	3.5			
2	135	7:54	600.25	.54	2.00	2.00	140	120	98	3.5	55	74	
1	140	7:44	606.420	.46	1.70	1.70	140	109	97	3.0	54	76	

SAMPLING TASK LOG

Plant Celotex Corporation
 Date 10-7-75

Plant Location Fairfield Alabama - TP-3
 Recorded by C. E. Hickey

Run	Comments	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
1	Started run	TP-2 Port B	Particulate	1416	1418	2	
1	Stopped due to problems with inlet to rain (TP-1)			1418	1433		
1	Continued sampling	TP-2 Port B	Particulate	1433	1508	35	
1	Process down			1508	1557		
1	Continued sampling	TP-2 Port B	Particulate	1557	1630	33	
1	Switched ports (process problems)	TP-2		1630	1756		
1	Continued sampling	TP-2 Port A	Particulate	1756	1854	58	
1	Process down	TP-2 Port A		1854	1932		
1	Continued sampling	TP-2 Port A	Particulate	1932	1944	12	
1	Completed run	TP-2		1944		Total total time 146 min	

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

PLANT _____

DATE: Oct 7 1974

SAMPLING LOCATION _____

SAMPLE TYPE _____

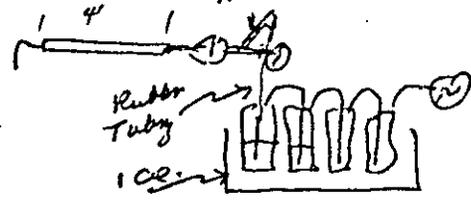
RUN NUMBER CRP-TP-2-1 - OUT FROM SMOG HOC

SAMPLE BOX NUMBER 19 - Glass set #2

CLEAN-UP MAN Bayer

Protecting range 0.242

COMMENTS: *Assemble Train, STD Method 5 - HC-analyser*



FRONT HALF

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK, FRONT HALF OF FILTER HOLDER
Bal-2

FILTER NUMBER _____
tare 0.387515 g
net _____

CONTAINER _____ 39.9/6.2 g

CONTAINER _____ 26.9 g

FRONT HALF SUBTOTAL 73.0 g

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER

CONTAINER _____ g
ETHER-CHLOROFORM
EXTRACTION _____ g

ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____ g

BACK HALF SUBTOTAL _____ g

TOTAL WEIGHT _____ g

	Rinse volumes		ml	ml	ml	ml	ml	ml
MOISTURE								
IMPINGERS	1	2	3	4	5	6		
FINAL VOLUME	<u>136</u>	<u>104</u>	<u>32</u>	<u>5.4</u>	<u>5</u>	<u>6</u>		
INITIAL VOLUME	<u>100</u>	<u>100</u>	<u>0</u>					
NET VOLUME	<u>36</u>	<u>4</u>	<u>2</u>					
SILICA GEL								
FINAL WEIGHT	<u>504.6</u>			<u>29.6</u>				
INITIAL WEIGHT	<u>475</u>			<u>36</u>				
NET WEIGHT	<u>29.6</u>			<u>4</u>				
				TOTAL MOISTURE		<u>71.6</u>		

*Some turbidity
no visible oil film*

- a 203 spot

71.6

Clotex Corp.
Fairfield Alabama

Particulates

TP-2 outlet Run 1

Traverse Point	WPs & TSPs	Vs	Qs
A 1	16.33	2460	11,600
2	17.70	2660	12,600
3	17.41	2620	12,400
4	18.74	2820	13,300
5	18.89	2840	13,400
6	18.51	2790	13,200
7	18.35	2760	13,000
8	18.51	2790	13,200
9	18.85	2840	13,400
10	19.29	2900	13,700
11	19.13	2880	13,600
12	18.80	2830	13,400
13	18.61	2800	13,200
14	17.66	2660	12,600
	274.91		
B 1	16.51	2480	11,700
2	18.18	2740	13,000
3	19.12	2830	13,600
4	19.65	2960	14,000
5	19.27	2900	13,700
6	19.08	2870	13,600
7	18.89	2840	13,400
8	17.60	2650	12,500
9	17.26	2600	12,300
10	17.10	2570	12,200
11	17.10	2570	12,200
12	17.10	2570	12,200
13	16.75	2520	11,900
14	16.69	2510	11,900
	525.21		13,300
	18.76	900	15,500

NOMOGRAPH DATA

PLANT Velotax, Fairfield Ak
 DATE 10-8-75
 SAMPLING LOCATION TP-2 Run 2

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	$\Delta H@$	1.88
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m\text{ avg.}}$	95
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.65
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	+0.02
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{ avg.}}$	132
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ avg.}}$	≈ 0.5
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ max.}}$	≈ 0.64
C FACTOR		1.10
CALCULATED NOZZLE DIAMETER, in.		0.244
ACTUAL NOZZLE DIAMETER, in.		0.242
REFERENCE Δp , in. H ₂ O		0.50

FIELD DATA Rain 2

PLANT Coltco Fairfield
 DATE 10-9-75
 SAMPLING LOCATION TP-2
 SAMPLE TYPE Dust
 RUN NUMBER RP-TP2-2
 OPERATOR Harrison/Davis
 AMBIENT TEMPERATURE 80
 BAROMETRIC PRESSURE 29.65
 STATIC PRESSURE (P) 1.02 H₂O
 FILTER NUMBER (S) BAL-66

Seak Dick
0.02 CFM @ 15" H₂O

PROBE LENGTH AND TYPE 1/2" glass steel
 NOZZLE I.D. 0.42
 ASSUMED MOISTURE, % 2
 SAMPLE BOX NUMBER RAC-3
 METER BOX NUMBER 198
 METER ΔH 1.98
 C FACTOR 1.10
 PROBE HEATER SETTING 60
 HEATER BOX SETTING 0.0
 REFERENCE ΔP 0.150

4-16-857

3951359

Collector Tare Weight(s) _____ SCHEMATIC OF TRAVERSE POINT LAYOUT _____ FID Gas Flow Rate _____

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _m) (l ₃)	VELOCITY HEAD (ΔP), in. H ₂ O	ORIFICE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	FID GAS TEMPERATURE, °F	FID-HC CONC. PPM Vol.
				DESIRED	ACTUAL		INLET (T _{m in}), °F	OUTLET (T _{m out}), °F			
B-14	10:20	607.687	.46	1.71	1.71	132	86	84	3.0	63	86
B-13	10:31	614.91	.48	1.78	1.78	132	96	85	3.0	62	85
B-12	10:36	618.55	.47	1.75	1.75	134	103	86	3.0	61	97
B-11	10:41	622.22	.47	1.75	1.75	134	108	87	3.0	59	100
B-10	10:46	626.10	.49	1.80	1.80	133	112	90	2.0	57	100
B-9	10:51	629.70	.50	1.83	1.83	137	115	92	3.0	58	100
B-8	10:56	633.56	.53	1.95	1.95	139	118	94	3.0	55	102
B-7	11:01	637.55	.58	2.10	2.10	135	120	95	3.0	55	102
B-6	11:06		.64	2.21	2.21	136	123	97	4.0	55	102
B-5	11:11	645.94	.63	2.30	2.30	136	125	99	4.0	55	100
B-4	11:16	650.16	.62	2.24	2.24	136	127	100	4.0	56	99
B-3	11:21	654.42	.63	2.30	2.30	136	127	101	4.0	56	98
B-2	11:26	658.33	.54	1.98	1.98	136	127	102	4.0	56	97
B-1	11:31	662.016	.45	1.65	1.65	136	124	102	4.0	56	102
			(14)								

COMMENTS:

CEP-Form 25

SAMPLING TASK LOG

Plant Celotex Corporation
 Date 10-8-75

Plant Location Fairfield Alabama TP-2
 Recorded by C. E. P. (C. E. P.)

Run	Sampling location (Port)	Pollutant	Clock Time Begun	Clock Time Ended	Elapsed Time (min)	Sample Nos.
2	TP-2 Port B	Particulate	10:31	11:31	70	
2	TP-2		11:31	11:42		
2	TP-2 Port A	Particulate	11:42	11:50	8	
2			11:50	12:06		
2	TP-2 Port A	Particulate	12:06	12:51	45	
2	TP-2		12:51	13:12		
2	TP-2 Port A	Particulate	13:12	13:25	13	
2			13:25	-		136
run	at 13:25 with a	total				sampling time
of 136 min. Duration	was made in order					
that another run could be	started also					
primary concern	was expected to be					
responsibility to	have or more. C. E. P.					
Note - During disassembly of	the glass	connector				between the probe
and filter was found to be	cracked. The	cracked				glass pieces
were still together however,	but it	could not				be determined when
the connector was broken.						

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

PLANT _____
DATE: OCT 8 1975
SAMPLING LOCATION _____
SAMPLE TYPE _____
RUN NUMBER CRP-TP-2-2 (glass set #5)
SAMPLE BOX NUMBER box #9
CLEAN-UP MAN Baylor
Smith boxes

COMMENTS:
- elbow connector between pipe
and filter cracked - when glassware
impinger train was dropped to clean-up area.
It is not known when the elbow cracked,
it may have cracked at the time of sampling
or it may have cracked at the end of the
run -

FRONT HALF

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK, FRONT HALF OF FILTER HOLDER
Bal 5
FILTER NUMBER _____
tare 0.395135 g
net _____

LABORATORY RESULTS

CONTAINER _____ 6.6 / 3.0 mg

CONTAINER _____ 6.0 mg

Connector broken

FRONT HALF SUBTOTAL 15.6 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER

CONTAINER _____ mg
ETHER-CHLOROFORM
EXTRACTION _____ mg

ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____ mg

BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT _____ mg

MOISTURE	Rinse volumes					
	ml	ml	ml	ml	ml	ml
IMPINGERS						
FINAL VOLUME	<u>132</u> ml	<u>302</u> ml	<u>32</u> ml	<u>4</u> ml	<u>5</u> ml	<u>6</u> ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>100</u> ml			
NET VOLUME	<u>32</u> ml	<u>2</u> ml	<u>2</u> ml			

SILICA GEL	g	g	g
FINAL WEIGHT	<u>500.6</u>		
INITIAL WEIGHT	<u>475.0</u>		
NET WEIGHT	<u>25.6</u>		

TOTAL MOISTURE 61.6

36
25.6
61.6

Celotex Corp.
Fairfield, Alabama

TP-2 Outlet Run 2

Traverse Point	Dist. (Tape)	Vs	Rs
A 1	14.64	2200	10,400
2	16.00	2410	11,400
3	17.25	2600	12,300
4	18.26	2750	13,000
5	19.25	2750	13,000
6	17.92	2700	12,800
7	17.59	2650	12,500
8	17.92	2700	12,800
9	18.50	2780	13,200
10	18.97	2850	13,500
11	19.06	2870	13,600
12	19.02	2860	13,500
13	18.59	2800	13,300
14	17.94	2700	12,800
	249.91		
B 1	16.38	2460	11,600
2	17.94	2700	12,800
3	19.33	2920	13,800
4	19.22	2890	13,700
5	19.33	2920	13,800
6	19.07	2870	13,600
7	18.58	2800	13,300
8	17.82	2680	12,700
9	17.28	2600	12,300
10	17.05	2570	12,200
11	16.71	2510	11,900
12	16.71	2510	11,900
13	16.86	2540	12,000
14	16.50	2480	11,700
	498.79		13,300 12,700
	17.81	Qa	14,800

NOMOGRAPH DATA

PLANT Celotex, Fairfield Ala.

DATE 10-8-75

SAMPLING LOCATION TP-2 run 3

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	ΔH_{or}	1.88
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m \text{ avg.}}$	95 105
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.66
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	.02
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s \text{ avg.}}$	135
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{avg.}}$	2.56
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{max.}}$	3.63
C FACTOR		1.10
CALCULATED NOZZLE DIAMETER, in.		.244
ACTUAL NOZZLE DIAMETER, in.		.242
REFERENCE Δp , in. H ₂ O		0.50

FIELD DATA

Run 3

PROBE LENGTH AND TYPE 4' stainless 4-067
 NOZZLE I.D. 0.242
 ASSUMED MOISTURE, % 2
 SAMPLE BOX NUMBER 8
 METER BOX NUMBER PAC-3
 METER A.H. # 108
 C FACTOR 1.10
 PROBE HEATER SETTING 100
 HEATER BOX SETTING 0.0
 REFERENCE A.P. 0.50

Soak check
 0.01905 m
 @ 15" Hg

PLANT C.O. Davis
 DATE 10-2-75
 SAMPLING LOCATION TP2
 SAMPLE TYPE Dust
 RUN NUMBER SRF-TP2-3
 OPERATOR Harrison / Davis
 AMBIENT TEMPERATURE 85
 BAROMETRIC PRESSURE 29.66
 STATIC PRESSURE (P₁) 0.02
 FILTER NUMBER (S) BAL-5



SCHEMATIC OF TRAVERSE POINT LAYOUT

FID Gas Flow Rate

READ AND RECORD ALL DATA EVERY 5 MINUTES

Collector Tare Weight(s)

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V _{nl} , ft ³)	VELOCITY HEAD (ΔP ₃), in. H ₂ O	ORIFICE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	FID GAS TEMPERATURE, °F	FID GAS TEMPERATURE, °F	FID-HC CONC. PPM Vol.
				DESIRED	ACTUAL		INLET (T _{m in}), °F	OUTLET (T _{m out}), °F				
A-14	16:45	717.953	0.52	1.91	1.91	148	92	90	0.0			
A-13	16:50	720.670	0.58	2.12	2.12	150	99	90	0.0	6.7	105	
A-12	17:00	728.90	0.64	2.30	2.30	149	103	90	0.0	6.9	110	
A-11	17:05	732.89	0.63	2.25	2.25	150	112	93	0.0	6.2	110	
A-10	17:10	737.05	0.61	2.20	2.20	154	117	75		5.9	112	
A-9	17:20	741.18	0.61	2.20	2.20	153	119	96	4.0	5.7	112	
A-8	17:20	745.17	0.57	2.05	2.05	152	121	98	5.0	5.6	112	
A-7	17:25	749.05	0.54	1.92	1.92	152	122	100		5.6	114	
A-6	17:30	752.87	0.54	1.92	1.92	152	122	101		5.6	113	
A-5	17:35	756.77	0.55	1.97	1.97	152	122	102		5.6	113	
A-4	17:40	760.70	0.55	1.97	1.97	151	124	103		5.6	112	
A-3	17:45	764.49	0.53	1.87	1.87	150	123	104		5.7	109	
A-2	17:50	768.23	0.48	1.74	1.74	146	122	105		5.7	109	
A-1	17:55	771.763	0.43	1.56	1.56	130	120	105		5.7	107	

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

PLANT _____
DATE OCT 6 1975
SAMPLING LOCATION _____
SAMPLE TYPE _____
RUN NUMBER CRP - TP 2-3
SAMPLE BOX NUMBER _____
CLEAN-UP MAN Bayton

COMMENTS:
nozzle wash has coloring matter.

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK, FRONT HALF OF FILTER HOLDER
Bal-9

CONTAINER _____ 28.1/2.5 g

FILTER NUMBER _____
tare 0.389755 g
net _____

CONTAINER _____ 8.2 g

FRONT HALF SUBTOTAL 38.8 g

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER

CONTAINER _____ g
ETHER-CHLOROFORM
EXTRACTION _____ g

ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____ g

BACK HALF SUBTOTAL _____ g

TOTAL WEIGHT _____ g

Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml

MOISTURE

IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	<u>128</u> ml	<u>102</u> ml	<u>32</u> ml	_____ ml	_____ ml	_____ ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>0</u> ml	_____ ml	_____ ml	_____ ml
NET VOLUME	<u>28</u> ml	<u>2</u> ml	<u>2</u> ml	_____ ml	_____ ml	_____ ml

SILICA GEL	1	2	3	4	5	6
FINAL WEIGHT	<u>502.4</u> g	_____ g	_____ g	_____ g	_____ g	_____ g
INITIAL WEIGHT	<u>475</u> g	_____ g	_____ g	_____ g	_____ g	_____ g
NET WEIGHT	<u>27.4</u> g	_____ g	_____ g	_____ g	_____ g	_____ g

27.4
32
59.4
TOTAL MOISTURE 59.4

Celotex Corp.
Fairfield Alabama

~~TP-2 Outlet Run 3~~

TP-2 Outlet Run 3

Inverse Point	Wassal (Test 60)	Us	Qs
A 1	15.93	2400	11,200
2	17.06	2570	12,000
3	17.98	2710	12,600
4	18.33	2760	12,800
5	18.35	2760	12,800
6	18.18	2740	12,700
7	18.18	2740	12,700
8	18.63	2810	13,100
9	19.34	2910	13,500
10	19.35	2910	13,500
11	19.60	2950	13,700
12	19.74	2970	13,800
13	18.81	2830	13,200
14	17.78	2680	12,500
	257.31		
B 1	17.41	2620	12,200
2	18.56	2790	13,000
3	19.73	2970	13,800
4	✓19.73	2970	13,800
5	18.94	2850	13,300
6	18.86	2840	13,200
7	✓18.65	2810	13,100
8	17.63	2650	12,300
9	17.63	2650	12,300
10	17.29	2600	12,100
11	17.11	2570	12,000
12	17.11	2570	12,000
13	16.71	2510	11,700
14	16.53	2490	11,600
	509.20		12,700
	18.19	Qa	15,000

NOMOGRAPH DATA

PLANT Calteev
 DATE 10-10-75
 SAMPLING LOCATION TP-2 Run 4

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	$\Delta H_{@}$	1.68
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m\text{ avg.}}$	95
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.70
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	30.2
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{ avg.}}$	135
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ avg.}}$	.52
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ max.}}$	.64
C FACTOR		1.11
CALCULATED NOZZLE DIAMETER, in.		.242
ACTUAL NOZZLE DIAMETER, in.		.242
REFERENCE Δp , in. H ₂ O		.52

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

PLANT _____
 DATE: OCT 10 1975
 SAMPLING LOCATION _____
 SAMPLE TYPE _____
 RUN NUMBER FP CRP-TP2-4
 SAMPLE BOX NUMBER 15 *glass ret # 2*
 CLEAN-UP MAN Bayton

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
 FLASK, FRONT HALF OF FILTER HOLDER
Bal-YS

CONTAINER _____

4.9/33 mg

FILTER NUMBER _____
 tare 0.390615 g
 net _____

CONTAINER _____

~~2.1~~ mg

FRONT HALF SUBTOTAL 10.3 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
 IMPINGERS, CONNECTORS, AND BACK
 HALF OF FILTER HOLDER

CONTAINER _____

_____ mg

ETHER-CHLOROFORM
 EXTRACTION

_____ mg

ACETONE WASH OF IMPINGERS, CONNECTORS,
 AND BACK HALF OF FILTER HOLDER

CONTAINER _____

_____ mg

BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT _____ mg

MOISTURE Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml

IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	<u>170</u> ml	<u>58</u> ml	_____ ml	_____ ml	_____ ml	_____ ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>0</u> ml	_____ ml	_____ ml	_____ ml
NET VOLUME	<u>70</u> ml	<u>-42</u> ml	_____ ml	_____ ml	_____ ml	_____ ml

	70				
<u>490.5</u> <u>16.2</u> <u>506.7</u>	<u>506.7</u>	<u>-42</u>	<u>28</u>	<u>31.7</u>	<u>59.7</u>
SILICA GEL	_____ g	_____ g	_____ g	_____ g	_____ g
FINAL WEIGHT	<u>490.5</u> g	_____ g	_____ g	_____ g	_____ g
INITIAL WEIGHT	<u>475.0</u> g	_____ g	_____ g	_____ g	_____ g
NET WEIGHT	<u>15.5</u> g	_____ g	_____ g	_____ g	_____ g

EPA (Dm) 231
 4/72 31.7 506.7
475.0
31.7

TOTAL MOISTURE 59.7

Celotex Corp.
Fairfield Alabama

TP-2 Outlet Run 4

Increase Point	WAS x 100	Vs	Qs
A 1	15.23	2290	10,900
2	16.69	2510	12,000
3	18.11	2720	13,000
4	18.77	2820	13,500
5	19.08	2870	13,700
6	18.72	2820	13,500
7	18.29	2750	13,100
8	✓ 18.44	2770	13,200
9	19.16	2880	13,700
10	19.13	2880	13,700
11	19.27	2900	13,800
12	19.23	2890	13,800
13	✓ 19.38	2920	13,900
14	18.75	2820	13,500
	258.25		
B 1	16.86	2540	12,100
2	18.21	2740	13,100
3	19.16	2880	13,700
4	19.46	2930	14,000
5	19.33	2920	13,900
6	19.09	2870	13,700
7	18.47	2780	13,300
8	17.18	2580	12,300
9	17.18	2580	12,300
10	16.83	2530	12,100
11	16.81	2530	12,100
12	16.94	2550	12,200
13	16.97	2550	12,200
14	16.97	2550	12,200
	507.76		13,000
	18.13	90	15,000

SAMPLING SUMMARY SHEET

Plant Celotex Corporation Location Fairfield, Alabama
 Sampled source Quartz TP 2 (Particulate)

Run	Date	N _p	P _m 2.0 L	P _b	V _m	T _m	V _m std	V _w	V _w gas	%M	M _d
1	10-7-75	28	2.00	29.68	111.562	94.91	106.91	71.6	3.39	3.07	969
2	10-8-75	28	1.98	29.65	107.198	107	99.71	61.6	2.92	2.85	972
3	10-8-75	28	1.98	29.66	108.221	104	101.23	59.4	2.82	2.71	973
4	10-10-75	28	2.00	29.70	109.038	97	103.42	59.7	2.83	2.66	973

Run	MW _d	MW	P _{st}	P _s	C _p	V _{AP,s} × (T _s +460) ³	V _s	T _s	T _t	P _h	%I
1	28.9	28.6	7.02	29.8	0.858	18.76	2820	133	140	242	98.3
2	28.9	28.6	7.02	29.7	0.858	17.81	2680	134	136	242	99.2
3	28.9	28.6	7.02	29.7	0.858	18.19	2740	145	140	242	97.4
4	28.9	28.6	7.02	29.7	0.858	18.13	2730	130	140	242	97.4

$$V_{m, std} = \frac{17.7 \times V_m (P_b + P_m)}{(T_m + 460)}$$

$$\% H = \frac{100 \times V_{w, gas}}{V_{m, std} + V_{w, gas}}$$

$$M_d = \frac{100 - \% H}{100}$$

$$M_d = (4CO_2 \times \frac{44}{100}) + (5O_2 \times \frac{32}{100}) + [(xCO + \%H_2) \times \frac{28}{100}]$$

$$M = M_d \times H_d + 18(1 - H_d)$$

$$P_s = P_b \pm P_{st}$$

$$V_s = 5128.8 \times C_p \times \sqrt{\frac{1}{P_s \times (T_s + 460)}} \left[\frac{1}{P_s \times H} \right]^{1/2}$$

$$\% I = \frac{1,032 \times (T_s + 460) \times V_{m, std}}{V_s \times T_t \times P_s \times H_d \times (0.1)^2}$$

Total No. of Sampling Points: 28
 Average Orifice Pressure Drop, in. H₂O: 0.858
 Barometric Pressure, in. Hg: 29.7
 Volume of Dry Gas at Meter Conditions, DCF: 107.198
 Average Meter Temperature, °F: 107
 Volume of Dry Gas at STP, DSCF: 106.91
 Total H₂O Collected in Impingers and Silica Gel, ml: 71.6

Volume of Water Vapor Collected at STP, SCF5: 3.39
 % Moisture by Volume: 3.07
 Mole Fraction of Dry Gas: 2.85
 Volume % Dry: 2.82
 Volume % Dry: 2.66
 Volume % Dry: 2.83
 Volume % Dry: 2.66
 Molecular Weight of Stack Gas, Dry Basis: 28.6
 Molecular Weight of Stack Gas, Wet Basis: 28.6

Static Pressure of Stack Gas, in. Hg: 242
 Stack Gas Pressure, in. Hg Absolute: 242
 Pitot Tube Coefficient: 0.858
 Stack Gas Velocity at Stack Conditions, fpm: 140
 Average Stack Temperature, °F: 133
 Net Time of Test, Min.: 140
 Sampling Nozzle Diameter, in.: 0.1
 % I Percent Isokinetic: 98.3

Dry standard cubic feet at 70°F, 29.92 in. Hg: 95-12,700
 Standard conditions at 70°F, 29.92 in. Hg: 98-15,000
 Is determined by averaging the square root of the product of the velocity head (ΔPs) and the absolute stack temperature from each sampling point: 95-13,000
98-15,000
95-12,700
98-15,000

APPENDIX D-3

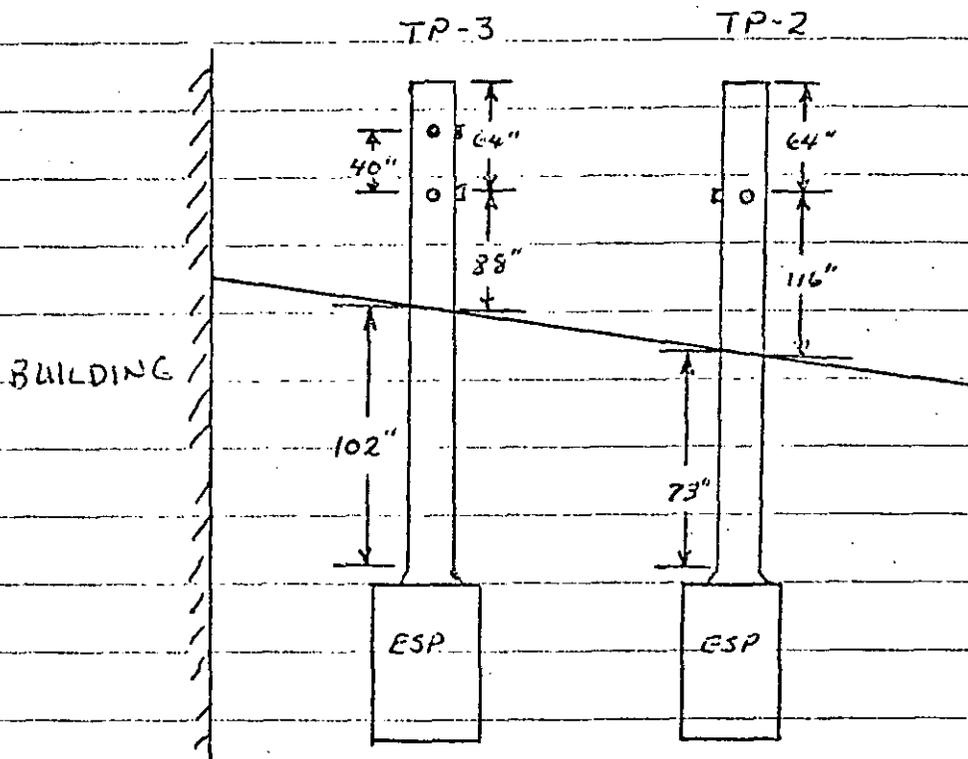
OUTLET LOCATION TP-3
FIELD DATA SHEETS

Celotex, Fairfield, ALA.

October 6, 1975

TP-2, TP-3. (ESP. OUTLETS)

WEK



Pitot Tube Coefficient Chart

	<u>Pitot Tube</u>	<u>A-side coefficient</u>	<u>B-side coefficient</u>
TP2	4-06	0.857	0.853
TP3	4-07	0.857	0.853
	5-01	0.852	0.851
TP1	5-05	0.848	0.847

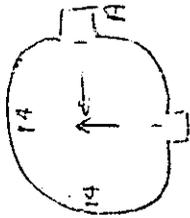
NOMOGRAPH DATA

PLANT Celotex Fairfield
 DATE Oct 7, 1975
 SAMPLING LOCATION TP-3 Rev 1

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	$\Delta H_{@}$	1.95
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m\text{avg.}}$	90
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2.0
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.68
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	29.70
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{avg.}}$	123
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta P_{\text{avg.}}$	0.58
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta P_{\text{max.}}$	0.63 (min 0.46)
C FACTOR		1.16
CALCULATED NOZZLE DIAMETER, in.		.234
ACTUAL NOZZLE DIAMETER, in.		0.245 0.242
REFERENCE Δp , in. H ₂ O		0.47 0.47

FIELD DATA

PLANT Celotex Fairfield
 DATE Oct 7 1975
 SAMPLING LOCATION IP 3
 SAMPLE TYPE Particulate
 RUN NUMBER 1
 OPERATOR Kelly
 AMBIENT TEMPERATURE 75
 BAROMETRIC PRESSURE 29.65
 STATIC PRESSURE, (P_s) FC.14 - H₂O
 FILTER NUMBER (s) BAZ - 7



PROBE LENGTH AND TYPE 4' stainless
 NOZZLE I.D. 0.255 to 0.272
 ASSUMED MOISTURE, % 2.0
 SAMPLE BOX NUMBER 14
 METER BOX NUMBER RAC 6
 METER # 1.95
 G FACTOR 1.16
 PROBE HEATER SETTING off
 HEATER BOX SETTING off
 REFERENCE SP. 0.49

Schematic of Traverse Point Layout
 FID Gas Flow Rate 200 cc

READ AND RECORD ALL DATA EVERY 5 MINUTES at 15' Pipet Tube 9-07 857

INVERT NUMBER	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _m), ft ³	VELOCITY HEAD (avg), in. H ₂ O	ORIFICE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	INLET TEMPERATURE, °F	OUTLET TEMPERATURE, °F	FID GAS TEMPERATURE, °F	FID-HC CONC. PPM VOL.
				DESIRED	ACTUAL		INLET (T _{m in}), °F	OUTLET (T _{m out}), °F					
A14	5	222.025	.51	1.91	1.91	127	78	78	2	50	81		
A13	10	225.945	.55	2.05	2.05	130	76	79	2	50	82		
A12	15	230.040	.61	2.27	2.27	131	76	79	2	55	91		
A11	20	234.150	.61	2.27	2.27	131	102	80	2	50	92		
A10	25	238.33	.62	2.30	2.30	132	107	83	3	50	92		
A9	30	242.92	.60	2.20	2.20	134	112	85	3	57	92		
A8	33:20	245.374	.57	2.15	2.15	129*	114	87	2	57	92		
A7	33:34	245.300											
A6	35	246.89	.58	2.15	2.15	131	88	84	2	48	84		
A5	40	250.88	.45	1.70	1.70	132	91	84	2	54	85		
A4	45	254.58	.44	1.68	1.68	133	103	85	2	56	85		
A3	50	258.20	.43	1.65	1.65	133	109	86	2	57	84		
A2	55	261.92	.41	1.55	1.55	134	111	88	2	58	84		
A1	60		.38	1.45	1.45	122	112	90	2	60	84		
	65	269.00	.34	1.32	1.32	115	114	91	2	65	83		
	70	272.37	.34	1.32	1.32	115	115	91	0	65	82		
	70	Change points											
		272.37											

* subject

Leak check : 0.015 cfm @ 15" Hg

COMMENTS:

CELATEX ROOFING PRODUCTS DRY MOLECULAR WEIGHT DETERMINATION

Fairfield, Alabama

PLANT Celotex Fairfield
 DATE Oct. 7, 1975
 COMMENTS: assemble sample in air filter

SAMPLING TIME (24-hr CLOCK) 1600 - 1630 / 1800 - 1830

SAMPLING LOCATION TP #3 - OUTLET OF 5400 POC.

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) integrated bag

ANALYTICAL METHOD oracat

AMBIENT TEMPERATURE 75°F

OPERATOR Kelly

GAS	1 <i>100 ppm</i>		2 <i>100 ppm</i>		3 <i>100 ppm</i>		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M _d , lb/lb-mole	
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET				
CO ₂	0.0 <i>(4 passes)</i>	0.0	0.5 <i>(4 passes)</i>	0.5	0.0	0.0	0.2	44/100	0.9	
O ₂ (NET IS ACTUAL O ₂ READING MINUS ACTUAL O ₂ READING) <i>8 passes</i>	20.9 <i>(8 passes)</i>	20.9	20.9	20.4	20.9	20.9	20.7	32/100	6.62	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O ₂ READING) <i>(4 passes)</i>	20.9 <i>(4 passes)</i>	0.0	20.9	0	20.9	0	0	28/100	—	
N ₂ (NET IS 100 MINUS ACTUAL CO READING)							79.4	28/100	22.15	
TOTAL									28.86	28.9

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS

Fairfield, Alabama

PLANT _____

DATE OCT 7 1975

COMMENTS: FLAM CONFIGURATION

same as TP-2

SAMPLING LOCATION _____

SAMPLE TYPE _____

RUN NUMBER CRP-TP-3-1 - out let from storage

SAMPLE BOX NUMBER 14

CLEAN-UP MAN Baytos

probe tip size 0.242

condensate in probe - next run, probe to be al. heated

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER

BAL-3

CONTAINER _____ 25.8 / 5.2 g

FILTER NUMBER _____

CONTAINER _____ 23.8 g

tare 0.345482 g

net _____

grease on all ball joints.

FRONT HALF SUBTOTAL 54.8 g

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER

CONTAINER _____
ETHER-CHLOROFORM EXTRACTION _____

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER

CONTAINER _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml

MOISTURE

IMPINGERS	<u>1</u>	<u>2</u>	<u>3</u>	<u>4 - 5.6</u>	<u>5</u>	<u>6</u>
FINAL VOLUME	<u>138</u> ml	<u>102</u> ml	<u>2</u> ml	_____ ml	_____ ml	_____ ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>0</u> ml	_____ ml	_____ ml	_____ ml
NET VOLUME	<u>38</u> ml	<u>2</u> ml	<u>2</u> ml	_____ ml	_____ ml	_____ ml

*muddy emulsion
movable oil film*

SILICA GEL	<u>~ 70% spent</u>		
FINAL WEIGHT	<u>599.6</u> g	_____ g	_____ g
INITIAL WEIGHT	<u>475</u> g	_____ g	_____ g
NET WEIGHT	<u>24.6</u> g	_____ g	_____ g

24.6
37
2
2
66.6 TOTAL MOISTURE 66.6

Celotex Corp.
Fairfield Alabama

Particulates

TP-3 Outlet Run 1

Increase Point	APR. ACTS/HOUR	Vs	Qs
A 1	13.98	2100	9890
2	13.98	2100	9890
3	14.87	2240	10,500
4	15.61	2350	11,100
5	15.97	2400	11,300
6	16.15	2430	11,400
7	16.32	2460	11,600
8	18.42	2770	13,000
9	18.88	2840	13,400
10	19.16	2880	13,600
11	18.99	2860	13,500
12	18.99	2860	13,500
13	18.01	2710	13,800
14	17.30	2600	12,200
	236.63		
B 1	11.41	1720	8100
2	14.61	2200	10,400
3	16.35	2460	11,600
4	16.86	2540	12,000
5	17.06	2570	12,100
6	17.20	2590	12,200
7	17.38	2610	12,300
8	18.37	2760	13,000
9	18.74	2820	13,300
10	19.02	2860	13,500
11	19.17	2880	13,600
12	19.33 19.38	2920	13,700
13	19.34	2910	13,700
14	19.02	2860	13,500
	480.54		12,100
	17.16		Qa = 13,700

NOMOGRAPH DATA

PLANT Celotex, Fairfield AL.

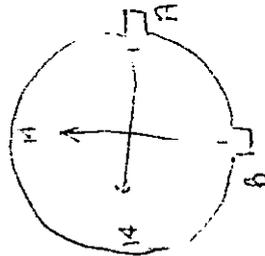
DATE Oct 8, 1975

SAMPLING LOCATION TP 3 Run 2

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	$\Delta H_{@}$	1.95
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m\text{ avg.}}$	94
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2.0
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.65
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	29.68
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{ avg.}}$	129
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ avg.}}$	.5
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ max.}}$	.64
C FACTOR		1.16
CALCULATED NOZZLE DIAMETER, in.		—
ACTUAL NOZZLE DIAMETER, in.		0.242
REFERENCE Δp , in. H ₂ O		0.49

FIELD DATA

PLANT Celanese Fairfield AL
 DATE Oct 8, 1975
 SAMPLING LOCATION TP-3
 SAMPLE TYPE particulate
 RUN NUMBER 2
 OPERATOR Keilly
 AMBIENT TEMPERATURE 70
 BAROMETRIC PRESSURE 30.65
 STATIC PRESSURE, (P_s) 44.1620
 FILTER NUMBER (S) BAL-7



PROBE LENGTH AND TYPE 4' stainless
 NOZZLE I.D. 0.242
 ASSUMED MOISTURE, % 2
 SAMPLE BOX NUMBER RACC
 METER BOX NUMBER 19
 METER ΔH₀ 1.65
 C FACTOR 1.16
 PROBE HEATER SETTING 35/100
 HEATER BOX SETTING off
 REFERENCE ΔP 0.179

FID Gas Flow Rate 0 micrometers per hour

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr CLOCK)	SAMPLING TIME, min	GAS METER READING (V _m), ft ³	VELOCITY HEAD (ΔP _s), in. H ₂ O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	FID GAS TEMPERATURE, °F	FID-HQ CONC. PPM VOL.
					DESIRED	ACTUAL		INLET (T _{m in}), °F	OUTLET (T _{m out}), °F			
A14	1021	0	332.618	1.53	2.00	2.00	135	88	85	2	68	80
A13	1026	5	336.56	1.58	2.18	2.18	135	88	86	2	72	82
A12	1030	10	344.79	1.60	2.22	2.22	137	104	87	2	68	85
A11	1041	20	348.898	1.62	2.30	2.30	137	110	89	2	63	84
A10	1046	25	353.16	1.60	2.28	2.28	136	112	91	2	61	90
A9	1051	30	357.21	1.59	2.20	2.20	136	114	92	2	61	90
A8	1056	35	361.32	1.56	2.08	2.08	136	115	94	2	60	90
A7	1101	40	365.12	1.46	1.73	1.73	135	117	96	2	59	92
A6	1106	45	368.16	1.44	1.67	1.67	135	117	98	2	58	91
A5	1111	50	372.51	1.42	1.60	1.60	136	116	90	2	59	90
A4	1116	55	376.08	1.40	1.51	1.51	135	116	49	2	59	89
A3	1121	60	379.65	1.40	1.51	1.51	134	115	100	2	60	88
A2	1126	65	383.09	1.36	1.38	1.38	122	115	100	2	60	87
A1	1131	70	386.884	1.31	1.18	1.18	110	115	100	2	60	87

COMMENTS:

TPS Row 2

02

100 (5000) 2.0

70

75 / 1148

77:17 / 1150

77:17 / 1207

80 / 1210

85 / 1215

90 / 1220

95 / 1225

100 / 1230

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V _m , ft ³)	VELOCITY HEAD (V _{ps} , in. H ₂ O)	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE (T _m , in.) °F		PUMP VACUUM, in. Hg	FILTER-GAS TEMPERATURE, °F	FID GAS TEMPERATURE, °F	FID-HC CONC. PPM Vol.
				DESIRED	ACTUAL		INLET (T _m , in.) °F	OUTLET (T _m , out.) °F				
B14	75 / 1148	386,254	160	2.25	2.25	135	102	98	2	54	84	
B13	77:17 / 1150	392,434	63	2.32	2.32	136	109	98	2	58	86	
B12	80 / 1210	394,198	63	2.35	2.35	130	86	84	2	54	84	
B11	85 / 1215	399,05	63	2.38	2.38	134	100	92	2	53	86	
B10	90 / 1220	403,33	63	2.38	2.38	132	106	94	2	56	88	
B9	95 / 1225	407,53	62	2.32	2.32	130	112	96	2	56	92	
B8	100 / 1230	411,67	59	2.20	2.20	132	116	97	2	56	118	
B7	105 / 1235	415,72	55	2.08	2.08	136	119	99	3	57	119	
B6	110 / 1240	419,62	56	1.88	1.88	135	120	100	2	57	112	
B5	115 / 1245	423,55	50	1.88	1.88	135	122	102	2	57	112	
B4	120 / 1250	427,48	50	1.88	1.88	134	122	103	2	58	113	
B3	125 / 1255	428,825	50	1.88	1.88	130	123	104	2	60	112	
B2	130 / 1320	428,825	50	1.88	1.88	134	104	100	2	54	104	
B1	135 / 1325	431,45	48	1.76	1.76	125	145	100	2	54	119	
B0	135 / 1325	435,28	33	1.48	1.45	120	113	101	2	57	121	
B7	stop process intercept				1.5							
B6	135 / 1325	438,932										
B5	rec neutral cond test											
B4												
B3												
B2												
B1												

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Celotex Fairfield, AL. COMMENTS:

DATE Oct 8, 1975

SAMPLING TIME (24-hr CLOCK) 1023-1129 / 1144-1152 / 1254-1252 / 1311-1325

SAMPLING LOCATION TP 3

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) integrated bag

ANALYTICAL METHOD ORSCA

AMBIENT TEMPERATURE 70

OPERATOR Kelly

GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d , lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO ₂	.1	.1	20.0 0	0	.1	.1	0.1	44/100	.04
O ₂ (NET IS ACTUAL O ₂ READING MINUS ACTUAL O ₂ READING)	21.1	21.0	21.4	21.4	21.4	21.3	21.2	32/100	6.78
CO (NET IS ACTUAL CO READING MINUS ACTUAL O ₂ READING)	21.1	0.0	21.4	0.0	21.4	0.0	0.0	28/100	—
N ₂ (NET IS 100 MINUS ACTUAL CO READING)							78.7	28/100	22.04
TOTAL									28.86
									28.9

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

PLANT _____
DATE OCT 1975
SAMPLING LOCATION _____
SAMPLE TYPE _____
RUN NUMBER CRP
EAP - TP-3-3
SAMPLE BOX NUMBER glass set # 6
CLEAN-UP MAN Bayto

COMMENTS:

FRONT HALF

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK, FRONT HALF OF FILTER HOLDER
Bal 7

FILTER NUMBER _____
tare 0.394095 g
net _____

CONTAINER _____ 7.0/3.3 mg

CONTAINER _____ 3.5 mg

FRONT HALF SUBTOTAL 13.8 mg

LABORATORY RESULTS

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER

CONTAINER _____
ETHER-CHLOROFORM
EXTRACTION _____

ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml

MOISTURE

IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	<u>124</u> ml	<u>104</u> ml	<u>32</u> ml	<u>4</u> ml	<u>5</u> ml	<u>6</u> ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>0</u> ml	<u>0</u> ml	<u>0</u> ml	<u>0</u> ml
NET VOLUME	<u>24</u> ml	<u>4</u> ml	<u>32</u> ml	<u>4</u> ml	<u>5</u> ml	<u>6</u> ml

SILICA GEL	1	2	3	4	5	6
FINAL WEIGHT	<u>499.3</u> g	_____ g	_____ g	<u>30</u> g	_____ g	<u>54.3</u> g
INITIAL WEIGHT	<u>475</u> g	_____ g	_____ g	<u>24.3</u> g	_____ g	_____ g
NET WEIGHT	<u>24.3</u> g	_____ g	_____ g	<u>54.3</u> g	_____ g	_____ g

TOTAL MOISTURE 59.3

EPA (Dm) 231
472

499.3
475
24.3

D-3-19

Calorex Corp.
Fairfield Alabama

TP-3 Outlet Run 2

Increase Point	APL (12/1/60)	Vs	Qs
A 1	13.29	2000	9,370
2	14.47	2130	10,200
3	15.41	2320	10,900
4	15.43	2320	10,900
5	15.32	2330	11,200
6	16.13	2430	11,400
7	16.54	2490	11,700
8	18.27	2750	12,900
9	18.75	2820	13,200
10	18.91	2850	13,400
11	19.24	2890	13,500
12	18.93	2850	13,400
13	18.58	2800	13,100
14	17.76	2670	12,500
	237.58		
B 1	—		
2	14.85	2230	10,500
3	16.76	2520	11,800
4	17.21	2590	12,100
5	17.23	2590	12,100
6	17.25	2600	12,200
7	17.25	2600	12,200
8	18.11	2720	12,700
9	18.69	2810	13,200
10	19.13	2830	13,500
11	19.31	2910	13,600
12	19.34	2910	13,600
13	19.38	2910	13,600
14	18.89	2840	13,300
	470.93		12,700
		Qs -	14,200
	17.44		

Runs 5 TP3 page 2 Oct 7 FID not connected

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _m , ft ³)	VELOCITY HEAD (10 ³ ft ² in. H ₂ O)	ORIFICE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE (T _m in, out), °F		PUMP VACUUM, in Hg	FILTER GAS TEMPERATURE, °F	FID GAS TEMPERATURE, °F	FID-HC CONC. PPM Vol.
				DESIRED	ACTUAL		INLET (T _m in), °F	OUTLET (T _m out), °F				
	70	493.480										
A14	75 / 1816	—	151	1.90	1.90	151	102	98	2	53	97	
A13	80 / 1821	501.40	155	2.05	2.05	152	110	97	2	55	101	
A12	85 / 1826	505.59	159	2.25	2.25	152	115	97	2	57	104	
A11	90 / 1831	509.87	161	2.35	2.35	154	116	98	2	58	108	
A10	95 / 1836	514.00	160	2.20	2.20	152	117	98	2	58	112	
A9	100 / 1841	518.22	159	2.35	2.35	154	118	98	2	58	113	
A8	105 / 1846	522.30	157	2.10	2.10	150	118	98	2	58	114	
A7	109 / 1850	525.398	148	1.80	1.80	147	117	98	2	58	114	
dry probe												
A14												
A7	109 / 1911	525.398	148	1.80	1.80	144	104	92	2	54	93	
A6	115 / 1917	529.88	145	1.70	1.70	150	104	92	2	54	93	
A5	120 / 1924	533.53	143	1.62	1.62	150	105	92	2	56	106	
A4	122:30 / 1924	534.362	143	1.62	1.62	148	105	92	2	58	109	
dry probe												
A14												
A4	125 / 1952	537.18	143	1.62	1.62	145	90	88	2	53	90	
A3	130 / 1957	540.77	142	1.58	1.58	140	94	89	2	52	102	
A2	135 / 2002	—	138	1.45	1.45	148	100	90	2	50	110	
A-1	140 / 2008	547.500	134	1.30	1.30	148	109	90	2	50	115	
dry probe												
dry probe												
dry probe												

DRY MOLECULAR WEIGHT DETERMINATION

PLANT White Township OH COMMENTS:
 DATE Oct 8, 1975
 SAMPLING TIME (24-hr CLOCK) 1703-1755 / 1850-1913-1924
 SAMPLING LOCATION TP-3
 SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
 ANALYTICAL METHOD AST
 AMBIENT TEMPERATURE 82°F
 OPERATOR Rebb

GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d , lb/lb-mole	
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET				
CO ₂	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44/100	0	
O ₂ (NET IS ACTUAL O ₂ READING MINUS ACTUAL CO ₂ READING)	21.4	21.4	21.2	21.2	21.2	21.2	21.3	32/100	6.82	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O ₂ READING)	20.4	0	21.2	0	21.2	0	0	28/100	0	
N ₂ (NET IS 100 MINUS ACTUAL CO READING)							78.7	28/100	22.04	
TOTAL										28.86

SAMPLING TASK LOG

Plant Celotex Corporation
 Date 10-6 to 10-10

Plant Location Fairfield Alabama TP-3
 Recorded by C.E. Kelly

Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
3	TP-3 Port B	Particulate	1646	1756	70	
3			1756	1811		
3	TP-3 Port A	Particulate	1811	1852	39	
3			1850	1911		
3	TP-3 Port A	Particulate	1911	1924	13	
3			1924	1950		
3	TP-3 Port A	Particulate	1950	2008	18	
3	TP-3		2008		Total time 140 min	
3	TP-3 Port A	Oxmat	1703	1755	52	
3			1755	1814		
3	TP-3 Port B	Oxmat	1814	1852	36	
3			1850	1913		
3	TP-3 Port B	Oxmat	1913	1924	11	
3			1924		Total for Oxmat 99 min	
1	TP-3 Port B	particulate	1710			
2	TP-3 Port B	"	1715			
3	TP-3 Port B	"	1719			

Comments

10-8-75
 Started run
 Switched ports
 Continued sampling
 Process down
 Continued sampling
 Process down
 Continued sampling
 Completed run
 Started run
 Stopped sampling
 Continued sampling
 Stopped sampling
 Continued sampling
 Terminated run
 Collected associated flask sample
 Collected associated flask sample
 Collected associated flask sample

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

PLANT _____
DATE OCT 8 1975
SAMPLING LOCATION _____
SAMPLE TYPE _____
RUN NUMBER CAP-TP-3-3
SAMPLE BOX NUMBER _____
CLEAN-UP MAN Bayton

COMMENTS:

FRONT HALF

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK, FRONT HALF OF FILTER HOLDER
Bal 10

FILTER NUMBER _____
tare 0.390539 g
net _____

LABORATORY RESULT

CONTAINER _____ 11.1/2.9 mg
CONTAINER _____ 9.0 mg

FRONT HALF SUBTOTAL 2.3 mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER

CONTAINER _____
ETHER-CHLOROFORM
EXTRACTION _____

ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml

MOISTURE

IMPINGERS	<i>cloudy -</i>					
FINAL VOLUME	<u>128</u> ml	<u>105</u> ml	<u>32</u> ml	<u>5.6</u> ml	<u>5</u> ml	<u>6</u> ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>0</u> ml			
NET VOLUME	<u>28</u> ml	<u>5</u> ml	<u>2</u> ml			

~ 75% Spent

SILICA GEL			
FINAL WEIGHT	<u>497.8</u> g	_____ g	_____ g
INITIAL WEIGHT	<u>475</u> g	_____ g	_____ g
NET WEIGHT	<u>22.8</u> g	_____ g	_____ g

TOTAL MOISTURE 57.8

35
22.8
57.8

Celotex Corp.
Fairfield Alabama

TP-3 Outlet Run 3

Traverse Point	W.P. (T.S. 40)	V.S	G.S
A 1	14.33	2160	9810
2	15.20	2290	10,400
3	15.87	2390	10,900
4	16.15	2430	11,000
5	16.30	2440	11,100
6	16.57	2490	11,300
7	17.03	2570	11,700
8	18.65	2810	12,800
9	19.03	2860	13,000
10	19.16	2880	13,100
11	19.35	2910	13,200
12	19.00	2860	13,000
13	18.35	2760	12,500
14	17.65	2660	12,100
	242.61		
B 1	13.66	2060	9360
2	14.83	2230	10,100
3	16.60	2500	11,400
4	16.96	2550	11,600
5	17.13	2580	11,700
6	17.13	2580	11,700
7	17.29	2600	11,800
8	17.98	2710	12,300
9	18.33	2760	12,500
10	18.86	2840	12,900
11	19.00	2860	13,000
12	19.27	2900	13,200
13	19.12	2880	13,100
14	19.13	2880	13,100
	487.90		11,900
	17.43	22	14,200

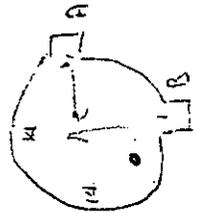
NOMOGRAPH DATA

PLANT Clatory
 DATE Oct 10, 1975
 SAMPLING LOCATION TP 3 Run 4

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	$\Delta H_{@}$	1.99
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m\text{ avg.}}$	95
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.70
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	29.73
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{ avg.}}$	130
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ avg.}}$	-
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ max.}}$	-
C FACTOR		1.16
CALCULATED NOZZLE DIAMETER, in.		-
ACTUAL NOZZLE DIAMETER, in.		0.242
REFERENCE Δp , in. H ₂ O		.49

FIELD DATA

PLANT Deloitte
 DATE 04-10-1975
 SAMPLING LOCATION TR-3
 SAMPLE TYPE POST-CONCRETE
 RUN NUMBER 1
 OPERATOR Kelly
 AMBIENT TEMPERATURE 75
 BAROMETRIC PRESSURE 29.76
 STATIC PRESSURE (P_s) 1.44
 FILTER NUMBER (S) 094.56



PROBE LENGTH AND TYPE 4' S.S.
 NOZZLE I.D. 0.242
 ASSUMED MOISTURE, % 2
 SAMPLE BOX NUMBER 19
 METER BOX NUMBER RACG
 METER ΔH₀ 1.89
 C FACTOR 1.16
 PROBE HEATER SETTING 120
 HEATER BOX SETTING 252
 REFERENCE ΔP 4.9

Collector Tare Weight(s) _____ FID Gas Flow Rate 0
 SCHEMATIC OF TRAVERSE POINT LAYOUT _____ MINUTES
 READ AND RECORD ALL DATA EVERY _____ MINUTES

FID not recalibrated new plant

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _m , IN)	VELOCITY HEAD (ΔP _s , in. H ₂ O)	ORIFICE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s , °F)	DRY GAS METER TEMPERATURE (T _m , °F)		PUMP VACUUM, in. Hg	FID GAS TEMPERATURE OF IMPROVER	FID GAS TEMPERATURE OF DETECTOR	FID-HC CONC. PPM VOL.
				DESIRED	ACTUAL		INLET (T _m in)	OUTLET (T _m out)				
A14	5 / 0851	660.781	.58	2.18	2.18	146	64	60	2	52	75	
A13	86.40 / 0853	666.036	0	2.15	2.15	212						
A12	15 / 0905	672.84	.62	2.32	2.32	143	78	63	2	48	97	
A11	20 / 0910	676.97	.63	2.35	2.35	142	83	67	2	48	110	
A10	25 / 0915	681.10	.62	2.32	2.32	126	92	70	2	50	113	
A9	30 / 0920	685.18	.59	2.20	2.20	125	95	70	2	51	115	
A8	35 / 0925	689.16	.56	2.10	2.10	126	104	74	2	52	116	
A7	40 / 0930	692.96	.46	1.80	1.80	126	107	77	2	51	118	
A6	45 / 0935	696.67	.44	1.68	1.68	125	111	83	2	53	122	
A5	50 / 0940	700.27	.42	1.60	1.60	126	112	85	2	54	126	
A4	55 / 0945	703.91	.42	1.60	1.60	129	113	88	2	57	125	
A3	60 / 0950	707.38	.37	1.41	1.41	132	114	90	2	55	126	
A2	65 / 0955	710.69	.19	1.24	1.24	126	114	92	2	56	127	
A1	70 / 1000	712.612	.18	1.10	1.10	126	112	93	2	56	120	

reset pot

Scale check: 0.006 cfm @ 16" Hg

COMMENTS:

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS

PLANT Fairfield, Alabama

COMMENTS:

DATE OCT 10 1978

SAMPLING LOCATION _____

SAMPLE TYPE _____

RUN NUMBER CRP-TP3-4

SAMPLE BOX NUMBER 19 *glass net # 3*

CLEAN-UP MAN Baylors

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK, FRONT HALF OF FILTER HOLDER
Bal-16

CONTAINER _____ 5.7 / 2.2

FILTER NUMBER _____

CONTAINER _____ 3.9

tare 0.391600 g

net _____

FRONT HALF SUBTOTAL 11.8

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER

CONTAINER _____
ETHER-CHLOROFORM
EXTRACTION

ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml _____ ml

MOISTURE

IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	<u>132</u> ml	<u>102</u> ml	<u>32</u> ml	_____ ml	_____ ml	_____ ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>0</u> ml	_____ ml	_____ ml	_____ ml
NET VOLUME	<u>32</u> ml	<u>2</u> ml	<u>2</u> ml	_____ ml	_____ ml	_____ ml

SILICA GEL						
FINAL WEIGHT	<u>495.9</u> g	_____ g	_____ g	<u>36</u> g	_____ g	<u>56.9</u> g
INITIAL WEIGHT	<u>475</u> g	_____ g	_____ g	<u>20.2</u> g	_____ g	_____ g
NET WEIGHT	<u>20.2</u> g	_____ g	_____ g	<u>56.9</u> g	_____ g	TOTAL MOISTURE <u>56.2</u>

Celotex Corp.
Fairfield Alabama

TP-3 Outlet Run 4

Traverse Point	W.P.S. ACTS 440	Vs						
A 1	10.27	1550	7290					
2	10.55	1590	7430					
3	14.80	2230	10,500					
4	15.73	2370	11,200					
5	15.69	2360	11,100					
6	16.04	2410	11,340					
7	16.43	2470	11,600					
8	18.12	2730	12,800					
9	18.53	2800	13,200					
10	19.06	2870	13,500					
11	19.28	2900	13,600					
12	19.49	2930	13,800					
13	19.34	2910	13,700					
14	18.65	2810	13,200					
	232.02							
B 1	14.02	2110	9930					
2	14.43	2170	10,200					
3	16.02	2410	11,300					
4	16.61	2500	11,800					
5	16.91	2540	12,000					
6	17.09	2570	12,100					
7	17.03	2560	12,000					
8	17.79							
9	18.49							
10	18.94							
11	19.19							
12	19.34							
13	19.34							
14	18.80							
8	17.83	2690	12,700					
9	18.49	2730	13,100					
10	18.94	2850	13,400					
11	19.19	2890	13,600					
12	19.34	2910	13,700					
13	18.91	2850	13,400					
14	18.80	2830	13,300					
	475.65		12,000					
	16.99	Qa	13,800					

As-779 5.41

SAMPLING SUMMARY SHEET

Plant Celotex Corporation Location Fairfield, Alabama
 Sampled source Outlet T P 3 (Particulate)

Run	Date	N _p	P _m	P _b	V _m	T _m	V _{m std}	V _w	V _{w gas}	%M	M _D
1	10-7-75	28	1.94	29.68	109.005	94	103.86	66.6	3.16	2.95	.971
2	10-8-75	28	1.96	29.65	106.314	103	99.58	54.3	2.57	2.52	.975
3	10-8-75	28	1.88	29.65	108.344	103	101.65	57.8	2.74	2.62	.974
4	10-10-75	28	1.88	29.70	106.647	93	101.85	56.9	2.70	2.58	.974

Run	MW _D	MW	P _{st}	P _s	C _p	V _{ΔP_s × (T_s + 460)}	V _s	T _s	T _t	D _η	%I
1	28.9	28.6	.03	29.7	.857	17.16	2580	137	140	.242	103.5
2	28.9	28.6	.03	29.7	.857	17.44	2620	132	135	.242	101.4
3	28.9	28.6	.03	29.7	.857	17.43	2620	150	140	.242	103.0
4	28.9	28.6	.03	29.7	.857	16.99	2560	129	140	.242	102.0

$$V_{m std} = \frac{17.7 \times V_m (P_b + \frac{P_m}{13.6})}{(T_m + 460)}$$

$$\% M = \frac{100 \times V_{w gas}}{V_{m std} + V_{w gas}}$$

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

$$MW_{gas} = 0.0474 \times V_w$$

$$MW = MW_D \times M_D + 18 (1 - M_D)$$

$$P_s = P_b \pm P_{st}$$

$$V_s = 5128.8 \times C_p \times \sqrt{\Delta P_s \times (T_s + 460)} \left[\frac{1}{P_s \times 2.9} \right]^{1/2}$$

$$\% I = \frac{V_s \times T_t \times P_s \times M_D \times (D_n)^2}{1,032 \times (T_s + 460) \times V_{m std}}$$

N_p Total No. of Sampling Points
 P_m Average Orifice Pressure Drop, in. H₂O
 P_b Barometric Pressure, in. (g. Absolute)
 V_m Volume of Dry Gas at Meter Conditions, DCF
 T_m Average Meter Temperature, °F
 V_{m std} Volume of Dry Gas at STP, DSCF^a
 V_w Total H₂O Collected in Impingers and Silica Gel, ml
 V_{w gas} Volume of Water Vapor Collected at STP, SCF
 % M % Moisture by Volume
 M_D Mole Fraction of Dry Gas
 % CO₂ Volume % Dry
 % O₂ Volume % Dry
 % CO Volume % Dry
 % N₂ Volume % Dry
 MW_D Molecular Weight of Stack Gas, Dry Basis
 MW Gas, Wet Basis
 P_{st} Static Pressure of Stack Gas, in. Hg
 P_s Stack Gas Pressure, in. Hg Absolute
 C_p Pitot Tube Coefficient
 V_s Stack Gas Velocity at Stack Conditions, fpm
 T_s Average Stack Temperature
 T_t Net Time of Test, Min.
 D_η Sampling Nozzle Diameter, in.
 % I Percent Isokinetic

^a Dry standard cubic feet at 70°F, 29.92 in. Hg.
^b Standard conditions at 70°F, 29.92 in. Hg.
^c $\sqrt{P_s \times (T_s + 460)}$ is determined by averaging the square root of the product of the velocity head (ΔP_s) and the absolute stack temperature from each sampling point.

① Q_s - 12,100
 Q_w - 13,900
 ② Q_s - 12,300
 Q_w - 14,200
 ③ Q_s - 11,900
 Q_w - 14,200
 ④ Q_s - 12,000

APPENDIX E
Gaseous Hydrocarbons Data

Contains

1. Parts Per Million Values Calculated at Each Sampling Point.
2. Gaseous Hydrocarbon Field Data Charts.

Calculation Procedure for Determining
Averages, Weighted Averages, and Total Mass Emissions

Averages

Average values for hydrocarbon levels in a duct (in ppm) were calculated for minimum, maximum, and average values for each sampling point using arithmetic averaging procedures. Arithmetic averages of volume flow per sampling point and mass emissions per sampling point were also calculated. The calculated values are reported on the attached computer printout sheets.

Weighted Average Hydrocarbon Values (Wet Basis)

Weighted average hydrocarbon concentrations were calculated for each run using the following procedure. See the following pages for conversion of wet basis values to dry basis.

$$\text{weighted average} = \frac{\text{HC}}{\text{HC}} = \frac{\sum_{i=1}^n (\text{HC}_{\text{ave}_i} \cdot \text{Vol}_i)}{\sum_{i=1}^n (\text{Vol}_i)}$$

where HC_{ave_i} = average hydrocarbon concentration at the i th sampling point.

In the above calculation volume flow data was involved for only those sampling points for which hydrocarbon data was available. Using the weighted average hydrocarbon value, the total mass of hydrocarbon emissions was calculated as follows:

$$\text{Total emissions (lb/hr)} = \frac{\text{HC}}{\text{HC}} (\text{ppm}) \cdot \text{Vol}_{\text{ave}} (\text{ft}^3 \text{ at } 21.1\text{C/min}) \cdot 2.4836 \cdot 10^{-6} \left(\frac{\text{min} \cdot \text{lb}}{\text{ft}^3 \text{ hr}} \right)$$

where Vol_{ave} = arithmetic average volume flow for all sample points

and $2.4836 \cdot 10^{-6}$ is derived from

$$\frac{60 (\text{min/hr}) \cdot 28.317 (1/\text{ft}^3) \cdot 16 (\text{gl molecules weight of CH}_4) \cdot 293}{22.4 (1/\text{gram molecular weight at } 0^\circ\text{C}) \cdot 453.59 (\text{g/lb}) \cdot 10^6} = \frac{293}{294.1}$$

The following tables indicating hydrocarbon concentrations and calculated emission rates for each run's particulate test traverse point are presented succeeding the following equation. Average concentrations and emission rates for each test are also included at the end of each table. Because hydrocarbon measurements were not always performed at the exact time that particulate runs were in progress, some of the particulate sampling points have no corresponding hydrocarbon measurement. Therefore, the number of valid hydrocarbon sampling points used at the particulate traverse points are indicated at the end of each table.

The concentration values in ppm as reported in the following tables are four and five-minute averages of actual recorder strip chart data. Since no moisture knockout trap was used, the ppm concentrations are on an as-measured ("wet") basis. When converting the ppmv measured concentrations to gr/dscf, the presence of stack gas moisture must be taken into consideration. Calculation of the equivalent "dry" hydrocarbon concentration was accomplished with the following equation:

$$C_{gr/DSCF} = \frac{C_{ppm}}{F_{dg}} \times \frac{M}{V} \times 7000 \text{ gr/lb} \times \frac{1}{10^6}$$

where:

$C_{gr/DSCF}$ = concentration of hydrocarbons (as CH_4) at dry standard conditions (70°F, 29.92 in. Hg), gr/DSCF

F_{dg} = proportion by volume of dry gas in the gas stream, dimensionless

M = molecular weight of CH_4 , 16 lb/lb mole

V = molar volume of CH_4 at standard conditions, 386.5 SCF CH_4 /lb mole

1 Pound = 7000 grains

$\frac{1}{10^6}$ = ppm to volume fraction conversion factor

Mass emission rate per point was determined by multiplication of that point concentration times the dry gas flow rate measured at that point. The "point" dry

gas flow rate was determined by the product of the calculated point velocity and the area of the stack represented by that traverse point of the X point test (i.e., stack area/X). The exact equations used to calculate mass emission rate per point are shown below:

$$Q_i = 60 (1 - B_{wo}) V_s \left(\frac{A}{48}\right) \left(\frac{T_{std}}{T_s}\right) \left(\frac{P_s}{P_{std}}\right)$$

where:

Q_i = volumetric flow rate for area with centroid at point i, DSCFM

B_{wo} = proportion by volume of water vapor in the gas stream, dimensionless

V_s = stack gas velocity at point i, FPS

A = cross-section area of the stack, ft^2

T_{std} = absolute temperature at standard conditions, $528^\circ R$

P_{std} = absolute pressure at standard conditions, 29.92 in. Hg

T_s = absolute stack gas temperature of point i, $^\circ R$

P_s = absolute stack gas pressure at point i, in. Hg

60 = conversion factor, sec/min

and

$$E_i = \left(\frac{60}{7000}\right) (C_i) (Q_i)$$

where:

E_i = mass emission rate from area with centroid at point i, lb/hr

C_i = concentration measured at point i, gr/DSCF

60 = conversion factor, min/hr

7000 = conversion factor, gr/lb

Combined volumetric flow rates from the two stacks are determined by summation of the Q_i 's. Likewise, total mass flow rate is calculated as the sum of the E_i 's.

In the cases where hydrocarbon point measurements were unavailable, summation of the existing E_i values will not equal the total mass flow rate. Under such circumstances the average hydrocarbon concentration, C_{ave} , was multiplied times the total volumetric flow to determine the total mass flow.

$$\left(\sum_{C=1} Q_i \right)$$

Copies of the recorder strip chart data along with copies of the unabridged strip chart data obtained during the actual times of sampling are included in this section.

HYDROCARBON TABULATED TABLES

TABLE E1.

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMV			VOL DSCFM	HC LB/HR
		MTN	MAX	AVG		
1	1434	ND	ND	ND	656	ND
2	1438	ND	ND	ND	742	ND
3	1442	ND	ND	ND	740	ND
4	1445	46.0	49.0	45.8	753	.09
5	1450	46.0	46.3	45.1	764	.09
6	1454	45.2	48.0	45.9	745	.09
7	1458	44.8	44.8	44.7	743	.09
8	1502	40.0	45.0	43.7	750	.09
9	ND	ND	ND	ND	750	ND
10	ND	ND	ND	ND	743	ND
11	ND	ND	ND	ND	763	ND
12	ND	ND	ND	ND	758	ND
13	1605	46.2	48.0	47.4	796	.10
14	1609	48.2	50.5	49.5	796	.11
15	1613	47.0	48.5	47.9	796	.10
16	1617	47.2	50.7	48.2	752	.10
17	1621	49.5	50.0	49.8	675	.09
18	1625	40.6	50.8	50.2	571	.08
19	1752	ND	ND	ND	679	ND
20	1758	31.3	37.8	34.9	736	.07
21	1802	35.0	43.2	40.0	776	.08
22	1805	42.2	44.2	43.3	796	.09
23	1810	44.0	44.2	44.1	761	.09
24	1814	38.5	44.0	41.2	702	.08
25	1815	38.2	38.7	38.4	705	.07
26	1822	38.8	38.4	38.2	697	.07
27	1826	37.0	41.3	38.2	682	.07
28	1830	36.0	41.0	39.8	703	.07
29	1834	39.3	40.4	39.9	696	.07
30	1838	34.7	39.6	38.2	705	.07
31	1842	34.5	36.3	35.3	712	.07
32	1845	34.7	34.9	34.8	715	.07
33	ND	ND	ND	ND	669	ND
34	ND	ND	ND	ND	654	ND
35	ND	ND	ND	ND	567	ND
36	ND	ND	ND	ND	499	ND

AVG 41.5 44.0 42.8 35,410 415 .08

WT. AVG (BASED ON 24 VALID READINGS) 42.9

GASEOUS EMISSION DATA: (GR/DSCFM) .0134

DSCFM-25,410 (LBS/HR) 2.74

(KGS/HR) 1.24

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points

Standard Conditions 70 F 29.92 " Hg

ND = No Data

CELOTEX, FAIRFIELD, ALABAMA RUN NO 2 INLET TPI 10/08/75
 DATA AVERAGED DURING 4 MINUTE INTERVAL

TABLE E6

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMV/L			VOL DSCFM	HC LB/HR
		MIN	MAX	AVG		
1	ND	ND	ND	ND	706	ND
2	1024	51.0	54.0	52.4	774	.11
3	1028	49.8	51.5	50.4	774	.10
4	1032	49.5	51.0	49.5	836	.11
5	1036	48.5	49.6	49.2	841	.11
6	1040	44.3	46.5	45.0	841	.10
7	1044	44.8	45.0	44.9	841	.10
8	1049	46.0	46.5	46.3	835	.10
9	1053	46.8	49.4	47.6	816	.10
10	1057	46.5	46.5	46.5	752	.09
11	1101	46.8	47.6	47.3	658	.08
12	1105	45.0	47.3	46.3	665	.08
13	1109	45.0	47.0	45.7	674	.08
14	1113	46.0	46.3	46.1	650	.08
15	1117	45.7	47.0	46.5	634	.08
16	1121	45.4	47.8	46.8	594	.07
17	1125	45.3	46.0	45.8	492	.05
18	1129	45.9	46.1	46.0	426	.05
19	ND	ND	ND	ND	772	ND
20	1208	31.7	37.0	33.6	745	.07
21	1212	32.6	37.2	34.8	754	.07
22	1216	37.2	38.8	38.1	761	.08
23	1220	38.9	39.7	39.4	759	.08
24	1224	40.5	42.0	41.1	739	.08
25	1229	41.2	43.5	42.3	725	.08
26	1233	40.3	42.4	41.2	709	.08
27	1237	38.0	41.0	40.0	708	.08
28	1241	36.8	37.0	36.9	736	.07
29	1245	35.2	37.0	36.4	772	.07
30	1249	35.7	39.0	35.6	791	.08
31	ND	ND	ND	ND	815	ND
32	ND	ND	ND	ND	815	ND
33	ND	ND	ND	ND	802	ND
34	ND	ND	ND	ND	761	ND
AVG		42.8	44.6	43.7	734	.08
WT. AVG (BASED ON 24 VALID READINGS)				43.6		
GASEOUS EMISSION DATA: (GR/DSCFM)						.0124
DSCFM = 26,255		(LBS/HR)			2.30	
(KG/HR)						1.30

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points

Standard Conditions 70 F 29.92 " Hg

ND = No Data

TABLE 3.

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL			VOL DSCFM	HC LB/HR
		MIN	MAX	AVG		
1	ND	ND	ND	ND	672	ND
2	ND	ND	ND	ND	716	ND
3	ND	ND	ND	ND	703	ND
4	ND	ND	ND	ND	727	ND
5	1707	46.2	47.3	46.8	727	.09
6	1711	46.2	48.0	46.7	727	.09
7	1715	45.9	46.2	46.1	713	.09
8	1719	45.7	46.3	45.4	707	.09
9	1723	43.2	43.9	43.5	700	.08
10	1727	44.7	45.0	44.5	700	.08
11	1731	43.2	45.3	44.3	733	.09
12	1735	40.5	44.0	42.5	759	.09
13	1739	43.2	44.8	44.0	772	.09
14	1743	43.5	45.8	44.7	790	.09
15	1747	45.0	45.3	45.5	802	.10
16	1751	44.8	47.7	45.7	778	.09
17	1755	47.7	44.0	43.9	713	.08
18	ND	ND	ND	ND	643	ND
1	1811	35.0	37.5	35.7	709	.07
2	1815	37.5	38.5	39.1	773	.08
3	1819	35.4	38.4	37.5	789	.08
4	1823	35.5	38.2	35.7	803	.08
5	1827	37.8	39.3	38.4	827	.08
6	1831	34.7	37.9	35.5	839	.08
7	1835	34.3	35.6	35.0	839	.08
8	1839	31.7	34.3	33.2	797	.07
9	1843	30.0	33.0	30.9	766	.06
10	1847	27.2	29.5	28.6	733	.06
11	1913	27.5	28.5	28.1	726	.05
12	1917	26.8	30.0	28.8	719	.06
13	1921	29.7	29.9	29.8	712	.06
14	ND	ND	ND	ND	712	ND
15	1954	27.0	29.3	28.6	747	.06
16	1958	29.7	30.5	30.0	708	.05
17	2002	30.5	32.2	31.0	679	.06
18	2035	31.0	31.3	31.1	617	.05
AVG		37.2	38.9	38.1	736	.08
WT. AVG (BASED ON 30 VALID READINGS)				38.1		
GASEOUS EMISSION DATA: (GR/DSCFM)						.011
DSCFM = 26,438 (LBS/HR)						2.51
						(KG/HR) 1.14

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points

Standard Conditions 70 F 29.92 " Hg

ND = No Data

TABLE E4

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVD			VOL DSCFM	HC LB/HR
		MIN	MAX	AVG		
1	ND	ND	ND	ND	786	ND
2	ND	ND	ND	ND	786	ND
3	858	55.0	55.3	55.2	818	.12
4	902	52.5	57.0	55.2	849	.12
5	906	40.8	47.5	44.0	855	.10
6	910	37.7	39.8	38.3	855	.09
7	914	34.2	37.2	35.5	841	.08
8	918	33.6	34.0	33.9	808	.07
9	922	33.4	34.0	33.7	802	.07
10	926	32.5	34.0	33.7	791	.07
11	930	32.0	33.9	33.5	694	.06
12	934	32.8	33.4	33.2	709	.06
13	938	35.0	38.0	35.8	702	.07
14	942	38.5	39.2	39.0	688	.07
15	946	39.4	39.7	39.5	674	.07
16	950	39.8	40.8	40.3	602	.06
17	954	38.5	40.5	40.0	531	.06
18	958	38.0	38.4	38.2	512	.05
19	1002	35.0	36.3	35.3	709	.07
20	1012	37.0	37.4	37.2	720	.07
21	1016	34.2	37.0	35.8	769	.07
22	1024	34.0	36.8	35.6	778	.07
23	1028	36.6	37.2	35.9	751	.07
24	1032	39.2	39.6	39.4	741	.08
25	1036	39.3	40.4	39.6	751	.08
26	1040	39.8	40.4	40.1	719	.08
27	ND	ND	ND	ND	684	ND
28	1105	39.5	41.5	40.3	712	.08
29	1109	41.3	43.0	42.1	729	.08
30	1113	41.7	42.5	42.0	756	.08
31	1117	41.7	42.8	42.3	772	.09
32	1121	40.5	43.0	41.1	785	.09
33	1125	40.3	40.7	40.5	790	.09
34	1129	39.6	41.0	39.8	770	.08
35	1133	38.5	39.8	39.2	717	.07
36	1137	39.8	40.2	40.0	640	.07

AVG 38.5 40.1 39.3 736 .08

WT. AVG (BASED ON 33 VALID READINGS) 39.4

GASEOUS EMISSION DATA: (GR/DSCF) .0113

DSCFM = 26,422 (LBS/HR) 2.60

(KG/HR) 1.18

Gaseous Emission Data based on Molecular Weight of CH₄, 16
 Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points
 Standard Conditions 70 F 29.92 " Hg
 ND = No Data E8

CELOTEX, FAIRFIELD, ALABAMA RUN NO 1 OUTLET TP2 10/07/75
 DATA AVERAGED DURING 5 MINUTE INTERVAL

TABLE E5.

SAMPLE POINT	MEAN TIME	HYDROCARBON, PP1V1DL			VOL DSCFM	HC LB/HR
		MIN	MAX	AVG		
14	1435	ND	ND	ND	452	ND
13	1440	43.0	43.5	43.1	450	.05
12	1445	45.0	47.0	45.1	460	.06
11	1450	45.7	47.5	46.6	460	.06
10	1455	47.0	50.5	49.2	460	.06
9	1500	47.0	48.5	47.5	465	.06
8	1504	42.5	48.5	45.3	474	.06
7	ND	ND	ND	ND	510	ND
6	ND	ND	ND	ND	513	ND
5	1608	57.0	59.0	58.2	516	.08
4	1613	58.0	58.5	58.2	531	.08
3	1618	58.5	62.5	60.0	529	.08
2	1623	60.5	63.0	61.8	503	.08
1	1623	62.7	63.0	62.9	457	.08

AVG 51.5 53.8 52.5 484 .07

WT. AVG (BASED ON 11 VALID READINGS) 52.8

GASEOUS EMISSION DATA: (GR/DSCFM) .0148

DSCFM = 13,412 (LBS/HR) 1.70

(KGS/HR) .91

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points

Standard Conditions 70 F 29.92 " Hg

ND = No Data

CFLDTEX, FAIRFIELD, ALABAMA RUN NO 2 OUTLET TP2 10/08/75
 DATA AVERAGED DURING 5 MINUTE INTERVAL

TABLE E6.

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL			VOL DSCFM	HC LB/HR
		MIN	MAX	AVG		
14	ND	ND	ND	ND	441	ND
13	ND	ND	ND	ND	451	ND
12	1034	46.0	47.8	45.8	445	.06
11	1039	45.2	48.0	47.0	445	.06
10	1044	45.0	45.3	45.2	455	.05
9	1049	46.4	47.5	47.1	458	.06
8	1054	47.6	48.7	48.1	471	.06
7	1059	47.8	49.6	48.5	494	.06
6	1104	49.8	50.7	50.2	506	.07
5	1109	49.2	51.4	50.5	515	.07
4	1114	51.5	52.5	52.2	511	.07
3	1119	52.8	53.0	52.9	515	.07
2	1124	53.0	54.5	53.8	476	.07
1	ND	ND	ND	ND	435	ND

AVG 48.6 49.9 49.3 472 .06

WT. AVG (BASED ON 11 VALID READINGS) 49.4

GASEOUS EMISSION DATA: (PP/DSCF) .0147

DSCFM-12,698 (LBS/HR) 1.62

(KG/HR) .74

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points

Standard Conditions 70 F 29.92 " Hg

ND = No Data

TABLE E7.

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL			VOL DSCFM	HC LB/HR
		MTN	MAX	AVG		
14	ND	ND	ND	ND	463	ND
13	1820	40.0	41.5	40.7	489	.05
12	1825	39.8	40.0	39.9	514	.05
11	1830	39.0	39.8	39.5	509	.05
10	1835	38.0	38.8	38.3	499	.05
9	1840	37.5	39.5	38.3	500	.05
8	1845	35.5	38.0	35.4	483	.05
7	1848	32.0	33.0	32.5	471	.04
6	ND	ND	ND	ND	471	ND
5	1922	41.4	43.0	42.1	475	.05
4	ND	ND	ND	ND	475	ND
3	ND	ND	ND	ND	467	ND
2	2000	42.2	47.0	44.7	446	.05
1	2005	45.0	47.0	45.2	428	.05

AVG 39.0 40.8 39.9 477 .05

WT. AVG (BASED ON 10 VALID READINGS) 39.8

GASEOUS EMISSION DATA: (GP/DSCFM) .012

DSCFM-12, 769 (LBS/HR) 1.32

(KG/HR) .60

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points

Standard Conditions 70 F 29.92 " Hg

ND = No Data

CELOTEX, FAIRFIELD, ALABAMA RUN NO 4 OUTLET TP2 10/10/75
 DATA AVERAGED DURING 4 MINUTE INTERVAL

TABLE E8.

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMV/L			VOL DSCFM	HC LB/HR
		MIN	MAX	AVG		
14	ND	ND	ND	ND	449	ND
13	ND	ND	ND	ND	449	ND
12	ND	ND	ND	ND	449	ND
11	ND	ND	ND	ND	453	ND
10	914	26.0	27.8	27.2	452	.03
9	919	28.4	30.2	29.3	462	.04
8	924	30.7	32.4	31.5	462	.04
7	929	32.5	32.5	32.5	498	.04
6	934	32.5	33.4	32.8	515	.05
5	939	34.2	38.5	35.1	524	.05
4	944	30.0	41.2	40.1	521	.06
3	949	41.8	43.9	42.5	513	.06
2	954	44.5	45.5	45.2	488	.06
1	959	45.2	46.6	45.9	456	.06

AVG 35.5 37.2 35.3 477 .05

WT. AVG (BASED ON 10 VALID READINGS) 35.4

GASEOUS EMISSION DATA: (GR/DSCFM) .0106

DSCFM-13,022 (LBS/HR) 1.21

(KG/HR) .55

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points

Standard Conditions 70 F 29.92 " Hg

ND = No Data

CELOTEX, FAIRFIELD, ALABAMA RUN NO 1 OUTLET TP3 10/07/75
 DATA AVERAGED DURING 5 MINUTE INTERVAL

TABLE E9

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMV			VOL DSCFM	HC LB/HR	
		MIN	MAX	AVG			
1	ND	ND	ND	ND	411	ND	
2	ND	ND	ND	ND	426	ND	
3	1810	51.0	51.5	51.2	448	.06	
4	1815	46.0	52.0	48.5	448	.06	
5	1820	46.0	51.4	48.2	451	.06	
6	1825	47.0	50.0	48.3	444	.06	
7	1830	52.2	54.0	53.2	434	.06	
8	1835	50.0	52.0	51.8	437	.06	
9	1840	44.0	50.0	45.2	384	.05	
10	1845	42.2	44.5	43.1	380	.04	
11	1850	42.0	45.0	43.0	375	.04	
12	ND	ND	ND	ND	366	ND	
13	ND	ND	ND	ND	356	ND	
14	1942	55.0	55.5	55.3	339	.05	
AVG		47.5	50.4	48.8	407	.05	
WT. AVG (BASED ON 10 VALID READINGS)				48.8			
GASEOUS EMISSION DATA: (G/DSCFM)						.0143	
12,203 - DSCFM (LBS/HR)						4.38150	
						(KG/HR)	.63

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points

Standard Conditions 70 F 29.92 " Hg

ND = No Data

CELOTex, FAIRFIELD, ALABAMA RUN NO 2 OUTLET TP3 10/08/75
 DATA AVERAGED DURING 5 MINUTE INTERVAL

TABLE E10.

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPM VOL			VOL DSCFM	HC LB/HR
		MIN	MAX	AVG		
14	ND	ND	ND	ND	417	ND
13	ND	ND	ND	ND	436	ND
12	1213	47.2	46.0	44.7	443	.05
11	1218	45.3	47.0	45.2	450	.06
10	1223	48.3	50.0	49.3	443	.06
9	1226	50.3	52.5	51.7	439	.06
8	1233	51.0	55.0	53.4	428	.06
7	1238	54.6	57.2	55.1	388	.06
6	1243	54.8	55.2	54.7	380	.06
5	1248	50.0	56.2	53.7	371	.05
4	ND	ND	ND	ND	362	ND
3	ND	ND	ND	ND	362	ND
2	ND	ND	ND	ND	344	ND
1	ND	ND	ND	ND	320	ND

AVG 49.7 52.4 51.2 399 .06

WT. AVG (BASED ON 3 VALID READINGS) 51.0

GASEOUS EMISSION DATA: (GR/DSCFM)

.0152

DSCFM = 12,192

(LB/HR)

1.6

(KG/HR)

.54

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points

Standard Conditions 70 F 29.92 " Hg

ND = No Data

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL			VOL DSCFM	HC LB/HR
		MIN	MAX	AVG		
14	ND	ND	ND	ND	438	ND
13	1654	41.5	43.2	42.4	438	.05
12	1659	43.5	45.0	44.3	442	.05
11	1704	44.0	44.7	44.4	433	.05
10	1709	45.0	46.0	45.7	429	.05
9	1714	46.0	46.5	46.2	419	.05
8	1719	46.2	47.5	46.4	411	.05
7	1724	44.0	45.2	44.7	396	.05
6	1729	45.2	47.8	46.4	391	.05
5	1734	46.0	46.5	46.2	391	.05
4	1739	46.0	51.5	49.2	387	.05
3	1744	49.0	50.2	49.5	378	.05
2	1749	49.2	50.3	49.7	339	.04
1	1754	47.2	49.2	48.0	317	.04

AVG 45.5 47.2 46.4 400 .05

WT. AVG (BASED ON 13 VALID READINGS) 46.2

GASEOUS EMISSION DATA: (PPM/DSCFM) .014

DSCFM = 11,970 (LBS/HR) 4.29/40

(KGS/HR) .58

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Points

Standard Conditions 70 F 29.92 " Hg

ND = No Data

TABLE E16

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL			VOL DSCFM	HC LB/HR
		MIN	MAX	AVG		
14	ND	ND	ND	ND	434	ND
13	1016	39.6	40.0	39.7	448	.05
12	1020	42.2	43.5	42.8	452	.05
11	1031	45.0	49.2	46.9	457	.06
10	1036	48.2	50.0	49.2	454	.06
9	1041	51.0	51.2	51.0	444	.06
8	ND	ND	ND	ND	432	ND
7	1108	50.5	52.2	51.6	391	.05
6	1113	52.2	53.1	52.5	383	.05
5	1118	51.3	52.6	51.8	374	.05
4	1123	51.9	51.8	51.3	373	.05
3	1128	50.3	51.3	50.7	349	.05
2	1133	50.5	50.9	50.7	252	.03
1	1137	49.9	50.3	50.3	245	.03
AVG		48.5	49.7	49.0	392	.05

WT. AVG (BASED ON 12 VALID READINGS) 48.7

GASEOUS EMISSION DATA: (OR/DSCFM)

.0145

DSCFM-12,051

(LBS/HR)

1.7375

(KG/HR)

.60

Gaseous Emission Data based on Molecular Weight of CH₄, 16

Sample Point Volume Based on Total Stack Area Divided by Total Number of Sample Point

Standard Conditions 70 F 29.92 " Hg

ND = No Data

Run No. 1 - Smog Hay Inlet - TPI
 Data Average - 4 Minute Intervals
 October 7, 1975

Traverse Points <u>Point B</u>	Mean <u>Time</u>	Min., <u>PPM</u>	Max., <u>PPM</u>	Avg., <u>PPM</u>
1	14 34	ND	ND	ND
2	14 38	ND	ND	ND
3	14 42	ND	ND	ND
4	14 46	46.0	49.0	46.8
5	14 50	46.0	46.3	46.1
6	14 54	45.2	43.0	46.9
7	14 58	44.6	44.8	44.7
8	15 02	40.0	45.0	43.7
9	ND	ND	ND	ND
10	"	"	"	"
11	"	"	"	"
12	"	"	"	"
13	16 05	46.2	48.0	47.4
14	16 09	43.2	50.5	49.5
15	16 13	47.0	48.5	47.9
16	16 17	47.2	50.7	48.2
17	16 21	49.5	50.0	49.8
18	16 25	49.6	50.8	50.2

<u>Point A</u>				
19	17 52	ND	ND	ND
20	17 58	31.3	37.8	34.9
21	18 02	35.0	43.2	40.0
22	18 06	42.2	44.2	43.3
23	18 10	44.0	44.2	44.1
24	18 14	38.5	44.0	41.2
25	18 18	38.2	38.7	38.4
26	18 22	38.0	38.4	38.2
27	18 26	37.0	41.3	38.2
28	18 30	39.0	41.0	39.8
29	18 34	39.3	40.4	39.9
30	18 38	34.7	39.6	38.2
31	18 42	34.5	36.3	35.3
32	18 46	34.7	34.9	34.8
33	ND	ND	ND	ND
34	"	"	"	"
35	"	"	"	"
36	"	"	"	"

TPI Ambient @ 14:15 : 2.0 PPM
 PPMV as CH₄

CELESTEX
 Run No. 1 - Smog Hog Outlets, TP 2 & TP 3
 Data Interval - 5 Minute Intervals
 October 7, 1975

Traverse Points	Mean	Min.	Max.	Avg.
TP 2., Port B	PPM	PPM	PPM	PPM
14	14.35	11	ND	ND
13	14.40	43.0	43.5	43.1
12	14.45	45.0	47.0	46.1
11	14.50	45.7	47.5	46.2
10	14.55	47.0	50.5	48.2
9	15.00	47.0	49.5	47.6
8	15.04	42.5	48.5	45.3
7	ND	ND	ND	ND
6	"	"	"	"
5	16.39	57.0	59.0	58.2
4	16.13	58.0	58.5	53.2
3	16.19	53.5	62.5	60.0
2	16.23	60.5	63.0	61.8
1	16.28	62.7	63.0	62.9

TP 3 - Port B

1	ND	ND	ND	ND
2	"	"	"	"
3	18.10	51.0	51.5	51.2
4	18.15	46.0	52.0	48.5
5	18.20	46.0	46.4	46.2
6	18.25	47.0	50.0	48.3
7	18.30	52.2	54.0	53.2
8	18.35	50.0	52.0	51.8
9	18.40	44.0	50.0	46.2
10	18.45	42.2	44.5	43.1
11	18.50	42.0	45.0	43.0
12	ND	ND	ND	ND
13	"	"	"	"
14	19.42	55.0	53.5	56.3

Outlet Ambient @ 14:20 = 3.0 ppm

Run No. 2 - Smag Hog Inlet - TPI
 Data Average - 4 Minute Intervals
 October 8, 1975

Traverse Points <u>Port A</u>	Mean <u>Time</u>	Min., <u>ppm</u>	Max., <u>ppm</u>	Avg., <u>ppm</u>
1	ND	ND	ND	ND
2	10 24	51.0	54.0	52.4
3	10 28	49.8	51.5	50.4
4	10 32	48.5	51.0	49.5
5	10 36	48.5	49.6	49.2
6	10 40	44.3	46.5	45.0
7	10 44	44.8	45.0	44.9
8	10 49	46.0	46.5	46.3
9	10 53	46.8	49.4	47.6
10	10 57	46.5	46.5	46.5
11	11 01	46.8	47.6	47.3
12	11 05	45.0	47.3	46.3
13	11 09	45.0	47.0	45.7
14	11 13	46.0	46.3	46.1
15	11 17	45.7	47.0	46.5
16	11 21	45.4	47.8	46.8
17	11 25	45.3	46.0	45.8
18	11 29	45.9	46.1	46.0

Port B

19	ND	ND	ND	ND
20	12 08	31.7	37.0	33.6
21	12 12	32.6	37.2	34.8
22	12 16	37.2	38.8	38.1
23	12 20	38.9	39.7	39.4
24	12 24	40.5	42.0	41.1
25	12 29	41.2	43.5	42.3
26	12 33	40.3	42.4	41.2
27	12 37	38.0	41.0	40.0
28	12 41	36.8	37.0	36.9
29	12 45	35.2	37.0	36.4
30	12 49	35.7	39.0	36.6
31	ND	ND	ND	ND
32	"	"	"	"
33	"	"	"	"
34	"	"	"	"
35	"	"	"	"
36	"	"	"	"

PPM as C19
 Inlet Ambient @ 10:05 = 4.0 ppm

Run terminated after 126 minutes because of excessive
 process down time.

FID TABLE - CELOTEX - FAIRFIELD, ALABAMA

Run No. 2 - Smog Hog Outlets, TP2 + TP3
 Data Average - 5 Minute Intervals
 October 8, 1975

Traverse Points TP2 - Port B	Mean Time	Min., ppm	Max., ppm	Avg., ppm
14	NO	NO	NO	NO
13	NO	NO	NO	NO
12	10.34	46.0	47.8	46.8
11	10.39	45.2	48.0	47.0
10	10.44	45.0	45.3	45.2
9	10.49	46.4	47.5	47.1
8	10.54	47.6	48.7	48.1
7	10.59	47.8	49.6	48.5
6	11.04	49.8	50.7	50.2
5	11.09	49.2	51.4	50.5
4	11.14	51.5	52.5	52.2
3	11.19	52.8	53.0	52.9
2	11.24	53.0	54.5	53.8
1	NO	NO	NO	NO

TP3 - Port B	Mean Time	Min., ppm	Max., ppm	Avg., ppm
14	NO	NO	NO	NO
13	"	"	"	"
12	12.13	43.2	46.0	44.7
11	12.19	45.3	47.0	46.2
10	12.23	48.3	50.0	49.3
9	12.28	50.3	52.5	51.7
8	12.33	51.0	55.0	53.4
7	12.38	51.6	57.2	56.1
6	12.43	54.8	55.2	54.7
5	12.48	50.0	56.2	53.7
4	NO	NO	NO	NO
3	"	"	"	"
2	"	"	"	"
1	"	"	"	"

Outlet Ambient @ 10:10 = 10.5 ppm

Run terminated after 136 minutes because of excessive
 process down time.

PPM Val CH₄

FID TABLE - CELOTEX - FURKFIELD, HAMPSHIRE

Run No. 3 - Smog Hog Inlet - TPI
 Data Hicage - 4 Minute Intervals
 October 8, 1975

Traverse Points Port B	Mean Time	Min., PPM	Max., PPM	Hog., PPM
1	ND	ND	ND	ND
2	"	"	"	"
3	"	"	"	"
4	"	"	"	"
5	17 07	46.2	47.3	46.0
6	17 11	46.2	48.0	46.7
7	17 15	45.9	46.2	46.1
8	17 19	45.0	46.8	45.4
9	17 23	43.2	43.9	43.5
10	17 27	44.0	45.0	44.5
11	17 31	43.2	45.3	44.3
12	17 35	40.5	44.0	42.5
13	17 39	43.2	44.8	44.0
14	17 43	43.5	45.8	44.7
15	17 47	45.0	45.8	45.6
16	17 51	44.8	47.0	45.7
17	17 55	43.5	44.0	43.9
18	ND	ND	ND	ND
<u>Port A</u>				
1	18 11	35.0	37.5	36.7
2	18 15	37.5	38.5	38.1
3	18 19	35.4	38.4	37.5
4	18 23	35.5	38.2	36.7
5	18 27	37.8	39.3	38.4
6	18 31	34.3	37.9	35.6
7	18 35	34.3	35.6	35.0
8	18 39	31.7	34.3	33.2
9	18 43	30.0	33.0	30.9
10	18 47	27.2	29.5	28.6
11	19 13	27.5	28.5	28.1
12	19 17	26.3	30.0	28.8
13	19 21	29.7	29.9	29.8
14	ND	ND	ND	ND
15	19 54	27.0	29.9	28.6
16	19 58	29.7	30.5	30.0
17	20 02	30.5	32.2	31.0
18	20 05	31.0	31.3	31.1

Inlet Ambient @ 16:35 = 4.5 ppm

PPM V. of C.H.L.

FID TABLE - CELOTEX - FAIRFIELD, HAMPSHIRE

Run No. 3 - Smog. Hg. Outlets, TP2 & TP3

Data Average - 5 Minute Intervals

October 8, 1975

Traverse Points	Mean Time	Min., PPM	Max., PPM	Hvg., PPM
<u>TP 3 - Port B</u>				
14	ND	ND	ND	ND
13	16 54	41.5	43.2	42.4
12	16 59	43.5	45.0	44.3
11	17 04	44.0	44.7	44.4
10	17 09	45.0	46.0	45.7
9	17 14	46.0	46.5	46.2
8	17 19	45.2	47.5	46.4
7	17 24	44.0	45.2	44.7
6	17 29	45.2	47.8	46.4
5	17 34	46.0	46.5	46.2
4	17 37	46.0	51.5	49.2
3	17 44	49.0	50.2	49.5
2	17 49	49.2	50.3	49.7
1	17 54	47.2	49.2	48.0
<u>TP 2 - Port B</u>				
14	ND	ND	ND	ND
13	18 20	40.0	41.5	40.7
12	18 25	39.8	40.0	39.9
11	18 30	39.0	39.8	39.5
10	18 35	38.0	38.8	38.3
9	18 40	37.5	39.5	38.3
8	18 45	35.5	38.0	36.4
7	18 48	32.0	33.0	32.5
6	ND	ND	ND	ND
5	19 22	41.4	43.0	42.1
4	ND	ND	ND	ND
3	"	"	"	"
2	20 00	42.2	47.0	44.7
1	20 05	45.0	47.0	46.2

Outlet Ambient @ 19:10 = 6.0 ppm

PMV as CH₄

FID TABLE - CELOTEX - FAIRFIELD, ALABAMA

Run No. 7 - Smog Hwy Inlet - TPI
 Data Average - 4 Minute Intervals
 October 10, 1975

Traverse Points Port A	Mean Time	Min., ppm	Max., ppm	Avg., ppm
1	ND	ND	ND	ND
2	"	"	"	"
3	8 58	55.0	55.3	55.2
4	9 02	52.5	57.0	55.2
5	9 06	40.8	47.5	44.0
6	9 10	37.3	39.8	38.3
7	9 14	34.2	37.2	35.5
8	9 18	33.8	34.0	33.9
9	9 22	33.7	34.0	33.7
10	9 26	33.5	34.0	33.7
11	9 30	33.0	33.9	33.5
12	9 34	32.8	33.4	33.2
13	9 38	35.0	38.0	35.8
14	9 42	38.5	39.2	39.0
15	9 46	39.4	39.7	39.5
16	9 50	39.8	40.8	40.3
17	9 54	38.5	40.5	40.0
18	9 58	38.0	38.4	38.2
<u>Port B</u>				
19	10 08	35.0	36.3	35.8
20	10 12	37.0	37.4	37.2
21	10 16	34.2	37.0	35.8
22	10 24	34.0	36.8	35.6
23	10 28	36.6	37.2	36.8
24	10 32	39.2	39.6	39.4
25	10 36	39.3	40.4	39.6
26	10 40	39.8	40.4	40.1
27	ND	ND	ND	ND
28	11 05	39.5	41.5	40.3
29	11 09	41.3	43.0	42.1
30	11 13	41.7	42.5	42.0
31	11 17	41.7	42.8	42.3
32	11 21	40.3	43.0	41.1
33	11 25	40.3	40.7	40.5
34	11 29	39.6	41.0	39.8
35	11 33	38.5	39.8	39.2
36	11 37	39.8	40.2	40.0

PPMV in CH₄
 Inlet Ambient @ 8:40 : 7.2 ppm

GRID THREE - CELLTEX - FAIRFIELD, H. H. BENTON

Run No. 4 - Smog Haz Outlets, TP2 + TP3
 Data Average - 5 Minute Intervals
 October 10, 1975

Traverse Points <u>TP2 - Port B</u>	Mean Time	Min., ppm	Max., ppm	Avg., ppm
14	ND	ND	ND	ND
13	"	"	"	"
12	"	"	"	"
11	"	"	"	"
10	9 14	26.0	27.8	27.2
9	9 19	28.4	30.2	29.3
8	9 24	30.7	32.4	31.5
7	9 27	32.5	32.5	32.5
6	9 34	32.5	32.4	32.8
5	9 39	34.2	33.5	36.1
4	9 44	39.0	41.2	40.1
3	9 49	41.3	43.9	42.6
2	9 54	44.5	45.5	45.2
1	9 59	45.2	46.6	45.9

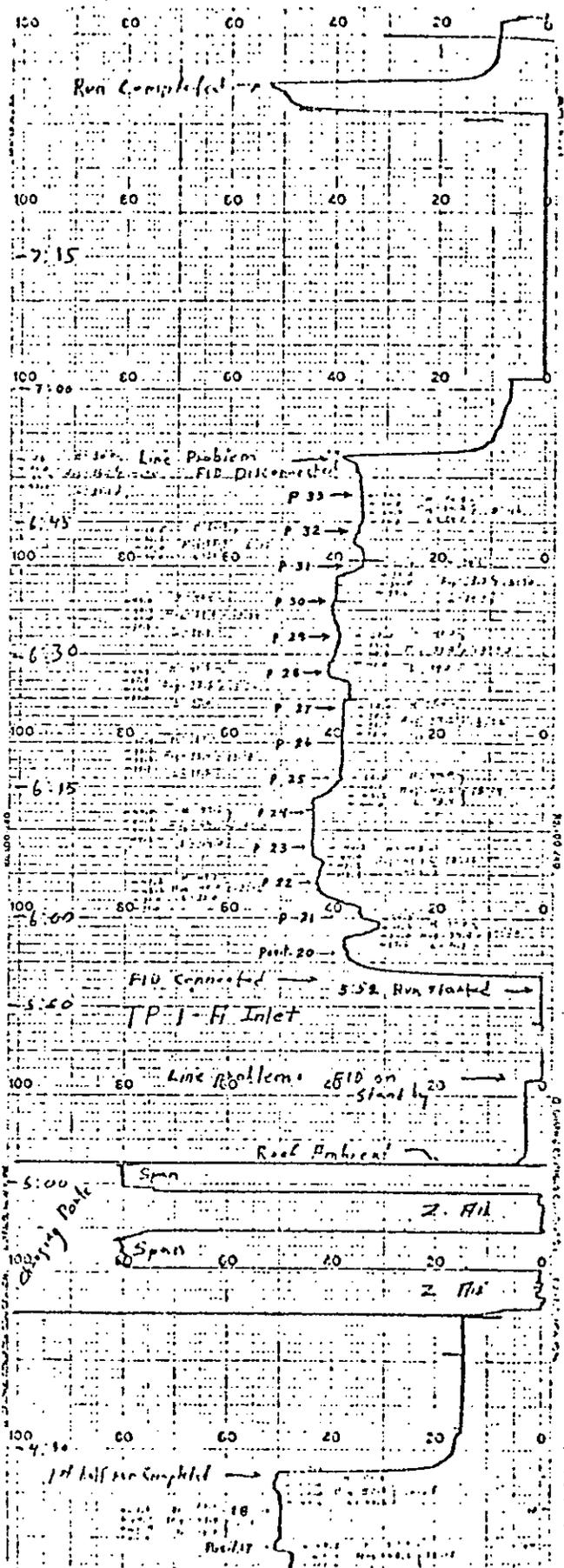
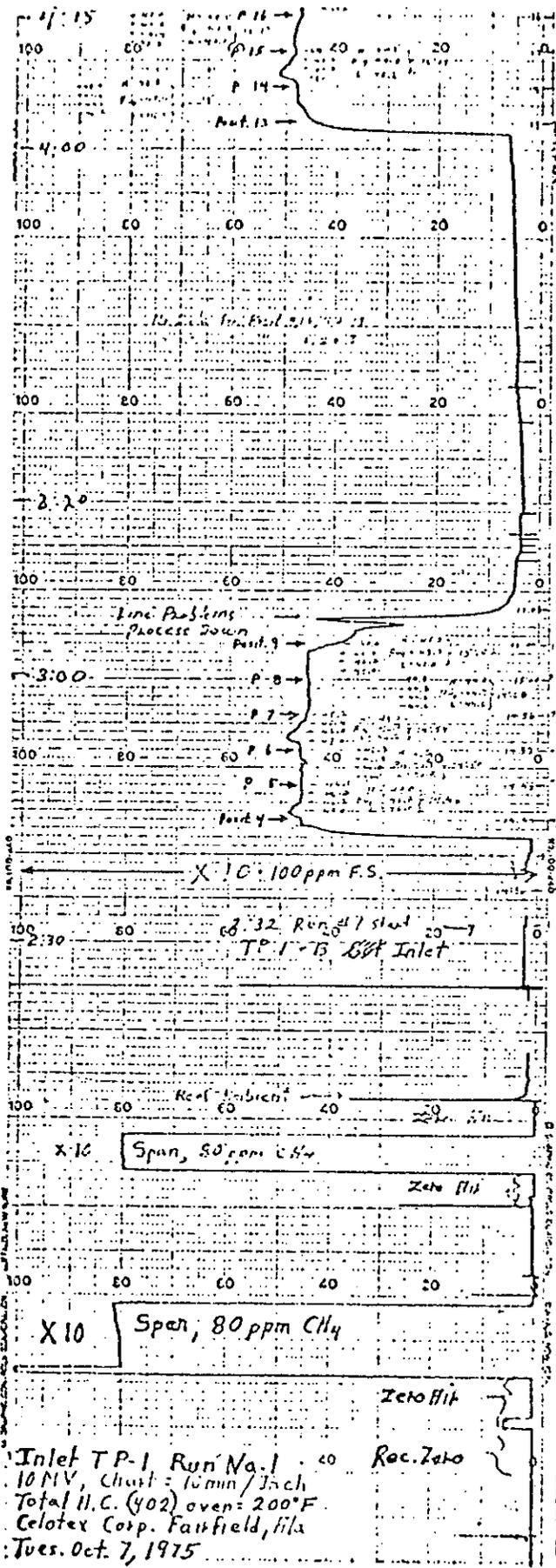
TP3 - Port B

14	ND	ND	ND	ND
13	10 16	39.6	40.0	39.7
12	10 26	42.2	43.5	42.8
11	10 31	45.0	49.2	46.9
10	10 36	48.2	50.0	49.2
9	10 41	51.0	51.2	51.0
8	ND	ND	ND	ND
7	11 03	50.5	52.2	51.6
6	11 13	52.2	53.1	52.5
5	11 18	51.3	52.6	51.8
4	11 23	50.9	51.8	51.3
3	11 28	50.3	51.3	50.7
2	11 32	50.5	50.9	50.7
1	11 37	49.9	50.4	50.5

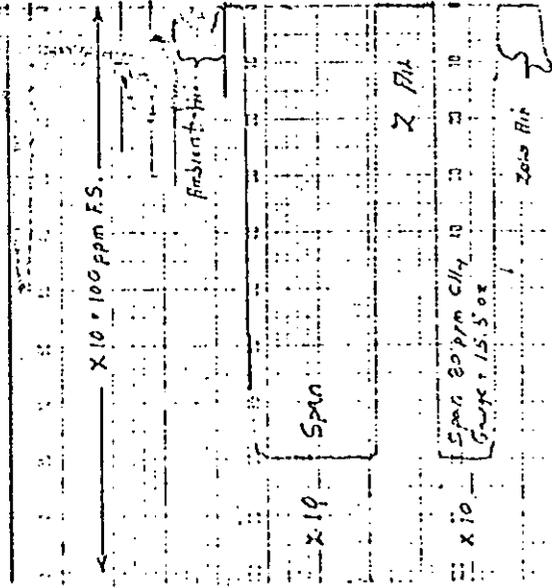
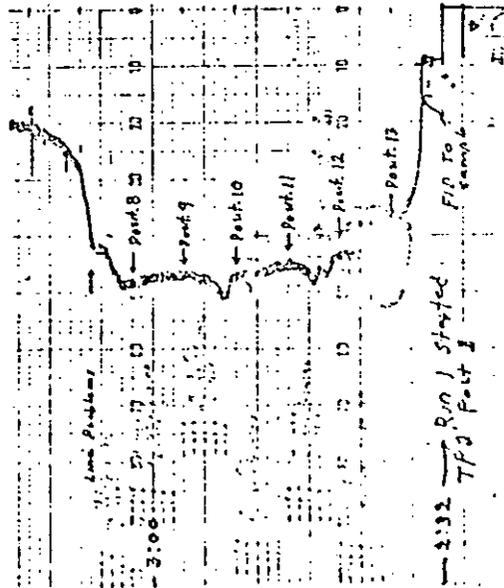
Outlet Hibernia on 8:40 = 10.0 ppm

PPMV as CH₄

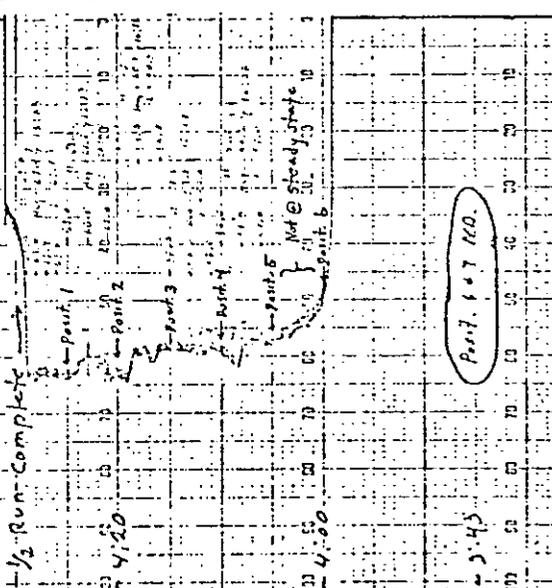
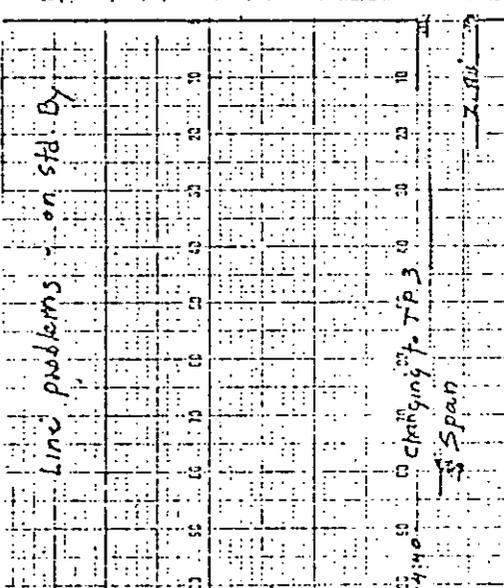
HYDROCARBON
UNABRIDGED STRIP CHARTS



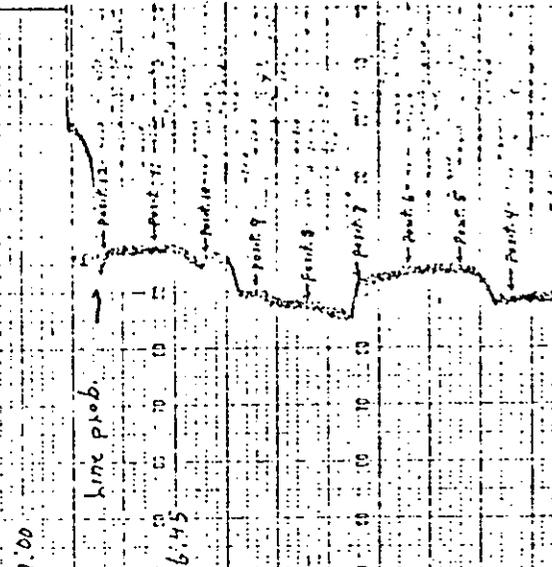
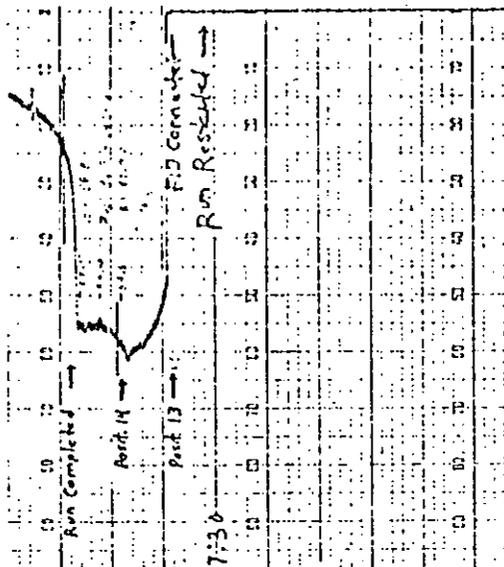
FID STRIP CHARTS - CELOTEX - FAIRFIELD, ALABAMA
Run No. 1 - Inlet



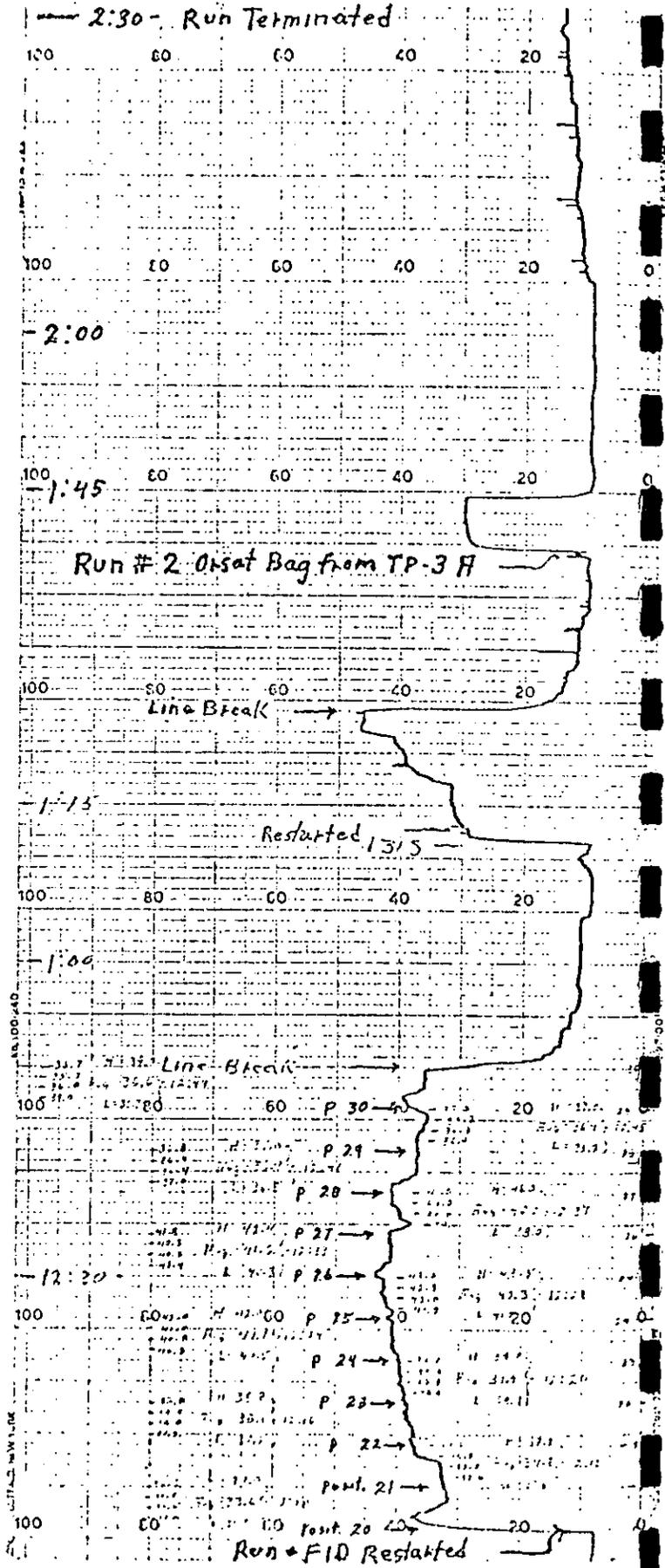
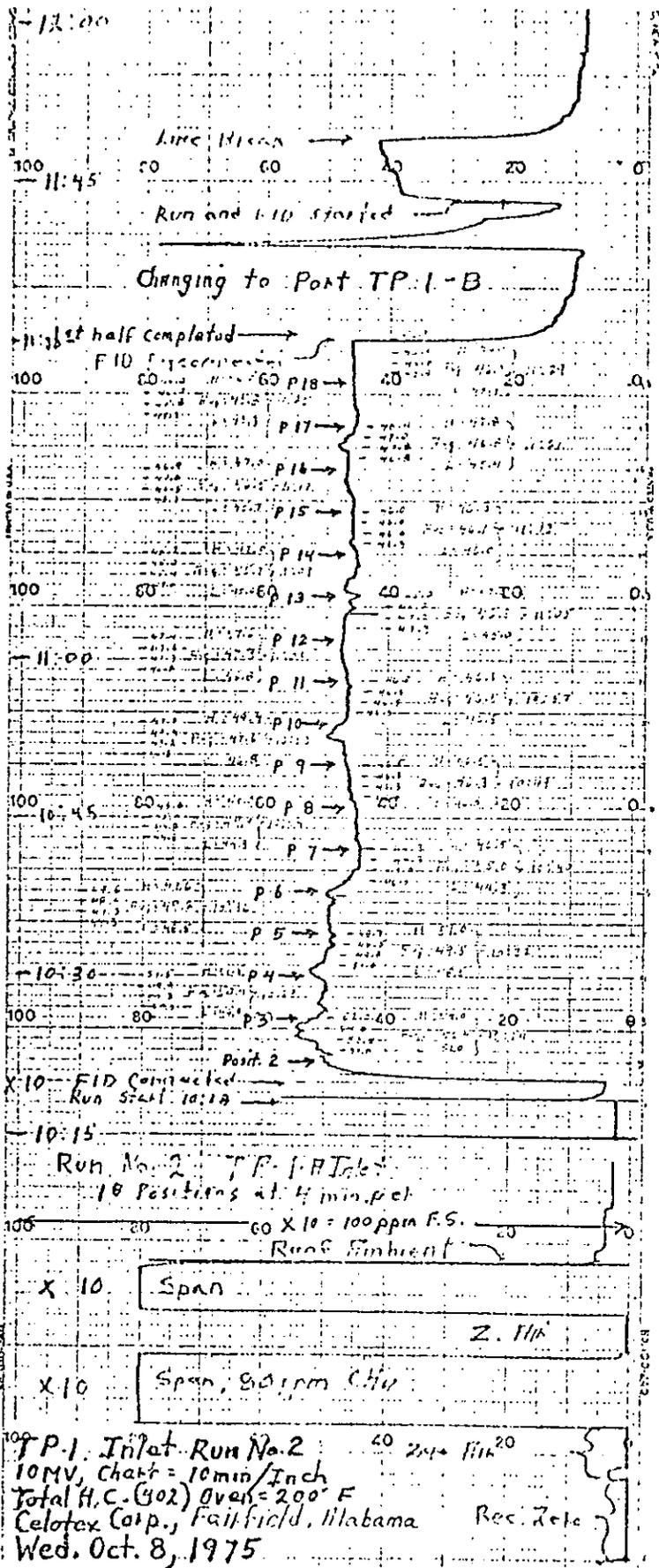
Run No. 1
 ESP Outlet, TP 2 & 3
 15 MV - flow: 10 min/Inch
 WPL H.C. (109)
 Calo Tex Corp., Fairfield, Ala.
 Tues Oct 7, 1975



3:00
 3:30
 3:45
 3:50
 3:55
 4:00
 4:05
 4:10
 4:15
 4:20
 4:25
 4:30
 4:35
 4:40
 4:45
 4:50
 4:55
 5:00
 5:05
 5:10
 5:15
 5:20
 5:25
 5:30
 5:35
 5:40
 5:45
 5:50
 5:55
 6:00

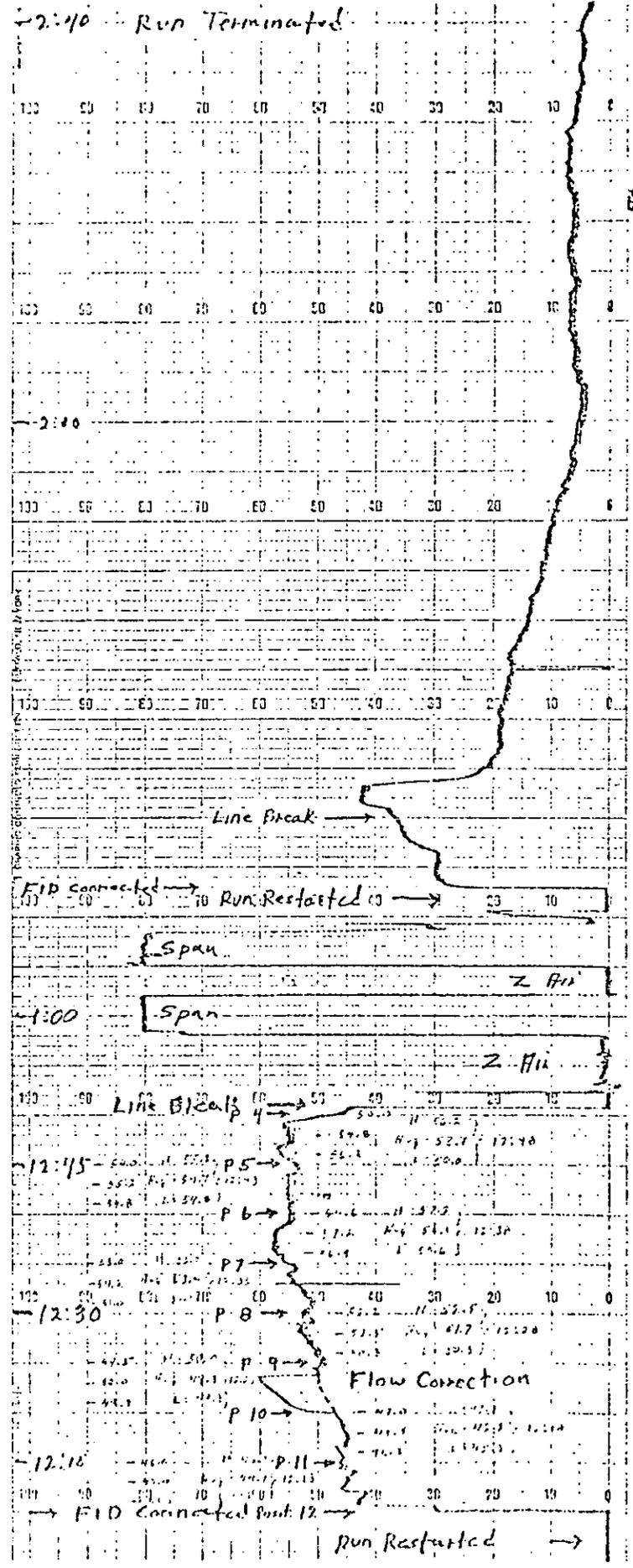
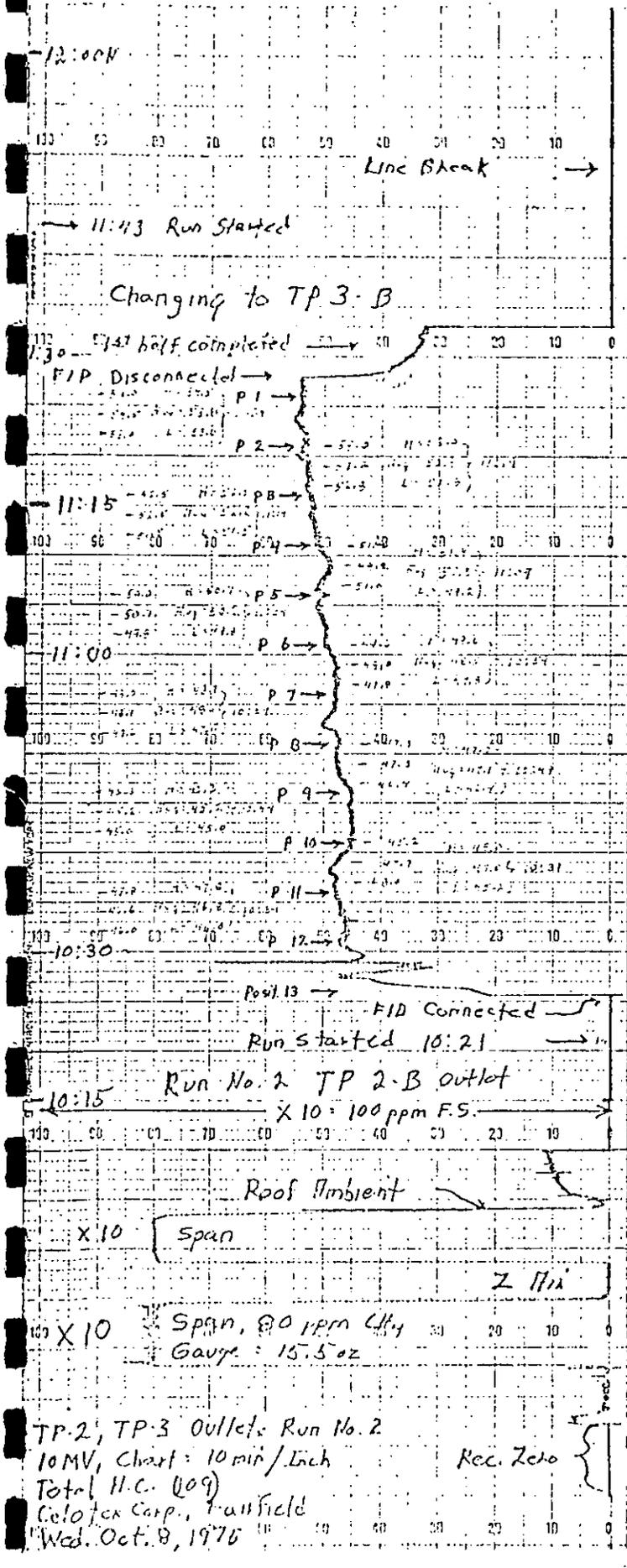


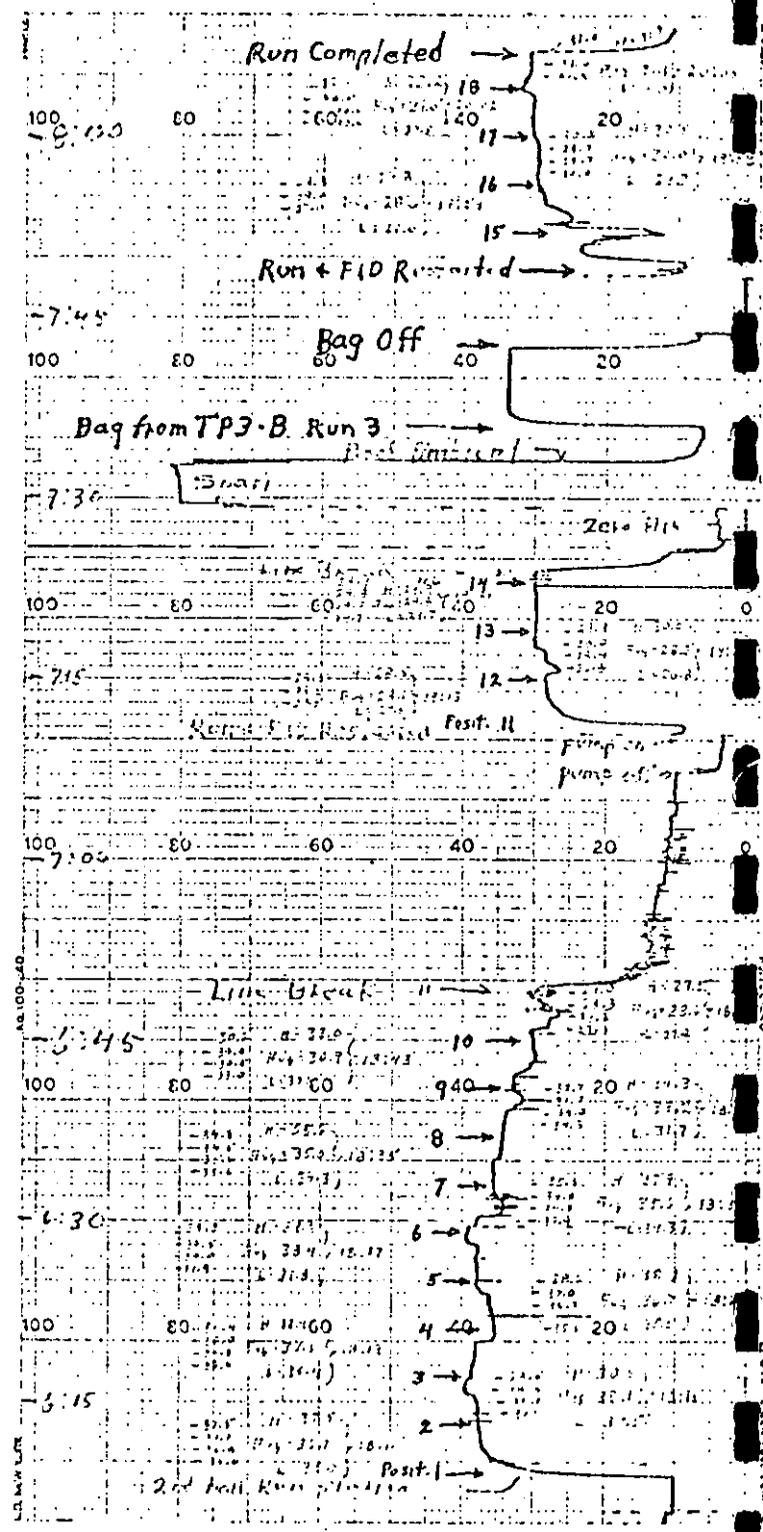
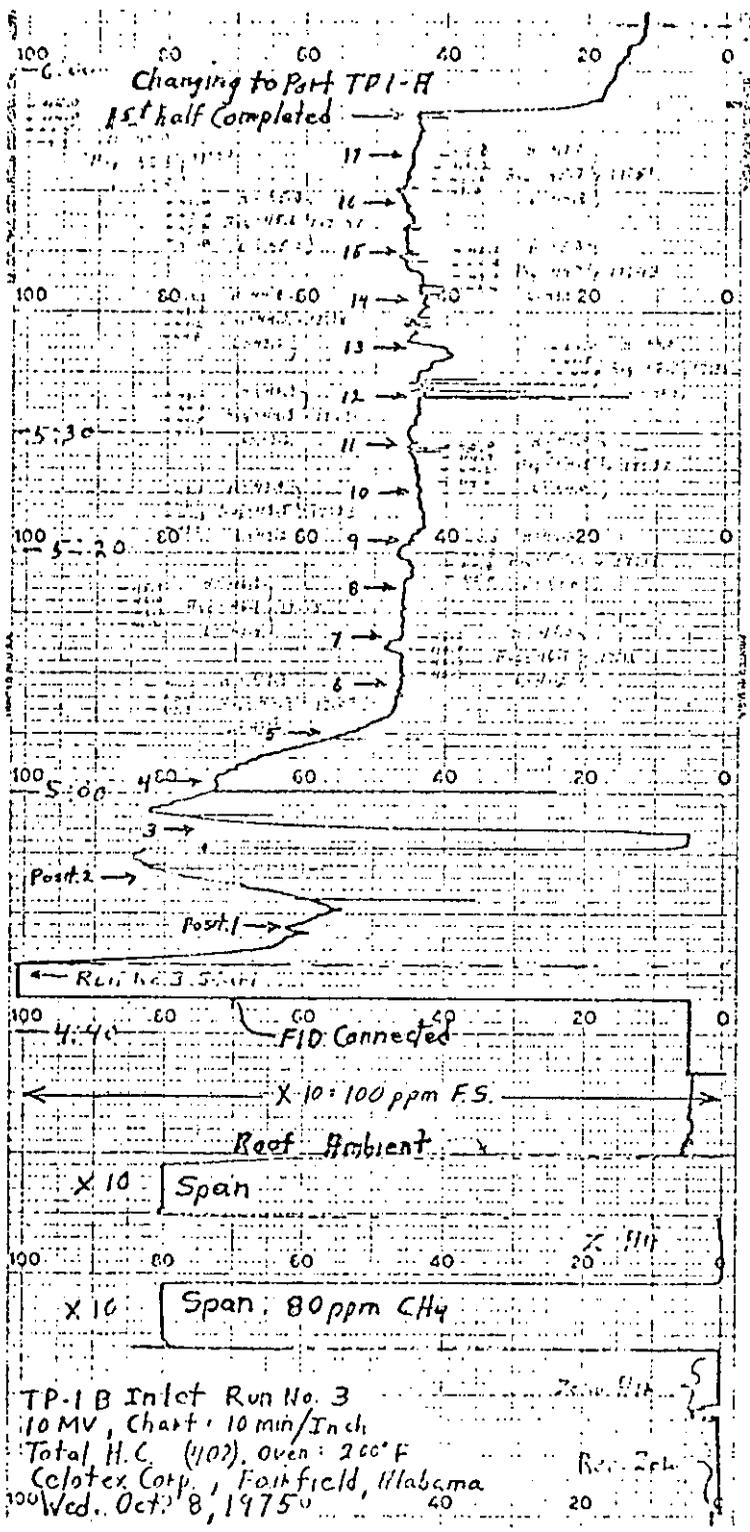
6:00
 6:45
 7:00
 7:30
 7:45
 8:00
 8:15
 8:30
 8:45
 9:00
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 10:45
 11:00
 11:15
 11:30
 11:45
 12:00



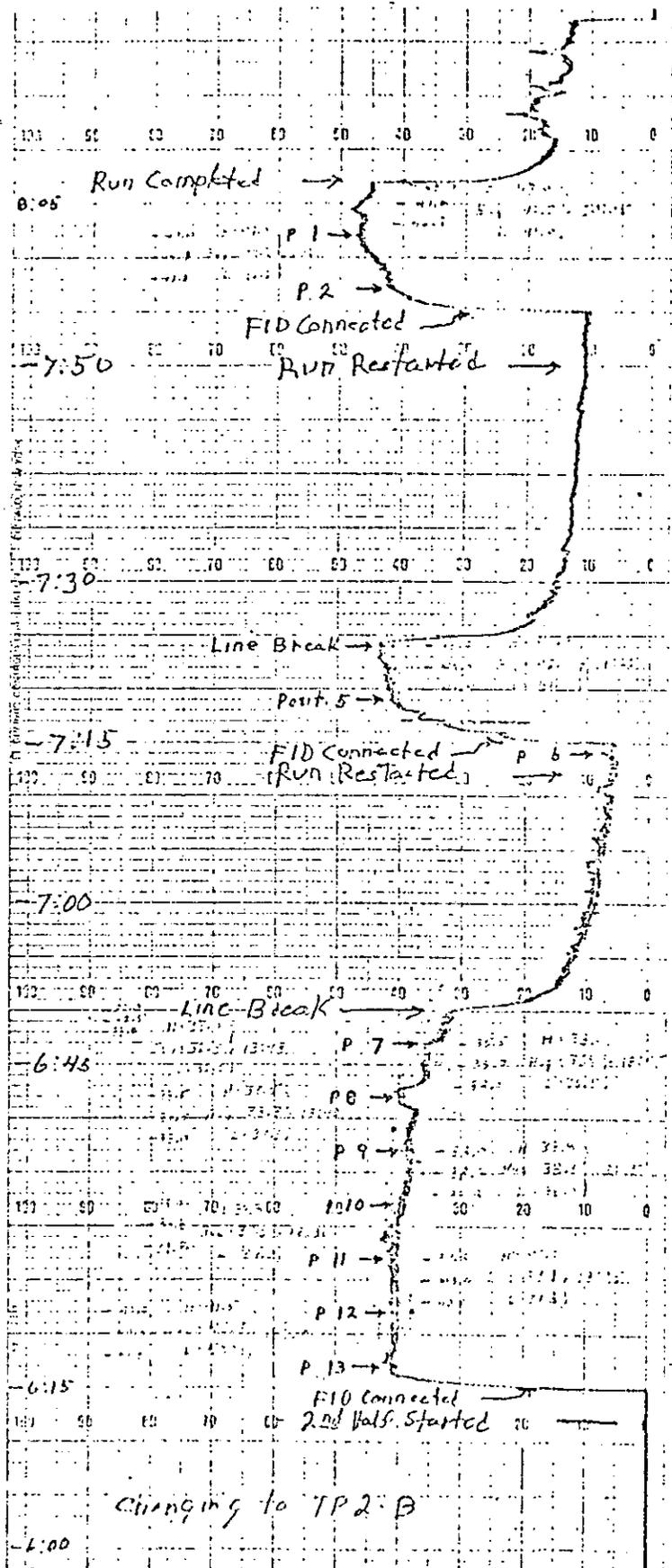
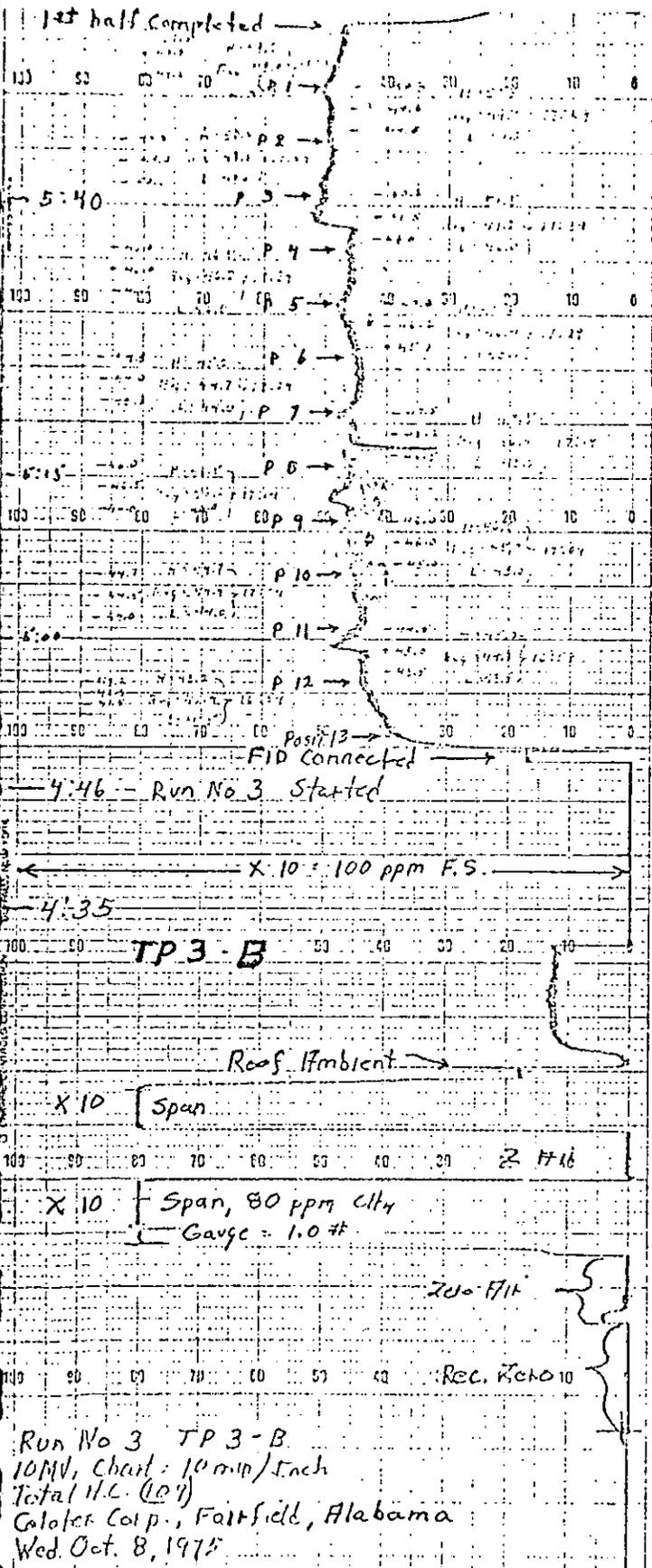
FID STRIP CHARTS - CELOTEX - FAIRFIELD, ALABAMA

Run No. 2 - Inlet

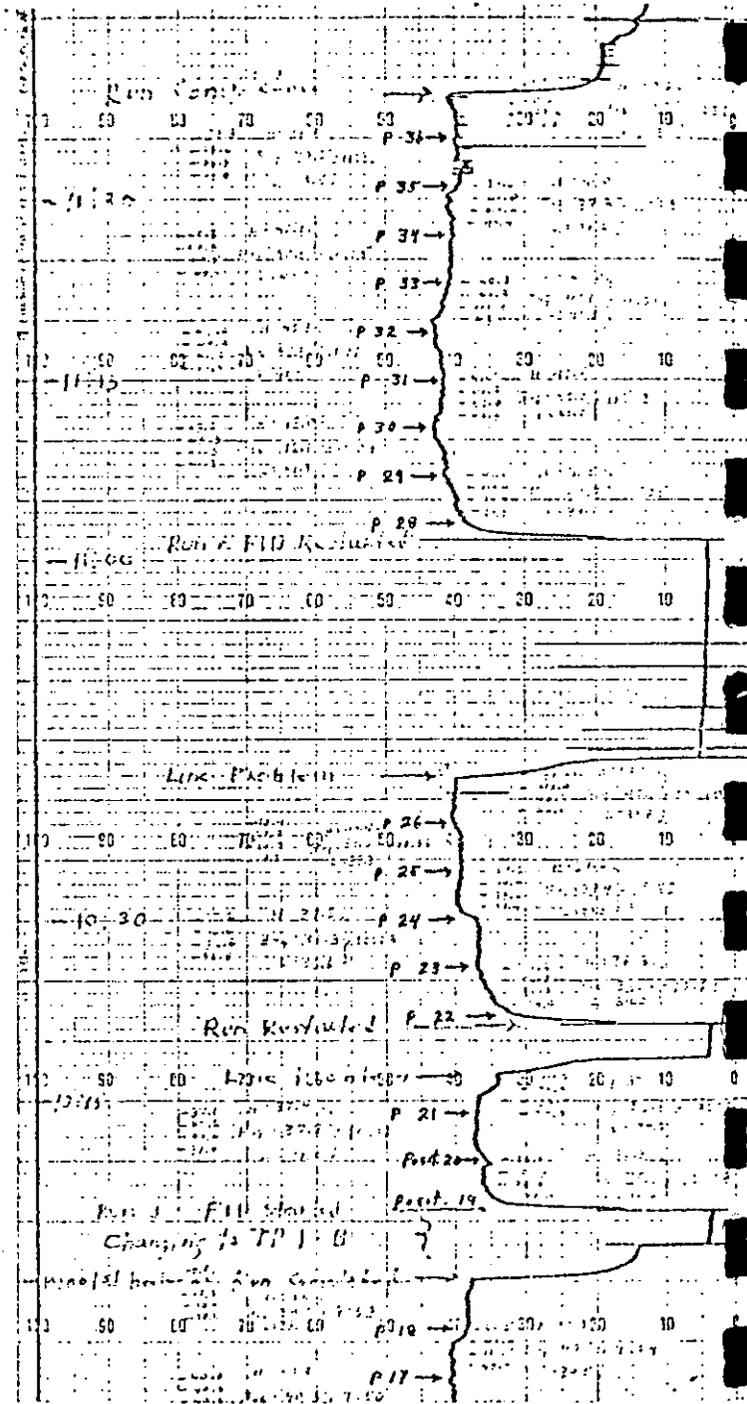
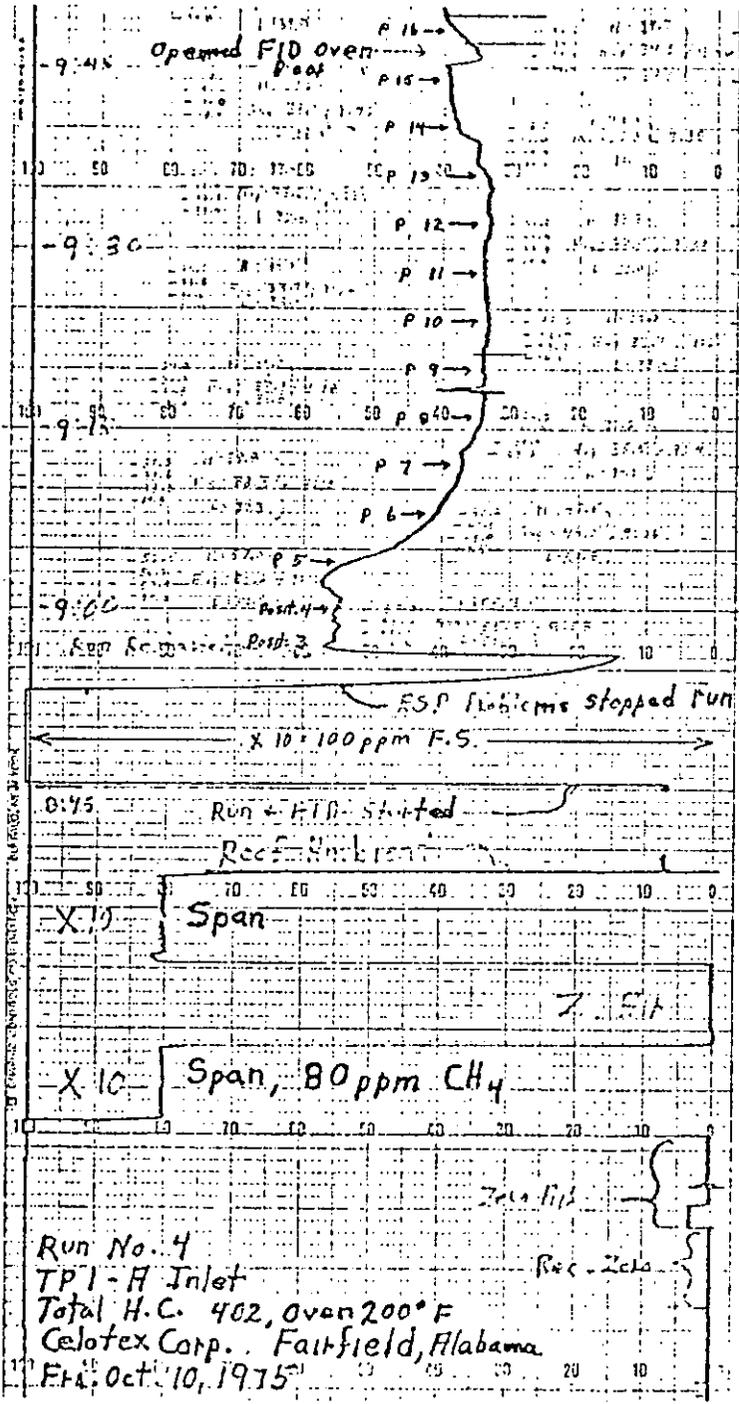




FID STRIP CHARTS - CELOTIX - FAIRFIELD, ALABAMA
Run No. 3 - Inlet

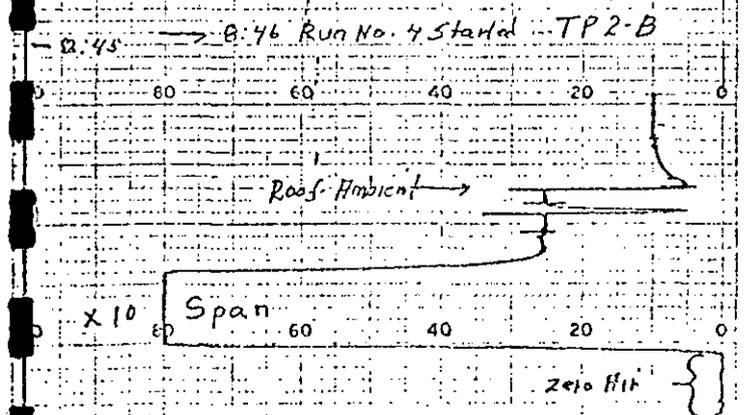
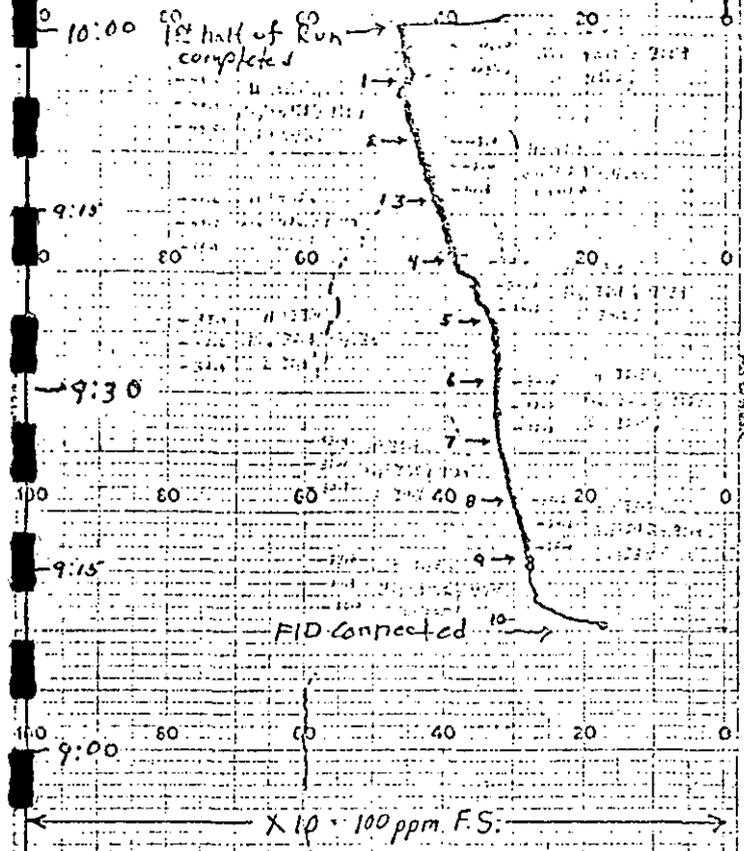


FID STRIP CHARTS - CELOTEX - FAIRFIELD, ALABAMA
Run No. 3 - Outlet



FID STRIP CHARTS - CELOTEX - FAIRFIELD, ALABAMA
Run No. 4 - Inlet

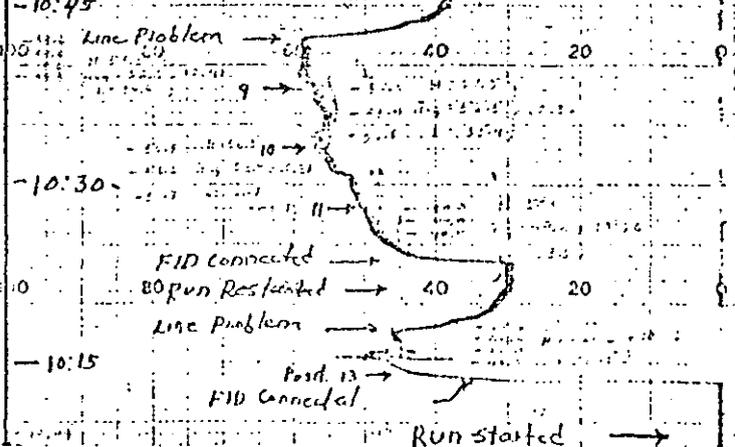
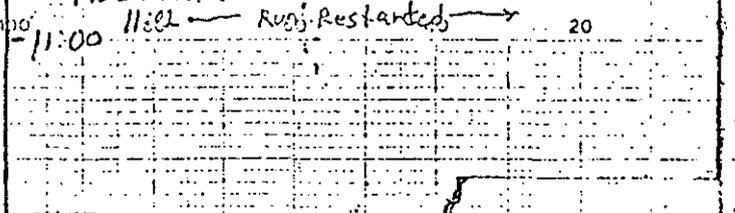
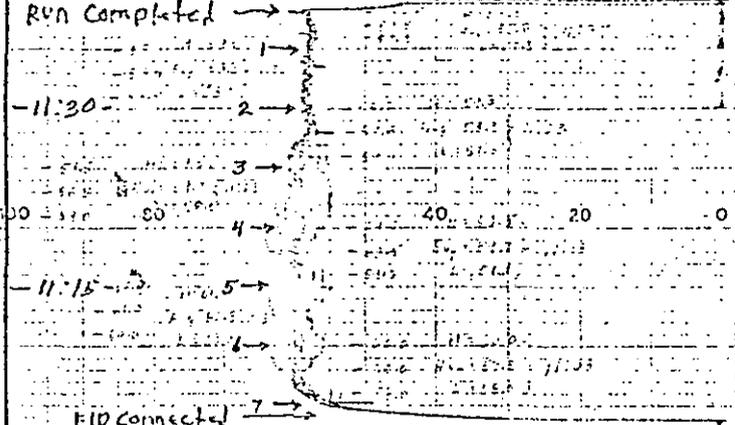
Changing to TP 3 - B Outlet



Run No. 4
 TP 2 - B Outlet
 10MV, Chart - 10mm/Inch
 Del. H.C. 109
 Celotex Corp., Fairfield, Alabama
 Fri. Oct. 10, 1975

Zero Hit }
 Zero Hit }
 Zero Hit }

310 Spag (Reading ~ 11 ppm High) 20



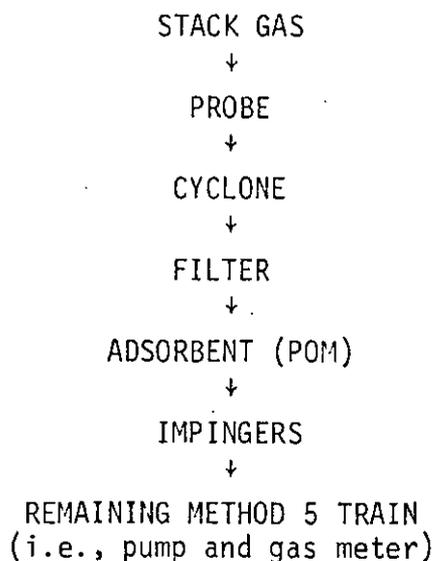
FID STRIP CHARTS - CELOTEX - FAIRFIELD, ALABAMA
 Run No. 4 - Outlet

APPENDIX F

POLYCYCLIC ORGANIC MATTER (POM)
DATA SHEETS

POLYCYCLIC ORGANIC MATTER (POM)

The POM sampling train (Figure F-1) was modified EPA Method 5 equipment with an adsorbent column inserted between the MSA glass fiber filter and the first water filled impinger. The adsorbent column (Figure F-2) consisted of a glass cooling coil (120 cm x 0.8 cm) and a cylindrical column (7 cm x 3 cm diameter) packed with tenax adsorbent. The adsorbent column was maintained at 125°F temperature with a thermostatically controlled, recirculating water bath (125-130°F). For POM testing the gas flow through the sampling train was:



POM SAMPLING TRAIN

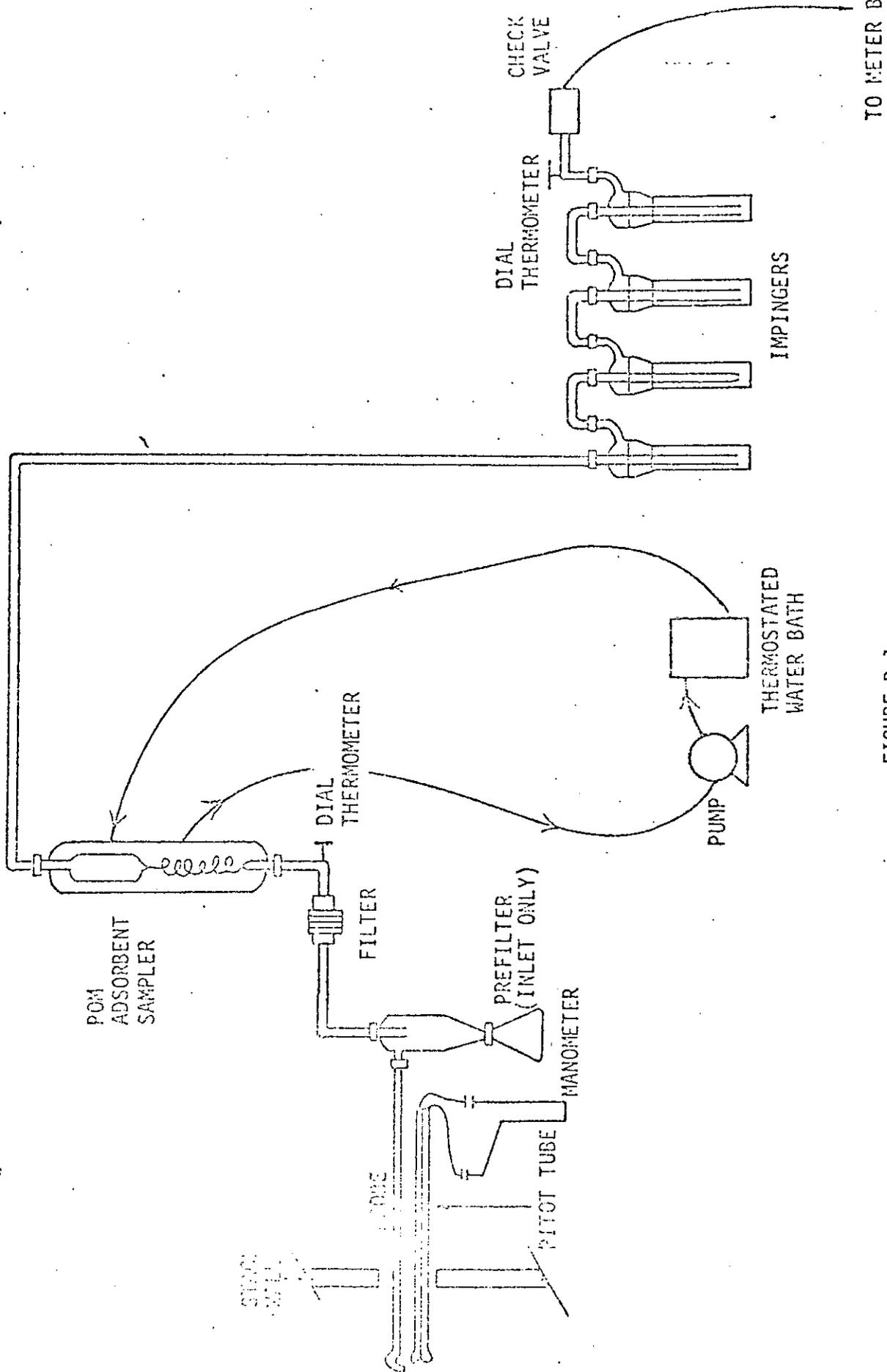


FIGURE B-1

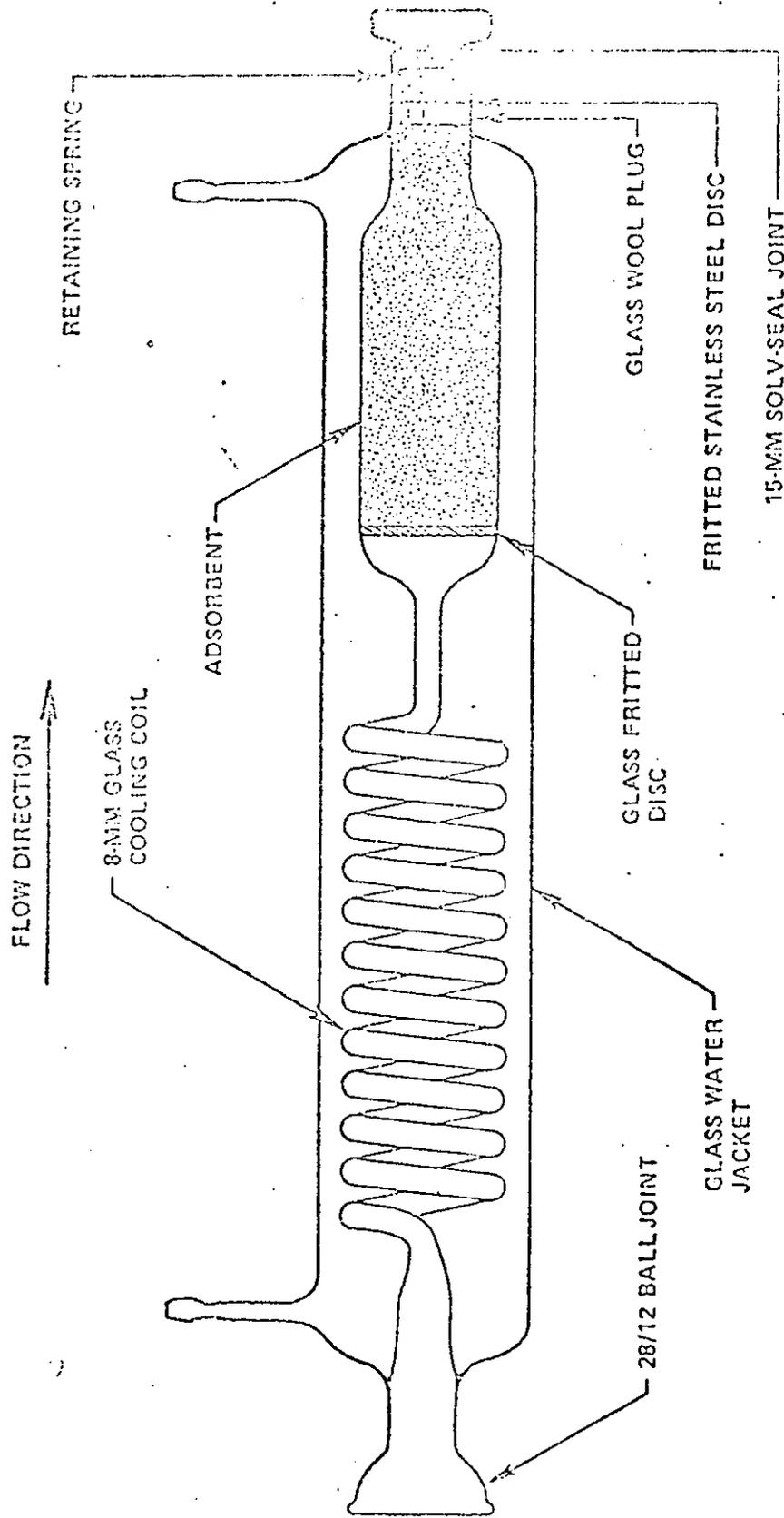


FIGURE B2-ADSORBENT SAMPLING SYSTEM

POM SAMPLING AND ANALYSIS USING THE SPECIAL POM SAMPLING TRAIN

Background

Several years ago, the need for sampling and analysis of polycyclic organic material (POM) arose on several programs at Battelle. At that time the best available technology for sampling for POM appeared to be some version of the EPA Method 5 particulate sampling train. Use of the Method 5 sampling train produced inconsistent POM emission data and led Battelle staff to question the suitability of using this train for POM sampling. As a result, Battelle developed a POM sampling train that retains many of the features and components of the Method 5 train, but which incorporates an additional element that serves to collect the majority of the POM in the gas sample.

Sampling for POM with the POM Sampling Train should be a straightforward procedure for those already familiar and skilled with the operation of a Method 5 train for particulate collection. The POM sampling procedure utilizes the existing Method 5 train, but also includes a chromatographic adsorbent (referred to as the adsorbent sampler). This additional component, and its auxiliary equipment, increases the time required for setup, and requires some additional precautionary measures over those associated with particulate sampling alone, but the additional effort and skill required to obtain a meaningful POM sample is not appreciable and the reliability of the POM data obtained is significantly increased.

Sampling System

The POM Sampling Train, as shown in Figure 1, consists of a Method 5 train with an adsorbent sampler located between the filter and the impingers. Immediately after leaving the hot filter, the gas sample passes into the cooling coil (120 x 0.8 cm) of the adsorbent sampler, and then passes through a Pyrex frit and into a cylindrical column of Tenax adsorbent (7' x 3-cm diameter). The cooling coil and Tenax adsorbent are maintained above the water dewpoint by means of a thermostated circulating water bath. Thus, the incoming gases are cooled to maintain adsorbent efficiency, yet the adsorbent is maintained at a temperature which precludes condensation of water vapor present in all combustion effluents. The gases leaving the sampler are drawn through impingers and a Drierite trap, dry gas meter, and leakless vacuum pump (as in Method 5 sampling).

With the system, POM emissions can be determined from the analysis of the probe wash, filter catch, and adsorbent sampler catch. The impingers are only used to cool and dry the stack gases before they enter the dry-gas meter. Laboratory tests, reported later, have shown that the probe, filter, and adsorbent sampler retain all the POM, and that the POM can be recovered during analysis.

Details of POM Absorber

A schematic representation of the adsorbent sampler is shown in Figure 3. The heat exchanger section consists of 12, 100-cm² of 8-mm Pyrex tubing wound in approximately eight coils. The adsorbent is retained by an inert coarse Pyrex frit and a spring loaded glass wool plug, as shown; Tenax 135 (100-mesh) is routinely used in the adsorbent trap of the adsorbent sampler. The dimensions of the adsorbent sampler are 15-mm radius and 70-mm length. The 28-12 Pyrex joint on the inlet to the sampler is compatible with the fittings commonly used in commercial EPA Method 5 sampling trains; the 15-mm Solv-Seal joint at the sampler outlet provides an efficient vacuum seal during sampling. (A 28-12 Pyrex joint could be used at the sampler outlet.) A vacuum hose coupling between the front sampler outlet and the impinger inlet is sufficient.

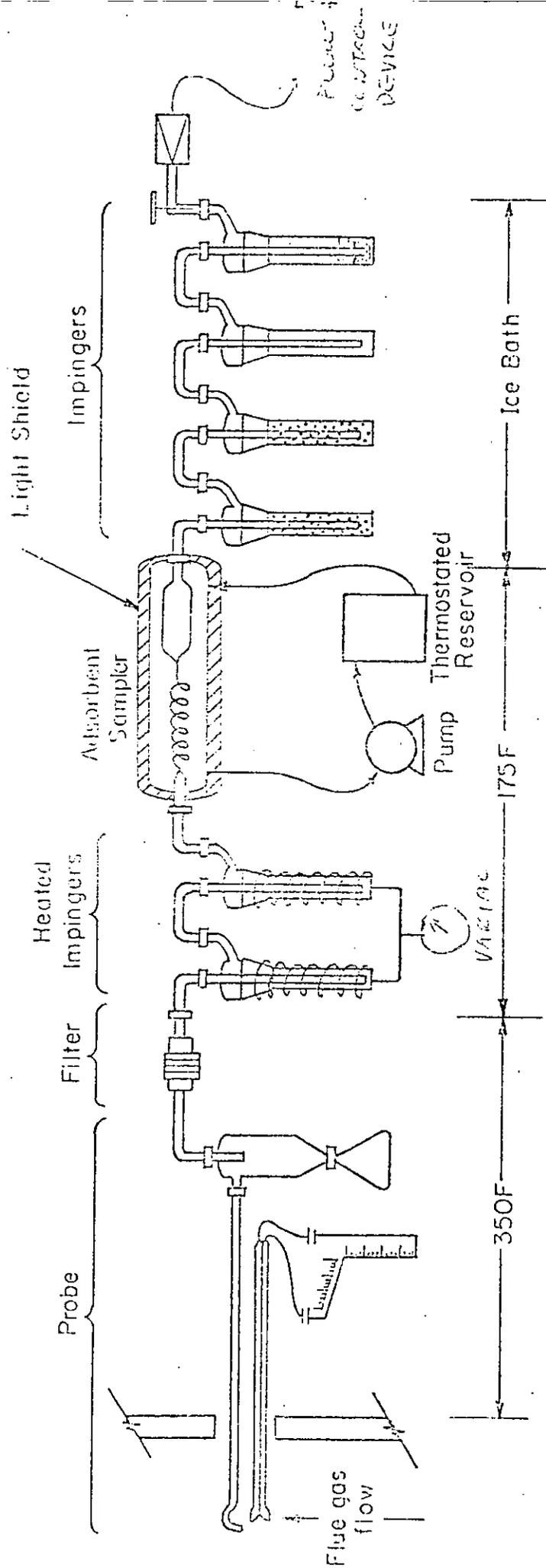


FIGURE 2. POM SAMPLE TRAIN CONFIGURATION FOR ASPHALT BLOWING STILL PROCESS

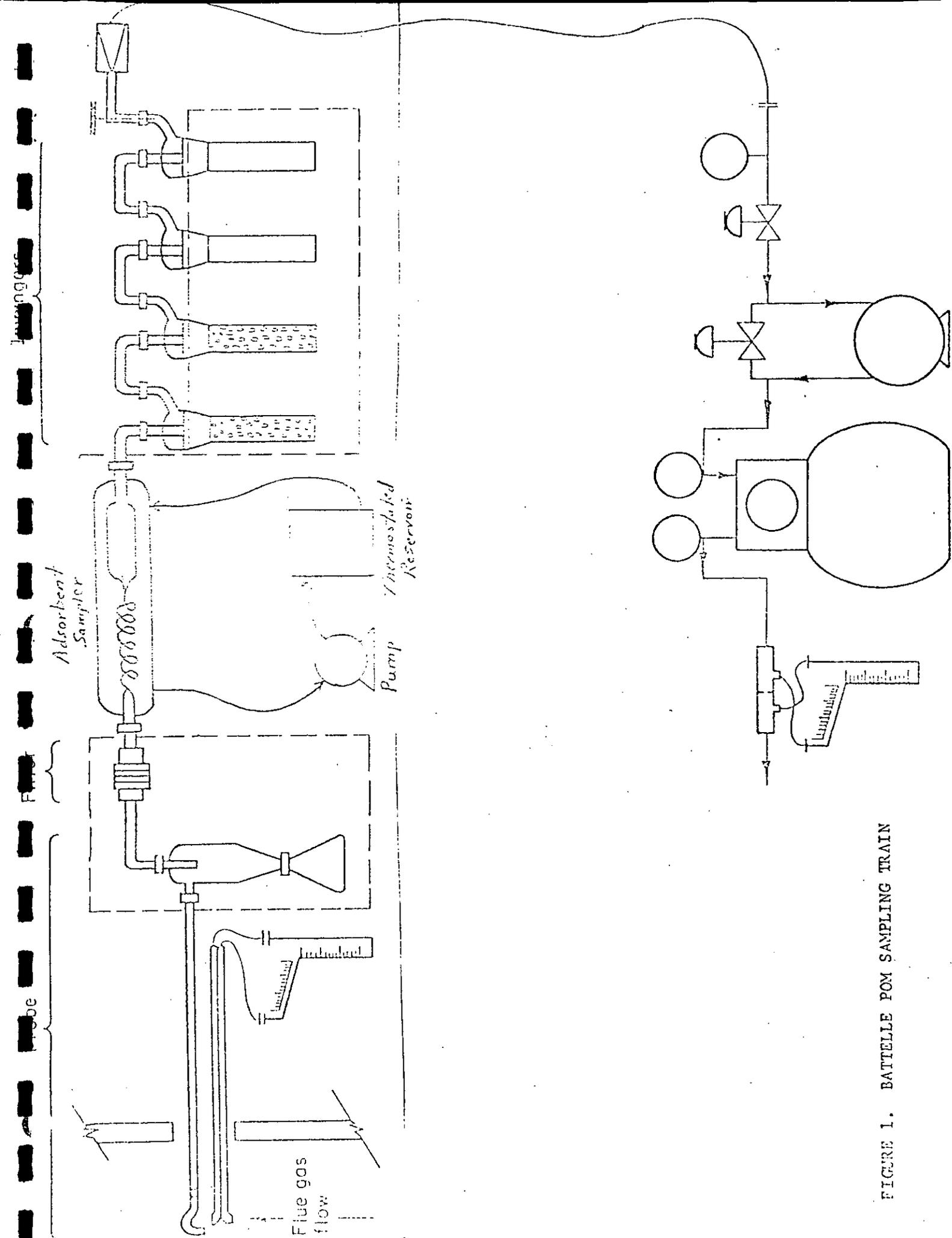


FIGURE 1. BATELLE POM SAMPLING TRAIN

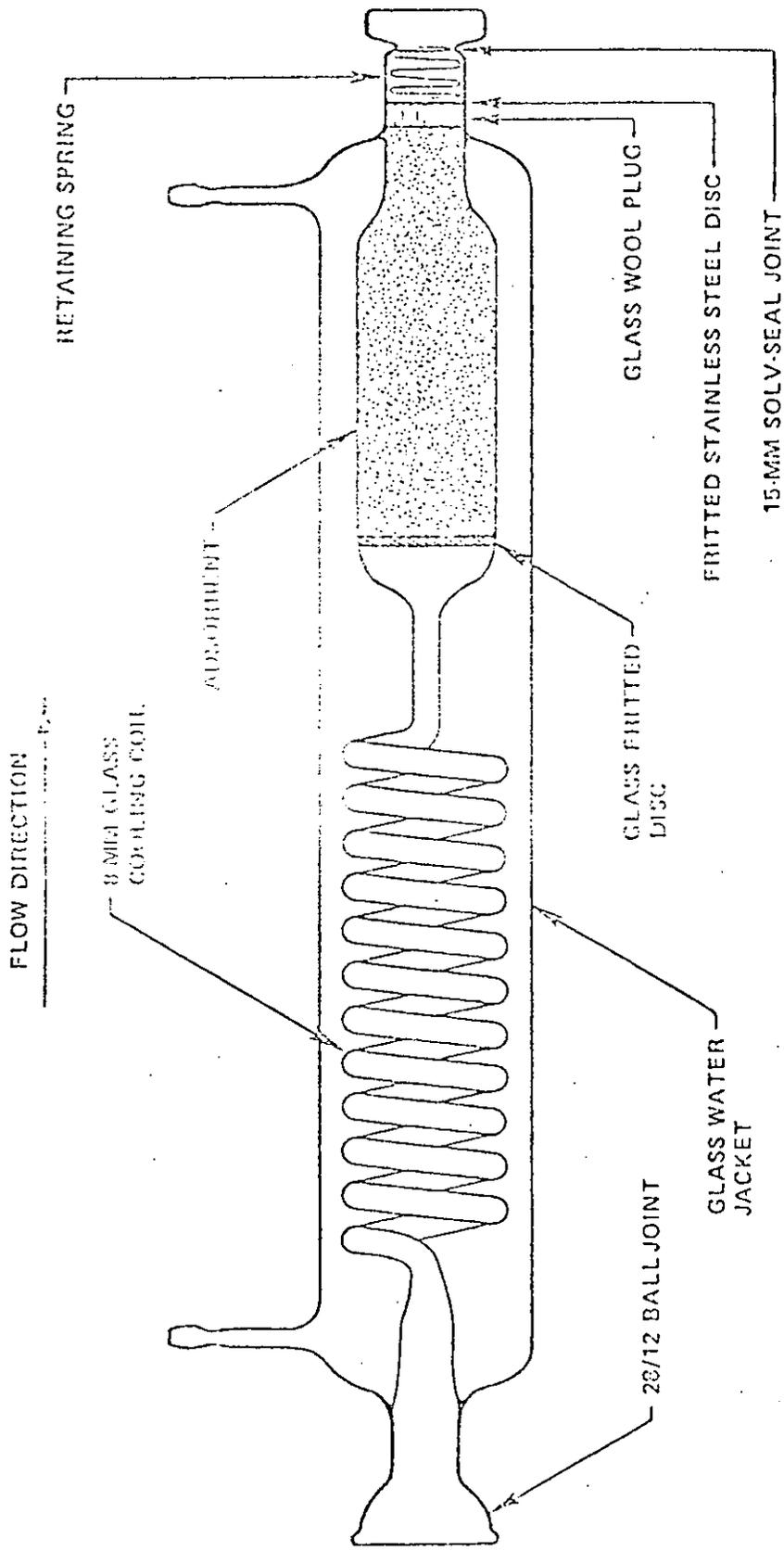


FIGURE 3. ADSORBENT SAMPLING SYSTEM

Adsorbent Sampler Temperature

The collection efficiency of the adsorbent sampler is dependent on the temperature of the adsorbent material. The optimum temperature of the adsorbent should be as low as possible without condensing large quantities of water vapor (present in most stack gases) and plugging the adsorbent device. Generally, this temperature is 20 to 25 F (10 to 15 C) above the dewpoint of the stack gases. For sampling gases that would consist primarily of vented air or products of combustion of fossil fuels it has been found that 125 F to 130 F (52 to 55 C) is a satisfactory adsorbent temperature. Of course, the adsorbent temperature is to be maintained at the predetermined temperature throughout the run to insure a continuous high POM collection efficiency.

Auxiliary Equipment

To maintain the adsorber at a temperature above the dewpoint, a thermostated controlled water bath is used. A 10-ℓ/min pump circulates water to the adsorbent sampler from a 4-ℓ reservoir. An aquastat is used to control a 450-watt heating element to maintain the water temperature. For stack gas temperatures up to at least 550 F (300 C) and sampling rates of 0.6 scfm (0.017 Nm³/min) to 0.75 scfm (0.021 Nm³/min), the heat loss from the water circulating loop to the ambient surroundings generally is greater than the heat gain from the stack gases to the water, so it usually is necessary to supply auxiliary heat to the water loop. Although unlikely, depending upon the conditions under which a sample is collected (at high stack temperatures and/or high ambient temperature), it may be necessary to cool the circulating water to maintain the desired temperature. A simple calculation of the heat transfer between the gas sample and the circulating water will determine whether or not cooling is needed. If cooling is needed, an additional cooling coil could be inserted between the adsorbent sampler and the reservoir.

Sampling

Sampling with the Battelle Sampling Train is conducted in essentially the same manner as sampling with the EPA Method 5 sampling train. The one difference between operation of these two sampling trains is that, in using the Battelle POM Sampling Train, it is desired to maintain the probe and filter temperature at 350 F (versus the 250 F when using the EPA sampling train). Maintaining the probe and filter at 350 F prevents condensation and/or adsorption of SO₃ and POM on these components (followed by destructive reaction of SO₃ with POM). Instead of being caught by the probe and filter, the POM passes through these components and is retained in the adsorbent sampler.

When sampling for POM, the stack gases are sampled isokinetically as described in Method 5. (Isokinetic sampling is desired because some of the POM may be physically associated with particulate in the gas stream.) The pressure drop associated with the flow of stack gases through the adsorbent device may interfere with maintaining an isokinetic sampling rate throughout the run, therefore it is usually a good idea to reduce the calculated nozzle size in order to reduce the flow rate and, thus, the pressure differential across the sampler.

Sample Recovery in the Field and Sample Preservation

Polycyclic organic materials are readily photooxidized in the presence of ultraviolet light (and possible visible light). Thus, the sampling train should be protected from sunlight and all other ultraviolet sources, both during and after sample collection. Also, some organic compounds which are collected by the adsorbent sample may have an appreciable vapor pressure, and care must be exercised to minimize losses of such materials. To prevent loss of POM by photooxidation, a heavy dark cloth is placed over the exposed sampling train glassware during sampling. Immediately after sample collection is completed, the adsorbent sampler is sealed with ball-joint and Solv-Seal stoppers and the filter and adsorbent sampler are stored in a cool light-free container for transport to the analytical lab.

The probe and glassware up to the filter (including the filter holder) are washed with acetone followed by methylene chloride*; these solvents are 'Distilled-in-Glass' quality or better. The solution and particulate matter from the probe rinse are stored in a dark (amber) glass bottle prior to analysis and kept cool.

*To minimize evaporative sample loss during solvent extraction, solvents with very low boiling points are used.

Sample Extraction and Recovery

Sample recovery from the POM Sampling Train for POM analysis involves extraction of three separate portions of the total sampling train:

- (1) Probe and glassware up to the filter
- (2) Filter
- (3) The adsorbent sampler.

Initial recovery of Item (1) is done in the field (i.e., the probe is washed as described above), while Items (2) and (3) are most conveniently extracted in the laboratory.

Sample Recovery from the Probe Wash

The probe wash (solvent and particulate mixture) is agitated for 1 hour in an ultrasonic bath before filtering off the solvent with a Whatman No. 40 filter.

Sample Recovery from the Filter

Organic material is extracted from the filter by means of Soxhlet extraction with methylene chloride ('Distilled-in-Glass'), or by ultrasonic agitation with methylene chloride followed by filtration using a Whatman No. 40 filter. While both methods have been found to be equally satisfactory, ultrasonic extraction is somewhat faster.

Sample Recovery from the Adsorbent Sampler

Great care must be taken not to expose the adsorbent sampler to polar solvents such as methylene chloride or acetone, since the Tenax adsorbent is readily soluble in these solvents. Our experience has shown that it is preferable to extract the adsorbent sampler with a low boiling point hydrocarbon such as pentane ('Distilled-in-Glass').

To extract the adsorbent sampler, the two stoppers are first removed, and the extraction apparatus assembled, as shown in Figure 4, under yellow safe-lights. A double surface water cooled condenser is preferred, the distilling flask is of 250-ml capacity. The adsorbent sampler is extracted with 'Distilled-in-Glass' pentane. An initial volume of 180 ml is usually necessary since there is an appreciable solvent holdup during extraction. The samplers are extracted with the continuous extraction apparatus for 24 hours, and it is normal to experience a small loss of pentane during this period. The extraction apparatus is then disassembled and the pentane extract stoppered and stored in darkness.

Thus, three extracts are obtained from the adsorbent sampler-Method 5 sampling train:

- (1) Acetone and methylene chloride probe extract
- (2) Methylene chloride filter extract
- (3) Pentane adsorbent sampler extract.

These extracts are sealed and kept in darkness while awaiting analysis.

Reactivation of Adsorbent Sampler

Following extraction, air is drawn through the sampler with an aspirator to remove most of the remaining pentane solvent. The sampler is then dismantled by withdrawing the stainless steel spring with a hooked spatula, removing the stainless steel perforated disk, discarding the glass wool plug, and emptying the almost dry Tenax into a clean glass container. The adsorbent sampler body is cleaned by blowing with compressed air to remove any trace materials and then rinsed with the following solvents in the order given:

- (1) Methylene chloride
- (2) Chromic acid
- (3) Water
- (4) Acetone
- (5) Methylene chloride
- (6) Pentane.

The sampler is then sealed with clean stoppers prior to refilling with activated Tenax.

Used pentane extracted Tenax may be reactivated and thoroughly cleaned by placing it in an oven at 200 C under nitrogen flow in a glass tube for 24 hours. New Tenax may be similarly prepared by first Soxhlet extracting with pentane for 24 hours and then heating under nitrogen. It is generally desirable to maintain a small supply of activated Tenax, and to reactivate the adsorbent from six or more samplers at one time.

An adsorbent sampler is prepared by filling the adsorbent section with activated Tenax to within 3/4 inch of the top of the sampler while agitating the sampler with an electrical vibrator. A clean glass wool plug is then inserted into the neck, followed by a perforated stainless steel disk and the stainless steel retaining spring. The sampler is then sealed with the appropriate 28/12 ball-joint and 15-mm Solv-Seal stoppers and is ready to use.

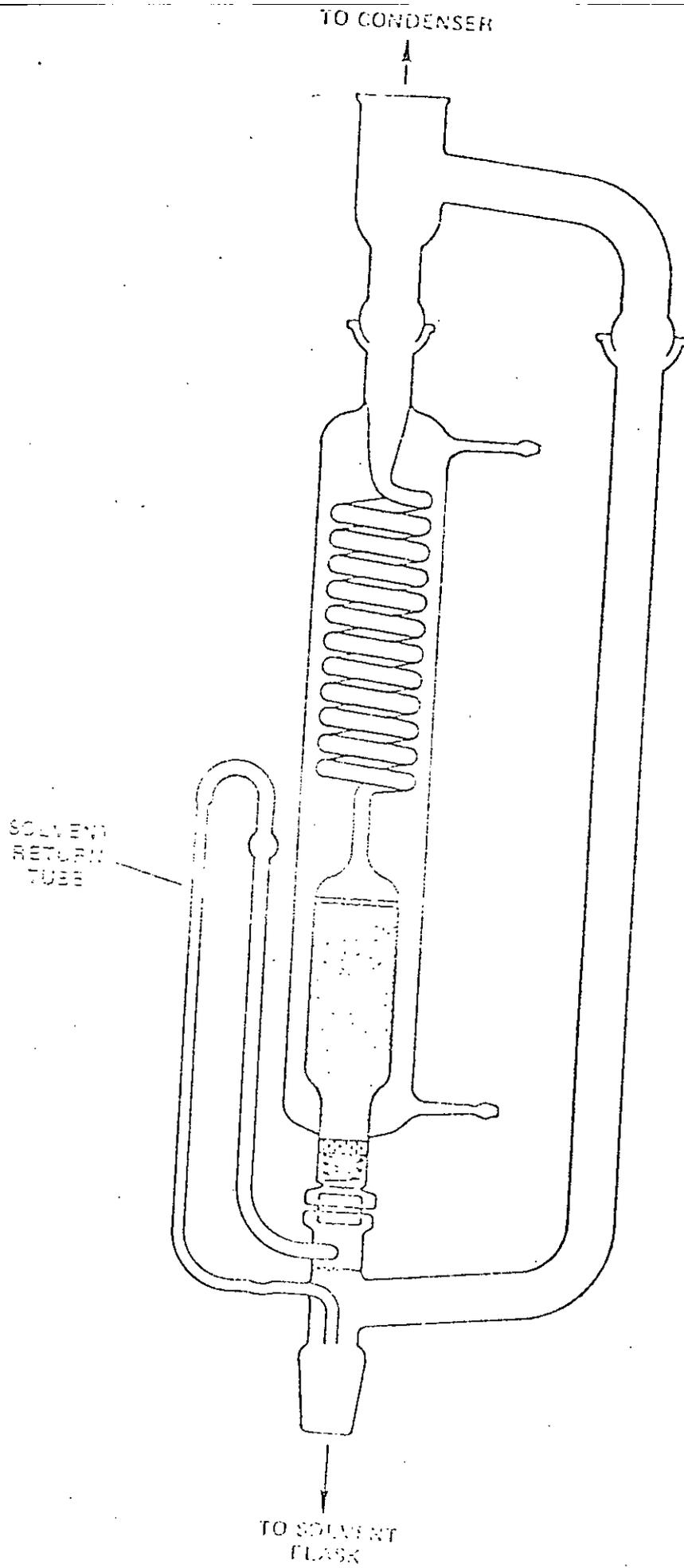


FIGURE 4. CONTINUOUS EXTRACTION ASSEMBLY FOR ABSORBENT SAMPLER

Analysis of Extracts

The three extracts from the probe, filter, and absorbent samples, may be analyzed separately for POM compounds, or they may be combined and a single POM analysis performed on the total sample.

Internal standards are added to the combined extracts from each sampling train prior to volume reduction by rotary evaporation and Kuderna-Danish evaporation. The extract is subjected to a Rosen-type liquid chromatography separation¹ in order to isolate the POM fraction before carrying out gas chromatographic-mass spectrometric (GC-MS) analysis. Gas chromatographic separation is achieved using a 14-foot x 2-mm, 25 percent, Dexil 300 column programmed from 170 C to 350 C at 4 C min⁻¹. Separation of the benzpyrene isomers is routinely accomplished using a one foot 1% N,N'-Bis (p-methoxy-benzylidene)- α,α' -bi-p-toluidine column isothermal at 130 C. Mass spectrometric analysis is carried out with a Finnigan 1015 quadrupole mass spectrometer with a chemical ionization source; methane is routinely used as the carrier and reagent gas. Data acquisition is accomplished with a System Industries 150 data acquisition system, and quantification of the POM compounds present is accomplished using a Digital PDP8 computer.

This mass spectrometric-computer quantification procedure makes use of specific absolute ion currents. The bases for the quantification procedure is to initially obtain the computer reconstructed gas chromatogram and mass spectrum in the normal fashion; this reconstructed gas chromatogram is then displayed on the CRT terminal and an overlay for the protonated molecular ion of the POM of interest is superimposed. This overlay represents the ion current corresponding to that specific POM molecular weight plus 1 mass unit. If there is an area in the reconstructed gas chromatogram where the overlay indicates that this mass number is prevalent, the mass spectrum of this peak is displayed on the CRT unit, and the presence of the POM may be confirmed. If the POM is found to be present at a correct relative retention time to the internal standards, the computer then sums the ion current due to all important ions in the POM's mass spectrum which represents the area of the peak of interest. Quantification of each POM is achieved by ratioing its ion current to that of an internal standard of known concentration. The relative ionization efficiencies of the internal standard and many POM species were previously determined, and the appropriate factor is used in quantification.

Preliminary experiments were carried out in order to determine the most suitable solvent for extraction of the absorbent sampler. Extraction was attempted with methylene chloride, acetone, methyl alcohol, p-dioxane, pentane, cyclohexane, benzene, and toluene; only saturated hydrocarbons proved entirely suitable, on account of partial Texan solubility in more polar solvents. Pentane was found to be the most suitable solvent, its high volatility minimized sample loss during extraction. The relatively low extraction efficiency of pentane is overcome by means of continuous solvent extraction for a period of over 24 hours, as described above.

Initial validation experiments involved sampling and recovery of measured quantities of anthracene; during this work the temperature of the sampler was allowed to rise to approximately 200 F (93 C), but quantitative anthracene recovery was always obtained. (Later field experiments have suggested that sampling with absorbent temperatures of 175 F (80 C) may not result in retention of a significant fraction of the POM compounds.)

Subsequent validation experiments were carried out with the sampler at 130 F (55 C) using pyrene, chrysene, perylene, benz(ghi)perylene, and coronene; these compounds are representative of commonly encountered POM species. Ten thousand ng of each of these compounds was separately sampled over a 2-hour time period; following pentane extraction and addition of internal standard, each POM compound was quantified by GC-MS using specific absolute ion current integration. The results of several representative laboratory validation experiments are given in Table I.

TABLE I. RECOVERY OF POM FROM ADSORBENT SAMPLER

Integration by GC-MS

POM	Spiked (ng)	Sample #1 Average % Recovery	Sample #2 Average % Recovery	Sample #3 Average % Recovery
Pyrene	10,000	91 ± 3	98 ± 4	104 ± 4
Chrysene	10,000	90 ± 5	92 ± 5	106 ± 5
Perylene	10,000	91 ± 4	105 ± 5	102 ± 6
Benz(ghi)perylene	10,000	101 ± 10	106 ± 10	103 ± 7
Coronene	10,000	80 ± 7	92 ± 8	100 ± 14

This quantification technique overcomes the problems associated with interfering or overlapping peaks and poor base-line separations since these interfering species usually have different molecular weights. Isomeric compounds such as pyrene and fluoranthrene which have the same molecular weight can be quantified easily since they are very adequately separated by gas chromatography and their order of elution is known.

In order to obtain optimum sensitivity during the gas chromatographic-mass spectrometric analyses, the ionization voltage must be adjusted at various stages during the analysis. This adjustment necessitated the incorporation of three internal standards so that an internal standard would elute between each ionization adjustment. The internal standards chosen were 9-methylanthracene, 9-phenylanthracene and 9,10-diphenylanthracene. It was fortuitous that 9,10-diphenylanthracene elutes almost coincident with the benz(a)pyrene/benz(e)pyrene isomers, giving a very accurate marker when searching for these important compounds. The relative retention times of other POM species to one or more of the internal standards are generally sufficiently well known to permit specific compound identification when the mass spectra are displayed.

This ion integration technique has proven to be far superior to GC for the analysis and quantification of POM due to its very high selectivity; it also offers a very significant advantage in speed of data handling.

Laboratory Validation Studies

Laboratory validation studies were performed on the adsorbent sampler component of the POM Sampling Train. These validation studies involved setting up an adsorbent sampler, to collect air drawn through a 500 F (260 C) tube furnace. A precisely measured quantity of polynuclear compounds in a few microliters of methylene chloride solution was then injected into the inlet of the adsorbent sampler, and heated air was passed through the system for at least an hour. Following solvent extraction of the sampler, a suitable internal standard was added, and analysis for the spiked polynuclear compound was made by GC-MS analysis.

References

- (1) Moore, G. G., Thomas, R. S., and Monkman, J. L., *J. Chromatog.*, 26, 456 (1967).

TABLE F-1

PARTICULATE CONCENTRATIONS IN ENGLISH UNITS				
DESCRIPTION	UNITS	Inlet		Outlet
		TP-1	TP-3	TP-3
DATE OF RUN		10-9-75	10-9-75	
STACK PRESSURE	FT2	1,290		5,410
WSP. TIME OF RUN	MIN	14.0		140.0
BAROMETRIC PRESSURE	IN. HG	29.80		29.80
AVG. ORIFICE PRESS. DIFF.	IN. H2O	1.010		1.320
VOL. OF GAS-METER PAND	SCF	83.33		104.30
AVG. GAS-METER TEMP.	DEG. F	95.0		97.0
VOL. OF GAS-TO CORRECT	SCF	79.48		9.30
FL. AT 42.0 CIL. COLTD	μl	.0		.0
VOL. AT 42.0 CIL. COLTD	SCF	.0		.0
PERCENT ASSISTIVE BY VOL.		2.1		2.2
VOL. OF PARTICULATE GAS		.071		.078
PERCENT OF 102 BY VOL. OF GAS		.0		.0
PERCENT OF 102 BY VOL. OF GAS		.0		.0
PERCENT OF 102 BY VOL. OF GAS		.0		.0
PERCENT OF 102 BY VOL. OF GAS		10.0		10.0
PERCENT OF 102 BY VOL. OF GAS		28.90		28.90
PERCENT OF 102 BY VOL. OF GAS		28.62		28.62
AVG. STACK TEMPERATURE	DEG. F	137.0		138.0
REF. SAMPLING POINT		1		1
STACK PRESS. COR. AMPL. EFF.	IN. HG	27.70		29.80
AVG. STACK GAS VELOCITY	FT3	45.210		42.864
SEC. FLOWRATE, DRY, 300 CIL.	SCFM	26615.		1209.
ACTUAL STACK FLOWRATE	SCFM	30625.		13914.
PERCENT DILUTION		106.7		9.7

TABLE F-II

PARTICULATE SUMMARY IN METRIC UNITS					
DESCRIPTION	UNITS	Inlet		Outlet	
		TP-1	TP-3	TP-1	TP-3
DATE OF RUN		10-9-75	10-9-75		
STACK PRESS	MM	1.049	1.503		
VELOCITY OF FLOW	FT/SEC	14.0	14.0		
BAROMETRIC PRESSURE	MM HG	756.92	756.92		
AVERAGE WIND DIRECTION	DEG	25.654	26.23		
WIND SPEED	MPH	2.36	2.05		
AVERAGE WIND DIRECTION	DEG	35.0	36.1		
WIND SPEED	MPH	2.25	2.81		
TEMPERATURE OF AIR	DEG C	.0	.0		
TEMPERATURE OF STACK GAS	DEG C	.0	.0		
PERCENT HUMIDITY BY VOLUME		2.1	2.2		
WATER VAPOR PRESSURE	MM HG	.971	.972		
PERCENT O ₂ BY VOLUME		.0	.0		
PERCENT CO ₂ BY VOLUME		.0	.0		
PERCENT SO ₂ BY VOLUME		.0	.0		
PERCENT H ₂ S BY VOLUME		10.0	10.0		
MOLECULAR WEIGHT OF GAS		28.90	28.90		
MOLECULAR WEIGHT OF GAS		28.67	28.67		
AVERAGE STACK TEMPERATURE	DEG C	52.3	52.0		
VELOCITY OF FLOW	FT/SEC	1	1		
STACK PRESSURE	MM HG	756.38	756.92		
AVERAGE STACK GAS VELOCITY	M/S	13.780	13.065		
SO ₂ EMISSION RATE, DRY BASIS BY WEIGHT		742.	740.		
SO ₂ EMISSION RATE	LBZ/HR	267.	267.		
PERCENT SO ₂ EMISSION		106.7	9.7		

TABLE FIII. SUMMARY OF POM DATA FOR CELOTEX PLANT (ALABAMA)

Component	NAS Notation	Raw Data (POM by GC-MS, no correction for blanks), μg		POM in Blank (EPA Sample S75-006-489; BCL Sample 2-5)		POM in Sample (Corrected for blank), μg		POM in Sample $\mu\text{g}/\text{Nm}^3$	
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
		(EPA Sample S75-006-497; BCL Sample I1)	(EPA Sample S75-006-504; BCL Sample I3)	(EPA Sample S75-006-489; BCL Sample 2-5)	(EPA Sample S75-006-489; BCL Sample 2-5)	(Corrected for blank), μg	(Corrected for blank), μg	$\mu\text{g}/\text{Nm}^3$	$\mu\text{g}/\text{Nm}^3$
Anthracene/Phenanthrene		52.0	45.6	0.800		51.2	44.8	45.7	32.9
Methyl anthracenes		183.0	103.4	1.200		181.8	102.2	162.3	75.1
Fluoranthene		1.00	6.30	0.050		0.950	6.25	0.85	4.60
Pyrene		7.50	3.00	0.100		7.40	2.90	6.61	2.13
Methyl Pyrene/Fluoranthene		4.00	20.9	none detected		4.00	20.9	3.57	15.37
Benzo(c)phenanthrene	***	0.350	none detected	"		0.350	---	0.31	--
Chrysene/Benz(a)anthracene	*	8.30	0.700	"		8.30	0.700	7.41	0.51
Methyl chrysenes	*	21.8	0.350	"		21.8	0.350	19.5	0.26
Benzo-fluoranthenes	**	5.30	0.350	"		5.30	0.350	4.73	0.26
Benzo(a)pyrene	***	13.50	0.900	"		13.50	0.900	12.1	0.66
Benzo(e)pyrene									
Perylene									
3-Methylcholanthrene	***								
Indeno(1,2,3,-cd)pyrene	*								
Benzo(ghi)perylene									
Dibenzo(a,h)anthracene	***								
Di benzo(c,g)carbazole	***								
Dibenzo(ai and ah)pyrenes	***								
Coronene									
TOTAL									
Sample Volume, Nm^3		1.12	1.36						

APPENDIX F-1
PPOM
FIELD DATA SHEETS

NOMOGRAPH DATA

PLANT Colony Al.
 DATE 10-9-75
 SAMPLING LOCATION TP-1 Inlet

BOM

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	$\Delta H@$	1.84
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m\text{ avg.}}$	95
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2.0
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.8
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	11
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{ avg.}}$	130
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta P_{\text{ avg.}}$	.60
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta P_{\text{ max.}}$	.72
C FACTOR		1.15
CALCULATED NOZZLE DIAMETER, in.		.230
ACTUAL NOZZLE DIAMETER, in.		.201
REFERENCE Δp , in. H ₂ O		1.01

FIELD DATA

PLANT Seaboard
 DATE 10-9-75
 SAMPLING LOCATION IP-1 Inlet
 SAMPLE TYPE PROP
 RUN NUMBER _____
 OPERATOR C. E. Alley
 AMBIENT TEMPERATURE 18.0
 BAROMETRIC PRESSURE 29.8
 STATIC PRESSURE, (P_s) 1.5" H₂O
 FILTER NUMBER(S) 13 0.39 20.7

PROBE LENGTH AND TYPE 5 ft extd. 5-05
 NOZZLE I.D. 1/8" 1.201
 ASSUMED MOISTURE, % 2
 SAMPLE BOX NUMBER _____
 METER BOX NUMBER RAC-1
 METER ΔH_m 1.84
 C FACTOR 1.15 1.45
 PROBE HEATER SETTING _____
 HEATER BOX SETTING 1.0
 REFERENCE Δp 0.44 1.01

Collector Tare Weight(s) _____
 SCHEMATIC OF TRAVERSE POINT LAYOUT _____
 READ AND RECORD ALL DATA EVERY 4 MINUTES

PROP Column Sampling

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V _m , ft ³)	VELOCITY HEAD (ΔP), in. H ₂ O	ORIFICE DIFFERENTIAL (ΔH, in. H ₂ O)		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	FID GAS TEMPERATURE OF FILTER GAS, °F	FID GAS TEMPERATURE OF FID GAS, °F	FID GAS CONC. PPM VOL
				DESIRED	ACTUAL		INLET (T _{m in}), °F	OUTLET (T _{m out}), °F				
Point A	0 1300	596.80										
1	4	599.19	.60	1.12	1.12	128	80	80	7.8	114	138	60
2	8	601.50	.57	1.00	1.10	124	82	80	7.0	150	131	54
3	12	604.02	.67	1.27	1.27	124	87	80	8.0	119	132	55
4	16	606.50	.70	1.30	1.30	142	92	81	8.0	129	134	59
5	20	609.05	.73*	1.27	1.27	147	97	83	8.0	106	132	59
6	24	611.58	.72	1.25	1.25	147	101	84	8.0	136	130	60
7	28	614.10	.72	1.25	1.25	135	101	86	8.0	148	125	61
8	32	616.59	.68	1.21	1.21	135	101	87	7.5	150	125	62
9	36	618.98	.62	1.10	1.10	136	102	88	7.0	120	122	62
10	40	621.80	.52	.94	.94	134	102	89	7.0	123	125	62
11	44	623.55	.51	.92	.92	120	102	90	6.8	140	126	63
12	48	625.75	.49	.88	.88	124	103	90	6.2	120	130	63
13	52	628.04	.51	.95	.95	122	103	91	7.0	134	128	63
14	56	630.32	.51	.95	.95	122	104	92	6.8	129	126	63
15	60	632.60	.49	.92	.92	122	104	92	6.8	120	130	63
16	64	634.65	.40	.75	.75	120	104	92	5.5	120	129	63
17	68	636.49	.32	.60	.60	120	103	93	5.0	126	130	63
18	72	638.15	.26	.48	.48	120	102	93	4.0	125	126	63
						10						

Leak check note - at 0.200 16" H₂O
 * adjusted manometer to 140

SAMPLING TASK LOG

Plant Cellulose Corporation
 Date 10-6 to 10-10

Plant Location Fairfield Alabama TR1
 Recorded by C. E. Wiley

Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample NOS.
1	TP-1 Port A	PPOM	1300	1312	72	
1	TP-1 Port B	PPOM	1312	1327		
1	TP-1 Port B	PPOM	1327	1355	28	
1	TP-1 Port B	PPOM	1355	1400		
1	TP-1 Port B	PPOM	1400	1438	38	
1	TP-1 Port B	PPOM	1438	1445		
1	TP-1 Port B	PPOM	1445	1451	6	
			1451		Total time	144 min

10-9-75 Comments

Started run
 Switched ports
 Continued run
 Process problems (speed low)
 Continued run
 Process problems (speed down)
 Continued run
 Completed run

NOMOGRAPH DATA

PLANT Celotex, Fairfield

PCM Sample

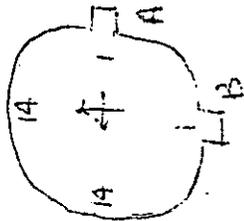
DATE Oct 9, 1975

SAMPLING LOCATION TP 3

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H ₂ O	$\Delta H_{@}$	1.99
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m\text{ avg.}}$	95
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2.5
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.80
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073 \times$ STACK GAUGE PRESSURE in in. H ₂ O)	P_s	29.82
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s\text{ avg.}}$	140 140
AVERAGE VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ avg.}}$	
MAXIMUM VELOCITY HEAD, in. H ₂ O	$\Delta p_{\text{ max.}}$	
C FACTOR		1.15
CALCULATED NOZZLE DIAMETER, in.		—
ACTUAL NOZZLE DIAMETER, in.		0.242
REFERENCE Δp , in. H ₂ O		0.50

FIELD DATA

PLANT Celotex
 DATE Oct 9, 1975
 SAMPLING LOCATION TP 3
 SAMPLE TYPE PM10
 RUN NUMBER 1
 OPERATOR Kelli, Davis
 AMBIENT TEMPERATURE 75°F
 BAROMETRIC PRESSURE 29.80
 STATIC PRESSURE, (P_s) .44
 FILTER NUMBER(S) _____



PROBE LENGTH AND TYPE 4' s.s. gilet 4-06, 855
 NOZZLE I.D. 0.242
 ASSUMED MOISTURE, % 2
 SAMPLE BOX NUMBER RA 15
 METER BOX NUMBER RAC 6
 METER ΔH 1.99
 C FACTOR 1.17
 PROBE HEATER SETTING 100
 HEATER BOX SETTING 65 100
 REFERENCE ΔP 0.50

Collector Tare Weight(s) _____
 SCHEMATIC OF TRAVERSE POINT LAYOUT _____
 FID Gas Flow Rate _____
 READ AND RECORD ALL DATA EVERY 5 MINUTES

Temp

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr CLOCK)	SAMPLING TIME, min	GAS METER READING (V _m), ft ³	VELOCITY HEAD (ΔP _s), in. H ₂ O	ORIFICE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s), °F	DRY GAS METER TEMPERATURE (T _m), °F		PUMP VACUUM, in. Hg	TEMPERATURE, °F	FID-A/C CONC. PPM/VOL.
					DESIRED	ACTUAL		INLET (T _{m in})	OUTLET (T _{m out})			
B14	1201	0	556, 271	.62	2.27	2.27	131	82	80	9	119	127
B13	1206	5	559, 92	.63	2.30	2.30	130	92	80	9	130	124
B12	1211	10	563, 68	.62	2.27	2.27	131	101	82	9	128	124
B11	1216	15	567, 92	.61	2.21	2.21	133	108	85	9	130	125
B10	1221	20	571, 14	.59	2.15	2.15	134	112	87	9	135	125
B9	1226	25	575, 38	.56	2.05	2.05	134	113	89	8	130	124
B8	1231	30	581, 87	.53	1.95	1.95	133	114	91	8	135	125
B7	1236	35	585, 14	.48	1.78	1.78	132	114	93	7	142	123
B6	1241	40	588, 96	.46	1.70	1.70	133	116	94	9	142	123
B5	1246	45	592, 98	.46	1.70	1.70	134	120	96	10	145	123
B4	1251	50	596, 87	.45	1.68	1.68	134	120	97	9	125	125
B3	1256	55	600, 80	.41	1.54	1.54	133	120	98	9	129	123
B2	1301	60	604, 55	.32	1.20	1.20	129	121	99	8	129	123
B1	1306	65	608, 107	.30	1.14	1.14	127	120	100	8	130	123
		70										
		75										
		80										
		85										
		90										
		95										
		100										
		105										
		110										
		115										
		120										
		125										
		130										
		135										
		140										
		145										
		150										
		155										
		160										
		165										
		170										
		175										
		180										
		185										
		190										
		195										
		200										

COMMENTS: Leak checked 10006 @ 15 of line

Collection Camp

Pom Run 1 p. 2 TP 3

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V _m , ft ³)	VELOCITY HEAD (V _g , in. H ₂ O)	ORIFICE DIFFERENTIAL (ΔH), in. H ₂ O		STACK TEMPERATURE (T _s , °F)	DRY GAS METER TEMPERATURE (T _m , °F)		PUMP VACUUM, in. Hg	FILTER GAS TEMPERATURE, °F	FID GAS TEMPERATURE, °F	FID-710 CONC. PPM (VOL)
				DESIRED	ACTUAL		INLET (T _{m in} , °F)	OUTLET (T _{m out} , °F)				
	7:00	608.107										
A14	75 / 1332	611.96	.56	2.05	2.05	133	94	90	10	57	138	122
A13	80 / 1337	616.02	.61	2.21	2.21	140	98	90	11	60	127	125
A12	85 / 1342	620.15	.63	2.25	2.25	137	103	89	11	62	129	123
A11	90 / 1347	624.28	.62	2.25	2.25	146	100	88	11	62	128	123
A10	95 / 1352	628.35	.61	2.21	2.21	146	108	88	11	61	141	127
A9	100 / 1357	630.554	.60	2.17	2.17	148	108	89	11	61	130	123
STOP RECORD												
START RECORD												
A9	97:45 / 1402	630.554	.60	2.17	2.17	140	94	88	11	57	128	123
A8	100 / 1409	632.38	.56	2.05	2.05	145	98	87	11	60	128	123
A7	105 / 1414	636.10	.45	1.68	1.68	145	102	88	11	62	130	124
A6	115 / 1419	643.69	.42	1.55	1.55	145	102	88	11	62	135	124
A5	120 / 1424	646.18	.40	1.47	1.47	145	103	88	8	61	140	124
A4	125 / 1429	650.66	.39	1.43	1.43	144	102	88	8	62	135	124
A3	130 / 1434	657.13	.39	1.48	1.45	145	100	86	8	63	136	124
A2	131 / 1435	654.797	.34	1.28	1.28	145	100	88	7	63	130	124
STOP RECORD												
START RECORD												
A2	131 / 1443	654.797										
A2	135 / 1447	657.40	.34	1.28	1.28	144	90	80	7	61	133	124
A1	140 / 1452	660.604	.32	1.20	1.20	145	97	87	7	60	140	124
STOP RECORD												

Pitot Tube Coefficient Chart

<u>Pitot Tube</u>	<u>A-side coefficient</u>	<u>B-side coefficient</u>
4-06	0.857	0.853
4-07	0.857	0.853
5-01	0.852	0.851
5-05	0.848	0.847

SAMPLING SUMMARY SHEET

Inlet - AS - 1626
Outlet - AS - 779

Plant Celanese Corporation Location Fairfield, Alabama
 Sampled source Inlet and Outlet (POM) TP-3

Run	Date	N _p	P _m	P _b	V _m	T _m	V _{m, std}	V _w	V _{w, gas}	%M	M _d
Run Inlet	10-9-75	36	1.01	29.80	83.38	95	79.44	35.0	1.65	2.05	180
Run Outlet	10-9-75	28	1.82	29.80	104.333	97	99.34	47.6	2.26	2.23	178

Run	MW _d	MW	P _{st}	P _s	C _p	V _{ΔP_s × (T_s + 460)^{3/2}}	V _s	T _s	T _t	D _n	%I
Run Inlet	28.9	28.7	0.10	29.7	0.857	18.19	2730	137	144	2.201	106.3
Run Outlet	28.9	28.7	0.03	29.8	0.857	17.14	2570	138	140	2.242	99.7

Equations:

$$V_{m, std} = \frac{17.7 \times V_m (P_b + \frac{P_m}{13.6})}{(T_m + 460)}$$

$$\% M = \frac{100 \times V_{w, gas}}{V_{m, std} + V_{w, gas}}$$

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

$$MW_d = (\% CO_2 \times \frac{44}{100}) + (\% O_2 \times \frac{32}{100}) + (\% CO + \% N_2) \times \frac{28}{100}$$

$$MW = MW_d \times M_d + 18 (1 - M_d)$$

$$P_s = P_b \pm P_{st}$$

$$V_s = 5128.8 \times C_p \times \sqrt{\Delta P_s \times (T_s + 460)} \left[\frac{1}{P_s \times MW} \right]^{1/2}$$

$$\% I = \frac{1.032 \times (T_s + 460) \times V_{m, std}}{V_s \times T_t \times P_s \times M_d \times (D_n)^2}$$

Table Headers:

- N_p: Total No. of Sampling Points
- P_m: Average Orifice Pressure Drop, in. H₂O
- P_b: Barometric Pressure, in. Hg. Absolute
- V_m: Volume of Dry Gas at Meter Conditions, DCF
- T_m: Average Meter Temperature, °F
- V_{m, std}: Volume of Dry Gas at STP, DSCF^d
- V_w: Total H₂O Collected in Impingers and Silica Gel, ml
- V_{w, gas}: Volume of Water Vapor Collected at STP, SCF
- % M: % Moisture by Volume
- M_d: Mole Fraction of Dry Gas
- % CO₂: % CO₂
- % O₂: % O₂
- % CO: % CO
- % N₂: % N₂
- MW_d: Molecular Weight of Stack Gas, Dry Basis
- MW: Molecular Weight of Stack Gas, Wet Basis
- C_p: Pitot Tube Coefficient
- V_s: Stack Gas Velocity at Stack Conditions, fpm
- T_s: Average Stack Temperature
- T_t: Net Time of Test, Min.
- D_n: Sampling Nozzle Diameter, in.
- % I: Percent Isokinetic

Notes:

- ^a Dry standard cubic feet at 70°F, 29.92 in. Hg.
- ^b Standard conditions at 70°F, 29.92 in. Hg.
- ^c $\sqrt{\Delta P_s \times (T_s + 460)}$ is determined by averaging the square root of the product of the velocity head (ΔP_s) and the absolute stack temperature from sampling point.

Handwritten Data:

Inlet - Q_s - 26,500
 Outlet - Q_s - 30,700
 Outlet - Q_s - 12,000

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

PLANT _____

COMMENTS:

DATE : OCT 9 1975

SAMPLING LOCATION _____

SAMPLE TYPE - P04 -

RUN NUMBER CRP-P04-TP-1 glass rather

SAMPLE BOX NUMBER _____

CLEAN-UP MAN Bayler

*filter soaked with oil,
noticeable on back side.
of filter,
acetone washed filter and
went in separate bottle.*

FRONT HALF

*max low
leakage : changed
to → Replace
BAL-11 BAL-13*

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK, FRONT HALF OF FILTER HOLDER

CONTAINER _____ mg

FILTER NUMBER _____

CONTAINER _____ mg

tare 0.388647 g 0.

net _____

FRONT HALF SUBTOTAL _____ mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER

CONTAINER _____ mg

ETHER-CHLOROFORM
EXTRACTION _____ mg

ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____ mg

BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT _____ mg

Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml

MOISTURE

IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	<u>106</u> ml	<u>100</u> ml	<u>32</u> ml	<u>56</u> ml	_____ ml	_____ ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>0</u> ml	_____ ml	_____ ml	_____ ml
NET VOLUME	<u>6</u> ml	<u>2</u> ml	<u>2</u> ml	_____ ml	_____ ml	_____ ml

SILICA GEL	1	2	3	4
FINAL WEIGHT	<u>500</u> g	_____ g	_____ g	_____ g
INITIAL WEIGHT	<u>475.0</u> g	_____ g	_____ g	_____ g
NET WEIGHT	<u>25.0</u> g	_____ g	_____ g	_____ g

TOTAL MOISTURE 35.0

ANALYTICAL DATA

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

PLANT _____
 DATE JUN 9 1978
 SAMPLING LOCATION _____
 SAMPLE TYPE POM
 RUN NUMBER CRP-POM-TP-2
 SAMPLE BOX NUMBER _____
 CLEAN-UP MAN _____

COMMENTS:

Noted a globe of grease which was suspended from the wall of the flask, this does not affect analysis

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK, FRONT HALF OF FILTER HOLDER

CONTAINER _____ mg

FILTER NUMBER BAL-12

CONTAINER _____ mg

tare 0.389682 g

net _____ g

FRONT HALF SUBTOTAL _____ mg

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER

CONTAINER _____ mg

ETHER-CHLOROFORM
EXTRACTION _____ mg

ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____ mg

BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT _____ mg

MOISTURE Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml

IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	<u>162</u> ml	<u>256</u> ml	<u>32</u> ml	<u>4</u> ml	<u>5</u> ml	<u>6</u> ml
INITIAL VOLUME	<u>100</u> ml	<u>100</u> ml	<u>0</u> ml	<u> </u> ml	<u> </u> ml	<u> </u> ml
NET VOLUME	<u>62</u> ml	<u>156</u> ml	<u>32</u> ml	<u>4</u> ml	<u>5</u> ml	<u>6</u> ml

SILICA GEL					
FINAL WEIGHT	<u>502.6</u> g	<u> </u> g	<u> </u> g	<u> </u> g	<u> </u> g
INITIAL WEIGHT	<u>475</u> g	<u> </u> g	<u> </u> g	<u> </u> g	<u> </u> g
NET WEIGHT	<u>27.6</u> g	<u> </u> g	<u> </u> g	<u> </u> g	<u> </u> g

$$\begin{array}{r} 64 \\ - 44 \\ \hline 20 \\ 27.6 \\ \hline 47.6 \end{array}$$
 TOTAL MOISTURE 47.6

62977-5730

Quantification Relation

Reference Number

I 1

575-006-497

I 2

" - " - 341

I 3

" - " - 504

I 4

575-007-056

I 5

" - 006 - 106

I 6

" - 006 - 155

I 7

" - 007 - 096

{ 575-006-112
" - " - 113

* 2-1

575-007-055

2-2

" - 006 - 329

2-3

" - " - 335

2-4

" - " - 439

2-5

* % of sample analyzed

$ng = \text{value} \times 10^{-3}$
 $= \text{value} \times 10^{-6}$

POM QUANTIFICATION

Component	NAS Notation	I1	I2	I3	I4	I5	I6	I7
Anthracene/Phenanthrene		52000	65500	40100	125700	99000	4500	1900
Methyl anthracenes		18500	102700	10000	112000	89200	2100	1900
Fluoranthene		10000	18200	6000	3500	6000	1000	10000
Pyrene		7500	48500	3000	7700	9800	1000	15000
Methyl Pyrene/Fluoranthene		400	13000	20700	57000	57800	2100	900
Benzo(c)phenanthrene	***	350				1000		
Chrysene/Benz(a)anthracene	*	3300	20350	7000	2200	4000	2100	5500
Methyl chrysenes	*	21800	20110	370	2100	3500	2100	150
Benzo fluoranthenes	**	5300	12500	350	1200	4700	2100	4500
Benzo(a)pyrene	***	13500	9900	900	1700	4500	2100	900
Benzo(c)pyrene								
Perylene								
3-Methylcholanthrene	****							
Indeno(1,2,3-cd)pyrene	*							
Benzo(ghi)perylene								
Dibenzo(a,h)anthracene	***							
Diebenzo(c,g)carbazole	***							
Dibenz(ah and ah)pyrenes	***							
Coronene								
								TOTAL

1/64
 1/64
 of Sample

POM QUANTIFICATION

Component	NAS Notation	1-2	1-3	1-4	1-5
Anthracene/Phenanthrene		426	631	10,000	300
Methyl anthracenes		1123	1257	2337	1200
Fluoranthene		30	8	150	50
Pyrene		44	60	850	100
Methyl Pyrene/Fluoranthene		689	125	2700	
Benzo(c)phenanthrene	***	20			
Chrysene/Benz(a)anthracene	*	188	35	1200	
Methyl chrysenes	*	615	13	4800	
Benzo fluoranthenes	**	18	19	1750	
Benzo(a)pyrene	***	8	10	700	
Benzo(c)pyrene		14	13	1200	
Perylene					
3-Methylcholanthrene	****	4.57	0.1	1600	
Indeno(1,2,3,-cd)pyrene	*	6.02			
Benzo(ghi)perylene					
Dibenzo(a,h)anthracene	***				
Diebenzo(c,g)carbazole	***				
Dibenz(ai and ah)pyrenes	***				
Coronene					

TOTAL

APPENDIX G

HIGH-VOLUME SAMPLING DATA

NOTE: Sampling Was Conducted at
TP-3 Outlet Test Location

HIGH-VOLUME SAMPLING

Introduction:

The high-volume train used in these tests was an automatic-isokinetic sampler manufactured by Rader Pneumatics, Portland, Oregon.

1. Principle and Applicability

1.1 Principle. Particulate matter is withdrawn isokinetically from the source at a high rate (up to 60 cfm), and is removed from the sample stream by means of a glass fiber filter. The mass of the collected particulate matter is determined gravimetrically.

1.2 Applicability. This method applies generally to the sampling of non-corrosive gas streams of low moisture content and low (< 500°F) temperature. The high sample rate is particularly advantageous for sampling clean exhaust streams (e.g., control device outlets), in that a weighable particulate sample can be collected in a relatively short amount of time.

2. Sampling Train (See Figure 1)

2.1 Nozzle. Thin-walled aluminum, with a sharp, tapered leading edge.

2.2 Probe. Thin-walled aluminum, sectioned, 1 7/8 inches in diameter (i.d.).

2.3 Pitot tube. Type-p, attached to probe, to monitor stack gas velocity.

2.4 Thermocouple. Chromel-alumel, attached to pitot tube, to monitor stack gas temperature.

2.5 Filter holder. Cast aluminum, designed to hold 8" x 10" glass fiber filters.

- 2.6 Umbilical cord. Flexible vacuum hose, approximately 2" in diameter.
- 2.7 Orifice meter. Calibrated orifice meter, to monitor the sampling rate. During sampling, the flowrate through the orifice is automatically regulated by the control computer (See 2.10 below), via a servo-controlled butterfly valve.
- 2.8 Orifice thermocouple. Chromel-alumel thermocouple, located immediately after the orifice meter, to monitor orifice temperature.
- 2.9 Control box. The control box receives pressure signals from the pitot tube and orifice meter, as well as temperature signals from the stack and orifice thermocouples. Transducers convert all of these signals into electrical signals, which are then fed to the control computer.
- 2.10 Control computer. The control computer receives the electrical signals from the control box, and sends a correcting signal to the servo motor, which opens the butterfly valve to the correct position to maintain isokinetic conditions.
- 2.11 Metering system. During a run, the control computer provides a continuous, digital readout of the total amount of gas which has passed through the orifice meter; the units of the readout are wet, standard cubic feet (wscf).
- 2.12 Moisture determination apparatus. Wet bulb-dry bulb thermometer, or equivalent.
- 2.13 Barometer. To measure atmospheric pressure to within 0.1" Hg.

3. Procedures

3.1 Preliminaries. The following things were done prior to sampling:

- a. Warm-up and synchronization. The unit was warmed up, and the red isokinetic toggle lights were synchronized.
- b. Selection of sampling nozzle. With the inlet to the probe plugged, the pitot tube was inserted into the gas stream. The "low", "med", and "high" buttons on the control box, which correspond, respectively, to the 1 7/8", 1 3/8", and 15/16" nozzles, were then pressed in succession; as each button was pressed, the panel display gave the approximate sampling rate for that nozzle size. The display readings showed that the 1 7/8" nozzle would give the optimum flowrate (~ 40 cfm); therefore, the 1 7/8" nozzle was chosen.
- c. Determination of number and location of sample points. The sampling ports were located about 5 1/2 diameters downstream and 2(+) diameters upstream of the nearest flow disturbances. For a low-volume sampling train (e.g. EPA Method 5), the correct number of sampling points corresponding to these upstream and downstream distances would be 28 (See. 12/23/71 Federal Register, Figure 1-1). For the high-volume train, however, the number of sampling points is a function of nozzle size. The cross-sectional area of a high-volume sampling nozzle is sometimes significantly large compared to the cross-section of the

stack; in other words, the high-volume nozzle occupies a definite area in space, rather than a point. Therefore, there should be few enough sample points to ensure a distance of one nozzle diameter between adjacent points; this prevents "overlapping"; i.e., sampling the same part of the duct cross-section more than once (See Figure 2). Additionally, those sample points nearest the stack walls should be located at least one inch or one nozzle diameter (whichever is greater) from the walls. Taking these things into account, the number of sample points was determined to be 12; this was the maximum number of points that could be sampled without overlapping. The sample points were located on 2 perpendicular diameters, according to Table 1-1 of the 12/23/71 Federal Register, except for the 4 points nearest the stack walls; these were located exactly one nozzle diameter (1.875") from the walls.

3.2 Sampling

At the beginning of each sample run, the probe was inserted into the stack and positioned at the first sample point. The blower was then turned on and sampling was started. During the run, isokinetic flow through the nozzle was maintained automatically; no manual adjustments were necessary. At the end of the run, the blower was turned off and the probe removed from the stack. The final display totalizer and orifice temperature readings were taken. The probe

and filter holder were then taken to the sample recovery area.

4. Sample recovery

The probe and filter holder were carefully moved from the test site to the clean-up area. The sample fractions from each run were recovered as follows:

Container #1: The filter was removed from the holder and placed in a plastic container. Care was taken to recover any filter fibers adhering to the rubber gasket.

Container #2: Probe washings and the rinse from the front half of the filter holder were combined in a second container. Reagent grade trichloroethylene (TCE) was used in the clean-up procedure; a blank sample of TCE was taken.

5. Analytical procedures

The following procedures were used in analyzing the samples from each run:

Container #1: The filter was transferred to a tared beaker, placed in a desiccator, and dried to a final, constant (to within 0.1 mg) weight. This final weight minus the combined tare weights of the beaker and the filter, gave the weight of the filter catch.

Container #2: The TCE wash was transferred to a tared beaker, and was evaporated to dryness at ambient temperature and pressure. The beaker was then placed in a desiccator and dried to a final, constant (to within 0.1 mg) weight. This final weight minus the beaker tare weight (and corrected for TCE blank value) gave the weight of the TCE rinse catch.

The total particulate weight for each run (m_t) was obtained by adding the weights of the catches from containers #1 and #2.

6. Calculations

The following calculations were performed for each run (See Table I):

6.1 Total volume of stack gas sampled, wet basis, stack conditions.

$$V_m = V_t \left(\frac{P_{std}}{P_s} \right) \left(\frac{T_s}{T_{std}} \right)$$

6.2 Total volume of stack gas sampled, dry basis, standard conditions.

$$V_{mstd} = V_t (1 - B_{wo})$$

6.3 Particulate concentration, wet basis, stack conditions.

$$C_a = 0.0154 \left(\frac{M_t}{V_m} \right)$$

6.4 Particulate concentration, dry basis, standard conditions.

$$C = 0.0154 \left(\frac{M_t}{V_{mstd}} \right)$$

6.5 Average flowrate through nozzle during sampling, wet basis, standard conditions.

$$Q_n = \frac{V_t}{\theta}$$

6.6 Average flowrate through nozzle during sampling, wet basis, stack conditions.

$$Q_{an} = Q_n \left(\frac{P_{std}}{P_s} \right) \left(\frac{T_s}{T_{std}} \right)$$

6.7 Average stack gas velocity, stack conditions*

$$\bar{v}_s = Q_{an} / A_n$$

* Assumes isokinetic conditions, i.e., that \bar{v}_s equals \bar{v}_n

6.8 Total stack gas volumetric flowrate, wet basis, stack conditions.

$$Q_s = \bar{v}_s A_s$$

6.9 Total stack gas volumetric flowrate, dry basis, standard conditions.

$$Q_{std} = Q_s \left(\frac{T_{std}}{T_s} \right) \left(\frac{P_s}{P_{std}} \right) (1 - B_{wo})$$

6.10 Particulate emission rate, dry basis, standard conditions

$$E = (8.58 \times 10^{-3})(C)(Q_{std})$$

7. Example calculation, Run #2

7.1

$$V_m = V_t \left(\frac{P_{std}}{P_s} \right) \left(\frac{T_s}{T_{std}} \right)$$

$$V_m = (4105) \left(\frac{29.92}{29.70} \right) \left(\frac{592}{530} \right)$$

$$V_m = 4,620 \text{ wacf}$$

7.2

$$V_{mstd} = V_t (1 - B_{wo})$$

$$V_{mstd} = (4105)(0.975)$$

$$V_{mstd} = 4000 \text{ dscf}$$

7.3

$$C_a = 0.0154 \left(\frac{M_t}{V_m} \right)$$

$$C_a = 0.0154 \left(\frac{152.1}{4620} \right)$$

$$C_a = 0.00051 \text{ grains/wacf}$$

7.4

$$C = 0.0154 \left(\frac{M_t}{V_{mstd}} \right)$$

$$C = 0.0154 \left(\frac{152.1}{4000} \right)$$

$$C = 0.00059 \text{ grains/dscf}$$

7.5

$$Q_n = \frac{V_t}{\theta}$$

$$Q_n = \frac{4105}{108}$$

$$Q_n = 38.0 \text{ wscfm}$$

7.6

$$Q_{an} = Q_n \left(\frac{P_{std}}{P_s} \right) \left(\frac{T_s}{T_{std}} \right)$$

$$Q_{an} = (38.0) \left(\frac{29.92}{29.70} \right) \left(\frac{592}{530} \right)$$

$$Q_{an} = 42.8 \text{ wacfm}$$

7.7

$$\bar{v}_s = \frac{Q_{an}}{A_n}$$

$$\bar{v}_s = \frac{42.8}{0.019}$$

$$\bar{v}_s = 2,250 \text{ ft/min}$$

7.8

$$Q_s = \bar{v}_s A_s$$

$$Q_s = (2,250)(5.41)$$

$$Q_s = 12,170 \text{ wacfm}$$

7.9

$$Q_{std} = Q_s \left(\frac{T_{std}}{T_s} \right) \left(\frac{P_s}{P_{std}} \right) (1 - B_{wo})$$

$$Q_{std} = (12,170) \left(\frac{530}{592} \right) \left(\frac{29.70}{29.92} \right) (0.975)$$

$$Q_{std} = 10,550 \text{ dscfm}$$

7.10

$$E = (8.58 \times 10^{-3})(C)(Q_{std})$$

$$E = (8.58 \times 10^{-3})(0.00059)(10,550)$$

$$E = 0.053 \text{ lb/hr}$$

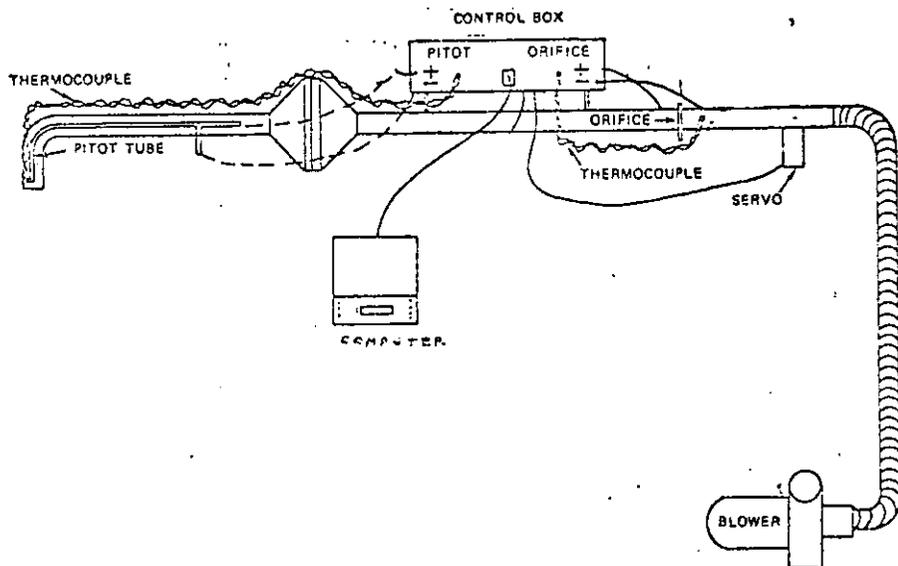


Figure G1. High-volume particulate train.

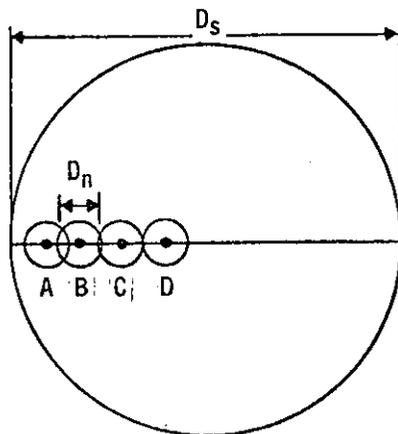


Figure 2a Distance between some adjacent points is $< D_n$; overlapping occurs.

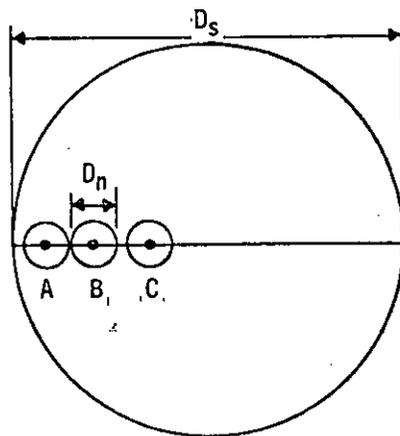


Figure G2 Distance between adjacent points is $\geq D_n$; no overlapping.

TABLE GI. High-Volume Sampling Nomenclature

Symbol	Explanation	Units
A_s	Cross-sectional area of stack	ft ²
A_n	Cross-sectional area of sampling nozzle	ft ²
B_{wo}	Proportion by volume of H ₂ O vapor in the sample stream	-
C	Particulate concentration, dry basis, standard conditions	grains/dscf
C_a	Particulate concentration, wet basis, stack conditions	grains/wacf
E	Particulate emission rate, dry basis, standard conditions	lb/hr
% I	Percent isokinetic	-
M_t	Total mass of particulate sample	mg
N	Number of sampling points	-
P_s	Absolute pressure of stack gas	in. Hg
P_{std}	Standard pressure, 29.92	in. Hg
Q_{an}	Average flowrate through nozzle during sampling, wet basis, stack conditions	wacfm
Q_n	Average flowrate through nozzle during sampling, wet basis, standard conditions	wscfm
Q_s	Total stack gas volumetric flowrate, wet basis, stack conditions	wacfm
Q_{std}	Total stack gas volumetric flowrate, dry basis, standard conditions	dscfm
T_s	Average stack gas temperature	°R
T_{std}	Standard temperature, 530	°R

TABLE G1
(Continued)

Symbol	Explanation	Units
V_m	Total volume of stack gas sampled, wet basis, stack conditions	wacf
V_{mstd}	Total volume of stack gas sampled, dry basis, standard conditions	cscf
V_t	Flow totalizer reading, wet basis, standard conditions	wscf
\bar{v}_s	Average stack gas velocity, stack conditions	ft/min
\bar{v}_n	Average velocity through nozzle during sampling	ft/min
θ	Total sampling time	minutes

TABLE GII. High-volume
Sampling Summary

Quantity	Units	Run #1	Run #2
Date	-	10/7/75	10/8/75
N	-	12	12
θ	min	36	108
A_n	ft ²	0.019	0.019
A_s	ft ²	5.41	5.41
P_s	in. Hg	29.70	29.70
T_s	°R	587	592
B_{wo}	-	0.971	0.975
V_t	wscf	1,401	4,105
V_m	wacf	1,560	4,620
V_{mstd}	dscf	1,360	4,000
\bar{v}_s	ft/min	2,285	2,250
Q_s	wacfm	12,360	12,170
Q_{std}	dscfm	10,755	10,550
C	grain/dscf	0.00055	0.00059
C_a	grain/wacf	0.00048	0.00051
E	lb/hr	0.051	0.053
% I*	-	100	100

* Assumed to be 100%

TABLE GIII. Comparison of Method ~~20~~
 And High-Volume Sampling Results
 at TP-3

Dates	Run No.		Percent Isokinetic		Particulate Concentration*	
	EPA 20	Hi-vol	EPA 20	Hi-vol	EPA 20	Hi-vol
10/7/75	1	1	102.8	100.0	0.00812	0.00055
10/8/75	2	2	101.5	100.0	0.00213	0.00059

* Comparison between front half of EPA Method~~20~~ and high-volume sampler results; units are grains/dscf.

APPENDIX G-1

HIGH VOLUME
FIELD DATA SHEETS

Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

High Volume Sampling at the Celotex
Fiberglass Roofing Plant in Fairfield, Alabama

November 11, 1975

Dr. Joe Vellano, TSS, MS 19

Dr. Joe Vellano, Chief, TSS, MS 19

During the week of October 5, 1975, the Rader automatic-isokinetic high volume particulate sampling train was field-tested at the Celotex fiberglass roofing plant in Fairfield, Alabama. On October 7th and 8th, 1975, steady-state particulate tests were conducted with the Rader unit and Method 5 train, at the outlet of a "smog-bag" electrostatic precipitator. The main objectives of these tests were: (1) to evaluate the performance of the electronic components of the Rader sampler; and (2) to provide comparison emissions data between the Rader and Method 5 trains.

The Rader sampling method differs from Method 5, in that stack gas velocity (AP) and stack gas temperature (T_g) readings are not actually taken and recorded during a sample run; rather, AP and T_g signals from the pitot tube and thermocouple are relayed to transducers and converted into electrical signals; based upon these electrical signals, the sampler automatically adjusts the flow rate through the orifice so that isokinetic conditions are maintained at the sampling nozzle. An electronic flow totalizer counts the total number of cubic feet of gas passing through the orifice during a run (adjusted to standard conditions); this totalizer displays a continuous digital readout of accumulated sample gas volume. At the end of a run, the final display reading is taken and recorded. Particulate concentration, stack gas velocity (V_g), and total stack gas volumetric flow rate (Q) are all calculated based upon this final value of total sample gas volume. There are a number of potential sources of error inherent in this type of system, however, because the following things are assumed: (1) that the AP and T_g signals are correct (i.e., the pitot tube and thermocouple are working properly); (2) that the transducers are interpreting and converting the AP and T_g signals properly; (3) that during the automatic adjustment of orifice flow rate, the butterfly valve is actually moving to the correct position; and (4) that the electronic totalizer is counting correctly. Unlike Method 5, in which the orifice meter and dry gas meter provide independent determinations of sample gas volume, the Rader sampler gives only a single readout of this quantity, with no "cross-check."

In view of the above, it was decided, prior to the Fairfield test, to evaluate the Rader unit by comparing its electronic determination of stack gas velocity and total volumetric flowrate (calculated based on the flow totalizer readout) to a manual determination of V_g and Q made by Method 5. The results of the Rader versus Method 5 comparison obtained at Fairfield are

presented below:

Site	Date	Sampling Train	Average Stack Gas Velocity (fpm)	Total Volumetric Flow Rate (acfm)
Cokebox Fairfield, Alabama	10/7/75	Radar	2,295	10,739
		Method 20	2,595	12,203
Cokebox Fairfield, Alabama	10/8/75	Radar	2,250	10,530
		Method 20	2,623	12,292

PLANT CELOTEX Fairfield, Alabama STACK PRESSURE 30.10" Hg

DATE(S) 10/17/75 NOZZLE DIAMETER 1 7/8

SAMPLING LOCATION Outlet PROBE LENGTH 15" ¹¹
TP3

OPERATOR Ray NO. OF POINTS 1+6=12

STACK DIAMETER 31.5" TIME PER POINT 3 min

Run # 1

	12:15		12:45			
RUN NO.	EST'D SAMPLE RATE (cfm)	CLOCK TIME	TOTAL GAS METERED (cf)	ORIFICE TEMP (°F)	WET BULB TEMP (°F)	DRY BULB TEMP (°F)
1	45	0	695	100F	/	/
	44	18	706	110F		
2		18	1401	100F		
		36		110F		
3						
4						
5						

ANALYTICAL DATA

PLANT Celotex, Fairfield, Alabama
DATE 10/7/75
SAMPLING LOCATION Precipitator outlet
SAMPLE TYPE particulate (hi vol)
RUN NUMBER 1
SAMPLE BOX NUMBER _____
CLEAN-UP MAN VOLLARO

COMMENTS: High-volume. In reported results below, blank values for TCE are considered.

FRONT HALF

LABORATORY RESULTS

TCE
ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK; FRONT HALF OF FILTER HOLDER

CONTAINER # 4-05 4-06 19.4 mg

FILTER NUMBER 512-423

CONTAINER # 4-09 29.1 mg

FRONT HALF SUBTOTAL 48.5 mg

BACK HALF N/A

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER

CONTAINER _____ mg
ETHER-CHLOROFORM
EXTRACTION _____ mg

ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____ mg
BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT 48.5 mg

MOISTURE N/A

IMPINGERS
FINAL VOLUME _____ ml
INITIAL VOLUME _____ ml
NET VOLUME _____ ml

SILICA GEL
FINAL WEIGHT _____ g _____ g _____ g
INITIAL WEIGHT _____ g _____ g _____ g
NET WEIGHT _____ g _____ g _____ g

TOTAL MOISTURE _____ g

PLANT CELOTEX, Fairfield, Alabama.

STACK PRESSURE 30.1" Hg

DATE(S) 10/3/75

NOZZLE DIAMETER 1.78"

SAMPLING LOCATION OUTLET
TP3

PROBE LENGTH 41"

OPERATOR RAY

NO. OF POINTS 6+6=12

STACK DIAMETER 31.5"

TIME PER POINT 9 min

Run 2.

10:25 AM

12:05 PM

Stop 12:57

Start 1:15

RUN NO.	EST'D SAMPLE RATE (cfm)	CLOCK TIME	TOTAL GAS METERED (cf)	ORIFICE TEMP (°F)	WET BULB TEMP (°F)	DRY BULB TEMP (°F)
1	42	0	999	105	/	/
		54 min	992	115		
			1991			
2		0	999	100		
		54 min	705	115		
		108	410			
3			2114			
4			1991			
5			4105			

ANALYTICAL DATA

PLANT Celotex, Fairfield, Alabama
DATE 10/8/75
SAMPLING LOCATION Precipitator Outlet
SAMPLE TYPE Particulate (hive 1)
RUN NUMBER 7
SAMPLE BOX NUMBER _____
CLEAN-UP MAN VOLLARO

COMMENTS: In results reported below, blank values for TCE wash have been subtracted out.

FRONT HALF

LABORATORY RESULTS

TCE
ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS),
FLASK, FRONT HALF OF FILTER HOLDER

CONTAINER # 4-07
4-08 55.7 mg

FILTER NUMBER 012-421

CONTAINER # 4-10 96.4 mg

FRONT HALF SUBTOTAL 152.1 mg

BACK HALF

n/a

IMPINGER CONTENTS AND WATER WASH OF
IMPINGERS, CONNECTORS, AND BACK
HALF OF FILTER HOLDER

CONTAINER _____ mg
ETHER-CHLOROFORM
EXTRACTION _____ mg

ACETONE WASH OF IMPINGERS, CONNECTORS,
AND BACK HALF OF FILTER HOLDER

CONTAINER _____ mg

BACK HALF SUBTOTAL _____ mg

TOTAL WEIGHT 152.1 mg

MOISTURE

n/a

IMPINGERS
FINAL VOLUME _____ ml
INITIAL VOLUME _____ ml
NET VOLUME _____ ml

SILICA GEL
FINAL WEIGHT _____ g _____ g _____ g
INITIAL WEIGHT _____ g _____ g _____ g
NET WEIGHT _____ g _____ g _____ g

TOTAL MOISTURE _____ g

SAMPLING TASK LOG

Plant
Date

(1) Colley
10/24/53 TP3

Plant Location
Recorded by

Fairfield Alameda
R. Smith

Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
2	TP3 - A	Particulate	1025		7	
"	"		1119	1119	54	
"	"		1205	1205	46	
	TP3 - A		1205		7	
"	"		1253	1253	48	
"	"		1315		3	
"	"		1321	1321	6	

Comments

Start test
End port
Change ports
Restart test
Stop process test
Restart process test
Stop test (end)

APPENDIX H
SAMPLING LOGS

Includes Collection Times For:

1. Particulate (Inlet and Outlet Locations)
2. Integrated Orsat (Outlet Stack TP-3 only)
3. Visible Emission (Both Outlet Stacks and Fugitive Fume Areas)
4. Particle Sizing (Inlet and Outlet Locations)
5. Gaseous Hydrocarbon (Inlet and Outlet Locations)
6. Evacuated Flask (Outlet Stack TP-3 only)
7. Particulate Polycyclic Organic Matter (One Test at Inlet TP-1 and One Test at Outlet TP-3)
8. Process Samples (See process sample collection log)
9. High Volume Sampling (2 runs at Outlet TP-3)

APPENDIX H-I
PARTICULATE AND ORSAT SAMPLING LOGS

SAMPLING TASK LOG

Plant Solutex Corporation
 Date 10-6 to 10-10-75

Plant Location Fairfield Alabama
 Recorded by C. E. Riley

TP-3

Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
1	TP-3 Port A	Particulate	1434	1507	33	
1	TP-3 Port A	Particulate	1507	1557		
1	TP-3 Port A	Particulate	1557	1634	37	
1	TP-3 Port B	Particulate	1634	1757		
1	TP-3 Port B	Particulate	1757	1854	57	
1	TP-3 Port B	Particulate	1854	1934		
1	TP-3 Port B	Particulate	1934	1947	13	
1	TP-3		1947		Total time 140 min	
1	TP-3 Port B	Onset	1600	1634	34	
1	TP-3 Port A	Onset	1634	1800		
1	TP-3 Port A	Onset	1800	1836	36	
1	TP-3		1836		Total time 70 min	

10-7-75
 Started run
 Process down
 Continued sampling
 Switched Ports (Process down)
 Continued sampling
 Process down
 Continued sampling
 Completed run

Started run
 Process down discontinued sampling
 Continued sampling
 Completed run

SAMPLING TASK LOG

Plant Celotex Corporation Plant Location Fairfield Alabama TP-1
 Date 10-6-66 Recorded by C.E. Riley

Run	Sampling Location (Port)	Pollutant	Clock Time Began	Elapsed Time (min)	Sample Nos.
10-8-75					
1	TP-1 Port A	Particulate	1021	1133	72
2			1133	1144	
2	TP-1 Port B	Particulate	1144	1149	5
2			1149	1206	
1	TP-1 Port B	Part.	1206	1252	46
2			1252	1312	
2	TP-1 Port B	Part	1312	1325	13
2			1325		
at 1325 with a total sampling time of 136 min. Decision was made in order that another run would be started also process down time was expected to be approximately 1/2 hour or more. C.E. Riley					
Total time 136 min					
Note - Cyclone and glass wool removed from train configuration					

SAMPLING TASK LOG

Plant Celotex Corporation
 Date 10-8-75

Plant Location Fairfield California TP 2
 Recorded by C. E. Perry

Run	Sampling location (Port)	Pollutant	Clock Time Began	Elapsed Time (min)	Sample Nos.
2	TP-2 Port B	Particulate	10:31	11:31	70
2	TP-2		11:31	11:42	
2	TP-2 Port A	Particulate	11:42	11:50	8
2			11:50	12:06	
2	TP-2 Port A	Particulate	12:06	12:51	45
2	TP-2		12:51	13:12	
2	TP-2 Port A	Particulate	13:12	13:25	13
2			13:25	-	136
<p>13:50 decided to terminate run at 13:25 with a total sampling time of 136 min. Reason was need in order that another run could be started also process down time was expected to be approximately 1 hour or more. C. E. Perry</p>					
<p>Note - During disassembly of train the glass connector between the probe and filter was found to be cracked. This cracked glass piece was still together however, but it could not be re-terminated when the connector was broken.</p>					

SAMPLING TASK LOG

Plant Celotex Corporation
 Date 10-6 to 10-10

Plant Location Fairfield Alabama
 Recorded by C.E. Kelley

TP-3

Run	Sampling location (Port)	Pollutant	Clock Time Began	Elapsed Time (min)	Sample Nos.	Comments
3	TP-3 Port B	Particulate	1646	70		Started run
3			1756			Switched ports
3	TP-3 Port A	Particulate	1811	39		Continued sampling
3			1850			Process down
3	TP-3 Port A	Particulate	1911	13		Continued sampling
3			1924			Process down
3	TP-3 Port A	Particulate	1950	18		Continued sampling
3	TP-3		2008	Total time 140 min		Completed run
3	TP-3 Port A	Ornat	1703	52		Started run
3			1755			Stopped sampling
3	TP-3 Port B	Ornat	1814	36		Continued sampling
3			1850			Stopped sampling
3	TP-3 Port B	Ornat	1913	11		Continued sampling
3			1924	Total test time 99 min		Terminated run
1	TP-3 Port B	Plas Commission	1710			Collected evacuated flask sample
1	TP-3 Port B	"	1715			Collected evacuated flask sample
3	TP-3 Port B	"	1719			Collected evacuated flask sample

APPENDIX H-II
VISIBLE EMISSION LOGS

Includes Observative Time Logs For:

1. Outlet Location TP-2
2. Outlet Location TP-3
3. Process Fugitive Fume Areas

APPENDIX H-III
PARTICLE SIZE SAMPLING LOGS

PARTICLE SIZE
SAMPLING TASK LOG

Plant Celotex Corporation
Date 10-7-75 through 10-9-75

Plant Location Fairfield, Alabama
Recorded by D. C. Harris

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Started sampling	TP1-1	Inlet "A"	Particle size	14:17	14:47	30	
Completed sampling				14:47			
Started sampling	TP1-2	Inlet "B"	Particle size	16:43	16:45	1.5	
Process down				16:45	17:53		
Completed sampling	TP1-2	Inlet "B"	Particle size	17:53	18:22	28.5	
			Total test time			30	
Started sampling	TP1-3	Inlet "B"	Particle size	09:24	09:28	3.5	
Process down				09:28	10:18		
Completed sampling	TP1-3	Inlet "B"	Particle size	10:18	10:59	41.5	
			Total sampling time			45	
Started sampling	TP2-1	Outlet "B"	Particle size	12:33	12:52	19	
Process down				12:52	13:11		
Continued sampling	TP2-1	Outlet "B"	Particle size	13:11	13:25	14	
Process down				13:25	15:34		
Completed sampling	TP2-1	Outlet "B"	Particle size	15:34	16:11	37	
			Total sampling time			70	
Started sampling	TP2-2	Outlet "B"	Particle size	17:25	17:55	30	
Process down--switched ports				17:55	18:19		
Continued sampling	TP2-2	Outlet "A"	Particle size	18:19	18:49	30	
Continued sampling; see following page!							

APPENDIX H-IV

GASEOUS HYDROCARBONS SAMPLING LOGS

SAMPLING TASK LOG

Plant Caltech Camp
 Date See comments

Plant Location Fairfield, Ala.
 Recorded by S. E. Miller

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Start Run 1 duct	1	TP-1	HC	14:34	15:06	32	
Continue				16:05	16:29	24	
Continue				17:52	17:56	4	
Continue and complete Run 1				17:58	18:50	52	
						112	
Start Run 2 duct	2	TP-1	HC	10:24	10:48	24	
Continue				10:49	11:33	44	
Continue				12:08	12:28	20	
Continue and complete Run 2				12:29	12:53	24	
						112	
Start Run 3 duct	3	TP-1	HC	17:07	17:59	52	
Continue				18:11	18:51	40	
Continue				19:13	19:25	12	
Continue and complete Run 3				19:54	20:10	16	
						120	
Start Run 4 duct	4	TP-1	HC	8:58	10:02	64	
Continue				10:03	10:20	12	
Continue				10:24	10:44	20	
Continue and complete Run 4				11:05	11:41	36	
						132	

APPENDIX H-V
EVACUATED FLASK SAMPLING LOG

APPENDIX H-VI

POLYCYCLIC ORGANIC MATTER
SAMPLING LOG

APPENDIX H-VII

PROCESS SAMPLE COLLECTION LOG

APPENDIX H-VIII

HIGH VOLUME SAMPLING LOG

APPENDIX I
PROCESS OPERATION FIELD DATA

Includes:

Field Data Containing Process Operating Parameters
Field Data On Asphalt Usage
Process Flow and Capacity Data Diagram

APPENDIX I-1

FIELD DATA ON PROCESS PARAMETERS

Table I-1. PROCESS PARAMETERS MONITORED DURING EMISSIONS TESTS ON October 7, 1975

Time	Down time (from-to)	Line speed (ft/min)	Felt roll No.	Saturant temperature (°F)	Filled coating temperature (°F)	AP across smog hogs (in. H ₂ O)		Amperage		Bundle counter reading	Felt counter reading (ft)
						I	II	I	II		
2:30 PM	-	350	14161	475	360	1.04	0.90	3.15	2.95	958,322	00215
	(Sampling for particulates and hydrocarbons commenced)										
2:45	-	350	14173	475	360	1.1	0.9	3.1	2.9	-	-
	(Striking in drum section kept open during test - saturator section fully closed)										
2:53	-	-	14163	-	-	-	-	-	-	-	-
3:00	-	350	14163	480	360	1.08	0.9	3.1	2.9	-	-
3:04	-	-	14163B	-	-	-	-	-	-	958,760	12,349
	(Felt break - stopped sampling)										
3:27	3:04-3:27	-	14163B	-	-	-	-	-	-	-	-
	(Line on)										
3:30	-	-	-	-	-	-	-	-	-	958,805	-
	(Felt break)										
3:48	3:30-3:48	-	-	-	-	-	-	-	-	-	-
	(Line on)										
3:55	-	310	14163B	485	350	-	-	-	-	958,889	16,595
	(Sampling resumed)										
4:00	-	350	14174	485	350	1.08	0.9	3.1	2.9	-	-
4:06	-	-	14177	-	-	-	-	-	-	-	-
4:15	-	360	14177	480	360	1.2	0.9	3.1	2.9	-	23,470
4:19	-	-	14174B	-	-	-	-	-	-	-	-
4:30	-	360	14162	480	360	1.24	0.9	3.1	2.9	-	-
4:35	-	310	-	-	-	-	-	-	-	-	-
	(Line speed reduced due to problems with filler - mixer)										
4:43	-	-	-	-	-	-	-	-	-	959,488	32,404
	(Felt break - sampling stopped)										
4:55	4:43-4:55	-	14275	-	-	-	-	-	-	-	-
	(Line on)										
4:58	-	250	-	-	-	-	-	-	-	-	-
5:00	-	-	-	-	-	-	-	-	-	-	-
	(Speed reduced due to problems associated with filler flow to coating mixer)										
5:05	-	-	-	-	-	-	-	-	-	-	-
	(Felt break)										
5:22	5:05-5:22	-	14277	-	-	-	-	-	-	-	-
	(Line on)										
5:35	-	250	14277	480	335	1.0	0.9	3.1	3.0	-	-
	(Low speed due to poor quality of felt)										
5:45	-	-	14178	-	-	-	-	-	-	-	-
5:50	-	320	14178	480	355	-	-	-	-	-	42,620
5:53	-	360	-	-	-	-	-	-	-	959,834	-
5:55	-	360	14178	480	360	1.12	0.9	3.1	2.9	959,852	44,218
	(Sampling resumed)										
5:58	-	-	14310	-	-	-	-	-	-	-	-

Table I.1. (Concluded)

Time	Down time (from-to)	Line speed (ft/min)	Felt roll No.	Saturant temperature (°F)	Filled coating temperature (°F)	AP across smog hogs (in. H ₂ O)		Amperage		Bundle counter reading	Felt counter reading (ft)	
						I	II	I	II			
6:10 PM	-	360	14310	475	360	1.10	0.9	3.1	2.9	3.1	2.9	-
6:13	-	-	14161	-	-	-	-	-	-	-	-	-
6:25	-	360	14312	480	360	1.14	0.9	3.0	2.9	3.1	2.9	-
6:40	-	360	-	480	355	1.12	0.9	3.1	2.9	3.1	2.9	-
6:42	-	-	14301	-	-	-	-	-	-	-	-	-
6:54	-	320	14301	485	360	0.96	0.9	3.2	3	3.2	3	-
6:55	-	-	-	-	-	-	-	-	-	-	-	63,164
7:10	-	-	-	-	-	-	-	-	-	-	-	960,577
7:11	-	-	-	-	-	-	-	-	-	-	-	-
7:25	-	-	-	-	-	-	-	-	-	-	-	-
7:31	-	360	14267	480	350	0.98	0.92	3.1	2.9	3.1	3.0	65,280
7:40	-	-	14173	-	-	-	-	-	-	-	-	-
7:45	-	360	14173	485	350	1.00	0.92	3.1	2.9	3.1	3.0	70,240
7:46	-	360	14173	485	350	1.0	0.9	3.1	2.9	3.1	3.0	70,780

Note: Total time for particulate and hydrocarbon sampling was 157 min. Production during this period amounted to 77 tons $\left(1,925 \text{ bundles} \times 80 \frac{\text{lb}}{\text{bundle}} \times \frac{1 \text{ ton}}{2,000 \text{ lb}}\right)$; felt used amounted to 9.2 tons $\left(52,389 \text{ ft} \times 0.35 \frac{\text{lb}}{\text{ft}} \times \frac{1 \text{ ton}}{2,000 \text{ lb}}\right)$. Therefore, production rate during sampling was $29.4 \frac{\text{tons}}{\text{hr}}$ and felt usage rate was 3.5 tons/hr.

* See Table A-1.1 for overall average weight computation.

Table I-1.1. WEIGHTS OF SHINGLE BUNDLES PRODUCED
BETWEEN 3 PM AND 7:30 PM

<u>Time</u>	<u>Weight (lb/bundle)</u>
3 PM	79.5, 83.5, 79
3:30	Not available
4:00	79, 85, 84
4:30	80, 82.5, 81
5:00	76, 78, 77
5:30	80, 82, 77.5
6:00	80, 82, 78
6:30	80, 80.5, 79
7:00	Not available
7:30	79, 79, 79.5

Overall average weight = 80 lb

Table I-2. PROCESS PARAMETERS MONITORED DURING EMISSIONS TESTS ON October 8, 1975

Time	Down time (from-to)	Line speed (ft/min)	Felt roll No.	Saturant temperature (°F)	Filled coating temperature (°F)	ΔP across smog hogs (in. H ₂ O)		Amperage		Bundle counter reading	Felt counter reading (ft)		
						I	II	I	II				
9:25 AM	-	320	14305	475	-	0.98	0.98	3.2	3	3.2	3.0	966,738	03360
	(Started particle sizing run)												
9:28	-	250	14266	-	-	-	-	-	-	-	-	-	-
	(Speed reduced due to accumulation down the line)												
9:33	-	-	-	-	-	-	-	-	-	-	-	-	-
	(Felt break - sampling stopped)												
10:05	-	-	14265	-	-	0.84	0.84	3.3	3.1	3.3	3.1	-	-
10:07	-	-	14265	-	-	-	-	-	-	-	-	-	-
	(Line on)												
10:15	-	320	No ID#	480	350	1.10	0.96	3.1	3.0	3.1	3.0	966,960	08600
10:20	-	360	14267	470	350	1.10	0.96	3.1	3.0	3.1	3.0	966,998	09200
	(Sampling of particulates and hydrocarbons commenced)												
10:35	-	360	-	470	-	1.10	0.94	3.1	3.0	3.1	3.0	-	-
10:38	-	-	14269	-	-	-	-	-	-	-	-	-	-
10:50	-	360	-	470	360	-	-	-	-	-	-	-	-
10:53	-	-	14281	-	-	-	-	-	-	-	-	-	-
11:05	-	360	14334	470	360	1.2	0.94	3.0	2.9	3.0	2.9	-	-
11:20	-	360	No ID#	470	360	-	-	-	-	-	-	-	-
11:32	-	-	14314B	-	-	-	-	-	-	-	-	-	-
11:35	-	360	14336B	470	360	1.26	0.94	3.0	2.9	3.0	2.9	-	-
11:44	-	-	14330	-	-	-	-	-	-	-	-	968,213	41,678
11:50	-	-	-	-	-	-	-	-	-	-	-	-	-
	(Felt break - sampling stopped)												
12:02 PM	11:50-12:02	-	-	-	-	-	-	-	-	-	-	-	-
	(Line on)												
12:05	-	-	No ID#	-	-	-	-	-	-	-	-	-	-
12:10	-	300	-	-	-	-	-	-	-	-	-	968,270	44,440
	(Sampling resumed)												
12:11	-	280	-	-	-	-	-	-	-	-	-	-	-
	(Speed reduced to splice roll)												
12:14	-	330	-	-	-	-	-	-	-	-	-	-	-
12:15	-	330	No ID#	470	360	1.14	0.92	3	2.8	3	2.9	-	-
12:17	-	-	14342	-	-	-	-	-	-	-	-	-	-
12:30	-	330	14331	470	350	-	-	-	-	-	-	-	-
	(Started particle sizing run at TP2)												
12:40	-	-	14333	-	-	-	-	-	-	-	-	-	-
12:45	-	270	14333	465	360	1.24	0.92	3	2.8	3	2.9	-	-
	(Line speed reduced to splice roll)												
12:48	-	310	-	-	-	-	-	-	-	-	-	968,766	57,194
12:52	-	-	-	-	-	-	-	-	-	-	-	-	-
	(Felt break - sampling stopped)												

Table 2. (Continued)

Time	Down time (from-to)	Line speed (ft/min)	Felt roll No.	Saturant temperature (°F)	Filled coating temperature (°F)	AP across smog hogs (ln. H ₂ O)		Ampereage		Bundle counter reading	Felt counter reading (ft)		
						I	II	I	II				
1:05 PM	12:52-1:05 (Line on)	-	-	-	-	-	-	-	-	-	-		
1:08	-	-	14339	-	-	-	-	-	-	-	-		
1:12	-	360 (Sampling resumed)	-	465	360	1.14	0.92	3	2.9	3	2.9	968,802	60,000
1:13	-	300 (Speed reduced to splice roll)	-	-	-	-	-	-	-	-	-	-	-
1:17	-	330	-	-	-	-	-	-	-	-	-	-	-
1:22	-	-	14175	-	-	-	-	-	-	-	-	-	-
1:25	-	-	-	-	-	1.14	0.92	3	2.9	3	2.9	969,007	64,260
1:35	-	-	-	-	-	-	-	-	-	-	-	-	-
1:25-1:35	-	-	-	-	-	-	-	-	-	-	-	-	-
1:39	-	-	-	-	-	-	-	-	-	-	-	-	-
1:45	-	-	-	-	-	-	-	-	-	-	-	-	-
1:47	-	-	-	-	-	1.14	0.92	3	2.9	3	2.9	-	-
1:51	-	-	-	-	-	-	-	-	-	-	-	-	-
2:20	-	-	-	-	-	-	-	-	-	-	-	-	-
1:51-2:20	-	-	-	-	-	-	-	-	-	-	-	-	-
2:25	-	-	-	-	-	-	-	-	-	-	-	69,486	-
<p>(Felt break)</p> <p>(Due to frequent felt breaks further sampling of particulates and HC's was abandoned and the test run was assumed to be completed at 1:25pm.)</p>													
3:35	-	320	-	485	360	1.22	0.9	2.9	2.8	3.0	2.8	969,230	0
<p>(Resumed particle sizing run at TP2 and started visible emission readings on both stacks (TP2 and TP3).)</p>													
3:42	-	-	14344	-	-	-	-	-	-	-	-	-	-
3:50	-	360	14257	485	360	-	-	-	-	-	-	-	-
4:05	-	360	14339	480	360	1.32	0.9	3	2.8	3.0	2.8	-	-
4:11	-	-	-	-	-	-	-	-	-	-	-	969,700	16,050
<p>(Felt break - particle sizing completed)</p>													
4:15	-	-	-	-	-	-	-	-	-	-	-	-	-
4:11-4:15	-	-	-	-	-	-	-	-	-	-	-	-	-
4:18	-	320	143408	485	360	-	-	-	-	-	-	969,760	14,655
<p>(Visible emission readings resumed)</p>													
4:35	-	370	143408	480	370	0.96	0.92	2.9	2.7	2.9	2.8	-	-
4:38	-	-	14336	-	-	-	-	-	-	-	-	-	-
4:45	-	370	14344	480	370	-	-	-	-	-	-	970,090	23,150
<p>(Started particulate and hydrocarbon sampling run)</p>													

Table I-2. (Concluded)

Time	Down time (from-to)	Line speed (ft/min)	Felt roll No.	Saturant temperature (°F)	Filled coating temperature (°F)	AP across smog hogs (in. H ₂ O)		Amperage		Bundle counter reading	Felt counter reading (ft)	
						I	II	I	II			
5:00 PM	-	370	F14340	480	370	0.98	0.94	2.9	2.7	2.9	2.8	-
5:10	-	-	14338	-	-	-	-	-	-	-	-	-
5:15	-	370	14338	480	365	-	-	-	-	-	-	-
5:18	-	-	14331	-	-	-	-	-	-	-	-	35,342
5:30	-	370	14338	480	360	0.96	0.94	2.85	2.7	2.85	2.7	-
5:37	-	-	14257	-	-	-	-	-	-	-	-	-
5:45	-	370	14257	475	360	-	-	-	-	-	-	-
5:49	-	-	F14260	-	-	-	-	-	-	-	-	-
6:00	-	370	B14260	480	360	0.96	0.94	2.85	2.7	2.85	2.7	971,065
6:15	-	370	14261	475	360	-	-	-	-	-	-	-
6:27	-	370	14263	475	360	0.96	0.94	2.85	2.7	2.9	2.75	-
6:43	-	-	-	-	-	-	-	-	-	-	-	-
6:44	-	-	-	-	-	-	-	-	-	-	-	-
6:49	-	-	-	-	-	-	-	-	-	971,774	-	67,662
7:05	-	-	-	-	-	-	-	-	-	-	-	-
7:08	-	-	-	-	-	-	-	-	-	-	-	-
7:11pm	-	350	14259	470	330	0.96	0.94	2.9	2.8	3.0	2.8	971,777
7:15	-	-	14258	-	-	-	-	-	-	971,790	-	69,600
7:17	-	-	-	-	-	-	-	-	-	-	-	-
7:25	-	360	14262	475	360	-	-	-	-	-	-	-
7:26	-	-	-	-	-	-	-	-	-	971,993	-	74,154
7:45	-	-	-	-	-	-	-	-	-	-	-	-
7:48	-	-	14256	-	-	-	-	-	-	-	-	75,578
7:50	-	300	14256	480	350	-	-	-	-	972,010	-	75,578
7:53-7:54	-	260	14256	-	-	-	-	-	-	-	-	-
7:55	-	360	14256	480	350	-	-	-	-	-	-	-
8:00	-	360	14256	480	360	0.96	0.92	3	2.8	3	2.85	-
8:03	-	-	14255	-	-	-	-	-	-	-	-	-
8:13	-	360	14255	480	360	0.96	0.92	3	2.8	3	2.85	972,300

Note: Total time for particulate and hydrocarbon sampling undertaken between 10:20 AM and 1:25 PM was 145 min. Production during this period amounted to 75.8 tons $\left(1,916 \text{ bundles} \times 79.1 \frac{\text{lb}}{\text{bundle}} \times \frac{1 \text{ ton}}{2,000 \text{ lb}} \right)$; felt used amounted to 8.7 tons $\left(49,492 \text{ ft} \times 0.35 \frac{\text{lb}}{\text{ft}} \times \frac{1 \text{ ton}}{2,000 \text{ lb}} \right)$. Therefore, production rate during sampling was $31.4 \frac{\text{tons}}{\text{hr}}$ and felt usage rate was $3.6 \frac{\text{tons}}{\text{hr}}$. Similarly, for the run sampled between 4:45 PM and 8:13 PM the production amounted to 88.2 tons $\left(2,177 \text{ bundles} \times 81 \frac{\text{lb}}{\text{bundle}} \times \frac{1 \text{ ton}}{2,000 \text{ lb}} \right)$ and felt used was 9.99 tons $\left(57,098 \text{ ft} \times 0.35 \frac{\text{lb}}{\text{ft}} \times \frac{1 \text{ ton}}{2,000 \text{ lb}} \right)$. This resulted in a production rate of $32.7 \frac{\text{tons}}{\text{hr}}$ and a felt usage rate of $3.7 \frac{\text{tons}}{\text{hr}}$. The actual sampling time for the latter run was 162 min.

a/ See Table A-2.1 for raw data and overall average weight.
 b/ See Table A-2.2 for raw data and overall average weight.

Table I-2.1. WEIGHTS OF SHINGLE BUNDLES PRODUCED
BETWEEN 10:20 AM AND 1:25 PM

<u>Time</u>	<u>Weight (lb)</u>
10:20-11 AM	Not available
11:18 AM	76, 75, 76
12:10 PM	79, 82, 78
12:40 PM	79, 80, 79
1:10 PM	82, 84, 79
Overall average weight = 79.1 lb	

Table I-2.2. WEIGHTS OF SHINGLE BUNDLES PRODUCED
BETWEEN 4:30 AND 8 PM

<u>Time</u>	<u>Weight (lb/bundle)</u>
4:30 PM	87, 83.5, 81
5:00 PM	82, 79.5, 80
5:30 PM	83, 80, 80
6:00 PM	83, 79, 81
6:30 PM	81, 79, 80
7:00 PM	82.5, 82, 79.5
7:30 PM	82.5, 82, 79.5
8:00 PM	80, 78, 79.5

Overall average weight = 81 lb

Table 3. PROCESS PARAMETERS MONITORED DURING EMISSIONS TESTS ON October 9, 1975

Time	Down time (from-to)	Line speed (ft/min)	Felt roll No.	Saturant temperature (°F)	Filled coating temperature (°F)	ΔP across smog hogs (in. H ₂ O)		Amperage		Bundle counter reading	Felt counter reading (ft)		
						I	II	I	II				
8:35 AM	-	300	107363	475	360	1.08	1.02	3.1	2.9	3.1	2.9	976,150	00060
8:45	(Started particle sizing run at TP2)												
8:50	-	340	107363	475	360	-	-	-	-	-	-	-	-
8:51	-	-	107365	-	-	-	-	-	-	-	-	-	-
9:05	-	290	107365	470	360	1.06	1.02	3.1	2.9	3.1	2.9	-	-
9:07	-	-	-	-	-	-	-	-	-	-	-	976,498	10,446
9:09	(Felt break - sampling stopped)												
9:07-9:09	(Line on)												
9:14	-	-	107355	-	-	-	-	-	-	-	-	-	-
9:18	-	310	107355	475	360	-	-	-	-	-	-	976,550	12,760
9:35	-	340	98829	475	360	1.06	1.02	2.6 ^a	2.9	3.05	2.9	-	-
9:50	-	340	107358	470	360	-	-	-	-	-	-	-	-
10:05	-	340	107358	470	365	1.36	0.98	3.05	2.9	3.05	2.9	-	-
10:10	-	-	98535	-	-	-	-	-	-	-	-	-	-
10:25	-	340	98535	470	365	1.02	0.98	3.0	2.8	3	2.9	-	-
10:31	-	-	107357	-	-	-	-	-	-	-	-	-	-
10:40	-	350	107357	470	370	-	-	-	-	-	-	-	-
10:46	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00	-	350	98530	460	370	1.1	0.98	2.6 ^a	2.8 ^a	3	2.85	-	-
11:12	-	-	98832	-	-	-	-	-	-	-	-	-	-
11:15	-	350	98832	455	370	-	-	-	-	-	-	-	-
11:30	-	350	107356	450	370	1.02	0.98	3 ^a	2.8 ^a	3	2.85	-	-
11:40	-	-	-	-	-	-	-	-	-	-	-	976,400	61,300
11:47	(Line down due to accumulation farther down the line)												
11:40-11:47	(Line on)												
11:53	-	340	-	-	-	-	-	-	-	-	-	-	-
11:55	-	-	107364	-	-	-	-	-	-	-	-	-	-
12:00 noon	-	350	107364	450	365	1.06	0.96	2.95 ^a	2.45 ^a	3	2.8	976,540	64,700
	(POM Sampling started at TP1 and TP3)												

a/ The Smog Hog representative made adjustments to the unit.

Table I-3. (Continued)

Time	Down time (from-to)	Line speed (ft/min)	Felt roll No.	Saturant temperature (°F)	Filled coating temperature (°F)	ΔP across smog hogs (in. H ₂ O)		Amperage		Bundle counter reading	Felt counter reading (ft)
						I	II	I	II		
12:15 PM	-	350	107364	450	365	-	-	-	-	-	-
12:18	-	-	98534	-	-	-	-	-	-	-	-
12:35	-	-	98531	-	-	-	-	-	-	-	-
12:40	-	350	98531	455	370	0.98	0.92	2.95	2.75	2.9	2.8
12:53	-	-	98835	-	-	-	-	-	-	-	-
12:55	-	350	98835	455	370	-	-	-	-	-	-
12:56	-	300	-	-	-	-	-	-	-	-	-
(Speed reduced due to accumulation further down the line)											
1:10	-	300	98835	455	370	1.06	0.92	2.8	2.75	2.9	2.75
1:15	-	-	107421	-	-	-	-	-	-	-	-
1:25	-	360	-	460	370	-	-	-	-	-	-
1:32	-	-	107429	-	-	-	-	-	-	-	-
1:40	-	360	107429	460	370	1.24	0.92	2.85	2.7	2.85	2.7
1:50	-	-	107423	-	-	-	-	-	-	-	-
1:55	-	-	-	-	-	-	-	-	-	979,980	4,302
(Line stopped due to accumulation at far end)											
1:58	1:55-1:58	-	-	-	-	-	-	-	-	-	-
1:59	(Line back)	320	107423	465	365	1.12	0.92	2.8	2.6	2.8	2.7
(Sampling resumed)											
2:10	-	-	107425	-	-	-	-	-	-	-	-
2:15	-	320	107425	465	365	-	-	-	-	-	-
2:30	-	-	-	460	-	-	-	-	-	-	-
2:32	-	-	107364	-	-	-	-	-	-	-	-
2:36	-	-	-	-	-	-	-	-	-	980,450	16,400
(Felt back)											
2:40	2:36-2:40	-	-	-	-	-	-	-	-	-	-
2:43	(Line on)	340	107364	460	365	1.18	0.92	2.8	2.65	2.8	2.7
POM sampling resumed											
2:54	-	370	107362	460	365	-	-	-	-	980,540	17,200
(Particle sizing run and POM sampling run completed)											
3:09	-	-	-	-	-	-	-	-	-	980,654	21,143
(Line down due to accumulation at far end)											
3:15	3:09-3:15	-	No ID#	-	-	-	-	-	-	-	-
(Line on)											
3:22	-	320	-	460	360	-	-	-	-	-	-
(Visible emission readings resumed on both stacks)											
3:35	-	370	-	455	360	1.14	0.92	2.85	2.7	2.85	2.7
3:40	-	-	98833	-	-	-	-	-	-	-	-
3:50	-	370	98833	455	365	-	-	-	-	-	-
3:55	-	-	107360	-	-	-	-	-	-	-	-

Table I-3. (Concluded)

Time	Down time (from-to)	Line speed (ft/min)	Felt roll No.	Saturant temperature (°F)	Filled coating temperature (°F)	ΔP across smog hogs (in H ₂ O)		Amperage		Bundle counter reading	Felt counter reading (ft)	
						I	II	I	II			
4:05 PM	-	320	107360	450	365	1.10	0.92	2.8	2.65	2.85	2.7	-
4:15	-	-	107430	-	-	-	-	-	-	-	-	-
4:20	-	320	107430	450	365	-	-	-	-	-	-	-
4:26	-	-	107427	-	-	-	-	-	-	-	-	-
4:35	-	320	107427	455	360	1.12	0.92	2.8	2.6	2.75	2.6	981,800
4:42	-	320	98046	455	360	1.12	0.92	2.8	2.6	2.75	2.6	981,840
(Completed visible emission readings on both stacks)												

Note: Total time for POM sampling was 163 min. Production during this period amounted to 78.8 tons $\left(2,004 \text{ bundles} \times 78.6 \frac{\text{lb}}{\text{bundles}} \times \frac{1 \text{ ton}}{2,000 \text{ lb}} \right)$; felt used amounted to 8.8 tons $\left(55,295 \text{ ft} \times 0.32 \frac{\text{lb}}{\text{ft}} \times \frac{1 \text{ ton}}{2,000 \text{ lb}} \right)$. Therefore, production rate during sampling was $29 \frac{\text{tons}}{\text{lb}}$ and felt usage rate was 3.2 tons/hr.

g/ See Table A-3.1 for overall average weight computation.

Table I-3.1. WEIGHTS OF SHINGLE BUNDLES PRODUCED
BETWEEN 12 NOON AND 3 PM

<u>Time</u>	<u>Weight (lb)</u>
12 noon	76, 77, 79
12:30	79, 80, 79
1:00	77, 77, 79
1:30	79, 80, 77
2:00	80, 80, 77
2:30	Not available
3:00	80, 79.5, 79.5

Overall average weight = 78.6 lb

Table I-4. PROCESS PARAMETERS MONITORED DURING EMISSIONS TESTS ON October 10, 1975

Time	Down time (from-to)	Line speed (ft/min)	Felt roll No.	Saturant temperature (°F)	Filled coating temperature (°F)	AP across smog hogs (in. H ₂ O)		Amperage		Bundle counter reading	Felt counter reading (ft)
						I	II	I	II		
8:45 AM	-	320	98815	460	355	0.94	0.86	3.2	3	990,780	00080
8:52	-	-	-	-	-	-	-	-	-	-	-
8:53	-	-	97988	-	-	-	-	-	-	-	-
8:56	-	-	-	-	-	-	-	-	-	990,864	02731
9:00	-	320	97988	455	355	0.94	0.86	3.2	3	990,906	03390
9:07	-	300	-	-	-	-	-	-	-	-	-
9:12	-	-	97999	-	-	-	-	-	-	-	-
9:15	-	300	97999	455	355	-	-	-	-	-	-
9:30	-	300	-	455	355	1.0	0.88	3.1	2.95	-	-
9:35	-	-	98820	-	-	-	-	-	-	-	-
9:45	-	360	98820	455	355	-	-	-	-	-	-
9:52	-	-	98809	-	-	-	-	-	-	-	-
10:00	-	360	98809	450	360	1.18	0.88	3.1	2.9	-	-
10:10	-	-	98008	-	-	-	-	-	-	-	-
10:15	-	360	98008	450	360	-	-	-	-	991,865	28,930
10:19	-	-	-	-	-	-	-	-	-	991,921	30,370
10:20	-	-	-	-	-	-	-	-	-	991,921	30,370
10:30	-	350	98008	455	360	1.24	0.88	3	2.85	-	-
10:32	-	-	98813	-	-	-	-	-	-	-	-
10:43	-	-	98813	-	-	-	-	-	-	992,226	38,106
10:56	-	320	97986	450	360	-	-	-	-	-	-
11:00	-	350	97986	450	360	-	-	-	-	992,239	39,590
11:15	-	350	97986	450	360	-	-	-	-	-	-
11:23	-	-	98806	-	-	-	-	-	-	-	-
11:30	-	350	98806	455	360	0.92	0.86	3.1	2.9	-	-
11:38	-	350	98242	455	360	0.92	0.88	3.0	2.9	992,740	52,750

Note: Total time for particulate and hydrocarbon sampling was 152 min. Production during this period amounted to 74.4 tons (1,905 bundles x $78.1 \frac{\text{lb}}{\text{bundles}} \times \frac{1 \text{ ton}}{2,000 \text{ lb}}$); felt used amounted to 8.6 tons ($50,527 \text{ ft} \times 0.34 \frac{\text{lb}}{\text{ft}} \times \frac{1 \text{ ton}}{2,000 \text{ lb}}$). Therefore, production rate was

29.4 tons/hr and felt usage rate was 3.4 tons/hr.

g/ See Table A-4.1 for raw data and overall average weight.

Table I-4.1. WEIGHTS OF SHINGLE BUNDLES PRODUCED
BETWEEN 9:40 AM AND 11:40 AM

<u>Time</u>	<u>Weight (lb)</u>
9:40 AM	77, 80, 77
10:10	79, 80, 79
10:40	78, 78, 79
11:10	76, 78, 78
11:40	78, 78, 77

Overall average weight = 78.1 lb

Table I-5. CHARACTERISTICS OF FELT ROLLS USED DURING EMISSIONS TESTS ON October 7, 1975

Felt characteristics	Roll numbers																
	14161	14173	14163	14163B	14174	14177	14174B	14162	14275	14277	14178	16310	14161	14312	14301	14267	14173
Length (ft)	-	3718	4805	-	4219	3618	4219	4719	3832	4690	4976	4862	-	4219	4776	5062	3718
Width (in.)	← 36 1/8 →																
Gauge (thickness)	-	55	55.5	55.5	55	55	55	54.5	54	53	54	57	-	54	55	54	55
Weight of roll (lb)	1688	1300	1680	1680	1475	1265	1475	1650	1340	1640	1740	1700	1685	1770	1670	1475	1300
Moisture content (%)	-	3.5	2.5	2.5	4.5	2.5	4.5	3.0	3.5	2.5	3.5	3.5	1.5	3.5	3.5	3.5	3.5
Kerosene value	-	136	136	136	134	133	134	133	136	134	135	135	130	137	-	139	136
Tensile	-	45	46	46	44	43	44	44	42	44	44	44	44	43	43	48	45

Table I-6. CHARACTERISTICS OF FELT ROLLS USED DURING EMISSIONS TESTS ON October 8, 1975

Felt characteristics	Roll numbers																	
	14305	14265	14267	14269	14281	14334	14266	14334B	14330	14342	14331	14333	14339	14175	14344	14257	14340B	14336
Length (ft)	-	-	4219	-	-	4662	-	-	3475	4333	4333	4161	-	-	3203	-	-	-
Width (in.)	← 36 1/8 →																	
Gauge (thickness)	-	54	54	-	-	-	55	-	-	-	-	-	56	-	52	-	54	55
Weight (lb)	1815	1660	1475	1695	1680	1665	1710	1665	1215	1645	1515	1455	1525	1595	1120	1595	1650	1770
Moisture content (%)	-	-	5.5	4.5	4.5	3.5	-	2.0	2.0	3.5	3.5	2.0	3.5	2.5	2.0	5.5	4.5	2.0
Kerosene value	137	138	139	137	130	135	139	135	138	145	148	142	135	141	148	137	135	137
Tensile	45	47	48	42	44	47	-	-	46	46	44	45	43	46	41	43	45	44

Felt characteristics	Roll numbers															
	14339	14344	F14340	14338	14331	14338	14257	F14260	B14260	14261	14263	14259	14258	14262	14256	14255
Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Width (in.)	← 36 1/8 →															
Gauge (thickness)	-	52	54	-	-	54	55	-	56	56	54	55	56	56	-	-
Weight (lb)	1670	1120	1650	975	1515	975	1695	1680	1680	1630	1595	1490	1065	1660	1890	1680
Moisture content (%)	3.5	2.0	4.5	3.5	3.5	3.5	5.5	3.5	3.5	5.5	4.0	5.5	3.5	7.0	3.5	3.5
Kerosene value	136	148	135	137	148	137	137	138	138	141	142	135	136	137	135	137
Tensile	45	41	45	46	44	46	43	44	44	42	46	46	41	45	40	40

Table I-7. CHARACTERISTICS OF FELT ROLLS USED DURING EMISSIONS TESTS ON October 9, 1975

Felt characteristics	Roll numbers															
	107363	107365	107355	98829	107358	98535	107357	98530	98832	107356	107364	98534	98531	98835	107421	107429
Length (ft)	-	-	6985	6266	6548	7243	6985	6553	6670	-	-	7243	6553	6667	-	6091
Width (in.)	← 36 1/8 →															
Gauge (thickness)	-	-	55.5	55.5	57	54	55	56.4	56	59.5	59.5	54.5	55	57.9	-	-
Weight (lb)	2430	2340	2360	2117	2213	2223	2360	2011	2254	2360	2360	2223	2011	2253	2330	2390
Moisture content (%)	-	-	6.0	5.1	5.6	7.0	6.0	4.9	5.1	-	7.0	7.0	4.9	6.0	-	-
Kerosene value	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	183
Tensile	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Felt characteristics	Roll numbers								
	107423	107425	107364	107362	98833	107360	107430	107427	98046
Length (ft)	6103	6703	-	-	-	-	-	-	-
Width (in.)	← 36 1/8 →								
Gauge (thickness)	-	-	59.5	56.6	57	56.8	56.8	56.8	60.4
Weight (lb)	2160	2410	2174	2308	2254	2213	2261	2265	2126
Moisture content (%)	-	-	6.3	-	-	5.6	4.5	6.7	7.8
Kerosene value	183	186	184	188	205	187	183	186	194
Tensile	-	-	-	-	-	-	-	-	-

Table I-8. CHARACTERISTICS OF FELT ROLLS USED DURING EMISSIONS TESTS ON October 10, 1975

Felt characteristics	Roll numbers											
	98815	97988	97999	98820	98809	98008	98813	97986	98806	98806	98242	
Length (ft)	-	-	-	-	6864	6864	6534	6616	6360	-	-	
Width (in.)	← 36 1/8 →											
Gauge (thickness)	59	60	56	59.6	55.9	56.8	59.7	62.5	58.4	56		
Weight (lb)	2208	2236	2436	2191	2320	2320	2208	2236	2149	2353		
Moisture content (%)	7.6	8.7	8.0	6.5	6.0	6.0	7.6	8.7	9.9	-		
Kerosene value	191	192	196	194	195	195	191	192	182	191		
Tensile	60	49	54	50	57	57	60	49	58	67		

I-I-I-∞

Table I-9. CHARACTERISTICS OF ASPHALT USED DURING OCTOBER 7-10, 1975^{a/}

	Softening point (°F)	Penetration	Flash point (°F)
Saturant	135-150 ^{b/} (140.6) ^{c/}	-	437+
Coating (unfilled)	200-220 ^{b/} (212-214) ^{c/}	14	437+

Percent saturation = 168.8-173.3

Breakdown of shingle by weight

Weight of cut-out shingle	= 97.8 lb
Dry felt	= 11.5 lb
Saturant	= 20.3 lb
Coating (unfilled)	= 13.6 lb
Filter	= 13.6 lb
Back coating and sand	= 8.8 lb
Granules	= <u>30.6 lb</u>
 Total	 98.4 lb

a/ Data provided by plant personnel.

b/ Range desired.

c/ Actually observed during the above period.

APPENDIX I-2

FIELD DATA ON ASPHALT USAGE

Table I-10. SUMMARY OF ASPHALT USAGE DURING October 7, 1975,
TO October 10, 1975

<u>Date and time</u>	<u>Asphalt used</u>	
	<u>Saturant</u>	<u>Unfilled coating^{a/}</u>
October 7, 1975 6 a.m.-7:55 p.m. (usage time 14 hr)	11,845 gal. (51.47 tons)	10,788 gal. (47.09 tons)
October 8, 1975 6 a.m.-8:15 p.m. (usage time 14 hr)	14,142 gal. (61.46 tons)	12,247 gal. (53.46 tons)
October 9, 1975 6 a.m.-3 p.m. (usage time 9 hr)	8,493 gal. (36.91 tons)	8,681 gal. (37.89 tons)
October 10, 1975 6 a.m.-12 noon (usage time 6 hr)	7,582 gal. (32.9 tons)	Not available

^{a/} Unfilled coating is coating asphalt without the filler. The filler is usually an inert material like limestone dust.

①

Calculations - Asphalt Usage

from AH lines
in storage
tanks

<u>10/7/75</u>	Tanks <u>2</u>	<u>3</u>
start 6 AM	15-11	2-9
stop 7:55 PM	16-8	5-6
	0-9 x 5288	2-9 x 5288 840
	3966 gal	2310 gal
	2310	

6276 gal x 8.6913 = 54,517

Transferred in (truck) 55,688 gal x 11 = 48,400

11845 gal	102,917
-----------	---------

Tanks <u>6</u>	<u>7</u>	thrust
start 6 AM	8-7	2-7
stop 7:55 PM	6-2	1-0
	-(2'-5")	-(1'-7")
Transfers in	11-0	9-10
from thrust	8-4	7-6
	2-8	2-4

Used from thrust: 2-8 x 3669 = 9784

2-4 x 3669 = 8560

18,344

" " tank #6 (2-5) x 840 = -2030

16,314

" " " #7 (1-7) x 840 = -2830

14,984 gal

14,984 gal x 8.7298 gal =	130,807
---------------------------	---------

Note: Saturated and coating into (#/gal) derived from data supplied by Hunt Oil company with the asphalt.

10/8/5

Tank 2

Tank 3

start 6 AM 16-0 3-4

stop 8:15 PM 17-8 3-1

1-8 -(0-3)

Usage from #2 1-8 x 5288 gal/Hr = 8813 gal

" + #3 -(0-3) x 840 gal/Hr = -210 gal

8603 gal

Wt. used 8,603 gal x 8.6913 = 74,771[#]

Truck deliveries 5,539 " x " = 48,140[#]

14,142 gal 122,911[#]

Tank 6

Tank 7

start 6 AM 10-10 6-8

stop 8:15 PM 7-2 1-0

-(3-8) -(5-8)

Usage from #6 -(3-8) x 840 gal/Hr = -3080 gal

T7 -(5-8) x 840 gal/Hr = -4761 gal

-7841 gal

Hunt transfers #1 #2

~~6-2~~ ~~5-7~~

~~10-8~~ ~~7-8~~

~~4-4~~ ~~2-1~~

Used from Hunt ~~4-4~~ x 3669 = 15898 gal

~~2-1~~ x 6 = 7644

23,542 gal

Net usage 23,542 +

- 7,841

15,701 gal x 8.7298[#]/gal = 137,067[#]

③

10/9/5

	Tank 2	Tank 3
Start 6 AM	10-5	3-7
Stop 3 PM	16-2	2-1
	-(0-3)	-(1-6)

Usage from T2 = $-(0-3) \times 5288 = -1322 \text{ gal}$
 T3 = $-(1-6) \times 840 = -1260$
 $= -2582 "$

Truck deliveries

#1 $48,160 \# / 8.6913 \#/\text{gal} = 5541 \text{ gal}$
 $48,100 \# / " = 5534 \text{ cu}$
96,260 # 11,075 "

Net usage

Trucks $11,075 \text{ gal} \times 8.6913 \#/\text{gal} = 96,260 \#$
 Tanks $-2582 " \times " = -22,441 \#$
8,493 gal 73,819 #

	Tank 6	Tank 7
Start 6 AM	10-0	5-4
Stop 3 PM	13-6	1-5
	3-6	-(3-11)

Usage from T6 $3-6 \times 840 \text{ gal}/\text{ft} = 2940 \text{ gal}$
 T7 $-(3-11) \times " = -3290 "$

-350 gal

~~350 gal x 8.7298 #/gal = 3055 #~~

Heat transfera ① $3-3 \times 3669 = 11,924 \text{ gal}$

Net Usage - Tanks $-350 \text{ gal} \times 8.7298 \#/\text{gal} = -3055 \#$
 Heat = $11,924 " \times " = 104,094$
11,574 gal 101,039 #

(9)

10/10/75

	Tank 2	Tank 3
start	15-1	5-0
stop	16-7	4-7
	1-6	-(0-5)

Usage from T2 = 1-6 x 5288 = 7932 gal
 T3 = -(0-5) x 840 = -350 "
 7582 "

Truck deliveries - none

Net usage = 7582 gal x 8.6913 gal = 65,897 "

	Tank 6	Tank 7
start 6AM	6-5	11-8
stop 3PM	6-1	0-6
	-(0-4)	-(11-2)

Usage from T6 = ~~3-5~~ x ~~840~~ gal/h = -280
 T7 = -(11-2) x " = -9382
 -9662 gal

Heat transfers 0

x 3669 gal/h =

no data available on AHJ heat transfer to units
 (calculated from AHJ in T6 and T7) will be low

T6 7-2

T7 11-2

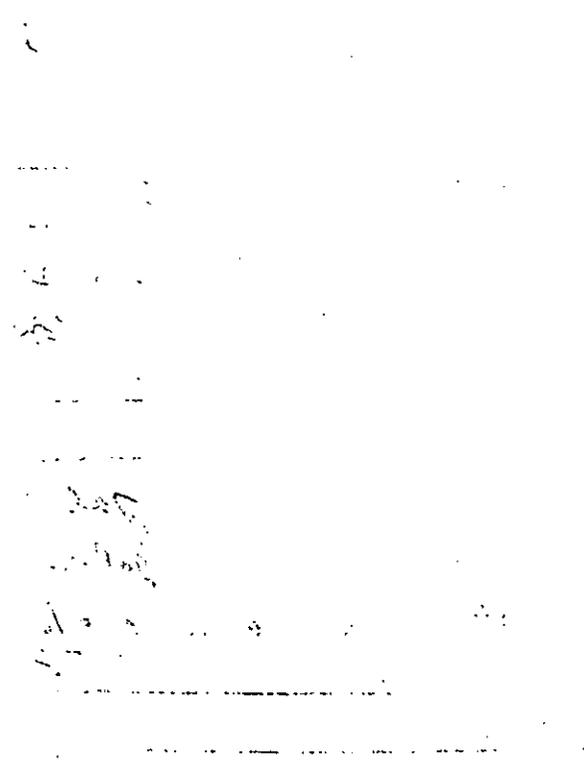
18-4 x 540 gal/h = 15660 gal

Net usage: tanks -9662 gal x 8.7298 gal = -84,347
 Heat 15660 " " = 136,450
 51,103 "

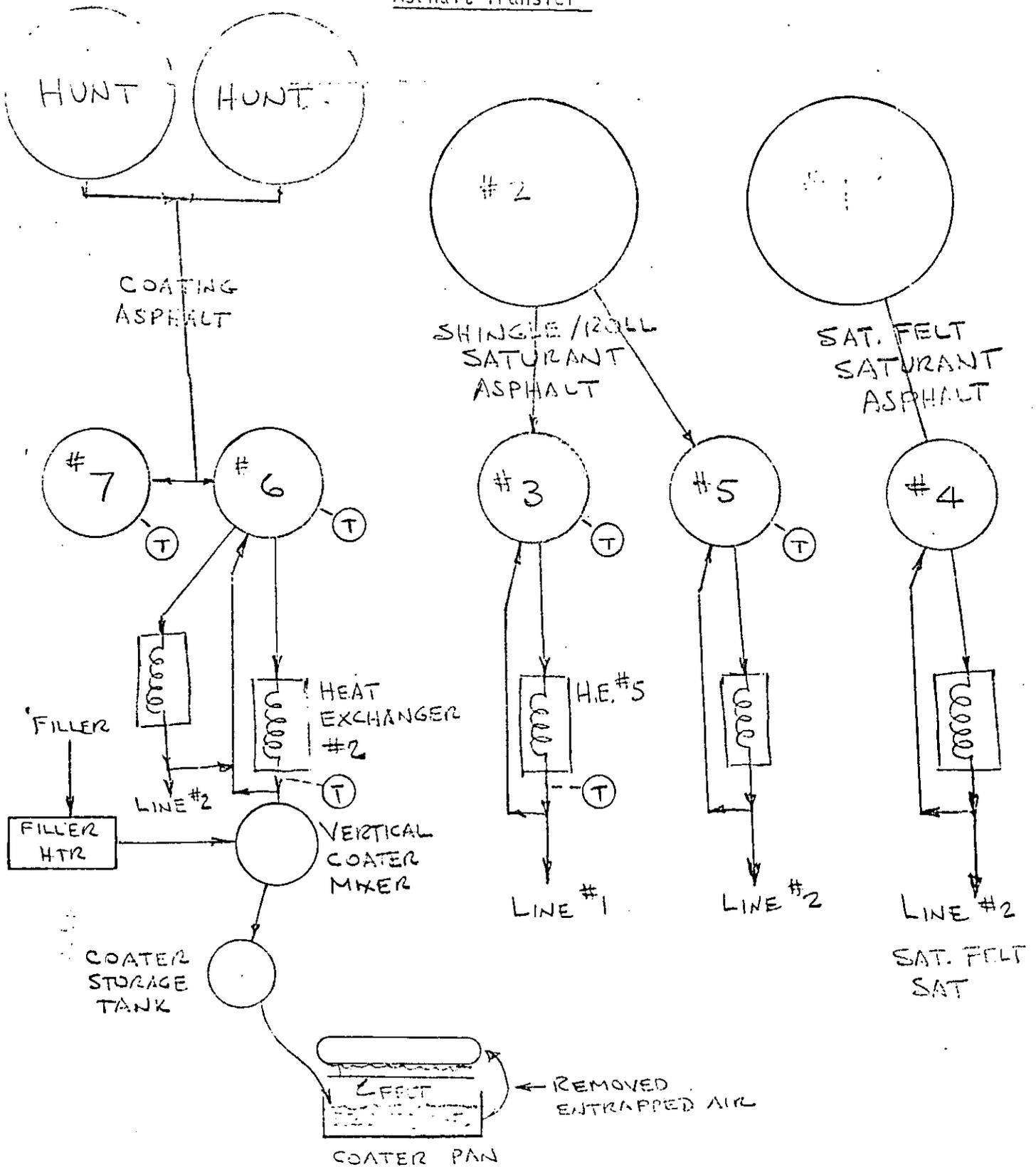


APPENDIX I-3

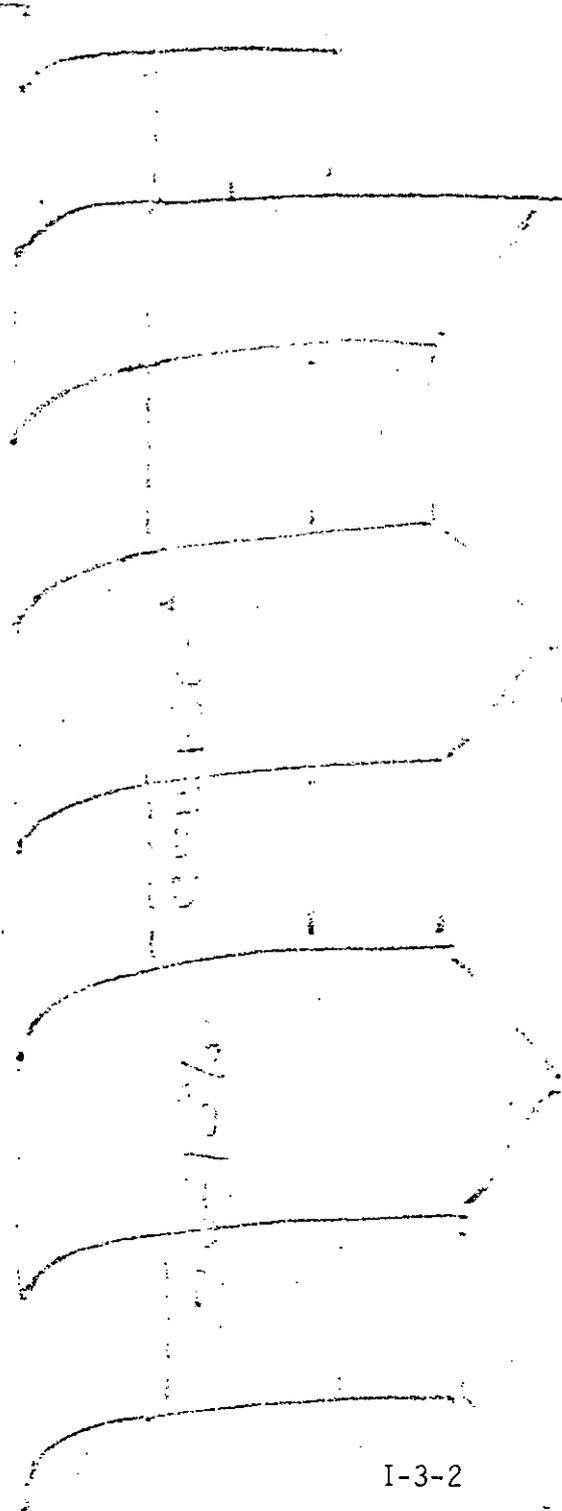
PROCESS FLOW AND CAPACITY DATA DIAGRAMS



Schematic
Asphalt Transfer

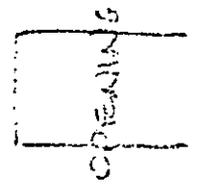


Handwritten notes at the top of the page, possibly describing the subject or context of the drawing.



OPENING FOR
SHAFT OF DIAL
(COVER MOUNT)

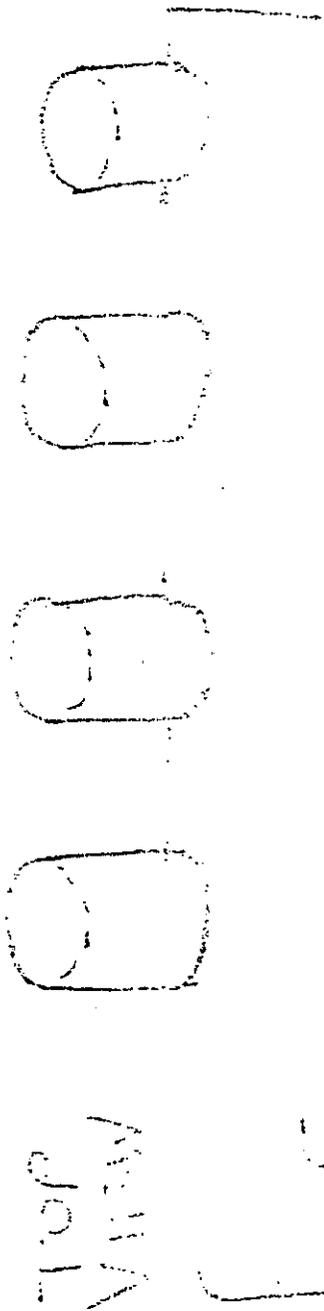
ALUMINUM 1/2" DEEP, ASPHALT 10',
LOWER ROLLER 6'-8" OFF
BOTTOM,
13 DIPS & 1 DANCER (SHALLOW
DIP)



STRIKING - 18'

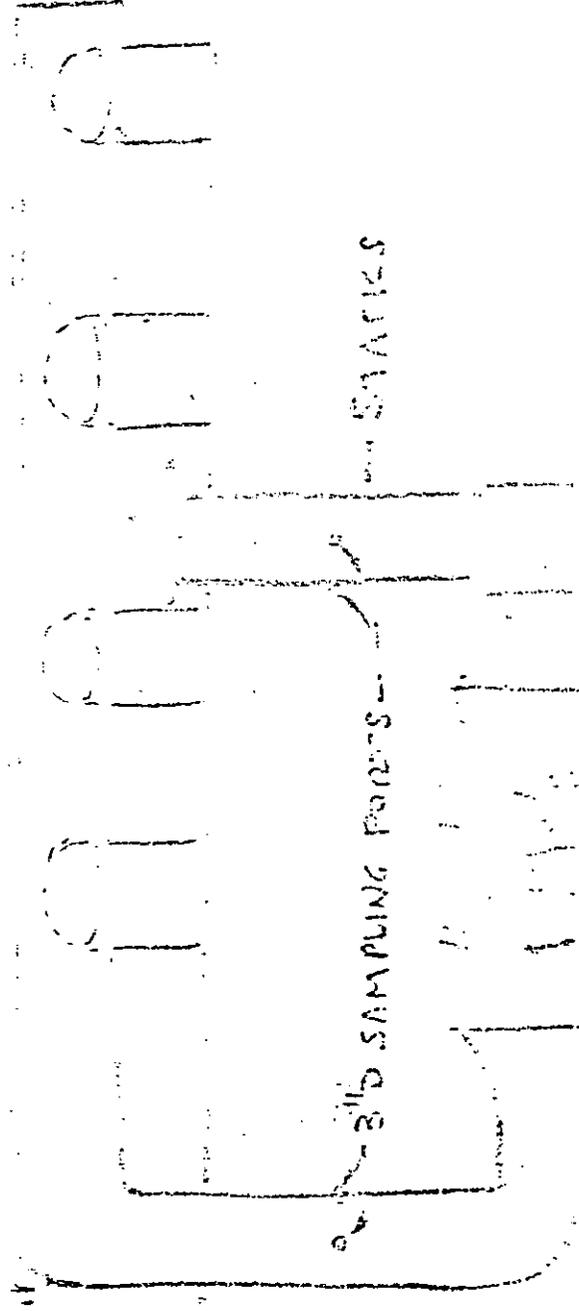
SATURATOR

Hand Threading / Cotton / Fourpins



TOP
BOTTOM

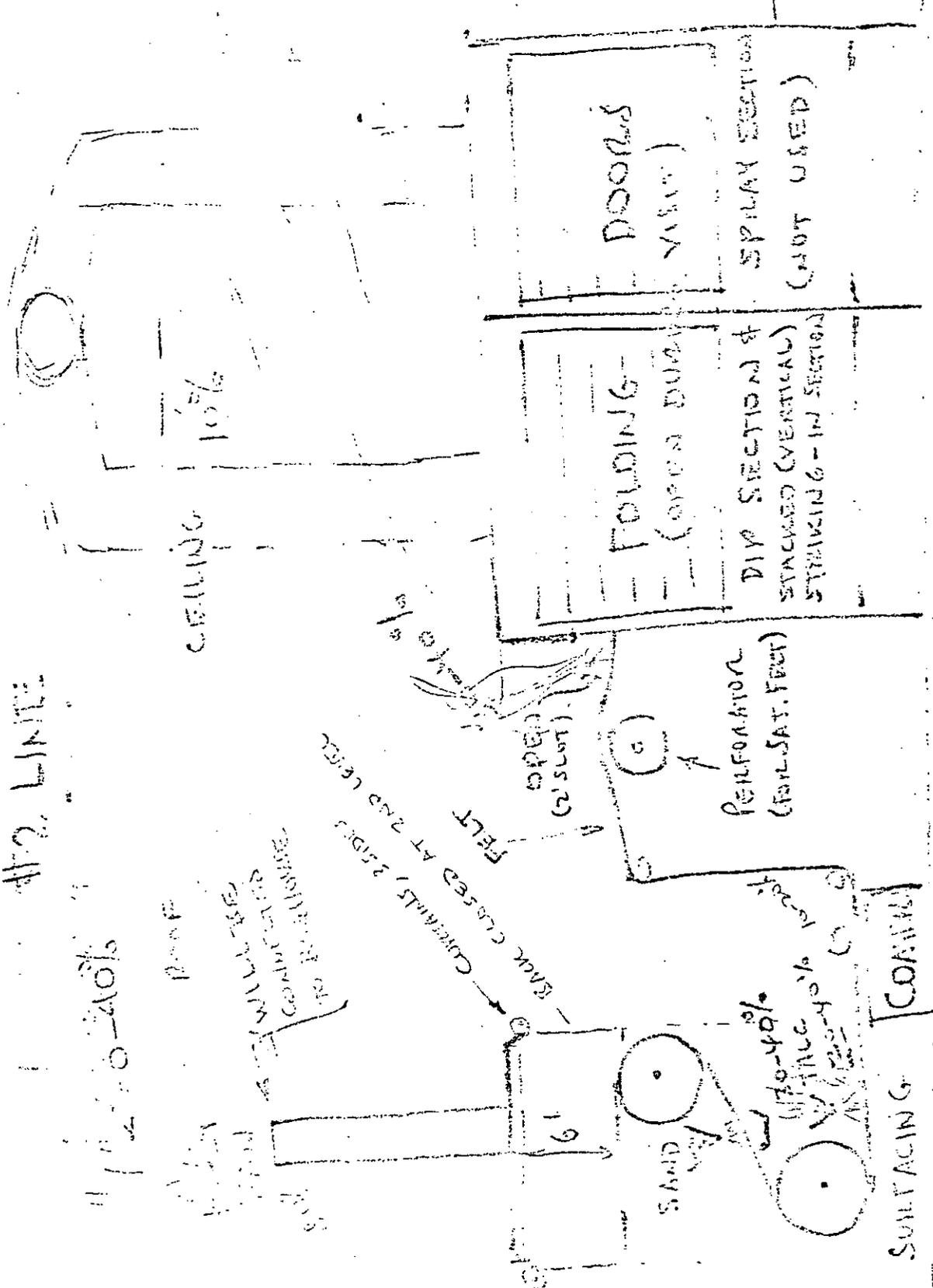
TOP SHAFT
BOTTOM SHAFT



TOP SHAFT
BOTTOM SHAFT

TOP SHAFT
BOTTOM SHAFT

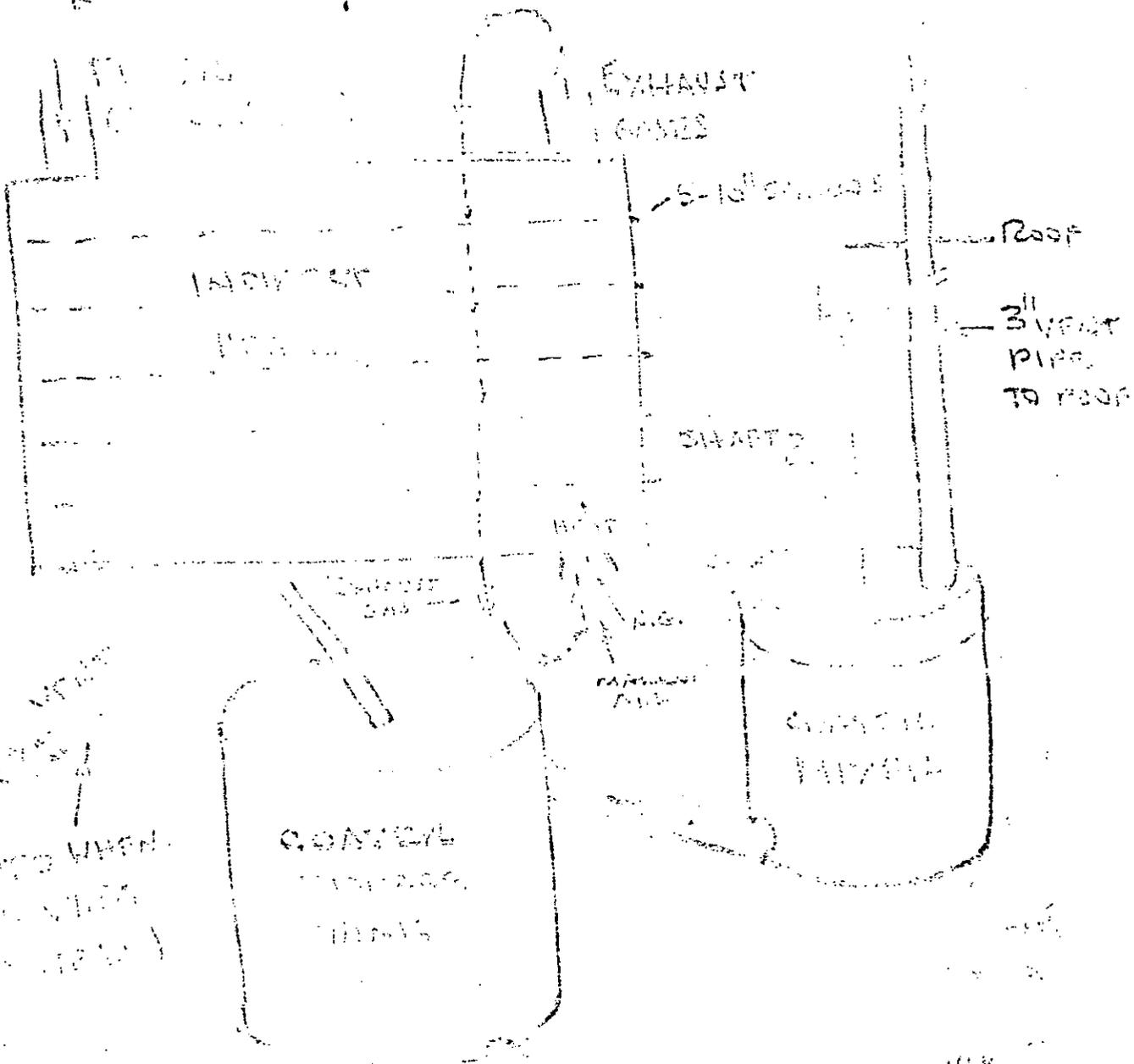
472 LINE



FEB FUMES ESCAPED HROD
EVEN WHEN OPEN

NO DUST
CONTROL
LITTLE VIBRA
(LOW 7007)

NO DUST
CONTROL



USED WHEN
 ...
 ...

Please Refer To
 ...
 ...

CELATEX PLANT
FAIRFIELD, ALABAMA
Oct 7, 1975

PROCESS PARAMETERS TO BE MONITORED

DURING EMISSION TESTS ON ASPHALT SHINGLE

SATURATOR AT CELATEX'S FAIRFIELD, ALABAMA PLANT

- 1) Line Speed (ft/min) every 15 minutes during run.
 - 2) Downtime (when it occurs)
 - 3) Saturant temperature (ie temp. of saturant in saturator) every 15 minutes during run
 - 4) Filled Coating temperature (ie temp of coating in coater) every 15 minutes during run
 - 5) Felt Roll No. & Felt characteristics such as felt gage, felt wt., tensile, kerosene value, % moisture ~~etc~~, felt width, etc
 - 6) Specs. of saturant, coating used during run.
(Specs. to include softening point, penetration, etc)
 - 7) Felt footage used during run
 - 8) No. of shingles and total weight of shingles produced during run.
 - 9) Pressure drop across filter of Smog Hog units
 - 10) Amperage readings for Smog Hog units
- (If observation during first run indicates constant reading then neglect for entire or minor variation runs)

Sampling Conditions

- 1) Sampling to be done when line speed is ≥ 300 ft/min
- 2) Sampling to be done only when line is running, even for reading visible emissions
- 3) Ananth to inform Gene Riley "start-stop" times for sampling.

Information on ESPs

- 1) Manufacturer, model No.
- 2) Capacity
- 3) Rating / Specs. and name plate data.
- 4) Specs on Transformer used.

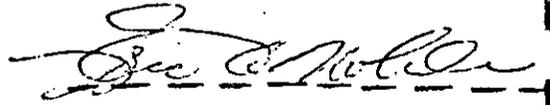
Other information

- 1) Level of asphalt in tank @ start/end of run (for saturant) (quantity used)
- 2) Level of asphalt in tank @ start/end of run (for coating) (" " " "



Essential to know
if coating is supplied
to 1 line or both.
If to both, then
omit reading level of
asphalt in tank.

- 3) check % saturation during run.



ERIC NOBLE
EPA

 Oct 17, 1975
K. P. ANANTH
MRI

APPENDIX J
SAMPLE IDENTIFICATION LOGS

IDENTIFICATION LOG OF SAMPLES COLLECTED

CELOTEX ROOFING PRODUCTS

Plant Prichard, Alabama
 Location _____
 Industry ROOFING PRODUCTS
 Project No. G 2872-3714

Battelle Record Book No 32220
 Collected & Recorded By Payton
 Page 1 of 10.

EPA No.	Date	Run Number	Sample Description	Remarks
S75-006			CLEAN-UP EVALUATION PRE-SAMPLING	
	10/6/75		CRP-CU TP1 (inlet to Smog Hog)	
360	"	"	TCE rinse of nozzle & probe, etc.	
361	"	"	Acetone rinse of -ditto-	
362	"	"	TCE rinse of prefilter	
363	"	"	Glass fiber filter (can be used as blank, also)	
364	"	"	Impinger catch	
365	"	"	TCE RINSE of impingers	
366	"	"	Acetone rinse of impingers	
			CRP-CU TP2 (outlet, North, from SMOG HOG)	
367	"	"	TCE rinse of nozzle & probe	
368	"	"	Acetone rinse of - ditto*	
369	"	"	TCE rinse of prefilter	
370	"	"	Glass fiber filter	
371	"	"	Impinger catch	
372	"	"	TCE rinse of impingers, connectors	
373	"	"	Acetone rinse of impingers, connectors	
			CRP-CU TP3 (outlet, South, from Smog Hog)	
374	"	"	TCE rinse of nozzle, probe, front half	
375	"	"	Acetone rinse of nozzle, probe, etc.	
376	"	"	TCE rinse of prefilter	
377	"	"	Glass fiber filter	
378	"	"	Impinger catch	
379	"	"	TCE rinse of impingers, connectors,	
380	"	"	Acetone rinse of impingers, connectors, etc.	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CELOTEX ROOFING PRODUCTS
 Location Madison, Alabama
 Industry Roofing
 Project No. G 2872-3714

Battelle Record Book No 32220
 Collected & Recorded By Baytos
 Page 2 of 10

EPA No.	Date	Run Number	Sample Description	Remarks
S75-006				
			STATION TP-1 (Inlet to Smog Hog)	
	10/7/75	CRP TP1-1		
381	"	"	TCE RINSE of nozzle & probe	28.9
382	"	"	Acetone rinse of -ditto-	5.4
383	"	"	TCE rinse of prefilter	457.9
384	"	"	Glass fiber filter BAL-4	38.7 - 0.6 = 38.1
385	"	"	Impinger catch	—
386	"	"	TCE RINSE OF impingers & connectors —	
387	"	"	Acetone rinse of Impingers & connectors —	
			CRP-TP1-2	
388	10/8/75	"	TCE rinse of front half	18.2
389			Acetone rinse of front half	3.4
390			TCE rinse of pre filter	(void, not necessary to use)
391			Glass fiber filter BAL-5	402.3 - 0.6 = 401.7
392			Impinger catch	—
393			Tce rinse of impingers & connectors —	
394			Acetone rinse of back half	—
			CRP-TP1-3	
395	"	"	TCE rinse of front half	12.3
396			Acetone rinse of Front half	3.7
397			TCE rinse of prefilter	void, not necessary to use.
398			Glass fiber filter 8	464.2 - 0.6 = 463.6
399			Impinger catch	
400			TCE rinse of back half	
401			Acetone rinse of back half	

530.3

423.3

489.6

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CELOTEX ROOFING PRODUCTS
 Location Montgomery, Alabama
 Industry Roofing
 Project No G 2872-3714

Battelle Record Book No 32220
 Collected & Recorded By Baytos
 Page 3 of 10

EPA No.	Date	Run Number	Sample Description	Remarks
S75-006			STATION TP-2 (Outlet from Smog Hog)	
	10/7/75	CRP-TP2-1		
402	"	"	TCE rinse of Nozzle & probe	39.9
403	"	"	Acetone rinse of Nozzle & probe	6.2
404	"	"	Glass fiber filter BAL 2	$27.5 - 0.6 = 26.7$ Note: no cyclone prefilter us
405	"	"	Impinger catch	—
406	"	"	Tce rinse of impinger	—
407	"	"	Acetone rinse of Impingers & connectors	—
		CRP-TP2-2	<i>Broken connector</i>	
408	10/8/75	"	TCE rinse of front half	6.6
409			Acetone rinse of front half	3.0
410			Glass fiber filter BAL 5.6	$6.57 - 0.6 = 6.0$
411			Impinger catch	—
412			TCE rinse of back half	—
413			ACetone rinse back half	—
		CRP-TP2-3		
414	"	"	TCE rinse of front half	28.1
415			Acetone rinse of front half	2.5
416			Glass fiber filter 9	$8.75 - 0.6 = 8.2$
417			Impinger catch	
418			TCE rinse of back half	
419			Acetone rinse of back half	

73.

15.6

38.

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CELOTEX ROOFING PRODUCTS
 Location PRICHARD, ALABAMA
 Industry Roofing
 Project No. G 2872-3714

Battelle Record Book No. 32220
 Collected & Recorded By Baytos
 Page 4 of 10

EPA No.	Date	Run Number	Sample Description	Remarks
S75-006				
			STATION TP-3 (Outlet from Smog Hog)	
	10/7/75	CRP-TP3-1		
420	"	"	TCE rinse of Nozzle & probe	25.8
421	"	"	Acetone rinse of nozzle & probe	5.2
422	"	"	Glass fiber filter BAL 3	24.4 - 0.6 = 23.8
423	"	"	Impinger catch	54.8
424	"	"	TCE rinse of impingers & connectors	
425	"	"	Acetone rinse of impingers & connectors	
		CRP-TP3-2		
426	10/8/75	"	TCE rinse of front half	7.0
427			Acetone rinse of front half	3.3
428			Glass fiber filter BAL 7	4.05 - 0.6 = 3.45 = 3.5
429			Impinger catch	13.8
430			TCE rinse of back half	
431			Acetone rinse of back half	
		CRP-TP3-3		
432			TCE rinse of front half	11.1
433			Acetone rinse of front half	2.9
434			Glass fiber filter BAL 10	9.57 - 0.6 = 9.0
435			Impinger catch	23,
436			TCE rinse of back half	
437			Acetone rinse of front half	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CELOTEX ROOFING PRODUCTS
 Location Fairfield, Alabama
 Industry Asphalt roofing
 Project No. _____

Battelle Record Book No 32220
 Collected & Recorded By Baytos
 Page 5 of 10.

EPA No. S75-006	Date	Run Number	Sample Description CLEAN -UP EVALUATION	Remarks
			POST SAMPLING	
		CRP-CU	TP1A	
438		"	TCE rinse of nozzle &	
439	"	"	Acetone rinse of nozzle & probe	
440	"	"	Acetone rinse of prefilter	
441	"	"	Glass fiber filter	
442	"	"	Impinger catch	
443	"	"	TCE rinse of impingers & connectors	
444	"	"	Acetone rinse of impingers & connectos	
		CRP-CU	TP2A	
445	"	"	TCE rinse of nozzle & probe	
446	"	"	Acetone rinse of nozzle & probe	
447	"	"	Glass fiber filter	
448	"	"	Impinger catch	
449	"	"	TCE rinse of impingers	
450	"	"	Acetone rinse of impingers	
		CRP-CU	TP3A	
451		"	TCE rinse of front half	
452	"	"	Acetone rinse of front half	
453			Glass fiber filter	
454			Impinger catch	
455			TCE rinse of back half	
456			Acetone rinse of back half	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CELOTEX ROOFING PRODUCTS
 Location Mobile, Alabama
 Industry Asphalt roofing
 Project No 2872-3714

Battelle Record Book No 32220
 Collected & Recorded By Baytos
 Page 8 of 10

EPA No. S75-006	Date	Run Number	Sample Description	Remarks
	10/10/75		CRP-TP1-4	
466	"	"	TCE rinse of front half	18.1
467	"	"	Acetone rinse of front half	2.6
468	"	"	Glass fiber filter BAL-14	332.6 - 0.6 = 332.
469	"	"	Impinger catch	352.7
470	"	"	TCE rinse of impingers	
471	"	"	Acetone rinse of impingers	
	"		CRP-TP2-4	
472	"	"	TCE RINSE OF FRONT HALF	4.9
473	"	"	Acetone rinse of front half	3.3
474	"	"	Glass fiber filter BAL-15	2.7 - 0.6 = 2.1
475	"	"	Impinger catch	10.3
476	"	"	TCE rinse of back half	
477	"	"	Acetone rinse of back half	
			CRP-TP3-4	
478	"	"	TCE rinse of front half	5.7
479	"	"	Acetone rinse of front half	2.2
480	"	"	Glass fiber filter BAL-16	4.5 - 0.6 = 3.9
481	"	"	Impinger catch	11.8
482	"	"	TCE rinse of back half	
483	"	"	Acetone rinse of back half	

APPENDIX K

ANALYTICAL DATA SHEETS
AS RECEIVED FROM
BATELLE COLUMBUS LABORATORIES

Includes:

1. Table summary of front half mass data.
2. Copies of lab notebook sheets relating to Item 1. (LRB-32220)
3. Lab report of ultimate analysis performed on ESP recovery oil sample.
4. Air drying weight loss vs time lab data.

master
Rec'd 5-74
2-5-74



Columbus Laboratories
515 King Avenue
Columbus, Ohio 43201
Telephone (614) 424-4424
Telex 24-3354

February 4, 1976

Mr. Clyde E. Riley
Emission Measurement Branch
Office of Air Quality Planning
and Standards
U.S. Environmental Protection Agency
Research Triangle Park
North Carolina 27711

Dear Gene:

The attachments to this letter, which reports results of additional analyses on samples relating to Task 37 of Contract 68-02-1409 (sampling at the Celotex Plant in Alabama), are as follows:

- (1) Table 1--a summary of front half mass data
- (2) Copies of lab notebook sheets relating to Item 1 (LRB-32220)

- (3) Table 2--ultimate analysis of the process samples
- (4) A copy of the lab report on the ultimate analysis.

Please call if you have any questions.

Sincerely,

Richard E. Barrett
Associate Manager
Combustion Systems Section

REB:iw

In triplicate

cc: T. Bibb (ltr only)

Barrett
Change

TABLE K-1. SUMMARY OF MASS COLLECTED IN FRONT HALF OF STACK GAS SAMPLING TRAIN, CELOTEX ROOFING, FAIRFIELD, ALABAMA, OCTOBER 6-11, 1975
(ALL VALUES IN MILLIGRAMS)

Run No.:	CRP- TP1-1		TP2-1		TP3-1		TP1-2		TP2-2		TP3-2		TP1-3		TP2-3		TP3-3		TP1-4		TP2-4		TP3-4	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Data, Not Corrected for Blanks																								
Filter Catch	38.7		27.5		24.4		402.2		6.6		4.0		464.2		8.7		9.6		332.6		2.7		4.5	
TCE Wash--front half	29.2		40.2		26.1		18.5		7.0		7.3		22.6		28.4		11.4		18.1		5.2		6.0	
Acetone Wash--front half	5.4		6.2		5.2		3.4		3.0		3.3		3.7		2.5		2.9		2.8		3.3		2.2	
Prefilter	458.2		--		--		--		--		--		--		--		--		--		--		--	
TOTAL	531.5		73.9		55.7		424.1		16.6		14.6		490.5		39.6		23.9		353.5		11.2		12.7	
Data, Corrected for Blanks																								
Filter Catch(a)	38.1		26.9		23.8		401.6		6.0		3.6		463.6		8.1		9.0		332.0		2.1		3.9	
TCE Wash, front half(b)	29.0		40.0		25.9		18.3		6.7		7.1		22.4		28.2		11.2		2.6		5.0		5.8	
Acetone Wash, front half(c)	5.4		6.2		5.2		3.4		3.0		3.3		3.7		2.5		2.9		18.1		3.3		2.2	
Prefilter	458.0		--		--		--		--		--		--		--		--		--		--		--	
TOTAL	530.5		73.1		54.9		423.3		15.7		14.0		489.7		38.8		23.1		352.7		10.4		11.9	

(a) Filter blank = 0.6 mg.
(b) TCE blank correction, 1.2 µg/ml.
(c) Acetone blank correction, < 0.0 µg/ml.

Work Performed by: B. Bayton B. Johnson Project No. Y2873-2714 Date of Work: September 20, 1975

Title or Purpose: Tare weights of filters Celotex Plac, Fairfield ALA. Continued from:

MSA GLASS FILTERS - CAT-75428 LOT # J 2162

86 Circles cut from 8x10 sheet stock - ea circle, stamped for I.D. over dish, dissected

ROW # EPA #	Final wt. 1-13-76 not dissected 1-15-75	TARE grams	Final wt. 10-15-75 dissected.	100C mg.
BAL - 1	CRP-TP2-1	0.391640	0.389740g	1.9
2	575-006-404 ✓	0.415757	0.387515g	0.415001 27.5 24.5 ✓
3	CRP-TP3-1 575-006-422 ✓	0.417832	0.395482g	0.419840 24.4
4	CRP-TP1-1 575-006-384 ✓	0.431730	0.393675g	0.432347 38.7 38.67
5	CRP-TP1-2 575-006-391 ✓	0.794960	0.374135g	0.796384 2.3402.25
BAL - 6	CRP-TP2-2 575-006-410 ✓	0.401200	0.395135g	0.401702 6.57 7.61
7	CRP-TP3-2 575-006-428 ✓	0.397736	0.394095g	0.398144 4.25 5.05 ✓
8	CRP-TP1-3 575-006-395 ✓	0.859370	0.396214g	0.860393 464.2 464.2
9	CRP-TP2-3 575-006-416 ✓	0.398015	0.389755g	0.398500 8.75
10	CRP-TP3-3 575-006-439 ✓	0.399524	0.370539g	0.400109 9.5
BAL - 11	CRP-P04-TP1 575-006-500	0.390213	0.388647g	1.6
12	CRP-P04-TP2 575-006-500 ✓		0.389682g	0.392956 3.3
13	CRP-P04-TP1 575-006-493 ✓		0.395087g	0.652327 257.2
14	CRP-TP1-4 575-006-468 ✓	0.723274	0.391970g	0.724565 332.6
15	CRP-TP2-4 575-006-474 ✓	0.393080	0.390615g	0.393327 2.7
BAL - 16	CRP-TP3-4 575-006-480 ✓	0.395805	0.391600g	0.396069 4.5
17		0.393151	0.392800g	-
18	BLANK 575-006-488 ✓	0.390209	0.389845g	0.390465 0.62 0.63
19	BLANK 575-006-482 ✓	0.390019	0.389682g	0.390242 0.5
20	BLANK 575-006-488 ✓		0.386415g	0.386965 0.55

Average blank - 0.6

BCL Record Book No 32220

Entered by: W. Bayton + Beryl Johnson

Date: _____ Continued to: _____

Performances of this work observed by:

Disclosed to and understood by me:

Date: _____ Date: _____
Date: _____ Date: _____

0 5 10 15 20 25 30

Work Performed by: *Boyle & Management* Project No. *2872-3718* Date of Work: *Jan 24, 1976* to
Title or Purpose: *Runt# CRP-TP1-1 (INLET)* *Rund for wt 32220* Continued from:

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

EPA No. S75-006-	Final Wt. grams	Tare grams	Weight Change mg	Remarks
------------------	-----------------	------------	------------------	---------

5	(1) Fiber Glass filter Filter No. <i>VAL-4</i>	<i>-384</i>	<i>0.43173³ - 1/13/16</i> <i>0.432347 10/15/15</i>	<i>0.393675</i>	<i>38.7</i>	<i>✓</i> <i>0.6 = 38.1</i>
10	(2) TCE wash of front half Evap. dish No. <i>381</i> Total vol <i>140.6 ml</i> <i>173.1g - 358.7 = 185.6g</i>	<i>381</i>	<i>46.9735 11/27/16</i> <i>124176</i> <i>46.3448³</i>	<i>140.6 x .0018 = 0.25308</i>	<i>29.2</i>	<i>✓</i> <i>0.2 = 29.2</i> <i>28.9</i>
15	(2a) Acetone wash of front half Evap. dish No. <i>382</i> Total vol <i>155 ml</i> <i>173.6 - 246.7 = 122.7</i>	<i>382</i>	<i>46.4268 11/27/16</i> <i>46.4214</i>		<i>5.4</i>	<i>✓</i> <i>5.4</i>
20	(2b) TCE rinse of pre filter. Evap. dish No. <i>383</i> Total vol <i>150 ml</i> <i>3x TCE 195.9</i>	<i>383</i>	<i>42.8495</i> <i>42.3413</i>	<i>150 x .0018 = 0.27</i>	<i>458.2</i>	<i>- 0.2 = 458.2</i> <i>457.9</i>
25	(3) Impinger water Evap. dish No _____ Total vol _____ ml					
30	(4) Solvent extractio of impinger water Evap. dish No _____ Total vol _____ ml					
35	(5) TCE rinse of back half Evap. dish No _____ Total vol _____ ml					
40	(5a) Acetone rinse of back half Evap. dish No _____ Total vol _____ ml					

0 5 10 15 20 25 30

Entered by: *Boyle* Date: _____ Continued to: _____
Performances of this work observed by: _____ Disclosed to and understood by me: _____
Date: _____ Date: _____
Date: _____ Date: _____

Work Performed by: Baylor + Merryman Project No. Y2872-3718 Date of Work: Jan 24, 1976

Title or Purpose: RUN# CRP-TP-1-2 (INLET) at 32220 Continued from: Reine Bach

CELCTEX ROOFING PRODUCTS

Fairfield, Alabama

EPA No.	Final Wt. grams	Tare grams	Weight Change mg	Remarks
S75-006-				- BLANK

(1) Fiber Glass filter

Filter No. DHL-5

391
 0.794960
 0.796384 - 10/15/75
 0.394135
 402.2
 402.3
 -0.6 = 401.7

(2) TCE wash of front half

Evap. dish No. 388
Total vol 161.5 ml

388
 46.4010
 112712.12
 46.3825
 18.5
 -0.2 = 18.3
 18.2

$175.0 - 388 = 213.2$

$161.5 \times 0.0018 = .29$

(2a) Acetone wash of front half

Evap. dish No. 389
Total vol 152.9 ml

389
 42.9724
 112712.12
 42.9690
 3.4
 -0 = 3.4

$173.6g - 294.2g = 120.6$



(3) Impinger water

Evap. dish No. _____
Total vol _____ ml

(4) Solvent extraction of impinger water

Evap. dish No. _____
Total vol _____ ml

(5) TCE rinse of back half

Evap. dish No. _____
Total vol _____ ml

(5a) Acetone rinse of back half

Evap. dish No. _____
Total vol _____ ml

Entered by: Baylor

Date: _____ Continued to: _____

Performances of this work observed by: _____

Disclosed to and understood by me: _____

Date: _____ Date: _____
 Date: _____ Date: _____

0 5 10 15 20 25 30

Work Performed by: *Bryant & Merrymen* Project No. *42872-3718* Date of Work: *Jan 24, 1976*

Title or Purpose: *RUN # CRP-TP1-3* *Remed. Cont.* # *3720* Continued from: *(NLET)*

GELOTEX ROOFING PRODUCTS
Fairfield, Alabama

EPA No.	Final Wt. grams	Tare grams	Weight Change mg	Remarks
S75-006-				

(1) Fiber Glass filter
Filter No. *PAE-8*

0.854370 - 1/13/76
0.860393 - 10/15/76 *0.396214* *464.2* *v E*
-0.6 = 463.6

(2) ICE wash of front half
Evap. dish No. *6-395*
Total vol *173* ml
176.9 - 405.5 = 228.6 grams

395 44.0891 1/27/76 am 44.0665 *22.6* *v E*
173 x .0018 = .31 *-0.2 = 22.4*
22.3

(2a) Acetone wash of front half
Evap. dish No. *6-396*
Total vol _____ ml
176.4 - 334.2

396 45.3530 1/27/76 am 45.3493 *3.7* *v E*
-0 = 3.7

(3) Impinger water
Evap. dish No. _____
Total vol _____ ml

(4) Solvent extraction of impinger water:
Evap. dish No. _____
Total vol _____ ml

(5) ICE rinse of back half
Evap. dish No. _____
Total vol _____ ml

5a) Acetone rinse of back half
Evap. dish No. _____
Total vol _____ ml

0 5 10 15 20 25 30

Entered by: *Bryant* Date: _____ Continued to: _____
Performances of this work observed by: _____ Disclosed to and understood by me: _____

Date: _____ Date: _____
Date: _____ Date: _____

Work Performed by: Bryant & Mangum Project No. 12872-3718 Date of Work: Jan 24, 1976

Title or Purpose: Run# CRP-TPI-4 32220 Continued from:

GELOYEX ROOFING PRODUCTS
Fairfield, Alabama

INLET

EPA No.	Final Wt. grams	Tare grams	Weight Change mg	Remarks
S75-006-				

(1) Fiber Glass filter

Filter No. BA-114

-468	0.723274 0.724666	0.391970	332.6	-0.6 = 332
------	----------------------	----------	-------	------------

(2) TCE wash of front half

Evap. dish No b-46
Total vol 130.8 ml

-466	45.8752	45	2.8	130.8 x .0018 = .24
------	---------	----	-----	---------------------

217.0 - 384.7 = 172.7g

(2a) Acetone wash of front half

Evap. dish No b-451
Total vol ml

-467	44.1 45.1222	44.9041	18.1	TCE and acetone samples believed to have been labeled wrong. (See below)
------	-----------------	---------	------	--

217.2 - 455.1

TPI

(b.t.)

(3) Impinger water

Evap. dish No
Total vol ml

	TCE	Acetone	Volume CFM
1.	29.9	5.4	105
2.	18.2	3.4	105

(4) Solvent extract of impinger water

Evap. dish No
Total vol ml

3.	22.3	3.7	113
4.	2.6	2.6	113

18.1 * check

(5) TCE rinse of back half

Evap. dish No
Total vol ml

* TCE - sample containers were believed to have been switched or labeled incorrectly. TCE has been proven to remove more of the oil residue than acetone. C.E. Riley 2-24-76

(5a) Acetone rinse of back half

Evap. dish No
Total vol ml

Entered by Bryant

Date: Continued to:

Performances of this work observed by:

Disclosed to and understood by me:

Date: Date:
Date: Date:

Work Performed by: *Rayford Mayman* Project No. *2872-3718* Date of Work: *Jan 24, 1976*

Title or Purpose: *RUAF CRP-TP2-1* *Revised Protocol* *32220* Continued from:

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

EPA No.	Final Wt. grams	Tare grams	Weight Change mg	Remarks
S75-006-				

(1) Fiber Glass filter
Filter No. *BAL-2*

4011 *0.415752* *0.415001-10/13/75* *0.387515*

27.5
24.5 - *0.6* = *26.1*

(2) TCE wash of front half
Evap. dish No. *402*
Total vol *152* ml

47.0873 *1/27/76* *47.6862*
81.6650 *152* *81.6278*

40.2 - *0.2* = *40.0*
39.9

173.3 - 312.6
374.4 - 173.0 = 201.4g

40.2 *7.0018* = *.27*

(2a) Acetone wash of front half
Evap. dish No. *403*
Total vol *173.6* ml

46.4592 *1/27/76* *46.4530*

6.2 *6.2*

173.3 - 312.6 = 139.3

(3) Impinger water
Evap. dish No. _____
Total vol _____ ml

(4) Solvent extraction of impinger water:
Evap. dish No. _____
Total vol _____ ml

(5) TCE rinse of back half
Evap. dish No. _____
Total vol _____ ml

(5a) Acetone rinse of back half
Evap. dish No. _____
Total vol _____ ml

Entered by: *Rayford* Date: _____ Continued to: _____

Performances of this work observed by: _____ Disclosed to and understood by me: _____

Date: _____ Date: _____
Date: _____ Date: _____

Work Performed by: Baylor Maryman Project No. 2272-3718 Date of Work Jan 24, 1976

Title or Purpose: Run # CRP TP 2-2 Round Brook
at 3222.0 Continued from:

CELOTEX ROOFING PRODUCTS

OUTLET

1	Fairfield, Alabama	EPA No. S75-006-	Final Wt. grams	Tare grams	Weight Change mg	Remarks
5	(1) Fiber Glass filter Filter No. <u>861-6</u>		0.40120 ^{1/12/76} 0.40170 ^{10/15/15}	0.395135	7.6	-0.6 = 6.0
10	(2) TCE wash of front half Evap. dish No. <u>403</u> Total vol <u>224.5</u> ml <u>175.5 - 48.0 = 30.5</u>		45.8850 ^{11/27/76}	45.8750	7.0	-0.3 = <u>6.6</u>
15	(2a) Acetone wash of front half Evap. dish No. <u>404</u> Total vol <u>207.5</u> ml <u>175.3 - 346.2 = 164.9</u>		43.2226 ^{11/27/76}	43.2196	3.0	3.0
20	(3) Impinger water Evap. dish No. <u> </u> Total vol <u> </u> ml					
25	(4) Solvent extraction of impinger water: Evap. dish No. <u> </u> Total vol <u> </u> ml					
30	(5) TCE rinse of back half Evap. dish No. <u> </u> Total vol <u> </u> ml					
30	5a) Acetone rinse of back half Evap. dish No. <u> </u> Total vol <u> </u> ml					

Entered by: Baylor

Date: _____ Continued to: _____

Performances of this work observed by:

Disclosed to and understood by me:

Date: _____ Date: _____
Date: _____ Date: _____

Work Performed by: Bryant Mayman Project No. 912872-3718 Date of Work: Jan 24, 1976

Title or Purpose: Run # CAP-TP 2-3 Rec'd Book 103 32220 Continued from:

CELOTEX ROOFING PRODUCTS
Fairfield, Alabama

EPA No.	Final Wt. grams	Tare grams	Weight Change mg	Remarks
S75-006-				

(1) Fiber Glass filter

Filter No. P121

416	0.39805 0.3985	0.384755	8.3	-0.6 = 5.7 8.2
-----	-------------------	----------	-----	-------------------

(2) TCE wash of front half

Evap. dish No. 419
Total vol 156.5 ml

414	45.4845	45.4664	28.4	28.2
	156.5 x 0.018 =			28.1

(2a) Acetone wash of front half

Evap. dish No. 415
Total vol 167.3 ml

415	42.2529	42.3504	2.5	2.5
-----	---------	---------	-----	-----

(3) Impinger water

Evap. dish No. _____
Total vol _____ ml

(4) Solvent extract of impinger water

Evap. dish No. _____
Total vol _____ ml

(5) TCE rinse of back half

Evap. dish No. _____
Total vol _____ ml

5a) Acetone rinse of back half

Evap. dish No. _____
Total vol _____ ml

Entered by: Bryant

Performances of this work observed by:

Date:

Disclosed to and understood by me:

Continued to:

Date:

Date:

Date:

Date:

0	5	10	15	20	25	30
---	---	----	----	----	----	----

Work Performed by: Baylor Meyman Project No. 2872-3718 Date of Work: Jan 24, 1976

Title or Purpose: Rem: CRP TP2-4 Rem: bal # 32220 Continued from:

GELONIA ROOFING PRODUCTS Birmingham, Alabama		EPA No. S75- 006-	Final Wt. grams	Tare grams	Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. <u>RAL-15</u>	-414	0.3933 ²⁷	10/15/16	0.3966 ¹⁵	2.7	<u>2.1</u> -0.6 = 2.1
(2) TCE wash of front half <u>6-471</u> Evap. dish No <u>471</u> Total vol <u>168.1 ml</u> <u>217.2 - 439.1 = 221.9</u>	-471	43.8379	11/27/16	43.8317	5.2	<u>6.5</u> -10.2 = 6.5
(2a) Acetone wash of front half <u>6-473</u> Evap. dish No <u>473</u> Total vol <u>239.7 ml</u> <u>217.0 - 402.4 = 184.4</u>	-473	47.2033		47.2000	3.3	<u>4.9</u>
<u>TP-2</u>						
(3) Impinger water Evap. dish No <u>1</u> Total vol <u>ml</u>	1	39.9		6.2	26.9	107
(4) Solvent extraction of impinger water: Evap. dish No <u>2</u> Total vol <u>ml</u>	2	6.6		3.0	6.0	<u>4.9</u> Broken connector
(4) Solvent extraction of impinger water: Evap. dish No <u>3</u> Total vol <u>ml</u>	3	28.1		2.5	8.2	101
(4) Solvent extraction of impinger water: Evap. dish No <u>4</u> Total vol <u>ml</u>	4	4.9		3.3	2.1	103
(5) TCE rinse of back half Evap. dish No <u>1</u> Total vol <u>ml</u>						<u>check</u>
5a) Acetone rinse of back half Evap. dish No <u>1</u> Total vol <u>ml</u>						

0	5	10	15	20	25	30
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Entered by: Baylor Date: _____ Continued to: _____

Performances of this work observed by: _____ Date: _____

Disclosed to and understood by me: _____ Date: _____

_____ Date: _____

_____ Date: _____

Work Performed by: Baxter/Morgan Project No. 2872-3718 Date of Work Jan 24, 1976

Title or Purpose: Part CRP 103-1 Rec'd Book No. 3220 Continued from:

CELGON ROOFING PRODUCTS PRATTVILLE, Alabama	EPA No. S75- 006-	Final Wt. grams	Tare grams	Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. <u>6AL-3</u>	<u>422</u>	<u>0.4178</u> <u>0.4198</u> ⁴⁰	<u>0.3954</u> ⁸²	<u>24.4</u>	<u>-0.6 = 23.8</u>
(2) TCE wash of front half Evap. dish No. <u>420</u> Total vol <u>154.9 ml</u> <u>174.2g - 378.8 = 224.5g</u>	<u>420</u>	<u>43.2250</u>	<u>43.1989</u>	<u>26.1</u>	<u>Sample has some water, found 6.6 wt. % of moisture. - 0.2 = 25.9</u>
(2a) Acetone wash of front half Evap. dish No. <u>421</u> Total vol <u>121.4 ml</u> <u>174.3g - 344.2g = -174.9g</u>	<u>-421</u>	<u>43.2600</u>	<u>43.2548</u>	<u>5.2</u>	
(3) Impinger water Evap. dish No. _____ Total vol _____ ml					
(4) Solvent extracti of impinger wate Evap. dish No. _____ Total vol _____ ml					
(5) TCE rinse of back half Evap. dish No. _____ Total vol _____ ml					
5a) Acetone rinse of back half Evap. dish No. _____ Total vol _____ ml					

Entered by: Baxter Date: _____ Continued to: _____
 Performances of this work observed by: _____ Disclosed to and understood by me: _____
 Date: _____ Date: _____
 Date: _____ Date: _____

Work Performed by: Baylor Mangman Project No: 2872-3718 Date of Work: Jan 24, 1976

Title or Purpose: Run # CAP-TP 3-2 Recycle Bank No. 32210 Continued from:

CELOTEX ROOFING PRODUCTS
Enterprise, Alabama

OUTLET

	EPA No.	Final Wt. grams	Tare grams	Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. <u>6AL-7</u>	S75-006-	0.3477 ³⁶ 0.3981 ⁴⁴	0.3940 ⁵⁵	4.0 5.1	- 0.6 = 3.6 3.5
(2) TCE wash of front half Evap. dish No <u>426</u> Total vol <u>160</u> ml <u>170.5 - 387.7 = 217.2</u>	426	48.3928 <u>160 x .0018 = .29</u>	48.3855	7.3	0.2 = 7.4 7.0
(2a) Acetone wash of front half Evap. dish No <u>427</u> Total vol <u>149.4</u> ml <u>175.0 - 332.5 = 157.5</u>	427	45.5960	45.5927	3.3	3.3
(3) Impinger water Evap. dish No _____ Total vol _____ ml					
(4) Solvent extracti of impinger water: Evap. dish No _____ Total vol _____ ml					
(5) TCE rinse of back half Evap. dish No _____ Total vol _____ ml					
5a) Acetone rinse of back half Evap. dish No _____ Total vol _____ ml					

Entered by: Baylor

Date:

Continued to:

Performances of this work observed by:

Disclosed to and understood by me:

Date:

Date:

Date:

Date:

0	5	10	15	20	25	30
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Work Performed by: Baylor/Murrayman Project No. 2872-3718 Date of Work: Jan 24, 1976

Title or Purpose: Rainfall CRP TP 3-3 Record No. 32220 Continued from:

CLEANEX ROOFING PRODUCTS Prattville, Alabama		EPA No.	Final Wt. grams	Tare grams	Weight Change mg	Remarks
outlet						
(1) Fiber Glass filter		S75-006-				- BLANK
Filter No. <u>434</u>			<u>0.399524</u>			
			<u>0.400109</u>	<u>0.390539</u>	<u>9.6</u>	<u>1.0</u>
(2) TCE wash of front half						
Evap. dish No. <u>432</u>				<u>11.1196</u>		
Total vol <u>172</u> ml		<u>432</u>	<u>44.0563</u>	<u>44.0449</u>	<u>11.4</u>	<u>11.2</u>
<u>176.8 - 404.6 = 227.2 g</u>				<u>172 x .0015 = 31</u>		<u>11.1</u>
(2a) Acetone wash of front half						
Evap. dish No. <u>433</u>						
Total vol <u>229.3</u> ml		<u>433</u>	<u>45.5262</u>	<u>45.5233</u>	<u>2.9</u>	<u>2.9</u>
<u>174.4 - 385.5 = 211.1 g</u>						
(3) Impinger water						
Evap. dish No. _____						
Total vol _____ ml						
(4) Solvent extract of impinger water						
Evap. dish No. _____						
Total vol _____ ml						
(5) TCE rinse of back half						
Evap. dish No. _____						
Total vol _____ ml						
(5a) Acetone rinse of back half						
Evap. dish No. _____						
Total vol _____ ml						

0	5	10	15	20	25	30
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Entered by: Baylor Date: _____ Continued to: _____

Performances of this work observed by: _____ Disclosed to and understood by me: _____

Date: _____ Date: _____

Date: _____ Date: _____

Work Performed by: Dayton/Maryman Project No. 7372-3718 Date of Work: Jan 24, 1976

Title or Purpose: Run # CRP TP 3-4 Record Book # 32220 Continued from:

CRP ROOFING PRODUCTS
Princeton, Alabama

outlet

	EPA No.	Final Wt. grams	Tare grams	Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. <u>0AL-16</u>	460	0.395805 0.396069	0.391600	4.5	- 0.6 = 3.9
(2) ICE wash of front half Evap. dish No. <u>475</u> Total vol <u>1500</u> ml <u>217.0 - 423.3 = 106.3g</u>	475	45.2633	45.2573	6.0	- 0.2 = 5.8
(2a) Acetone wash of front half Evap. dish No. <u>479</u> Total vol <u>1600</u> ml <u>217.0 - 343.5 = 126.5g</u>	479	44.2480	44.2458	2.2	2.2
<u>TP 3</u>					
(3) Impinger water Evap. dish No. <u>1</u> Total vol <u> </u> ml	1				
(4) Solvent extract of impinger water Evap. dish No. <u>4</u> Total vol <u> </u> ml	4				
(5) ICE rinse of back half Evap. dish No. <u> </u> Total vol <u> </u> ml					
(5a) Acetone rinse of back half Evap. dish No. <u> </u> Total vol <u> </u> ml					

Entered by: Dayton Date: _____ Continued to: _____

Performances of this work observed by:	Disclosed to and understood by me:
Date: _____	Date: _____
Date: _____	Date: _____

0	5	10	15	20	25	30
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Work Performed by: *Baxter/...* Project No. *877-3718* Date of Work *Jan 24, 1976*
Rec'd Book # 32220

Title or Purpose: *- BLANKS -* Continued from:

CELESTEX ROOMING PRODUCTS Fairfield, Alabama	EPA No. S75- 006-	Final Wt. grams	Tare grams	Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. <i>Pol 18</i> <i>Pol 19</i>	<i>-482</i>	<i>0.3964⁶⁵</i>	<i>0.3898¹⁵</i>	<i>0.63</i>	<i>0.6 mg</i>
	<i>-488</i>	<i>0.3962⁴²</i>	<i>0.3896⁸²</i>	<i>0.56</i>	
(2) TCE wash of front half Evap. dish No. <i>0-16</i> Total vol <i>144</i> ml <i>516.2 - 216.5 = 299.7 =</i>	<i>-483</i>	<i>0.3869⁶⁵</i>	<i>0.3864¹⁵</i>	<i>0.55</i>	
(2a) Acetone wash of front half Evap. dish No. <i>0-47</i> Total vol <i>144</i> ml <i>410.2 - 216.7 = 193.5</i>	<i>485</i>	<i>46.8278</i>	<i>46.8275</i>	<i>0.3 mg</i>	<i>0.2 mg</i> <i>1164 = 1.2 mg/ml</i>
(2b) TCE rinse of pre filter. Evap. dish No. <i>0-11</i> Total vol <i>250</i> ml <i>467.3 - 216.8 = 250.4</i>	<i>486</i>	<i>45.4510</i>	<i>45.4511</i>	<i>0.0</i>	<i>0.11 mg/ml</i>
(3) Impinger water Evap. dish No. <i>0-11</i> Total vol <i>250</i> ml	<i>484</i>	<i>43.9020</i>	<i>43.9004</i>	<i>1.6</i>	<i>0.50 water</i> <i>862.497303</i>
(4) Solvent extraction of impinger water Evap. dish No. _____ Total vol _____ ml					
(5) TCE rinse of back half Evap. dish No. _____ Total vol _____ ml					
(5a) Acetone rinse of back half Evap. dish No. _____ Total vol _____ ml					

0	5	10	15	20	25	30
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Entered by: *Baxter* Date: _____ Continued to: _____
 Performances of this work observed by: _____ Date: _____
 Disclosed to and understood by me: _____ Date: _____
 _____ Date: _____

The NALIN LABORATORIES - - - - -

2441 CLEVELAND AVENUE
AREA CODE 814
PHONE 263-3580

COLUMBUS, OHIO 43211
February 1, 1976

CONSULTING
TECHNICAL SERVICES
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COAL ANALYSIS
WATER ANALYSIS
STANDARD SOLUTIONS FOR WATER ANALYSIS

CERTIFICATE OF ANALYSIS

LABORATORY NO. 44664

DATE February 1, 1976

SUBMITTED BY Battelle Memorial Institute, Attn: Mr. Bill Baytos
P. O. No. L-6056

IDENTIFICATION Recovery Oil S-75-006-458
Task No. 37
Celotex Corporation, Fairfield, Ala.

DATE RECEIVED AT LABORATORY October 31, 1975

ULTIMATE ANALYSIS

	AS RECEIVED	DRY SAMPLE
AIR-DRIED MOISTURE 0.04 %		
TOTAL MOISTURE %	1.68	---
VOLATILE MATTER %	98.02	99.70
FIXED CARBON %	0.10	0.10
ASH %	0.20	0.20
TOTAL CARBON, %	75.99	77.29
NITROGEN, KJELDAHL %	0.22	0.22
SULPHUR %	3.84	3.90
HYDROGEN %	5.28	5.37
B. T. U. PER LB. OXYGEN	18,729	19,043
FREE SWELLING INDEX	12.79	13.02
M-ASH FREE	19.087	

ASH FUSION TEMPERATURE _____ °F
INITIAL DEFORMATION _____ °F
FLUID TEMPERATURE _____ °F

Respectfully submitted,
THE NALIN LABORATORIES

[Signature]
PROFESSIONAL CHEMIST

Specific gravity - 0.9300

D. D. Neveu/dc

Information and data in this report are reliable to the best of our knowledge and belief; however, results are not guaranteed and no responsibility is assumed. No part of this report is to be reproduced for advertising or any other purposes without our consent in writing.

TABLE K-2

AIR DRYING OF OIL SAMPLERecovery Oil, Celotex (Ala.)

<u>Time, hrs.</u>	<u>Weight, grams</u>
0	1120.0
16	1119.1
42	1118.8
64	1118.0
87	1117.5 (-0.2%)

TABLE K-3

SPECIFIC GRAVITY FOR RECOVERY OIL

<u>EPA No.</u>	<u>Sp. G.</u>
S75-006-458	0.9300

TABLE K-4

LONG-TERM CHANGES IN FILTER-CATCH WEIGHTSOutlet Filter Catch Weights, mg

			<u>Weight Loss, %</u>
Run 1-A	27.5	25.1	8.7
-B	24.4	22.2	9.0
Run 2-A	6.8	6.1	10.3
-B	4.1	3.6	12.2
Run 3-A	8.7	8.1	6.9
-B	9.6	9.0	6.3

A represents weighings conducted on 10-15-75
 B represents weighings conducted on 1-19-76

APPENDIX L
SAMPLING AND ANALYTICAL PROCEDURES

APPENDIX L-1
PARTICULATE
AND
GASEOUS HYDROCARBON EMISSIONS

METHOD 20--DETERMINATION OF PARTICULATE AND
TOTAL GASEOUS HYDROCARBON EMISSIONS FROM
THE ASPHALT ROOFING INDUSTRY

PROPERTY
DO NOT WRITE ON THIS

1. Principle and Applicability

1.1 Principle. Particulate matter and gaseous hydrocarbons are withdrawn isokinetically from the source and collected on glass fiber filter maintained at temperatures of no greater than 50°C (122°F). The particulate mass is determined gravimetrically after removal of uncombined water and solvent. Hydrocarbons are determined from a small side stream extracted after the filter and analyzed by a flame ionization detector (FID) analyzer.

1.2 Applicability. This method is applicable for the determination of particulate and gaseous hydrocarbon emissions from the asphalt roofing industry.

2. Apparatus

2.1 Sampling train. A schematic of the sampling train used in this method is shown in Figure 20-1. Commercial models of the particulate train are available. However, if one desires to build his own, complete construction details are described in APTD-0581; for changes from the APTD-0581 document and for allowable modifications to Figure 20-1, see the following subsections. Commercial FID analyzer systems are also available.

The operating and maintenance procedures for the particulate sampling train are described in APTD-0576. Since correct usage is important in obtaining valid results, all users should read the APTD-0576 document and adopt the operating and maintenance

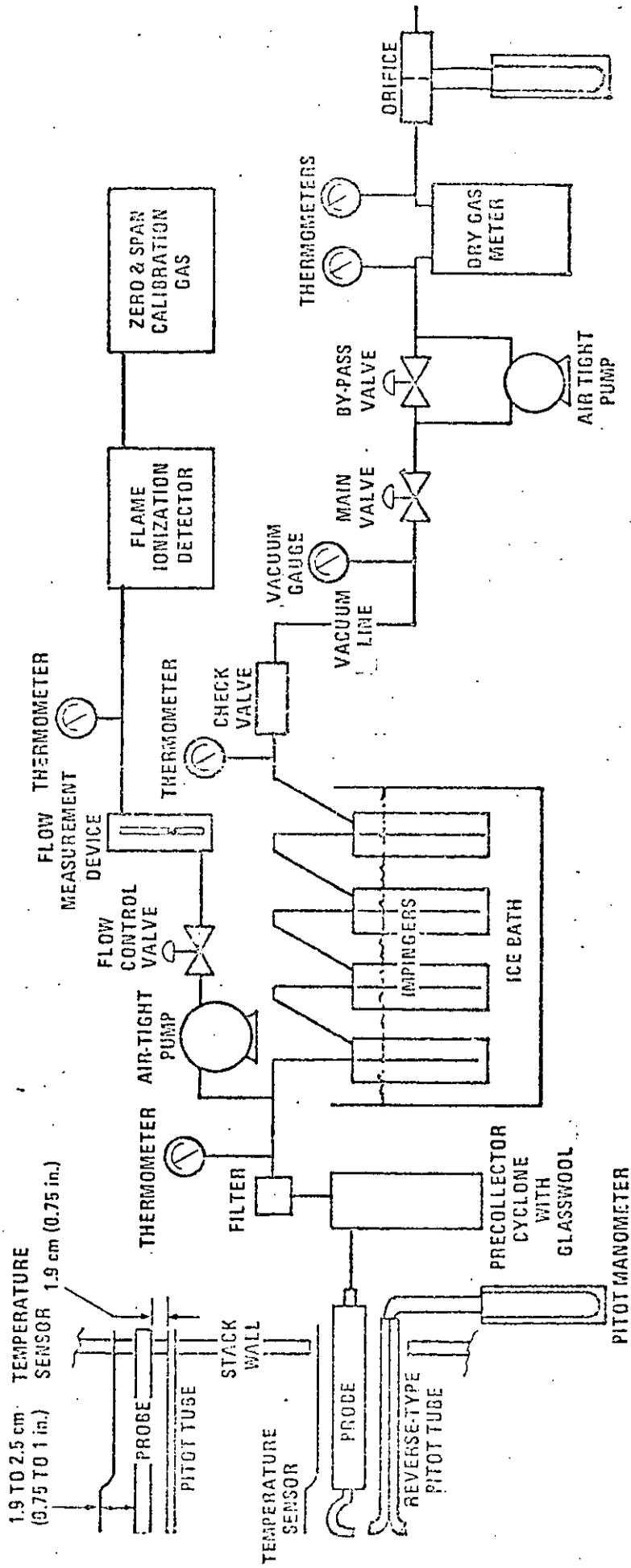


Figure 20.1. Particulate and gaseous hydrocarbon sampling train.

procedures outlined in it, unless otherwise specified herein. Manufacturers' instructions should be followed for the gaseous hydrocarbon measurement system, unless otherwise specified herein.

2.1.1 Probe nozzle--Stainless steel (316) with sharp, tapered leading edge. The angle of taper shall be $\leq 30^{\circ}$ and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise approved by the Administrator. The nozzle shall be constructed from seamless stainless steel tubing. Other configurations and construction material may be used subject to approval from the Administrator.

A range of sizes suitable for isokinetic sampling should be available, e.g., 0.32 cm (1/8 in.) up to 1.27 cm (1/2 in.) inside diameter (ID) nozzles (or larger if higher volume sampling trains are used) in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in the calibration section.

2.1.2 Probe--Borosilicate or quartz glass tubing with a heating or cooling system capable of maintaining a gas temperature at the exit end of the filter during sampling of no greater than -50°C (122°F). In most cases, ambient cooling of the probe is sufficient to maintain the desired temperature. After incinerators, it may be necessary to use water cooled probes. In this case, stainless steel (316) probes may be used.

2.1.3 Pitot tube--Type S, or other device approved by the Administrator, attached to probe to allow constant monitoring of the stack gas velocity. The face openings of the pitot tube and the probe nozzle shall be adjacent and parallel to each other, not necessarily on the same plane, during sampling. The free space between the nozzle and pitot tube shall be at least 1.9 cm (0.75 in.). The free space shall be set based on a 1.3 cm (0.5 in.) ID nozzle. If the sampling train is designed for sampling at higher flow rates than that described in APTD-0581, thus necessitating the use of larger sized nozzles, the largest sized nozzle shall be used to set the free space.

The pitot tube must also meet the criteria specified in Method 2 and calibrated according to the procedure in the calibration section of that method.

2.1.4 Differential pressure gauge--Inclined manometer capable of measuring velocity head to within 10% of the minimum measured value or ± 0.013 mm (0.0005 in.), whichever is greater. Below a differential pressure of 1.3 mm (0.05 in.) water gauge, micromanometers with sensitivities of 0.013 mm (0.0005 in.) should be used. However, micromanometers are not easily adaptable to field conditions and are not easy to use with pulsating flow. Thus, methods or other devices acceptable to the Administrator may be used when conditions warrant.

2.1.5 Particulate and moisture cyclone precollector-- Optional for use when stack gas oil and moisture concentrations

are high and would cause liquids to seep through the glass filter mat. Above 10% moisture content water vapor will condense and saturate the filter mat to prevent liquid carry-over, a cyclone collector is recommended (other devices may be used with approval from the Administrator). The collector shall be constructed of borosilicate glass. The top section of the cyclone (see Figure 20-1) contains a known weight of glass wool to trap the condensed oil and/or water. A 125 ml, or larger, Erlenmeyer collecting flask of borosilicate glass is connected to the cyclone to hold any condensate.

2.1.6 Filter holder--Borosilicate glass with a glass frit filter support and a silicone rubber gasket. Other materials of construction may be used with approval from the Administrator, e.g., if probe liner is stainless steel, then filter holder may be stainless steel. The holder design shall provide a positive seal against leakage from the outside or around the filter.

2.1.7 Filter temperature control system--Any system capable of maintaining a temperature of gas exiting the filter holder during sampling of no greater than 50°C (122°F). A temperature gauge capable of measuring temperature to within 3°C (5.4°F) shall be installed (with sensor tip within 2.5 cm or 1 in. of the filter frit) such that the gas temperature after the filter can be regulated and monitored during sampling.

2.1.8 Total gaseous hydrocarbon measurement system--To remove and analyze a portion of the filtered gas for total hydrocarbons (see Figure 20-1).

2.1.8.1 Heated Sample line--FEP fluorocarbon tubing heated

to maintain gas temperature entering the FID analyzer to slightly above filter exit temperature. The tubing length should be kept to a minimum to reduce transport delay time.

2.1.8.2 Flame ionization detector analyzer--Commercially available systems with a gas pump and flow regulation device for conveying a known amount of sample gas to the detector cell. The operating temperature is about 50°C (122°F); therefore, either ambient or heated cell FID instruments may be used. Operating instructions and calibration procedures are given in later sections.

2.1.8.3 Data Recorder--That portion of the measurement system that provides a permanent record of the output signal in terms of concentration units.

2.1.9 Condenser--Any system that cools the sample gas stream and allows measurement of the water condensed and moisture leaving the condenser, each to within 1 ml or 1 g. Acceptable means are to measure the condensed water either gravimetrically or volumetrically and to measure the moisture leaving the condenser (1) by monitoring the temperature and pressure at the exit of the condenser and using Dalton's law or (2) by passing the sample gas stream through a tared silica gel trap with exit gases kept below 20°C (68°F) and below 380 mm Hg (15 in. Hg) vacuum and determining the weight gain.

If means other than silica gel are used to determine the amount of moisture leaving the condenser, it is recommended that silica gel still be used between the condenser system and pump to prevent moisture condensation in the pump and metering devices.

Unless otherwise specified by the Administrator, flexible vacuum lines may be used to connect the filter holder to the condenser.

2.1.10 Metering system--Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3°C (5.4°F), dry gas meter with 2% accuracy, and related equipment, or equivalent, as required to maintain an isokinetic sampling rate and to determine sample volume. Sampling trains utilizing metering systems designed for higher flow rates than that described in APTD-0581 or APTD-0576 may be used provided that the specifications in section 2 of this method are met. When the metering system is used in conjunction with a pitot tube, the system shall enable checks of isokinetic rates.

2.1.11 Barometer--Mercury, aneroid, or other barometers capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases, the barometric reading may be obtained from a nearby weather bureau station, in which case the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

2.1.12 Gas density determination equipment--Temperature and pressure gauges and gas analyzer as described in Methods 2 and 3.

2.1.13 Temperature and pressure gauges--If Dalton's law is used, to monitor temperature and pressure at condenser outlet. The temperature gauge shall have an accuracy of 1°C (2°F). The pressure gauge shall be capable of measuring pressure to within 2.5 mm Hg (0.1 in. Hg). If silica gel is used in the condenser system the temperature and pressure must be measured before the silica gel component.

2.2 Sample recovery.

2.2.1 Probe liner and probe nozzle brushes--Nylon bristles with stainless steel wire handles. The probe brush shall have extensions, at least as long as the probe, of stainless steel, nylon, teflon, or similarly inert material. Both brushes shall be properly sized and shaped to brush out the probe liner and nozzle.

2.2.2 Glass wash bottles--Two.

2.2.3 Glass sample storage containers--Chemically resistant, borosilicate glass bottles, for 1,1,1-trichloroethane washes, 500 ml or 1,000 ml. Screw cap closures shall be teflon rubber-backed liners or of such construction so as to be leak free and prevent chemical attack from the 1,1,1-trichloroethane. (Narrow mouth glass bottles have been found to be less prone to leakage.) Other types of containers must be approved by the Administrator.

2.2.4 Petri dishes--For filter samples, glass, unless otherwise specified by the Administrator.

2.2.5 Graduated cylinder and/or balance--To measure condensed water to within 1 ml or 1 g. Graduated cylinders shall have subdivisions no greater than 2 ml. Most labora-

balances are capable of weighing to the nearest 0.5 g or less. Any of these balances are suitable for use here and in section 2.3.4.

2.2.6 Plastic storage containers--Air tight containers to store silica gel.

2.2.7 Funnel and rubber policeman--To aid in transfer of silica gel to container; not necessary if silica gel is weighed in the field.

2.3 Analysis.

2.3.1 Glass weighing dishes.

2.3.2 Desiccator.

2.3.3 Analytical balance--To measure to within 0.1 mg.

2.3.4 Balance--To measure to within 0.5 g.

2.3.5 Beakers--250 ml.

2.3.6 Hygrometer--To measure the relative humidity of the laboratory environment.

2.3.7 Temperature gauge--To measure the temperature of the laboratory environment.

3. Reagents

3.1 Sampling.

3.1.1 Filters--Glass fiber filters, without organic binder exhibiting at least 99.95% efficiency ($\leq 0.05\%$ penetration) on 0.3 micron dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM standard method D 2986-71. Test data from the supplier's quality control program is sufficient for this purpose.

3.1.2. Precollector glass wool--Glass fibers, No. 7220, Pyrex brand, or equivalent.

3.1.3 Silica gel--Indicating type, 6-16 mesh. If previously used, dry at 175°C (350°F) for 2 hours. New silica gel may be used as received.

3.1.4 Water.

3.1.5 Crushed ice.

3.1.6 Zero Gas--A grade of compressed zero air containing less than 1 ppm hydrocarbon as methane.

3.1.7 Calibration Gas--A compressed gas mixture of a known concentration of methane or propane in air. Nominal concentrations of 50% and 90% of the instrument full scale range are required. The higher concentration gas mixture is used to set and check the instrument span and is referred to as the span gas.

3.2 Sample recovery.

3.2.1 1,1,1-Trichloroethane (TCE)--Reagent grade, \leq 0.001% residue, in glass bottles. TCE blanks shall be run prior to field use and only TCE with low blank values (\leq 0.001%) shall be used.

3.3 Analysis.

3.3.1 1,1,1-Trichloroethane--Same as 3.2.1.

3.3.2 Desiccant--Anhydrous calcium sulfate, indicating type.

4. Procedure

4.1 Sampling. The sampling shall be conducted by competent personnel experienced with this test procedure.

4.1.1 Pretest preparation--All the components shall be maintained and calibrated according to the procedure described in APTD-0576, unless otherwise specified herein.

Weigh approximately 200-300 g of silica gel in air tight containers to the nearest 0.5 g. Record the total weight, both silica gel and container, on the container. More silica gel may be used but care should be taken during sampling that it is not entrained and carried out from the impinger. As an alternative, the silica gel may be weighed directly in the impinger or its sampling holder just prior to the train assembly.

Check filters visually against light for irregularities and flaws or pinhole leaks. Label a filter of proper diameter on the back side near the edge using numbering machine ink. As an alternative, label the shipping container and keep the filter in this container at all times except during sampling and weighing.

Desiccate the filters and glass wool at $20 \pm 5.6^{\circ}\text{C}$ ($68 \pm 10^{\circ}\text{F}$) and ambient pressure for at least 24 hours and weigh at 6 or more hour intervals to a constant weight, i.e., ≤ 0.5 mg change from previous weighing, and record results to the nearest 0.1 mg. During each weighing the filter or glass wool must not be exposed to the laboratory atmosphere for a period greater than 2 minutes and a relative humidity above 50%. Clean and preweigh the precollector (cyclone) to the nearest 0.1 mg. Install a preweighed amount of glass wool and seal the openings of precollector.

4.1.2 Preliminary determinations--Select the sampling site and the minimum number of sampling points according to Method 1 or as specified by the Administrator. Determine the stack pressure, temperature, and the range of velocity heads using Method 2 and moisture content using Approximation Method 4 or its alternatives for the purpose of making isokinetic sampling rate calculations. Estimates may be used. However, final results will be based on actual measurements made during the test. Note: A portion of flow will go to the FID analyzer. This flow rate must be included when establishing isokinetic sampling rates. See section 6.3.1 for this calculation.

Select a nozzle size based on the range of velocity heads such that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates. During the run, do not change the nozzle size. Ensure that the differential pressure gauge is capable of measuring the minimum velocity head value to within 10%, or as specified by the Administrator.

Select a total sampling time greater than or equal to the minimum total sampling time specified in the test procedures for the specific industry such that the sampling time per point is not less than 2 min. or some greater time interval as specified by the Administrator and the sample volume that will be taken will exceed the required minimum total gas sample volume specified in the test procedures for the specific industry. The latter is based on an approximate average sampling rate. Note also that the minimum total sample volume is corrected to standard conditions.

It is recommended that 1/2 or an integral number of minutes be sampled at each point in order to avoid timekeeping errors.

In some circumstances, e.g., batch cycles, it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas sample volumes. In these cases, the Administrator's approval must first be obtained.

4.1.3 Preparation of collection train--During preparation and assembly of the sampling train, keep all openings where contamination can occur covered until just prior to assembly or until sampling is about to begin.

Place 100 ml of water in each of the first two impingers, leave the third impinger empty, and place approximately 200-300 g or more, if necessary, of preweighed silica gel in the fourth impinger. Record the weight of the silica gel and container to the nearest 0.5 g. Place the container in a clean place for later use in the sample recovery.

Using a tweezer or clean disposable surgical gloves, place the labeled (identified) and weighed filter in the filter holder. Be sure that the filter is properly centered and the gasket properly placed so as to not allow the sample gas stream to circumvent the filter. Check filter for tears after assembly is completed.. . .

Assemble the filter holder and attach the precollector cyclone ahead of the filter when the precollector is to be used.

When glass liners are used, install selected nozzle using a Viton A O-ring when stack temperatures are less than 260°C

(500°F) or an asbestos string gasket when temperatures are higher. The Viton A O-ring and asbestos string gasket are installed as a seal where the nozzle is connected to a glass liner. See APTD-0576 for details. When metal liners or water cooled probes are used, install the nozzle as above or by a leak free direct mechanical connection. Mark probe with heat resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

Unless otherwise specified by the Administrator, attach a temperature probe to the metal sheath of the sampling probe so that the sensor does not touch any metal. Its position should be about 1.9 to 2.54 cm (0.75 to 1 in.) from the pitot tube and probe nozzle to avoid interference with the gas flow.

Set up the train as in Figure 20-1, using no silicone grease on ground glass joints ahead of the filter. Silicone grease is soluble in TCE, therefore, clean glassware with only water seals shall be used.

Place crushed ice around the impingers.

4.1.4 Leak check procedure--If a Viton A O-ring or other leak free connection is used in assembling the probe nozzle to the probe liner, leak check the train at the sampling site by plugging the nozzle and pulling a 380 mm Hg (15 in. Hg) vacuum. (Note: A lower vacuum may be used provided that it is not exceeded during the test.) If an asbestos string is used, do not connect the probe to the train during the leak check. Instead, leak check the train as above by first plugging the inlet to the

the filter holder. Then connect the probe to the train and leak check at about 25 mm Hg (1 in. Hg) vacuum. A leakage rate in excess of 4% of the average sampling rate or $0.00057 \text{ m}^3/\text{min}$. (0.02 cfm), whichever is less, is unacceptable. The gaseous hydrocarbon system may be shut off for the leak check. However, all fittings on the analyzer system should be checked to insure they are properly tightened.

The following leak check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with by-pass valve fully open and coarse adjust valve completely closed. Partially open the coarse adjust valve and slowly close the by-pass valve until 380 mm Hg (15 in. Hg) vacuum is reached. Do not reverse direction of by-pass valve. This will cause water to back up into the filter holder. If 380 mm Hg (15 in. Hg) is exceeded, either leak check at this higher vacuum or end the leak check as shown below and start over.

When the leak check is completed, first slowly remove the plug from the inlet to the probe or filter holder and immediately turn off the vacuum pump. This prevents the water in the impingers from being forced backward into the filter holder and silica gel from being entrained backward into the third impinger.

Leak checks shall be conducted as described whenever the train is disengaged, e.g., for silica gel or filter

changes during the test, prior to each test run, and at the completion of each test run. Close the flow control valve of the gaseous hydrocarbon measurement system. If leaks are found to be in excess of the acceptable rate, the test will be considered invalid. To reduce lost time due to leakage occurrences, it is recommended that leak checks be conducted between port changes at the highest vacuum reading drawn during that sampling traverse.

4.1.5 Particulate train operation--During the sampling run, isokinetic sampling rate to within 10%, or as specified by the Administrator, of true isokinetic and the temperature of the gas exiting the filter of no greater than 50°C (122°F) shall be maintained.

For each run, record the data required on the example data sheet shown in Figure 20-2. Be sure to record the initial dry gas meter reading. Record the dry gas meter readings at the beginning and end of each sampling time increment, when changes in flow rates are made, and when sampling is halted. Take other data point readings at least once at each sample point during each time increment and additional readings when significant changes (20% variation in velocity head readings) necessitate additional adjustments in flow rate. Level and zero the manometer.

Clean the portholes prior to the test run to minimize the chance of sampling the deposited material. Allow time for

hydrocarbon analyzer operation to stabilize and for the heated hydrocarbon sample line to reach the required temperature. To begin sampling, remove the nozzle cap, verify that the filter and probe are at the proper temperature, and that the pitot tube and probe are properly positioned. Position the nozzle at the first traverse point with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs are available for sampling trains using type S pitot tubes with 0.85 ± 0.02 coefficient and when sampling in air or a stack gas with equivalent density (molecular weight equal to $29 + 4$), which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations. APTD-0576 details the procedure for using these nomographs. If C_p and M_d are outside the above stated ranges, do not use the nomograph unless appropriate steps (see Reference 7.7) are taken to compensate for the deviations.

After starting and adjusting the flow of the sampler pump, start the flow of sample gas through the hydrocarbon analyzer and allow a constant regulated amount of gas to go to the hydrocarbon analyzer. The flow rate of the hydrocarbon system should be preset to no more than 1.0 liters per minute. A correction for the flow of gas not passing through the sample train meter should be made. To permit accurate isokinetic flow rate settings the nomograph should be corrected by converting the flow rate of gas through the hydrocarbon analyzer to a pseudo moisture content and

add this amount to the actual moisture content when setting the nomograph reference points, see section 6.3.1.

When the stack is under significant negative stack pressure take care to close the coarse adjust valve before inserting the probe into the stack to avoid water backing into the filter holder. If necessary, the pump may be turned on with the coarse adjust valve closed.

When the probe is in position, block off the openings around the probe and porthole to prevent unrepresentative dilution of the gas stream.

Traverse the stack cross section, as required by Method 1 or as specified by the Administrator, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe through the portholes to minimize chance of extracting deposited material. Note the hydrocarbon value for each traverse point, both on the analyzer chart recorder and on a form.

During the test run, make periodic adjustments to keep the temperature of gas exiting the filter holder at the proper temperature and add more ice and, if necessary, salt to maintain a temperature of less than 20°C (68°F) at the condenser/silica gel outlet to avoid excessive moisture losses. Also, periodically check the level and zero of the manometer.

If a yellow-brown color forms on the filter or the condensed moisture begins to fill the precollector, the precollector and the filter shall be replaced in the midst of a sample run.

It is recommended that another complete precollector and filter assembly be used rather than attempting to change the filter itself. After the new assembly is installed conduct a leak check. The particulate weight shall include the summation of all filter assembly catches.

A single train shall be used for the entire sample run, except for precollector, filter and silica gel changes. However, if approved by the Administrator, two or more trains may be used for a single test run when there are two or more ducts or sampling ports. The results shall be the total of all sampling train catches.

At the end of the sample run shut off the flow of sample gas to the hydrocarbon system, turn off the sample train pump, remove the probe and nozzle from the stack, and record the final dry gas meter reading. Perform a leak check at a vacuum equal to or greater than the maximum reached during sampling. Calculate percent isokinetic (see calculation section) to determine whether another test run should be made. If there is difficulty in maintaining isokinetic rates due to source conditions, consult with the Administrator for possible variance on the isokinetic rates.

4.2 Hydrocarbon analyzer operation.

4.2.1 Install the hydrocarbon analyzer system as close as possible to the probe and filter apparatus. Heat the fluorocarbon sample line to above the filter temperature to prevent condensation

of hydrocarbons. Note: Due to the design of most FID analyzers, it will be necessary to protect the instrument from the ambient environment (rain, dust, extreme heat or cold, etc.). Check for stable electrical power; voltage fluctuations can cause instrument drift in some analyzers. Calibrate the analyzer using a span concentration, zero air and one other upscale concentration of methane in air to check linearity of system. Refer to calibration section 5.2 for details of this procedure.

After the particulate sampling train is operating at the first traverse point, the gaseous hydrocarbon sample pump shall be started and the flow regulated so that the analyzer functions properly. The average hydrocarbon analyzer reading shall be recorded for each traverse point. A strip chart or other data recorded can also be used to monitor the analyzer output.

At the conclusion of the test shut off the hydrocarbon system before stopping the particulate sampling train pump. The hydrocarbon analyzer shall be recalibrated after the test so that zero and calibration gas drift can be determined.

4.2.2 "Zero drift" is the change in analyzer output during the performance of the test when the input to the measurement system is a zero grade air (zero gas). The maximum zero drift for measurement systems used in this method is $\pm 2\%$ of the specified instrument span. The zero drift calculation is to be made for each test. It is determined from the zero concentration values measured at the start and finish of each test.

Calculate the difference between these readings expressed in concentration units. Record the data and report zero drift as a percentage of the instrument span, using a form similar to Figure 20.3.

4.2.3 "Span drift" is the change in analyzer output during the performance of the test when the input to the measurement system is span gas. The maximum span drift for measurement systems used in this method is $\pm 2\%$ of the specified instrument span. The span drift calculation is to be made for each gas for each test. It is determined by measuring the response of the instrument when span gas mixture is introduced into the system at the start and finish of each test. Calculate the difference between these readings expressed in concentration units. These values should be corrected for the corresponding zero drift during that period. The correction for zero drift is explained in Figure 20.3. Record the data and report span drift as a percentage of the instrument span, using a form similar to Figure 20.3.

4.2.4 "Response time" is defined as the time interval from a step change in pollutant concentration at the system inlet to the time at which 95% of the final value is reached as displayed on output recording system. The maximum response time for a hydrocarbon analyzer meeting the requirements of this method

is one minute. To determine response time, first introduce zero gas to the system until the reading is stable and then introduce the span gas to the system. The time to the 95% final value is recorded as the upscale response time. Zero gas is then introduced and the time to 95% final response is recorded as the downscale response time. This procedure is to be followed three times, the readings averaged and the upscale or downscale response time, whichever is greater, shall be reported as the "response time." Record this data on a form similar to Figure 20.4. This test shall be conducted prior to the initial test and repeated if changes are made to the measurement system.

4.3 Sample recovery. Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period.

When the probe can be safely handled, wipe off all external oil particulate matter near the tip of the probe nozzle and place a cap over it to prevent losing or gaining particulate matter.

Before moving the sample train to the cleanup site, disconnect the hydrocarbon analyzer system, remove the probe from the sample train, and cap the open outlet of the probe. Be careful not to lose any condensate, if present. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used between the first impinger or condenser and the filter holder, disconnect the line at the filter holder and let any condensed water or liquid drain into the impingers

or condenser. Cap off the filter holder outlet and impinger inlet. Either Teflon or ground glass stoppers may be used to close these openings. If plastic or rubber caps are used, they must not react with TCE.

Transfer the probe and filter impinger assembly to the cleanup area. This area should be clean and protected from the wind so that the chances of contaminating or losing the sample will be minimized.

Save a portion of the TCE used for cleanup as a blank. Place about 200 ml of this TCE taken directly from the wash bottle being used in a glass sample container labeled "TCE blank."

Inspect the train prior to and during disassembly and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder and place in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the particulate cake is inside the fold. Quantitatively remove any particulate matter and/or filter which adheres to the filter holder by carefully using a dry nylon bristle brush and/or a sharp-edged blade and place into this container. Seal the container.

Container No. 2. Remove the collector flask from the cyclone using glass or other nonreactive caps, seal ends of cyclone and store for shipment to the laboratory.

Container No. 3. Taking care to see that material on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover particulate matter or any condensate from the probe nozzle, probe fitting, probe liner, cyclone collector flask and front half of the filter holder by washing these components with TCE and placing the wash into a glass container in the following manner.

Carefully remove the probe nozzle and clean the inside surface with a nylon bristle brush. Brush until TCE rinse shows no visible particles, or discoloration after which make a final rinse of the inside surface with TCE.

Brush and rinse with TCE the inside parts of the Swagelok fitting in a similar way until no visible particles remain.

Rinse the probe liner with TCE by tilting the probe and squirting TCE into its upper end, while rotating the probe so that all inside surfaces will be rinsed with TCE. Let the TCE drain from the lower end into the sample container. A funnel may be used to aid in transferring liquid washes to the container. Follow the TCE rinse with a probe brush. Hold the probe in an inclined position, squirt TCE into the upper end as the probe brush is being pushed with a twisting action through the probe, hold a sample container underneath the lower end of the probe,

and catch any TCE and particulate matter which is brushed from the probe. Run the brush through the probe three times or more until no visible particulate matter is carried out with the TCE or remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped. Rinse the brush with TCE and quantitatively collect these washings in the sample container. After the brushing make a final acetone (reagent grade) rinse of the probe as described above. This rinse is to promote drying of the equipment and is not retained for analysis. It is recommended that two people be used to clean the probe to minimize losing the sample. Between sampling runs, keep brushes clean and protected from contamination.

Clean the inside of the cyclone collection flask and the front half of the filter holder by rubbing the surfaces with a nylon bristle brush and rinsing with TCE. Rinse each surface three times or more if needed to remove visible particulate and condensed moisture. Make a final rinse of the brush, flask and filter holder. After all TCE washings and particulate matter are collected in the sample container, tighten the lid on the sample container so that TCE will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether or not leakage occurred during transport. Label container to clearly identify its contents. To promote the drying of the glassware a final rinse of the components with acetone is recommended. This rinse should not be saved for analysis.

Container No. 4. Note color of indicating silica gel to determine if it has been completely spent and make a notation of its condition. Transfer the silica gel from the fourth impinger to the original container and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the walls and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure under analysis.

Impinger water. Treat the impingers or condenser as follows: Make a notation of any color or film in the liquid catch. Measure the liquid which is in the first three impingers to within ± 1 ml by using a graduated cylinder or, if available, to within ± 0.5 mg by using a balance. Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

4.4 Analysis. Record the data required on the example sheet shown in Figure 20-5. Handle each sample container as follows:

(For the purpose of this section 4.4, the term "constant weight" means a difference of no more than 10% between two weighings 24 hours apart. The "final weight" to be used in calculations is the average of these two values.)

Container No 1. Leave in shipping container or transfer the filter from the sample container to a tared glass weighing dish and desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Rinse the filter container with TCE and combine this rinse with the contents of Container 3. Weigh to a constant weight and report the results to the nearest 0.1 mg.

Container No. 2. Clean the outside of the cyclone, remove caps, and desiccate for 24 hours or until any condensed water has evaporated. Weigh the cyclone with the oil and glass wool plug in place. Subtract the weight of the cyclone and the tare weight of glass wool. Clean out the oil and glass wool with TCE into a tared weighing dish. Desiccate the cyclone for 24 hours and reweigh the cyclone. If the final weight of the clean cyclone is within 10 mg of the initial weight of the clean cyclone, the calculated oil weight will be considered valid. If the weight difference is greater, then the cyclone will be assumed damaged and the oil must be extracted from the glass wool and this oil solution added to Container 3. Note: This procedure is subject to error if the glass wool fibers are not kept out of the oil solution.

Container No. 3. Note level of liquid in container and confirm on analysis sheet whether or not leakage occurred during transport. Measure the liquid in this container either volumetrically to ± 1 ml or gravimetrically to ± 0.5 g. If the volume of condensed water appears larger than 5 ml it will be necessary to separate the oil-TCE fraction from the water. This should be done with a separatory funnel. Additional rinses of the water fraction shall be made with 25 ml portions of TCE until, by visual observation, the TCE does not remove, any additional organic material. The remaining water fraction shall be evaporated to dryness at 200°C , desiccated for 25 hours and weighed to the nearest 0.1 mg. Treat the TCE fraction with the following procedure. Transfer the TCE and oil to a tared 250 ml beaker, and evaporate at ambient temperature and pressure. The terms dryness and constant weight are not appropriate for liquid oil samples which continue to lose weight through evaporation. The volume of TCE required to remove the oil from the sample train should be estimated. When it appears that its volume has been evaporated the sample should be desiccated and weighed at 24 hour intervals to obtain a "constant weight." The "final weight" is the sum of the evaporated particulate weight fractions for TCE-oil and water. Report the results to the nearest 0.1 mg.

Container No. 4. Weigh the spent silica gel to the nearest 0.5 g using a balance. This step may be conducted in the field.

"TCE Blank" Container. Measure TCE in this container either volumetrically or gravimetrically. Transfer the TCE to a tared 250 ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours and weigh to a "constant weight." Report the results to the nearest 0.1 mg.

5. Calibration

5.1 Particulate Sampling Equipment. Maintain a laboratory log of all calibrations.

5.1.1 Probe nozzle--Using a micrometer, measure the inside diameter of the nozzle to the nearest 0.025 mm (0.001 in.). Make 3 separate measurements using different diameters each time and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in.).

When nozzles become nicked, dented, or corroded, they shall be reshaped, sharpened, and recalibrated before use.

Each nozzle shall be permanently and uniquely identified.

5.1.2 Pitot tube. The pitot tube shall be calibrated according to the procedure outlined in Method 2.

5.1.3 Dry gas meter and orifice meter. Both meters shall be calibrated according to the procedure outlined in APTD-0576. When a diaphragm pump is used, assure that there is no leak.

5.1.4 Probe heater calibration. The probe heating system shall be calibrated according to the procedure contained in APTD-0576. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used.

the indicated concentration. The calibration analysis shall be certified traceable to a National Bureau of Standards certified gas concentration.

6. Calculations

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

6.1 Nomenclature

A_n	= Cross sectional area of nozzle, m^2 (ft^2)
A_s	= Cross sectional area of stack, m^2 (ft^2)
B_{ws}	= Water vapor in the gas stream, proportion by volume
B_{wt}	= water vapor in the sample gas stream, proportion by volume
C_a	= TCE blank residue concentration, mg/g
c_s	= Concentration of particulate matter in stack gas, corrected to standard conditions, g/dscm (g/dscf)
I	= Percent of isokinetic sampling
m_n	= Total amount of particulate matter collected, mg.
M_w	= Molecular weight of water, 18 g/g-mole (18 lb/lb-mole)
m_a	= Mass of residue of TCE after evaporation, mg.
P_{bar}	= Barometric pressure at the sampling site, mm Hg (in. Hg)

- P_{mr} = Pollutant mass rate, g/hr (lb/hr)
 ppm_v = Parts per million by volume
 P_s = Absolute stack gas pressure, mm Hg (in. Hg)
 P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg)
 Q_h = Flow rate through hydrocarbon analyzer, cm/min (cfm)
 R = Ideal gas constant, 0.06236 mm Hg³/^oK-mole (21.83 in. Hg-ft³/^oR-lb-mole)
 T_m = Absolute average dry gas meter temperature (see Figure 52), ^oK (^oR)
 T_h = Absolute temperature of hydrocarbon sample at flow meter, ^oK (^oR)
 T_s = Absolute average stack gas temperature (see Figure 52), ^oK (^oR).
 T_{std} = Standard absolute temperature, 293^oK (528^oR)
 V_a = Volume of TCE, blank ml
 V_{aw} = Volume of TCE used in wash, ml
 V_h = Volume of hydrocarbon sample gas, cm (cf)
 V_{lc} = Total volume of liquid collected in impingers and silica gel (see Figure 5-3, ml.)
 V_m = Volume of gas sample as measured by dry gas meter, dcm (dcf)

- $V_{m(std)}$ = Volume of gas sample measured by the dry gas meter corrected to standard conditions, dscm (dscf).
- V_{pc} = Volume of water collected in particulate catch, ml
- $V_{w(std)}$ = Volume of water vapor in the gas sample corrected to standard conditions, scm (scf).
- $V_{wt(std)}$ = Volume of water vapor in sample gas corrected to standard conditions, scm, (scf)
- v_s = Stack gas velocity, calculated by Method 2, Equation 2-7 using data obtained from Method 5, m/sec (ft/sec)
- W_a = Weight of residue in TCE wash, mg
- ΔH = Average pressure differential across the orifice meter (see Figure 5-2), mm H₂O (in. H₂O)
- ρ_a = Density of TCE, mg/ml (see label on bottle)
- ρ_w = Density of water, g/ml (0.00220 lb/ml)
- θ = Total sampling time, min.
- 13.6 = Specific gravity of mercury
- 60 = sec/min
- 100 = Conversion to percent

6.2 Particulate Calculations.

6.2.1 Average dry gas meter temperature and average orifice pressure drop. See data sheet (Figure 52).

6.2.2 Hydrocarbon Analyzer Sample Volume

$$V_h = (Q_h)(\theta) \left(\frac{T_{std}}{T_h} \right) \left(\frac{P_{bar}}{P_{std}} \right) (1-B_{ws})$$

$$= Z (Q_h)(\theta) \left(\frac{P_{bar}}{T_h} \right) (1-B_{ws}) \quad \text{*Equation 20-1}$$

where:

$$Z = .386 \text{ metric units}$$

$$= 17.65 \text{ english units}$$

*Note: Equation 20-1. The term B_{ws} must be estimated. Use Equation 20-4-1 for B_{ws} and assume V_h to be dry gas.

6.2.3 Dry gas volume. Correct the sample volume measured by the dry gas meter to standard conditions (20° C, 760 mm Hg or 68° F, 29.92 in. Hg) by using Equation 20-1.

$$V_{m(std)} = V_m \left(\frac{T_{std}}{T_m} \right) \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}} \right) + V_h$$

$$= K V_m \left(\frac{P_{bar} + \Delta H/13.6}{T_m} \right) + V_h \quad \text{Equation 20-2}$$

where:

$$K = 0.3856 \text{ }^{\circ}\text{K/mm Hg for metric units}$$

$$= 17.65 \text{ }^{\circ}\text{R/in. Hg for English units}$$

6.2.4 Volume of water vapor.

$$V_{m(std)} = V_{lv} \left(\frac{P_w}{M_w} \right) \left(\frac{RT_{std}}{P_{std}} \right) = K V_{lc}$$

Equation 20-3-1

$$V_{wt(std)} = (V_{lc} + V_{fh}) \left(\frac{\rho_w}{M_w} \right) RT \quad *Equation 20-3-1$$

where:

$$K = 0.00134 \text{ m}^3/\text{ml} \text{ for metric units}$$

$$= 0.0472 \text{ ft}^3/\text{ml} \text{ for English units}$$

*Note: Equation 20-3-2 for use when there is water condensation in the particulate catch.

6.2.5 Moisture content.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + (V_{w(std)} - V_n)} \quad Equation 20-4-1$$

$$B_{wt} = \frac{V_{wt(std)}}{V_{m(std)} + V_{wt}} \quad *Equation 20-4-2$$

6.2.6 TCE blank concentration.

$$C_a = \frac{m_a}{V_a \rho_a} \quad Equation 20-5$$

6.2.7 TCE wash blank.

$$W_a = (C_a)(V_{aw})(\rho_a) \quad Equation 20-6$$

6.2.8 Total particulate weight. Determine the total particulate catch from the sum of the weights obtained from containers 1 and 2 less the TCE blank (see Figure 20-5).

6.2.9 Particulate concentration.

$$c_s = (0.001 \text{ g/mg}) \left(\frac{m_n}{V_{m(std)}} \right) \quad Equation 20-7$$

*Note: Equation 20-4-2 for use when there is water condensation in the particulate catch.

6.2.10 Conversion factors:

From	To	Multiply by
scf	m ³	0.0283
g/ft ³	gr/ft ³	15.4
g/ft ³	lb/ft ³	2.205 x 10 ⁻³
g/ft ³	g/m ³	35.31

6.2.11 Isokinetic variation.

6.2.1.1 Calculations from raw data.

$$I = \frac{100 T_s [K V_{lc} + (V_m/T_m) (P_{bar} + \Delta H/13.6)]}{60 \theta v_s P_s A_n}$$

Equation 20-8

where:

$$K = 0.00346 \text{ mm Hg-m}^3/\text{ml-}^\circ\text{K for metric units}$$

$$= 0.00267 \text{ in. Hg-ft}^3/\text{ml-}^\circ\text{R for English units}$$

6.2.11.2 Calculations from intermediate values.

$$I = \frac{T_s V_{m(std)} P_{std} 100}{T_{std} v_s \theta A_n P_s 60 (1-B_{ws})}$$

$$= K \frac{T_s V_{m(std)}}{P_s v_s A_n \theta (1-B_{ws})}$$

Equation 20-9

where:

$$K = 4.323 \text{ for metric units}$$

$$= 0.0944 \text{ for English units}$$

6.2.11.3 Acceptable results. If $90\% \leq I \leq 110\%$, the results are acceptable. If the results are low in comparison to the standards and I is beyond the acceptable range, the Administrator may option to accept the results. Use reference 7.4 to make judgments. Otherwise, reject the results and repeat the test.

6.3 Gaseous Hydrocarbon Calculations.

6.3.1 Correction to set isokinetic flow is necessary because the hydrocarbon sample gas does not pass through the orifice meter in the sampling train. The orifice meter volume must be compensated for or the isokinetic sampling velocity will not be correct. The simplest approach is to determine the volume to be sampled by the hydrocarbon system (V_h) and to add this volume to the volume of moisture to be collected by the sampling train. The hydrocarbon sample gas, similar to moisture content, does not pass through the orifice meter. The resulting pseudo water volume is used in the calculation to determine the isokinetic sampling rate. If the nomograph is used, the pseudo moisture content used in C factor nomograph (Figure 22 of APTD-0576) can be calculated. This estimated moisutre content can be improved upon after an initial test.

6.3.2 Average the ppm by volume readings of gaseous hydrocarbons for each traverse point and calculate the average concentration. The stack area and the velocity data from Method 2 can be used to calculate the mass emission rate of hydrocarbons as methane by using Equation 20-8.

$$\text{pmr} = 0.67 \times 10^6 (\overline{\text{ppm}_V}) (v_s) (A_s) \quad \text{Equation 20-10}$$

7. References

7.1 Addendum to Specifications for Incinerator Testing at Federal Facilities, PHS, NCAPC, Dec. 6, 1967.

7.2 Martin, Robert M., Construction Details of Isokinetic Source Sampling Equipment, Environmental Protection Agency, APTD-0581.

7.3 Rom, Jerome J., Maintenance, Calibration, and Operation of Isokinetic Source Sampling Equipment, Environmental Protection Agency, APTD0576.

7.4 Smith, W. S., R. T. Shigehara, and W. F. Todd, A Method of Interpreting Stack Sampling Data, Paper presented at the 63d Annual Meeting of the Air Pollution Control Association, St. Louis, Mo., June 14-19, 1970.

7.5 Smith, W. S., et al., Stack Gas Sampling Improved and Simplified with New Equipment, APCA paper No. 67119, 1967.

7.6 Specifications for Incinerator Testing at Federal Facilities, PHS, NCAPC, 1967.

7.7 Shigehara, R. T., Adjustments in the EPA Nomograph for Different Pitot Tube Coefficients and Dry Molecular Weights, Stack Sampling News 2:411, Oct. 1974.

Plant _____

Date _____

Run No. _____

Relative Humidity _____

Amount liquid lost during transport _____

blank volume, ml _____

wash volume, ml _____

blank concentration, mg/mg (equation 5-4) _____

wash blank, mg (equation 5-5) _____

CONTAINER NUMBER	WEIGHT OF PARTICULATE COLLECTED, mg		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
1			
2			
3			
Total			
Less acetone blank			
Weight of particulate matter			

	VOLUME OF LIQUID WATER COLLECTED	
	IMPINGER VOLUME, ml	SILICA GEL WEIGHT, g
FINAL		
INITIAL		
LIQUID COLLECTED		
TOTAL VOLUME COLLECTED		g* ml

CONVERT WEIGHT OF WATER TO VOLUME BY DIVIDING TOTAL WEIGHT INCREASE BY DENSITY OF WATER (1g/ml).

$$\frac{\text{INCREASE, g}}{1 \text{ g/ml}} = \text{VOLUME WATER, ml}$$

Figure 20.5 Analytical data.

Zero and Span Drift Data

Site Location _____ Operator _____

Date: _____

Test No.: _____

Analyzer: Type _____ S/N _____

	Initial Calibration ppm or %	Final Calibration ppm or %	Difference Initial-Final ppm or %	% of Span
Zero Gas				
High Calibration Gas (Span Gas)			*	

$$\% \text{ of Span} = \frac{\text{Absolute Value of Difference}}{\text{Instrument Span}} \times 100$$

*Corrected for zero drift, i.e., if zero drift over test period is +2 ppm then 2 ppm shall be subtracted from the difference between the initial and final readings.

Figure 20.3

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RESPONSE TIME

Date of Test	_____
Analyzer Type	_____ S/N _____
Span Gas Concentration	_____ ppm
Analyzer Span Setting	_____ ppm
Upscale	1 _____ seconds
	2 _____ seconds
	3 _____ seconds
Average upscale response	_____ seconds
	1 _____ seconds
Downscale	2 _____ seconds
	3 _____ seconds
Average downscale response	_____ seconds
System response time = slower average time =	_____ seconds.

Figure 20.4

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CALIBRATION DATA

Date	_____		
Analyzer Type	_____	S/N	_____
High Range Gas Conc.	_____	% Full Scale	_____
Mid Range Gas Conc.	_____	% Full Scale	_____
Low Range Gas Conc.	_____	% Full Scale	_____
Zero Gas	_____	% Full Scale	_____

Figure 20.6

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12-17
4/2/74

EMISSION MEASUREMENT AND CONTINUOUS MONITORING

L.1 Emission Measurement Methods

Organic pollutants are generated in the manufacture of asphalt roofing products. These compounds were divided into 2 categories-- particulates (oil droplets) and gaseous hydrocarbons (organics in the vapor state at filtration temperature).

Method development tests were conducted at two asphalt roofing plants to evaluate the proposed sampling trains to collect these pollutants. These studies resulted in the use of a modified Method 5 system to isokinetically sample the gas stream. The modifications to Method 5 include:

1. Change of filtration temperature from 120°C to 50°C.

The physical state of the organic matter is a function of temperature. Therefore, it was necessary to select a filtration temperature to provide a basis for evaluating the different control systems and the emissions from the different plants. The 50°C upper limit was selected to be consistent with the optimum operating temperature of 40°C for the collection systems, i.e. filtration and electrostatic precipitation.

2. Use of a precollector filter to reduce the oil droplet loading on the primary filter.

This change was necessary to prevent oil from seeping through the glass fiber filter mat during periods of high oil droplet concentrations. A procedure to avoid having to quantitatively remove the oil from the precollector was added to the method. This involves weighing the precollector system before and after sampling to obtain the mass collected by difference.

3. Extraction of a small portion (1 lpm) of the sample gas after filtration

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and use of continuous flame ionization detector (FID) analyzer to measure the gaseous hydrocarbon (HC) content.

The sample gas to the FID analyzer is transported through heated lines to prevent condensation. The FID analyzer monitors the level of total gaseous hydrocarbons by ionizing the hydrocarbons in a hydrogen rich flame and measuring the current produced. This type measurement system has been used by EPA as a reference method at other emission sources and is accurate over a wide range of concentrations.

To develop background information on the chemical composition of the emitted organics, specific hydrocarbons were identified using techniques which included infrared analysis, gas chromatography (GC), and GC mass spectroscopy (GCMS). The oil droplet fractions were semi-quantitatively analyzed and found to contain almost every category of hydrocarbons, e.g., ringed, straight chained, partially oxidized, etc. However, the gaseous portion which was defined using quantitative GCMS analyses showed that the hydrocarbons were primarily 1- through 3-carbon chains for noncombustion control devices, and methane for after-burners. Therefore, the FID response to the gaseous hydrocarbons was determined to be satisfactory. These data are described in the individual test reports and in the test reports concerning the method development.

4. Change in cleanup reagent from acetone to 1,1,1-trichloroethane.

Sample cleanup and recovery procedures were also developed and tested during the method development program. Various solvents were used, e.g., acetone, chloroform, hexane, 1,1,1-trichloroethane, diethyl ether, methylene chloride, and trichloroethylene. The chlorinated hydrocarbons

proved to be most effective solvents. Chloroform and methylene chloride were rejected as unsafe due to the toxic chemical exposure criteria established by OSHA. The solvent, 1,1,1-trichloroethane (TCE) was decided upon because it was most effective in dissolving the baked-on oil and tars and, due to its lower vapor pressure, was potentially less toxic.

5. Change in analysis procedure to minimize sample loss through evaporation.

In the laboratory the cleanup reagent presented some problems. The low vapor pressure of TCE caused an increase in the time necessary to evaporate the samples at ambient temperature to a final weight. Experiments were conducted to quantify the loss of light hydrocarbons by condensing the vapors from the evaporation process and analyzing it by gas chromatography. Results showed that the hydrocarbon loss for outlet sample fractions was minimal.

A continuous weight loss was recorded for the samples over a period of several weeks after removal of the condenser. The weight loss was most significant for inlet samples. The outlet samples also continued to lose weight, but to a lesser degree. Consequently, the criterion of "constant weight" was defined as "a less than 10 percent weight change between two sequential weighings twenty-four hours apart." Most samples weighed in this manner reached a constant weight between the 24 to 48 hour weighings.

6. Collection and analysis procedure for condensed water.

In cases where moisture contents of the stack gases were above 10%,

condensation in the filtration section of the sample occurred. These conditions did not happen when sampling saturator line emissions, but did occur during the blowing still test. By cooling the sample gas to 50°C in the probe and precollector, the moisture was trapped in the cyclone collection flask. In the analyses, the oil was extracted from the water phase using a separatory funnel and TCE. The remaining water fraction was evaporated at 100°C, desiccated, and weighed.

Previous investigators used test methods which differed from the EPA approach. These methods, e.g., LAAPCD and conventional Method 5 including impinger analysis, measured both filterable and condensable hydrocarbons as particulate. The gaseous hydrocarbons were measured by flame ionization analysis; the sample gas, however, was taken directly from the stack. The gases were neither filtered nor cooled to 50°C. In some cases the data gave similar emission rates. In other cases, large differences occurred. Since EPA did not conduct comparative tests, it cannot be determined if these differences were due to process operating conditions or to differences in the test methods.

Visible emissions were measured by Method 9.

L.2 Continuous Monitoring

The effluent gas stream from an asphalt roofing plant is not suited to measurement of visible emissions by an in-stack transmissometer. The variable dilution caused by the process hooding and the effects of stack gas temperatures could cause the readings of the transmissometer to be invalid. For example, by increasing the stack temperature, the oil droplets that cause the visible emissions will be converted into a gas which would not be detected by the transmissometer, but which will recondense and be visible in the atmosphere.

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EPA-600/3-77-010

Continuous monitoring of gaseous hydrocarbons is technically possible but EPA has not investigated monitors of this type and has not developed any performance specifications for them.

Equipment and installation costs for a transmissometer are estimated to be \$18,000 to \$20,000 and annual operating costs, including data recording and reduction, are estimated at \$8,000 and \$9,000.

Gaseous carbon monitoring equipment and installation costs are estimated to be \$10,000 to \$12,000 and annual operating costs are estimated at \$8,000 to \$9,000.

L.3 Performance Test Methods

Performance Test Method 20, which is recommended for the measurement of asphalt roofing emissions, was based on the EPA definitions of particulate and gaseous hydrocarbons. The sample train is essentially a modification of the Method 5 sampling equipment. Changes were made in the sample filtration temperature and in the cleanup and analysis. The procedure is sufficiently similar to Method 5 that test personnel experienced with Method 5 should have no difficulty with Method 20. Gaseous hydrocarbons are measured after the sample train filter using a flame ionization detector analyzer. This instrument is relatively simple to calibrate and operate. It requires some special protection for field use as it is basically a laboratory device.

The asphalt roofing industry has two major processes, each with peculiar problems which hamper the performance of the emission test. The asphalt saturator line is a continuous process. However, it is subject to numerous line speed fluctuations and stoppages, making coordination of testing with the process essential. The sampling equipment must be stopped and removed from the stack

whenever the process is not at steady state. Extra care must be used to maintain the sample integrity during these times.

The blowing still facility is a batch process. It must be tested over a complete cycle which may be several hours. Emissions, flow rates, and temperatures are a function of time. Careful attention is required to ensure that the cycle being tested is indicative of the normal process operation.

Sampling costs for a test consisting of 3 Method 20 runs is estimated to be about \$8,000 to \$12,000. If in-plant personnel are used to conduct the tests, the costs will be somewhat less.

Method 9 is recommended for visible emission measurement.

APPENDIX L-2

POLYCYCLIC ORGANIC MATTER EMISSIONS

POM SAMPLING AND ANALYSIS USING THE
BATTELLE POM SAMPLING TRAIN

Background

Several years ago, the need for sampling and analysis of polycyclic organic material (POM) arose on several programs at Battelle. At that time the best available technology for sampling for POM appeared to be some version of the EPA Method 5 particulate sampling train. Use of the Method 5 sampling train produced inconsistent POM emission data and led Battelle staff to question the suitability of using this train for POM sampling. As a result, Battelle developed a POM sampling train that retains many of the features and components of the Method 5 train, but which incorporates an additional element that serves to collect the majority of the POM in the gas sample.

Sampling for POM with the Battelle POM Sampling Train should be a straightforward procedure for those already familiar and skilled with the operation of a Method 5 train for particulate collection. The POM sampling procedure utilizes the existing Method 5 train, but also includes a chromatographic adsorbent device (referred to as the adsorbent sampler). This additional component, and its auxiliary equipment, increases the time required for setup, and requires some additional precautionary measures over those associated with particulate sampling alone, but the additional effort and skill required to obtain a meaningful POM sample is not appreciable and the reliability of the POM data obtained is significantly increased.

Sampling System

The Battelle POM Sampling Train, as shown in Figure 1, consists of a Method 5 train with an adsorbent sampler located between the filter and the impingers. Immediately after leaving the hot filter, the gas sample passes into the cooling coil (120 x 0.8 cm) of the Adsorbent Sampler, and then pass through a Pyrex frit and into a cylindrical column of Tenax adsorbent (7 x 3-cm diameter). The cooling coil and Tenax adsorbent are maintained above the water dewpoint by means of a thermostated circulating water bath. Thus, the incoming gases are cooled to maintain adsorbent efficiency, yet the adsorbent is maintained at a temperature which precludes condensation of water vapor present in all combustion effluents. The gases leaving the sampler are drawn through impingers and a Drierite trap, dry gas meter, and leakless vacuum pump (as in Method 5 sampling).

With this system, POM emissions can be determined from the analysis of the probe wash, filter catch, and adsorbent sampler catch. The impingers are only used to cool and dry the stack gases before they enter the dry-gas meter. It has been our experience, that the probe, filter, and adsorbent sampler retain all the POM.

Details of POM Absorber

A schematic representation of the adsorbent sampler is shown in Figure 2. The heat exchanger section consists of 120 cm (4 feet) of 8-mm Pyrex tubing wound in approximately eight coils. The adsorbent is retained by an extra coarse Pyrex frit and a spring loaded glass wool plug, as shown; Tenax (35/60 mesh) is routinely used in the adsorbent trap of the Battelle Adsorbent Sampler. The dimensions of the adsorbent section are 15-mm radius and 70-mm length. The 28/12 Pyrex joint on the inlet to the sampler is compatible with the fittings commonly used in commercial EPA Method 5 sampling trains; the 15-mm Solv-Seal joint at the sampler outlet provides an efficient vacuum seal during sampling. (A 28/12 Pyrex joint could be used at the sampler outlet.) A vacuum hose coupling between the front sampler outlet and the impinger inlet is sufficient.

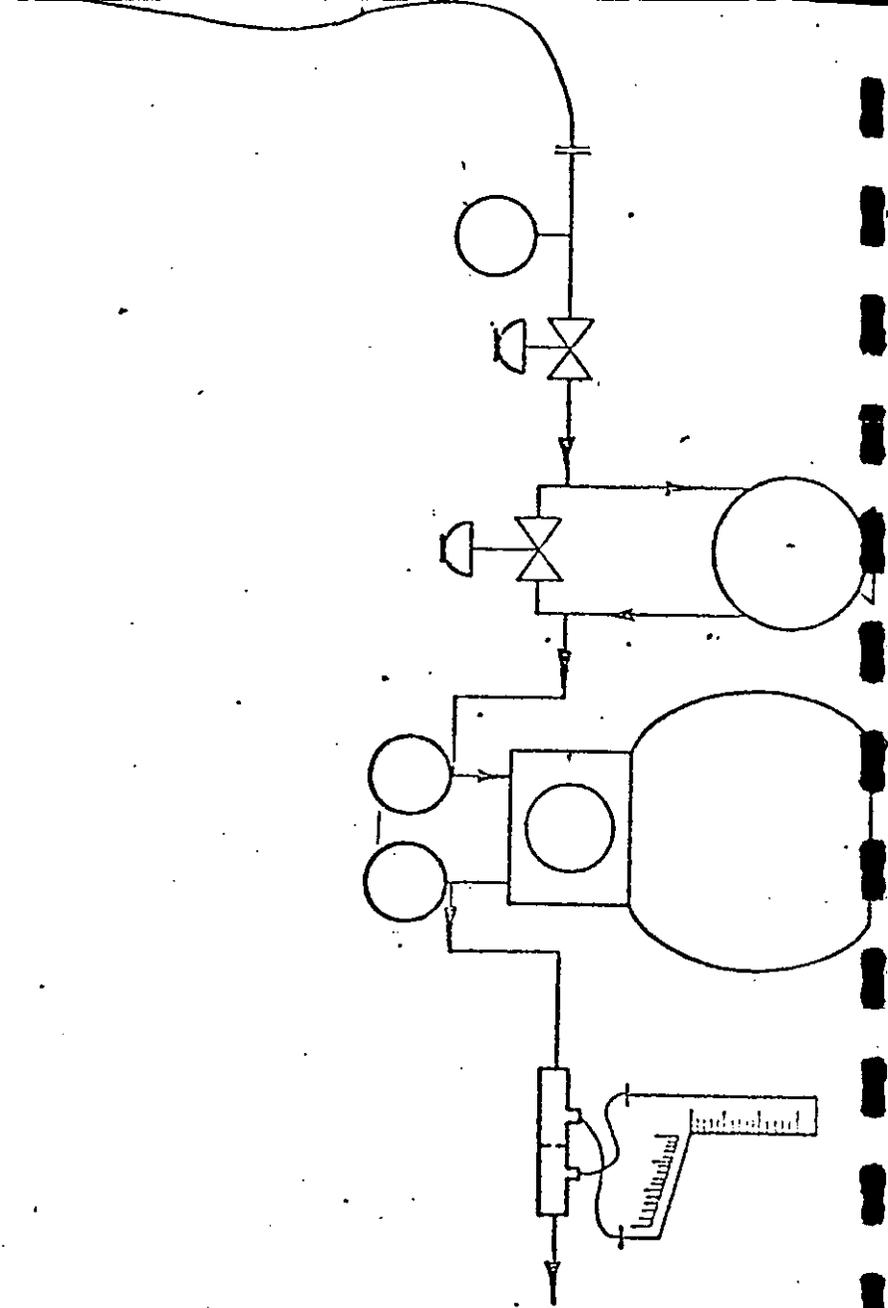
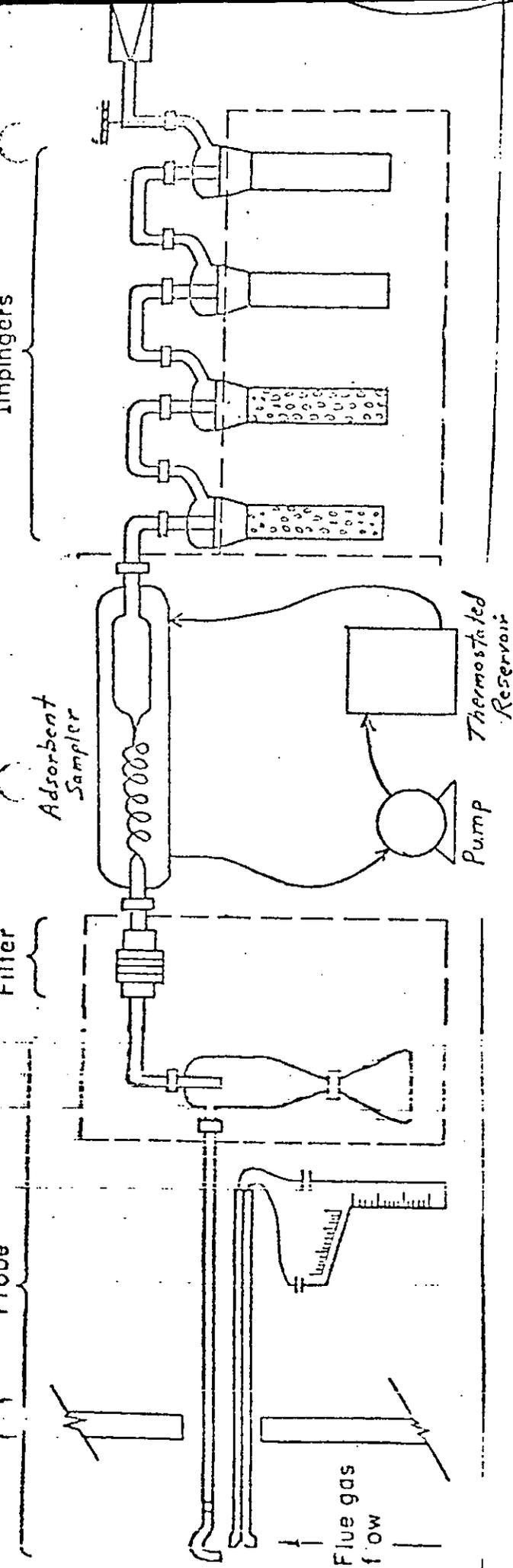


FIGURE 1. BÄTTELLE POM SAMPLING SYSTEM

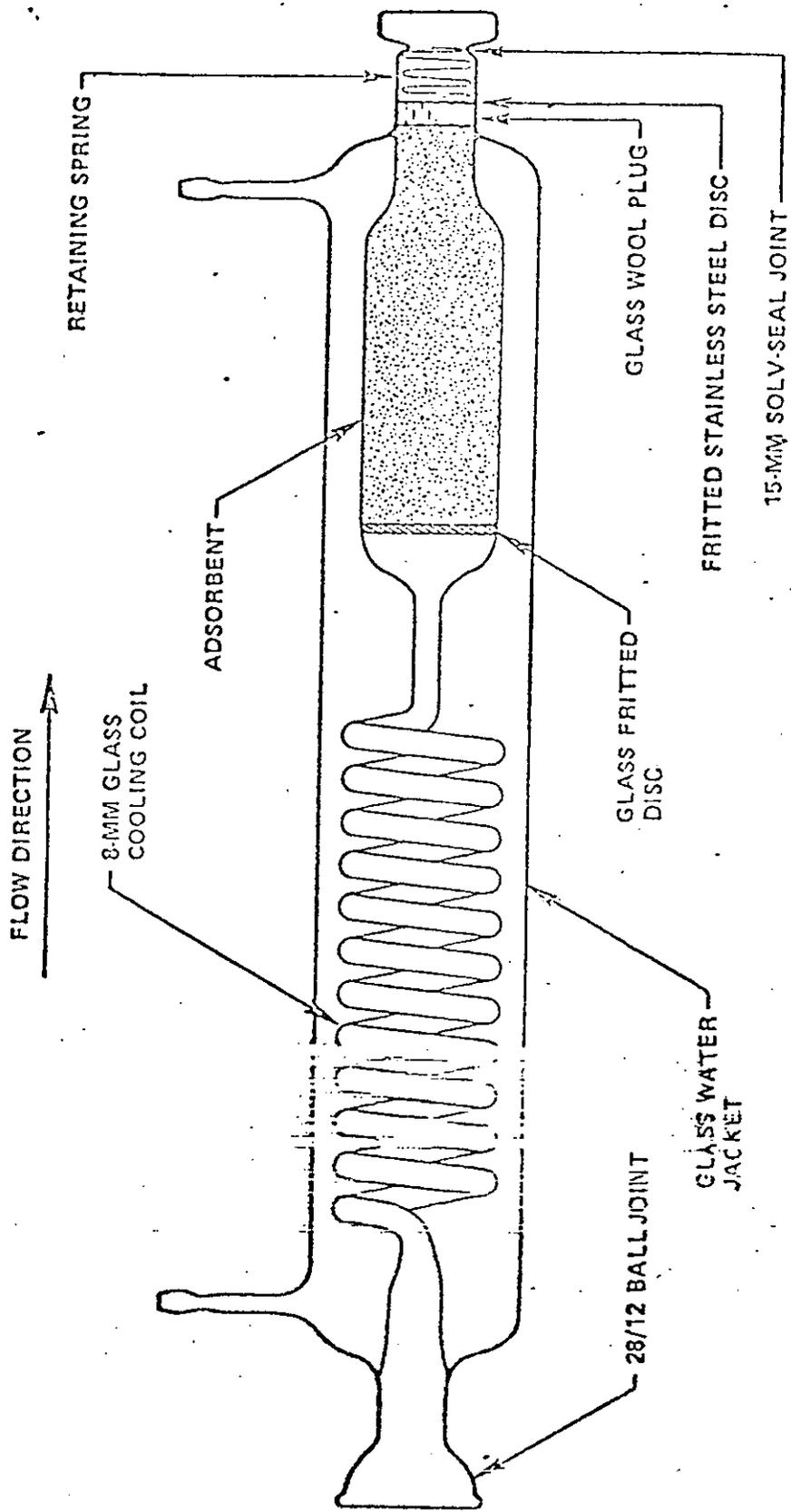


FIGURE 2. ADSORBENT SAMPLING SYSTEM

Adsorbent Sampler Temperature

The collection efficiency of the adsorbent sampler is dependent on the temperature of the adsorbent material. The optimum temperature of the adsorbent should be as low as possible without condensing large quantities of water vapor (present in most stack gases) and plugging the adsorbent device. Generally, this temperature is 20 to 25 F (10 to 15 C) above the dewpoint of the stack gases. For sampling gases that would consist primarily of vented air or products of combustion of fossil fuels it has been found that 125 F to 130 F (52 to 55 C) is a satisfactory adsorbent temperature. Of course, the adsorbent temperature is to be maintained at the predetermined temperature throughout the run to insure a continuous high POM collection efficiency.

Auxiliary Equipment

To maintain the adsorber at a temperature above the dewpoint, a thermostated controlled water bath is used. A 10-gal/min pump circulates water to the adsorbent sampler from a 4-gal reservoir. An aquastat is used to control a 450-watt heating element to maintain the water temperature. For stack gas temperatures up to at least 550 F (300 C) and sampling rates of 0.6 scfm (0.017 Nm³/min) to 0.75 scfm (0.021 Nm³/min), the heat loss from the water circulating loop to the ambient surroundings generally is greater than the heat gain from the stack gases to the water, so it usually is necessary to supply auxiliary heat to the water loop. Although unlikely, depending upon the conditions under which a sample is collected (at high stack temperatures and/or high ambient temperature), it may be necessary to cool the circulating water to maintain the desired temperature. A simple calculation of the heat transfer between the gas sample and the circulating water will determine whether or not cooling is needed. If cooling is needed, an additional cooling coil could be inserted between the adsorbent sampler and the reservoir.

Sampling

Sampling with the Battelle POM Sampling Train is conducted in essentially the same manner as sampling with the EPA Method 5 sampling train. The one difference between operation of these two sampling trains is that, in using the Battelle POM Sampling Train, it is desired to maintain the probe and filter temperature at 350 F (versus the 250 F when using the EPA sampling train). Maintaining the probe and filter at 350 F presents condensation and/or adsorption of SO_3 and POM on these components (followed by destructive reaction of SO_3 with POM). Instead of being caught by the probe and filter, the POM passes through these components and is retained in the absorbent sampler.

When sampling for POM, the stack gases are sampled isokinetically as described in Method 5. (Isokinetic sampling is desired because some of the POM may be physically associated with particulate in the gas stream.) The pressure drop associated with the flow of stack gases through the adsorbent device usually does not interfere with maintaining an isokinetic sampling rate throughout the run.

Sample Recovery in the Field and Sample Preservation

Polycyclic organic materials are readily photooxidized in the presence of ultraviolet light (and possibly visible light). Thus, the sampling train should be protected from sunlight and all other ultraviolet sources, both during and after sample collection. Also, some organic compounds which are collected by the adsorbent sample may have an appreciable vapor pressure, and care must be exercised to minimize losses of such materials. To prevent loss of POM by photooxidation, a heavy dark cloth is placed over the exposed sampling train glassware during sampling. Immediately after sample collection is completed, the adsorbent sampler is sealed with ball-joint and Solv-Seal stoppers and the

filter and adsorbent sampler are stored in a cool light-free container for transport to the analytical lab.

The probe and glassware up to the filter (including the filter holder) are washed with acetone followed by methylene chloride^(a); these solvents are 'Distilled-in-Glass' quality or better. The solution and particulate matter from the probe rinse are stored in a dark (amber) glass bottle prior to analysis and kept cool.

Sample Extraction and Recovery

Sample recovery from the Battelle POM Sampling Train for POM analysis involves extraction of three separate portions of the total sampling train:

- (1) Probe and glassware up to the filter
- (2) Filter
- (3) The adsorbent sampler.

Initial recovery of Item (1) is done in the field (i.e., the probe is washed as described above), while Items (2) and (3) are most conveniently extracted in the laboratory.

Sample Recovery from the Probe Wash

The probe wash (a solvent and particulate mixture) is agitated for 1 hour in an ultrasonic bath before filtering off the solvent with a Whatman No. 40 Filter.

Sample Recovery from the Filter

Organic material is extracted from the filter by means of Soxhlet extraction with methylene chloride ('Distilled-in-Glass'), or by ultrasonic agitation with methylene chloride followed by filtration using a Whatman No. 40 filter. While both methods have been found to be equally satisfactory; ultrasonic extraction is somewhat faster.

(a) To minimize evaporative sample loss during solvent extraction, solvents with very low boiling points are used.

Sample Recovery from the Adsorbent Sampler

Great care must be taken not to expose the adsorbent sampler to polar solvents such as methylene chloride or acetone, since the Tenax adsorbent is readily soluble in these solvents. Our experience has shown that it is preferable to extract the adsorbent sampler with a low boiling point hydrocarbon such as pentane ('Distilled-in-Glass').

To extract the adsorbent sampler, the two stoppers are first removed, and the extraction apparatus assembled, as shown in Figure 3, under yellow safe-lights. A double surface water cooled condenser is preferred, the distilling flask is of 250-ml capacity. The adsorbent sampler is extracted with "Distilled-in-Glass" pentane. An initial volume of 180 ml is usually necessary since there is an appreciable solvent hold-up during extraction. The samplers are extracted with the continuous extraction apparatus for 24 hours, and it is normal to experience a small loss of pentane during this period. The extraction apparatus is then disassembled and the pentane extract stoppered and stored in darkness.

Thus, three extracts are obtained from the adsorbent sampler-Method 5 sampling train:

- (1) Acetone and methylene chloride probe extract
- (2) Methylene chloride filter extract
- (3) Pentane adsorbent sampler extract.

These extracts are sealed and kept in darkness while awaiting analysis.

Reactivation of Adsorbent Sampler

Following extraction, air is drawn through the sampler with an aspirator to remove most of the remaining pentane solvent. The sampler is then dismounted by withdrawing the stainless steel spring with a hooked spatula, removing the stainless steel perforated disk, discarding the glass wool plug, and emptying the almost dry Tenax into a clean glass container. The adsorbent sampler body is cleaned by blowing with compressed air to remove any trace materials and then rinsed with the following

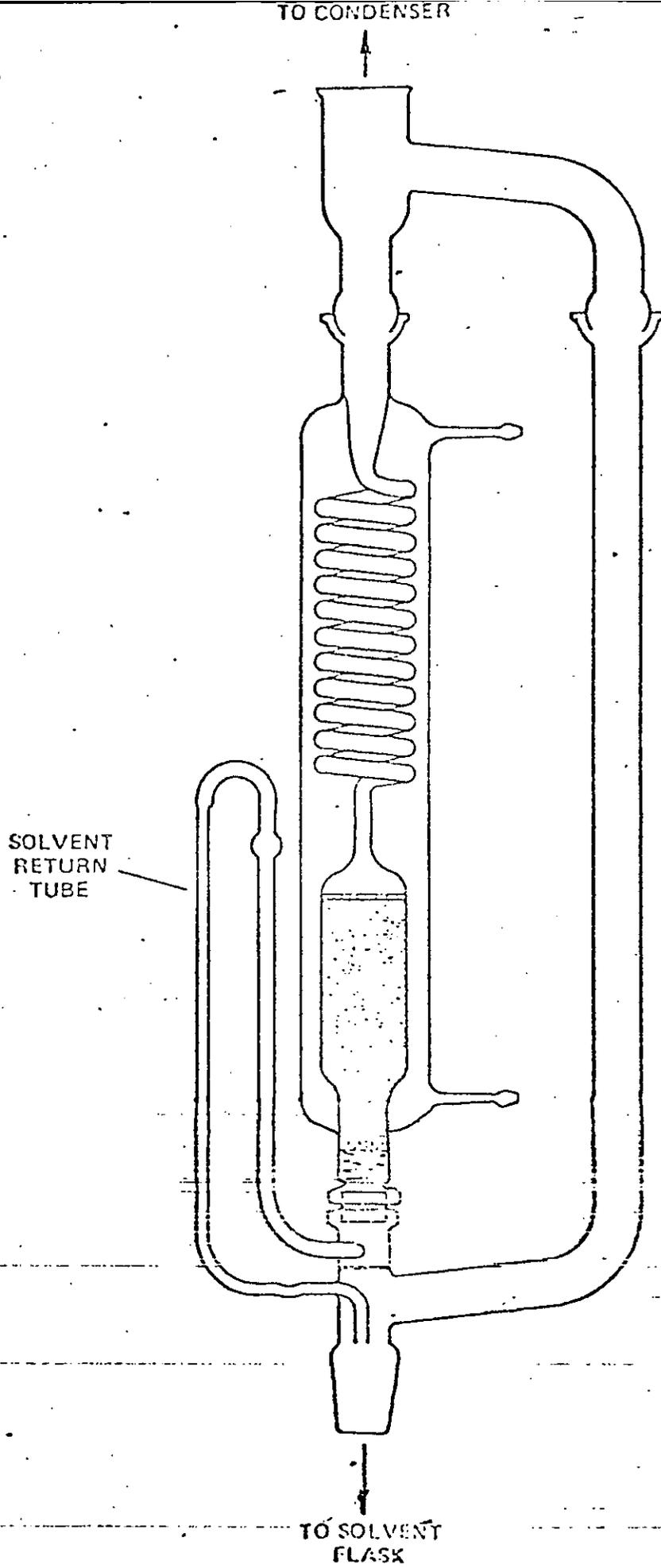


FIGURE 3. CONTINUOUS EXTRACTION ASSEMBLY FOR ADSORBENT SAMPLER

solvents in the order given:

- (1) Methylene chloride
- (2) Chromic acid
- (3) Water
- (4) Acetone
- (5) Methylene chloride
- (6) Pentane.

The sampler is then sealed with clean stoppers prior to refilling with activated Tenax.

Used pentane extracted Tenax may be reactivated and thoroughly cleaned by placing it in an oven at 200 C under nitrogen flow in a glass tube for 24 hours. New Tenax may be similarly prepared by first Soxhlet extracting with pentane for 24 hours and then heating under nitrogen. It is generally desirable to maintain a small supply of activated Tenax, and to reactivate the adsorbent from six or more samplers at one time.

An adsorbent sampler is prepared by filling the adsorbent section with activated Tenax to within 3/4 inch of the top of the sampler while agitating the sampler with an electrical vibrator. A clean glass wool plug is then inserted into the neck, followed by a perforated stainless steel disk and the stainless steel retaining spring. The sampler is then sealed with the appropriate 28/12 ball-joint and 15-mm Solv-Seal stoppers and is ready for use.

Analysis of Extracts

The three extracts from the probe, filter, and adsorbent samples, may be analyzed separately for POM compounds, or they may be combined and a single POM analysis performed on the total sample.

Internal standards are added to the combined extracts from each sampling train prior to volume reduction by rotary evaporation and Kuderna-Danish evaporation. The extract is subjected to a Rosen-type liquid chromatography separation⁽¹⁾ in order to isolate the POM fraction before carrying

out gas chromatographic-mass spectrometric (GC-MS) analysis. Gas chromatographic separation is achieved using a 14-foot x 2-mm, 2-1/2 percent, Dexil 300 column programmed from 170 C to 350 C at 4 C min⁻¹. Separation of the benzpyrene isomers is routinely accomplished using a one foot 1%N, N'-Bis(p-methoxy-benzylidene)- α,α' -bi-p-toluidine column isothermal at 130 C. Mass spectrometric analysis is carried out with a Finnigan 1015 quadrupole mass spectrometer with a chemical ionization source; methane is routinely used as the carrier and reagent gas. Data acquisition is accomplished with a System Industries 150 data acquisition system, and quantification of the POM compounds present is accomplished using a Digital PDP8 computer.

This mass spectrometric-computer quantification procedure makes use of specific absolute ion currents. The bases for the quantification procedure is to initially obtain the computer reconstructed gas chromatogram and mass spectrum in the normal fashion; this reconstructed gas chromatogram is then displayed on the CRT terminal and an overlay for the protonated molecular ion of the POM of interest is superimposed. This overlay represents the ion current corresponding to that specific POM molecular weight plus 1 mass unit. If there is an area in the reconstructed gas chromatogram where the overlay indicates that this mass number is prevalent, the mass spectrum of this peak is displayed on the CRT unit, and the presence of the POM may be confirmed. If the POM is found to be present at a correct relative retention time to the internal standards, the computer then sums the ion current due to all important ions in the POM's mass spectrum which represents the area of the peak of interest. Quantification of each POM is achieved by ratioing its ion current to that of an internal standard of known concentration. The relative ionization efficiencies of the internal standards and many POM species were previously determined, and the appropriate factor is used in quantification.

This quantification technique overcomes the problems associated with interfering or overlapping peaks and poor base-line separations since these interfering species usually have different molecular weights. Isomeric compounds such as pyrene and fluoranthrene which have the same molecular weight can be quantified easily since they are very adequately separated by gas chromatography and their order of elution is known.

In order to obtain optimum sensitivity during the gas chromatographic-mass spectrometric analyses, the ionization voltage must be adjusted at various stages during the analysis. This adjustment necessitated the incorporation of three internal standards so that an internal standard would elute between each ionization adjustment. The internal standards chosen were 9-methylanthracene, 9-phenylanthracene, and 9,10-diphenylanthracene. It was fortuitous that 9,10-diphenylanthracene elutes almost coincident with the benz(a)pyrene/benz(e)pyrene isomers, giving a very accurate marker when searching for these important compounds. The relative retention times of other POM species to one or more of the internal standards are generally sufficiently well known to permit specific compound identification when the mass spectra are displayed.

This ion integration technique has proven to be far superior to GC for the analysis and quantification of POM due to its very high selectivity; it also offers a very significant advantage in speed of data handling.

Laboratory Validation Studies

Laboratory validation studies were performed on the adsorbent sampler component of the Battelle POM Sampling Train. These validation studies involved setting up an adsorbent sampler, to collect air drawn through a 500 F (260 C) tube furnace. A precisely measured quantity of polynuclear compounds in a few microliters of methylene chloride solution was then injected into the inlet of the adsorbent sampler, and heated air was passed through the system for at least an hour. Following solvent extraction of the sampler, a suitable internal standard was added, and analysis for the spiked polynuclear compound was made by GC-MS analysis.

Preliminary experiments were carried out in order to determine the most suitable solvent for extraction of the adsorbent sampler. Extraction was attempted with methylene chloride, acetone, methyl alcohol, p-dioxane, pentane, cyclohexane, benzene, and toluene; only saturated hydrocarbons proved entirely suitable, on account of partial Texan solubility in more polar solvents. Pentane was found to be the most suitable solvent, its high volatility minimized sample loss during extraction. The relatively low extraction efficiency of pentane is overcome by means of continuous solvent extraction for a period of over 24 hours, as described above.

Initial validation experiments involved sampling and recovery of measured quantities of anthracene; during this work the temperature of the sampler was allowed to rise to approximately 200 F (93 C), but quantitative anthracene recovery was always obtained. (Later field experiments have suggested that sampling with adsorbent temperatures of 175 F (80 C) may not result in retention of a significant fraction of the POM compounds.

Subsequent validation experiments were carried out with the sampler at 130 F (55 c) using pyrene, chrysene, perylene, benz(ghi)perylene, and coronene; these compounds are representative of commonly encountered POM species. 10,000 ng of each of these compounds was separately sampled over a 2-hour time period; following pentane extraction and addition of internal standard, the POM compound was quantified by GC-MS using specific absolute ion current integration. The results of several representative laboratory calibration experiments are given in Table 1.

TABLE 1. RECOVERY OF POM FROM ADSORBENT SAMPLER

Integration by GC-MS

POM	Spiked (ng)	Sample #1 Average % Recovery	Sample #2 Average % Recovery	Sample #3 Average % Recovery
Pyrene	10,000	91 ± 3	98 ± 4	104 ± 4
Chrysene	10,000	90 ± 5	92 ± 5	106 ± 5
Perylene	10,000	91 ± 4	105 ± 5	102 ± 6
Benz(ghi)perylene	10,000	101 ± 10	106 ± 10	103 ± 7
Coronene	10,000	80 ± 7	92 ± 8	100 ± 14

APPENDIX L-3
PROCESS SAMPLES
AND
SPECIAL DRYING OF MASS SAMPLES

*Fairfield
File*



Battelle

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Columbus, Ohio 43201
Telephone 614-292-1151
Telex 24-5454

February 6, 1976

Mr. Clyde E. Riley
Emission Measurement Branch
Office of Air Quality Planning
and Standards
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Dear Gene:

Enclosed are some additional data that were requested at the January 27 meeting. Computer printout sheets are included for the hydrocarbon data for Fairfield.

ASTM standards used for the ultimate analyses were D3176-74 which refers to the following for specific analyses:

- D3177 - Sulfur
- D3178 - Carbon and hydrogen
- D3179 - Nitrogen.

Oxygen is supposed to be by difference, but the reported total does not add up to the 100 percent.

Proximate analysis was by D3172 with specific methods as follows:

- D3175 - Volatile matter
- D3173 - Moisture
- D3174 - Ash.

Fixed carbon is by difference.

If you have any questions, please call.

Best regards,

Richard E. Barrett
Associate Manager
Combustion Systems Section

REB:bp

Encs.



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Columbus, Ohio 43201
Telephone (614) ~~XXXXXX~~ 424-6424
Telex 24-5454

January 7, 1976

*Recd 1-9-76
C.E. Riley*

Mr. Clyde E. Riley
Emission Measurement Branch
Office of Air Quality Planning
and Standards
U.S. Environmental Protection Agency
Research Triangle Park
North Carolina 27711

Dear Gene:

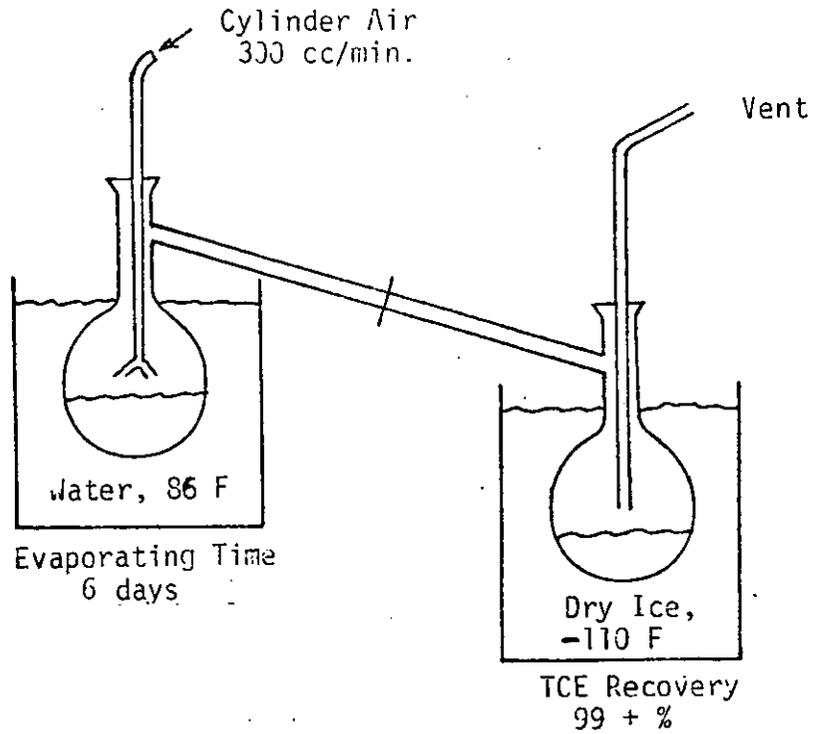
The purpose of this brief letter report is to bring you up-to-date on our progress on analysis of the asphalt plant samples and to report additional results.

Firstly, the drying of the "exploratory" mass samples went much slower than anticipated. As you recall, we pointed out that volatile components might be lost if mass samples were dried according to standard Method 5 procedures, and that the significance of such a loss would be unknown. With your agreement, we selected several (four) representative samples and have been drying these samples using special procedures so that we could establish if any "particulate" mass loss was occurring during the drying process. Our special drying procedure consisted of drying the samples at the same conditions as usual for Method 5, but collecting (by condensation) the evaporating solvent (or water) so that the vaporized solvent could be analyzed for organics. The concept was that if no organic material (particulate) is found in the solvent condensate, we are not losing organic matter (particulate) during the drying process.

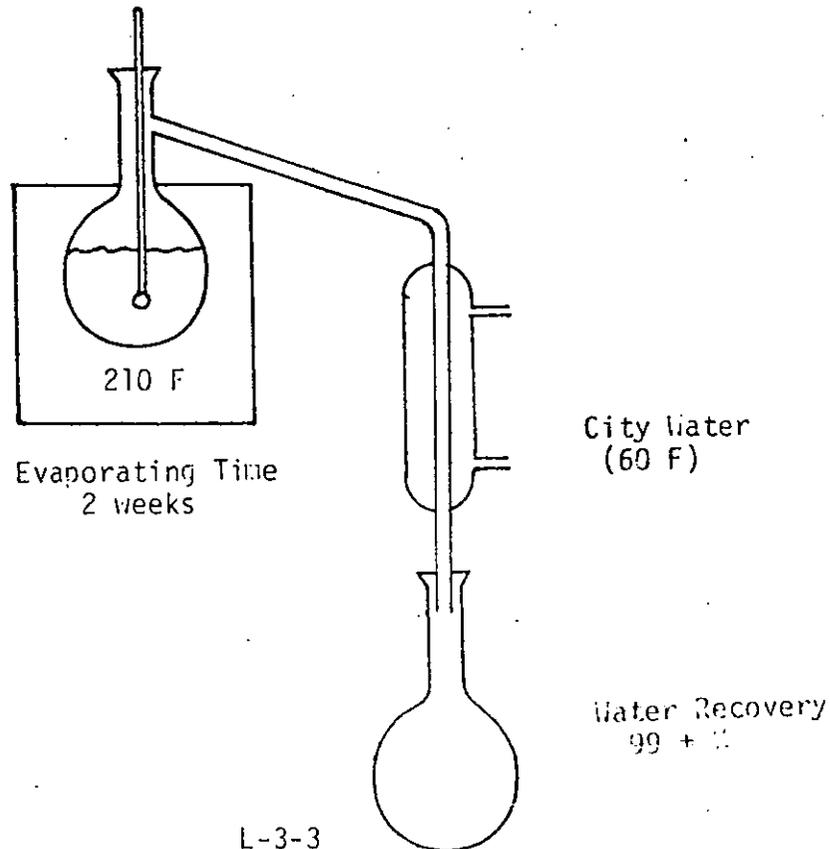
It turned out that the evaporation process progressed very slowly under our controlled conditions. (For example, we did not run the drying apparatus overnight as the dry ice being used to condense the solvent would have been expended and, thus, we would have lost solvent.) However, drying of all samples but one has been completed, and some analyses have been completed. Results to date, with outlet samples, have shown no detectable organics in the solvent condensate. However, these solvents had relatively small amounts of organic in solution, and, thus, these results have not necessarily been definitive. We expect to complete analyses of the condensates from the inlet sample by Friday (January 9) and expect this result to be definitive as to whether particulate will be lost during normal Method 5 drying procedures.

SPECIAL DRYING OF SELECTED SAMPLES

TCE SAMPLES



WATER SAMPLES



Mr. Clyde E. Riley
EPA

2

January 7, 1976

As a result of the slowness of this process, our progress on drying remaining mass samples has been delayed. If the results we obtain Friday are negative (no particulate lost during drying), we will move rapidly to dry remaining samples. Conversely, if the data suggest that particulate is being lost during solvent evaporation, we will have to agree on how to proceed.

~~Table 1 shows our updated schedule. Ultimate analyses of process samples are on schedule. POM analyses are in progress.~~

~~Tables 2 and 3 contain additional results of ultimate analyses of process samples.~~

I will call you Friday (January 9) to discuss the results of our "exploratory" drying study.

Best regards,



Richard E. Barrett
Associate Manager
Combustion Systems Section

REB:bp

Encs. (3)

APPENDIX M
PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

Celotex Corporation
Fairfield, Alabama

October 3 through October 10

Battelle Columbus Laboratories

R.E. Barrett, Associate Manager
Coordinator

S.E. Miller, Chemist - Gaseous Measurements

W.C. Baytos, Scientist - Clean up

K.W. Turner, Technician - Delivered Equipment

Midwest Research Institute

Dr. K. P. Ananth, Engineer - Process Monitor

Monsanto Research Corporation

D. L. Harris, Research Group Leader - Particle Sizing

Environmental Protection Agency
Research Triangle Park, N.C.
Emission Standards and Engineering Division

Emission Measurement Branch
Field Testing Section

C. E. Riley, Environmental Protection Specialist - Project Coordinator
W. E. Kelly, Engineer - Particulate Measurements
R. T. Harrison, Engineer - Particulate Measurements
L. S. Granger, Engineer - Visible Emissions
J. J. Burbank, Engineer - Particulate Measurements
J. M. Davis, Engineer - Particulate Measurements

Test Support Section

T. J. Logan, Engineer	Sampling Coordinator
F. C. Bidby, Technician	Particulate Measurements
R. E. Mobley, Technician	High Volume Sampling
W. A. Shulby, Technician	Visible Emission

Industrial Studies Branch

Standards Support Section

E. A. Noble, Engineer Project Coordinator - Process

Emission Test Report Review Checklist--Short Form

Reviewer: Brian Shrager
 Review Date: 1/5/93

A. Background Information

1. Facility name: Celotex Corporation
 Location: Fairfield, Alabama
2. Source category: Asphalt Roofing
3. Test date: October 6-10, 1975
4. Test sponsor: EPA
5. Testing contractor: Battelle-Columbus-Hydrocarbons (w/MS), Monsanto-PS
6. Purpose of test: NSPS

7. Pollutants measured (include test method and indicate if valid): Filterable PM - 5A (EPA Method) ✓
Total VOC's - Method 25A (FID) ✓
PM - 1 run only Modified Method 5 → ~~Method 5~~ DO NOT USE!
Particle size - Data considered questionable → DO NOT USE!

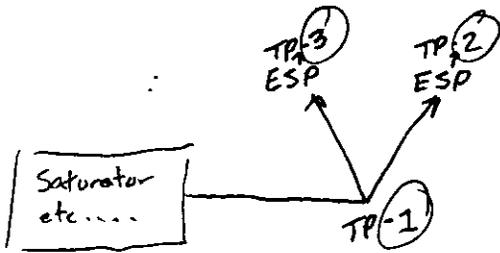
*ORSAT gas analysis at outlet showed outlet gases to contain essentially the same components as ambient air. Data were not included in report!

8. Process overview: Attach a process description and a block diagram. Identify processes tested with letters from the beginning of the alphabet (A, B, C, etc...) and APC systems with letters from the end of the alphabet (V, W, X, etc...). Also identify test locations with Arabic numerals (1,2,3, ...). Using the ID symbols from the diagram, complete the table below.

Test ID	Process	Process ID	Emissions tested		APCD (controlled emissions only)
			Uncontrolled	Controlled	
1	Saturator, drying drum, looper, + cooler	A	✓		ID: <u>2 ESP's</u> Type: <u>2 ESP's</u> Model #: <u>Smog hog</u>
2	"	"		✓	ID: <u>2</u> Type: <u>2 ESP's</u> Model #: <u>Smog hog MS-16-AT</u>
					ID: Type: Model #:
					ID: Type: Model #:

B. Process Information

1. Provide a brief narrative description of the process and attach process flow diagram. (Note: If the process description provided in the test report is adequate, attach a copy here.)



Process typical!

C. 1. List any APCD parameters (supplied in the test report) below.

APCD ID	Parameter	Units	Readings			
			Run 1 SPECS	Run 2	Run 3	Run 4
Z	ΔP	in. H ₂ O	0.88-0.9			
Type of APCD: 2 ESP's (parallel) "Smog-Hog" by United Air Systems	15 hp					
Type of APCD:						
Type of APCD:						

2. Include any additional information (such as capture techniques for fugitive systems) and descriptions of the air pollution control systems (use a separate page if necessary).

