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

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

AP42 Section: 11.2

Reference: 7

Title: Air Pollution Emission Test, Certain-Teed Products, Shakopee, Minnesota,

EMB Report No. 76-ARM-12,

U. S. Environmental Protection Agency, Research Triangle Park, NC,

May 1977.

Section 4 Reference 2
AP-42 Reference __

Emission Test Report Review Checklist--Short Form

Reviewer: Brian Shrager
Review Date: 1/6/93

A. Background Information

1. Facility name: Certain-Teed Products
   Location: Shakopee, Minnesota
2. Source category: Asphalt Roofing
3. Test date: Sept. 9-13, 1975
4. Test sponsor: EPA
5. Testing contractor: Battelle-Columbus
6. Purpose of test: NSPS
7. Pollutants measured (include test method and indicate if valid):
   - ✓ Filterable PM - Method 5A
   - Total Condensible PM - Back-half analysis of Method 5A catch → 1 run. Do not use!
   - ✓ Trace Metals - 1 run → show in section 4, but not in AP-42. *
   - ✓ Total VOC's - Method 25A
   - Aldehydes - LA wet chemistry method
   - POM - modified method 5 w/POM collection column - Single Run. Do NOT USE!
   - ✓ CO - NDIR
   - SO_2
   - NO_x
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: Uncontrolled	Emissions tested: Controlled	APCD (controlled emissions only)
1	Saturator, coater, drying-in drums	A	✓		ID: Type: ~~Afterburner (2 parallel)~~ Model #:
2	~~Storage tanks~~ " outlet includes storage tanks	A		✓	ID: Z Type: Afterburners (2) Manuf. by HIRT parallel Model #: HFL 9 MX
3	Storage tanks	B	✓		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.)

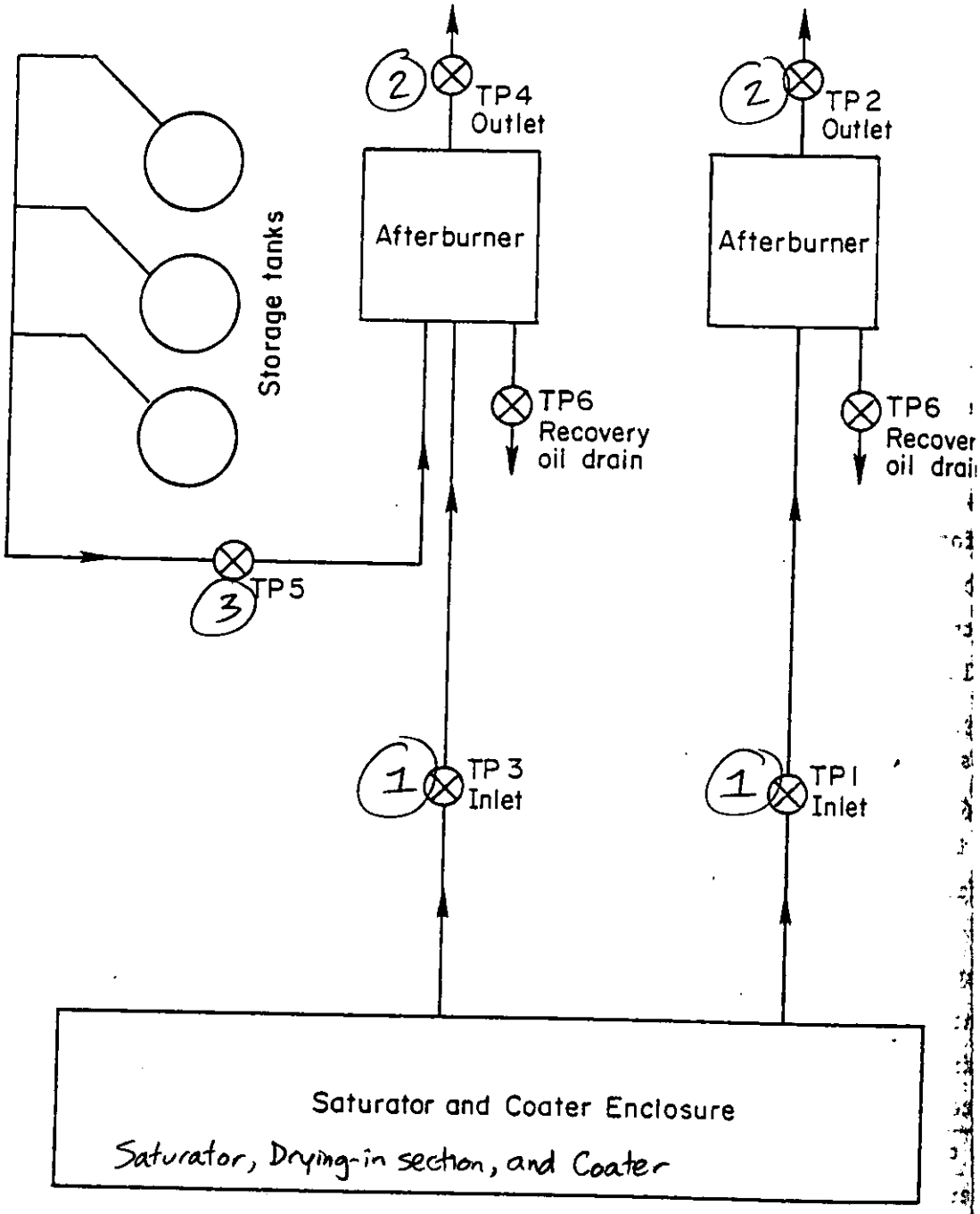


FIGURE 1. BLOCK DIAGRAM SHOWING RELATIVE LOCATIONS OF PROCESS COMPONENTS AND SAMPLE POINTS

III. PROCESS DESCRIPTION AND OPERATION

The roofing plant was built in November, 1974. This plant was tested during September 9 to 13, 1975, to determine emissions from the asphalt saturator and the asphalt storage tanks and to determine the efficiency of the two afterburners used to control these emissions.

Process Description

Saturation of organic felt with asphalt is done by drawing the felt over a series of rollers of which the bottom rolls are completely submerged in hot asphalt at 400 to 470 F. The rotating rollers move the felt along the manufacturing line. The Certain-Teed plant at Shakopee has 18 dip rolls in its saturator. After saturation, the felt passes over drying-in drums which press the asphalt into the felt. Then the felt passes through the coating section where the coating (containing about 50 percent coating asphalt and 50 percent mineral stabilizer) is applied. From then on, the operations include granule and backing agent application, cooling, and cutting and packaging. Process parameters such as line speed, saturant temperature, coating temperature, length of felt used, etc., which were monitored during the emissions tests are presented in Appendix K.

Emissions Control System

Asphalt fumes from the saturator, drying-in section, and coater are collected in a single, large, rectangular enclosure. This enclosure has seven large vertical sliding doors each with a 2 x 1 foot glass window. In addition, there is a 3 x 6 foot door in front of the drying-in section and a 5 x 8 foot glass sliding door in front of the coater. All doors touch the floor when closed. A two speed blower on one afterburner increases the suction when any of the doors are opened. The coater door

C. 1. List any APCD parameters (supplied in the test report) below.

APCD ID	Parameter	Units	Readings			
			Run 1	Run 2	Run 3	Run 4
Z						
Type of APCD: 2 afterburners	#1 operates @ 1000 °F					
	#2 operates @ 1200 °F					
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).

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2*	Run 3	Run 4
1	Stack temperature	°F	111/214	214/187	218/202	
Combines TP1 + TP3	Moisture	%	3.0/5.7	2.0/3.6	1.8/4.3	
	Oxygen	—				
	Volumetric flow, actual	acfm	17,792	19,758	19,645	
	Volumetric flow, standard	dscfm	14,457	15,074	14,841	
	Percent isokinetic		95.7/100.8	102.1/101.8	95.7/97.2	
Circle: Production or feed rate → shingles Capacity:		tons/hr	42	~~48~~ 39	~~48~~ 41	
	Pollutant concentrations:					
	Filterable PM	gr/dscf	2.39	0.162	0.263	
	Total Condensible PM	gr/dscf				
	Total VOC's	gr/dscf	0.035	0.029	0.026	
	CO	ppm	300	~~31~~ CANNOT USE RUN 2 BECAUSE OF ADDITIONAL SOURCE OF CO (STORAGE TANKS)	200	
	Pollutant mass flux rates:					
TP1 + TP3	Filterable PM	lb/hr	296	21.0	33.4	
	Total Condensible PM	lb/hr			3.03 ← 1 run only DO NOT USE!	
	Total VOC's	lb/hr	4.22	3.88	3.27	
	CO (pg. 20 of test report)	lb/hr	0.91 *	—	0.70	
	Emission factors:					AVG.
	Filterable PM	lb/ton	7.0	0.538	0.821	2.8
	Total VOC's	lb/ton	0.10	~~0.0995~~ 0.0995	~~0.078~~ 0.080	0.093
	CO	lb/ton	0.0217	—	0.0170	0.019

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported Run 1	Run 2	Run 3	Avg of 3 runs Run 4
2	Stack temperature	°F	621	618	593	
TP-2 + TP4 combined	Moisture	%	4.0	2.7	2.1	
	Oxygen	—				
	Volumetric flow, actual	acfm				
	Volumetric flow, standard	dscfm	26072	26616	26612	26433
	Percent isokinetic					
Circle: Production or feed rate → Shingles Capacity:		tons/hr	42	39	41	41
TP-2 + TP-4 combined	**Pollutant concentrations:**					
	Filterable PM	gr/dscf	0.017	0.014	0.020	
	Total VOC's	gr/dscf	0.021	0.015	—	
	CO	ppm				
	NOx	ppm	10	10	10	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	3.8	3.1	4.5	
	Total VOC's	lb/hr	4.66	3.42	—	
	CO	lb/hr	41	35	33	
	NOx	lb/hr	1.90	1.94	1.94	
	Emission factors:					AVG.
controlled	Filterable PM	lb/ton	0.0905	0.0795	0.110	0.093
	Total VOC's	lb/ton	0.111	0.0877	—	0.099
	CO	lb/ton	0.98	0.90	0.80	0.89
	NOx	lb/ton	0.0452	0.0497	0.0473	0.047

NOx (as NO_2) $\rho = 0.1214$ lb/ft³ at 68° & 29.92 in. Hg.

$lb/hr = 0.1214\ lb/ft^3 \times 26072\ dscfm \times 60\ m/hr \times 10 \times 10^{-6} = 1.90\ lb/hr$

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
3	Stack temperature					
	Moisture					
	Oxygen					
	Volumetric flow, actual					
	Volumetric flow, standard					
	Percent isokinetic					
Circle: Production or feed rate Capacity:	OVERALL AVERAGE SHINGLE	PROD. ton/hr	38	38	38	38
	Pollutant concentrations:					
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	0.046	1.6	3.6	1.4
	Total VOC's	lb/hr	—	0.64	0.81	—
	CO - Insufficient Data					
	Provided for CO.					
	Emission factors:					
	Filterable PM	lb/ton	0.00121	0.0421	0.0947	0.0368
	Total VOC's	lb/ton	—	0.0168	0.0213	—
	AVG. Filt. PM = 0.044	lb/ton				
	AVG. TVOC's = 0.095	lb/ton				

FILENAME: F:\PRIVATE\BRI\AP42\ROOF\METALS.TBL

UNCONTROLLED AND CONTROLLED METAL EMISSION FACTORS FOR ASPHALT ROOFING[a]

Pollutant	Afterburner inlet concentration (ppm)	Uncontrolled emission factor ($lbx10^{-6}$/ton)	Afterburner outlet concentration (ppm)	Controlled emission factor ($lbx10^{-6}$/ton)	Storage tank outlet concentration (ppm)	Storage tank: uncontrolled emission factor ($lbx10^{-6}$/ton)
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	6.5	5.3	303	29	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Vanadium	11	8.9	192	18	2	0.19
Manganese	55	45	530	50	24	2.3
Nickel	135	110	30410	2900	53	5.0
Antimony	ND	ND	ND	ND	ND	ND
Chromium	26.5	21	5073	481	16	1.5
Zinc	707.5	570	1310	120	39	3.7
Copper	92	75	2580	240	7	0.66
Lead	47	38	69	6.5	ND	ND
Boron	1033	840	2620	248	115	11
Lithium	113	92	845	80	10	0.95
Silver	ND	ND	81	7.7	6	0.57
Selenium	910	740	345	33	131	12
Iron	365	300	16690	1600	95	9.0
Strontium	6	4.9	72	6.8	ND	ND
Sodium	670	540	11600	1100	140	13
Potassium	ND	ND	ND	ND	ND	ND
Calcium	ND	ND	ND	ND	ND	ND
Silicon	ND	ND	ND	ND	ND	ND
Magnesium	ND	ND	ND	ND	ND	ND
Barium	148	120	660	63	152	14

[a]Data is based on a single test run at each sampling point and therefore will not be used in the AP-42 section.

8.2

Report No. 76-ARM-12
With Appendices

FINAL

AIR POLLUTION EMISSION TEST

Final Report
Certain-Teed Products
Shakopee, Minnesota

FINAL

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
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

SUBJECT: Source Test Report

DATE: June 20, 1977

FROM: J. E. McCarley, Chief, Field Testing Section, EMB
Emission Measurement Branch, ESED (MD-13)

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 (telephone: 8/629-5548). Additional copies of this report are available from the ERC Library, Research Triangle Park, North Carolina 27711.

Industry: Asphalt Roofing

Process: Saturator

Company: Certain-Teed Products

Location: Shakopee, Minnesota

Project Report Number: 76-ARM-12

Project Officer: C. E. Riley

Enclosure

Addressees:
John Nader (MD-46)
Arch MacQueen (MD-14)
Director, Air & Hazardous Materials Division, Region V
(copy enclosed for State agency)
APTIC (MD-18)

EPA Form 1320-6 (Rev. 6-72)

FINAL REPORT

on

PARTICULATE AND GASEOUS EMISSIONS FROM THE ASPHALT ROOFING PROCESS SATURATOR AT THE CERTAIN-TEED PRODUCTS PLANT SHAKOPEE, MINNESOTA

to

ENVIRONMENTAL PROTECTION AGENCY

May 31, 1977

by

P. R. Webb, W. C. Baytos, S. E. Miller,
and R. E. Barrett

Contract No. 68-02-1409
Task No. 35

Battelle
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. SUMMARY RESULTS	10
Particle Size Measurements	11
III. PROCESS DESCRIPTION AND OPERATION	27
Process Description	27
Emissions Control System	27
Process Operation	30
IV. LOCATION OF SAMPLING POINTS	36
V. SAMPLING AND ANALYTICAL PROCEDURES	41
Particulate Sampling and Analysis	41
Hydrocarbon Sampling and Analysis	43
Gas Composition Glask Sampling and Analysis	46
POM Sampling and Analysis	46
Aldehyde Sampling and Analysis	47
SO_2 and NO_x Measurements	48
Carbon Monoxide Measurements	49
Visible Emission Measurements	51
Particle Size Sampling	51
Trace Metals Analysis	55
Analysis of Process Samples and Recovery Oil	55
VI. REFERENCES	57

TABLE OF CONTENTS
(Continued)

Page

APPENDIX A

FIELD AND LABORATORY DATA RELATED TO PARTICULATE SAMPLING A-1

APPENDIX B

SPECIAL STUDY OF DRYING OF SAMPLES COLLECTED AT SATURATOR PLANTS B-1

APPENDIX C

COMPLETE PARTICULATE RESULTS WITH SAMPLE CALCULATIONS C-1

APPENDIX D

GASEOUS HYDROCARBON FIELD DATA AND CALCULATED EMISSIONS AT EACH SAMPLING POINT D-1

APPENDIX E

SO_2, NO_x, AND CO FIELD AND LABORATORY DATA E-1

APPENDIX F

EPA DRAFT METHOD FOR DETERMINATION OF PARTICULATE AND TOTAL GASEOUS HYDROCARBON EMISSIONS FROM THE ASPHALT ROOFING INDUSTRY F-1

APPENDIX G

POM FIELD DATA AND CALCULATED EMISSIONS G-1

APPENDIX H

PARTICLE SIZE TESTING H-1

APPENDIX I

ALDEHYDE EMISSIONS I-1

APPENDIX J

LABORATORY RESULTS J-1

TABLE OF CONTENTS
(Continued)

Page

APPENDIX K

FIELD DATA ON PROCESS PARAMETERS K-1

APPENDIX L

VISIBLE EMISSION DATA L-1

APPENDIX M

BATTELLE SAMPLING CREW TEST LOG M-1

APPENDIX N

PROJECT PARTICIPANTS N-1

LIST OF TABLES

Page

Table 1. Sampling Test Log, Certain-Teed Products Plant Shakopee, Minnesota 5

Table 2. Performance Summary of Combined Emission Reduction Systems 13

Table 3. Summary of Particulate and Gaseous Hydrocarbon Concentrations and Emission Rates - English Units 14

Table 4. Summary of Particulate and Gaseous Hydrocarbon Concentrations and Emission Rates - Metric Units 15

Table 5. Particulate and Gaseous Hydrocarbon Results of Saturator-Afterburner System 16

Table 6. NO_x Results--Certain-Teed Products Company 19

Table 7. CO Emissions and Emission Rates 20

Table 8. Analysis of Flask Sample from Certain-Teed Products Plant 21

Table 9. Summary of POM Data for Certain-Teed Plant 22

Table 10. Aldehyde Results for Certain-Teed Plant 23

Table 11. Summary of Visible Emission Data 24

Table 12. Trace Metal Analysis of Certain-Teed Samples 25

Table 13. Ultimate Analyses of Process Sample from Certain-Teed Plant 26

Table 14. Summary of Process Information 31

Table 15. Estimates of Saturant and Coating Asphalt Used 34

Table 16. Raw Material and Product Characteristics Observed During Sampling Periods 35

Table 17. Summary of Particulate and Gaseous Hydrocarbon Matter for Front and Back Catches 44

LIST OF FIGURES

	Page
Figure 1. Block Diagram Showing Relative Locations of Process Components and Sample Points	2
Figure 2. Schematic of Emissions Control System and Sampling Points at Certain-Teed's Shakopee Plant	29
Figure 3. TP-1 Inlet Stack Geometry Showing Sampling Location and Sample Point Configuration	37
Figure 4. TP-3 Inlet Stack Geometry Showing Sampling Location and Sample Point Configuration	38
Figure 5. TP-2 and TP-4 Outlet Stack Geometry Showing Sampling Location and Sample Point Configuration	39
Figure 6. TP-5 Storage Vent Duct Showing Sampling Location and Sample Point Configuration	40
Figure 7. Particulate and Gaseous Hydrocarbon Sampling Train	42
Figure 8. Sampling Train for Determining CO Emissions at the Afterburner Outlet	50
Figure 9. Physical layout of stacks TP4 and TP2 and reader Locations	52
Figure 10. Location of Observers at Saturator - Coater Enclosure	53

PARTICULATE AND GASEOUS EMISSIONS FROM THE
ASPHALT ROOFING PROCESS SATURATOR AT THE
CERTAIN-TEED PRODUCTS PLANT
SHAKOPEE, MINNESOTA

I. INTRODUCTION

In accordance with Section III of the Clean Air Act of 1970, the Environmental Protection Agency (EPA) is charged with the responsibility of developing standards of performance for emissions from new stationary sources (New Source Performance Standards) which may contribute significantly to air pollution. A standard of performance developed under the Act for emissions of air pollutants must be based on emissions data from the best emission reduction systems that have been adequately demonstrated for the particular industry being studied, taking into account economic considerations.

Presently, EPA is assembling background information, including emissions data, for the promulgation of New Source Performance Standards for the asphalt roofing industry. To obtain necessary emissions data, EPA is having various organizations measure emissions from five asphalt roofing plants.

As one part of this effort, EPA engaged Battelle-Columbus to measure stack emissions from a saturator process at an asphalt roofing plant of the Certain-Teed Products Company in Shakopee, Minnesota. The roofing plant was built in November, 1974. This plant was tested during September 9 to 13, 1975, to determine emissions from the asphalt saturator and the asphalt storage tanks and to determine the efficiency of the two afterburners used to control these emissions. Battelle-Columbus was responsible for conducting sampling and analyses for particulate emissions, gaseous emissions, and process samples. Simultaneously, Monsanto conducted opacity readings and conducted particle size measurements and Midwest Research Institute staff obtained necessary process data.

Emissions from the roofing products saturator line are controlled by passing the exhaust gas through two parallel afterburner units. Figure 1 is a flow diagram of the plant showing relative locations of process components and sampling points.

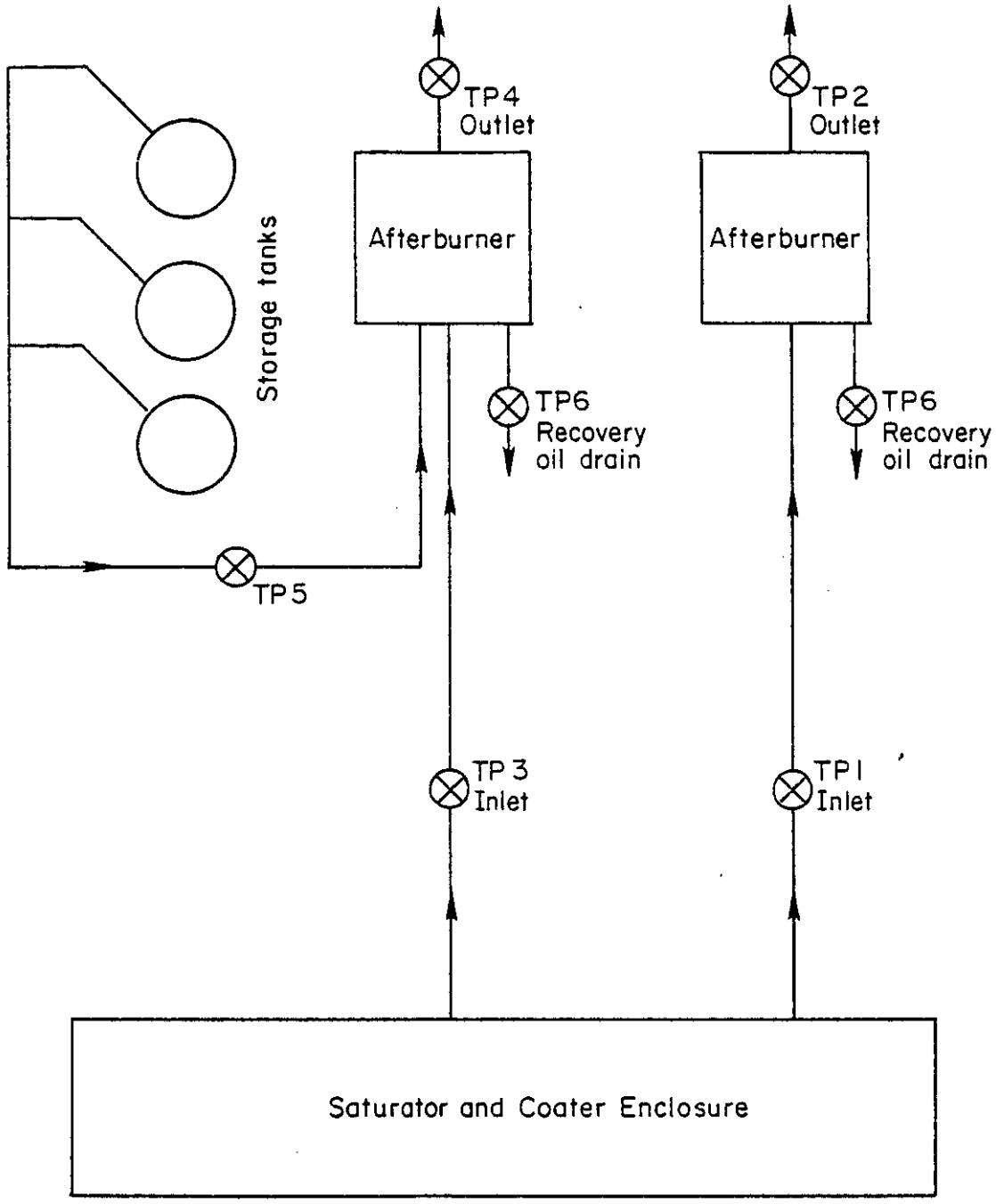


FIGURE 1. BLOCK DIAGRAM SHOWING RELATIVE LOCATIONS OF PROCESS COMPONENTS AND SAMPLE POINTS

Emissions were measured simultaneously at the inlet and outlet of each afterburner while standard 235-240 pound, three tab, seal-down shingles were being produced. These shingles are produced from 55 pound felt that is 49 inches wide. Emissions from six asphalt storage tanks were measured also.

Particulate emissions samples were obtained simultaneously at test points TP-1, TP-2, TP-3, and TP-4 using an EPA procedure entitled "EPA Draft Method for Determination of Particulate and Total Gaseous Hydrocarbon Emissions from the Asphalt Roofing Industry". (See Appendix F for a description of the method.) Simultaneously, hydrocarbon emissions were measured at these points with a flame-ionization detector (FID). Inlet and outlet gas composition was determined from integrated gas samples which were collected in appropriate containers during the course of each run; analysis of CO_2 and O_2 was by Orsat; CO concentration being determined by nondispersive infrared (NDIR). The opacities of the stack emissions for both outlet stacks were monitored by two certified observers during the particulate sampling.

Evacuated flask samples were taken at one afterburner inlet and both afterburner outlets for analysis by gas chromatography. Continuous measurements for NO_x and SO_2 concentration were made at one afterburner outlet during one run by an electrochemical method. Three runs were made to determine aldehyde concentrations utilizing the Los Angeles wet chemistry method[1]. Total polycyclic organic material (POM) was measured simultaneously at the inlet and outlet of one afterburner utilizing a modified EPA Method 5 train in conjunction with a BCL developed POM collection column. Process samples, collected during the course of the test program included recovered oil, bulk asphalt, saturant, coating asphalt, felt, coater asphalt, talc, filler, and sand. Trace metals analysis relating to the emission samples were determined by optical emission spectroscopy.

Table 1, the Sampling Test Log, shows the actual times the sampling was conducted at each location.

The following sections of this report cover the summary of results, process description and operation, location of sampling

points, and sampling ana analytical procedures. Detailed descriptions of procedures, field and laboratory data, and calculations are presented in various appendices, as noted.

TABLE 1.
CERTAIN-TEED PRODUCTS PLANT
SHAKOPEE, MINNESOTA

Date	Clock Time	Line Speed	Particulate TP-1	Particulate TP-2	Particulate TP-3	Particulate TP-4	Particulate TP-5	THC TP-1	THC TP-2	THC TP-3	THC TP-4	THC TP-5	Particulate Size TP-1	Particulate Size TP-2	Particulate Size TP-3	Visible Emissions TP-2	Visible Emissions TP-4	Visible Emissions Hoods	Orsat TP-2	Orsat TP-4	Orsat TP-5
9-9-75	9:35	200					Damper														
	10:50	250					closed														
	10:51																				
	10:54																				
	10:55	Break																			
	12:30	350																			
	12:43																				
	13:43																				
	13:48																				
	13:56	375(13:57)																			
	14:09																				
	14:25																				
	14:43																				
	16:06	370(16:02)																			
	16:26																				
	16:08	355(18:00)																			
	18:09																				
	18:09																				
	18:10																				
	18:12																				
	18:15																				
	18:23																				
	18:30	375																			
	18:32																				
	18:35	Break(18:33)																			
	18:36																				
	18:53	360																			
	18:58																				
	19:02																				
	19:24																				
	19:28																				
	19:30																				
	19:35	250(19:35)																			
	19:39																				
	19:41																				
	19:43																				
	19:44																				
	19:45	372																			
	19:50																				
	19:51																				
	19:59																				
	20:00	372																			
	20:03																				
	20:05																				
	20:15	372																			
	20:23																				
	20:29																				
	20:30	372																			
	20:42																				
	20:53																				
	20:56	378(20:58)																			
	21:00	250																			
	21:12																				
	21:15	375																			

TABLE 1. (Continued)

Date	Clock Time	Line Speed	Part. TP-5	THC TP-5	Part. Size TP-1	Part. Size TP-3	Orsat TP-5
9-10-75	10:18	250(10:20)					
	10:48	235(10:50)					
	11:05						
	11:12						
	12:05						
	12:07						
	12:08						
	12:37						
	12:38						
	12:40						
	13:08						
	14:20	240					
	15:15						
	15:20	200					
	16:15						
	16:18						
	17:18						

TABLE 1. (Continued)

Date	Clock Time	Line Speed	Particulate TP-1	Particulate TP-2	Particulate TP-3	Particulate TP-4	Particulate TP-5	THC TP-1	THC TP-2	THC TP-3	THC TP-4	THC TP-5	Particulate Size TP-1	Particulate Size TP-2	Particulate Size TP-3	Visible Emissions TP-2	Visible Emissions TP-4	Visible Emissions Hoods	Orsat TP-5
9-11-75	9:35	370					Damper Open												
	10:15	300																	
	10:45	350																	
	11:15	210																	
	11:17																		
	11:18																		
	11:31	300(11:30)																	
	11:32																		
	11:35	355																	
	11:39																		
	11:40																		
	11:42																		
	11:46																		
	11:48	Break																	
	11:50																		
	11:59																		
	12:21																		
	12:30	350(12:35)																	
	12:53																		
	12:55																		
	12:57																		
	13:04																		
	13:27																		
	13:30	370			(13:39)														
	13:46																		
	13:51	Break(13:50)																	
	13:57																		
	14:04																		
	14:09	305(14:10)																	
	14:12																		
	14:14																		
	14:15																		
	14:17																		
	14:20																		
	14:23																		
	14:31	360(14:30)																	
	14:39																		
	14:40																		
	15:03																		
	15:18																		
	15:22																		
	15:28																		
	15:30																		
	15:33																		
	15:38																		
	15:43	Break(15:42)																	
	15:45																		
	16:30	355																	
	16:40																		
	16:43																		
	17:00	355																	
	17:43																		
	17:44																		
	18:44																		

TABLE 1. (Continued)

Date	Clock Time	Line Speed	Particulate TP-1	Particulate TP-2	Particulate TP-3	Particulate TP-4	Particulate TP-5	THC TP-1	THC TP-2	THC TP-3	THC TP-4	THC TP-5	Part. Size TP-1	Part. Size TP-2	Part. Size TP-3	Visible Emissions TP-2	Visible Emissions TP-4	Visible Emissions Hoods	No. Emissions TP-1	No. Emissions TP-2	No. Emissions TP-3	No. Emissions TP-4
5-12-75	9:09						Damper Closed															
	10:36	355(10:35)																				
	10:53	Break(10:52)																				
	11:57																					
	12:09	350(12:05)																				
	12:11	Break(12:10)																				
	14:01	310(14:00)																				
	14:02																					
	14:03																					
	14:08	335																				
	14:10																					
	14:23																					
	14:24	Break																				
	14:25																					
	14:36																					
	15:40																					
	16:10	350																				
	16:12																					
	16:15	350																				
	16:16																					
	16:18																					
	16:20																					
	16:28																					
	16:30	352																				
	16:36																					
	16:37	Break																		16:45		
	16:40																					
	16:55	350																				
	17:00	Break																				
	17:01																					
	17:02																					
	17:03																					
	17:30																					
	17:31																					
	17:33																					
	17:35	325(17:37)																				
	17:44																					
	17:45																					
	17:46																					
	17:47																					
	17:48																					
	17:53	350																				
	17:54																					
	18:10																					
	18:13																					
	18:18																					
	18:20																					
	18:23																					
	18:30																					
	18:43	365(18:42)																				
	18:45	185																				
	18:46																					18:50
	18:57	365(18:55)																				
	19:04																					
	19:05																					
	19:30	365																				

TABLE 1. (Continued)

Date	Clock Time	Line Speed	POM TP-1	POM TP-2	Aldehydes TP-3	Aldehydes TP-4
9-13-75	14:19	355				
	14:20					
	14:26					
	14:44					
	14:45	355				
	14:51					
	14:52					
	15:09					
	15:10					
	15:14	Stop(15:20)				
	15:36	335				
	15:37					
	15:38					
	15:52					
	15:53					
	15:55	335				
	16:01					
	16:04					
	16:06	190				
	18:07	Break(16:10)				
	18:09					
	18:13					
	18:18					
	18:20	350				
	18:23					
	19:07					
	19:10	100				
	19:24	355(17:25)				
	19:26					
	19:29	Break(19:30)				
	19:34					
	19:46					
	19:56					

II. SUMMARY OF RESULTS

Orsat analyses of inlet and outlet showed the exhaust gas was essentially air. Average inlet flow (dry) for TP-1 and TP-3 were 221 and 196 Nm^3/min. (7,834 and 6,957 dscfm), respectively; gas temperatures were 82 and 94 C (181 and 201 F), respectively. Average outlet flow (dry) for TP-2 and TP-4 381 and 365 Nm^3/min. (13,488 and 12,946 dscfm), respectively; gas temperatures were 280 and 363 C (537 and 687 F), respectively. Gas moisture content was essentially the same at both inlet and outlet and averaged 3.2 percent. Isokinetic sampling rates for the particulate sampling runs ranged from 91.7 to 108.8 percent, and sample gas volumes ranged from 1.47 to 3.2 Nm^3 (51.9 to 114.3 dscf).

Average inlet particulate concentrations as measured at TP-1 and TP-3 (front half of the sampling train) were 412.1 and 4326.8 mg/Nm^3 (0.179 and 1.884 gr/dscf), respectively. Average outlet particulate concentrations as measured at TP-2 and TP-4 were 53.9 and 21.9 mg/Nm^3 (0.023 and 0.010 gr/dscf), respectively. Particulate loadings at TP-5 averaged 583.5 mg/Nm^3 (0.254 gr/dscf). The average control efficiencies of the two afterburner systems were 78 and 96 percent.

Continuous monitoring of gaseous hydrocarbons passing through the filter on the particulate sampling train by a flame-ionization detector (a Beckman Model 109 or 402* instrument calibrated on methane) showed a range of 21.0 ppm (TP2-2) to 285.0 (TP3-1) during the runs at TP-1, TP-2, TP-3, and TP-4. Average gaseous hydrocarbon emissions, based on these data, were 0.61 and 1.11 kg/hr (1.35 and 2.44 lb/hr) at the afterburner inlets and 0.69 and 1.09 kg/hr (1.52 and 2.40 lb/hr) at the outlets.

Emission results are tabulated as follows:

Table 2 - Performance Summary of Combined Emission Reduction Systems

Table 3 - Summary of Particulate and Gaseous Hydrocarbon Concentrations and Emission Rates - English Units

Table 4 - Summary of Particulate and Gaseous Hydrocarbon Concentrations and Emission Rates - Metric Units

---

* Mention of trade names or manufacturers is not intended to constitute endorsement by EPA or its contractors.

Table 5 - Particulate and Gaseous Hydrocarbon Results of Saturator-Afterburner System
Table 6 - NO_x Results
Table 7 - CO Emissions and Emission Rates
Table 8 - Gaseous Analysis of Flask Sample
Table 9 - Summary of POM Data
Table 10 - Aldehyde Results
Table 11 - Summary of Visible Emission Data
Table 12 - Trace Metal Analysis
Table 13 - Ultimate Analyses of Process Sample

Particle Size Measurements

The analysis of the data illustrates some peculiarities. The weight of material collected from the aluminum pans from all runs are shown in Appendix H.

The weights vary between 1 to 2.4 milligrams of material and the majority are in the 1.3 milligram range and appear to be quite uniform. The samples, however, were observed at the time of their collection by visual observation to vary to quite an extent. Strangely enough the highest loaded pans were from the run conducted on the outlet of the incinerator. The normal technique for particle mass determination in a solvent is to evaporate to dryness in a tared container and desiccate to a constant weight. This procedure was followed for these samples. While this process is good for nonsoluble, solid particles, it is not conducive to accurate results when dealing with liquid droplets of organic materials. A better method would be a chromatographic analysis of the liquids, however, this procedure would be extensive, costly, and time consuming.

There is convincing evidence to indicate that a process emitting organic material as an aerosol cannot be sampled with a cascade impactor system as currently used. The evidence indicates that the field results are not representative, and considerable loss of volatile

material may occur during sampling, transit and sampling handling procedures. As a result, the data presented in this report cannot be considered representative of the size distribution of particles in the gas streams.

TABLE 2. PERFORMANCE SUMMARY OF COMBINED EMISSION REDUCTION SYSTEMS

Run Number	1		2		3	
Location	Afterburners 1 and 2 Inlet	Afterburners 1 and 2 Outlet	Afterburners 1 and 2 Inlet	Afterburners 1 and 2 Outlet	Afterburners 1 and 2 Inlet	Afterburners 1 and 2 Outlet
Date	9/9/75		9/11/75		9/12/75	
Volumetric Flow Rate, dscfm[a]	14,457	26,072	15,074	26,616	14,841	26,612
Stack Temperature, °F	157	621	201	618	211	593
Percent Moisture by Volume	4.2	4.0	2.8	2.7	3.0	2.1
Particulates--Probe, Cyclone, and Filter Catch						
gr/dscf[b]	2.389	0.017	0.162	0.014	0.263	0.020
lb/hr	295.8	3.8	21.0	3.1	33.4	4.5
Collection Efficiency, Percent						
Combined Systems per Run	98.7		85.2		86.5	
Combined Systems Per 3 Runs (Based on numerical average)			90.1			
	(TP-5 emissions not included in above values)		(TP-5-4 emissions included in above values)		(TP-5 emissions not included in above values)	
Gaseous Hydrocarbons Average Results						
ppmv as CH_4[b]	115.6	71.2	93.9	51.4	88.0	(Data set incomplete--No HC data for TP-2-3)
gr/dscf[b]	0.035	0.021	0.029	0.015	0.026	
lb/hr	4.22	4.66	3.88	3.42	3.27	
Collection Efficiency, Percent						
Combined Systems Per Run (Based on numerical average)	0		11.9		(Data set incomplete)	

(a) Dry standard cubic feet per minute at 70°F, 29.92 in. Hg.

(b) Weighted average based on dscfm volumetric flows.

TABLE 3. SUMMARY OF PARTICULATE AND GASEOUS HYDROCARBON CONCENTRATION AND EMISSION RATES-ENGLISH UNITS

	Afterburner Number 1								Afterburner Number 2							
							Average/3 Runs								Average/3 Runs	
Run Number	TP-1 1	TP-2 1	TP-1 2	TP-2 2	TP-1 3	TP-2 3	TP-1	TP-2	TP-3 1	TP-4 1	TP-3-2 TP-5-4	TP-4 2	TP-3 3	TP-4 3	TP-3 & TP-5	TP-4
Date	9/9/75	9/9/75	9/11/75	9/11/75	9/12/75	9/12/75			9/9/75	9/9/75	9/11/75	9/11/75	9/12/75	9/12/75		
Volume Gas Sampled, dscf[a]	90.1	83.0	90.2	114.3	112.4	110.5	97.6	102.6	51.9	109.3	133.8	112.5	95.9	101.6	93.9	107.8
Percent Moisture by Volume	3.0	3.4	2.0	2.5	1.8	1.4	2.3	2.4	5.7	4.6	3.6[e]	3.0	4.3	2.8	4.5	3.5
Stack Temperature, F	111.	555.	214.	524.	218.	532.	181.	537.	214.	691.	187.[e]	712.	202.	657.	201.	657.
Stack Volumetric Flow Rate, dscfm[b]	8,043.	13,452.	7,599.	13,318.	7,860.	13,693.	7,834.	13,488.	6,414.	12,620.	7,475.	13,298.	6,981.	12,919.	6,957.	12,946.
Stack Volumetric Flow Rate, acfm[c]	9,035.	27,118.	10,077.	25,810.	10,394.	26,322.	9,835.	26,417.	8,757.	29,017.	9,681.	30,841.	9,251.	28,227.	9,230.	29,362.
Percent Isokinetic	95.7	108.8	102.1	108.6	95.7	102.1	97.8	106.5	100.8	101.0	101.8	99.0	97.2	91.7	99.9	97.2
Particulates--Probe, Cyclone and Filter Catch																
mg	1,210.7	134.9	879.6	147.3	1,321.7	182.6	1,137.3	154.9	17,274.7	57.7	1,305.1	50.3	2,208.2	89.5	7,096.0	65.8
gr/dscf	0.207	0.025	0.150	0.020	0.181	0.025	0.179	0.023	5.121	0.008	0.175[e]	0.007	0.355	0.014	1.864	0.010
gr/acf	0.184	0.012	0.113	0.010	0.137	0.013	0.145	0.012	3.748	0.004	0.136[e]	0.003	0.267	0.006	1.384	0.004
lb/hr	14.3	2.9	9.8	2.3	12.2	3.0	12.1	2.7	281.5	0.9	11.2	0.8	21.2	1.5	104.6	1.1
Collection Efficiency, Percent									(Damper Closed)		(Damper Open)		(Damper Closed)			
Individual Runs	79.7		76.5		75.4		77.7		99.7		92.9		92.9		95.2	
Gaseous Hydrocarbons Average Results																
Weighted Average Value, ppmv as CH_4[d]	71.3	64.9	67.6	25.2	67.7	ND	68.9	45.1	171.2	78.0	120.5[f]	77.7	110.7	66.1	134.1	73.9
gr/dscf	0.021	0.019	0.020	0.007	0.020	ND	0.020	0.013	0.053	0.024	0.039[f]	0.023	0.033	0.020	0.042	0.022
lb/hr	1.45	2.19	1.28	0.84	1.33	ND	1.35	1.52	2.77	2.47	2.60[g]	2.58	1.94	2.14	2.44	2.40
Collection Efficiency Percent	0		34.4		ND				10.8		1.0[h]		0		1.6	

(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) ppmv--parts per million by volume.

(e) Weighted average of Runs TP-3-2 and TP-5-4.

(f) Weighted average of Runs TP-3-2 with average of Runs TP-5-2 and TP-5-3.

(g) TP-5-2 and TP-5-3 averaged and added to TP-3-2 for combined lb/hr.

(h) Based on weighted average.

ND = No Data.

TABLE 4. SUMMARY OF PARTICULATE AND GASEOUS HYDROCARBON CONCENTRATION AND EMISSION RATES-METRIC UNITS

Run Number	Afterburner No. 1 TP-1 1	TP-2 1	TP-1 2	TP-2 2	TP-1 3	TP-2 3	Average/3 runs TP-1	TP-2	Afterburner No. 2 TP-3 1	TP-4 1	TP-3-2 TP-5-4	TP-4 2	TP-3 3	TP-4 3	Average/3 runs TP-3 & TP-5	TP-4
Date	9/9/75	9/9/75	9/11/75	9/11/75	9/12/75	9/12/75			9/9/75	9/9/75	9/11/75	9/11/75	9/12/75	9/12/75		
Volume Gas Sampled, Nm^3 (a)	2.54	2.34	2.54	3.22	3.17	3.12	2.75	2.89	1.47	3.08	3.89 (e)	3.17	2.70	2.87	2.69	3.04
Percent Moisture by Volume	3.0	3.4	2.0	2.5	1.8	1.4	2.3	2.4	5.7	4.6	3.6	3.0	4.3	2.8	4.5	3.5
Stack Temperature, C	43	290	101	273	103	277	82	280	101	366	86 (e)	377	94	347	94	363
Stack Volumetric Flow Rate, Nm^3/min (b)	226	379	214	375	221	386	220	380	180	356	210	375	196	364	195	365
Stack Volumetric Flow Rate, m^3/min (c)	254	764	284	728	293	742	277	745	247	818	272	870	260	796	260	828
Percent Isokinetic	95.7	108.8	102.1	108.6	95.7	102.1	97.8	106.5	100.8	101.0	101.8 (e)	99.0	97.2	91.7	99.9	97.2
Particulates--Probe, Cyclone and Filter Catch																
mg	1,210.7	134.9	879.6	147.3	1,321.7	182.6	1,137.3	154.9	17,274.7	57.7	1,805.1	50.3	2,208.2	89.5	7,096.0	65.8
mg/Nm^3	475.2	57.5	345.1	45.6	416.1	58.5	412.1	53.9	11,763.2	18.7	402.4 (e)	15.8	814.8	31.2	4,326.8	21.9
mg/m^3	422.7	28.5	260.0	23.5	314.4	30.4	332.4	27.5	8,608.9	8.1	310.1 (e)	6.8	614.4	14.2	3,177.8	9.7
kg/hr	6.5	1.3	4.4	1.0	5.5	1.4	5.5	1.2	127.7	0.4	5.1	0.4	9.6	0.7	47.5	0.5
Collection Efficiency, Percent																
Individual Runs	79.7		76.5		75.4		77.7		(Damper Closed) 99.7		(Damper Closed) 92.9		(Damper Closed) 92.9		95.2	
Gaseous Hydrocarbons																
Average Results																
Weighted Average Value, ppmv as CH_4 (d)	71.3	64.9	67.6	25.2	67.7	ND	68.9	45.1	171.2	78.0	120.5 (f)	77.7	110.7	66.1	134.1	73.9
mg/Nm^3	48.2	43.6	45.9	16.1	45.9	ND	46.7	29.9	121.7	55.1	89.5	52.8	75.8	45.9	95.7	51.3
kg/hr	0.66	0.99	0.58	0.38	0.60	ND	0.61	0.69	1.26	1.12	1.18 (g)	1.17	0.88	0.97	1.11	1.09
Collection Efficiency Percent	0		34.4		ND				10.8		1.0 (h)		0		1.6	

(a) Dry standard cubic meters at 20 C, 29.92 MHg.

(b) Dry standard cubic meters per minute at 20 C, 29.92 in. Hg.

(c) Actual cubic meters per minute.

(d) ppmv--parts per million by volume.

(e) Weighted average of Runs RP-3-2 and TP-5-4.

(f) Weighted average of Runs TP-3-2 with average of Runs TP-5-2 and TP-5-3.

(g) TP-5-2 and TP-5-3 averaged and added to TP-3-2 for combined kg/hr.

(h) Based on weighted DSCFM average.

ND--No data.

TABLE 5. PARTICULATE AND GASEOUS HYDROCARBON RESULTS OF SATURATOR-AFTERBURNER SYSTEM AT CERTAIN-TEED PLANT IN SHAKOPEE, MINNESOTA (Weights are minus blanks)

	TP-1				TP-2			
	TP1-1	TP1-2	TP1-3	Average	TP2-1	TP2-2	TP2-3	Average
Particulate Results								
Front half train, TCE wash, mg	168.3	176.5	323.7	--	85.0	72.5	83.5	--
Front half train, acetone wash, mg	CS	CS	6.0	--	CS	4.8	4.1	--
Prefilter, TCE wash, mg	728.7	518.0	792.0	--	CS	40.3	72.3	--
Glass fiber filter catch, mg	313.7	185.1	200.0	--	49.9	29.7	22.7	--
Total front half, mg	1,210.7	879.6	1,321.7	--	134.9	147.3	182.6	--
Concentration, gr/dscf	0.207	0.150	0.181	0.179	0.025	0.020	0.025	0.023
Concentration, mg/Nm^3	475.2	345.1	416.1	412.1	57.5	45.6	58.5	53.9
Particulate emission rate, lb/hr	14.3	9.8	12.2	12.1	2.9	2.3	3.0	2.7
Particulate emission rate, kg/hr	6.5	4.4	5.5	5.5	1.3	1.0	1.4	1.2
Gaseous Hydrocarbon Results								
Minimum value, ppm	50.0	44.3	47.2	--	48.5	21.0	--	--
Maximum value, ppm	88.0	81.0	77.6	--	92.0	32.0	--	--
Weighted average value, ppm	71.3	67.6	67.7	68.9	64.9	25.2	--	45.1
Hydrocarbon emission rate, lb/hr	1.45	1.28	1.33	1.36	2.19	0.84	--	1.52
Hydrocarbon emission	0.66	0.58	0.60	0.61	0.99	0.38	--	0.69

TABLE 5. (Continued)

	TP-3				TP-4			
	TP3-1	TP3-2[a]	TP3-3	Average[a]	TP 4-1	TP4-2	TP4-3	Average
Particulate Results								
Front half train, TCE wash, mg	16,091.3	127.6	333.3	--	24.4	13.5	10.3	--
Front half train, acetone wash, mg	CS	CS	18.5	--	CS	18.1	42.1	--
Prefilter, TCE wash, mg	1,112.9	335.4	878.7	--	27.7	10.6	23.6	--
Glass fiber filter catch, mg	70.5	147.5	977.6	--	5.6	8.1	13.5	--
Total front half, mg	17,274.7	610.5	2,208.1	--	57.7	50.3	89.5	--
Concentration, gr/dscf	5.121	0.175	0.355	1.884	0.008	0.007	0.014	0.010
Concentration, mg/Nm^3	11,763.2	402.4	814.8	4,326.8	18.7	15.8	31.2	21.9
Particulate emission rate, lb/hr	281.5	11.2	21.2	104.6	0.9	0.8	1.5	1.1
Particulate emission rate, kg/hr	127.7	5.1	9.6	47.5	0.4	0.4	0.7	0.5
Gaseous Hydrocarbon Results								
Minimum value, ppm	102.0	80.0	95.0		58.5	56.5	61.0	--
Maximum value, ppm	285.0	123.0	124.0		87.0	90.0	72.0	--
Weighted average value, ppm	171.2	120.5	110.7	134.1	78.0	77.7	66.1	73.9
Hydrocarbon emission rate, lb/hr	2.77	2.60	1.94	2.44	2.47	2.58	2.14	2.40
Hydrocarbon emission rate, kg/hr	1.26	1.18	0.88	1.11	1.12	1.17	0.97	1.09

TABLE 5. (Continued)

	TP-5				
	TP5-1	TP5-2	TP5-3	TP5-4	Average
Particulate Results					
Front half train, TCE wash, mg	47.9	NS	218.4	49.4	--
Front half train, acetone wash, mg	CS	CS	1.6	2.8	--
Prefilter, TCE wash, mg	CS	980.7	2,773.4	1,084.2	--
Glass fiber filter catch, mg	1.1	926.8	85.0	58.2	--
Total front half, mg	49.0	1,907.5	3,078.4	1,194.6	--
Concentration, gr/dscf	0.007	0.248	0.539	0.223	0.254
Concentration, mg/Nm^3	15.8	569.1	1,237.1	512.0	583.5
Particulate emission rate, lb/hr	0.046	1.6	3.6	1.4	1.7
Particulate emission rate, kg/hr	0.021	0.7	1.6	0.6	0.7
Gaseous Hydrocarbon Results					
Minimum value, ppm	--	75.0	235.0	--	--
Maximum value, ppm	--	685.0	570.0	--	--
Weighted average value, ppm	--	335.0	419.9	--	377.5
Hydrocarbon emission rate, lb/hr	--	0.64	0.81	--	0.73
Hydrocarbon emission rate, kg/hr	--	0.29	0.37	--	0.33

(a) Considering only TP-3 and TP-4 data.

(b) Including TP-5 emissions with TP-3 inlet data.

NS = No sample; CS = Sample combined with other sample portion.

TABLE 6. NO_x RESULTS--CERTAIN-TEED PRODUCTS COMPANY

Sampling Location	Time of Sampling		NO_x, ppm
	Date	Hour	
TP-1, inlet	9-12-75	1810-1820	0
TP-2, outlet	9-12-75	1645-1700	15
TP-2, outlet	9-12-75	1730-1745	10
TP-2, outlet	9-12-75	1815-1830	10
TP-3, inlet	9-12-75	a.m.	0
TP-4, outlet	9-12-75	1850-1905	10

Analysis method: Grab samples analyzed by electrochemical cell analyzer (see p 47).

TABLE 7. CO EMISSIONS AND EMISSION RATES

Run	CO Concentrations, ppm					Emission Rates, lb/hr			
						Inlet		Outlet	
	TP-1	TP-2	TP-3	TP-4	TP-5	TP-1	TP-3+5	TP-2	TP-4
1	10.0	290.	20.	440.	270.	0.35	0.56	16.96	24.13
2	12.0	250.	19.	355.	145.	0.40	0.62	14.54	20.52
3	10.0	265.	12.	300.	240.	0.34	0.36	15.77	16.84
POM	--	280.	--		--	--	--	16.24	--
Average	10.7	271.	17.	365.	218.	0.36	0.51	15.88	20.50
					Total	0.87		36.38	

Analysis method: Grab samples analyzed by non-dispersive infrared analyzer (see p 48).

Co: .0727 lb/ft3 @ 1 atm + 68°F

TABLE 8. ANALYSIS OF FLASK SAMPLE FROM CERTAIN-TEED PRODUCTS PLANT (EPA SAMPLE S76-006-348)

(For Sample Collected From the Particulate Sampling Train Downstream of the Filter)

Component	Analysis
	Volume percent
O_2	19.3
CO_2	0.97
N_2	78.6
A	0.99
CO	0.02
H_2	0.10
	ppm by Volume
SO_2	<0.3
H_2S	<0.1
NO_x	<0.5
COS	<0.3
CH_3OH	0.4
C_2H_5OH	<0.2
HCHO	<0.5
CH_3COCH_3	1.0
CH_4	260.
C_2H_6	17.
C_3H_8	0.2
C_4H_{10}	0.2
C_5H_{12}	<0.2
C_6H_{14}	<0.2
C_2H_4	24.
C_3H_6	4.0
C_4H_8	2.0
C_5H_{10}	<0.5
C_2H_2	0.5
C_6H_6	<0.1
$C_6H_5CH_3$	<0.01

TABLE 9. SUMMARY OF POM DATA FOR CERTAIN-TEED PLANT

Component	NAS Notation	Raw Data (POM by GC-MS, No Correction for Blanks, μg		POM in Blank, μg	POM in Sample (Corrected for blank), μg		POM, Loading in Gas Stream, μg/Nm³	
		Inlet (EPA Sample S75-006-329; BCL Sample 2-3)	Outlet (EPA Sample S75-006-341; BCL Sample I2)	(EPA Sample S75-006-155; BCL Sample I6)	Inlet	Outlet	Inlet	Outlet
Anthracene/Phenanthrene		631.	633.3	0.45	630.6	632.9	254.	280.
Methyl anthracenes		1359.	1027.3	<0.1	1359.	1027.3	548.	455.
Fluoranthene		8.	18.2	0.1	7.9	18.1	3.19	8.01
Pyrene		60.	48.5	0.1	59.9	48.4	24.2	21.4
Methyl Pyrene/Fluoranthene		185.	130.6	<0.1	185.	130.6	74.6	57.8
Benzo(c)phenanthrene	***	ND	ND	ND	-	-	-	-
Chrysene/Benz(a)anthracene	*	35.	203.3	<0.1	35.	203.3	14.1	90.0
Methyl chrysenes	*	13.	221.1	<0.1	13.	221.1	5.24	97.8
Benzo fluoranthenes	**	1.9	12.5	<0.1	1.9	12.5	0.77	5.53
Benz(a)pyrene	***	1.0	9.9	<0.1	1.0	9.9	0.40	4.38
Benz(e)pyrene		1.3			1.3		0.52	
Perylene		0.1	ND	ND	0.1	ND	0.04	ND
3-Methylcholanthrene	****							
Indeno(1,2,3,-cd)pyrene	*							
Benzo(ghi)perylene								
Dibenzo(a,h)anthracene	***							
Dibenzo(c,g)carbazole	***							
Dibenz(ai and ah)pyrenes	***							
Coronene								
TOTAL							925	1020
Sample Volume, Nm³		2.48	2.26					

TABLE 10. ALDEHYDE RESULTS FOR CERTAIN-TEED PLANT

Run Number	Clock Time[a]	Gas Sample Volume dscf	Gas Sample Volume Nm^3[b]	Aldehyde mg HCHO[c]	Aldehyde Concentration, mg HCHO/Nm^3	Stack Flowrate, Nm^3/min	Emission Rate, kg/hr
TP3-1	1426-1445	15.31	0.433	4.5	10.4	189 [d]	0.118
TP3-2	1452-1510	15.77	0.446	4.4	9.9	189 [d]	0.112
TP3-3	1538-1555	15.69	0.444	5.9	13.3	189 [d]	0.151
TP4-1	1426-1444	16.09	0.455	7.6	16.7	365 [e]	0.366
TP4-2	1451-1509	16.99	0.481	9.5	19.8	365 [e]	0.434
TP4-3	1538-1555	15.91	0.450	8.6	19.1	365 [e]	0.418
				Average Inlet	11.2		0.127
				Outlet	18.5		0.406

Note: TP3 = Inlet TP4 = Outlet

(a) All samples taken on 9-13-75.
(b) Corrected to standard conditions, 20 C and 29.92 "Hg.
(c) Results corrected for blank
(d) Mean flow at TP3 from particulate runs.
(e) Mean flow at TP4 from particulate runs.

TABLE 11. SUMMARY OF VISIBLE EMISSION DATA CERTAIN-TEED, SHAKAPEE, MN

Date	24-hr Clock Time	Observer	Discharge Area	Distance to Source, ft	Direction From Source	Wind Direction	Wind Velocity, mph	Weather	Background	
9-9-75	0935-1230	1	A	30	S	SE	8-15	Overcast Partly Cloudy	Gray Clouds and Light Blue Sky	175 min - 0%
9-9-75	0935-1230	2	A	30	S	SE	8-15	Overcast Partly Cloudy	Gray Clouds and Light Blue Sky	175 min - 0%
9-9-75	1425-1830	1	A	30	S	SE	5-15	NA	NA	245 min - 0%
9-9-75	1425-1830	2	A	30	S	SE	5-15	NA	NA	245 min - 0%
9-11-75	0935-1230	1	B	50	E	N-NW	8-15	Partly Cloudy	White Brick Building	150 min - 0%
9-11-75	0935-1230	2	B	50	E	N-NW	8-15	Partly Cloudy	White Brick Building	150 min - 0%
9-11-75	1330-1640	1	B	50	S	NW	10-20	Overcast Partly Cloudy	White, Gray Clouds, Blue Sky	190 min - 0%
9-11-75	1330-1640	2	B	50-60	S	NW	10-20	Overcast Partly Cloudy	White, Gray Clouds, Blue Sky	190 min - 0%
9-12-75	0900-1930	1	C	10-20	N	*	*	*	Green and White Doors and Hood	331 min 30 sec - 0% 8 min 15 sec - 5% 3 min 15 sec - 10% 4 min 45 sec - 15% 13 min 0 sec - 20% 6 min 0 sec - 25% 7 min 30 sec - 30% 1 min 0 sec - 35% 0 min 15 sec - 40%
9-12-75	0900-1930	2	C	10-20	N	*	*	*	Green and White Doors and Hood and Gray Machinery	338 min 0 sec - 0% 18 min 30 sec - 5% 9 min 0 sec - 10% 0 min 45 sec - 15% 5 min 0 sec - 20% 4 min 15 sec - 30%

Notes: * Indoors
NA Not Applicable
Discharge Area A - Test Point 4 (Outlet)
Discharge Area B - Test Point 2 (Outlet)
Discharge Area C - Saturator Hood, Hot Looper, Coater Section.

TABLE 12. TRACE METALS ANALYSIS OF CERTAIN-TEED SAMPLES

Sampling Location (Run No.)	Sample[a]	Trace Metals, ppm																							
		Be	Cd	As	V	Mn	Ni	Sb	Cr	Zn	Cu	Pb	B	Li	Ag	Sn	Fe	Sr	Na	K	Ca	Si	Mg	Ba
TP-1 (3)	FH	<1	<1	<2	<1	8	60	<1	10	<10	2	<1	<35	5	<1	<1	<20	<1	<90	<40	<60	<120	<130	<2
	F	<1	<10	<10	<1	<5	<5	<5	<5	<25	20	<1	<50	<10	<1	25	<25	<5	(b)	(b)	(b)	--	<250	40
	BH	<1	<4	<13	<1	30	<13	<4	<4	75	40	10	270	40	<1	500	150	1	<670	<300	<4500	<9000	<335	90
TP-2 (3)	FH	<1	5	<12	<1	40	920	<4	200	290	270	1	430	60	35	80	1000	<1	1000	<300	<4300	<8600	<250	<10
	F	<1	<40	<40	<4	<40	<40	<40	<40	<220	<40	<4	<400	<40	<4	130	<220	<40	(b)	(b)	(b)	--	<2200	90
	BH	<1	8	<20	<2	60	1470	<6	<5	40	50	2	<400	60	<1	40	380	8	<1000	<500	<7000	<14,000	<840	40
TP-3 (3)	FH	<1	4	<2	10	10	60	<1	10	40	10	15	<30	<3	<1	4	140	<1	<80	<40	<570	<1100	<25	<4
	F	<1	<2	<2	<1	1	<1	<1	<1	<10	10	<1	<10	<2	<1	20	<5	1	(b)	(b)	(b)	--	<50	10
	BH	<1	<3	<10	<1	3	<10	<3	<3	570	10	20	700	60	<1	360	<100	<1	630	<290	<4000	<8000	<170	5
TP-4 (2)	FH	<1	140	<40	<4	200	26,000	<10	3000	400	960	50	840	410	30	20	9800	<4	4000	<1000	<14,000	<29,000	<600	70
	F	<2	<250	<250	120	<120	1,200	<120	1700	<600	1100	<25	<1200	<250	<25	<60	4000	<60	(b)	(b)	(b)	--	<6200	370
	BH	<1	<10	<30	70	150	800	<10	150	170	180	<3	<700	170	<2	<15	1400	15	6100	<850	<11,000	<23,000	<4500	85
TP-5 (3)	FH	<1	<1	<1	1	3	10	<1	10	4	1	<1	20	2	5	<1	50	<1	40	<15	<250	<500	<10	<1
	F	<1	<10	<10	<1	20	40	<10	<10	<50	<10	<1	<100	<10	<1	100	<50	<10	(b)	(b)	(b)	--	<600	150
	BH	<1	<1	<4	<1	<1	<5	<1	<1	<20	<2	<1	<90	<6	<1	30	<40	<1	<200	<100	<1500	<3000	<60	<2
--	Unblown Flux	<0.002	<0.06	<0.06	60	0.2	20	<0.06	1	0.4	0.6	2	0.02	<0.2	<0.005	<0.06	20	0.6	40	20	40	20	4	4

(a) FH = Front half
F = Filter
BH = Back half.

(b) Measured value less than blank.

TABLE 13. ULTIMATE ANALYSES OF PROCESS SAMPLES FROM CERTAIN-TEED PLANT[a]

	Sample				
	Flux (Unblown Asphalt)	Saturant Asphalt	Coating Asphalt	Recovery Oil, TP-3 Duct	Recovery Oil, TP-3 Afterburner
EPA Sample No...	S75-006-301	S75-006-296	S75-006-303	S75-006-300	S75-006-299
Volatile matter, percent	87.48	85.14	83.95	88.61	98.68
Fixed carbon, percent	12.21	14.67	15.63	6.73	0.45
Ash, percent	0.28	0.19	0.42	4.42	0.08
Moisture, percent	0.03	0.00	0.00	0.24	0.79
Carbon, percent	78.38	78.72	78.64	74.47	76.77
Hydrogen, percent	5.44	5.46	5.45	5.18	5.33
Sulfur, percent	3.54	1.89	2.86	2.38	1.75
Nitrogen, percent	0.51	0.98	0.09	0.23	0.17
Oxygen, percent	11.82	12.76	12.54	13.08	15.11
Specific gravity	1.1421	1.1112	1.0130	0.9971	-
Heating value, Btu/lb	18,642	18,501	18,068	17,325	18,999

(a) All data reported on "as received" basis.

III. PROCESS DESCRIPTION AND OPERATION

The roofing plant was built in November, 1974. This plant was tested during September 9 to 13, 1975, to determine emissions from the asphalt saturator and the asphalt storage tanks and to determine the efficiency of the two afterburners used to control these emissions.

Process Description

Saturation of organic felt with asphalt is done by drawing the felt over a series of rollers of which the bottom rolls are completely submerged in hot asphalt at 400 to 470 F. The rotating rollers move the felt along the manufacturing line. The Certain-Teed plant at Shakopee has 18 dip rolls in its saturator. After saturation, the felt passes over drying-in drums which press the asphalt into the felt. Then the felt passes through the coating section where the coating (containing about 50 percent coating asphalt and 50 percent mineral stabilizer) is applied. From then on, the operations include granule and backing agent application, cooling, and cutting and packaging. Process parameters such as line speed, saturant temperature, coating temperature, length of felt used, etc., which were monitored during the emissions tests are presented in Appendix K.

Emissions Control System

Asphalt fumes from the saturator, drying-in section, and coater are collected in a single, large, rectangular enclosure. This enclosure has seven large vertical sliding doors each with a 2 x 1 foot glass window. In addition, there is a 3 x 6 foot door in front of the drying-in section and a 5 x 8 foot glass sliding door in front of the coater. All doors touch the floor when closed. A two speed blower on one afterburner increases the suction when any of the doors are opened. The coater door

remained open during the tests, so the two-speed fan operated at the high speed continuously. There were no visible emissions outside the enclosure unless more than one large door was open.

Two afterburners are used at the plant for emission control. Three ducts transport emissions from the saturator, drying-in section, and the coating section to a manifold above the roof. From the manifold, two ducts transport the gases to the two afterburners. Figure 2 is a schematic of the exhaust gas streams and the afterburners. The sampling points are also shown in the figure. It can be seen from the figure that one of the afterburners is also used to control emissions from one surge tank and six asphalt storage tanks. The storage tanks each have a capacity of 30,000 gal. One of these was shut down for maintenance during the tests. The design and operating data on the two afterburners are presented below:

Afterburner No. 1*

Manufacturer: HIRT Combustion Engineers, Montebello, California
Model No.: HFL 9 MX
Serial No.: .10241073
Design Air Flow: 5,000 and 8,000 scfm
Operating temperature: 1000 F
Fuel used: natural gas/oil (only natural gas was used during test)
Fan motor: 2 speed, 20 hp; 1,750 rpm
Fan manufacturer: U.S. Electric Motors

Afterburner No. 2*

Manufacturer: Same as No. 1
Model No.: Same as No. 1
Serial No.: 10231073
Design Air Flow: 9,000 scfm
Operating temperature: 1200 F
Fuel used: natural gas/oil (only natural gas was used during test)
Main fan motor: 20 hp; 1,775 rpm
Fan manufacturer: U.S. Electric Motors
Second fan motor: 3 hp (i.e., vent from storage tanks).

---

* Both afterburners have dilution air being added to the stack gases after combustion to reduce stack temperatures. No external air was used for combustion, however.

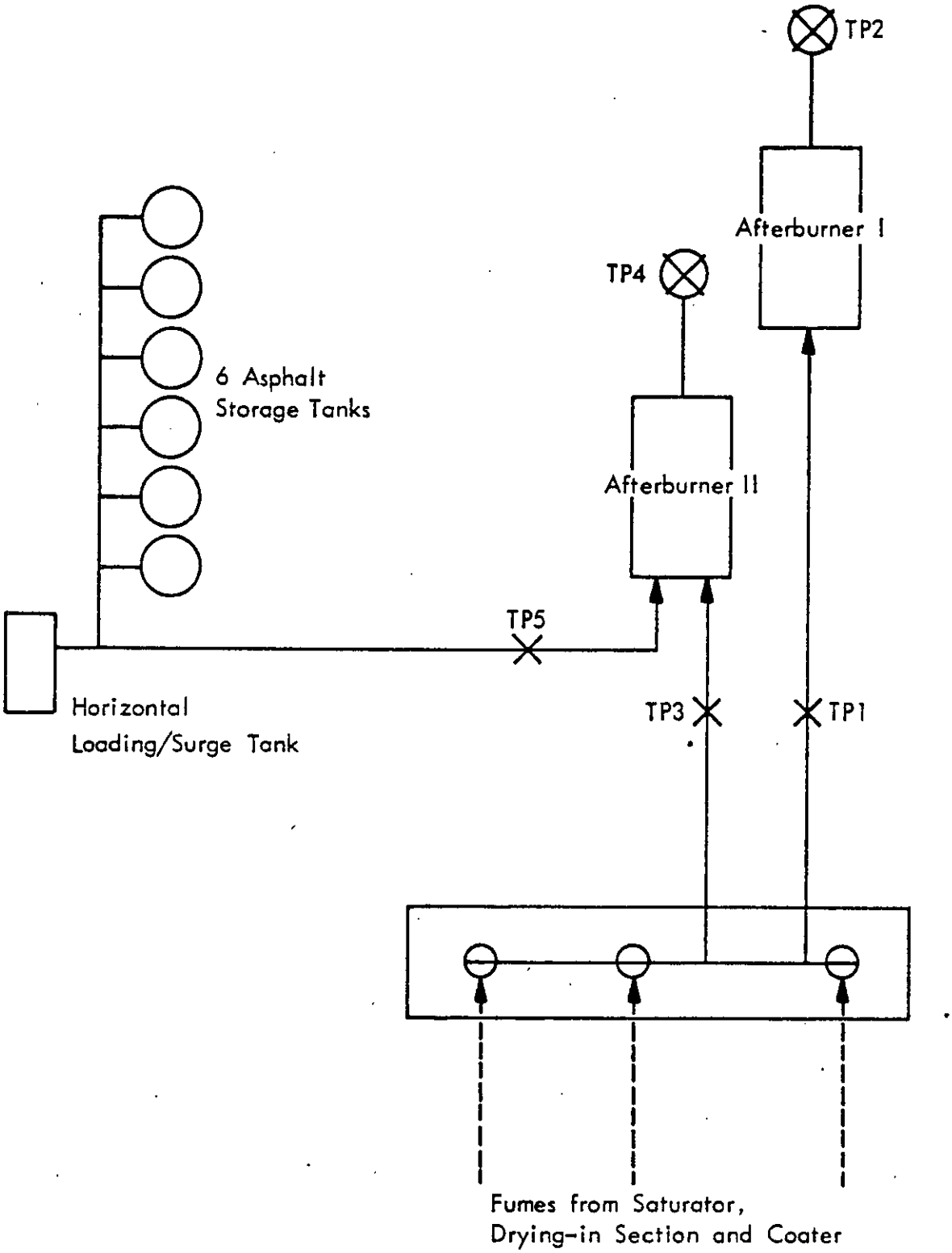


FIGURE 2. SCHEMATIC OF EMISSIONS CONTROL SYSTEM AND SAMPLING POINTS AT CERTAIN-TEED'S SHAKOPEE PLANT

Process Operation

Emission tests were conducted to determine uncontrolled emissions levels of particulate, gaseous hydrocarbon (HC), and polycyclic organic particulate (POM) and afterburner (A/B) efficiency in controlling these emissions. Simultaneous samples were taken of the inlet and outlet of each A/B for particulate and gaseous hydrocarbon, gas composition, particle size and POM. Visible emissions from the afterburner stacks and fugitive emissions from the saturator enclosure were also monitored during normal plant operation. The line was considered to be under normal operating condition when it was running. Sampling was discontinued only when the line was down. For POM's (particulate polycyclic organic matter), however, the sampling was stopped at line speeds below 300 ft/min. This was done to ensure the collection of an adequate amount of sample for analysis.

The production rate of the line was determined from the number of shingle bundles produced during the tests, the weight of the bundle and the total test time. The number of bundles made was recorded with a counter and the weight of the bundle was obtained from quality control personnel at the plant. The length of felt used during the test was also monitored with a felt counter. From the felt characteristics (i.e., weight and length of roll), the weight per unit length of felt was determined and from this, the total weight of felt used was estimated for each run. Other parameters such as line speed, saturant temperature, coating temperature, etc., were obtained directly from charts installed on the line. All of these values including felt characteristics, as obtained from plant personnel, are shown in the Appendix K.

The production rates, felt usage rates, asphalt usage rates, and line speeds observed during the sampling are summarized from data contained in the Appendix K and are presented in Table 14. Total quantities of saturant and coating asphalt used were estimated from data contained in tables in Appendix K and are summarized in Table 15. These are best estimates only and therefore should be used with caution. Table 16 summarizes raw material and product characteristics based on data contained in Appendix K. These data were supplied by plant personnel.

TABLE 14. SUMMARY OF PROCESS INFORMATION

Date, Sampling Time, and Product	Pollutants Sampled	Sampling Duration	Sampling Time[b]	Interruptions to Sampling[a]	Line Speed Min	Line Speed Max	Line Speed WTD Avg[c]	Roofing Prod. Rate, T/hr	Asphalt Usage Rate, t/hr Saturant	Asphalt Usage Rate, t/hr Coating	Felt Usage Rate, t/hr	Calculation Code[d]
9/9/75 10:50 a.m. - 2:13 p.m. Standard Shingle	Particle size TP1	203	21	1	250	380	350	41.1 --	8.3 7.7[e]	7.2 9.2[e]	4.9 --	B D
9/9/75 9:35 a.m. - 12:30 p.m. Standard Shingle	Visible Emissions TP2 & TP4 stacks	175	175 (109)[f]	0 (3)[f]	0 (120)	380	273[g]	38.4 32.1 44.3	7.6 6.4 8.8	6.6 5.5 7.6	4.5 3.7 5.1	A B C
9/9/75 12:45 p.m. - 2:50 p.m. Standard Shingle	Particulate TP5	125	125	0		N.A.		--	8.2	9.9	--	D
9/9/75 2:25 p.m. - 6:30 p.m. Standard Shingle	Visible Emissions, TP2 and TP4 stacks	245	245 (151)[h]	0	250	375	351	37.6[i] 41.2 42.2	7.4[i] 8.2 8.4	6.5[i] 7.1 7.3	6.4[i] 4.8 4.9	A B C
9/9/75 4:02 p.m. - 4:43 p.m. Standard Shingle	Particle size TP1	41	41	0	348	370	362	44.0 42.5 99.6 --	8.7 8.6 -- 7.9[e]	7.6 7.5 -- 9.5[e]	5.1 5.0 11.8 --	A B C D
9/9/75 6:08 p.m. - 9:15 p.m. Standard Shingle	Particulate and Gas HC TP1 - TP4	187	167	1	250	378	358	41.0 42.1 43.6 --	8.1 8.3 8.6 7.9[i]	7.1 7.2 7.5 9.4[i]	4.8 4.9 5.1 --	A B C D
9/10/75 10:20 a.m. - 10:50 a.m. 9-in. Starter Rolls	Particle Size TP1	30	30	0	200	250	235	17.6 17.6	3.5 3.5	2.1 2.1	2.2 2.2	B C

(a) Due either to felt breaks or inadequate line speed.
(b) Excluding periods when sampling was interrupted except where noted.
(c) Based on time intervals and line speed readings shown in Appendix K using the formula: $\frac{\sum V \frac{\Delta t}{\text{Avg } \Delta t}}{\text{No. readings}}$.
(d) Figures based on: A - Shingle Production, B - Line Speed, C - Felt Usage, and D - Asphalt Usage. Formulas used are listed in Appendix K.
(e) Based on asphalt usage from 12:45 to 2:50 p.m.
(f) Line operation intermittent, but sampling continuous.
(g) Based on the period line was in operation.
(h) Process data available only from 4:02 to 6:33 p.m.
(i) Based on shingle production from 4:02 to 6:33 p.m.

TABLE 14. (Continued)

Date, Sampling Time, and Product	Pollutants Sampled	Sampling Duration	Sampling Time[b]	Interruptions to Sampling[a]	Line Speed Min	Line Speed Max	Line Speed WTD Avg[c]	Roofing Prod. Rate, T/hr	Asphalt Usage Rate, t/hr Saturant	Asphalt Usage Rate, t/hr Coating	Felt Usage Rate, t/hr	Calculation Code[d]
9/10/75 11:05 a.m. - 1:10 p.m. N.A.	Particulate and Gas HC TP5	125	125	0		N.A.		32.7 --	7.5	4.6	--	D
9/10/75 2:20 p.m. - 3:20 p.m. "lok" shingles	Particle size TP3	60	60	0	200	255	225	21.4 17.3 14.3	4.2 3.4 2.8	3.7 3.0 2.5	2.5 2.0 1.7	A B C
9/10/76 3:15 p.m. - 5:15 p.m. N.A.	Particulate and Gas HC TP5	120	120	0		N.A.		22.7 --	4.5[j]	3.9	--	D
9/11/75 9:35 a.m. - 12:35 p.m. Standard Shingle	Visible Emissions, TP2 and TP4 stacks	180	180 (153)[f]	0 (1)[f]	0 (110)	370	272[g]	30.4 32.0 34.7 -- --	6.0 6.3 6.9 6.0 6.1[k]	5.2 5.5 6.0 2.9 5.8[k]	3.5 3.7 4.0 -- --	A B C D D
9/11/75 10:15 a.m. - 10:45 a.m. Standard Shingle	Particle size TP3	30	30	0	300	350	325	22.7 38.2 36.4 -- --	4.5 7.6 7.2 4.3[l] 6.1[k]	3.9 6.6 6.3 12.5[l] 5.8[k]	2.6 3.8 4.2 -- --	A B C D D
9/11/75 11:15 a.m. - 3:40 p.m. Standard Shingle	Particulate and Gas HC TP1 - TP4	265	171	3	140	370	306	39 41.9 36.0 39 39.1 -- --	8.3 7.1 7.7 11.3 6.1[k]	7.2 6.2 6.7 11.8 5.8[k]	4.9 4.2 4.5 -- --	A B C D D
9/11/75 1:30 p.m. - 4:30 p.m. Standard Shingle	Visible Emissions, TP2 and TP4 stacks	180	180 (153)[f]	0 (2)[f]	0 (140)	370	282[g]	29.5 33.1 28.8 -- --	5.8 6.6 5.7 9.2 6.1[k]	5.1 5.7 5.0 5.7 5.8[k]	3.4 3.8 3.3 -- --	A B C D D

(j) Based on coating asphalt usage.
(k) Based on asphalt usage from 9:35 a.m. to 6:44 p.m.
(l) Based on asphalt usage from 9:35 to 11:00 a.m.

TABLE 14. (Continued)

Date, Sampling Time, and Product	Pollutants Sampled	Sampling Duration	Sampling Time[b]	Interruptions to Sampling[a]	Line Speed Min	Line Speed Max	Line Speed WTD Avg[c]	Roofing Prod. Rate, T/hr	Asphalt Usage Rate, t/hr Saturant	Asphalt Usage Rate, t/hr Coating	Felt Usage Rate, t/hr	Calculation Code[d]
9/11/75 2:09 p.m. - 2:39 p.m. Standard Shingle	Particle size TP3	30	30	0	305	360	333	39.1 -- --	7.8 11.8[m] 6.1[k]	6.8 10.2[m] 5.8[k]	4.5 -- --	B D D
9/11/75 4:30 p.m. - 5:00 p.m. Standard Shingle	Particle size TP3	30	30	0	355	355	355	38.5 41.7 43.9 --	7.6 8.3 8.7 6.1[k]	6.6 7.2 7.6 5.8[k]	4.5 4.8 5.1 --	A B C D
9/11/75 4:43 p.m. - 6:44 p.m. Standard Shingle	Particulate and Gas HC TP5	121	121	0		N.A.		--	4.4	7.7	--	D
9/12/75 9:45 a.m. - 7:30 p.m. Standard Shingle	Fugitive Emissions, Line	585	354	6	150	365	322	48.0 37.8 49.5 --	9.5 7.5 9.8 3.6[n]	8.3 6.5 8.5 3.6[n]	5.6 4.4 5.8 --	A B C D
9/12/75 10:35 a.m. - 5:00 p.m. Standard Shingle	Particle size TP2	400	181	5	Test Abandoned							
9/12/75 2:02 - 7:10 p.m. Standard Shingle	Particulate and Gas HC TP1 - TP4	308	247	3	150	365	323	42.4 38.0 42.7	8.4 7.5 8.5	7.3 6.5 7.3	4.9 4.4 5.0	A B C
9/13/75 2:20 p.m. - 7:15 p.m. Standard Shingle	POM TP1 and TP2 Aldehydes TP3 and TP4	331	172	5	150	355	309	44.2 36.3 48.0	8.8 7.2 9.5	7.6 6.2 8.3	5.1 4.2 5.6	A B C

(m) Based on asphalt usage from 2:00 to 3:00 p.m.
(n) Based on asphalt usage from 9:30 a.m. to 2:00 p.m.

TABLE 15. ESTIMATES OF SATURANT AND COATING ASPHALT USED

Date and sampling time	Asphalt Used		Asphalt Usage Rate (tons/hour)	
	Saturant	Coating[a/]	Saturant	Coating[a/]
September 9, 1975 12:45 p.m. - 2:50 p.m.	4,511 gal. (17.1 tons)	5,413 gal. (20.6 tons)	8.23	9.87
September 10, 1975 11:05 a.m. - 1:10 p.m.	4,089 gal. (15.5 tons)	2,514 gal. (9.6 tons)	7.46	4.59
September 10, 1975 3:15 p.m. - 5:15 p.m.	2,368 gal.[b/] (9.0 tons)	2,056 gal. (7.8 tons)	4.50[b/]	3.91
September 11, 1975 9:35 a.m. - 6:44 p.m.	14,783 gal. (56.2 tons)	13,836 gal. (52.6 tons)	6.14	5.75
September 12, 1975 9:30 a.m. - 2:00 p.m.	5,617 gal. (21.3 tons)	5,617 gal. (21.3 tons)	4.74	4.74

a/ This is coating asphalt prior to addition of filler.

Note: Conversion rate used is 1 gal. of asphalt = 7.6 lb.

b/ Estimate, based on coating usage.

TABLE 16. RAW MATERIAL AND PRODUCT CHARACTERISTICS[a] OBSERVED DURING SAMPLING PERIODS

Date and sampling time	Felt (% moisture)			Asphalt[b]						Average Shingle weight (lb/bundle)
				Saturant			Unfilled coating			
	Min.	Max.	Overall average	Softening point (°F)	Penetration	Flash point (°F)	Softening point (°F)	Penetration	Flash point (°F)	
September 9, 1975 6:08 p.m.-9:15 p.m.	4.4	6.8	5	← NA →						78
September 10, 1975 2:20 p.m.-3:20 p.m.	4.5	6.6	5.4	← NA →						83
September 11, 1975 10:15 a.m.-10:45 a.m.	6.2	7.3	6.8	125	← NA →		228	16.5	NA	78
September 11, 1975 4:30 p.m.-5:00 p.m.	4.5	5.3	4.9	125	← NA →		228	16.5	NA	78
September 11, 1975 11:15 a.m.-3:40 p.m.	4.5	6.2	5.4	125	← NA →		228	16.5	NA	78
September 12, 1975 2:02 p.m.-7:10 p.m.	4.4	7.3	5.5	123	← NA →		229-231	15	NA	78
September 13, 1975 2:20 p.m.-7:51 p.m.	4.4	6.5	5.2	← NA →						78

a/ Provided by plant personnel
b/ Data were summarized from Table A-23.
Note: NA = not available.

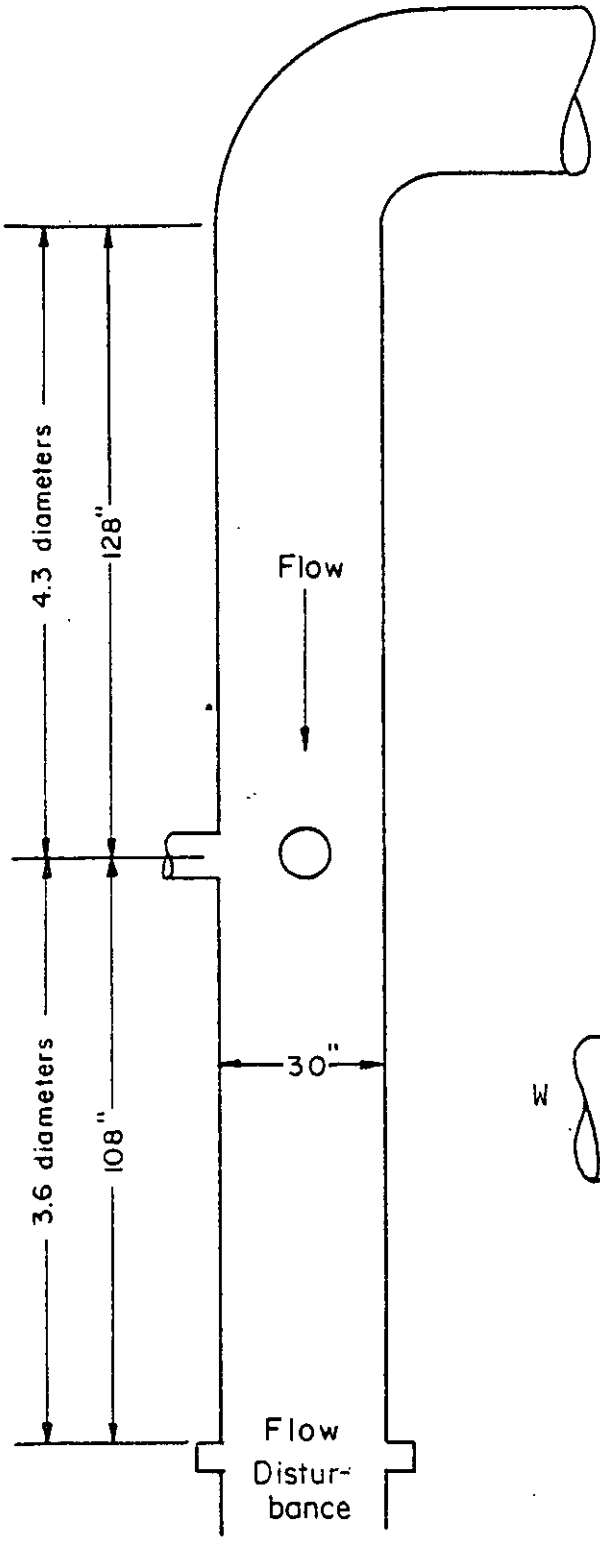
IV. LOCATION OF SAMPLING POINTS

Sampling port and point locations were determined as outlined in the Federal Register, December 23, 1971, Method 1. Accordingly, the inlet, outlet, and storage vent stack geometries, as presented in Figures 3, 4, 5, and 6, indicate the sample port locations relative to the nearest upstream and downstream flow disturbances, for test points TP-1, TP-2, TP-3, TP-4, and TP-5, respectively. The number of stack diameters from any flow disturbance are presented as follows:

Upstream Sample Port Configuration

Test Point	Location	Undisturbed Diameters Upstream	Undisturbed Diameters Downstream	Number of Sample Points
1	Inlet	4.3	3.6	36
2	Outlet	5.9	2.6	28
3	Inlet	3.5	3.4	40
4	Outlet	5.9	2.6	28
5	Storage Vent	10.0	4.3	8

As indicated, the minimum number of downstream stack diameters (2 diameters) was met for all 5 stacks. Detailed sample point locations for each port are presented on Figures 3 through 6. (Sampling was only shown on one traverse on Figures 3 through 6 because diameters were the same for both traverses.)



Point	Percent of Diameter	Distance from Outside of Sample Port, in.	Point	Percent of Diameter	Distance from Outside of Sample Port, in.
1	1.4	6-3/4	10	61.8	24-1/4
2	4.4	7-1/8	11	70.4	26-3/4
3	7.5	8.0	12	76.4	28-5/8
4	10.9	9.0	13	81.2	30-1/4
5	14.6	10-1/8	14	85.4	31-1/4
6	18.8	11-3/8	15	89.1	32-3/8
7	23.6	12-3/4	16	92.5	33-1/2
8	29.6	14-5/8	17	95.6	34-1/2
9	38.2	17-1/4	18	98.6	34-3/4

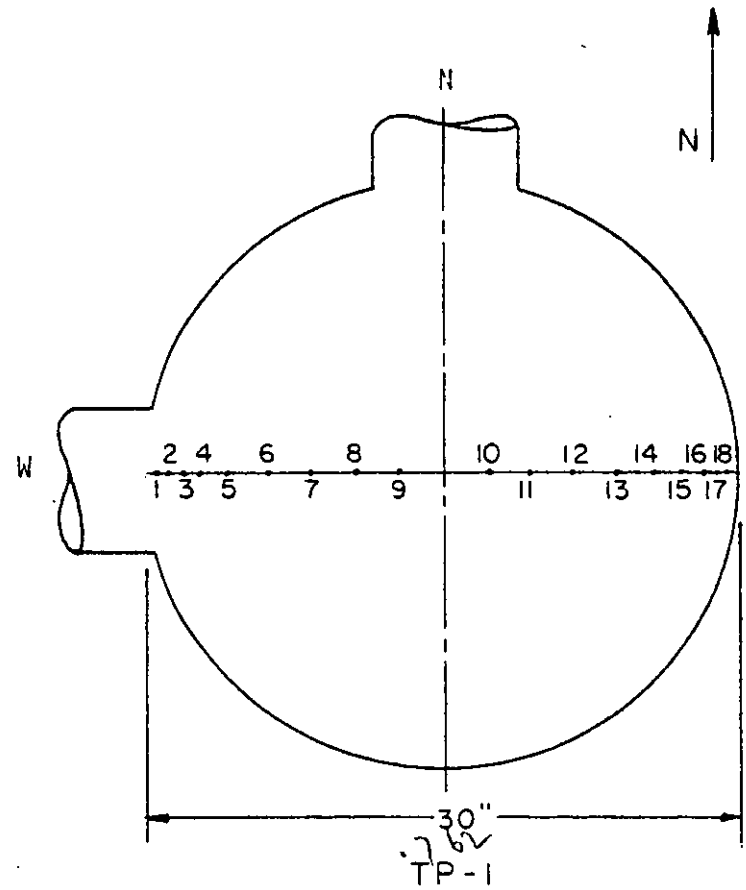
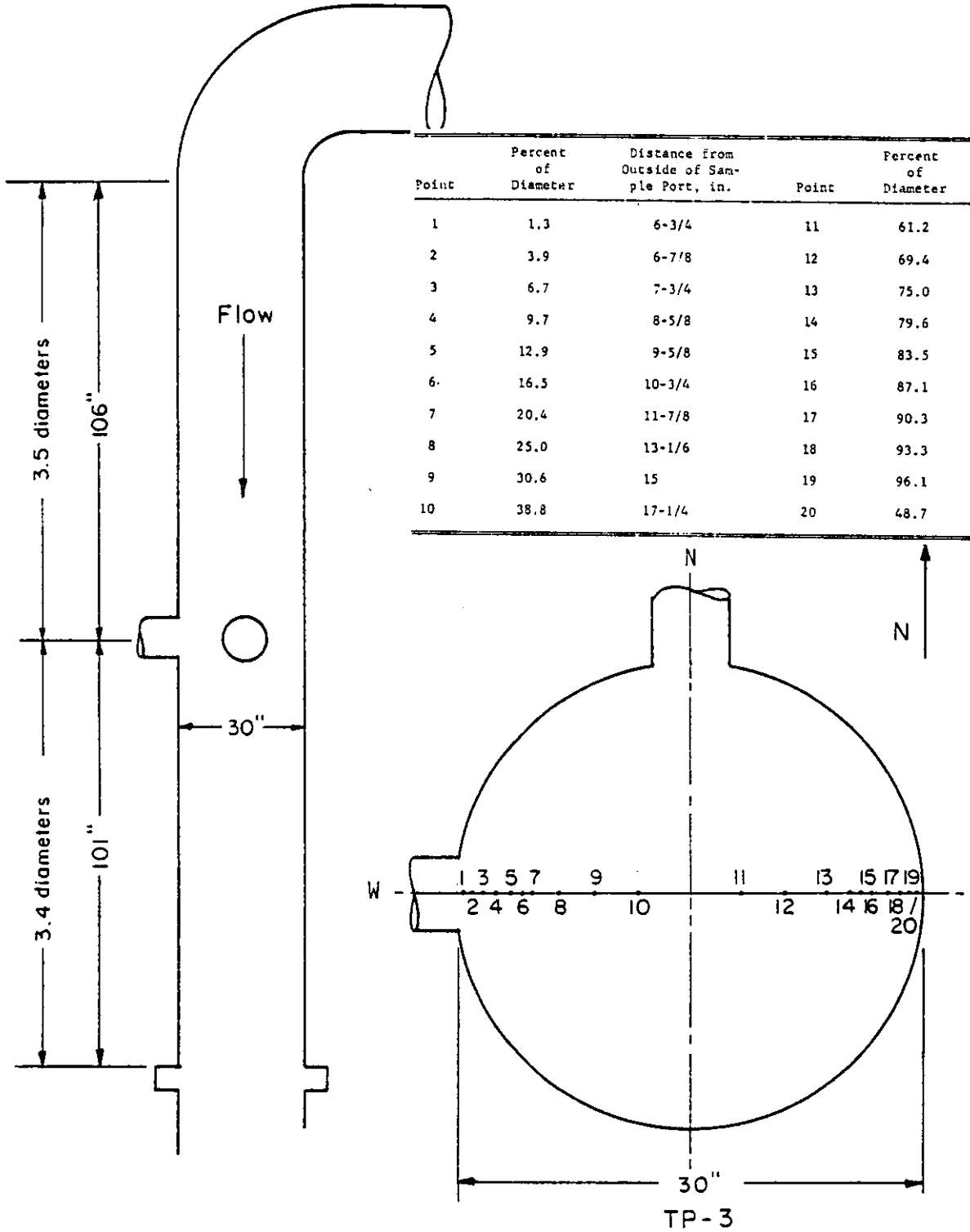
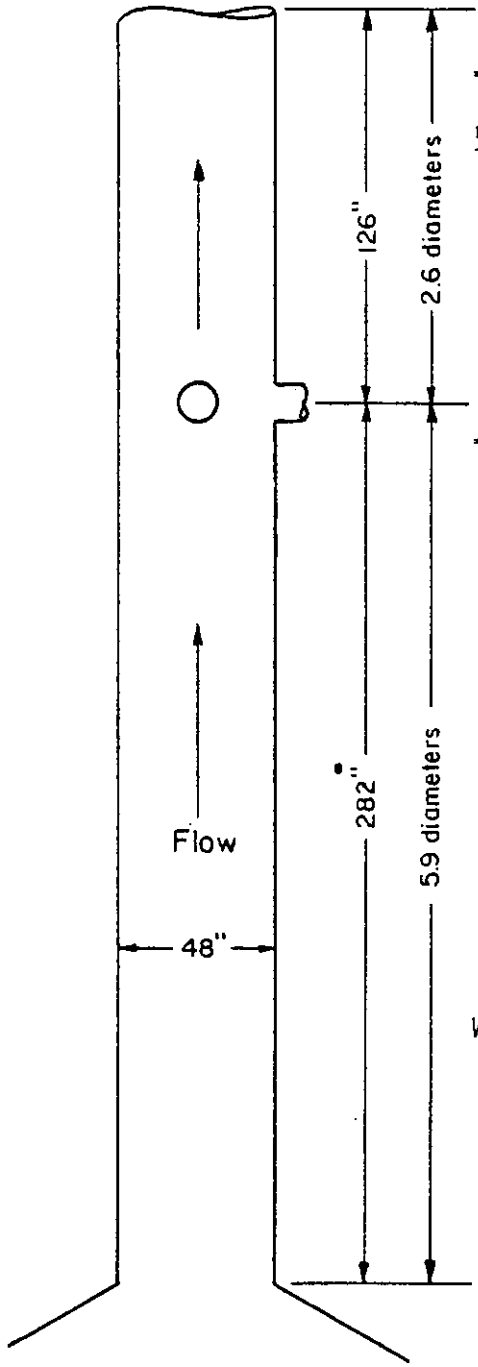


FIGURE 3. TP-1 INLET STACK GEOMETRY SHOWING SAMPLING LOCATION AND SAMPLE POINT CONFIGURATION



Point	Percent of Diameter	Distance from Outside of Sample Port, in.	Point	Percent of Diameter	Distance from Outside of Sample Port, in.
1	1.3	6-3/4	11	61.2	24-1/4
2	3.9	6-7/8	12	69.4	26-1/2
3	6.7	7-3/4	13	75.0	28-1/4
4	9.7	8-5/8	14	79.6	29-5/8
5	12.9	9-5/8	15	83.5	30-7/8
6	16.5	10-3/4	16	87.1	31-7/8
7	20.4	11-7/8	17	90.3	32-7/8
8	25.0	13-1/6	18	93.3	33-3/4
9	30.6	15	19	96.1	34-1/2
10	38.8	17-1/4	20	48.7	34-3/4

FIGURE 4. TP-3 INLET STACK GEOMETRY SHOWING SAMPLING LOCATION AND SAMPLE PORT CONFIGURATION



Point	Percent of Diameter	Distance from Outside of Sample Port, in.	Point	Percent of Diameter	Distance from Outside of Sample Port, in.
1	1.8	6-3/4	8	63.4	36-1/4
2	5.7	8-1/2	9	73.1	40-7/8
3	9.9	10-1/2	10	79.9	44-1/4
4	14.6	12-3/4	11	85.4	46-3/4
5	20.1	15-3/8	12	90.1	49
6	26.9	18-5/8	13	94.3	51-1/8
7	36.6	23-1/4	14	98.2	52-3/4

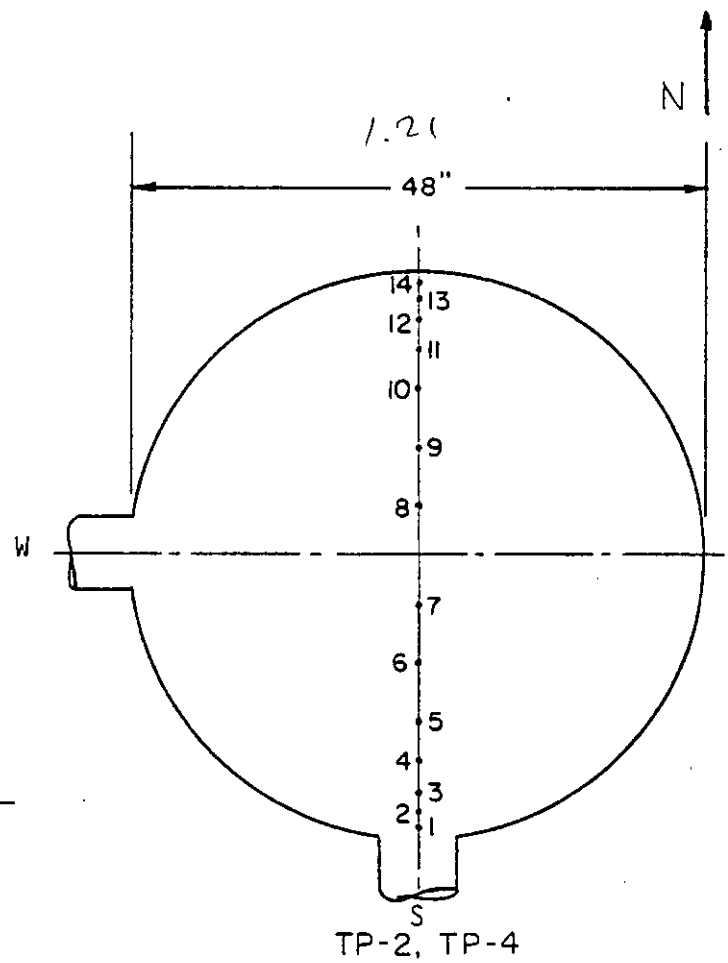
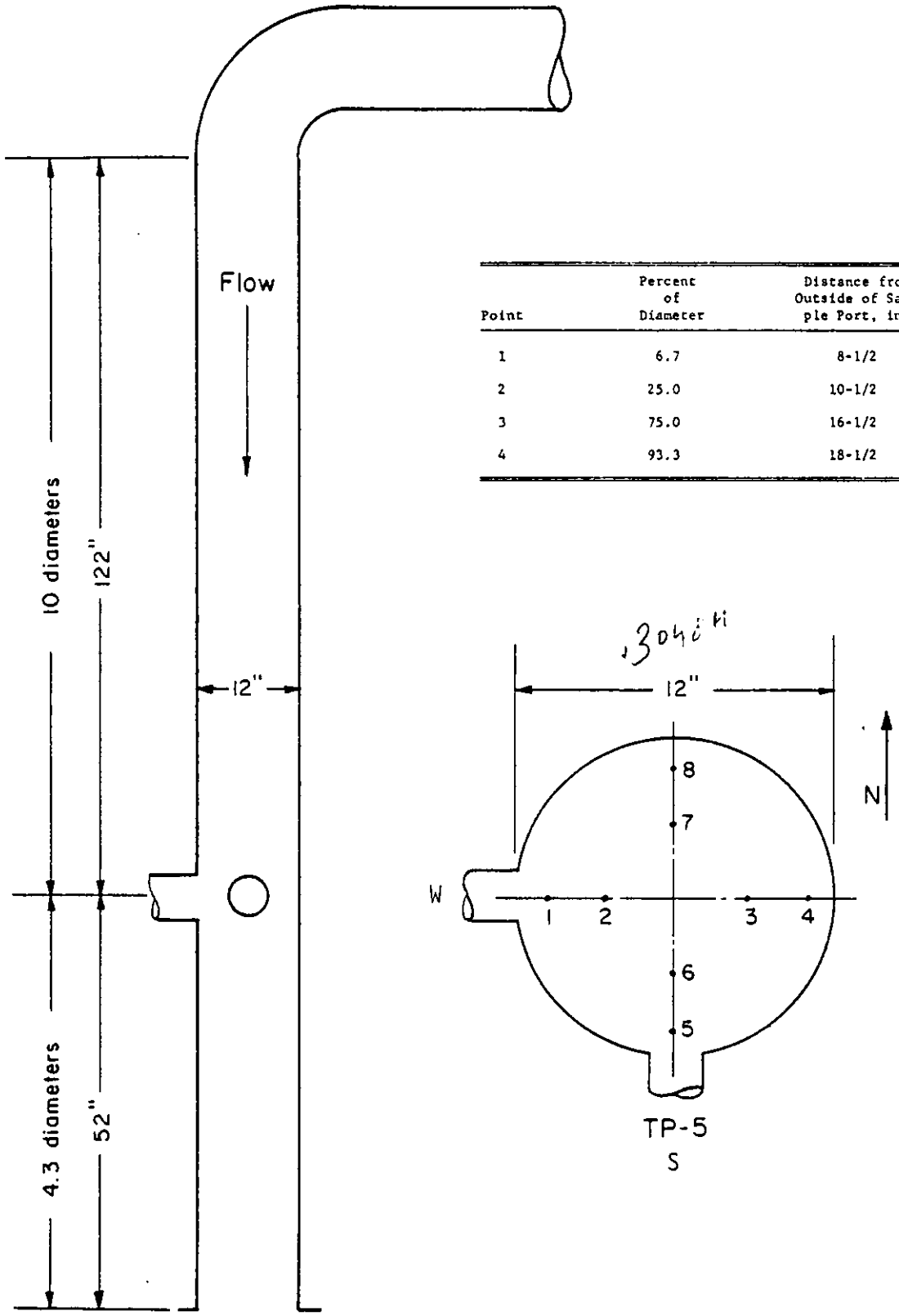


FIGURE 5. TP-2 AND TP-4 OUTLET STACK GEOMETRY SHOWING SAMPLING LOCATION AND SAMPLE POINT CONFIGURATION



Point	Percent of Diameter	Distance from Outside of Sample Port, in.
1	6.7	8-1/2
2	25.0	10-1/2
3	75.0	16-1/2
4	93.3	18-1/2

FIGURE 6. TP-5 STORAGE VENT DUCT SHOWING SAMPLING LOCATION AND SAMPLE POINT CONFIGURATION

V. SAMPLING AND ANALYTICAL PROCEDURES

Particulate Sampling and Analysis

Particulate sampling was conducted using a draft method train as specified by EPA (see Appendix F). The sampling train is shown in Figure 7. EPA conducted method development tests at two asphalt roofing plants to evaluate the proposed sampling trains for collecting asphalt process pollutants. These studies resulted in the development of the draft method (using a modified Method 5 system) to isokinetically sample the gas stream. The modifications to Method 5 include:

1. Change of filtration temperature from 250 F (120 C) to 125 F (50 C). Due to its volatile nature, 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 125 F (50 C) upper limit was selected to be consistent with the optimum operating temperature of 104 F (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 mat during periods of high oil droplet concentrations.

3. Extraction of a small portion (1 ℓ/min) of the sample gas after filtration and use of continuous flame-ionization detector (FID) analyzer to measure the gaseous hydrocarbon (HC) content of this sample.

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,

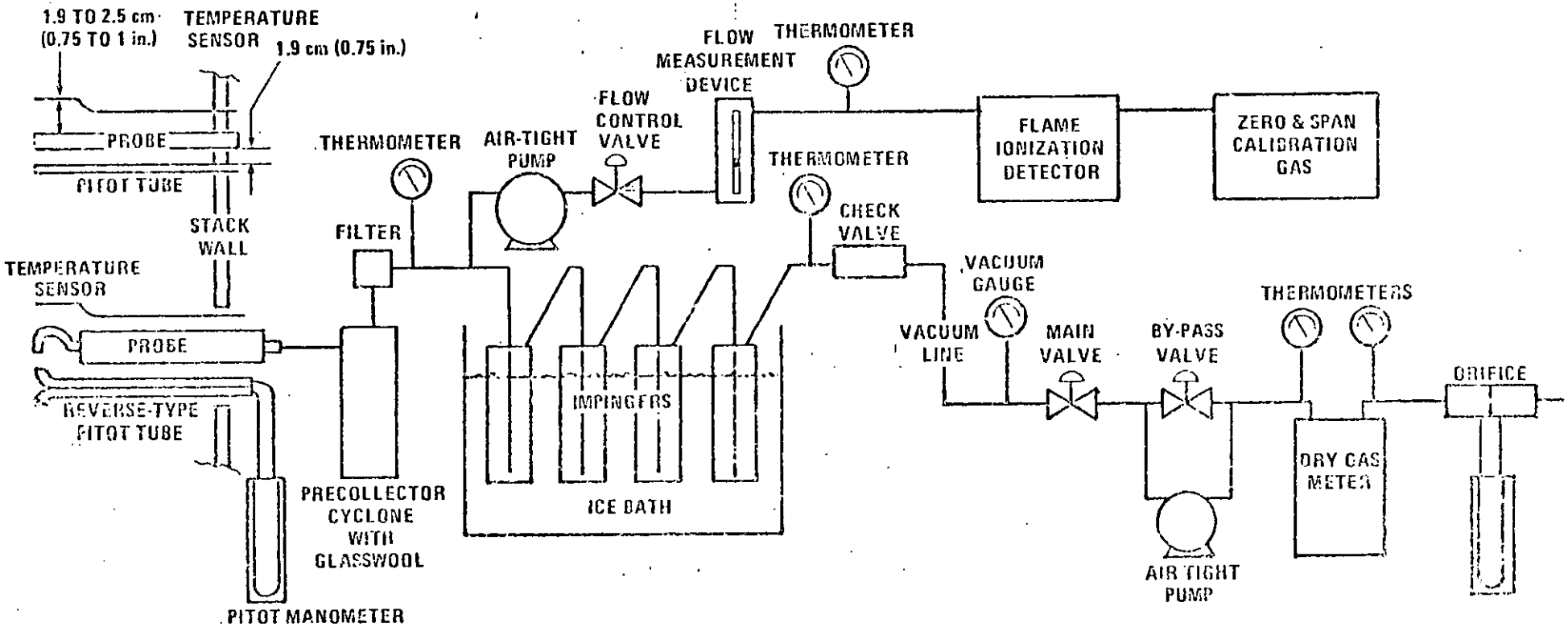


Figure 7. Particulate and gaseous hydrocarbon sampling train.

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 to a final weight at ambient temperature. Experiments were conducted to quantify the loss of light hydrocarbons by condensing the vapors from the evaporating process and analyzing it by gas chromatography. These special studies and their results are described in Appendix B.

   The results of the above studies showed that saturator process samples were not expected to experience significant weight loss during drying and weighting. Thus, particulate sample weights for front-half samples were determined by procedures similar to those defined in the Federal Register, December 23, 1971.

   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 24 hours apart." Most samples weighed in this manner reached a constant weight between the 24 to 48-hour weighings.

Appendix C includes complete particulate emission results and a sample calculation for obtaining particulate concentrations and mass emissions. Table 17 summarizes both the front and back half particulate catches and contains results for total particulate and control device efficiency based on total particulate.

Hydrocarbon Sampling and Analysis

As discussed earlier, a slipstream of the particulate gas sample was removed from the sample train immediately downstream of the filters.

Table 17. SUMMARY OF PARTICULATE AND GASEOUS HYDROCARBON MATTER FOR FRONT AND BACK CATCHES

	Afterburner No. 1		Afterburner No. 2[c]			
Run number	TP1-3	TP2-3	TP3-3	TP5-3	TP3-3	TP4-2
Location	inlet	outlet	inlet	inlet	TP5-3 combined	outlet
Date	9-12-75	9-12-75	9-12-75	9-10-75		9-11-75
Volume gas sampled, dscf[a]	112.4	110.5	95.9	88.0	183.9	112.5
Stack volumetric flow rate, dscfm[b]	7,860	13,693	6,981	775	7,756	13,298
Particulates (Front Catch)						
Probe and filter catch, mg	1,322	182.6	2,208	3,078	5,286	50.3
gr/dscf	0.181	0.025	0.355	0.539	0.373	0.007
lb/hr	12.2	3.0	21.2	3.6	24.8	0.80
Particulates (Back Catch)						
Impinger contents with TCE and acetone rinses, mg	93.1	88.7	98.3	66.1	164.4	59.6
TCE extraction of impinger contents, mg	56.2	7.0	75.8	399	474.8	0
Combined total for impingers, mg	149.3	95.7	174.1	465.1	639.2	59.6
gr/dscf	0.020	0.013	0.028	0.081	0.033	0.008
lb/hr	1.35	1.53	1.68	0.54	2.22	0.91
Gaseous Hydrocarbons						
Average Results						
lb/hr	1.33	1.52[d]	1.94	0.81	2.75	2.58
Particulate (Total Catch)						
mg	1,473.3	278.3	2,382.1	3,543.1	5,925.2	109.9
gr/dscf	0.202	0.038	0.383	0.620	0.406	0.015
lb/hr	13.61	4.46	22.92	4.12	27.04	1.71
Removal percent	67.2				93.7	

(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) Damper on TP5 line open during outlet run TP4-2.

(d) No HC data available for run TP2-3. Used average of TP2-1, TP2-3.

This gas sample was diverted to an FID analyzer for gaseous hydrocarbon analysis. The gas sample to the FID analyzer was 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 include infrared analysis, gas chromatography (GC), and GC-mass spectroscopy (GC-MS). 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 GC-MS analyses showed that the hydrocarbons were primarily 1- through 3-carbon chains for noncombustion control devices, and methane for afterburner control devices. 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.

Control system inlet emission concentrations were expected to be high. Thus, in order to avoid line loss due to condensation, it was considered necessary to heat the FID sample lines. The Beckman 402* FID utilities a heated inlet line and an oven to maintain hydrocarbon emissions in the gaseous state within the analyzer and was considered appropriate for inlet sampling

Since the FID was in parallel with the sampling train, the total flow through the sample nozzle would be the sum of the two sample flows. Therefore, in order to maintain isokinetic conditions at the sample nozzle, the particulate sampling train flow had to be adjusted by an amount equal to the flow through the FID. This was accomplished by treating the FID flow as a pseudo moisture.

Using a nominal particulate sampling train flowrate of 0.75 cfm and an FID flowrate of 0.083 cfm for the 402, the percent moisture

---

* Mention of trade names or manufacturers is not intended to constitute endorsement by EPA or its contractors.

adjustment would be 0.083/0.75 or 11 percent. The nomograph was then adjusted by an amount equal to the sum of the actual stack moisture plus the calculated FID pseudo moisture.

At the end of each run the FID sample volume was calculated by multiplying the run time by the FID flowrate. The FID volume was then corrected for moisture. The total dry sample volume was then calculated as the sum of the gas volumes passed through the sample train and the FID.

Outlet emission concentrations were expected to be relatively low and to consist of lower molecular weight hydrocarbons. Thus, the Beckman 109* FID analyser, which has a lower flowrate and does not incorperate heated sample lines, was considered satisfactory for hydrocarbon sampling and analysis at this location.

The sample flowrate through the 109 is on the order of 240 cc/min. which is small (about 1 percent) compared to the sampling train flowrate. Hence, it was not considered necessary to adjust the flow for isokinetic considerations, as was necessary for the inlet.

Gas Composition Flask Sampling and Analysis

Three evacuated flasks were obtained from the FID sample line during Run TP-4 while sampling outlet emissions. Only one of the flask samples, S75-006-348, was analyzed at Battelle using gas chromatography techniques. Table 8 reports the analysis of this flask. Laboratory data reported for this analysis are given in Appendix J.

POM Sampling and Analysis

POM sampling was conducted simultaneously at locations TP-1 and TP-2 (inlet and outlet) on September 13, 1975. Sampling was conducted using the Battelle POM Sampling Train which, essentially, is an EPA Method 5 sampling train with an adsorbent sampler located between the filter and the impingers. Analysis was by gas chromatography-mass spectrometry (GC-MS).

---

* Mention of trade names or manufacturers is not intended to constitute endorsement by EPA or its contractors.

Details of the sampling train, its operation, sample recovery, and analysis are included in Appendix G. Table 9 summarizes POM emissions results.

For some POM compounds, the concentration at the afterburner outlet was greater than at the inlet. This phenomena might be the results of:

(1) POM produced in the afterburner
(2) Inadequate sampling methodology
(3) Inadequate cleanup methodology
(4) Inadequate analysis methodology.

Concerning Item 1, it is known that POM is produced in combustion processes. However, the state-of-the-art of the knowledge of mechanisms of POM formation is not such that it can be predicted whether or not POM might form in an afterburner device such as used at the Certain-Teed plant.

The sampling and cleanup 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. The absorbent sampler, the curtial component of the POM sampling train, has been validated for a limited number of laboratory samples.

The GC-MS analysis technique is fairly well proven, as discussed in Appendix G. Battelle analysts claim an accuracy of ± 12 percent for sample recovery and analysis of laboratory samples.

Thus, it is difficult to evaluate why the POM appeared to increase in the afterburner. Probably the data must be accepted as "order-of-magnitude" and evaluated on that basis.

Aldehyde Sampling and Analysis

The inlet and outlet stack gases of one of the two afterburner control devices were sampled to determine aldehyde concentration. It was assumed that the level of concentration would be relatively low and that a large sample volume would be necessary to enable detection by titration. Therefore, to facilitate the sampling, the Method 5 sample train was set up (without the filter in place) so that large volumes of gases could be sampled in a relatively short period of time.

The referenced procedure used for the sampling and analysis of aldehydes was Los Angeles Method[1].

One hundred cc's of one (1) percent sodium bisulfite was placed in each of the first two impingers of the sampling train. The third impinger was empty and the forth impinger contained 200 grams of indicating Drierite.

The inlet and outlet stack gases were sampled simultaneously to obtain sample volumes of approximately 15-20 ft^3. The reagents were treated according to the Los Angeles Method[1], stored in glass containers and returned to BCL for analysis. The results of these measurements are presented in Table 10. The increase of aldehyde concentration through the afterburner may be the result of aldehyde formation in the lean fuel-air combustion process occurring in the afterburner. It is noted that diesel engines operate with lean fuel-air ratios at all but high load, and that these engines are a recognized source of aldehyde emissions.

The analytical report card which includes additional information regarding the analysis and field data forms are presented in Appendix I.

SO_2 and NO_x Measurements

The sulfur dioxide and nitric oxides concentrations were measured in stack gas samples from both inlet and outlet sides of the afterburner. Two different electronic monitoring instruments were used: (1) EnviroMetrics Model NS300 SO_2/NO_x analyzer*, and (2) Dynascience Nitrogen Oxides analyzer*. Both instruments operate on the same detection principle - the Farristor electro-chemical cell. These sensitive detection cells are affected by abrupt temperature changes such as are ordinally found in field situations. These cells perform best in sheltered areas, as in a laboratory.

After attempting to measure the SO_2/NO_x concentration in the stacks while on the scaffolding, it was found that stable conditions suitable for the detection cells (electric voltage and temperature) could not be obtained. Thus, a decision was reached in conjunction with the Project Officer in which integrated bag samples could be substituted for direct and

---

* Mention of trade names or manufacturers is not intended to constitute endorsement by EPA or its contractors.

continuous stack monitoring. The monitoring instruments were then set-up in the mobile "clean-up" laboratory.

One inlet stack was monitored for NO_x continuously, while ambient conditions were stable. The NO_x concentration in this inlet stack was below the detection limits of the sensing cell.

Representative stack gas samples were collected over a 10 to 15-minute time period in evacuated, teflon, gas sampling bags (one cubic foot capacity). These gas samples were analysed within 30 minutes after collecting.

The recorder strip charts taken from the analyser measurements and the "work-up" data sheets are referenced in Appendix E.

Carbon Monoxide Measurements

Carbon monoxide (CO) emission samples were obtained at test points TP-1, TP-2, TP-3, TP-4, and TP-5. The integrated gas samples were collected in Teflon bags during the course of each run and transported to an air conditioned van where they were analyzed within 30 minutes after collection. The CO analyzer was set up in the van because of unstable sampling conditions on the scaffolding, i.e., wind, rain, vibrations and voltage fluctuations. The instrument used to measure CO was a Beckman* Model 315B nondispersive infrared analyzer. The analyzer was calibrated before and after each run with zero nitrogen and certified standard CO span gas of 1050 ppm.

A schematic drawing of the sampling train used to collect the CO samples is shown in Figure 8. The primary function of the impingers in the train is the removal of water and CO_2, which are infrared-absorbing and cause serious interference effects if not minimized.

To calculate CO emissions, the average CO concentrations were determined for each sampling point (where valid data were obtained). The CO was sampled from a single point (centroid at each test point). The CO concentration was assumed uniform throughout the duct and, thus, the particulate sampling train velocity data were used to calculate CO emission rates.

---

* Mention of trade names or manufacturers is not intended to constitute endorsement by EPA or its contractors.

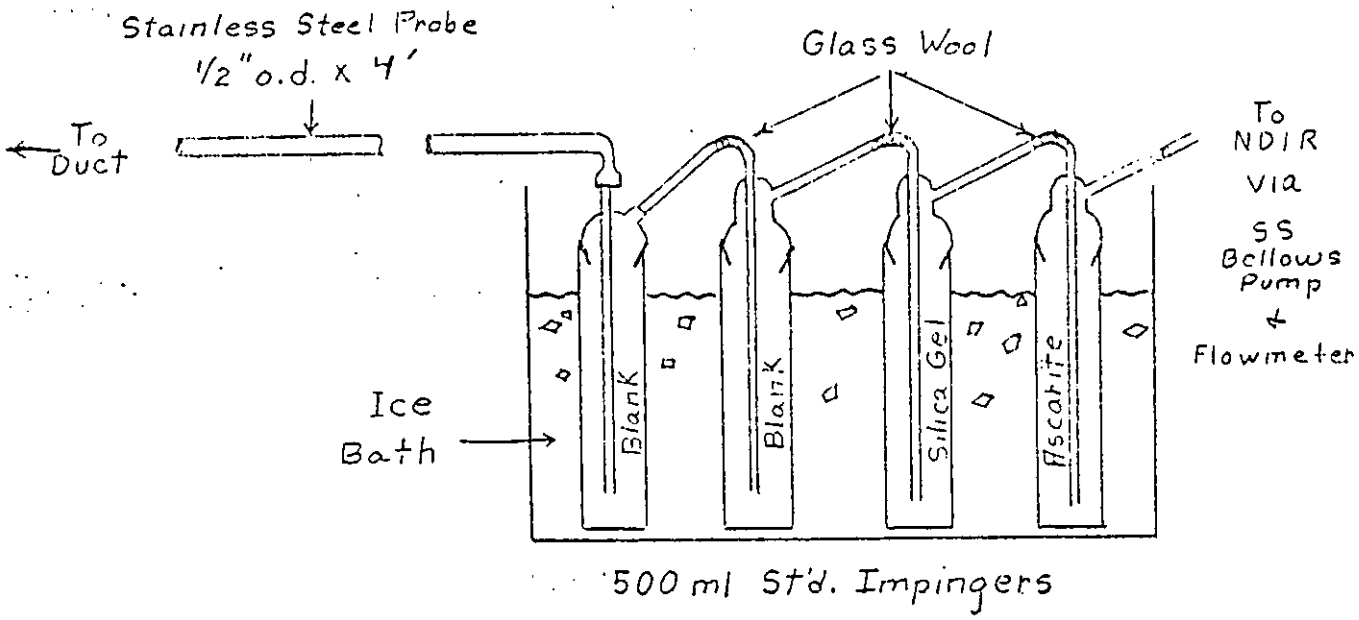


FIGURE 8. SAMPLING TRAIN FOR DETERMINING CO EMISSIONS AT THE AFTERBURNER OUTLET

Visible Emission Measurements

Monsanto Research Corporation, as a contractor to the Environmental Protection Agency under the "Field Sampling of Atmospheric Emissions" program, was requested to provide visible emission data from the Certain-Teed Asphalt Plant, Shakopee, Minn. Visible emissions were observed from the afterburner outlet stacks TP-2 and TP-4 and fugitive emissions were observed from the saturator-coater enclosure during the period of September 9-12, 1975. Figures 9 and 10 show the relative location of the readers and the emission sources. The visible emission data were recorded for a total of more than twenty hours over a 3-day period, at the 15-second intervals as specified by EPA Method 9, described in the Federal Register, Vol. 39, No. 219, November 12, 1974. A summary of the time of observation, discharge area, pertinent distances, weather conditions and opacity is presented in Table 11.

The complete visible emission report, as presented by Monsanto to EPA (which includes the field data sheets), is presented as Appendix L.

Particle Size Sampling

Particle size distribution tests employing a Brink BMS-11* cascade impactor were conducted on the inlet (TP-1) and outlet (TP-2) of one afterburner, and the inlet duct (TP-3) of a second control afterburner. Four runs were conducted at each of the inlet ducts and a single run was conducted at the outlet duct. The run times ranged from 15 to 60 minutes at the inlets and 130 minutes at the outlet.

It was anticipated that the material to be sampled would most likely be an aerosol of organic material resembling a light motor oil. For this reason, aluminum foil cups were fabricated to fit the pans in the Brink impactor in an effort to reduce the tare weights and thereby facilitate the weighing accuracy. The aluminum cups were preweighed in the laboratory and shipped to the test site with the sampling equipment. After the test the exposed aluminum pans were hand-carried to the Monsanto Laboratory in Dayton,

---

* Mention of trade names or manufacturers is not intended to constitute endorsement by EPA or its contractors.

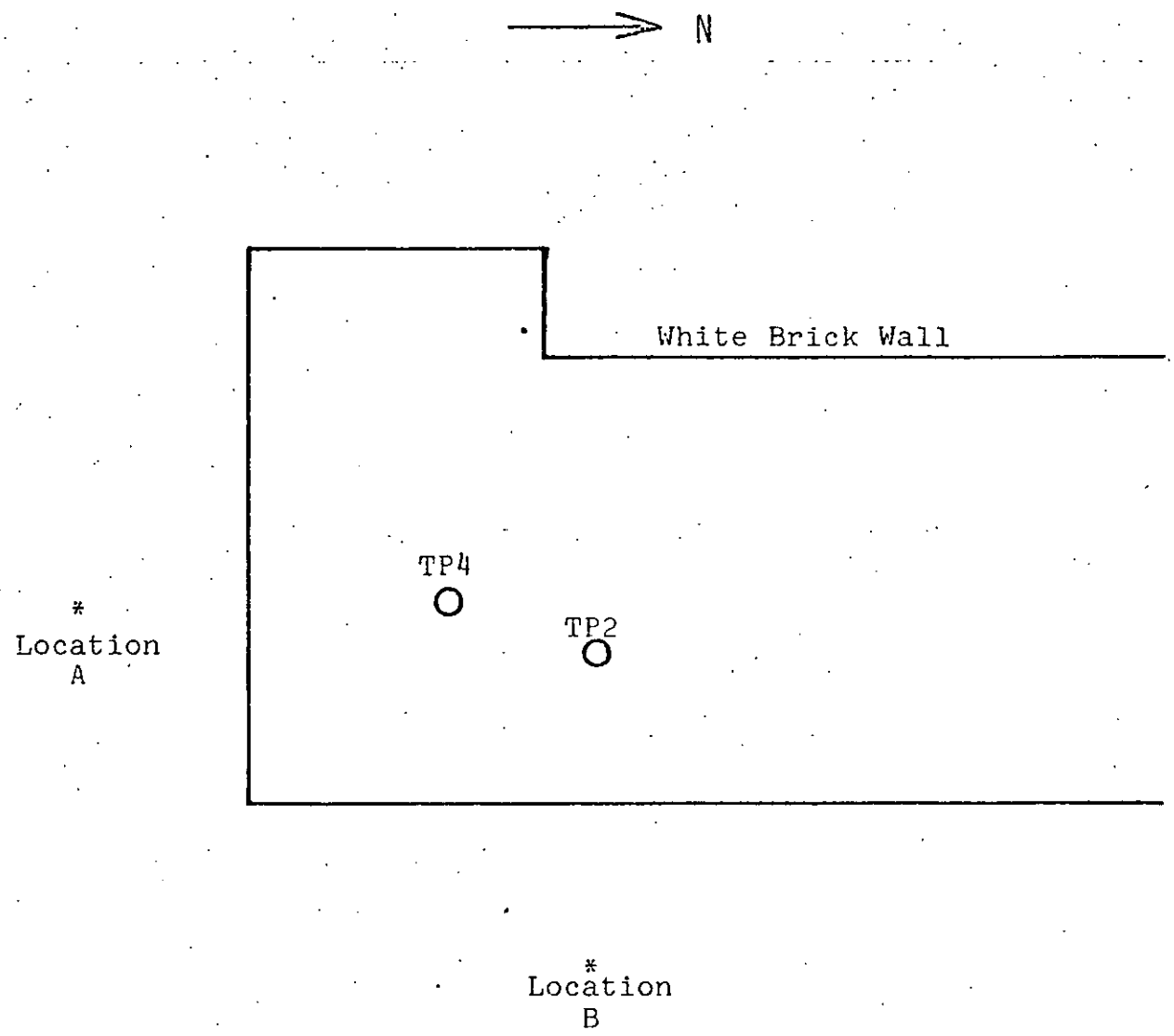


Figure 9. Physical layout of stacks TP4 and TP2 and reader locations.

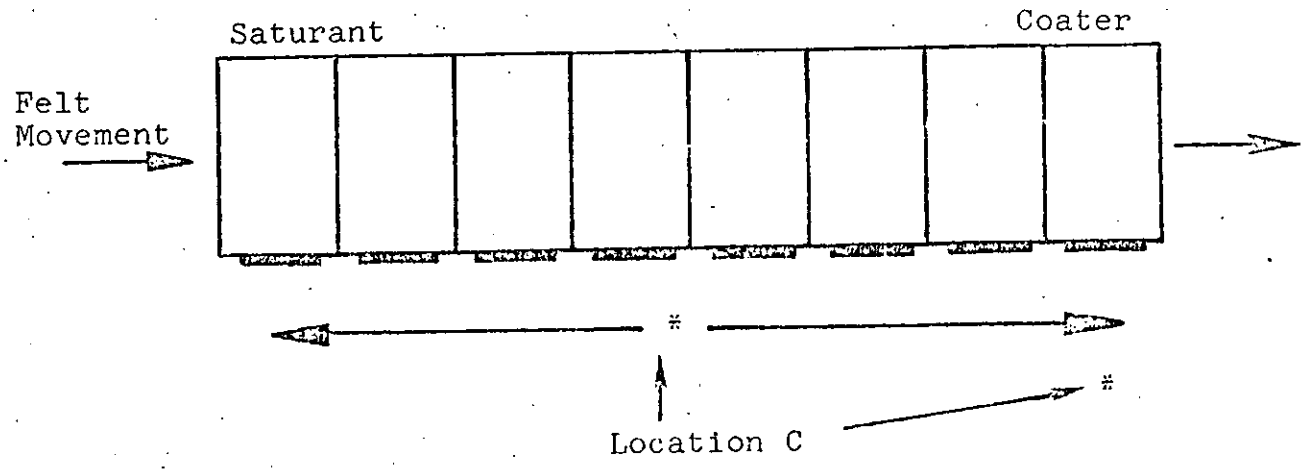


Figure 10. Location of observers at saturator - coater enclosure

Ohio, and reweighed. It was not established whether or not the organic material that was collected during sampling was stable enough to remain on pans until reaching the laboratory to be weighed. It is probable that some volatile materials were lost due to evaporation. As a result, the particle size distribution data may be questionable or invalid.

Summaries of the test results are presented in Appendix H.

Trace Metals Analysis

Trace metal analyses were conducted by optical emission spectroscopy (OES) on samples from one particulate run at each sampling location. The OES analysis technique is a analytical survey method that produces data for a large number of metals, but does not provide data on several volatile metals (specifically Hg, F, and Se). Each run was analyzed as three separate fractions, front half (upstream of the filter), filter, and back half (downstream of the filter). Table 12 presents the results of these analyses. The laboratory data sheets are included in Appendix J.

Analysis of Process Samples and Recovery Oil

Process samples were collected of the following: recovery oil (duct), recovery oil (afterburner), flux (bulk unblown asphalt), saturant asphalt, coating asphalt, felt, coater asphalt, talc, filler, mica, and used mini-HEAF filter media.

Flux (unblown asphalt--EPA Sample No. S75-006-301), saturant and coating asphalt (EPA Sample Nos. S75-006-296 and S75-006-303, respectively), and recovery oils (EPA S75-006-300 and S75-006-299) were analyzed by ASTM procedures for proximate and ultimate analyses. That analysis was done by Darwin Nevey of Nalin Laboratories of Columbus, Ohio, on Battelle Purchase Order No. L-6056. Values are reported for volatile matter, fixed carbon, moistrue, ash, C, H, O, S, and N. The applicable ASTM procedures used for these analyses were:

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

Table 13 summarizes process analysis results. Copies of the laboratory reports of these analyses are included in Appendix J.

VI. REFERENCES

1. Los Angeles Procedure for Sampling and Analysis for Aldehydes, Los Angeles Air Pollution Control District Publication Number APCD 5-46.

APPENDIX A

FIELD AND LABORATORY DATA RELATED TO PARTICULATE SAMPLING

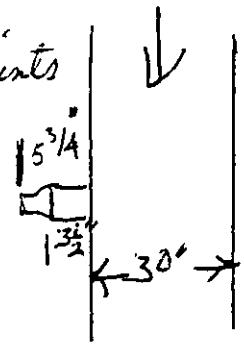
Preliminary Data	A-1
Sample Run Data	A-29
Molecular Weight Calculations	A-61
Field Analytical Data	A-81
Sample Drying Data	A-100
Sample Log Identification	A-118

Preliminary Data

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

36 sampling points

PLANT Certain Teed Products
DATE 9/9/75
SAMPLING LOCATION TP-1 Inlet
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 33 1/2"
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 3 1/2"
STACK I.D., (DISTANCE A - DISTANCE B) 30"
NEAREST UPSTREAM DISTURBANCE 4.3 dia
NEAREST DOWNSTREAM DISTURBANCE 3.6 dia
CALCULATOR C. E. Riley



SCHEMATIC OF SAMPLING LOCATION

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	30"	~~.42~~ 1.0	~~3 1/2~~ 5 3/4	~~4 1/2~~ = 6 3/4
2	4.4		1.32		~~4 7/8~~ 7 1/8
3	7.5		2.25		~~5 3/4~~ 8.0
4	10.9		3.27		~~6 3/4~~ 9.0
5	14.6		4.38		~~7 7/8~~ 10 1/8
6	18.8		5.64		~~9 1/8~~ 11 3/4
7	23.6		7.08		~~10 1/2~~ 12 3/4
8	29.6		8.88		~~12 3/8~~ 14 5/8
9	38.2		11.5		~~15~~ 17 1/4
10	61.8		18.5		~~22~~ 24 1/4
11	70.4		21.1		~~24 1/2~~ 26 3/4
12	76.4		22.9		~~26 7/8~~ 28 5/8
13	81.2		24.4		~~28~~ 30 1/4
14	85.4		25.6		~~29~~ 31 1/4
15	89.1		26.7		~~30 1/8~~ 32 3/8
16	92.5		27.7		~~31 1/4~~ 33 1/2
17	95.6		28.7		~~32 1/4~~ 34 1/2
18	98.6	30"	~~29.6~~ 29.0	~~3 1/2~~	~~32 1/2~~ 34 3/4

EPA (Dur) 232
4/72

5.05 PM. 2" Vac. Static 1.0

5123

A-3

PRELIMINARY VELOCITY TRAVERSE

PLANT Cantron Tend

DATE SEP 8 1975

LOCATION TP#1. Inlet

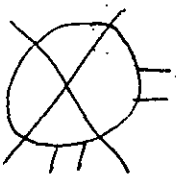
STACK I.D. 30"

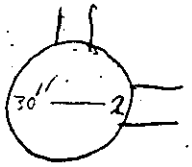
BAROMETRIC PRESSURE, in. Hg

STACK GAUGE PRESSURE, in. H_2O

OPERATORS Turner + Hupp

1.84 H_2O





15 Points 2" Apart

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F	
4"	.30	194	
6"	.28	188	
8"	.25	185	
10"	.24	187	
12"	.25	187	
14"	.25	187	2" Vac.
16"	.25	196	
18"	.24	196	
20"	.25	198	2" Vac 523.9
22"	.25	198	
24"	.25	198	
26"	.35	101°C 212	
28"	.36	103°C 215	
30"	.26	103° 215°	533.0
15"	.24	105° 221°F	
	Stopped		542.4
AVERAGE			

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
	.22	
AVERAGE		

Static @ .94

EPA (Dur) 233
4/72

25

NOMOGRAPH DATA

PLANT Certian - Teed.

DATE 9 - 9 - 75

SAMPLING LOCATION TP-1 Inlet.

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.90 ~~1.82~~
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m_{avg.}}$	85
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	12 % ~~2%~~
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.64
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	1.0 1½0
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	250 ~~200~~ 214
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.25 0.21
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.36
C FACTOR		.95 ~~1.15~~ ~~1.12~~ 1
CALCULATED NOZZLE DIAMETER, in.		.298 .325
ACTUAL NOZZLE DIAMETER, in.		.270
REFERENCE Δp, in. H_2O		.460 ~~.360~~ ~~.370~~

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Certian Teed

DATE 9-11-75

SAMPLING LOCATION TP-1 Inlet

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.90
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	80
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	12 ~~4%~~
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.37
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	225
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.25
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.36
C FACTOR		1.1
CALCULATED NOZZLE DIAMETER, in.		.320 ~~.300~~
ACTUAL NOZZLE DIAMETER, in.		.270
REFERENCE Δp, in. H_2O		.486 ~~.390~~

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Certain Teed

DATE 9-12-75

SAMPLING LOCATION TP-1 Inlet.

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.90
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	80
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	9%
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.54
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	1.3 H.O
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	225
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.25
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.36
C FACTOR		.99
CALCULATED NOZZLE DIAMETER, in.		.310
ACTUAL NOZZLE DIAMETER, in.		.305
REFERENCE Δp, in. H_2O		.265 ~~.315~~

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Certain Teed

DATE 9-13-75

SAMPLING LOCATION Inlet TP-1 (Pom)

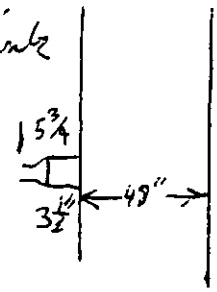
CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.90
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	80
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	3%
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.60
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	225
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.25
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.36
C FACTOR		1.1
CALCULATED NOZZLE DIAMETER, in.		.300
ACTUAL NOZZLE DIAMETER, in.		.270
REFERENCE Δp, in. H_2O		.38

EPA (Dur) 234
4/72

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

28 sampling points

PLANT Certain Teed Products
DATE 9/9/75
SAMPLING LOCATION TP2 Outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 51 1/2"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 3 1/2"
STACK I.D., (DISTANCE A - DISTANCE B) 48"
NEAREST UPSTREAM DISTURBANCE 5.9 dia ~~use~~
NEAREST DOWNSTREAM DISTURBANCE 2.6 dia
CALCULATOR C. E. Riley



SCHEMATIC OF SAMPLING LOCATION

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	1.8	48"	~~.86~~ 1.0	~~3 1/2~~ 5 3/4	~~4 1/2~~	6 3/4
2	5.7		2.74		6 1/4	8 1/2
3	9.9		4.75		8 1/4	10 1/2
4	14.6		7.01		10 1/2	12 3/4
5	20.1		9.65		13 1/8	15 3/8
6	26.9		12.9		16 3/8	18 5/8
7	36.6		17.6		21.0	23 1/4
8	63.4		30.4		34.0	36 1/4
9	73.1		35.1		38 5/8	40 7/8
10	79.9		38.4		42	44 1/4
11	85.4		~~40.0~~ 41.0		44 1/2	46 3/4
12	90.1		43.2		46 3/4	49 -
13	94.3		45.3		48 7/8	51 1/8
14	98.2	48"	~~47.1~~ 47.0	3 1/2	50 1/2	52 3/4

EPA (Dur) 232
4/72

NOMOGRAPH DATA

PLANT Certain-Teed Products, Shakopee

DATE 9/9/75

SAMPLING LOCATION TP2 stack

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.72
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	75
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	5
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.42
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	29.40
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	530
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.20
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	0.25
C FACTOR	0.95	
CALCULATED NOZZLE DIAMETER, in.	0.34	
ACTUAL NOZZLE DIAMETER, in.	0.365	
REFERENCE Δp, in. H_2O	0.39	

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Certain Teed Shakopee

DATE 9/11/75

SAMPLING LOCATION TP 2-2

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.72
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	60
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	3
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	29.
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	550
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.21
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	
C FACTOR	0.95	
CALCULATED NOZZLE DIAMETER, in.	0.350	
ACTUAL NOZZLE DIAMETER, in.	0.360	
REFERENCE Δp, in. H_2O	0.20	

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Certain Teed Shakopee

DATE 9/12/75

SAMPLING LOCATION TP-2 stack

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.72
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	55
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	3
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	525
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.21
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	0.23
C FACTOR	0.95	
CALCULATED NOZZLE DIAMETER, in.	0.355	
ACTUAL NOZZLE DIAMETER, in.	0.360	
REFERENCE Δp, in. H_2O	0.20	

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Certain teed

DATE 9/13/75

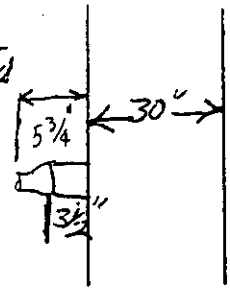
SAMPLING LOCATION TP2

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.72
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	80
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	3
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.60
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	29.60
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	530
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.21
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	0.23
C FACTOR	1.0	
CALCULATED NOZZLE DIAMETER, in.	0.350	
ACTUAL NOZZLE DIAMETER, in.	0.305	
REFERENCE Δp, in. H_2O	0.37	

EPA (Dur) 234
4/72

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

40 sampling points



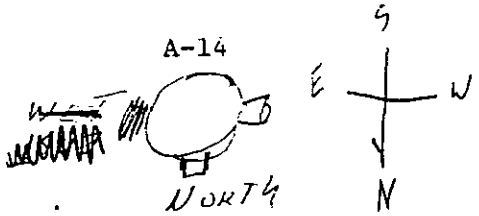
PLANT Certain Teed Products
DATE 9/9/75
SAMPLING LOCATION TP-3 Inlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 33 1/2"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) ~~3 1/2"~~ 5 3/4"
STACK I.D., (DISTANCE A - DISTANCE B) 30"
NEAREST UPSTREAM DISTURBANCE 3.5
NEAREST DOWNSTREAM DISTURBANCE 3.4
CALCULATOR C. E. Riley

SCHEMATIC OF SAMPLING LOCATION

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	1.3	30"	~~.39~~ 1.0	~~3 1/2~~ 5 3/4	~~4 1/2~~ = 6 3/4"
2	3.9		1.17		~~4 5/8~~ 6 7/8
3	6.7		2.01		~~5 1/2~~ 7 3/4
4	9.7		2.91		~~6 3/8~~ 8 7/8
5	12.9		3.87		~~7 3/8~~ 9 5/8
6	16.5		4.95		~~8 1/2~~ 10 3/4
7	20.4		6.12		~~9 5/8~~ 11 7/8
8	25.0		7.50		~~11~~ 13 1/4
9	30.6		9.18		~~12 3/8~~ 12 3/4 15
10	38.8		11.6		~~15~~ 17 1/4
11	61.2		18.4		~~22~~ 24 1/4
12	69.4		20.8		~~24 1/4~~ 26 1/2
13	75.0		22.5		~~26~~ 28 1/4
14	79.6		23.9		~~27 7/8~~ 29 5/8
15	83.5		25.1		~~28 5/8~~ 30 7/8
16	87.1		26.1		~~29 5/8~~ 31 7/8
17	90.3		27.1		~~30 7/8~~ 32 7/8
18	93.3		28.		~~31 1/2~~ 33 3/4
19	96.1		28.8		~~32 1/4~~ 34 1/2
20	98.7	30"	~~29.6~~ 29	~~3 1/2~~	~~32 1/2~~ 34 3/4

EPA (Dur) 232
4/72

A-14



NOMOGRAPH DATA

PLANT Certian-Teed

DATE 9-9-75

SAMPLING LOCATION T-R 3

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.82
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	85°F
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2.0%
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.64
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	-1.0" H_2O
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	200
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.25
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.36
C FACTOR		1.1
CALCULATED NOZZLE DIAMETER, in.		0.3
ACTUAL NOZZLE DIAMETER, in.		.245
REFERENCE Δp, in. H_2O		.55

8-132

.25

PROBE TIP ~~STACK~~ 0.3

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Cortine Feed

DATE 9-11-75

SAMPLING LOCATION TP-3

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.80" H_2O	
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	80°F	
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	22%	changed to 12% (HO2 divided equally between TP-1 and TP-3)
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.37	
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	-1.0" H_2O	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0	
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	200	230
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.25	0.27
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.36	
C FACTOR		.75	→ 0.9 for 12% H_2O
CALCULATED NOZZLE DIAMETER, in.		.33	→ .32
ACTUAL NOZZLE DIAMETER, in.		.245	
REFERENCE Δp, in. H_2O		.75	→ 0.65 for 12% H_2O

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Certain Teed

DATE 9-12-75

SAMPLING LOCATION TP-3

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.82
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	60+20=80
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	11
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.45
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	-1.0 "H_2O
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	200°F
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.25
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.36
C FACTOR		.92
CALCULATED NOZZLE DIAMETER, in.		.315
ACTUAL NOZZLE DIAMETER, in.		.325
REFERENCE Δp, in. H_2O		.22

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Austin Test

DATE 9-13-75

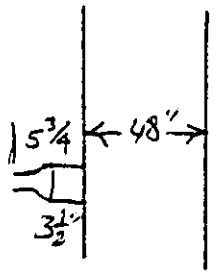
SAMPLING LOCATION INLET TP 1 NORTH PORT PCM

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.82
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	80
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	3.02
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	-1.0
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	325
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.25
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.36
C FACTOR		1.05
CALCULATED NOZZLE DIAMETER, in.		
ACTUAL NOZZLE DIAMETER, in.		.245
REFERENCE Δp, in. H_2O		

EPA (Dur) 234
4/72

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Cartan Teed Products
DATE 9/9/75
SAMPLING LOCATION TP-4 Outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 51 1/2
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 3 1/2
STACK I.D., (DISTANCE A - DISTANCE B) 48"
NEAREST UPSTREAM DISTURBANCE 5.9
NEAREST DOWNSTREAM DISTURBANCE 2.6
CALCULATOR C. E. Riley



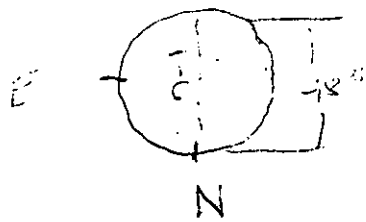
SCHEMATIC OF SAMPLING LOCATION

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	1.8	48	~~.86~~ 1.0	~~3 1/2~~ 5 3/4	~~4 1/2~~ 6 3/4
2	5.7		2.74		~~6 1/4~~ 8 1/2
3	9.9		4.75		~~8 1/4~~ 10 1/2
4	14.6		7.01		~~10 1/2~~ 12 3/4
5	20.1		9.65		~~13 1/8~~ 15 3/8
6	26.9		12.9		~~16 3/8~~ 18 5/8
7	36.6		17.6		~~21.0~~ 23 1/4
8	63.4		30.4		~~34.0~~ 36 1/4
9	73.1		35.1		~~38 3/8~~ 40 7/8
10	79.9		38.4		~~42~~ 44 1/4
11	85.4		41.0		~~44 1/2~~ 46 3/4
12	90.1		43.2		~~46 3/4~~ 49.0
13	94.3		45.3		~~48 7/8~~ 51 1/8
14	98.2	48	~~47.1~~ 47.0	~~3 1/2~~	~~50 1/2~~ 52 3/4

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Certain-Teed Shakopee, Minn.
DATE 9-8-75
LOCATION Outlet #4
STACK I.D. 48"
BAROMETRIC PRESSURE, in. Hg 29.64
STACK GAUGE PRESSURE, in. H_2O 1.0
OPERATORS F.L. Rice



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.23	710
2	0.24	
3	0.23	
4	0.23	
5	0.23	
6	0.23	
AVERAGE	0.23	710

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

EPA (Dur) 233
4/72

NOMOGRAPH DATA

PLANT Certain - Teed

DATE 9-9-75

SAMPLING LOCATION Outlet CT P4

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.82
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	80
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2.0
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.64
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	Atmospheric
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	710
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.23
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	0.24
C FACTOR	1.05	
CALCULATED NOZZLE DIAMETER, in.	0.355	
ACTUAL NOZZLE DIAMETER, in.	0.375	
REFERENCE Δp, in. H_2O	1.8	

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Certain-Teed

DATE 9/12/75

SAMPLING LOCATION TP 4

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.82
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	80
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	5%
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	700
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.23
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	
C FACTOR		1.00
CALCULATED NOZZLE DIAMETER, in.		.360
ACTUAL NOZZLE DIAMETER, in.		.375
REFERENCE Δp, in. H_2O		0.19

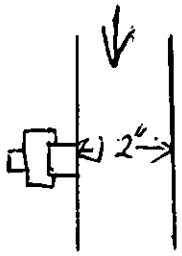
EPA (Dur) 234
4/72

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Flow

12 points
x.67
8 points/traverse

PLANT Certain-Teed Products
DATE 9/9/75
SAMPLING LOCATION TP-5 Storage tanks vent
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 19½"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 7½"
STACK I.D., (DISTANCE A - DISTANCE B) 12"
NEAREST UPSTREAM DISTURBANCE 10 dia
NEAREST DOWNSTREAM DISTURBANCE 4 dia
CALCULATOR C. C. Riley



3½" nipple
4" coupling fitting

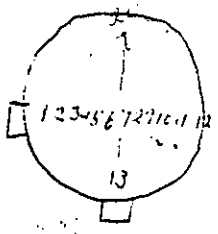
SCHEMATIC OF SAMPLING LOCATION

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	6.7	12"	~~.804~~ 1.0	7½	8½
2	25.0	12"	3.0	7½	10½
3	75.0	12"	9.0	7½	16½
4	93.3	12"	~~11.2~~ 11.0	7½	18½

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT _____
DATE 9/8/75
LOCATION TP-5
STACK I.D. 12"
BAROMETRIC PRESSURE, in. Hg .01
STACK GAUGE PRESSURE, in. H_2O _____
OPERATORS _____



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	-.050	155
2	-.069	158
3	-.064	161
4	-.064	162
5	-.064	163
6	-.062	162
7	-.062	162
8	-.062	162
9	-.062	162
10	-.060	160
11	-.056	158
AVERAGE		

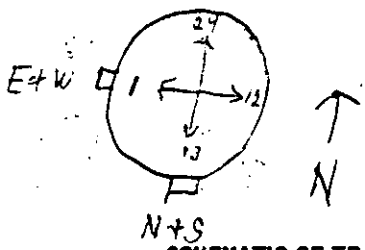
TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
13	-.042	156
14	-.052	157
15	-.056	158
16	-.060	160
17	-.060	161
18	-.060	161
19	-.060	160
20	-.060	161
21	-.062	161
22	-.062	160
23	-.060	158
AVERAGE		

EPA (Dur) 233
4/72

PRELIMINARY VELOCITY TRAVERSE

1.75
.02
.0350

PLANT _____
DATE 9/9/75
LOCATION TP-5
STACK I.D. 12"
BAROMETRIC PRESSURE, in. Hg _____
STACK GAUGE PRESSURE, in. H_2O .035
OPERATORS Leonard, Lyons



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1		
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

EPA (Dur) 233
4/72

Run #1

NOMOGRAPH DATA

PLANT CEIR - TLEED

DATE 9/9/75

SAMPLING LOCATION TP5

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.83
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	80
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2%
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.52
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	.035 ~~0~~
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	131
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.040
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.042
C FACTOR		1.08
CALCULATED NOZZLE DIAMETER, in.		0.465 ✓ ~~[illegible]~~
ACTUAL NOZZLE DIAMETER, in.		0.430
REFERENCE Δp, in. H_2O		0.055

EPA (Dur) 234
4/72

Run #2

NOMOGRAPH DATA

PLANT Certain - Teed

DATE 9/10/75

SAMPLING LOCATION TP-5

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.83
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	95
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2 %
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1.0
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	131
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.040
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	042
C FACTOR		1.08 ~~0.465~~
CALCULATED NOZZLE DIAMETER, in.		0.465
ACTUAL NOZZLE DIAMETER, in.		0.430
REFERENCE Δp, in. H_2O		0.055

EPA (Dur) 234
4/72

Run # 3

NOMOGRAPH DATA

PLANT Cert-Teed

DATE 9/10/75

SAMPLING LOCATION TP-5

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.83
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	90
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2% +10% = 12%
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	135
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	0.10
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	0.12
C FACTOR		~~1.10~~ .95
CALCULATED NOZZLE DIAMETER, in.		.365
ACTUAL NOZZLE DIAMETER, in.		.370
REFERENCE Δp, in. H_2O		~~.096~~ 0.110

EPA (Dur) 234
4/72

NOMOGRAPH DATA

PLANT Certain-Teed

DATE 9/11/75

SAMPLING LOCATION TP5

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.83
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	80
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	2%
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	135
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.100
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.120
C FACTOR		1.08
CALCULATED NOZZLE DIAMETER, in.		.370
ACTUAL NOZZLE DIAMETER, in.		.370
REFERENCE Δp, in. H_2O		.100

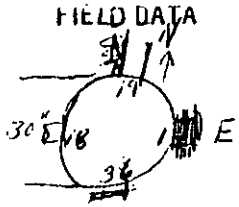
EPA (Dur) 234
4/72

Sample Run Data

36 Points
144 min.
4 min/point.

FIELD DATA

PLANT Certain-Teed.
DATE 9-9-75
SAMPLING LOCATION TPI Inlet
SAMPLE TYPE Part HC.
RUN NUMBER Cer-TPI-1
OPERATOR Turner
AMBIENT TEMPERATURE 65
BAROMETRIC PRESSURE 29.64
STATIC PRESSURE, (P_s) -1.0
FILTER NUMBER (s)



PROBE LENGTH AND TYPE 5' Glass
NOZZLE I.D. .270
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER 5
METER BOX NUMBER 3
METER $\Delta H_@$ ~~1.52~~ 1.90
C FACTOR ~~1.1~~ .92
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp ~~.37~~ ~~.36~~ .460

USED 409 HC ANAL.
FLOW RATE 0.08263 cfm

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F Filter	IMPINGER TEMPERATURE, °F
			193.4									
1	0	18 08		.25	1.2	1.2	[illegible]	17	17	7	68	60
2	4	18 12	198.8	.20	1.0	1.0	112	20	17	7	78	65
3	8	18 16		.20	1.0	1.0	112	21	17	7	84	68
4	12	18 20	202.9	.19	.96	.96	113	23	17	7	86	68
5	16	18 24	205.1	.18	.90	.90	113	23	17	7.5	93	69
6	20	18 28	207.4	.27			113	24	17	7.5	104	70
7	28	18 32	208.2	.24	.98	.98	114	[illegible]	[illegible]			
		18 33	208.2	Down.								
7	24	18 ~~47~~ 53	209.1	.25	1.0	1.0	[illegible]	23	19	7.5	104	64
8	28	18 ~~37~~	211.4	.23	.92	.92	[illegible]	[illegible]	19	7.0	104	64
9	32	~~18 07~~ 18 38	213.4	.22	.89	.89	112	[illegible]	[illegible]	7.0	103	63
10	36	19 02	215.6	.22	.89	.89	106	[illegible]	19	7.0	103	66
11	40	19 06	218.0	.22	.89	.89	109	24	19	7.0	102	67
12	44	19 10	219.9	.24	.97	.97	109	[illegible]	[illegible]	7.5	102	67
13	48	19 14	221.6	.26	1.05	1.05	109	23	18	8.0	101	67
14	52	19 18	224.6	.28	1.15	1.15	110	[illegible]	[illegible]	8.5	103	69
15	56	19 22	227.4	.31	1.25	1.25	109	23	18	9.0	106	70
16	60	19 26	229.7	.30	1.2	1.2	113	[illegible]	[illegible]	9.0	108	70
17	64	19 30	231.7	.25	1.0	1.0	10[illegible]	24	[illegible]	8.5	111	72
18	68	19 34	234.8	.25	1.0	1.0	105	23	18	8.5	110	71
	72	19 38		Change	Ports.							

COMMENTS:

EPA (Dur) 235
4/72

A-30

FIELD DATA

PLANT _____
DATE _____
SAMPLING LOCATION _____
SAMPLE TYPE _____
RUN NUMBER _____
OPERATOR _____
AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE _____
STATIC PRESSURE, (P_s) _____
FILTER NUMBER (s) _____

PROBE LENGTH AND TYPE _____
NOZZLE I.D. _____
ASSUMED MOISTURE, % _____
SAMPLE BOX NUMBER _____
METER BOX NUMBER _____
METER $\Delta H_@$ _____
C FACTOR _____
PROBE HEATER SETTING _____
HEATER BOX SETTING _____
REFERENCE Δp _____

Cont.

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 MINUTES

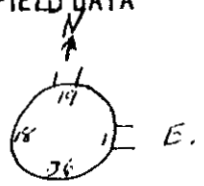
TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	
			234.8										
19	72	1943	237.5	.32	1.3	1.3	107	21	17	10	100	69	31
20	76	1947	239.7	.32	1.3	1.3	110	23	17	10	102	69	31
21	80	1951	242.2	.32	1.3	1.3	110	23	17	10	100	70	29
22	84	1953	244.6	.32	1.3	1.3	112	23	17	10	100	70	25
23	88	1957	247.1	.31	1.25	1.25	112	23	17	10	99	69	35
24	92	2001	250.2	.31	1.25	1.25	113	24	17	10	99	70	30
25	96	2005	252.9	.30	1.2	1.2	113	25	17	10	99	70	
26	100	2009	254.5	.29	1.2	1.2	113	25	17	10	100	70	30
27	104	2013	256.9	.27	1.1	1.1	113	26	18	9.5	100	70	
28	108	2017	259.3	.25	1.0	1.0	113	[illegible]	18	9	100	70	32
29	112	2021	261.5	.23	.94	.94	113	27	19	8	102	70	28
30	116	2025	263.8	.25	1.0	1.0	113	27	19	8	102	70	26
31	120	2029	266.0	.25	1.0	1.0	114	27	19	8	95	68	23
32	124	2033	268.3	.27	1.1	1.1	113	26	19	9	95	68	23
33	128	2037	270.7	.31	1.25	1.25	109	26	19	10	92	67	23
34	132	2041	273.2	.33	1.35	1.35	113	25	18	11	92	67	23
35	136	2045	275.9	.33	1.35	1.35	113	25	18	11	92	67	23
36	140	2049	278.4	.31	1.25	1.25	113	25	18	10	94	67	23
	144	2053		Shut off									
		245	85.0			1.10	110°	70°F					

COMMENTS:

EPA (Dur) 235
4-72

FIELD DATA

PLANT Certain Teed
DATE 9-11-75
SAMPLING LOCATION TPI Inlet
SAMPLE TYPE Part. (HCl)
RUN NUMBER CER-TPI-(2)
OPERATOR Turner & Lemmond
AMBIENT TEMPERATURE 6
BAROMETRIC PRESSURE 29.37
STATIC PRESSURE, (P_s) -1.0
FILTER NUMBER (s)



PROBE LENGTH AND TYPE 5' Pyrex
NOZZLE I.D. .270
ASSUMED MOISTURE, % 4
SAMPLE BOX NUMBER 3
METER BOX NUMBER 3
METER $\Delta H_@$ 1.90
C FACTOR .340
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp ~~.370~~ .480

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 MINUTES

	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F Filter		IMPINGER TEMPERATURE, °F
Effluent				278.5										
	*			278.8	~~.18~~	.84	.84	~~300~~	62	59	.5	Dial	T.C.	
	1	0	11 ~~13~~	279.9	Power	off	Circuit	Breaker.				~~49~~		
				280.103										
60	1	0	11 ~~31~~	283.3	.27	1.15	1.15	217	65	60	6.5	69	69	54
61	2	4	11 ~~35~~		.23	1.1	1.1	222	72	60	6.5	73	70	54
	~~3~~	~~8~~	11 ~~37~~	284.5 Power off			Changed filter.							
				284.800										
59	3	8	12 ~~53~~	287.2	.30	1.4	1.4	193	65	62	7.5	60	66	54
57	4	12	12 ~~57~~	289.9	.31	1.5	1.5	202	69	62	8.5	64	67	52
59	5	16	13 ~~01~~	292.5	.30	1.4	1.4	206	72	62	8	70	68	57
60	6	20	13 ~~05~~	295.4	.28	1.3	1.3	209	75	62	8	75	71	58
61	7	24	13 ~~09~~	297.8	.25	1.2	1.2	215	77	63	7.5	83	74	60
62	8	28	13 ~~13~~	299.9	.25	1.2	1.2	217	78	63	7.5	86	75	60
62	9	32	13 ~~17~~	304.0	.24	1.15	1.15	219	77	63	7.0	87	76	60
62	10	36	13 ~~21~~		.23	~~.99~~	~~.99~~	223	78	63	6.5	92	80	60
63	11	40	13 ~~25~~	306.9	.23	~~.99~~	~~.99~~	224	78	64	6.5	96	80	61
63	12	44	13 ~~29~~	309.2	.25	~~1.1~~	~~1.1~~	225	78	64	7	98	80	60
63	13	48	13 ~~33~~	311.6	.29	1.1	1.1	227	78	64	6.5	102	82	60
63	14	52	13 ~~37~~	313.9	.30	1.15	1.15	228	78	64	6.5	103	83	60
63	15	56	13 ~~41~~	317.0	.33	1.25	1.25	229	76	64	7	104	82	60
63	16	60	13 ~~45~~	319.2	.33	1.25	1.25	230	77	64	7	106	85	60
			13 ~~46~~	319.8	~~.28~~	Shut	off.					~~75~~	~~74~~	
60	17	64	14 ~~49~~		.28	1.05	1.05	266	66	63		75	71	55

COMMENTS:

Changed Nomograph To 12%.

EPA (Dur) 235
4/72

FIELD DATA

Sheet 2 of 2

PLANT
DATE 9/11/7[illegible]
SAMPLING LOCATION
SAMPLE TYPE
RUN NUMBER TP-1-2
OPERATOR
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE
NOZZLE I.D.
ASSUMED MOISTURE, % 3 + 6 HCl = 9 %
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$
C FACTOR
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 MINUTES

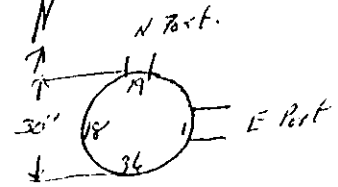
	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F Dial	SAMPLE BOX TEMPERATURE, °F TC	IMPINGER TEMPERATURE, °F
Effluent				322.0										
60	18	68	14 12	324.3	.26	1.05	1.05	207	70	63	6	80	73	56
		72	14 15		Changed Ports.								76	
61	19	72	14 17	326.4	.27	1.05	1.05	214	70	63	6	82	75	58
60	20	76	14 21	328.7	.27	1.05	1.05	217	73	63	6	85	78	58
60	21	80	14 25	331.0	.32	1.2	1.2	219	74	63	7	86	74	60
61	22	84	14 29	334.2	.35	1.35	1.35	222	75	63	8	86	75	58
61	23	88	14 33	336.0	.35	1.35	1.35	207	76	63	8	85	75	60
62	24	92	14 37	338.4	.33	1.2	1.2	206	76	63	7.5	85	75	60
62	25	96	14 41	342.0	.30	1.15	1.15	202	77	63	7	86	76	60
62	26	100	14 45	344.2	.28	1.05	1.05	196	77	63	6	89	75	62
62	27	104	14 49	[illegible]	.24	.90	.96	197	78	63	5.5	88	76	61
62	28	108	14 53	348.6	.27	1.05	1.05	209	78	63	6	87	75	60
62	29	112	14 57	350.7	.27	1.05	1.05	211	79	63		89	76	60
63	30	116	15 01	353.0	.27	1.05	1.05	215	79	63	6	90	78	62
63	31	120	15 05	355.2	.27	1.05	1.05	217	78	64	6	92	76	61
63	32	124	15 09	357.5	.27	1.05	1.05	207	78	64	6	95	76	62
63	33	128	15 13	359.4	.27	1.05	1.05	219	78	64	6	94	78	62
63	34	132	15 17	361.9	.26	.98	.98	222	78	64	6	97	79	62
63	35	136	15 21	364.0	.25	.95	.95	222	79	64		99	81	62
63	36	140	15 25	366.1	.25	.95	.95	214	78	64		99	80	62
		144	15 29			Shut Down.								
				87.6	0.28		1.12	214	69					

COMMENTS:

EPA (Dur) 235
4 72

FIELD DATA

PLANT Perrin Test
DATE 9-12-75
SAMPLING LOCATION TP-1-Inlet
SAMPLE TYPE Part. (H.C.)
RUN NUMBER CER-9
OPERATOR Turner
AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 29.24
STATIC PRESSURE, (P_s) 1.0 "H_2O
FILTER NUMBER (s)



PROBE LENGTH AND TYPE 5' water cooled
NOZZLE I.D. .305
ASSUMED MOISTURE, % 3 + 6 Hg = 9%
SAMPLE BOX NUMBER 5
METER BOX NUMBER 3
METER $\Delta H_@$ 1.90
C FACTOR .99
PROBE HEATER SETTING N/A
HEATER BOX SETTING N/A
REFERENCE Δp ~~.345~~ .265

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 MINUTES

Effluent.	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F D.B.	SAMPLE BOX TEMPERATURE, °F W.B.	FILTER IMPINGER TEMPERATURE, °F
				366.100										
41	1	0	14 03	368.9	.30	2.05	2.05	215	65	61	13.5	70	65	61
56	2	4	14 06	372.0	.28	1.9	1.9	217	68	62	13.5	64	63	~~60~~ 57
57	3	8	14 10	375.0	.28	1.9	1.9	219	74	62	12	73	60	58
60	4	12	14 14	378.2	.31	2.1	2.1	220	76	63	12	76	70	57
59	5	16	14 18	381.3	.30	2.05	2.05	221	74	63	12	79	71	56
59	6	20	14 22	383.7	.27	1.8	1.8	222	78	64	10.5	83	77	50
5			14 25	384.1	stopped.			~~217~~	~~60~~	~~61~~		~~79~~	~~108~~	~~53~~
56	7	24	16 10	386.9	.24	1.75	1.75	217	60	61	11.0	79	108	53
58	8	28	16 14	389.9	.24	1.75	1.75	221	65	61	11.0	82	102	51
59	9	32	16 18	392.7	.26	1.7	1.7	222	68	61		86	102	53
60	10	36	16 24	395.5	.25	1.65	1.65	223	71	61	10.5	90	105	57
61	11	40	16 26	398.3	.25	1.65	1.65	220	73	61	10.5	94	108	57
61	12	44	16 30	401.2	.27	1.8	1.8	224	74	61	11	97	105	58
61	13	48	16 34	403.0	.30	2.0	2.0	225	76	61	12	104	101	57
			16 37	463.0	shut off.							~~80~~	~~80~~	~~54~~
			16 55	463.4	Back on.			~~203~~						
57	14	52	16 35	406.9	.33	2.2	2.2	203	62	60	13.5	80	81	52
58	15	56	16 39	408.2	.37			210	69	60		85	~~81~~	56
55	15	59	17 07	408.2	shut off			~~203~~	~~61~~	~~61~~		67	~~107~~	52
	15	~~60~~ 59	17 30	410.0	.33	2.2	2.2	203	61	61		~~84~~	109	51
55	16	60	17 32	413.3	.33	2.2	2.2	208	64	61	12.5	81	109	57
59	17	64	17 36	416.2	.30	2.0	2.0	208	70	61	13	87	108	57
60	18	68	17 40		.27	1.8	1.8	210	72	61	11	94	111	58
		72	17 44											

COMMENTS: Change Ports.

EPA (Dur) 235
4 72

FIELD DATA

2 of 2.

Cont.

PLANT
DATE
SAMPLING LOCATION
SAMPLE TYPE
RUN NUMBER
OPERATOR
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE
NOZZLE I.D.
ASSUMED MOISTURE, %
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$
C FACTOR
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 MINUTES

	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F Dial	TC	IMPINGER TEMPERATURE, °F
				419.4										
Effluent 60	19	72	17 43	422.5	.35	2.3	2.3	212	74	62	14	95	106	57
60	20	76	17 48	425.9	.35	2.3	2.3	215	76	61	14	101	101	58
61	21	80	17 53	429.1	.37	2.45	2.45	217	77	62	16	101	95	59
61	22	84	17 57	432.4	.37	2.45	2.45	219	77	62	16	100	94	59
61	23	88	18 01	435.9	.37	2.45	2.45	221	77	62	14	99	95	59
61	24	92	18 05	439.2	.33	2.2	2.2	242	77	62	14.5	99	100	59
61	25	96	18 09	442.4	.33	2.2	2.2	212	77	62	14.5	99	108	59
61	26	100	18 13	446.0	.28	1.75	1.75	220	74	62	10	99	108	59
60	27	104	18 17	448.5	.28	1.75	1.75	221	76	62	10	101	104	57
61	28	108	18 21	451.4	.29	1.8	1.8	222	74	62	10.5	101	100	57
60	29	112	18 25	454.4	.29	1.8	1.8	222	77	62	10.5	102	98	57
59	30	116	18 29	457.3	.29	1.8	1.8	223	75	61	10.5	102	98	57
60	31	120	18 33	460.1	.29	1.8	1.8	224	75	62	10.5	103	100	57
60	32	124	18 37	463.1	.29	1.8	1.8	224	75	63	10.5	105	98	57
60	33	128	18 41	465.9	.29	1.8	1.8	225	76	63	10.5	106	98	57
59	34	132	18 45	468.8	.29	1.5	1.8	212	74	62	10	105	86	58
60	35	136	18 49	471.7	.26	1.6	1.6	209	75	63	9	104	91	56
60	36	140	18 53	474.3	.26	1.6	1.6	218	73	63		105	91	55
		144	18 57			shut	off							
									4	167				
					11.06 / 36		70.15 / 36							

COMMENTS:

T=144

474.3
366.1
108.2

144(.0323) 11.9 ← 11.0.
120.1 113

0.031

1.95 ≈ 2.0

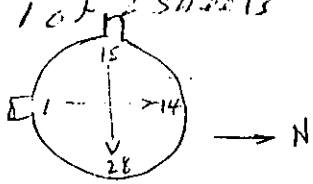
67

EPA (Dur) 235
4 72

FIELD DATA

PLANT: Certain-Teed Products
DATE: 9/8/75
SAMPLING LOCATION: TP-2-1 Stack
SAMPLE TYPE: Particulate
RUN NUMBER: TP2-1
OPERATOR: E. Schultz & Y. Fuller
AMBIENT TEMPERATURE: 62
BAROMETRIC PRESSURE: 29.42
STATIC PRESSURE, (P_s): 29.40
FILTER NUMBER (s):

1 of 2 sheets



PROBE LENGTH AND TYPE: 5' Inconel
NOZZLE I.D.: 0.285
ASSUMED MOISTURE, %: 5
SAMPLE BOX NUMBER: 7
METER BOX NUMBER: 5
METER ΔH@: 1.72
C FACTOR: 0.95
PROBE HEATER SETTING:
HEATER BOX SETTING: 100
REFERENCE Δp: 0.39

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	Filter outlet Temp	IMPINGER TEMPERATURE, °F	Meter Probe Dial Temp
	6:00 PM		562.0											
NS 1	6:15	5	58.4	0.16	0.74	0.74	524	62	61	0	92	102	52	73
2	6:20	10	61.0	0.18	0.85	0.85	537	62	61	0	86	100	52	77
3	6:25	15	64.3	0.20	0.95	0.95	541	62	61	0	84	99	53	79
4	6:30	20	67.2	0.20	0.95	0.95	547	63	61	1	100	102	53	84
5	6:35	25	70.1	0.21	0.98	0.98	553	63	61	1	110	108	53	96
5	6:35 / 6:36	1	70.1 / 70.6	0.21	0.98	0.98	555	63	61	2	82	98	53	82
6	6:01	5	74.9	0.22	1.00	1.00	567	66	63	2	85	98	52	87
7	7:00	10	77.0	0.22	1.00	1.00	566	66	63	2	88	98	52	92
8	7:10	15	79.8	0.22	1.00	1.00	560	66	64	2	84	99	54	105
9	7:16	20	82.7	0.21	0.98	0.98	587	64	64	2	80	100	55	112
10	7:21	25	85.7	0.21	0.98	0.98	598	63	63	2	80	100	56	120
11	7:26	30	88.7	0.23	1.10	1.10	584	61	62	2	95	101	56	121
12	7:31	35	91.7	0.22	1.00	1.00	581	61	61	2	94	105	57	123
13	7:36	40	94.6	0.21	0.98	0.98	556	61	60	2	90	105	57	124
14	7:41	45	97.5	0.14	0.90	0.90	556	61	60	2	100	108	58	135
NS 1	7:50 / 7:55	5	97.9 / 100.1	0.16	0.74	0.74	576	64	61	2	85	95	54	102
2	8:00	10	103.1	0.20	0.95	0.95	539	63	61	2	84	92	54	92
3		15	105.8	0.21	0.98	0.98	544	62	61	2	89	90	55	85
4		20	108.7	0.22	1.00	1.00	542	62	60	2	84	92	56	89
5		25	111.6	0.22	1.00	1.00	545	62	60	2	88	93	55	76
6		30	114.6	0.20	0.95	0.95	552	63	60	2	98	93	56	78
7		35	117.3	0.18	0.83	0.83	555	64	60	2	91	95	56	87

COMMENTS:

EPA (Dur) 235
4/72

FIELD DATA

Sheet 2 of 2

PLANT Certain Teed Products
DATE 9/9/75
SAMPLING LOCATION TP2 ; Stack
SAMPLE TYPE Particulate
RUN NUMBER TP 2-1
OPERATOR
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE
NOZZLE I.D.
ASSUMED MOISTURE, %
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$
C FACTOR
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F		IMPINGER TEMPERATURE, °F	Probe Water Temp °F
WE 8	40	120.3	0.22	1.00	1.00	557	64	60	2	94	98	57	93
9	45	123.3	0.22	1.00	1.00	566	65	60	2	95	96	57	98
10	50	126.2	0.22	1.00	1.00	562	65	61	2	108	99	57	110
11	55	129.2	0.23	1.10	1.10	568	65	61	2	103	100	57	114
12	60	132.2	0.22	1.00	1.00	566	63	61	2	93	101	56	114
13	65	135.6	0.21	0.98	0.98	548	64	61	2	90	102	56	126
14	70	138.0	0.19	0.87	0.87	532	64	61	2	104	103	58	131
	140 min	81.8			0.96	544	62						

COMMENTS:

EPA (Dur) 235
4/72

FIELD DATA

PLANT Centrad-Tacd
DATE 9/11/75
SAMPLING LOCATION TP 2
SAMPLE TYPE Particulate
RUN NUMBER TP 2-2
OPERATOR Ehl / + P Fritz
AMBIENT TEMPERATURE 42
BAROMETRIC PRESSURE 29.40
STATIC PRESSURE, (P_s) 29.40
FILTER NUMBER (s) 0.37857 - JUL 32

1 of 2 sheets

PROBE LENGTH AND TYPE 5' Inconel
NOZZLE I.D. 0.360
ASSUMED MOISTURE, % 3
SAMPLE BOX NUMBER 7
METER BOX NUMBER 5
METER $\Delta H_@$ 1.72
C FACTOR 0.95
PROBE HEATER SETTING —
HEATER BOX SETTING 100 °F
REFERENCE Δp 0.32

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	Filter Exit Gas Temp °F	IMPINGER TEMPERATURE, °F	Probe Water Temp °F
	11:22	0	140.2											
NE 1	11:22	5	144.0	0.11	1.3	1.3	514	51	48	3	105	108	38	68
2	11:28	7.50	145.4	0.18	1.65	1.65	520	51	48	4	—	—	—	—
2	11:34	10	147.6	0.18	1.65	1.65	513	48	47	4	89	99	35	64
3	11:35	15	149.8	0.20	1.85	1.85	550	53	50	5	110	113	39	70
4	1:06	20	153.6	0.19	1.80	1.80	545	55	50	5	99	114	40	70
5	1:10	25	159.1	0.19	1.4	1.4	540	57	50	4	93	112	42	75
6	1:15	30	162.1	0.19	1.80	1.80	539	58	50	5	99	111	42	78
7	1:20	35	167.6	0.20	1.85	1.85	532	60	50	5	97	102	43	80
8	1:25	40	170.9	0.21	1.95	1.95	530	60	50	.5	97	104	43	94
9	1:30	45	174.4	0.21	1.95	1.95	524	60	49	.5	95	117	43	99
10	1:35	50	178.4	0.21	1.95	1.95	508	59	49	5	100	119	43	101
11	1:40	55	182.3	0.21	1.95	1.95	518	60	49	5	96	115	43	93
12	1:45	60	187.0	0.20	1.85	1.85	510	58	49	5	95	113	42	91
13	1:50	65	190.9	0.19	1.80	1.80	491	57	48	5	90	112	41	96
14	1:55	67	192.1	0.18	1.65	1.65	500	56	50	4	101	108	39	105
14	2:00	70	195.1	0.18	1.65	1.65	500	57	50	4	102	117	39	105
NS 1	2:25	75	198.7	0.14	1.30	1.30	448	49	49	3	90	119	39	72
2	2:30	80	202.3	0.17	1.60	1.60	504	49	47	4	77	104	39	73
3	2:35	85	206.1	0.18	1.70	1.70	520	49	47	4	91	103	40	73
4	2:40	90	210.0	0.19	1.80	1.80	521	49	48	.5	91	104	41	75
5	2:45	95	214.0	0.19	1.80	1.80	519	50	49	.5	86	104	42	77
6	2:50	100	217.9	0.20	1.85	1.85	525	50	46	.5	90	106	42	81
7	2:55	105	221.4	0.20	1.85	1.85	531	52	47	.5	102	108	44	86

COMMENTS:

EPA (Dur) 235
4/72

FIELD DATA

PLANT Certain-Teed Shakopee
DATE 9/11/75
SAMPLING LOCATION TP2
SAMPLE TYPE Particulate
RUN NUMBER TP2-2
OPERATOR Eilig - Pfeiffer
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

Sheet 2 of 2

PROBE LENGTH AND TYPE 5' Inconel
NOZZLE I.D. 0.310
ASSUMED MOISTURE, % 3
SAMPLE BOX NUMBER 7
METER BOX NUMBER 5
METER $\Delta H_@$ 1.72
C FACTOR 0.95
PROBE HEATER SETTING —
HEATER BOX SETTING 100
REFERENCE Δp 0.2

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F		IMPINGER TEMPERATURE, °F	
NS 8	30	110	225.9	0.20	1.85	1.85	540	54	48	5	94	112	44	98
9	35	115	230.0	0.21	1.95	1.95	543	55	48	5	90	116	46	103
10	40	120	234.2	0.22	2.10	2.10	544	55	48	5	88	114	45	93
11	45	125	238.6	0.23	2.20	2.20	546	54	48	5	78	109	45	89
12	50	130	242.9	0.22	2.10	2.10	538	53	48	5	77	107	45	100
13	55	135	246.8	0.21	1.95	1.95	532	52	48	5	98	109	44	107
14	60	140	250.8	0.19	1.80	1.80	520	52	47	5	96	116	45	114
			110.6			1.8	524	51						

COMMENTS:

250.8
140
110.6

EPA (Dur) 235
4/72

FIELD DATA

PLANT Certain-Teed Products Shakopee
DATE 9/21/75
SAMPLING LOCATION TP-2
SAMPLE TYPE Particulate
RUN NUMBER TP-2-3
OPERATOR E.L.G. & R.E.Fitter
AMBIENT TEMPERATURE 56
BAROMETRIC PRESSURE 29.54
STATIC PRESSURE, (P_s) 29.54
FILTER NUMBER (s) 0.38915

Job 2 Sheets

PROBE LENGTH AND TYPE 5' Inconel
NOZZLE I.D. 0.360
ASSUMED MOISTURE, % 7
SAMPLE BOX NUMBER 7
METER BOX NUMBER 5
METER $\Delta H_@$ 1.72
C FACTOR 0.95
PROBE HEATER SETTING —
HEATER BOX SETTING 120
REFERENCE Δp 0.35

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)		GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	FILTER outlet Temp °F	IMPINGER TEMPERATURE, °F	Probe H_2O Temp °F
	2 03	0	252.8											
WE 1	2 05	5	255.8	0.12	1.1	1.1	504	51	51	4	7	70	45	63
2	2 11	10	259.4	0.14	1.35	1.35	528	54	52	5	114	85	45	70
3	2 18	15	263.2	0.18	1.65	1.65	546	55	52	5	106	106	46	69
4	2 23	20	267.0	0.19	1.75	1.75	548	54	51	6	97	117	46	68
5	2 ~~28~~ 25	~~25~~	268.1	0.20	1.85	1.85	—	—	—	—	—	—	—	—
5	~~4 12~~ / 4 16	25	270.8	0.20	1.85	1.85	547	62	55	6	107	99	43	65
Lost power → 6	~~4 20~~ / 4 25	30	274.7	0.21	1.90	1.90	546	59	54	6	99	104	43	71
7	4 30	35	278.7	0.20	1.85	1.85	540	57	54	6	89	103	45	77
8	4 35	40	282.6	0.20	1.85	1.85	540	57	53	6	86	104	45	91
9	4 41	45	286.5	0.20	1.85	1.85	532	56	53	6	85	107	46	99
10	~~4 55~~ 5 00	~~50~~	290.1	0.20	1.85	1.85	546	58	54	6	95	86	47	90
11	~~5 04~~ / ~~5 51~~ 5 53	~~55~~	293.4	0.20	1.85	1.85	534	59	55	6	96	111	46	94
12	5 28	60	297.1	0.20	1.85	1.85	522	53	54	6	99	85	42	99
13	5 43	65	300.9	0.18	1.65	1.65	516	52	52	6	96	102	43	102
14	5 48	70	304.6	0.18	1.65	1.65	498	53	52	5	96	105	44	107
1	~~5 53~~ / ~~5 58~~	75	308.1	0.16	1.45	1.45	496	50	50	4	80	93	43	79
2	~~6 03~~	80		0.18	1.65	1.65	504	51	49	5	91	94	43	79
3	6 08	85	—	0.20	1.85	1.85	517	52	49	6	100	98	43	78
4	6 13	90	319.4	0.20	1.85	1.85	512	52	49	6	102	99	43	79
5	6 18	95	323.3	0.21	1.90	1.90	521	53	49	6	90	104	44	82
6	6 23	100	327.3	0.21	1.90	1.90	523	54	49	6	89	103	44	85
7	6 28	105	331.5	0.23	2.10	2.10	542	54	49	7	86	110	44	84
8	6 33	110	335.6	0.23	2.10	2.10	537	54	48	7		99	45	86

COMMENTS:

EPA (Dur) 235
4 72

FIELD DATA

PLANT Certain Teed Shakopee
DATE 9/18/75
SAMPLING LOCATION TP2
SAMPLE TYPE Particulate
RUN NUMBER TP-2-3
OPERATOR Elchuk & Futter
AMBIENT TEMPERATURE 45
BAROMETRIC PRESSURE
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 15' Inconel
NOZZLE I.D. 0.360
ASSUMED MOISTURE, % 3
SAMPLE BOX NUMBER 7
METER BOX NUMBER 5
METER $\Delta H_@$ 1.72
C FACTOR 0.95
PROBE HEATER SETTING —
HEATER BOX SETTING 100
REFERENCE Δp 0.30

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY _____ MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F		IMPINGER TEMPERATURE, °F	
9	6:35	115	339.9	0.23	2.10	2.10	548	55	48	7	97	99	45	90
10	6:40	120	344.1	0.23	2.10	2.10	546	55	48	7	92	101	46	92
11	~~6:45~~ 6:50	125	348.5	0.23	2.10	2.10	546	55	48	7	90	100	44	94
12	6:55	130	352.7	0.24	2.20	2.20	547	55	49	7	93	104	45	104
13	7:00	135	356.8	0.23	2.10	2.10	531	55	44	7	101	109	45	106
14	7:05	140	360.7	0.20	1.85	1.85	514	55	49	6	101	111	45	105
			107.9	0.20		1.83	530	53						

COMMENTS:

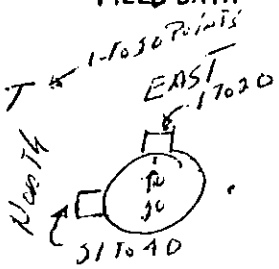
72.85

EPA (Dur) 235
4/72

120 minutes
40 Points
3 minutes/Point

FIELD DATA

PLANT Certain-Teed
DATE 9-9-73
SAMPLING LOCATION INLET EAST PORT
SAMPLE TYPE PARTICULATE
RUN NUMBER (1) TP-3-1
OPERATOR DonHepp
AMBIENT TEMPERATURE 85
BAROMETRIC PRESSURE 29.64
STATIC PRESSURE, (P_s) -1.0
FILTER NUMBER (s)



SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE 5 FT GLASS
NOZZLE I.D. 0.243
ASSUMED MOISTURE, % 3
SAMPLE BOX NUMBER 12
METER BOX NUMBER
METER ΔH@ 1.83
C FACTOR 1.05
PROBE HEATER SETTING
HEATER BOX SETTING 340°F
REFERENCE Δp 0.60 out (.68 in H_2O) on 7 point check

.74 @ 22 in H_2O

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F AFTER FILTER	IMPINGER TEMPERATURE, °F AFTER IMPINGERS
	0	1609	173.66									
1	3	612		.2	.62	.62	216	72	72	6.0	220	50
2	6	615		.2	.62	.62	216	66	72	6.0	210	50
3	9	618		.23	.71	.71	215	66	72	7.0	145	50
4	12	621		.23	.71	.71	216	66	71	7.0	126	58
5	15	624		.22	.68	.68	216	66	71	7.0	119	60
6	18	627		.22	.68	.68	220	66	71	7.0	135	74
7	21	630		.2	.54	.54	220	67	76	6.0	95	64
8	24	633		.2	.54	.54	220	67	76	6.0	95	64
9	27	635	184.383	.18	.49	.49	220	67	76	5.8	95	61
10	30	658		.17	.46	.46	210	70	72	5.9	89	56
11	33	7:01	187.1	.2	.52	.52	210	67	76	6.0	88	56
12	36	7:04		.2	.52	.52	210	67	76	6.0	88	56
13	39	7:07		.19	.51	.51	215	68	76	6.0	89	61
14	42	7:10	191.1	.21	.59	.59	217	69	76	6.5	89	64
15	45	7:13		.24	.64	.64	219	69	76	6.5	90	65
16	48	7:16	193.3	.24	.64	.64	221	69	76	6.0	90	67
17	51	7:19		.25	.67	.67	221	69	76	7.0	91	65
18	54	7:22	196.4	.25	.68	.68	221	69	76	7.2	93	70
19	57	7:25	197.50	.22	.6	.6	221	69	76	7.2	93	72
20	60	7:28	198.7	.21	.6	.6	221	69	76	7.0	94	69

COMMENTS:

Stuck! 6 54 Pt Check 64 29 Pt

EAST Port INLET

Pitot .68 Down .55

A-42

EPA (Dur) 235
4/72

FIELD DATA

PLANT Certain-Teed
DATE 9-9-75
SAMPLING LOCATION North Pipe Inlet Points 1 to 40
SAMPLE TYPE Particulate HC
RUN NUMBER 6
OPERATOR Don Hupp
AMBIENT TEMPERATURE 65
BAROMETRIC PRESSURE 29.64
STATIC PRESSURE, (P_s) -1.0 "H_2O
FILTER NUMBER (s)

North Point 21 to 40

PROBE LENGTH AND TYPE 5 FT Glass
NOZZLE I.D. .243
ASSUMED MOISTURE, % 2.0
SAMPLE BOX NUMBER 12
METER BOX NUMBER
METER $\Delta H_@$ 1.82
C FACTOR 1.1
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp .55

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F Filter	IMPINGER TEMPERATURE, °F After 1st
		0	730	198.7									
1	21	3	7:33		.23	.62	.62	203	73	79	7.5	92	69
2	22	6	7:36	201.3	.24	.65	.65	203	73	79	7.5	93	68
3	23	9	739		.24	.65	.65	203	73	79	7.5	92	66
4	24	12	742	203.6	.26	.7	.7	206	73	79	8.0	91	66
5	25	15	745		.26	.72	.72	206	73	79	8.2	91	70
6	26	18	748	206.3	.23	.62	.62	206	73	79	8.2	91	70
7	27	21	751		.22	.6	.6	216	73	79	7.0	91	71
8	28	24	754	208.8	.2	.54	.54	216	73	79	7.0	89	74
9	29	27	757	210.1	.18	.49	.49	216	73	79	6.6	88	73
10	30	30	800		.18	.5	.5	216	73	79	6.6	88	71
11	31	33	803		.2	.57	.57	216	73	79	6.6	80	70
12	32	36	806	213.7	.22	.61	.61	216	73	79	6.6	89	71
13	33	39	809	215.1	.2	.55	.55	212	73	79	8.0	89	70
14	34	42	812		.21	.57	.57	212	73	79	8.0	89	71
15	35	45	815	217.9	.21	.57	.57	210	72	78	7.5	90	70
16	36	48	818		.20	.55	.55	210	72	78	7.5	91	70
17	37	51	821	220.1	.19	.53	.53	210	72	78	7.5	94	70
18	38	54	824		.15	.42	.42	210	72	78	7.5	96	70
19	39	57	827	222.3	.15	.42	.42	210	72	78	6.5	96	70
20	40	60	830	223.458	.15	.42	.42	210	72	78	6.5	96	70
				End of Run		8.30							

HC Start

HC OFF

HC ON 829

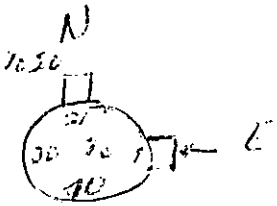
Probe Tube with Start Nozzle Mouth 24 inches

COMMENTS: 120 min 49.8 cf 0.58 214 74

EPA (Dur) 235
4/72

FIELD DATA

PLANT [illegible]
DATE 7.11.93
SAMPLING LOCATION [illegible]
SAMPLE TYPE [illegible]
RUN NUMBER (2)
OPERATOR Don Hopp
AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 29.37
STATIC PRESSURE, (P_s) −1.0 "H_2O
FILTER NUMBER (s) No assigned number



PROBE LENGTH AND TYPE [illegible]
NOZZLE I.D. [illegible]
ASSUMED MOISTURE, % [illegible]
SAMPLE BOX NUMBER [illegible]
METER BOX NUMBER [illegible]
METER $\Delta H_@$ [illegible]
C FACTOR [illegible]
PROBE HEATER SETTING [illegible]
HEATER BOX SETTING 4
REFERENCE Δp [illegible]

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F Filter	IMPINGER TEMPERATURE, °F
	0	11:15	223.6 / 228.66									
1	2	11:18	225.655	.2	.5	.5	190	65	65	4.0	124	55
1	3	11:21		.2	.5	.5	190	65	65	4.0	124	55
2	6	11:36		.5	.5	.5	190	65	65	4.0	124	55
3	9	11:39		.52	.52	.52	200	63	65	4.0	124	55
4	10	11:40		.24	.58	.58	200	63	64	4.0	110	55
4	12	11:48		.24	.58	.58	190	63	64	4.2	97	55
5	14	11:50		.24	.58	.58	190	63	64	4.2	97	55
5	15	12:54		.23	.56	.56	182	70	70	4.1	80	55
6	18	12:57	232.0	.23	.56	.56	182	70	70	4.1	82	55
7	21	1:00	233.8	.21	.5	.5	188	68	68	4.1	89	55
8	24	1:03		.2	.49	.49	188	68	68	4.1	90	60
9	27	1:06		.18	.44	.44	195	68	68	4.1	106	60
10	30	1:09		.18	.44	.44	195	70	70	4.0	113	60
11	33	1:12	238.4	.19	.45	.45	195	70	70	4.0	113	60
12	36	1:15	239.5	.18	.43	.43	196	70	70	4.0	114	60
13	39	1:18		.21	.52	.52	196	70	70	4.3	115	65
14	42	1:21		.21	.52	.52	196	70	70	4.4	118	65
15	45	1:24		.24	.66	.66	203	70	70	4.5	118	65
16	48	1:27		.26	.72	.72	203	70	70	4.5	118	65
17	51	1:30		.25	.7	.7	203	70	70	4.0	112	60
18	54	1:33	247.0	.25	.69	.69	203	70	70	3.0	130	70
19	57	1:36		.25	.69	.69	203	70	70	4.9	106	72
20	60	1:39	249.711	.21	.59	.59	206	70	70	4.5	104	72

COMMENTS:

EPA (Dur) 235
4/72

A-44

FIELD DATA

PLANT Centralia - Feed
DATE [illegible]
SAMPLING LOCATION Inlet North Port [illegible]
SAMPLE TYPE Particulate
RUN NUMBER [illegible]
OPERATOR [illegible]
AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 28.32
STATIC PRESSURE, (P_s) [illegible]
FILTER NUMBER (s) None assigned

PROBE LENGTH AND TYPE 9' [illegible] Glass Pitot
NOZZLE I.D. .245
ASSUMED MOISTURE, % 15
SAMPLE BOX NUMBER [illegible]
METER BOX NUMBER [illegible]
METER $\Delta H_@$ [illegible]
C FACTOR [illegible]
PROBE HEATER SETTING [illegible]
HEATER BOX SETTING [illegible]
REFERENCE Δp [illegible]

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY _____ MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F FILTER	IMPINGER TEMPERATURE, °F
		2:40	249.74									
1	21	3 - 243		.24	.66	.66	178	69	69	5.0	180	65
2	22	6 - 246	252.7	.26	.72	.72	180	69	69	5.0	180	65
3	23	9 - 249		.25	.7	.7	180	69	69	5.0	168	65
4	24	12 - 252		.28	.8	.8	180	69	69	5.0	160	68
5	25	15 - 255	257.6	.27	.75	.75	185	69	69	5.0	160	68
6	26	18 - 258		.26	.72	.72	189	68	69	5.0	150	68
7	27	21 - 301	259.8	.23	.64	.64	189	68	69	5.0	130	70
8	28	24 - 304		.22	.62	.62	193	68	69	5.0	125	71
9	29	27 - 307		.19	.52	.52	199	68	69	5.0	112	72
10	30	30 - 310	263.6	.2	.55	.55	200	68	69	4.5	105	72
11	31	33 - 313	264.9	.21	.58	.58	190	68	69	4.5	100.5	72
12	32	36 - 316		.21	.59	.59	194	68	69	4.5	100.	72
13	33	39 - 319	267.4	.22	.6	.6	199	68	69	4.5	105	72
14	34	42 - 322		.22	.61	.61	205	68	69	4.5	105	74
15	35	45 - 325	270.0	.23	.64	.64	205	68	69	5.0	106	74
16	36	48 - 328		.23	.64	.64	205	68	69	5.0	108	74
17	37	51 - 331		.22	.6	.6	200	68	69	5.0	110	75
18	38	54 - 334		.21	.58	.58	200	68	69	5.0	110	70
19	39	57 - 337	274.4	.19	.52	.52	200	68	69	5.0	110	70
20	40	60 - 340	275.7	.19	.52	.52	200	68	69	5.0	110	70
		60 - 343	276.6									

DOWN & START

COMMENTS:

END OF RUN

53.0 0.22 0.59 195 68

EPA (Dur) 235
4 72

FIELD DATA

TP-3 STACK

#3 Run

403 HC. Just flow was was checked this morning and turned out to be 4.95 CFH.

PLANT Certain Teed
DATE 9-12-75
SAMPLING LOCATION TP-3 INLET EAST PORT
SAMPLE TYPE Particulate + HC
RUN NUMBER (3)(TP)
OPERATOR HUPP
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.54
STATIC PRESSURE, (P_s) -1.0
FILTER NUMBER (s)

EAST

NORTH

PROBE LENGTH AND TYPE 4 ft active length
NOZZLE I.D. .320
ASSUMED MOISTURE, % 5 + 6 (HC) = 11
SAMPLE BOX NUMBER 12
METER BOX NUMBER 12 Just Built
METER $\Delta H_@$ 1.82
C FACTOR .92
PROBE HEATER SETTING not used
HEATER BOX SETTING Low Light Filter temp 100°F
REFERENCE Δp .22

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F FILTER	IMPINGER TEMPERATURE, °F
	0	2:01	277.0									
1	3	2:04		.2	1.8	1.8	190	68	68	13	77	51
2	6	2:07		.22	1.85	1.85	190	68	68	13	83	51
3	9	2:10		.21	1.85	1.85	200	67	67	13.3	88	60
4	12	2:13	285.4	.23	1.95	1.95	200	65	71	13.3	90	65
5	15	2:16		.23	1.95	1.95	200	65	71	13.0	94	68
6	18	2:19		.22	1.85	1.85	200	65	71	13.0	104	70
7	21	2:21		.21	1.75	1.75	200	65	71	13.0	116	75
8	24	2:24	296.0	.2	1.7	1.7	200	65	71	13.0	120	80
9	27	2:01 4:10		.24	2.05	2.05	200	65	66	12.0	82	55
10	30	4:13		.24	2.05	2.05	200	66	66	12.0	88	60
11	33	4:19	301.4	.24	2.05	2.05	200	65	66	12.0	90	65
12	36	4:22		.24	2.05	2.05	205	66	66	12.0	92	65
13	39	4:25		.24	2.05	2.05	205	66	67	12.0	112	68
14	42	4:28		.25	2.2	2.2	205	66	67	13.0	115	75
15	45	4:31		.27	2.25	2.2	206	66	67	13.0	116	80
16	48	4:34	313.4	.3	2.5	2.2	206	66	67	13.0	117	80
17	51	4:37	316.06	.29	2.5	2.2	206	66	67	13.0	118	82
18	54	4:40 4:58		.31	2.55	2.2	194	66	67	13.0	90	65
19	57	5:01	321.3	.29	2.4	2.2	194	66	67	13.0	95	65
20	60	5:03 5:33	323.4	.24	2.0	2.0	195	66	67	5	60	82

15 CFH 1 STOP

1:16 3:16 5:16

STOP 4:37 DOI STOPPED

5:30 37.13

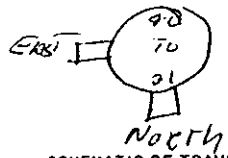
COMMENTS:

EPA (Dur) 235
4/72

FIELD DATA

PLANT _____
DATE 9-12-77
SAMPLING LOCATION INLET TP3 North PORT
SAMPLE TYPE PARTICULATE+HC
RUN NUMBER 3
OPERATOR DON HUPP
AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 29.59
STATIC PRESSURE, (P_s) -1.0" H_2O
FILTER NUMBER (s) _____

PROBE LENGTH AND TYPE 4 ft
NOZZLE I.D. .325
ASSUMED MOISTURE, % 11
SAMPLE BOX NUMBER 12
METER BOX NUMBER 13 Not Built
METER $\Delta H_@$ 1.62
C FACTOR .92
PROBE HEATER SETTING _____
HEATER BOX SETTING _____
REFERENCE Δp .22



SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F Exhaust	IMPINGER TEMPERATURE, °F
		0	5:46	323.4									
1	21	3	5:49		.25	2.15	2.15	200	60	62	5.0	132	55
2	22	6	5:52		.27	2.2	2.2	200	60	62	5.0	134	55
3	23	9	5:55		.29	2.4	2.4	200	60	62	5.5	134	55
4	24	12	5:58		.29	2.45	2.45	205	60	67	5.5	106	55
5	25	15	6:01	333.8	.28	2.4	2.4	205	60	67	5.5	100	60
6	26	18	6:04	335.75	.26	2.2	2.2	205	60	67	5.5	94	60
7	27	21	6:07		.24	2.1	2.1	205	60	67	5.5	92	65
8	28	24	6:10		.24	2.1	2.1	205	60	67	5.5	88	64
9	29	27	6:13		.21	1.8	1.8	205	60	67	5.5	86	60
10	30	30	6:16	347.8	.21	1.8	1.8	205	60	67	5.5	88	60
11	31	33	6:19		.22	1.9	1.9	205	60	67	5.5	92	60
12	32	36	6:22		.22	1.9	1.9	205	60	67	5.5	96	60
13	33	39	6:25		.22	1.9	1.9	206	60	67	5.5	100	60
14	34	42	6:28		.23	1.9	1.9	206	60	67	5.0	102	60
15	35	45	6:31		.23	1.95	1.95	206	60	67	5.0	104	60
16	36	48	6:34		.24	2.05	2.05	206	60	67	5.0	105	60
17	37	51	6:37		.23	1.95	1.95	206	60	67	5.0	106	62
18	38	54	6:40	364.4	.21	1.8	1.8	206	64	75	5.0	107	62
19	39	57	6:42		.17	1.45	1.45	206	64	75	4.0	106	63
20	40	60	6:45	369.9	.17	1.45	1.45	206	64	75	4.2	106	62
				END OF RUN									

COMMENTS:

T=120

369.9 ft^3
277.0
92.9
9.9 ← H.C (ft³)
102.8 ft³

T = 120 (.0825) =

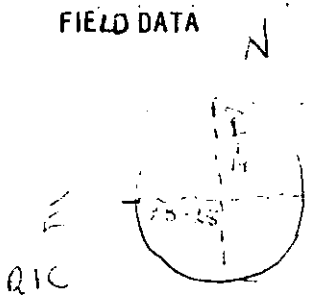
9.86/40 = 0.247

1.9 200 65

EPA (Dur) 235
4 72

FIELD DATA

PLANT Certain-Teed
DATE 7-9-75
SAMPLING LOCATION Outlet TP4
SAMPLE TYPE Particulate
RUN NUMBER 1
OPERATOR FL Rice
AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 29.64
STATIC PRESSURE, (P_s) ~~0~~ ATMOSPHERIC
FILTER NUMBER (s)



PROBE LENGTH AND TYPE 5' Quartz
NOZZLE I.D. 0.375
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER 2
METER BOX NUMBER 2
METER $\Delta H_@$ 1.83
C FACTOR 1.05
PROBE HEATER SETTING 1
HEATER BOX SETTING 1
REFERENCE Δp ~~0.8~~ 0.18

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

Gas Temp After Filter	TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	Probe Wall Temp
			454.756										
112	1	6:13		0.13	1.35	1.35	678	65	61	0.5	122	51	72
110	2	6:18		0.16	1.85	1.85	674	62	60	1.0	104	50	74
106	3	6:23		0.19	1.95	1.95	682	63	60	1.5	102	54	75
100	4	6:28		0.21	2.17	2.17	696	65	61	2.0	96	57	75
102	5	6:33		0.20	2.05	2.05	706	66	61	2.4	92	57	72
		(1) Int 6:36	470.648										
90	5	6:50	470.648	0.22	2.2	2.2	706	65	63	2.0	80	54	[illegible]
92	6	7:00		0.22	2.2	2.2	710	65	63	2.0	82	55	86
100	7	7:05		0.22	2.2	2.2	709	66	63	2.0	81	55	86
100	8	7:10		0.23	2.35	2.35	709	65	63	2.2	87	57	100
108	9	7:15		0.22	2.2	2.2	725	66	62	2.2	87	56	120
110	10	7:20		0.22	2.2	2.2	726	63	60	2.2	84	55	132
110	11	7:25		0.23	2.35	2.35	695	62	59	2.2	80	57	140
112	12	7:30		0.23	2.35	2.35	700	61	58	2.2	70	57	132
115	13	7:35		0.21	2.17	2.17	693	61	58	2.1	70	58	122
118	14	7:40		0.19	1.95	1.95	665	62	58	2.1	72	55	170
		7:45											
			507.996										

COMMENTS: (1) stopped on pit 5 at 6:36. by Gene Riley assumed at 6:55

EPA (Dur) 235
4/72

FIELD DATA

PLANT Certain-Teed
DATE 9-2-75
SAMPLING LOCATION Outlet TF7
SAMPLE TYPE Particulate
RUN NUMBER 1
OPERATOR FL Rice
AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 29.67
STATIC PRESSURE, (P_s) Atmospheric
FILTER NUMBER (s)

See page 1

PROBE LENGTH AND TYPE 5' manual
NOZZLE I.D. 0.325
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER 3
METER BOX NUMBER 2
METER $\Delta H_@$ 1.52
C FACTOR 1.65
PROBE HEATER SETTING 100
HEATER BOX SETTING 100
REFERENCE Δp ~~0.5~~ 0.18

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

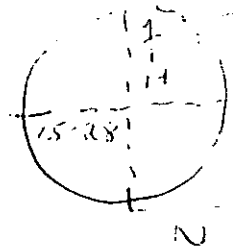
Gas After Filter	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	Probe & after
				56.996										
77	15		8:05		0.13	1.7	1.7	672	59	59	1.9	65	52	88
76	16		8:10		0.18	1.85	1.85	672	60	59	2.0	67	51	79
84	17		8:15		0.22	2.2	2.2	689	61	59	2.5	66	53	78
94	18		8:20		0.22	2.2	2.2	691	64	59	3.0	68	54	92
94	19		8:25		0.22	2.2	2.2	694	65	59	3.0	69	55	100
94	20		8:30		0.22	2.2	2.2	697	66	59	3.5	71	56	100
95	21		8:35		0.23	2.35	2.35	698.2	66	60	3.7	70	55	102
96	22		8:40		0.23	2.35	2.35	688	64	60	3.5	72	56	106
98	23		8:45		0.23	2.35	2.35	689	67	60	3.5	73	57	110
102	24		8:50		0.22	2.2	2.2	690	66	61	3.5	80	59	110
103	25		8:55		0.23	2.35	2.35	691	68	60	3.5	73	58	140
110	26		9:00		0.22	2.2	2.2	687	70	60	3.5	89	60	146
115	27		9:05		0.21	2.17	2.17	677	71	60	3.5	92	61	138
115	28		9:10		0.18	1.85	1.85	652	71	60	2.0	78	62	145
			9:15	56.782										
							2.10	691°	62°					
			182	107.03										
			1.4 cfm											
					Page 2 of 2									

COMMENTS:

EPA (Dur) 235
4/72

FIELD DATA

PLANT Captain Tech
DATE 6-11-95
SAMPLING LOCATION Outlet TP4
SAMPLE TYPE Particulate
RUN NUMBER 2
OPERATOR FL Rice
AMBIENT TEMPERATURE 62
BAROMETRIC PRESSURE 29.4
STATIC PRESSURE, (P_s) Atmospheric
FILTER NUMBER (s) 564



PROBE LENGTH AND TYPE 5' metal
NOZZLE I.D. 0.375
ASSUMED MOISTURE, % —
SAMPLE BOX NUMBER 2
METER BOX NUMBER 2
METER $\Delta H_@$ 1.83
C FACTOR 1.65
PROBE HEATER SETTING 160
HEATER BOX SETTING —
REFERENCE Δp 0.18

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

Gas Temp After F.H	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	Probe Water Temp
				566.666										
60	1		11:15		0.18	1.85	1.85	685	61	60	1.5	64	56	60
	2/2/1		End 11:17:30	566.651										
62	2 1		11:31		0.18	1.85	1.85	680	64	62	1.5	64	57	63
62	2 2		11:33		0.15	1.55	1.55	655	66	62	1.5	67	56	64
		2	End 11:35	570.385										
70	2 2		11:48		0.19	1.95	1.95	681	65	61	1.5	63	57	66
		3	End 11:50	571.552										
62	1 2		12:55		0.20	2.05	2.05	715	66	65	1.7	64	56	64
62	5 3		12:56		0.22	2.2	2.2	719	66	64	2.0	65	56	67
68	5 4		1:01		0.23	2.35	2.35	727	66	65	2.5	71	56	65
80	5 5		1:06		0.25	2.55	2.55	723	69	64	4.0	84	55	65
94	5 4		1:11		0.25	2.55	2.55	724	70	64	4.0	93	57	105
96	5 7		1:16		0.25	2.55	2.55	725	72	64	4.0	91	59	35
97	5 8		1:21		0.24	2.45	2.45	728	73	64	4.0	92	61	76
102	5 9		1:26		0.24	2.45	2.45	715	72	64	4.0	100	61	100
104	5 10		1:31		0.25	2.55	2.55	717	72	64	4.0	104	61	132
105	5 11		1:36		0.24	2.45	2.45	709	71	64	4.0	101	61	116
102	5 12		1:41		0.25	2.55	2.55	705	71	64	4.0	116	61	110
98	5 13		1:46		0.23	2.35	2.35	697	70	63	4.0	93	61	114
		(4)	End 1:51	615.137	0.21	2.17	2.17	676	65	64	3.5	74	62	125
83	5 14		2:09											
			2:14	616.726										
695				Page 1 of 2										

COMMENTS:
(1) A run stopped due to loss of power at TP 2 (2) once again (3) run stopped due to problem at inlet TP. (4) stopped at 125 due to dust [illegible]

EPA (Dur) 235
4-72

FIELD DATA

PLANT Centralia Test
DATE 7-11-75
SAMPLING LOCATION Outlet TP4
SAMPLE TYPE Pb, Acetate
RUN NUMBER
OPERATOR F. Rice
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 29.4
STATIC PRESSURE, (P_s) atmospheric
FILTER NUMBER (s)

see page 1

PROBE LENGTH AND TYPE 5' Inconel
NOZZLE I.D. 0.375
ASSUMED MOISTURE, %
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.53
C FACTOR
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

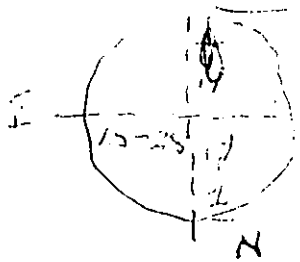
Gas After Filter	TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	Probe & Outlet Temp
			674.926										
80	15	2:23		0.19	1.95	1.95	681	64	63	2.0	79	66	70
82	16	2:28		0.18	1.85	1.80	688	65	62	2.0	83	57	64
78	17	2:33		0.22	2.20	2.20	712	66	62	3.5	86	57	66
74	18	2:38		0.23	2.35	2.35	719	67	61	3.7	89	57	65
82	19	2:43		0.24	2.45	2.45	725	67	61	3.9	95	58	67
92	20	2:48		0.25	2.55	2.55	733	70	62	4.0	106	59	67
100	21	2:53		0.25	2.55	2.55	738	73	63	4.1	112	60	67
88	22	2:58		0.24	2.45	2.45	735	76	64	4.0	102	63	66
100	23	3:03		0.24	2.45	2.45	739	78	66	4.0	113	66	66
92	24	3:08		0.24	2.45	2.45	720	78	67	4.0	108	66	120
90	25	3:13		0.25	2.55	2.55	717	75	65	4.1	104	66	120
92	26	3:18		0.24	2.45	2.45	716	77	66	4.0	105	66	105
95	27	3:23		0.22	2.2	2.2	711	77	66	4.0	113	67	105
96	28	3:28		0.19	1.95	1.95	668	78	64	2.2	119	65	105
		3:33	674.998										
						2.17	710						
T=	139.5							67					
			112.33	0.23									
					2	2	2						

COMMENTS:

EPA (Dur) 235
4 72

FIELD DATA

PLANT Certain-Teed
DATE 9-13-75
SAMPLING LOCATION [illegible]
SAMPLE TYPE Particulate
RUN NUMBER 3
OPERATOR Bonard Miller
AMBIENT TEMPERATURE [illegible]
BAROMETRIC PRESSURE 29.7
STATIC PRESSURE, (P_s) Atmospheric
FILTER NUMBER (s)



SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE 5' [illegible]
NOZZLE I.D. [illegible]
ASSUMED MOISTURE, % 5
SAMPLE BOX NUMBER [illegible]
METER BOX NUMBER [illegible]
METER $\Delta H_@$ 1.82
C FACTOR 0
PROBE HEATER SETTING [illegible]
HEATER BOX SETTING [illegible]
REFERENCE Δp .19

READ AND RECORD ALL DATA EVERY 5 MINUTES

Gas After Filter Temp	TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	Probe Heater Temp
			675.642										
77°	1	2:02		.160	1.55	1.55	635	60	59	2.5	65	64	60
92	2	2:07	678.7	.200	1.95	1.95	655	64	59	3.0	83	63	68
98	3	2:12	682.3	.210	2.00	2.00	658	69	59	3.5	108	70	78
112	4	2:17	686.0	.220	2.10	2.10	659	71	59	3.5	84	73	80
102	5	2:22	689.8	.230	2.20	2.20	670	72	60	3.5	96	69	75
		2:24 off	filter changed										
105	5	4:10 on		.210	2.00	2.00	665	69	68	3.0	113	63	80
	6	4:13	693.5	.140	1.40	1.40	665	71	68	2.0	114	59	
107	7	4:18	696.8	.200	1.95	1.95	662	72	66	3.0	110	59	80
109	8	4:23	700.1	.210	2.00	2.00	670	74	66	3.0	107	58	112
102	9	4:28	703.8	.220	2.10	2.10	662	76	66	3.5	112	58	115
105	10	4:33	707.5	.220	2.10	2.10	669	78	66	3.5	108	59	110
		4:37 off	710.415										
		4:55 on	710.415										
92	11	4:56	711.0	.220	2.10	2.10	670	68	66	3.5	86	52	138
		5:01 off	714.778										
78	12	5:31 on	714.778	.220	2.10	2.10	643	67	66	3.5	75	62	110
90	13	5:36	718.5	.210	2.00	2.00	656	71	66	3.0	86	61	108
94	14	5:41	722.3	.180	1.75	1.75	633	73	65	3.0	88	52	114
	change ports	5:46	725.905		change ports								
	15	5:54	725.905	.130	1.30	1.30	633	69	64	2.5	77	58	
88	16	5:59	728.9	.180	1.75	1.75	655	73	64	3.0	82	56	84
	17	6:04	732.3										

4:20 leak sample

4:35 leak sample

COMMENTS:

EPA (Dur) 235
4/72

FIELD DATA

PLANT Carbon - Tech
DATE 9-13-75
SAMPLING LOCATION Outlet TP4
SAMPLE TYPE Particulate
RUN NUMBER #3
OPERATOR Bonard, Wilkie
AMBIENT TEMPERATURE 60°
BAROMETRIC PRESSURE 29.7
STATIC PRESSURE, (P_s) Atmospheric
FILTER NUMBER (s)

see page 1

PROBE LENGTH AND TYPE 5' Inconel
NOZZLE I.D. [illegible]
ASSUMED MOISTURE, % 5
SAMPLE BOX NUMBER [illegible]
METER BOX NUMBER [illegible]
METER $\Delta H_@$ 1.82
C FACTOR 1.00
PROBE HEATER SETTING [illegible]
HEATER BOX SETTING [illegible]
REFERENCE Δp .19

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

Gas after filter temp.	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	poli water temp.
94	17		6:04	732.3	.200	1.95	1.95	662	76	64	3.0	92	56	80
96	18		6:09	735.8	.200	1.95	1.95	671	77	65	3.5	92	56	80
98	19		6:14	739.4	.210	2.00	2.00	670	78	65	3.5	98	56	84
94	20		6:19	743.1	.210	2.00	2.00	666	78	65	3.5	109	56	100
100	21		6:24	746.9	.220	2.10	2.10	670	80	66	3.5	116	50	90
106	22		6:29	750.8	.230	2.20	2.20	662	78	65	3.5	105	51	94
92	23		6:34	754.5	.230	2.20	2.20	662	79	65	3.5	102	52	94
88	24		6:39	758.5	.220	2.10	2.10	655	78	65	3.5	98	52	98
92	25		6:44	762.1	.230	2.20	2.20	658	78	65	3.5	103	52	118
108	26		6:49	766.0	.220	2.10	2.10	650	79	65	3.5	112	53	108
106	27		6:54	770.3	.210	2.00	2.00	644	78	65	3.5	110	54	105
102	28		6:59	774.1	.180	1.75	1.75	629	78	65	3.0	104	54	108
	off		7:04	777.586										
					5.72 / 28		1.9	660		70				
					0.211									

Pitot - 2 in

COMMENTS:

T = 140

777.59
675.64
101.95 cf
1.09 ucf
.04

EPA (Dur) 235
4-72

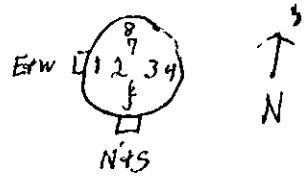
FIELD DATA

TP-5 (1)

byrite
O_2 – 21 } 14:10
CO_2 – 0

O_2 – 21 } 14:55
CO_2 – 0

PLANT CER-TEED
DATE 9/9/75
SAMPLING LOCATION TP5
SAMPLE TYPE part
RUN NUMBER CER-TP-5(1)
OPERATOR Fernard, Kyonz
AMBIENT TEMPERATURE 60°
BAROMETRIC PRESSURE 29.64
STATIC PRESSURE, (P_s) -.035
FILTER NUMBER (s) JUL-27 0.38290



SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE 18" Glass
NOZZLE I.D. .430
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER 1
METER BOX NUMBER 1
METER $\Delta H_@$ 1.83
C FACTOR 1.08
PROBE HEATER SETTING 0
HEATER BOX SETTING 0
REFERENCE Δp 0.025

READ AND RECORD ALL DATA EVERY 5 MINUTES

probe	TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F TC / DIAL	IMPINGER TEMPERATURE, °F	
			351.796										
74	1	12:43		.065	2.2	2.2	124	71	65	6.0	65/70	63	
82	1	12:48	356.1	.065	2.2	2.2	127	75	65	6.0	66/78	65	
86	1	12:53	360.2	.065	2.2	2.2	127	78	66	6.0	66/82	68	
88	2	12:58	363.5	.086	2.85	2.85	130	80	67	8.0	66/87	68	bottom
91	2	13:03	368.9	.086	2.85	2.85	131	81	68	8.0	69/86	68	
73	2	13:08	373.6	.090	3.00	3.00	132	82	69	8.5	74/88	70	
95	3	13:13	378.3	.090	3.00	3.00	130	82	69	8.5	79/91	70	
102	3	13:18	383.6	.090	3.00	3.00	130	82	69	8.5	84/94	69	A-54
108	3	13:23	387.9	.090	3.00	3.00	131	83	70	8.5	87/97	69	
112	4	13:28	392.9	.088	2.95	2.95	131	83	70	8.5	88/98	69	
116	4	13:33	397.5	.086	2.90	2.90	128	83	71	8.5	90/100	69	13:41
119	4	13:38	402.2	.084	2.85	2.85	127	83	72	8.0	90/101	69	trench
		13:43	406.687	.086	2.90	2.90							around
110	5	13:48	406.696	.066	2.20	2.20	125	77	72	6.5	91/98	60	
102	5	13:53	410.9	.072	2.40	2.40	125	79	72	7.0	92/99	63	
99	5	13:58	415.1	.074	2.45	2.45	127	79	72	7.0	96/100	65	
96	6	14:03	419.8	.084	2.85	2.85	130	80	72	8.0	87/100	64	
95	6	14:08	423.8	.084	2.85	2.85	126	81	72	8.0	82/99	65	
95	6	14:13	428.5	.084	2.85	2.85	130	81	72	8.0	85/98	65	
96	7	14:18	433.2	.091	3.05	3.05	132	80	72	8.5	85/99	65	trench
103	7	14:23	438.2	.094	3.20	3.20	133	81	72	9.0	84/100	65	100
109	7	14:28	443.2	.096	3.25	3.25	132	83	72	9.0	86/101	65	14:23
115	8	14:33	448.0	.096	3.25	3.25	141	82	72	9.0	80/103	65	trench around
123	COMMENTS: 8	14:38	453.0	.092	3.15	3.15	139	82	73	9.5	82/104	65	14:24
127	8	14:43	457.1	.070	2.35	2.35	140	80	73	9.0	87/107	64	
	EPA (Dur) 235 4-72	14:45		.090	3.00	3.00							
		14:48	462.773	.094									
			351.796										

08 9246 72.75 3.03 24 75

FIELD DATA

12:12 { 21.0 O_2 / 0 CO_2

13:12 { 20.0 O_2 / 0 CO_2

PLANT: Contain - Tech
DATE: 9/10/95
SAMPLING LOCATION: TP 5-2
SAMPLE TYPE: Port
RUN NUMBER: 2
OPERATOR: Lyons, Turner
AMBIENT TEMPERATURE: 85
BAROMETRIC PRESSURE: 29.28
STATIC PRESSURE, (P_s): 0.35
FILTER NUMBER (s): Eco. TP-5-2 - JUL-34-0.38546
Filter Number Con. - TP.5-(2) 2-JUL-32-0.38324

A
B

E + W = 1-13
N + S = 14-27

PROBE LENGTH AND TYPE: 18" glass
NOZZLE I.D.: 0.430
ASSUMED MOISTURE, %: 2
SAMPLE BOX NUMBER: 1
METER BOX NUMBER: 1
METER $\Delta H_@$: 1.83
C FACTOR:
PROBE HEATER SETTING:
HEATER BOX SETTING:
REFERENCE Δp:

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

Probe	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F TC	Dial	IMPINGER TEMPERATURE, °F
				463.176										
74	1 1		11:05		0.065	2.54	2.54	131	67	66	5.5	65	80	67
73	2 1		11:10	467.4	0.060	2.05	2.05	131	71	66	5.0	66	84	69
74	3 1		11:15	471.5	0.065	2.2	2.2	137	75	67	5.0	68	85	67
74	4 2		11:20	475.6	0.075	2.58	2.58	140	81	68	5.6	71	100	64
73	5 2		11:25	480.1	0.085	2.9	2.9	142	83	69	6.5	71	105	65
73	6 2		11:30	484.9	0.085	2.9	2.9	141	85	70	6.5	71	105	64
72	7 3		11:35	484.7	0.085	2.9	2.9	142	87	71	6.5	69	105	64
73	8 3		11:40	494.5	0.085	2.9	2.9	142	88	72	6.5	69	105	65
73	9 3		11:45	499.3	0.085	2.9	2.9	140	89	73	6.5	70	105	67
73	10 4		11:50	504.2	0.85	2.9	2.9	141	91	75	6.5	71	107	68
74	11 4		11:55	509.1	0.085	2.9	2.9	141	92	76	6.8	70	105	69
75	12 4		12:00	514.0	0.085	2.9	2.9	141	93	77	6.8	71	105	70
	13		12:05	518.909	Change		Pump					72		
73	14 1		12:07		0.065	2.2	2.2	137	90	78	5.5	72	100	66
74	15 1		12:12	523.3	0.065	2.2	2.2	137	92	74	5.5	73	96	68
74	16 1		12:17	527.5	0.08	2.7	2.7	137	94	79	7.0	72	96	70
74	17 2		12:22	532.2	0.085	2.9	2.9	140	95	80	8.0	73	98	70
74	18 2		12:27	537.0	0.090	3.1	3.1	143	96	81	9.0	72	99	70
75	19 2		12:32	542.0	0.95	3.2	3.2	143	97	82	9.5	74	100	70
	20		12:37	547.260	Change		filters							
76	21 3		12:38		0.120	4.1	4.1	144	97	83	8.0	75	80	68
76	22 3		12:43	552.7	0.120	4.1	4.1	144	98	83	8.0	74	80	69
76	23 3		12:48	558.5	0.11	3.8	3.8	144	99	84	7.5	74	80	68
76	24		12:53	564.2	0.115	3.95	3.95	143	99	85	7.5	78	85	68
76	25 4		12:58	569.8	0.115	3.95	3.95	142	98	86	7.8	81	85	68
77	26		13:03	575.5	0.115	3.95	3.95	142	99	86	7.8	81	86	68
	27		13:08	581.146										
				117.968 CF			72.76 / 24	3.03		3821 / 6996 / 48				
				0.983 CFM										

COMMENTS:

EPA (Dur) 235

Turner Arrived 11:18

12:21

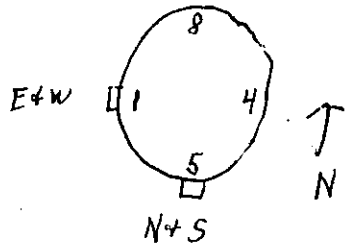
FIELD DATA

pyrite

4:05 CO_2 - 0
O_2 - 20.5%

5:15 CO_2 - 0
O_2 - 20.5%

PLANT Cert-Teed
DATE 9/10/75
SAMPLING LOCATION TP5
SAMPLE TYPE part
RUN NUMBER 3
OPERATOR Leonard
AMBIENT TEMPERATURE 70°
BAROMETRIC PRESSURE 29.20
STATIC PRESSURE, (P_s) .03
FILTER NUMBER (s) JUL-31 0.39009



SCHEMATIC OF TRAVERSE POINT LAYOUT

PROBE LENGTH AND TYPE 18" glass
NOZZLE I.D. .370
ASSUMED MOISTURE, % 2%
SAMPLE BOX NUMBER 1
METER BOX NUMBER 1
METER $\Delta H_@$ 1.83
C FACTOR 1.10
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp .096

READ AND RECORD ALL DATA EVERY 5 MINUTES

probe	TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	
			581.830										
82	1	3:15		.070	1.30	1.30	138	88	81	4.0	88	67°	truck one 3:18
82	1	3:20	585.4	.075	1.45	1.45	138	89	82	4.0	92°	66°	
82	1	3:25	588.7	.075	1.45	1.45	140	92	82	4.0	95°	67°	
83	2	3:30	592.1	.092	~~1.55~~	~~1.55~~	142	94	83	4.5	100°	67°	NOM 10% H_2O
83	2	3:35	595.9	.104	1.75	1.75	144	96	83	5.0	108°	67°	
83	2	3:40	600.0	.104	1.75	1.75	144	98	84	5.0	110°	67°	
81	3	3:45	603.4	.104	1.75	1.75	143	98	85	5.0	105°	68°	
81	3	3:50	607.2	.104	1.75	1.75	143	98	86	5.0	103°	68°	
81	3	3:55	611.1	.104	1.50	1.50	143	99	86	4.5	103°	69°	nom. 20% H_2O
82	4	4:00	614.6	.100	1.40	1.40	143	98	87	4.0	102°	70°	truck left 3:56,
83	4	4:05	618.1	.094	1.35	1.35	142	99	87	4.0	102°	70°	truck in 3:57
83	4	4:10	621.6	.094	1.35	1.35	140	99	88	4.0	103°	70°	
	off	4:15 Change ports	625.048										
81	5	4:18 on	625.048	.092	1.30	1.30	114	96	88	4.0	102°	72°	
81	5	4:23	628.3	.090	1.30	1.30	116	97	88	4.0	102°	70°	
81	5	4:28	631.5	.090	1.30	1.30	117	98	89	4.0	102°	71°	truck left 4:37,
81	6	4:33	634.8	.100	1.40	1.40	119	98	88	4.0	102°	72°	truck in 4:38
81	6	4:38	638.2	.102	1.55	1.55	120	99	89	4.5	105°	72°	
81	6	4:43	641.8	.102	1.55	1.55	120	100	89	4.5	107°	72°	
81	7	4:48	645.4	.114	1.65	1.65	118	100	89	4.5	107°	72°	
81	7	4:53	649.1	.120	1.70	1.70	117	100	90	4.5	106°	73°	
80	7	4:58	652.9	.124	1.80	1.80	116	100	90	5.0	111°	74°	
80	8	5:03	656.7	.124	1.80	1.80	115	100	90	5.0	110°	73°	truck out 5:08
80	8	5:08	660.4	.122	1.75	1.75	113	100	90	5.0	110°	73°	truck in 5:09
	8	5:13	664.3	.120	1.70	1.70	113	100	90	5.0	110	72°	
	EPA (Dup) 235 472	5:18 off	668.580										

COMMENTS:

A-56

FIELD DATA

PLANT Ort - Reed
DATE 9/11/75
SAMPLING LOCATION TP5
SAMPLE TYPE part
RUN NUMBER 4
OPERATOR Bernard, Lyons
AMBIENT TEMPERATURE 60°
BAROMETRIC PRESSURE
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 18" Pitot
NOZZLE I.D. .370
ASSUMED MOISTURE, % 2
SAMPLE BOX NUMBER 1
METER BOX NUMBER 1
METER $\Delta H_@$ 1.83
C FACTOR 1.08
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp .100

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

probe	TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	
			669.787										
54	1	4:43		0.70	1.25	1.25	117	54	53	3.5	65	65	
55	1	4:48	673.2	0.70	1.25	1.25	119	58	54	3.5	68	67	
54	1	4:53	676.3	0.74	1.35	1.35	121	60	54	4.0	74	74	
54	2	4:58	679.6	0.86	1.55	1.55	123	62	54	4.5	85	63	Truck in 5:00
53	2	5:03	683.0	0.86	1.55	1.55	123	64	55	4.5	87	57	
52	2	5:08	686.7	0.86	1.55	1.55	123	64	55	4.5	93	55	
52	3	5:13	690.1	0.86	1.55	1.55	122	65	55	4.5	107	54	A-57
54	3	5:18	693.6	0.84	1.50	1.50	130	65	56	4.5	112	55	
53	3	5:23	697.1	0.84	1.50	1.50	133	66	56	4.5	103	55	
53	4	5:28	700.5	0.80	1.45	1.45	134	67	57	4.0	95	55	
53	4	5:33	704.0	0.80	1.45	1.45	130	66	56	4.0	95	55	
52	4	5:38	707.4	0.80	1.45	1.45	129	66	56	4.0	103	55	Truck out 5:45
		5:43 Cannot read meter	710.840										
52	5	5:44 on	710.840	0.60	1.10	1.10	121	64	57	3.5	105	55	
52	5	5:49	713.9	0.60	1.10	1.10	120	65	57	3.5	103	53	
52	5	5:54	717.4	0.65	1.18	1.18	120	66	57	3.5	100	53	
52	6	5:59	719.9	0.80	1.45	1.45	119	66	57	4.0	99	53	
51	6	6:04	723.2	0.80	1.45	1.45	120	65	57	4.0	90	53	
52	6	6:09	726.6	0.80	1.45	1.45	121	66	57	4.0	95	54	
53	7	6:14	730.1	0.90	1.62	1.62	120	66	57	4.5	105	55	
52	7	6:19	733.7	0.92	1.68	1.68	119	66	57	4.5	108	55	
51	7	6:24	737.5	0.96	1.75	1.75	118	66	57	4.5	106	55	
51	8	6:29	741.0	0.96	1.75	1.75	119	65	56	4.9	102	55	
51	8	6:34	744.9	0.96	1.75	1.75	117	66	56	4.9	96	55	
51	8	6:39	748.5	0.96	1.75	1.75	117	65	57	4.9	98	55	
		6:43	752.180				116						Truck in 6:43

COMMENTS:

EPA (Our) 235
4 72

752.18
669.79
19.57
24 .082
1.5
61

SAMPLING TASK LOG

Plant Certain Teed
Date 9/9/75

Plant Location
Recorded by H. Leonard

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Ended	Elapsed Time (min)	Sample Nos.
filter not at high enough temp.	1	TP.5		12:58			
(~ 80°) so impinger box heater turned							
on.							
Truck arrived at 13:41							
Truck left at 14:23							
next truck arrived at 14:24							
Truck still there when sampling							
completed at 14:48							
Truck left at: 14:55							
at 14:43 a drop in pressure							
was noted in the stack from							
0.092" H_2O to 0.070" H_2O. The truck							
could have started pumping but							
this is not known for sure. Two							
minutes later the pressure increased							
to 0.092" H_2O.							
Difficulty was encountered in							
obtaining a bag sample for orsat.							
Sample was obtained ~ 15 min after							
sampling was completed. Bag was							
filled in ~ 15 min.							

SAMPLING TASK LOG

Plant Contain - Tool
Date 9/10/75

Plant Location
Recorded by Lyons, T.

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Truck Arrived + Departed	2	TP 5		11:38	12:34		
Truck Arrived + Departed				12:21			
				12:37	13:06		
Change Filter + Sicloner at							
12:37 due to oil getting on							
Filter							

SAMPLING TASK LOG

Plant Certain - Teed
Date 9/10/75

Plant Location Mpls.
Recorded by H. Lenard

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Truck arrived at 3:18	3	TP 5					
Truck left at 3:56							
at 3:30 nomograph recalculated							
at 10% H_2O							
at 3:55 nomograph recalculated							
at 20% H_2O to compensate for							
FID running.							
Truck in 3:57							
Truck left 4:37							
Truck in 4:38							
Truck left 5:08							
Truck in 5:09							
Truck still dumping when							
run was completed.							

Molecular Weight Calculations

UEBB P

Sample 1B TP-1 INLET TUESDAY 9/9/75

Burette Reading		Contraction	Contraction × 100/cc Spl	
With Sample	0.0/0.0			
After CO_2 Absorption	0.0/0.0	0/0	N/0	= % CO_2
" " O_2 " "	21.0/20.6	21.0/20.6	20.8	= % O_2 21.0/20.6
" " CO " "			0	= % CO
			79.2	% N_2

" " Reserving H_2+CH_4 Spl _____

For Oxidant Vol, Air or O_2 _____

Contraction × 100/cc Spl × cc after CO min / cc reserved

Sum; cc Oxidant + cc H_2+CH_4 Spl _____

After Combustion _____ _____

" " 2nd CO_2 Absorpt. _____ _____ _____ % CH_4

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × $\frac{2}{3}$ = _____ _____ % H_2

Sample ID TP 1 INLET 2-11-75 DON HUPP

Burette Reading	Contraction		Con Fraction $\times \frac{100}{cc\ Spl}$	
With Sample				
After CO_2 Absorption	0.1 / 0.1	0.2 / 0.2	.2 / 0.0	= % CO_2 0.2
" " O_2 " "	21.2 / 21.1	21.2 / 21.0	21.0 / 20.8	= % O_2 20.8
" " CO " "				= % CO 0
" " Reserving H_2+CH_4 Spl				
Cor Oxidant Vol, Air or O_2				
Cum; cc Oxidant + cc H_2+CH_4 Spl.				
After Combustion				
" " 2nd CO_2 Absorpt.				% CH_4

Contraction $\times \frac{cc\ after\ CO\ mod.}{cc\ reserved} \times \frac{100}{cc\ Spl}$

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) $\times \frac{2}{3}$ = _____ _____ % H_2

Contact Feed Tar Prod
9/4/79

Sample ID TP-2-OUT

Burette Reading		Contraction	Contraction × 100/cc Spl	
With Sample	0.5/0.8			
After CO_2 Absorption	1.4/1.15		0.9	= % CO_2
" " O_2 " "	20.9/21.3		19.4	= % O_2
" " CO " "			0	= % CO
			79.7	% N_2

" " Reserving H_2+CH_4 Spl _____

For Oxidant Vol, Air or O_2 _____

Contraction × 100/cc Spl × cc reserved CO min / cc reserved

Sum; cc Oxidant + cc H_2+CH_4 Spl _____

After Combustion _____

" " 2nd CO_2 Absorpt. _____ % CH_4

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × 2/3 = _____ % H_2

0.91 × .44 = 0.040
19.51 × .32 = 6.250
20.42
100.00
79.58 × .28 = 22.270
28.560

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Certain-Teed Shakopee Mfg COMMENTS:
DATE 2/9/75
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION TP-2 Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR McMally

RUN / 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	1.45	1.0%	1.65	0.9%			0.9%	44/100	0.04
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.9	19.5%	21.0	19.5%			19.5%	32/100	6.24
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)							79.5%	28/100	22.26
Sample	0.5		0.8					TOTAL	28.5

EPA (Dur) 230
4/72

TP-2 OUTLET 9-11-75 DEH

Sample 1 D

Burette Reading		Contraction	Contraction × 100 / cc Spl	
With Sample	8.5 / 0	10	10	
After CO_2 Absorption	8.5 / 1.3 1.2	7.6 / 1.3 1.2	7.3 / 1.2 1.2	= % CO_2 0.91
" " O_2 " "	19.9 / 20.6 19.1	16.2 / 20.7 19.5	17.4 / 19.5 18.2	= % O_2 19.1
" " CO " "				= % CO 0

" " Reserving H_2+CH_4 Spl _____

For Oxidant Vol., Air or O_2 _____

Contraction × 100 / cc Spl × cc after CO min / cc reserved

Sum; cc Oxidant + cc H_2+CH_4 Spl. _____

After Combustion _____ _____

" " 2nd CO_2 Absorpt. _____ _____ _____ % CH_4

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × $\frac{2}{3}$ = _____ _____ % H_2

* Leaky syst.; void column

Run 1B TP-2, Fri Sept 12, 1840

OUTLET

Burette Reading		Contraction	Contraction × 100/cc Spl	
With Sample	0.45/49.7			
After CO_2 Absorption	1.35/50.1	0.9/0.4	0.9/0.8	= % CO_2
" " O_2 " "	20.8/60.1	19.5/16.0	19.6/20.1	= % O_2
" " CO " "				= % CO

" " Reserving H_2+CH_4 Spl

For Oxidant Vol, Air or O_2

Contraction × 100/cc Spl × cc after CO min / cc reserved

Rm; cc Oxidant + cc H_2+CH_4 Spl

After Combustion

" 2nd CO_2 Absorpt. % CH_4

(Contract. Contraction − 2 × 2nd CO_2 Absorpt.) × 2/3 = % H_2

TP3 - INLET Tag PM Sept 9 WEBB P

Sample ID

Burette Reading		Contraction,	Con Fraction $\times \frac{100}{cc\ spl}$	
With Sample	0.0/0.0			
After CO_2 Absorption	0.0/0.0	0/0	0	= % CO_2 N.I/N.I
" " O_2 " "	20.7/20.8	20.7/20.8	20.8	= % O_2 20.7/20.8
" " CO " "			0	= % CO
			79.2	% N_2

" " Reserving H_2+CH_4 Spl _____

For Oxidant Vol, Air or O_2 _____

Contraction $\times \frac{cc\ after\ CO\ min}{cc\ reserved} \times \frac{100}{cc\ spl}$

Sum; cc Oxidant + cc H_2+CH_4 Spl _____

After Combustion _____ _____

" " 2nd CO_2 Absorpt. _____ _____ _____ % CH_4

Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × $\frac{2}{3}$ = _____ _____ % H_2

Sample ID TP-3 INLET [illegible]

Burette Reading		Contraction	Contraction × 100 / cc Spl.	
With Sample	0.21			
After CO_2 Absorption	[illegible]		11.0	= % CO_2
" " O_2 " "	21.2		21.0	= % O_2
" " CO " "				= % CO
" Reserving H_2+CH_4 Spl				
For Oxidant Vol., Air or O_2				
Sum; cc Oxidant + cc H_2+CH_4 Spl.				
After Combustion				
" " 2nd CO_2 Absorpt.				% CH_4

Contraction × 100 / cc Spl. × cc oxidant CO mixt. / cc reserved

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × $\frac{2}{3}$ = _____ _____ % H_2

D.H.

Sample ID TP-3, Fri Sept. 12, 19:15
INLET

Burette Reading		Contraction	Contraction × 100 / cc Spl	
With Sample	50ml	50ml		
After CO_2 Absorption	50 ml N.I.	50 ml N.I.	N.I. / N.I.	= % CO_2
" " O_2 " "	39.3 ml N.I.	39.2 ml N.I.	39.4 / 39.4	= % O_2
" " CO " "				= % CO

" " Reserving H_2+CH_4 Spl _____

For Oxidant Vol, Air or O_2 _____

Contraction × cc after CO ... / cc reserved × 100 / cc Spl

Comb; cc Oxidant + cc H_2+CH_4 Spl. _____

After Combustion _____ _____

" " 2nd CO_2 Absorpt. _____ _____ _____ % CH_4

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × $\frac{2}{3}$ = _____ _____ % H_2

TP-4-OOT Test #1
8/4/75

Sample 1B

Burette Reading		Contraction	Contraction × 100/cc Spl	
With Sample	9.5/9.7			
After CO_2 Absorption	1.6/1.9	1.1/1.2	1.15	= % CO_2 1.1/1.2
" " O_2 " "	20.6/20.8	19.0/18.9	19.0	= % O_2 19.1 19.0
" " CO " "			0	= % CO
			79.8	% N_2

" " Reserving H_2+CH_4 Spl

Vol. Oxidant Vol., Air or O_2

Contraction × 100/cc Spl × cc oxidant CO mult. / cc reserved

Comb. cc Oxidant + cc H_2+CH_4 Spl.

After Combustion

" " 2nd CO_2 Absorpt. % CH_4

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × 2/3 = % H_2

1.15 × .44 = .506
19.0 × .32 = 6.140
20.30
80.00
79.70 × .28 = 22.300
28.946

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Coal-Fired Stokers Mining
DATE Sept 9 1975
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION TP-4 Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR McNally

COMMENTS:

GAS \ RUN	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	1.4	1.1%	1.9	1.2%			1.2 %	44/100	0.52
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.6	19.1%	20.8	19.0%			19.0 %	32/100	6.14
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	N/1	-					N/1 %	28/100	20.3
N_2 (NET IS 100 MINUS ACTUAL CO READING)							79.8%	28/100	
Sample	0.5		0.7					TOTAL	28.9

EPA (Dur) 230
4/72

— P ≠ OUTLET 7-11-75 Don Hupp

Sample ID

Burette Reading		Contraction	Contraction × 100 / cc Sol	
With Sample	0/			
After CO_2 Absorption	0.8/ 0.8	0.2/ 0.8	.5 0.5	= % CO_2
" " O_2 " "	20.0/ 19.2	20.0/ 19.2	1.2 1.2	= % O_2
" CO " "				= % CO
" Reserving H_2 + CH_4 Sol				
Vol. Oxidant Vol., Air or O_2				
Contraction × 100 / cc Sol			Contraction × cc after CO mix / cc reserved	
Comb. cc Oxidant + cc H_2 + CH_4 Sol.				
After Combustion				
" " 2nd CO_2 Absorpt.				% CH_4

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × $\frac{2}{3}$ = _____ _____ % H_2

Sample 1B

TP-4 9-12-75 DON HUPP
OUTLET

Burette Reading		Contraction	Contraction × 100 / cc Spl	
With Sample	50.2 ml			
After CO_2 Absorption	49.0	49.0	24/24	= % CO_2
" " O_2 " "	39.2	39.2	20.3/20.3	= % O_2
" " CO " "				= % CO

" " Reserving H_2 + CH_4 Spl _____

For Oxidant Vol., Air or O_2 _____

Contraction × 100 / cc Spl × cc after CO ml / cc reserved

Comm; cc Oxidant + cc H_2 + CH_4 Spl. _____

After Combustion _____ _____

" " 2nd CO_2 Absorpt. _____ _____ _____ % CH_4

Contract. (Contraction − 2 × 2nd CO_2 Absorpt.) × $\frac{2}{3}$ = _____ _____ % H_2

McM.

Sample ID certain-Tank TP-5-P4 Bag Spl.

Burette Reading		Contraction	Contraction × 100/cc Spl	
With Sample	0.7/0.55			
After CO_2 Absorption	[illegible]	0.6/0.4	0.5	= % CO_2
" " O_2 " "	[illegible]	20.3/20.4	20.35	= % O_2
" " CO " "	[illegible]	0/0	0	= % CO
			79.15	% N_2

" " Reserving H_2+CH_4 Spl _____

For Oxidant Vol, Air or O_2 _____

Contraction × 100/cc Spl × cc after CO min / cc reserved

Sum; cc Oxidant + cc H_2+CH_4 Spl. _____

After Combustion _____ _____

" " 2nd CO_2 Absorpt. _____ _____ _____ % CH_4

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × 2/3 = _____ _____ % H_2

0.503 × .44 = 0.221

[illegible] × .32 = 6.570

[illegible]

[illegible]

78.946 × .28 = 22.076 / 28.861

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Cotter-Teal, Shakopee, Minn.
DATE
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION TP-5 (1)
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR Medlitz

COMMENTS:

GAS \ RUN	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	1.3	0.6%	1.1	0.4%			0.5 %	44/100	0.22
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	21.6	20.1%	21.4	20.1%			20.5 %	32/100	6.56
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	21.6	Nil	21.35	Nil			Nil	28/100	0.00
N_2 (NET IS 100 MINUS ACTUAL CO READING)							78.9 %	28/100	
Sample	0.7		0.55					TOTAL	28.78

EPA (Dur) 230
4/72

Webb, P.

CT-TP-5-2 WEDNESDAY 9/10/75

ple 1B

Burette Reading		Contraction	Contraction × 100/cc Spl	
With Sample	0.0/0.0			
After CO_2 Absorption	0.0/0.0		0	= % CO_2
" " O_2 " "	21.0/21.0		21	= % O_2
" " CO " "			0	= % CO
			79	% N_2
" " Reserving H_2 + CH_4 Spl				
Vol. Oxidant Vol., Air or O_2			Contraction × 100/cc Spl × cc after CO mixt./cc reserved	
Vol. Oxidant + cc H_2 + CH_4 Spl.				
After Combustion				
" " 2nd CO_2 Absorpt.				% CH_4

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × 2/3 = _____ _____ % H_2

21.0 × 0.32 = 6.72
79.0 × 0.28 = 22.12
28.87

21.0 × 0.32 = 6.72
78.0 × 0.28 = 21.84
1.0 × 0.40 = 0.40
28.96

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Carbon-Feed, Skokopee Minn.
DATE Sept. 10, 1975
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION TP-5-21
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR Webb

COMMENTS:

RUN / 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	Nil	0.0	Nil			Nil %	44/100	-0.7
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	21.0	21.0%	21.0	21.0%			21.0 %	32/100	6.7
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)							79.0	28/100	22.15
Sample	0.0		0.0					TOTAL	28.85

EPA (Dur) 230
4/72

D. [illegible]

Sample ID [illegible] - TP-5 - 3 [illegible]

Burette Reading		Contraction	Contraction × 100 / cc Spl	
With Sample	0.0/0.0			
After CO_2 Absorption	0.0/0.0	N.I N.I	N.I/N.I	= % CO_2
" " O_2 " "	20.5/20.6	20.5 20.6	20.5/N.I	= % O_2
" CO " "			N.I	= % CO

" Reserving H_2 + CH_4 Spl _____

Vol. Oxidant Vol. Air or O_2 _____

Contraction × 100 / cc Spl × cc after CO mixed / cc reserved

Comb. cc Oxidant + cc H_2 + CH_4 Spl _____

After Combustion _____ _____

" " 2nd CO_2 Absorpt. _____ _____ _____ % CH_4

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × $\frac{2}{3}$ = _____ _____ % H_2

TP 5 - [illegible]

[illegible] Don Hupp

Sample 10

5 [illegible]

Burette Reading		Contraction	Contraction × 100/cc Spl	
With Sample	0/			
After CO_2 Absorption	0.0 ml	0.0 ml	ml	= % CO_2
" " O_2 " "	21.0 ml	21.0 ml	21 ml	= % O_2
" " CO " "				= % CO

" " Reserving H_2+CH_4 Spl. _____

For Oxidant Vol., Air or O_2 _____

Contraction × 100/cc Spl × reserve CO ml/cc reserve vol.

Sum; cc Oxidant + cc H_2+CH_4 Spl. _____

After Combustion _____ _____

" " 2nd CO_2 Absorpt. _____ _____ _____ % CH_4

(Combust. Contraction − 2 × 2nd CO_2 Absorpt.) × $\frac{2}{3}$ = _____ _____ % H_2

Field Analytical Data

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 8 1975 - MONDAY -

SAMPLING LOCATION TP-1 - INLET

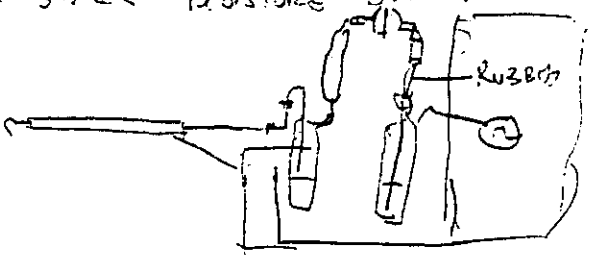
SAMPLE TYPE MOISTURE,

RUN NUMBER — CER - PREL.

SAMPLE BOX NUMBER _____, glass

CLEAN-UP MAN _____

COMMENTS:
TO DETERMINE THE EFFECT OF STACK MOISTURE ON FLOW.



FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER JUL-70 _____ — CONTAINER _____ _____ mg

tare 0.31466 g _____

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	97 ml	_____ ml	_____ ml	_____ ml	_____ ml	_____
INITIAL VOLUME	100 ml	_____	_____	_____	_____	_____
NET VOLUME	-3 ml	_____ ml	_____ ml	_____ ml	_____ ml	_____ ml

SILICA GEL			
FINAL WEIGHT	483.7 g	_____ g	_____ g
INITIAL WEIGHT	475 g	_____ g	_____ g
NET WEIGHT	8 g	_____ g	_____ g

TOTAL MOISTURE 5 _____ g

EPA (Dur) 231
4/72

TP 1-1

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 9 1975

SAMPLING LOCATION

SAMPLE TYPE EPA 5

RUN NUMBER CER-TP-1-1 (INLET

SAMPLE BOX NUMBER ~~#25~~, glass ~~#6~~ 7

CLEAN-UP MAN McNulty

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER ~~[illegible]~~ Jel 39 — CONTAINER _____ _____ mg

tare ~~0.38477~~ g 0.38139

net

cyclone ~~1.2628~~ g 1.1332

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	109 ml	8.8 ml	5 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	9 ml	9 ml	5 ml	ml	ml	ml

SILICA GEL			
FINAL WEIGHT	507 g	g	g
INITIAL WEIGHT	475 g	g	g
NET WEIGHT	32 g	g	g

TOTAL MOISTURE 55 g

EPA (Dur) 231
4/72

TP-1-2

ANALYTICAL DATA

PLANT Carbon-Tech, Shakopee Minn

DATE Sep 11 75

SAMPLING LOCATION [illegible]

SAMPLE TYPE [illegible] TP-1-2

RUN NUMBER —

SAMPLE BOX NUMBER [illegible] [illegible]

CLEAN-UP MAN

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER [illegible] _____ — CONTAINER _____ _____ mg

tare [illegible] g _____

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	[illegible] ml	4.8 ml	2.3 ml	/ ml	/ ml	/
INITIAL VOLUME	[illegible] ml	0.0	0.0	/		
NET VOLUME	3.5 ml	4.8 ml	2.3 ml	ml	ml	ml

SILICA GEL			
FINAL WEIGHT	[illegible] g	g	g
INITIAL WEIGHT	[illegible] g	g	g
NET WEIGHT	27 g	g	g

3.5
4.8
2.3
[illegible]
38.3

TOTAL MOISTURE 37.6 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 12 1975

SAMPLING LOCATION

SAMPLE TYPE EPA #5 w/ HC Fabricate

RUN NUMBER CER - TP-1-3

SAMPLE BOX NUMBER Box #12 Glass Set #6

CLEAN-UP MAN WEN

COMMENTS:

FRONT HALF

HOLD FOR STAND-BY

		LABORATORY RESULTS
ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER		
FILTER NUMBER	Jul 44	JUL-61
tare	0.37910 g	0.38014
net		
CONTAINER		mg
CONTAINER		mg
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	98 ml	6 ml	31 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME/loss	(2.0) ml	6 ml	31 ml	ml	ml	ml

SILICA GEL			
FINAL WEIGHT	508 g	g	g
INITIAL WEIGHT	475 g	g	g
NET WEIGHT	33 g	g	g

TOTAL MOISTURE 41 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 9 1975

SAMPLING LOCATION

SAMPLE TYPE

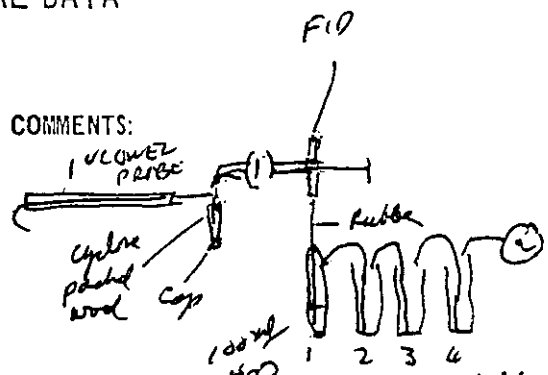
RUN NUMBER CER-TP-2 OUT (-1)

SAMPLE BOX NUMBER Box #7, Glass ware #2

CLEAN-UP MAN Bayton

operator - { Schultz Fruhter

COMMENTS:



note moisture observed past filter in FID line, removed washing from cyclone and included in TCC emptying bottle

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER

CONTAINER _____ _____ mg

FILTER NUMBER JUL-36 _____ _____

CONTAINER _____ _____ mg

tare 0.38831 g _____

net _____ _____

cyclone prefilter tare 1.1978 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

Rinse volumes _____ ml _____ ml _____ ml _____ ml _____ ml _____

MOISTURE

IMPINGERS	1	2	3	4 Silica gel	5	6
FINAL VOLUME	133 ml	5 ml	3 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	33 ml	5 ml	3 ml	ml	ml	ml

91

SILICA GEL about 70% spent

FINAL WEIGHT	495.0 g	g	g
INITIAL WEIGHT	475 g	g	g
NET WEIGHT	20.0 g	g	g

TOTAL MOISTURE 61 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE 8 SEP 1 1 1975

SAMPLING LOCATION

SAMPLE TYPE

RUN NUMBER CER-TP-2 (2)

SAMPLE BOX NUMBER 7

CLEAN-UP MAN Dayton

COMMENTS:
Starting with this run, the TCE soluble fraction from the probe + nozzle rinse will be separated from the acetone probe + nozzle rinse. As was observed previously, there are 2 diff soluble fractions, an TCE soluble and an acetone.
TCE rinse bottle #2 - lot# 742435

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER JOL 32 _____ _____ — CONTAINER _____ _____ mg

tare 0.37857 g _____

net _____ _____

pre filter washing went into front half - bottle TCE, probe + nozzle rinse

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 / yellow-white emulsion _____ ml _____ ml _____ ml _____ ml _____ ml _____

MOISTURE

+1 ml oil

IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	130 ml	6 ml	3 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	30 ml	6 ml	3 ml	ml	ml	ml

~70% spent

SILICA GEL			
FINAL WEIGHT	498.6 g	g	g
INITIAL WEIGHT	475 g	g	g
NET WEIGHT	23.6 g	g	g

TOTAL MOISTURE 62.60 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 12 1975

SAMPLING LOCATION

SAMPLE TYPE

RUN NUMBER CER-TP-2-3

SAMPLE BOX NUMBER 7

CLEAN-UP MAN Bayto Shirley

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER JUL-29 _____ — CONTAINER _____ _____ mg

tare 0.38015 g _____

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	101 ml	6 ml	3 ml	5.6 ml	0 ml	0
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	1 ml	6 ml	3 ml	ml	ml	ml

SILICA GEL			
FINAL WEIGHT	498.5 g	g	g
INITIAL WEIGHT	475 g	g	g
NET WEIGHT	23.5 g	g	g

TOTAL MOISTURE 33.5 g

EPA (Dur) 231
4/72

TP3-1 Line

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC ~~Shakopee, Minnesota~~

DATE SEP 9 1975

SAMPLING LOCATION

SAMPLE TYPE

RUN NUMBER CER-TP-3-1 (INLET)

SAMPLE BOX NUMBER T2, Glass box #6

CLEAN-UP MAN

Hupp operator

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER 30E-39 _____ 31-38 _____ — CONTAINER _____ _____ mg

tare 0.38139 g 0.35472

net _____ _____

cyclone 1.1332 g 1.2628

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

	1	2	3	4 silica gel	5	6
IMPINGERS	Impinger 1	<0.1 ml	Impingers 1-3 <0.3 ml			
FINAL VOLUME	115 ml	12 ml	6 ml	____ ml	____ ml	____
INITIAL VOLUME	100 ml	0	0	____	____	____
NET VOLUME	15 ml	12 ml	6 ml	____ ml	____ ml	____ ml
SILICA GEL						
FINAL WEIGHT	504.7 g	____ g	____ g			
INITIAL WEIGHT	475 g	____ g	____ g			
NET WEIGHT	30 g	____ g	____ g			

15
12
6
33

TOTAL MOISTURE 63 g

EPA (Dur) 231
4/72

TP. 3 - 2

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 11 1975

SAMPLING LOCATION

SAMPLE TYPE EPA #5

RUN NUMBER CER-TP. 3 - 2

SAMPLE BOX NUMBER 12 Box #6

CLEAN-UP MAN Bayto

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER JUL-40 _____ — CONTAINER _____ _____ mg

tare 0.37713 g _____

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

1 ml lost

IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	112 ml	5 ml	3 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	12 ml	5 ml	3 ml	ml	ml	ml

20

SILICA GEL			
FINAL WEIGHT	499.8 g	g	g
INITIAL WEIGHT	475 g	g	g
NET WEIGHT	24.8 g	g	g

TOTAL MOISTURE 44.8 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 12 1975

SAMPLING LOCATION

SAMPLE TYPE [illegible] w/ HC [illegible]

RUN NUMBER CER - TP-3 - 3

SAMPLE BOX NUMBER 12 and Glass set #6

CLEAN-UP MAN McNulty / Boyles

COMMENTS: [illegible]

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

VOID. FOR SCHED-BY

	JUL · 27	~~JUL · 61~~
FILTER NUMBER		
tare	0.38278 g	~~0.38014~~
net		

CONTAINER _____ _____ mg

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 56	5	6
FINAL VOLUME	[illegible] ml	[illegible] ml	518 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	[illegible] ml	[illegible] ml	518 ml	ml	ml	ml

SILICA GEL			
FINAL WEIGHT	[illegible] g	g	g
INITIAL WEIGHT	475.0 g	g	g
NET WEIGHT	[illegible] g	g	g

34.3
15.7
518
[illegible]

TOTAL MOISTURE 874 g

EPA (Dur) 231
4/72

38.5
[illegible]
[illegible]

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 9 1975

SAMPLING LOCATION

SAMPLE TYPE Particulate

RUN NUMBER CER-TP-4 (f) bot run

SAMPLE BOX NUMBER 2, glassware #3

CLEAN-UP MAN Bayles

operator { Rice / White

COMMENTS:

have two bttls of probe wash 2d bottle has TCE rinse of cyclone & front half of filter.

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER JUL-35 _____ _____ — CONTAINER _____ _____ mg

tare 0.38212 g _____

net _____ _____

cyclone filter #

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 silica gel	5	6
FINAL VOLUME	170 ml	9 ml	5 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	70 ml	9 ml	5 ml	ml	ml	ml

SILICA GEL			
FINAL WEIGHT	503.0 g	g	g
INITIAL WEIGHT	475.0 g	g	g
NET WEIGHT	28.0 g	g	g

TOTAL MOISTURE 112. g

EPA (Dur) 231
4/72

70 gr

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 1 1 1975

SAMPLING LOCATION

SAMPLE TYPE

RUN NUMBER CER-TP-4-2

SAMPLE BOX NUMBER 2

CLEAN-UP MAN Baylor

COMMENTS:

note fit rubber separated from fit replace

FILTER IS wet, as is the fit

FRONT HALF

Filter weighed caused by stick-back due to disappearance of static charge filter -

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER JUL-30 JUL-69 — CONTAINER _____ _____ mg

tare 0.38361 g 0.37487

net

Charge on prefilter not required

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

	1	2	3	4	5	6
Rinse volumes	ml	ml	ml	ml	ml	
IMPINGERS	2 oil					
FINAL VOLUME	138 ml	8 ml	2 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	38 ml	8 ml	~~10~~ 2 ml	ml	ml	ml

SILICA GEL — ~80% spent

FINAL WEIGHT	499.2 g	g	g
INITIAL WEIGHT	425 g	g	g
NET WEIGHT	74.2 g	g	g

TOTAL MOISTURE 72.2 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 12 1975

SAMPLING LOCATION

SAMPLE TYPE

RUN NUMBER CER-TP-4-3

SAMPLE BOX NUMBER 2

CLEAN-UP MAN Beyto

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER JUL-28 / JUL-26 — CONTAINER _____ _____ mg

tare 0.37737 g / 0.37918

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	109 ml	26 ml	3 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	9 ml	26 ml	3 ml	ml	ml	ml

SILICA GEL

FINAL WEIGHT	499.8 g	g	g
INITIAL WEIGHT	475 g	g	g
NET WEIGHT	24.8 g	g	g

TOTAL MOISTURE 62.8 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 9 1975

SAMPLING LOCATION

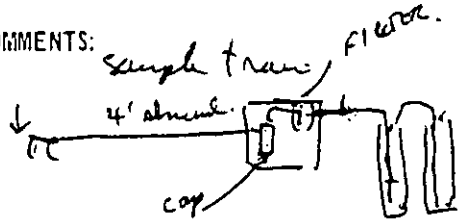
SAMPLE TYPE Particulate - Method 5 (modified)

RUN NUMBER ~~CER-TP-2-out~~ set-up for CER-TP-5-1

SAMPLE BOX NUMBER 1, Glass Box #1

CLEAN-UP MAN Bayless/McNally

COMMENTS: Sample train, floor. 4' above. cap



FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER

CONTAINER _____ _____ mg

FILTER NUMBER JUL-37 _____ _____

CONTAINER _____ _____ mg

tare 0.38290 g _____

net _____ _____

cyclone prefilter 2.3086

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

	1	2	3	4	5	6
Rinse volumes	1 ml of 1 ml of 1 ml of 1 ml of 1 ml of 1 ml of					
IMPINGERS	1	2	3	4	5	6
FINAL VOLUME	103 ml	5 ml	1 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	3 ml	5 ml	1 ml	ml	ml	ml
SILICA GEL						
FINAL WEIGHT	501.7 g	g	g			
INITIAL WEIGHT	475.0 g	g	g			
NET WEIGHT	26.7 g	g	g			

TOTAL MOISTURE 34.7 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 1 0 1975

SAMPLING LOCATION

SAMPLE TYPE

RUN NUMBER CER - TP 5 - (2)

SAMPLE BOX NUMBER 1

CLEAN-UP MAN Baylor

COMMENTS: filter wadding moved during run, allowing oil to enter filter —

condensed this wadding into the probe nozzle wash

filter oil pushed to one side

FRONT HALF

		LABORATORY RESULTS
ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER	CONTAINER	mg
FILTER NUMBER JUL-34 / JUL-33	CONTAINER	mg
tare 0.38546 g / 0.38389 grams		
net		

cyclone - tare 1.0689

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 (1 ml oil)	2	3	4 (silica)	5	6
FINAL VOLUME	114 ml	8 ml	5 ml	ml	ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	14 ml	8 ml	5 ml	ml	ml	ml

SILICA GEL			
FINAL WEIGHT	503.2 g	g	g
INITIAL WEIGHT	~~501.5~~ g	g	g
NET WEIGHT	28 g	g	g

TOTAL MOISTURE 55.0 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT _____

DATE Sept 1 [illegible]

SAMPLING LOCATION _____

SAMPLE TYPE _____

RUN NUMBER [illegible] TU-5-3

SAMPLE BOX NUMBER _____

CLEAN-UP MAN _____

COMMENTS: Prep'd for subsequent stack test using glass paper filters no. Sul 43, 0.38205 [illegible] called test # TP5-4

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER _____ _____ — CONTAINER _____ _____ mg

tare _____ g _____

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	12[illegible] ml	[illegible] ml	ml	ml	ml	
INITIAL VOLUME	10[illegible] ml	0	0			
NET VOLUME	[illegible] ml	[illegible] ml	3 ml	ml	ml	ml

SILICA GEL			
FINAL WEIGHT	495.5 g	g	g
INITIAL WEIGHT	475 g	g	g
NET WEIGHT	21 g	g	g

TOTAL MOISTURE _____ 53 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 10 1975

SAMPLING LOCATION

SAMPLE TYPE

RUN NUMBER CER-TP-5-(3)

SAMPLE BOX NUMBER 1

CLEAN-UP MAN Bayles

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER JOL-31 _____ — CONTAINER _____ _____ mg

tare 0.38009 g _____

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

MOISTURE

	1	2	3	4	5	6
Rinse volumes	____ ml	____ ml	____ ml	____ ml	____ ml	____
IMPINGERS						
FINAL VOLUME	124 ml	5.5 ml	3 ml	5.6 ml	____ ml	____
INITIAL VOLUME	100 ml	0	0	____	____	____
NET VOLUME	____ ml	____ ml	3 ml	____ ml	____ ml	____ ml

SILICA GEL			
FINAL WEIGHT	495.5 g	____ g	____ g
INITIAL WEIGHT	475 g	____ g	____ g
NET WEIGHT	____ g	____ g	____ g

TOTAL MOISTURE 53.0 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT _____

DATE Jan 11 75

SAMPLING LOCATION _____

SAMPLE TYPE _____

RUN NUMBER TP-5-4

SAMPLE BOX NUMBER _____

CLEAN-UP MAN McN

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER 5143 _____ — CONTAINER _____ _____ mg

tare 0.38205 g _____

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	[illegible] ml	[illegible] ml	[illegible] ml	[illegible] ml	[illegible] ml	[illegible]
INITIAL VOLUME	[illegible] ml	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NET VOLUME	[illegible] ml	[illegible] ml	[illegible] ml	[illegible] ml	[illegible] ml	[illegible] ml

SILICA GEL			
FINAL WEIGHT	[illegible] g	_____ g	_____ g
INITIAL WEIGHT	[illegible] g	_____ g	_____ g
NET WEIGHT	18 g	_____ g	_____ g

TOTAL MOISTURE _____ 18.5 g

EPA (Dur) 231
4/72

[illegible]
99.1

Sample Drying Data

6

Work Performed by: Baylor/Merryman Project No. 2872-3518 Date of Work:

Title or Purpose: RUN No. CER TP1-1 LRB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JUL-39	-233	0.69506	-1/29/76	0.38139		313.7	- Blank
(2) TCE wash of front half Evap. dish No. 1-1 219 Total vol 164.7 ml 391.7 - 173.3 = 217.4		44.1398	2/5/76 24				
		44.1408	2/4/76			170.2 171.2	
		44.1920	2/3/76	43.9696		222.4 - X =	222.2
		44.1247	2/9/76 120			2.3	
		44.1202	2/17/76				
		44.1155	2/24/76 pm				
(2a) Acetone wash of front half Evap. dish No___ Total vol____ml							
		48.2865	2/2/76				
		48.2889	2/17/76				
		48.2898	2/9/76				
(2b) TCE rinse of pre filter. Evap. dish No. 1-1 214A Total vol 86.4 ml 286.5 - 180.4 = 106.1		48.2912	2/5/76			729.4	
		48.2920	2/4/76	47.5618	1/28/76 A	730.2 - X =	730.1
						1.1	
(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: Baylor 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. 2872-3518 Date of Work:

Title or Purpose: RUN CER-TP1-2 LRB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JUL-42	-229	0.56380	1/19/76	0.37868		185.1	
(2) TCE wash of front half Evap. dish No. 1-2 225 Total vol 160.0 ml 382.7-174.2=208.5		47.3675	2/9/76				
		47.3856	2/5/76			183.2	
		47.4087	2/4/76			206.3	
		47.4542	2/3/76	47.2024		251.8	2.2 ~~-2~~ = 251.6
		47.3631	2/17/76				
		47.3568	2/24/76				
(2a) Acetone wash of front half Evap. dish No. ___ Total vol ___ ml							
		48.5946	2/24/76				
		48.5941	2/17/76				
		48.5937	2/9/76				
(2b) TCE rinse of pre-filter. Evap. dish No. 1-2 231 Total vol 31.0 ml 252.6-211.7=40.9	2-2	48.5940	2/6/76	48.0755	1/29/76	518.5	0.4 ~~-2~~ = 518.3
(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: Baylor Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Bayton/Merryman Project No. 12872-3518 Date of Work:

Title or Purpose: RUN No. CER-TP1-3 LRB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JVL-44	235	0.57911	1/19/76	0.37910		200.0	
		47.3045	2/6/76				
		47.3208	2/9/76				
(2) TCE wash of front half Evap. dish No. 1-3 231		47.3492	2/5/76			310.6	
Total vol 126.4 ml		47.3790	2/4/76			340.4	
360.7 - 193.8 = 166.9		47.5100	2/3/76	47.0386		471.4	-1.8
		47.2952	2/24/76				
(2a) Acetone wash of front half Evap. dish No. 1-3 2316		44.4710	2/24/76				
Total vol 156.9 ml		3	2/4/76				
	231	44.4715	2/3/76	44.4641	1/28/76 A	7.4	-1.3
318.2 - 194.3 = 123.9							
(2b) TCE rinse of pre-filter. Evap. dish No. 1-3 2368		46.3910	2/24/76				
		46.3922	2/17/76				
Total vol 42.8 ml		46.3949	2/5/76				
165.3 - 108.8 = 56.5	236A	46.3986	2/6/76	45.6048	1/29/76 A	793.8	-0.6
(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: Bayton 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. 92872-3518 Date of Work:

Title or Purpose: RUN No. CER-TP2-1 LAB 32279 Continued from:

CERTAIN-TEED, INC Shakopee, Minnesota	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JOL-36	-241	0.43819		0.38831		49.9	
		43.6883	2/17/76				
		43.6876	2/19/76				
(2) TCE wash of front half		43.6883	2/5/76			86.9	
Evap. dish No 237	2-1	43.6895	2/4/76			88.1	
Total vol 177.7 ml		43.7042	2/3/76	43.6014		102.8	-2.5
408.5 - 174 c = 234.5		43.6865	2/24/76				
(2a) Acetone wash of front half Evap. dish No___ Total vol_____ml							
(2b) TCE rinse of pre-filter. Evap. dish No___ Total vol_____ml							
(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: Baylor Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Baxter/Merryman Project No. 12872-3518 Date of Work:

Title or Purpose: RUN No. CER TP2-2 LAB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JUL-32	-247	0.40830		0.37857		29.7	
		45.6862 2/19/76					
		45.6846 2/19/76					
(2) TCE wash of front half 2-2 Evap. dish No 243 Total vol ____ ml		45.6852 2/5/76				70.1	
		45.6865 2/4/76				71.3	
		45.6934 2/3/76		45.6152		78.2	-2.3 (avg)
		45.6849 2/24/76					
(2a) Acetone wash of front half 2-2 Evap. dish No 243B Total vol 186.6 ml 345.0 - 197.6 = 147.4		48.4256 2/24/76					
		48.4254 2/3/76		48.4192	11/28/76 A	6.2	-1.5
		45.8222 2/24/76					
		45.8221 2/17/76					
		45.8222 2/9/76					
(2b) TCE rinse of pre-filter. 2-2 Evap. dish No 243A Total vol 130.0 ml 379.2 - 207.6 = 171.6		45.8235 2/5/76				41.7	
		45.8243 2/4/76		45.7818	11/28/76 A	42.5	-1.8
(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: Baxter Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Baytos/Merryman Project No. J2872-3518 Date of Work:

Title or Purpose: RUN No. CER-TP 2-3 LRB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JUL-29	-253	1.40288		0.38015		22.7	
		44.9817	2/17/76				
		44.9833	2/19/76				
(2) TCE wash of front half		44.9898	2/25/76			86.8	
Evap. dish No 249 (2-3)		44.9870	2/27/76			84.0	
Total vol 138.9 ml		45.0077	2/27/76	44.9030		104.7	-1.9
442.2 - 258.9 = 183.3		44.9790	2/24/76				
		48.9912	2/24/76				
(2a) Acetone wash of front half		48.9924	2/17/76				
Evap. dish No 249B (2-3)		48.9910	2/4/76				
Total vol 188.8 ml		48.9904	2/3/76	48.9851	1/28/76 A	5.3	-1.5
407.7 - 258.6 = 149.1		46.8907	2/24/76				
		46.8922	2/17/76				
(2b) TCE rinse of pre-filter.		46.8913	2/9/76				
Evap. dish No 249A' (2-3)		46.8922	2/5/76			71.9	
Total vol 2.6 ml		46.8934	2/4/76	46.8207	1/28/76 A	72.7	-0
205.1 - 201.7 = 3.4 (No rinse)							
(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: Baytos 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. 2872-3518 Date of Work:

Title or Purpose: RUN No. CER-TP3-1 LRB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JUL-38	259	0.45517	1/29/76	0.38472		70.5	
		58.3527	2/24/76				
		59.5134	2/9/76				
(2) TCE wash of front half 3-1 Evap. dish No 255 Total vol 231.7 ml		62.2282	2/5/76			15,279.4	
		64.8583	2/4/76			16,909.5	
		66.9420	2/3/76	46.9488		19,993.2	-3.2
2 {#5.8-173.8 = 272 mm; 206.6-172.8 = 33.8}							
(2a) Acetone wash of front half Evap. dish No___ Total vol___ml							
(2b) TCE rinse of pre-filter. Evap. dish No___ Total vol___ml							-0.8 (est)
(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: Baylor Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Baxter / Moneyman Project No. 32872-358 Date of Work:

Title or Purpose: RUN No CER -TP3-2 LRS 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JUL-40	-259	0.52459	1/19/76	0.37713		147.5	
		47.2930	2/17/76 (8 mo)				
		47.2988	2/5/76				
(2) TCE wash of front half 3-2 Evap. dish No 261 Total vol 170.9 ml 417.3 - 191.7 = 225.6		47.3057	2/5/76			131.2	
		47.3033	2/4/2			128.8	
		47.3317	2/31/76	47.1745		157.2	-2.4
		47.2871	2/24/76				
(2a) Acetone wash of front half Evap. dish No ___ Total vol ___ ml							
		47.7537	2/24/76				
(2b) TCE rinse of pre-filter. 3-2 Evap. dish No 266h Total vol 34.8 ml 254.8 - 204.8 = 46.0		47.7542	2/17/76				
		47.7551	2/5/76				
		47.7562	2/6/76	47.4199	1/29/76	336.3	-0.5
(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: Baxter Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Baytos/Merryman Project No. G2872-3 518 Date of Work:

Title or Purpose: RUN No. CER-TP3-3 LRB 32279 Continued from:

CERTAIN-TEED, INC Shakopee, Minnesota	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter	-271	1.35035	4/9/76	0.38278	1.35035 .38278 .97157	987.6	
Filter No. JUL-27		45.2476	2/17/76				
		45.2634	2/5/76				
(2) TCE wash of front half		45.2920	2/5/76			322.8	
		46.3167	2/4/76			347.5	
Evap. dish No 267 (3-3)		45.4241	2/3/76	44.9692		454.9	-1.9
Total vol 134.0 ml							
368.3 - 191.4 = 176.9		45.2353	2/24/76				
(2a) Acetone wash of front half		45.3123	2/24/76				
Evap. dish No 268 (3-3)	267	45.3129	2/3/76	45.2933	1/28/76 A	19.6	-1.1
Total vol 133.3 ml			8 2/4/76				
295.4 - 190.1 = 105.3							
(2b) TCE rinse of pre filter.		46.8572	2/24/76				
		46.8608	2/17/76				
Evap. dish No 11A (3-3)		46.8664	2/9/76				
Total vol 46.6 ml		46.8699	2/6/76	45.9893	1/29/76 A	880.6	-0.7
169.7 - 108.2 = 61.5							
(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: Baytos Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Bayto/Merrigman Project No. 9278-3518 Date of Work:

Title or Purpose: RUN No. CER-TP4-1 LEB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter		0					
Filter No. JUL-35	-277	1.38770		0.38242		5.6	
(2) TCE wash of front half		46.8617	2/17/76				
Evap. dish No 273		9					
Total vol 176.3 ml		46.8614		46.8348		26.6	-2.5
407.1 - 174.4 = 232.7							
(2a) Acetone wash of front half							
Evap. dish No___							
Total vol_____ml							
(2b) TCE rinse of pre-filter.		45.7698	2/17/76				
Evap. dish No 273A		45.7700	2/5/76			28.0	
Total vol 38.6 ml		45.7703	2/4/76	45.7420	1/28/76 tm	28.3	-0.5
236.2 - 178.2 = 57.0							
(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: Bayto Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Baytox/Merryman Project No. 9 2782-3578 Date of Work:

Title or Purpose: RUN No. CER TP4-2 LRB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter							
Filter No. JUL-30	283	0.38656		0.38361		3.0	
JUL-69	283	0.38000		0.37487		5.1	
						8.1	
(2) TCE wash of front half 4-2		42.6688	2/24/76				
		42.6699	2/17/76				
		89	2/5/76				
		4	2/4/76				
Evap. dish No 279		42.6690	2/3/76	42.6534		15.6	-2.3 (2nd)
Total vol ____ ml							
(2a) Acetone wash of front half 4-2		44.7106	2/24/76				
		5	2/4/76				
Evap. dish No 279D	279	44.7108	2/3/76	44.6909	1/28/76 A	19.9	-1.7
Total vol 214.2 ml							
364.5-195.7 = 169.2							
(2b) TCE rinse of pre-filter. 4-2		46.1694	2/24/76				
		46.1654	2/17/76				
		46.1642	2/9/76				
		46.1652	2/5/76			12.0	
Evap. dish No 279B		46.1660	2/4/76	46.1532	1/28/76 A	12.8	-1.8
Total vol 131.1 ml							
378.8-205.8 = 173.0							
(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: Baytox Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Bayton/Merryman Project No. G2782-3518 Date of Work:

Title or Purpose: RUN CER·TP4-3 LCB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter JUL 28 →	289	0.38694		0.37737		9.6	
Filter No. JUL-26 →	289	0.38304	1/19/76	0.37918		3.9	
						13.5	
(2) TCE wash of front half 4-3		45.3023	2/24/76				
		45.3038	2/17/76				
Evap. dish No. 285		5	2/4/76				
Total vol 163.9 ml		45.3030	2/3/76	45.2907		12.3	-2.3
475.0 - 258.6 = 216.4		46.6004	2/24/76				
		46.6027	2/17/76				
(2a) Acetone wash of front half 4-3		46.6019	2/9/76				
		46.6035	2/5/76			44.2	
Evap. dish No. 285B		46.6049	2/4/76	46.5593	1/28/76	45.6	-2.8
Total vol 350.8 ml							
536.0 - 258.9 = 277.1							
(2b) TCE rinse of pre-filter. 4-3		45.3481	2/17/76				
		45.3479	2/5/76			23	
Evap. dish No. 285A		45.3484	2/4/76	45.3243	1/28/76	24.1	-0.3
Total vol 18.5 ml							
225.2 - 200.8 = 24.4							
(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: Bayton Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Baytos/Merryman Project No. 32782-3518 LRB Date of Work:

Title or Purpose: RUN No. CER TP 5-1 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JUL-37	-185	0.38397 · 1/9/76		0.38290		1.1	
(2) TCE wash of front half Evap. dish No. 5-1 181 Total vol 66.1 ml		45.7562 2/9/76					
		45.7585 2/5/76				45.0	
		45.7612 2/4/76				47.7	
		45.7636 2/3/76		45.7135		49.8	-0.9
262.2 - 174.5 = 87.3		45.7562 2/17/76					
		~~45.~~					
(2a) Acetone wash of front half Evap. dish No___ Total vol___ml							
(2b) TCE rinse of pre-filter. Evap. dish No___ Total vol___ml							
(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: Baytos Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Bayton / Merryman Project No. D 2872-3518 Date of Work:

Title or Purpose: RUN No. CER-TP 5-2 LRB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter	JUL34 → 191-192	1.31210		0.38546		926.6	
Filter No. JUL-33 →	-191 2/2	0.38407 1/19/76		0.38389		0.2	
(2) TCE wash of front half							
Evap. dish No___							
Total vol____ml							
(2a) Acetone wash of front half							
Evap. dish No___							
Total vol____ml							
(2b) TCE rinse of pre filter.		49.5800 2/24/76					
		49.5874 2/17/76					
		49.5975 2/9/76					
Evap. dish No 5-2 187A		49.6054 2/6/76		48.6203 1/29/76		985.1	-1.8
Total vol 131.2 ml							
373.0 - 199.8 = 173.2							
(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: Bayton Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Baxter/Merryman Project No. 92782-3518 LRB Date of Work:

Title or Purpose: RUN No. CER-TP5-3 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JUL-31	-197	0.46510		0.38009		85.0	
(2) TCE wash of front half 5-1 Evap. dish No 193 Total vol 107.3 ml 314.5-172.9=141.6		46.7618	2/24/76				
		46.7654	2/17/76				
		46.7702	2/9/76				
		46.7719	2/6/76	46.5522	11/29/76 AM	219.7	-1.5
(2a) Acetone wash of front half 5-1 Evap. dish No 193B Total vol 57.7 ml 219.0-173.4=45.6		41.7448	2/24/76				
		41.7443	2/17/76				
		41.7450	2/9/76				
		41.7440	2/6/76	41.7422	11/29/76 AM	1.8	-0.5
(2b) TCE rinse of pre-filter. 5-1 Evap. dish No 193A Total vol 43.1 ml 242.5-185.6=56.9		49.7211	2/24/76				
		49.7416	2/17/76				
		49.7710	2/9/76				
		49.7987	2/6/76	47.0156	11/29/76 AM	2783.1	-0.6
(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: Baxter Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Bayless / Merryman Project No. 2872-3518 Date of Work:

Title or Purpose: RUN No. CER-TP 5-4 LBB 32279 Continued from:

CERTAIN-TEED, INC
Shakopee, Minnesota

	EPA No. S75-006-	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter Filter No. JUL-43	309	0.44027		0.38205		58.2	
(2) TCE wash of front half 5-4 Evap. dish No 305 Total vol 116.0 ml 440.3 - 287.2 = 153.1	305	44.8937 2/24/76 44.8961 2/9/76 44.8960 2/6/76		44.8451 1/29/76		50.9	-1.6
(2a) Acetone wash of front half 5-4 Evap. dish No 305B Total vol 94.8 ml 176.7 - 101.8 = 74.9	305	43.4333 2/24/76 43.4330 2/17/76 43.4331 2/9/76 43.4326 2/6/76		43.4292 1/29/76		3.4	-0.8
(2b) TCE rinse of pre-filter. 5-4 Evap. dish No 310A Total vol 23.6 ml 140.4 - 109.3 = 31.1	310	47.7478 2/24/76 47.7545 2/17/76 47.7676 2/9/76 47.7733 2/6/76		46.6863 1/29/76		1087.0	-0.3
(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: Bayless Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

40

Work Performed by: Baytos / Merryman Project No. W2872-3518 LRS 32279 Date of Work:

Title or Purpose: BLANKS. Continued from:

CERTAIN-TEED, INC Shakopee, Minnesota	EPA No. S75-006	Final Wt. grams		Tare grams		Weight Change mg	Remarks
(1) Fiber Glass filter JUL 47				0.37974			
Filter No. JUL 48	357			0.37846			S.G. 1.302
JUL 49				0.37970			
(2) TCE ~~wash of front half~~		46.9200	2/24/76				FISHER CERTIFIED Lot # 742435
		46.9192	2/17/76				
Evap. dish No 1-A Total vol 100.0 ml	352	46.9196	2/9/76	− 46.9182	2/5/76	= 1.4 mg/100 ml = ~~1.4~~ µg/ml 14 µg/ml	
(2a) Acetone ~~wash of front half~~		45.1950	2/24/76				BURDIC + JACKSON Lot # 7426
		45.1944	2/17/76				
Evap. dish No 1-B Total vol 100.0 ml	353	45.1948	2/9/76	− 45.1940	2/5/76	= 0.8 mg/100 ml = ~~0.8~~ µg/ml 8 µg/ml	
(2b) TCE rinse of pre-filter. Evap. dish No ___ Total vol ___ ml	354						
(3) Impinger water Evap. dish No ___ Total vol ___ ml	351						
(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: Baytos Date: Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

TABLE A-1. DRYING DATA FOR PARTICULATE SAMPLES COLLECTED AT CERTAIN-TEED PRODUCTS

Time, hrs	Sampling Point and Run															
	TP1-1	TP1-2	TP1-3	TP2-1	TP2-2	TP2-3	TP3-1	TP3-2	TP3-3	TP4-1	TP4-2	TP4-3	TP5-1	TP5-2	TP5-3	TP5-4
TCE Wash of Nozzle, Probe, and Front-Half Glassware (except prefilter)																
0[a]	222.2	251.8	471.4	102.8	78.2	104.7	19,993.2	157.2	454.9	26.6	15.6	12.3	49.8		219.7	50.9
24	171.2	206.3	340.4	88.1	71.3	86.8	16,909.5	128.8	347.5	27.1	16.0	12.8	47.7		218.0[c]	51.0[c]
48	170.2	183.2	310.6	86.9	70.1	84.0	15,279.4	131.2	322.8	26.9	15.5	13.1	45.0		213.2[d]	--
144	155.1	165.1	282.2	86.2	69.4	80.3	12,564.6	124.3	294.2	--	--	11.6	42.7		209.6[f]	48.6[f]
336	150.6	160.7	265.9	86.9	71.0	78.7	--	118.5	278.4	--	--	--	42.7			
504	145.9	154.4	256.6	--	69.7	76.0	11,403.9	112.6	266.1	--	--	--	--			
Value used	170.6	178.7	325.5	87.5	74.8	85.4	16,094.5	130.0	335.2	26.9	15.8	12.6	48.8		219.9	51.0
blank	168.3	176.5	323.7	85.0	72.5	83.5	16,091.3	127.6	333.3	24.4	13.5	10.3	47.9		218.4	49.4
TCE Rinse of Prefilter																
0[a]	730.2	518.5	793.8		42.5	72.7	1119.3	336.3	880.6	28.3	12.8	24.1		985.1	2783.1	1087.0
24	729.4	--	--		41.7	71.9	1108.1	--	--	28.0	12.0	23.6		--	--	--
72	--	518.2	790.1		--	--	1098.6	335.2	877.1	--	--	--		977.2	2755.4	1079.3
120	728.0	--	--		40.4	70.6	--	--	--	--	11.0	--		--	--	--
264	--	518.6	787.4		--	--	--	334.3	871.5	--	--	--		967.1	2726.0	1068.2
312	727.1	--	--		40.9	71.5	--	--	--	27.8	12.2	23.8		--	--	--
432	--	--	786.2		--	--	--	333.8	867.9	--	--	--		959.7	2705.5	1061.5
480	724.7	--	--		40.4	70.0	--	--	--	--	11.2	--		--	--	--
Value used	729.8	518.4	792.6		42.1	72.3	1113.7	335.9	879.4	28.2	12.4	23.9		982.5	2774.0	1084.5
blank	728.7	518.0	792.0		40.3	72.3	1112.9	335.4	878.7	27.7	10.6	23.6		980.7	2773.4	1084.2
Acetone Wash of Nozzle, Probe, and Front-Half Glassware (including prefilter)																
0[a]			7.4		6.2	5.3			19.6		19.9	45.6			1.8	3.4
24			7.2		6.4	5.9			19.5		19.6	44.2			2.8[c]	3.9[c]
336						7.3						43.4[e]			2.1[d]	3.8[d]
504						6.1						41.1[g]			2.6[f]	4.1[f]
Value used			7.3		6.3	5.6			19.6		19.8	44.9			2.1	3.6
blank			6.0		4.8	4.1			18.5		18.1	42.1			1.6	2.8
Filter																
0[b]	313.7	185.1	200.0	49.9	29.7	22.7	70.5	147.5	977.6	5.6	8.1	13.5	1.1	926.8	85.0	58.2

(a) Time zero weighing if after apparent evaporation of all TCE followed by 24 in desiccator.
(b) After 24 hr in desiccator
(c) At 72 hr.
(d) At 264 hr.
(e) At 312 hr.
(f) At 432 hr.
(g) At 480 hr.

Note: Sampling points TP1 and TP3 were on the control device inlet; TP2 and TP4 on the control device outlet; TP5 was a side stream.

Sample Log Identification

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CERTAIN-TEED, INC
Location Shakopee, Minnesota
Industry Asphalt roofing
Project No.

Battelle Record Book No
Collected & Recorded By
Page 2 of 12.

EPA No. S75-00b	Date 9/9/75	Run Number	Sample Description	Remarks
			STATION--TP-1 (INLET TO AFTERBURNER)	
-219		CER-TP-1	(1) TCE rinse of probe and nozzle	
-220		"	Impinger water	
-221		"	TCE rinse of impinger and connectors	
-222		"	Acetone rinse of impinger and connectors	
-223		"	Glass fiber filter JUL 39	
-224		"	Glass wool prefilter	
-225		CER-TP-1	(2) TCE rinse of probe and nozzle	
-226		"	Impinger H_2O	
-227		"	TCE rinse of impinger and connectors	
-228		"	Acetone rinse of impinger and connectors	
-229		"	Glass fiber filter JUL 42	
-230		"	Glass wool prefilter	
-231		CER-TP-1	(3) TCE rinse of probe and nozzle	
-232		"	Impinger water	
-233		"	TCE rinse of impinger and connectors	
-234		"	Acetone rinse of impinger and connectors	
-235		"	Glass fiber filter JUL 44	
-236		"	Glass wool prefilter	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CERTAIN-TEED, INC
Location Shakopee, Minnesota
Industry Asphalt roofing
Project No. G-2872-3514

Battelle Record Book No 32148
Collected & Recorded By Baytos/McNulty
Page 3 of 12.

EPA No. S75-00	Date	Run Number	Sample Description	Remarks
	9/9/75			
			STATION TP-2 OUTLET FROM AFTERBURNER	
-237		CER-TP-2	(1) TCE rinse of probe and nozzle	
-238		"	Impinger catch	
-239		"	TCE rinse of Impinger and connectors	
-240		"	Acetone rinse of impinger and connectors	
-241		"	Glass fiber filter JUL 36	
-242		"	Glass wool prefilter	
-243		CER-TP-2	(2) TCE rinse of probe and nozzle	
-244		"	Impinger catch	
-245		"	TCE rinse of impinger and connectors	
-246		"	Acetone rinse of impinger and connectors	
-247		"	Glass fiber filter JUL 32	
-248		"	Glass wool prefilter	
-249		CER-TP-2	(3) TCE rinse of probe and nozzle	
-250		"	Impinger catch	
-251		"	TCE rinse of impinger and connectors	
-252		"	Acetone rinse of impinger and connectors	
-253		"	Glass fiber filter JUL 29	
-254		"	Glass wool prefilter	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CERTAIN-TEED, INC
Location Shakopee, Minnesota
Industry Asphalt roofing
Project No. G-2872-3514

Battelle Record Book No 32148
Collected & Recorded By
Pages 4 of 12.

EPA No. S75-00b	Date 9/9/75	Run Number	Sample Description	Remarks
			STATION TP-3 (INLET TO ASTON BOILER #2	
-255		CER-TP-3	(1) TCE rinse of probe and nozzle	
-256		"	Impinger catch	
-257		"	TCE rinse of impinger and connectors	
-258		"	Acetone rinse of impinger and connectors	
-259		"	Glass fiber filter JUL-38	
-260		"	Glass wool prefilter	
-261		CER-TP-3	(2) TCE rinse of probe and nozzle	
-262		"	Impinger catch	
-263		"	TCE rinse of impinger and connectors	
-264		"	Acetone rinse of impinger and connectors	
-265		"	Glass fiber filter JUL-40	
-266		"	Glass wool prefilter	
-267		CER-TP-3	(3) TCE rinse of probe and nozzle	
-268		"	Impinger catch	
-269		"	TCE rinse of impinger and connectors	
-270		"	Acetone rinse of impinger and connectors	
-271		"	Glass fiber filter JUL 27	
-272		"	Glass wool filter	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CERTAIN-TEED, INC
Location Shakopee, Minnesota
Industry asphalt roofing
Project No. G-2872-3514

Battelle Record Book No 32148
Collected & Recorded By
Page 5 of 12.

EPA No. S75-006	Date 9/9/75	Run Number	Sample Description	Remarks
			STATION TP-4 (OUTLET FROM AFBIR BOILER #2)	
-273		CER-TP-4	(1) TCE rinse of probe and nozzle	
-274		"	Impinger catch	
-275		"	TCE rinse of impinger and connectors	
-276		"	Acetone rinse of impinger and connectors	
-277		"	Glass fiber filter JUL-35	
-278		"	Glass wool prefilter	
-279		CER-TP-4	(2) TCE rinse of probe and nozzle	
-280		"	Impinger catch	
-281		"	TCE rinse of impinger and connectors	
-282		"	Acetone rinse of impinger and connectors	
-283		"	Glass fiber filter JUL 35 [illegible]	
-284		"	Glass wool prefilter	
-285		CER-TP-4	(3) TCE rinse of probe and nozzle	
-286		"	Impinger catch	
-287		"	TCE rinse of impinger and connectors	
-288		"	Acetone rinse of impinger and connectors	
-289		"	Glass fiber filter JUL 22 AND JUL 26	
-290		"	Glass wool prefilter	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CERTAIN-TEED, INC
Location Shakopee, Minnesota
Industry Asphalt Roofing
Project No. G-2872-3514

Battelle Record Book No 32148
Collected & Recorded By
Page 6 of 12.

EPA No. S75-00b	Date 9/9/75	Run Number	Sample Description	Remarks
			STATION TP-5 (OUTLET OF STORAGE TANKS)	
-181		CER-TP-5	(1) TCE rinse of probe and nozzle	
-182		"	Impinger water	
-183		"	TCE rinse of impinger and connectors	
-184		"	Acetone rinse of impinger and connectors	
-185		"	Glass fiber filter J-UL-37	
-186		"	Glass wool prefilter	
-187		CER-TP-5	(2) TCE rinse of probe and nozzle	
-188		"	Impinger water	
-189		"	TCE rinse of impinger and connectors	
-190		"	Acetone rinse of impinger and connectors	~~may-(4 JUL-33~~
-191		"	Glass fiber filter JUL 34 AND	JUL 33 - 2
-192		"	Glass wool prefilter	
-193		CER-TP-5	(3) TCE rinse of probe and nozzle	
-194		"	Impinger water	
-195		"	TCE rinse of impinger and connectors	
-196		"	Acetone rinse of impinger and connectors	
-197		"	Glass fiber filter JUL-31	
-198		"	Glass wool prefilter	
-305		CER-TP-5	(4) TCE rinse of probe and nozzle	
-306		"	Impinger water	
-307		"	TCE rinse of impinger and connectors	
-308		"	Acetone rinse of impinger and connectors	
-309		"	Glass fiber filter JUL 43	
-310		"	Glass wool prefilter	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CERTAIN-TEED, INC
Location Shakopee, Minnesota
Industry Asphalt Roofing
Project No. G-2872-3514

Battelle Record Book No 32148
Collected & Recorded By
Page 8 of 12.

EPA No. S75-006	Date 9/9/75	Run Number	Sample Description	Remarks
			PROCESS SAMPLES	
-292			Granules	
-293			Talc, backing agent	
-294			Filler	
-295			Coating asphalt (with filter)	
-296			Saturant asphalt	
-297			TP-1 inlet, after burner ~1/4 qt, 3hrs--1810, 2110	
-298			TP-1 inlet, duct, ~1 ml (line may be plugged)	
-299			TP-3 inlet, recovery oil, afterburner, ~75 ml	
-300			TP-3 inlet, duct, 1/3 qt	
-301			Asphalt flux--Trumoul Oil Co., Minneapolis	
-302	9/9		Sealant, 3 p.m. collected	
-303	9/10		Coating asphalt, unfilled (without filler), 12:30 p.m.	
-304	9/11		Felt 55 grade, 1300	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant ~~CERTAIN TEED, INC~~
Location ~~Shakopee, Minnesota~~
Industry ~~Asphalt roofing~~
Project No. G-2872-3514

Battelle Record Book No 32148
Collected & Recorded By
Page 9 of 12.

EPA No. S75-006	Date 9/13/75	Run Number	Sample Description	Remarks
			ALDEHYDES	
			Inlet	
-312		AL-TP3-1	Impinger No. 1	
-313		"	Impinger No. 2	
-314		AL-TP3-2	Impinger No. 1	
-315		"	Impinger No. 2	
-316		AL-TP3-3	Impinger No. 1	
-317		"	Impinger No. 2	
			Outlet	
-318		AL-TP4-1	Impinger No. 1	
-319		"	Impinger No. 2	
-320		AL-TP4-2	Impinger No. 1	
-321		"	Impinger No. 2	
-322		AL-TP4-3	Impinger No. 1	
-323		"	Impinger No. 2	
-356			Blank - Na_2SO_3; Sodium Bisulfite	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CERTAIN-TEED, INC
Location Shakopee, Minnesota
Industry Asphalt Roofing
Project No. G-2872-3514

Battelle Record Book No 32148
Collected & Recorded By
Page 10 of 12.

EPA No. S75-00b	Date 9/13/75	Run Number	Sample Description	Remarks
			PPOM	
				1 TCE 2 ~~Acetone~~
-324	POM	TP-1-127F	Probe and nozzle wash	3 Cyclone
-325		"	impinger catch	
-326		"	TCE rinse of impingers	
-327		"	Acetone rinse of impingers	
-328		"	Glass fiber filter #JUL45	
-329		"	POM column	
				1 TCE 2 ~~Acetone~~
-330	POM	TP1-175F	Probe and nozzle wash	3 Cyclone
-331		"	Impinger catch	
-332		"	TCE rinse of impingers	
-333		"	Acetone rinse of impingers	
-334		"	Glass fiber filter #JUL46	
-335		"	POM column	
				1 TCE 2 Acetone
-336	POM	TP2-125F	Probe and nozzle wash	3 Cyclone
-337		"	Impinger catch	
-338		"	TCE rinse of impingers	
-339		"	Acetone rinse of impingers	
-340		"	Glass fiber filter AJUL 60	
-341		"	POM column	

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CERTAIN-TEED, INC
Location Shakopee, Minnesota
Industry Asphalt roofing
Project No. G-2872-3514

Battelle Record Book No 32148
Collected & Recorded By
Page 11 of 12.

EPA No. S75-006	Date 9/12/75	Run Number	Sample Description	Remarks
			EVACUATED FLASK	
-343		TP-4	16:20	
-344		TP-2(3)	4:30, from HC sample tap	Select for CH4 analysis. 9/23/75
-345		TP-4	4:35 p.m., 16:30 (60 sec)	
-346		TP-4	17:45, stack sample	
-347		TP-4	Void, 5:40 p.m.	
-348		TP-2	18:25	
-349		TP-2	18:07, stack gas	
-350		TP-3	From FID at 18:24, 110 F, off the	filter after aldehyde run

IDENTIFICATION LOG OF SAMPLES COLLECTED

Plant CERTAIN-TEED, INC
Location Shakopee, ~~Minnesota~~
Industry ~~Asphalt roofing~~
Project No.

Battelle Record Book No
Collected & Recorded By
Page 12 of 12.

EPA No. S75-006	Date	Run Number	Sample Description	Remarks
			SAMPLE BLANKS	
-351	9/13/75		Demineralized double distilled water, OSU No. 97805	
-352	"		1,1,1 Trichloroethane (Fisher T-391, Lot No. 742435)	
-353	"		Acetone, distilled in glass, Burdick & Jackson Lot No. 7426	
~~-353~~ 357	"		Glass fiber filters, 3 each	
-354	"		Prefilter, packed with DMSO washed glass wool	
-355	"		Chloroform/Ether	

APPENDIX B

SPECIAL STUDY OF DRYING OF SAMPLES COLLECTED AT SATURATOR PLANTS

APPENDIX B

SPECIAL STUDY OF DRYING OF SAMPLES COLLECTED AT SATURATOR PLANTS

Dué to the possibly volatile nature of particulate samples collected at asphalt roofing plants, questions were raised with regard to drying the samples. Not only were the samples primarily thought to be organic materials as judged by the viewing of processes, but the samples were collected at much lower temperatures than is normally used for Method 5 sampling trains. Prefilter and filter temperatures were maintained at 32 to 38 C (90 to 100 F), whereas in normal Method 5 sampling these temperatures are about 121 C (250 F). Thus, sampling at the asphalt plants would be more likely to result in collection of more volatile compounds than is typically the case with Method 5 sampling.

EPA concurred that data on sample volatility should be obtained on a few samples before proceeding with preparation of the bulk of the samples. Results and conclusions of this brief study of sample drying for asphalt plants with saturator processes is given below.

Collection of particulate samples at saturator plants resulted in obtaining of samples as follows:

Sampling Train Components	Sample	Sample Identification
Nozzle, probe and front-half glassware	TCE wash	Container 1
Nozzle, probe and front-half glassware	Acetone wash	Container 2
Prefilter	Prefilter & TCE wash	Container 3
Prefilter	Acetone wash	Container 2
Filter	---	Container 4
Back half glassware and impingers	Water & Oil (bulk)	Container 7
Back half glassware and impingers	TCE wash	Container 5
Back half glassware and impingers	Acetone wash	Container 6

EPA determined that filter and the sample portions collected upstream of the filter were the only samples of immediate interest. Hence, for saturant plants the samples stored in Containers 5, 6, and 7 were not treated further. In addition samples collected at saturant plant outlets did not include pre-filters due to the low particulate loading of the gas streams.

Special Drying of Selected Samples

TCE washes of the nozzle, probe, and front-half glassware for two saturant plant outlet samples were selected for special drying procedures. These samples were outlet run samples for plants controlled with a HEAF filter (Celotex, Los Angeles--EPA Sample S75-002-015) and an electrostatic precipitator (Celotex, Fairfield, Alabama--EPA Sample S75-006-402).

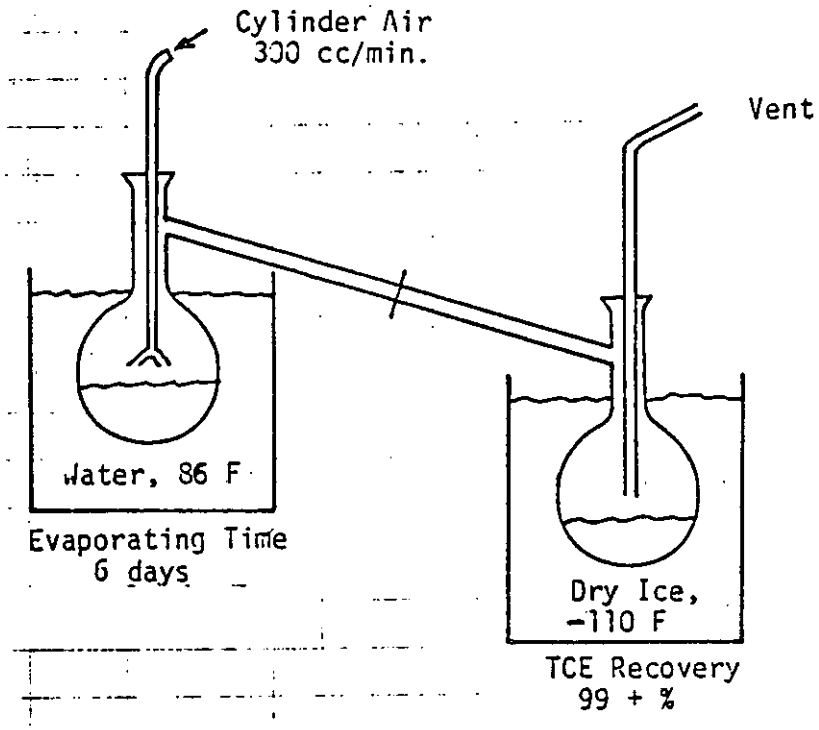
The samples were dried with equipment set up as shown in Figure B-1. TCE was evaporated at about 86 F with a steady stream of air passing over the sample (to represent a sample drying under a hood at ambinet temperature). The evaporated solvent was collected in a condensor maintained at -79 C (-110 F) in dry ice. Over 99 percent of the mass of the sample was collected in the condensor in each case--suggesting minimal losses during this evaporization/condensation process.

Chromatographic analysis of the condensate showed no straight-chain hydrocarbons above C11 for condensate from Sample S75-002-015 and no evidence of straight-chain hydrocarbons for condensate from Sample S75-006-402 (when compared to TCE blanks in both cases). Thus, there was no evidence that significant particulate catch from these samples was being evaporated while the solvent was being evaporated.

Long-Term Drying of Filters

The long-term weight loss of filters from saturant plants was also examined. Results of these observations are reported in Table B-1. Based on drying of filter samples over a period of 3 to 4 months, weight loss of filter samples was very low. Of course, some organics could have been lost during the dessication period, prior to the initial weighings. However, the best interpretation of these data suggests only a small weight loss of the filters over a long-time period.

TCE SAMPLES



WATER SAMPLES

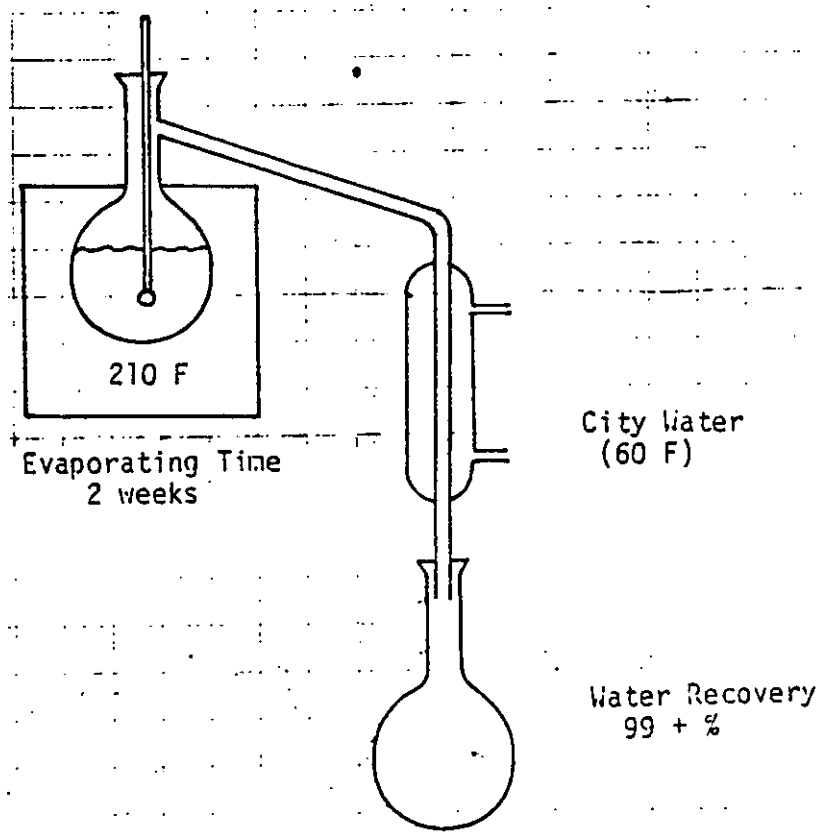


FIGURE B-1. APPARATUS FOR SPECIAL DRYING OF SELECTED SAMPLES

TABLE B-1. LONG-TERM CHANGES IN FILTER WEIGHTS-
OUTLET SAMPLES FROM SATURANT PLANT

Asphalt Plant	Plant Location	Sample No.	Initial Filter Data Mass, mg	Initial Filter Data Date	Final Filter Data Mass, mg	Final Filter Data Date	Change, percent
Johns-Manville	Waukegan, Ill.		31.2	9/24/75	29.3	1/19/75	-6.1
			39.8	9/24/75	37.4	1/19/75	-6.0
			50.5	9/24/75	47.3	1/19/75	-6.3
Celotex	Fairfield, Ala.		27.5	10/15/75	25.1	1/19/75	-8.7
			24.4	10/15/75	22.2	1/19/75	-9.0
			6.8	10/15/75	6.1	1/19/75	-10.3
			4.1	10/15/75	3.6	1/19/75	-12.2
			8.7	10/15/75	8.1	1/19/75	-6.9
			9.6	10/15/75	9.0	1/19/75	-6.3
Celotex	Los Angeles, Cal.		44.0	10/29/75	41.9	1/19/75	-4.8
			10.6	10/29/75	10.3	1/19/75	-2.8
			34.5	10/29/75	33.0	1/19/75	-4.3

Conclusions

As best could be determined, the bulk of the outlet particulate samples consisted of material that was not rapidly lost during normal sample drying procedures and procedures similar to those specified by Method 5 could be used for drying and weighing these samples.

Because none of the samples examined in the brief study of sample drying were from afterburner plants, it was concluded that the volatile content of inlet samples would be lower (on a percentage basis) than for outlet samples--as only the less volatile portions would be expected to be collected in HEAF filters or electrostatic precipitator collectors. Thus, it was assumed that the normal Method 5 sampling drying procedures would be suitable for inlet samples as well.

Because there was no basis for believing that saturator plant samples collected at the Certain-Teed Products plant in Shakopee, Minnesota, would be substantially different from other saturator plant samples, which were examined in more detail, it was concluded that samples from those plants also could be dried using procedures similar to those specified in Method 5.

Thus, all particulate samples collected at saturator plants were dried using the following procedures:

For the wash of nozzle, probe, and prefilter

- Evaporate the solvent by placing the sample in an evaporating dish and in a hood at ambient temperature.
- When all of the sample solvent appears to have been evaporated, place the sample in a dessicator for 24 hours and then weigh the sample.
- If the sample has lost substantial mass during the 24 hours of dessication, place in dessicator for an additional 24 hours and weigh again. Repeat until consecutive weights differ by less than 10 percent.
- When two weights are obtained that differ by less than 10 percent, use the average of these two weights as the mass of the sample.

For filters

- Dessicate for a minimum of 24 hours and weigh.

Experience on drying saturator samples suggested that one or two 24-hour periods in the dessicator were sufficient to obtain stable mass data.

APPENDIX C

COMPLETE PARTICULATE RESULTS WITH SAMPLE CALCULATIONS

C-1

CERTAIN-TEED INLET RESULTS TP-1

	RUN NO.	1	2	3
	TEST DATE	9/9	9/11	9/12
	SAMPLING TIME, 24 HOUR CLOCK FROM	1808	1115	1402
	TO	2053	1528	1857
DN	SAMPLING NOZZLE DIAMETER, IN.	0.270	0.270	0.305
TT	NET TIME OF TEST, MIN.	144	143	144
PB	BAROMETRIC PRESSURE, IN. HG ABSOLUTE	29.64	29.37	29.54
PM	AVG. ORIFICE PRESSURE DROP, IN. H2O	1.10	1.12	1.95
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, DCF	90.8	91.5	112.7
TM	AVG. GAS METER TEMPERATURE, F	70	69	67
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS, DSCF	90.1	90.2	112.4
VW	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML	58.8	39.3	42.7
VWGAS	VOLUME OF H2O VAPOR COLLECTED, SCF	2.8	1.9	2.0
%M	PERCENT MOISTURE IN STACK GAS BY VOLUME	3.00	2.02	1.77
MD	MOLECULAR FRACTION OF DRY GAS	0.97	0.98	0.98
% CO2	VOLUME PERCENT DRY	0.1	0.1	0.1
% O2	VOLUME PERCENT DRY	20.8	20.8	20.8
% CO	VOLUME PERCENT DRY	0.1	0.1	0.1
% N2	VOLUME PERCENT DRY	79.0	79.0	79.0
% EA	PERCENT EXCESS AIR	37143	37143	37143
MWD	MOLECULAR WEIGHT OF STACK GAS, DRY BASIS	28.8	28.8	28.8
MW	MOLECULAR WEIGHT OF STACK GAS, WET BASIS	28.5	28.6	28.7
CP	PITOT TUBE COEFFICIENT	0.85	0.85	0.85
TS	AVG. STACK TEMPERATURE	111	214	218
NP	NET SAMPLING POINTS	36	36	36

CERTAIN-TEED INLET RESULTS TP-1

FORM NO 6413

	RUN NO.	1	2	3
	TEST DATE	9/9	9/11	9/12
	SAMPLING TIME, 24 HOUR CLOCK FROM	1808	1115	1402
	TO	2053	1528	1857
PST	STATIC PRESSURE OF STACK GAS, IN. HG.	-0.07	-0.07	-0.07
PS	STACK GAS PRESSURE, IN. HG ABS.	29.57	29.30	29.47
VS	STACK GAS VELOCITY AT STACK CONDITIONS, FPM	1842	2054	2119
AS	STACK AREA, SQ. IN.	707	707	707
QS	DRY STACK GAS VOLUMETRIC FLOW RATE AT STANDARD CONDITIONS,DSCFM	8043	7599	7860
QA	STACK GAS VOLUMETRIC FLOW RATE AT STACK CONDITIONS, ACFM	9035	10077	10394
% I	PERCENT ISOKINETIC	95.7	102.1	95.7
% C	PERCENT CAPACITY	NA	NA	NA
TC	UNIT FEED RATE, TONS/HR	ND	ND	ND
MF	PARTICULATE--PROBE, CYCLONE, AND FILTER, MG	1210.7	879.6	1321.7
MT	PARTICULATE--TOTAL, MG	1210.7	879.6	1321.7
IC	PERCENT IMPINGER CATCH	.0	.0	.0
CAN	PARTICULATE--PROBE, CYCLONE, AND FILTER, GR/SCF	0.207	0.156	0.181
CAO	PARTICULATE--TOTAL, GR/SCF	0.207	0.156	0.181
CAT	PARTICULATE--PROBE, CYCLONE, AND FILTER, GR/ACF	0.184	0.113	0.137
CAU	PARTICULATE--TOTAL, GR/ACF	0.184	0.113	0.137
CAW	PARTICULATE--PROBE, CYCLONE, AND FILTER, LB/HR	14.26	9.78	12.20
CAX	PARTICULATE--TOTAL, LB/HR	14.26	9.78	12.20
PTF	PARTICULATE--PROBE, CYCLONE, AND FILTER, LB/TON FEED	ND	ND	ND
PTT	PARTICULATE--TOTAL, LB/TON FEED	ND	ND	ND

NA = Not Applicable
ND = No Data

CERTAIN-TEED INLET RESULTS TP-1

RUN NO.	1	2	3
TEST DATE	9/9	9/11	9/12
VOLUME OF GAS SAMPLED, DSCF	90.1	90.2	112.4
PERCENT MOISTURE BY VOLUME	3.0	2.0	1.8
AVERAGE STACK TEMPERATURE, F	111	214	218
STACK VOLUMETRIC FLOW RATE, DSCFM	8043	7599	7860
STACK VOLUMETRIC FLOW RATE, ACFM	9035	10077	10394
PERCENT ISOKINETIC	95.7	102.1	95.7
PERCENT EXCESS AIR	37143	37143	37143
PERCENT OPACITY	NA	NA	NA
FEED RATE, TONS/HR	ND	ND	ND

PARTICULATES - PROBE,CYC,FILTER CATCH

MG	1210.7	879.6	1321.7
GR/DSCF -	0.207	0.150	0.181
GR/ACF -	0.184	0.113	0.137
LB/HR -	14.3	9.8	12.2
LB/TON FEED	ND	ND	ND

PARTICULATES - TOTAL CATCH

MG	1210.7	879.6	1321.7
GR/DSCF -	0.207	0.150	0.181
GR/ACF -	0.184	0.113	0.137
LB/HR -	14.3	9.8	12.2
LB/TON FEED	ND	ND	ND

PERCENT IMPINGER CATCH	.0	.0	.0

NA = Not Applicable
ND = No Data

CERTAIN-TEED INLET RESULTS TP-1

RUN NO.	1	2	3
TEST DATE	9/9	9/11	9/12
VOLUME OF GAS SAMPLED, NCM	2.54	2.54	3.17
PERCENT MOISTURE BY VOLUME	3.0	2.0	1.8
AVERAGE STACK TEMPERATURE, C	43	101	103
STACK VOLUMETRIC FLOW RATE, NCMM	226	214	221
STACK VOLUMETRIC FLOW RATE, CMM	254	284	293
PERCENT ISOKINETIC	95.7	102.1	95.7
PERCENT EXCESS AIR	37143	37143	37143
PERCENT OPACITY	NA	NA	NA
FEED RATE, MTON/HR	ND	ND	ND

PARTICULATES - PROBE,CYC,FILTER CATCH

MG	1210.7	879.6	1321.7
MG/NCM -	475.2	345.1	416.1
MG/CM -	422.7	260.0	314.4
KG/HR -	6.5	4.4	5.5
KG/MTON FEED	ND	ND	ND

PARTICULATES - TOTAL CATCH

MG	1210.7	879.6	1321.7
MG/NCM -	475.2	345.1	416.1
MG/CM -	422.7	260.0	314.4
KG/HR -	6.5	4.4	5.5
KG/MTON FEED	ND	ND	ND
PERCENT IMPINGER CATCH	.0	.0	.0

NA = Not Applicable
ND = No Data

CERTAIN-TEED OUTLET RESULTS TP-2

	RUN NO.	1	2	3
	TEST DATE	9/9	9/11	9/12
	SAMPLING TIME, 24 HOUR CLOCK FROM	1810	1132	1403
	TO	2100	1530	1905
DN	SAMPLING NOZZLE DIAMETER, IN.	0.305	0.360	0.360
TT	NET TIME OF TEST, MIN.	140	140	140
PB	BAROMETRIC PRESSURE, IN. HG ABSOLUTE	29.42	29.40	29.54
PM	AVG. ORIFICE PRESSURE DROP, IN. H2O	0.96	1.80	1.83
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, DCF	83.0	111.7	107.9
TM	AVG. GAS METER TEMPERATURE, F	62	51	53
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS, DSCF	83.0	114.3	110.5
VW	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML	61.0	62.6	33.5
VWGAS	VOLUME OF H2O VAPOR COLLECTED, SCF	2.9	3.0	1.6
%M	PERCENT MOISTURE IN STACK GAS BY VOLUME	3.37	2.53	1.42
MD	MOLECULAR FRACTION OF DRY GAS	0.97	0.97	0.99
% CO2	VOLUME PERCENT DRY	1.1	1.1	0.1
% O2	VOLUME PERCENT DRY	19.3	19.3	20.8
% CO	VOLUME PERCENT DRY	0.1	0.1	0.1
% N2	VOLUME PERCENT DRY	79.5	79.5	79.0
% EA	PERCENT EXCESS AIR	1143	1143	37143
MWD	MOLECULAR WEIGHT OF STACK GAS, DRY BASIS	28.9	28.9	28.8
MW	MOLECULAR WEIGHT OF STACK GAS, WET BASIS	28.6	28.7	28.7
CP	PITOT TUBE COEFFICIENT	0.85	0.85	0.85
TS	AVG. STACK TEMPERATURE	555	524	532
NP	NET SAMPLING POINTS	28	28	29

CERTAIN-TEED OUTLET RESULTS TP-2

	RUN NO.	1	2	3
	TEST DATE	9/9	9/11	9/12
	SAMPLING TIME, 24 HOUR CLOCK FROM	1810	1132	1403
	TO	2100	1530	1905
PST	STATIC PRESSURE OF STACK GAS, IN. HG.	.00	.00	.00
PS	STACK GAS PRESSURE, IN. HG ABS.	29.42	29.40	29.54
VS	STACK GAS VELOCITY AT STACK CONDITIONS, FPM	2159	2055	2096
AS	STACK AREA, SQ. IN.	1809	1809	1809
QS	DRY STACK GAS VOLUMETRIC FLOW RATE AT STANDARD CONDITIONS, DSCFM	13452	13318	13693
QA	STACK GAS VOLUMETRIC FLOW RATE AT STACK CONDITIONS, ACFM	27118	25810	26322
% I	PERCENT ISOKINETIC	108.8	108.6	102.1
% O	PERCENT OPACITY	NA	NA	NA
TC	UNIT FEED RATE, TONS/HR	ND	ND	ND
MF	PARTICULATE--PROBE, CYCLONE, AND FILTER, MG	134.9	147.3	182.6
MT	PARTICULATE--TOTAL, MG	134.9	147.3	182.6
IC	PERCENT IMPINGER CATCH	.0	.0	.0
CAN	PARTICULATE--PROBE, CYCLONE, AND FILTER, GR/SCF	0.025	0.020	0.025
CAO	PARTICULATE--TOTAL, GR/SCF	0.025	0.020	0.025
CAT	PARTICULATE--PROBE, CYCLONE, AND FILTER, GR/ACF	0.012	0.010	0.013
CAU	PARTICULATE--TOTAL, GR/ACF	0.012	0.010	0.013
CAW	PARTICULATE--PROBE, CYCLONE, AND FILTER, LB/HR	2.89	2.27	2.99
CAX	PARTICULATE--TOTAL, LB/HR	2.89	2.27	2.99
PTF	PARTICULATE--PROBE, CYCLONE, AND FILTER, LB/TON FEED	ND	ND	ND
PTT	PARTICULATE--TOTAL, LB/TON FEED	ND	ND	ND

NA = Not Applicable
ND = No Data

CERTAIN-TEED OUTLET RESULTS TP-2

RUN NO.	1	2	3
TEST DATE	9/9	9/11	9/12
VOLUME OF GAS SAMPLED, DSCF	83.0	114.3	110.5
PERCENT MOISTURE BY VOLUME	3.4	2.5	1.4
AVERAGE STACK TEMPERATURE, F	555	524	532
STACK VOLUMETRIC FLOW RATE, DSCFM	13452	13318	13693
STACK VOLUMETRIC FLOW RATE, ACFM	27118	25810	26322
PERCENT ISOKINETIC	108.8	108.6	102.1
PERCENT EXCESS AIR	1143	1143	37143
PERCENT OPACITY	NA	NA	NA
FEED RATE, TONS/HR	ND	ND	ND

PARTICULATES - PROBE,CYC,FILTER CATCH

MG	134.9	147.3	182.6
GR/DSCF -	0.025	0.020	0.025
GR/ACF -	0.012	0.010	0.013
LB/HR -	2.9	2.3	3.0
LB/TON FEED	ND	ND	ND

PARTICULATES - TOTAL CATCH

MG	134.9	147.3	182.6
GR/DSCF -	0.025	0.020	0.025
GR/ACF -	0.012	0.010	0.013
LB/HR -	2.9	2.3	3.0
LB/TON FEED	ND	ND	ND

PERCENT IMPINGER CATCH	.0	.0	.0

NA = Not Applicable
ND = No Data

CERTAIN-TEED OUTLET RESULTS TP-2

RUN NO.	1	2	3
TEST DATE	9/9	9/11	9/12
VOLUME OF GAS SAMPLED, NCM	2.34	3.22	3.12
PERCENT MOISTURE BY VOLUME	3.4	2.5	1.4
AVERAGE STACK TEMPERATURE, C	290	273	277
STACK VOLUMETRIC FLOW RATE, NCMM	379	375	386
STACK VOLUMETRIC FLOW RATE, CMM	764	728	742
PERCENT ISOKINETIC	108.8	108.6	102.1
PERCENT EXCESS AIR	1143	1143	37143
PERCENT OPACITY	NA	NA	NA
FEED RATE, MTON/HR	ND	ND	ND

PARTICULATES - PROBE,CYC.FILTER CATCH

MG	134.9	147.3	182.6
MG/NCM -	57.5	45.6	58.5
MG/CM -	28.5	23.5	30.4
KG/HR -	1.3	1.0	1.4
KG/MTON FEED	ND	ND	ND

PARTICULATES - TOTAL CATCH

MG	134.9	147.3	182.6
MG/NCM -	57.5	45.6	58.5
MG/CM -	28.5	23.5	30.4
KG/HR -	1.3	1.0	1.4
KG/MTON FEED	ND	ND	ND

PERCENT IMPINGER CATCH	.0	.0	.0

NA = Not Applicable
ND = No Data

CERTAIN-TEED INLET RESULTS TP-3

	RUN NO.	1	2	3
	TEST DATE	9/9	9/11	9/12
	SAMPLING TIME, 24 HOUR CLOCK FROM	1809	1115	1401
	TO	2030	1543	1846
DN	SAMPLING NOZZLE DIAMETER, IN.	0.245	0.245	0.325
TT	NET TIME OF TEST, MIN.	120	120	120
PB	BAROMETRIC PRESSURE, IN. HG ABSOLUTE	29.64	29.37	29.54
PM	AVG. ORIFICE PRESSURE DROP, IN. H2O	0.58	0.59	1.90
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, DCF	52.8	56.1	95.8
TM	AVG. GAS METER TEMPERATURE, F	74	68	65
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS, DSCF	51.9	55.3	95.9
VW	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML	66.8	47.4	90.1
VWGAS	VOLUME OF H2O VAPOR COLLECTED, SCF	3.2	2.2	4.3
%M	PERCENT MOISTURE IN STACK GAS BY VOLUME	5.75	3.90	4.27
MD	MOLECULAR FRACTION OF DRY GAS	0.94	0.96	0.96
% CO2	VOLUME PERCENT DRY	0.1	0.1	0.1
% O2	VOLUME PERCENT DRY	20.8	20.8	20.8
% CO	VOLUME PERCENT DRY	0.1	0.1	0.1
% N2	VOLUME PERCENT DRY	79.0	79.0	79.0
% EA	PERCENT EXCESS AIR	37143	37143	37143
MWD	MOLECULAR WEIGHT OF STACK GAS, DRY BASIS	28.8	28.8	28.8
MW	MOLECULAR WEIGHT OF STACK GAS, WET BASIS	28.2	28.4	28.4
CP	PITOT TUBE COEFFICIENT	0.85	0.85	0.85
TS	AVG. STACK TEMPERATURE	214	194	202
NP	NET SAMPLING POINTS	40	40	40

CERTAIN-TEED INLET RESULTS TP-3

FORM NO 6413

	RUN NO.	1	2	3
	TEST DATE	9/9	9/11	9/12
	SAMPLING TIME, 24 HOUR CLOCK FROM	1859	1115	1401
	TO	2030	1543	1846
PST	STATIC PRESSURE OF STACK GAS, IN. HG.	-0.07	-0.07	-0.07
PS	STACK GAS PRESSURE, IN. HG ABS.	29.57	29.30	29.47
VS	STACK GAS VELOCITY AT STACK CONDITIONS, FPM	1785	1869	1886
AS	STACK AREA, SQ. IN.	707	707	707
QS	DRY STACK GAS VOLUMETRIC FLOW RATE AT STANDARD CONDITIONS, DSCFM	6414	6761	6981
QA	STACK GAS VOLUMETRIC FLOW RATE AT STACK CONDITIONS, ACFM	8757	8873	9251
% I	PERCENT ISOKINETIC	100.8	101.9	97.2
% O	PERCENT OPACITY	NA	NA	NA
TC	UNIT FEED RATE, TONS/HR	ND	ND	ND
MF	PARTICULATE--PROBE, CYCLONE, AND FILTER, MG	17274.7	610.5	2208.1
MT	PARTICULATE--TOTAL, MG	17274.7	610.5	2208.1
IC	PERCENT IMPINGER CATCH	.0	.0	.0
CAN	PARTICULATE--PROBE, CYCLONE, AND FILTER, GR/SCF	5.121	0.170	0.355
CAO	PARTICULATE--TOTAL, GR/SCF	5.121	0.170	0.355
CAT	PARTICULATE--PROBE, CYCLONE, AND FILTER, GR/ACF	3.748	0.129	0.267
CAU	PARTICULATE--TOTAL, GR/ACF	3.748	0.129	0.267
CAW	PARTICULATE--PROBE, CYCLONE, AND FILTER, LB/HR	281.52	9.85	21.22
CAX	PARTICULATE--TOTAL, LB/HR	281.52	9.85	21.22
PTF	PARTICULATE--PROBE, CYCLONE, AND FILTER, LB/TON FEED	ND	ND	ND
PTT	PARTICULATE--TOTAL, LB/TON FEED	ND	ND	ND

NA = Not Applicable
ND = No Data

CERTAIN-TEED INLET RESULTS TE-3

RUN NO.	1	2	3
TEST DATE	9/9	9/11	9/12
VOLUME OF GAS SAMPLED, DSCF	51.9	55.3	95.9
PERCENT MOISTURE BY VOLUME	5.7	3.9	4.3
AVERAGE STACK TEMPERATURE, F	214	194	202
STACK VOLUMETRIC FLOW RATE, DSCFM	6414	6761	6981
STACK VOLUMETRIC FLOW RATE, ACFM	8757	8873	9251
PERCENT ISOKINETIC	100.8	101.9	97.2
PERCENT EXCESS AIR	37143	37143	37143
PERCENT OPACITY	NA	NA	NA
FEED RATE, TONS/HR	ND	ND	ND

PARTICULATES - PROBE,CYC,FILTER CATCH

MG	17274.7	610.5	2208.1
GR/DSCF -	5.121	0.170	0.355
GR/ACF -	3.748	0.129	0.267
LB/HR -	281.5	9.8	21.2
LB/TON FEED	ND	ND	ND

PARTICULATES - TOTAL CATCH

MG	17274.7	610.5	2208.1
GR/DSCF -	5.121	0.170	0.355
GR/ACF -	3.748	0.129	0.267
LB/HR -	281.5	9.8	21.2
LB/TON FEED	ND	ND	ND

PERCENT IMPINGER CATCH	.0	.0	.0

NA = Not Applicable
ND = No Data

CERTAIN-TEED INLET RESULTS TP-3

FORM NO 6413

RUN NO.	1	2	3
TEST DATE	9/9	9/11	9/12
VOLUME OF GAS SAMPLED, NCM	1.47	1.56	2.70
PERCENT MOISTURE BY VOLUME	5.7	3.9	4.3
AVERAGE STACK TEMPERATURE, C	101	90	94
STACK VOLUMETRIC FLOW RATE, NCMM	180	190	196
STACK VOLUMETRIC FLOW RATE, CMM	247	250	260
PERCENT ISOKINETIC	100.8	101.9	97.2
PERCENT EXCESS AIR	37143	37143	37143
PERCENT OPACITY	NA	NA	NA
FEED RATE, MTON/HR	ND	ND	ND

PARTICULATES - PROBE,CYC,FILTER CATCH

MG	17274.7	610.5	2208.1
MG/NCM -	11763.2	390.4	814.8
MG/CM -	8608.9	297.3	614.4
KG/HR -	127.7	4.5	9.6
KG/MTON FEED	ND	ND	ND

PARTICULATES - TOTAL CATCH

MG	17274.7	610.5	2208.1
MG/NCM -	11763.2	390.4	814.8
MG/CM -	8608.9	297.3	614.4
KG/HR -	127.7	4.5	9.6
KG/MTON FEED	ND	ND	ND
PERCENT IMPINGER CATCH	.0	.0	.0

NA = Not Applicable
ND = No Data

CERTAIN-TEED OUTLET RESULTS TP-4

	RUN NO.	1	2	3
	TEST DATE	9/9/75	9/11	9/12
	SAMPLING TIME, 24 HOUR CLOCK FROM	1813	1115	1402
	TO	2115	1533	1904
DN	SAMPLING NOZZLE DIAMETER, IN.	0.375	0.375	0.375
TT	NET TIME OF TEST, MIN.	140	140	140
PB	BAROMETRIC PRESSURE, IN. HG ABSOLUTE	29.64	29.40	29.70
PM	AVG. ORIFICE PRESSURE DROP, IN. H2O	2.10	2.17	1.90
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, DCF	108.2	113.3	102.0
TM	AVG. GAS METER TEMPERATURE, F	62	67	70
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS, DSCF	109.3	112.5	101.6
VW	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML	112.0	72.2	62.8
VWGAS	VOLUME OF H2O VAPOR COLLECTED, SCF	5.3	3.4	3.0
%M	PERCENT MOISTURE IN STACK GAS BY VOLUME	4.63	2.95	2.85
MD	MOLECULAR FRACTION OF DRY GAS	0.95	0.97	0.97
% CO2	VOLUME PERCENT DRY	1.1	1.1	1.1
% O2	VOLUME PERCENT DRY	19.3	19.3	19.3
% CO	VOLUME PERCENT DRY	0.1	0.1	0.1
% N2	VOLUME PERCENT DRY	79.5	79.5	79.5
% EA	PERCENT EXCESS AIR	1143	1143	1143
MWD	MOLECULAR WEIGHT OF STACK GAS, DRY BASIS	28.9	28.9	28.9
MW	MOLECULAR WEIGHT OF STACK GAS, WET BASIS	28.4	28.6	28.6
CP	PITOT TUBE COEFFICIENT	0.85	0.85	0.85
TS	AVG. STACK TEMPERATURE	691	712	657
NP	NET SAMPLING POINTS	28	28	29

CERTAIN-TEED OUTLET RESULTS TP-4

	RUN NO.	1	2	3
	TEST DATE	9/9/75	9/11	9/12
	SAMPLING TIME, 24 HOUR CLOCK FROM	1813	1115	1402
	TO	2115	1533	1904
PST	STATIC PRESSURE OF STACK GAS, IN. HG.	.00	.00	.00
PS	STACK GAS PRESSURE, IN. HG ABS.	29.64	29.40	29.70
VS	STACK GAS VELOCITY AT STACK CONDITIONS, FPM	2311	2456	2248
AS	STACK AREA, SQ. IN.	1809	1809	1809
QS	DRY STACK GAS VOLUMETRIC FLOW RATE AT STANDARD CONDITIONS, DSCFM	12620	13298	12919
QA	STACK GAS VOLUMETRIC FLOW RATE AT STACK CONDITIONS, ACFM	29017	30841	28227
% I	PERCENT ISOKINETIC	101.0	99.0	91.7
% O	PERCENT OPACITY	NA	NA	NA
TC	UNIT FEED RATE, TONS/HR	ND	ND	ND
MF	PARTICULATE--PROBE, CYCLONE, AND FILTER, MG	57.7	50.3	89.5
MT	PARTICULATE--TOTAL, MG	57.7	50.3	89.5
IC	PERCENT IMPINGER CATCH	.0	.0	.0
CAN	PARTICULATE--PROBE, CYCLONE, AND FILTER, GR/SCF	0.008	0.007	0.014
CAO	PARTICULATE--TOTAL, GR/SCF	0.008	0.007	0.014
CAT	PARTICULATE--PROBE, CYCLONE, AND FILTER, GR/ACF	0.004	0.003	0.006
CAU	PARTICULATE--TOTAL, GR/ACF	0.004	0.003	0.006
CAW	PARTICULATE--PROBE, CYCLONE, AND FILTER, LB/HR	0.88	0.78	1.50
CAX	PARTICULATE--TOTAL, LB/HR	0.86	0.78	1.50
PTF	PARTICULATE--PROBE, CYCLONE, AND FILTER, LB/TON FEED	ND	ND	ND
PTT	PARTICULATE--TOTAL, LB/TON FEED	ND	ND	ND

NA = Not Applicable
ND = No Data

CERTAIN-TEED OUTLET RESULTS TP-4

FORM NO 6413

RUN NO.	1	2	3
TEST DATE	9/9/75	9/11	9/12
VOLUME OF GAS SAMPLED, DSCF	109.3	112.5	101.6
PERCENT MOISTURE BY VOLUME	4.6	3.0	2.8
AVERAGE STACK TEMPERATURE, F	691	712	657
STACK VOLUMETRIC FLOW RATE, DSCFM	12620	13298	12919
STACK VOLUMETRIC FLOW RATE, ACFM	29017	30841	28227
PERCENT ISOKINETIC	101.0	99.0	91.7
PERCENT EXCESS AIR	1143	1143	1143
PERCENT OPACITY	NA	NA	NA
FEED RATE, TONS/HR	ND	ND	ND
PARTICULATES - PROBE,CYC,FILTER CATCH			
MG	57.7	50.3	89.5
GR/DSCF -	0.008	0.007	0.014
GR/ACF -	0.004	0.003	0.006
LB/HR -	0.9	0.8	1.5
LB/TON FEED	ND	ND	ND
PARTICULATES - TOTAL CATCH			
MG	57.7	50.3	89.5
GR/DSCF -	0.008	0.007	0.014
GR/ACF -	0.004	0.003	0.006
LB/HR -	0.9	0.8	1.5
LB/TON FEED	ND	ND	ND
PERCENT IMPINGER CATCH	.0	.0	.0

NA = Not Applicable
ND = No Data

CERTAIN-TEED OUTLET RESULTS TP-4

RUN NO.	1	2	3
TEST DATE	9/9/75	9/11	9/12
VOLUME OF GAS SAMPLED, NCM	3.08	3.17	2.87
PERCENT MOISTURE BY VOLUME	4.6	3.0	2.8
AVERAGE STACK TEMPERATURE, C	366	377	347
STACK VOLUMETRIC FLOW RATE, NCMM	356	375	364
STACK VOLUMETRIC FLOW RATE, CMM	818	870	796
PERCENT ISOKINETIC	101.0	99.0	91.7
PERCENT EXCESS AIR	1143	1143	1143
PERCENT OPACITY	NA	NA	NA
FEED RATE, MTON/HR	ND	ND	ND
PARTICULATES - PROBE,CYC,FILTER CATCH			
MG	57.7	50.3	89.5
MG/NCM -	18.7	15.8	31.2
MG/CM -	8.1	6.8	14.2
KG/HR -	0.4	0.4	0.7
KG/MTON FEED	ND	ND	ND
PARTICULATES - TOTAL CATCH			
MG	57.7	50.3	89.5
MG/NCM -	18.7	15.8	31.2
MG/CM -	8.1	6.8	14.2
KG/HR -	0.4	0.4	0.7
KG/MTON FEED	ND	ND	ND
PERCENT IMPINGER CATCH	.0	.0	.0

NA = Not Applicable
ND = No Data

CERTAIN-TEED STORAGE VENT RESULTS TP-5

	RUN NO.	1	2	3	4
	TEST DATE	9/9	9/10	9/10	9/11
	SAMPLING TIME, 24 HOUR CLOCK FROM	1243	1105	1515	1643
	TO	1448	1308	1718	1847
DN	SAMPLING NOZZLE DIAMETER, IN.	0.430	0.430	0.370	0.370
TT	NET TIME OF TEST, MIN.	120	120	120	120
PB	BAROMETRIC PRESSURE, IN. HG ABSOLUTE	29.64	29.28	29.20	29.37
PM	AVG. ORIFICE PRESSURE DROP, IN. H2O	3.03	3.03	1.60	1.50
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, DCF	111.0	122.6	91.6	82.4
TM	AVG. GAS METER TEMPERATURE, F	75	80	80	61
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS, DSCF	109.6	118.6	88.0	82.5
VW	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML	36.2	57.2	55.9	20.7
VWGAS	VOLUME OF H2O VAPOR COLLECTED, SCF	1.7	2.7	2.6	1.0
%M	PERCENT MOISTURE IN STACK GAS BY VOLUME	1.54	2.24	2.92	1.17
MD	MOLECULAR FRACTION OF DRY GAS	0.98	0.98	0.97	0.99
% CO2	VOLUME PERCENT DRY	0.3	0.3	0.3	0.3
% O2	VOLUME PERCENT DRY	20.3	20.3	20.3	20.3
% CO	VOLUME PERCENT DRY	0.1	0.1	0.1	0.1
% N2	VOLUME PERCENT DRY	79.3	79.3	79.3	79.3
% EA	PERCENT EXCESS AIR	3196	3196	3196	3196
MWD	MOLECULAR WEIGHT OF STACK GAS, DRY BASIS	28.9	28.9	28.9	28.9
MW	MOLECULAR WEIGHT OF STACK GAS, WET BASIS	28.7	28.6	28.5	28.7
CP	PITOT TUBE COEFFICIENT	0.85	0.85	0.85	0.85
TS	AVG. STACK TEMPERATURE	130	134	129	122
NP	NET SAMPLING POINTS	24	24	24	24

CERTAIN-FEED STORAGE VENT RESULTS TF-5

FORM NO 6413

	RUN NO.	1	2	3	4
	TEST DATE	9/9	9/10	9/10	9/11
	SAMPLING TIME, 24 HOUR CLOCK FROM	1243	1105	1515	1643
	TO	1448	1308	1718	1847
PST	STATIC PRESSURE OF STACK GAS, IN. HG.	.00	.00	.00	.00
PS	STACK GAS PRESSURE, IN. HG ABS.	29.64	29.28	29.20	29.37
VS	STACK GAS VELOCITY AT STACK CONDITIONS, FPM	1045	1166	1159	1536
AS	STACK AREA, SQ. IN.	113	113	113	113
QS	DRY STACK GAS VOLUMETRIC FLOW RATE AT STANDARD CONDITIONS, DSCFM	719	776	775	714
QA	STACK GAS VOLUMETRIC FLOW RATE AT STACK CONDITIONS, ACFM	820	915	909	868
% I	PERCENT ISOKINETIC	98.6	98.7	99.2	101.6
% O	PERCENT OPACITY	NA	NA	NA	NA
TC	UNIT FEED RATE, TONS/HR	ND	ND	ND	ND
MF	PARTICULATE--PROBE, CYCLONE, AND FILTER, MG	49.0	1907.5	3078.4	1194.6
MT	PARTICULATE--TOTAL, MG	49.0	1907.5	3078.4	1194.6
IC	PERCENT IMPINGER CATCH	.0	.0	.0	.0
CAN	PARTICULATE--PROBE, CYCLONE, AND FILTER, GR/SCF	0.007	0.248	0.539	0.223
CAO	PARTICULATE--TOTAL, GR/SCF	0.007	0.248	0.539	0.223
CAT	PARTICULATE--PROBE, CYCLONE, AND FILTER, GR/ACF	0.006	0.211	0.459	0.197
CAU	PARTICULATE--TOTAL, GR/ACF	0.006	0.211	0.459	0.197
CAW	PARTICULATE--PROBE, CYCLONE, AND FILTER, LB/HR	0.04	1.65	3.58	1.36
CAX	PARTICULATE--TOTAL, LB/HR	0.04	1.65	3.58	1.36
PTF	PARTICULATE--PROBE, CYCLONE, AND FILTER, LB/TON FEED	ND	ND	ND	ND
PTT	PARTICULATE--TOTAL, LB/TON FEED	ND	ND	ND	ND

NA = Not Applicable
ND = No Data

CERTAIN-TEED STORAGE VENT RESULTS TE-E

RUN NO.	1	2	3	4
TEST DATE	9/9	9/10	9/10	9/11
VOLUME OF GAS SAMPLED, DSCF	109.6	118.6	88.0	82.5
PERCENT MOISTURE BY VOLUME	1.5	2.2	2.9	1.2
AVERAGE STACK TEMPERATURE, F	130	134	129	122
STACK VOLUMETRIC FLOW RATE, DSCFM	719	776	775	714
STACK VOLUMETRIC FLOW RATE, ACFM	820	910	909	808
PERCENT ISOKINETIC	98.6	98.7	99.2	101.0
PERCENT EXCESS AIR	3196	3196	3196	3196
PERCENT OPACITY	NA	NA	NA	NA
FEED RATE, TONS/HR	ND	ND	ND	ND

PARTICULATES - PROBE,CYC,FILTER CATCH

MG	49.0	1907.5	3078.4	1194.6
GR/DSCF -	0.007	0.248	0.539	0.223
GR/ACF -	0.006	0.211	0.459	0.197
LB/HR -	0.0	1.6	3.6	1.4
LB/TON FEED	ND	ND	ND	ND

PARTICULATES - TOTAL CATCH

MG	49.0	1907.5	3078.4	1194.6
GR/DSCF -	0.007	0.248	0.539	0.223
GR/ACF -	0.006	0.211	0.459	0.197
LB/HR -	0.0	1.6	3.6	1.4
LB/TON FEED	ND	ND	ND	ND
PERCENT IMPINGER CATCH	.0	.0	.0	.0

NA = Not Applicable
ND = No Data

CERTAIN-TEED STORAGE VENT RESULTS TF-E

FORM NO 6413

RUN NO.	1	2	3	4
TEST DATE	9/9	9/10	9/10	9/11
VOLUME OF GAS SAMPLED, NCM	3.09	3.34	2.48	2.33
PERCENT MOISTURE BY VOLUME	1.5	2.2	2.9	1.2
AVERAGE STACK TEMPERATURE, C	54	56	53	50
STACK VOLUMETRIC FLOW RATE, NCMM	20	21	21	20
STACK VOLUMETRIC FLOW RATE, CMM	23	25	25	22
PERCENT ISOKINETIC	98.6	98.7	99.2	101.0
PERCENT EXCESS AIR	3196	3196	3196	3196
PERCENT OPACITY	NA	NA	NA	NA
FEED RATE, MTON/HR	ND	ND	ND	ND

PARTICULATES - PROBE,CYC,FILTER CATCH

MG	49.0	1907.5	3078.4	1194.6
MG/NCM -	15.8	569.1	1237.1	512.0
MG/CM -	13.8	485.1	1053.9	451.8
KG/HR -	0.0	0.7	1.6	0.6
KG/MTON FEED	ND	ND	ND	ND

PARTICULATES - TOTAL CATCH

MG	49.0	1907.5	3078.4	1194.6
MG/NCM -	15.8	569.1	1237.1	512.0
MG/CM -	13.8	485.1	1053.9	451.8
KG/HR -	0.0	0.7	1.6	0.6
KG/MTON FEED	ND	ND	ND	ND
PERCENT IMPINGER CATCH	.0	.0	.0	.0

NA = Not Applicable
ND = No Data

Sample Particulate Calculations

1. Volume of dry gas sampled at standard conditions[a], dscf

$$V_{m_{std}} = \frac{17.7 \times V_m (P_b + \frac{P_m}{13.6})}{(T_m + 460)} = \frac{17.7 \times 90.8\ (29.64 + \frac{1.10}{13.6})}{(\ 70 + 460)} = 90.1 \quad \text{dscf}$$

2. Volume of water vapor at standard conditions, scf

$$V_{w_{gas}} = 0.0474 \times V_w = 0.0474 \times 58.8 = 2.8 \quad \text{scf}$$

3. Moisture in stack gas, percent

$$\%M = \frac{100 \times V_{w_{gas}}}{V_{m_{std}} + V_{w_{gas}}} = \frac{100 \times 2.8}{90.1 + 2.8} = 3.0$$

4. Mole fraction of dry gas

$$M_d = \frac{100 - \%M}{100} = \frac{100 - 3.0}{100} = 0.97$$

5. Molecular weight of dry stack gas

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

$$(0.1 \times \frac{44}{100}) + (20.8 \times \frac{32}{100}) + 79.0 \times \frac{28}{100}) = 28.8$$

6. Molecular weight of wet stack gas

$$MW = MW_d \times M_d + 18(1 - M_d) = 28.8 \times 0.97 + 18(1 - 0.97) = 28.5$$

(a) Standard conditions at 70 F, 29.92 in. Hg.

7. Stack gas velocity at stack conditions[b], fpm

$$V_s = 4{,}360 \sqrt{\Delta P_s \times (T_s + 460)} \quad \frac{1}{P_s \times MW}^{1/2} =$$

$$4{,}360 \times 12.295 \left[\frac{1}{29.57 \times 28.5}\right]^{1/2} = 1842 \text{ fpm}$$

8. Stack gas volumetric flow rate at standard conditions, dscfm

$$Q_s = \frac{0.123 \times V_s \times A_s \times M_d \times P_s}{T_s + 460} = \frac{0.123 \times 1842 \times 707 \times 0.97 \times 29.57}{111 + 460}$$

$$= 8043 \text{ dscfm}$$

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

$$Q_a = \frac{0.05645 \times Q_s (T_s + 460)}{P_s \times M_d} = \frac{0.05645 \times 8043 \ (111 + 460)}{29.57 \times 0.97} = 9035 \text{ acfm}$$

10. Percent isokinetic

$$\%I = \frac{1{,}032 \ (T_s + 460) \times V_{m_{std}}}{V_s \times T_t \times P_s \times M_d \times (D_n)^2} = \frac{1{,}032 \ (111 + 460) \times 90.1}{1842 \times 144 \times 29.57 \times 0.97 \times (0.270)^2}$$

$$=$$

11. Particulate concentration based on probe, cyclone, and filter catch, gr/dscf

$$C_{an} = 0.0154 \times \frac{m_f}{V_{m_{std}}} = 0.0154 \times \frac{1210.7}{90.1} = 0.207 \quad \text{gr/dscf}$$

12. Particulate concentration based on total catch, gr/dscf

$$C_{ao} = 0.0154 \times \frac{m_t}{V_{m_{std}}} = 0.0154 \times \frac{1210.7}{90.1} = 0.207 \quad \text{gr/dscf}$$

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

13. Particulate concentration based on probe, cyclone, and filter catch, at stack conditions, gr/acf

$$C_{at} = \frac{17.7 \times C_{an} \times P_s \times M_d}{(T_s + 460)} = \frac{17.7 \times 0.207 \times 29.57 \times 0.97}{(111 + 460)} = 0.184 \text{ gr/acf}$$

14. Particulate concentration based on total catch, at stack conditions, gr/acf

$$C_{au} = \frac{17.7 \times C_{ao} \times P_s \times M_d}{(T_s + 460)} = \frac{17.7 \times 0.207 \times 29.57 \times 0.97}{(111 + 460)} = 0.184 \text{ gr/acf}$$

15. Particulate emissions based on probe, cyclone, and filter catch, lb/hr

$$C_{aw} = 0.00857 \times C_{an} \times Q_s = 0.00857 \times 0.207 \times 8043 = 14.26 \text{ lb/hr}$$

16. Particulate emissions based on total catch, lb/hr

$$C_{ax} = 0.00857 \times C_{ao} \times Q_s = 0.00857 \times 0.207 \times 8043 = 14.26 \text{ lb/hr}$$

APPENDIX D

GASEOUS HYDROCARBON FIELD DATA AND
CALCULATED EMISSIONS AT EACH SAMPLING POINT

Tabulated Data	D-1
Calculation Procedures	D-14
Copies of Field Chart	D-17

CERTAIN-TEED SHAKOPEE,MINN TP-1 RUN NO 1 INLET 9/9/75
DATA AVERAGED DURING 4 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	ND	ND	ND	ND	218	ND
2	ND	ND	ND	ND	194	ND
3	ND	ND	ND	ND	194	ND
4	ND	ND	ND	ND	189	ND
5	ND	ND	ND	ND	184	ND
6	ND	ND	ND	ND	226	ND
7	ND	ND	ND	ND	213	ND
8	ND	ND	ND	ND	210	ND
9	ND	ND	ND	ND	205	ND
10	ND	ND	ND	ND	205	ND
11	ND	ND	ND	ND	204	ND
12	ND	ND	ND	ND	214	ND
13	ND	ND	ND	ND	222	ND
14	1924	50.0	67.0	54.5	230	.03
15	1928	69.0	81.0	76.6	243	.05
16	1932	56.5	60.0	58.0	239	.03
17	1936	52.4	54.7	52.6	218	.03
18	1939	51.5	53.0	52.2	219	.03
19	ND	ND	ND	ND	247	ND
20	ND	ND	ND	ND	246	ND
21	ND	ND	ND	ND	246	ND
22	ND	ND	ND	ND	246	ND
23	ND	ND	ND	ND	242	ND
24	2003	78.8	87.0	84.0	242	.05
25	2007	79.5	80.2	79.9	238	.05
26	2011	76.8	80.0	78.7	234	.05
27	2015	77.4	79.2	78.4	226	.04
28	2019	78.5	79.5	78.9	217	.04
29	ND	ND	ND	ND	208	ND
30	ND	ND	ND	ND	217	ND
31	ND	ND	ND	ND	217	ND
32	2034	80.5	88.0	84.4	226	.05
33	2038	67.0	78.0	72.1	243	.04
34	2042	70.5	77.0	74.6	250	.05
35	ND	ND	ND	ND	250	ND
36	ND	ND	ND	ND	242	ND
AVG		68.3	74.2	71.1	224	.04

WT. AVG (BASED ON 13 VALID READINGS) 71.3 PPM

TOTAL VOLUME, DSCFM 8064

GASEOUS EMISSION DATA: (GR/DSCF) .021

(LBS/HR) 1.45

(KG/HR) .66

CERTAIN-TEED SHAKOPEE, MINN TP-1 RUN NO 2 INLET 9/11/75
DATA AVERAGED DURING 4 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	ND	ND	ND	ND	209	ND
2	ND	ND	ND	ND	192	ND
3	ND	ND	ND	ND	224	ND
4	ND	ND	ND	ND	226	ND
5	ND	ND	ND	ND	222	ND
6	ND	ND	ND	ND	214	ND
7	ND	ND	ND	ND	201	ND
8	ND	ND	ND	ND	201	ND
9	ND	ND	ND	ND	197	ND
10	ND	ND	ND	ND	192	ND
11	1327	76.8	81.0	79.3	192	.04
12	1331	76.5	78.0	77.2	200	.04
13	1335	76.5	76.8	76.6	215	.04
14	1339	73.2	75.0	74.2	218	.04
15	1343	72.5	73.2	72.8	229	.04
16	1347	72.2	72.5	72.4	229	.04
17	ND	ND	ND	ND	214	ND
18	ND	ND	ND	ND	206	ND
19	ND	ND	ND	ND	209	ND
20	1423	58.3	60.0	59.0	209	.03
21	1427	60.6	62.5	61.1	227	.04
22	1431	49.0	62.3	58.1	237	.04
23	1435	44.3	45.7	45.2	239	.03
24	ND	ND	ND	ND	233	ND
25	ND	ND	ND	ND	223	ND
26	ND	ND	ND	ND	216	ND
27	ND	ND	ND	ND	200	ND
28	ND	ND	ND	ND	210	ND
29	ND	ND	ND	ND	210	ND
30	ND	ND	ND	ND	209	ND
31	ND	ND	ND	ND	209	ND
32	ND	ND	ND	ND	210	ND
33	ND	ND	ND	ND	208	ND
34	ND	ND	ND	ND	204	ND
35	1522	69.5	80.7	76.8	200	.04
36	1526	60.6	66.0	63.7	201	.03
AVG		65.8	69.5	68.0	212	.04

WT. AVG (BASED ON 12 VALID READINGS) 67.6

GASEOUS EMISSION DATA: (GR/DSCF) .020

(LBS/HR) 1.28

(KG/HR) .58

CERTAIN-TEED SHAKOPEE,MINN TP-1 RUN NO 3 INLET 9/12/75
DATA AVERAGED DURING 4 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	ND	ND	ND	ND	222	ND
2	1408	47.2	53.0	50.4	214	.03
3	1412	53.6	54.0	53.8	214	.03
4	1416	55.0	56.2	55.5	225	.03
5	1420	54.8	55.4	55.1	221	.03
6	ND	ND	ND	ND	210	ND
7	ND	ND	ND	ND	198	ND
8	ND	ND	ND	ND	198	ND
9	ND	ND	ND	ND	206	ND
10	ND	ND	ND	ND	202	ND
11	1628	74.8	76.5	75.7	202	.04
12	1632	75.5	76.5	76.1	209	.04
13	ND	ND	ND	ND	221	ND
14	ND	ND	ND	ND	235	ND
15	ND	ND	ND	ND	242	ND
16	1735	66.0	67.4	66.9	234	.04
17	1739	65.4	68.0	67.0	223	.04
18	1743	67.7	69.0	68.4	212	.04
19	ND	ND	ND	ND	241	ND
20	ND	ND	ND	ND	240	ND
21	ND	ND	ND	ND	246	ND
22	ND	ND	ND	ND	246	ND
23	ND	ND	ND	ND	246	ND
24	ND	ND	ND	ND	232	ND
25	ND	ND	ND	ND	234	ND
26	ND	ND	ND	ND	202	ND
27	ND	ND	ND	ND	212	ND
28	1823	74.5	76.0	75.2	217	.04
29	1827	73.5	74.2	74.0	217	.04
30	1831	74.5	77.0	75.8	217	.04
31	1835	77.2	77.6	77.4	217	.04
32	1839	77.5	77.6	77.5	217	.04
33	ND	ND	ND	ND	217	ND
34	ND	ND	ND	ND	219	ND
35	ND	ND	ND	ND	208	ND
36	ND	ND	ND	ND	206	ND
AVG		66.9	68.5	67.8	220	.04

WT. AVG (BASED ON 14 VALID READINGS) 67.7

GASEOUS EMISSION DATA: (GR/DSCF) .020

(LBS/HR) 1.33

(KG/HR) .60

CERTAIN-TEED SHAKOPEE,MINN TP-2 RUN NO 1 OUTLET 9/9/75
DATA AVERAGED DURING 5 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	1813	84.0	90.0	87.5	436	.10
2	1818	84.0	89.0	86.2	460	.11
3	1823	85.0	88.5	86.8	484	.11
4	1828	87.0	89.0	88.0	482	.11
5	1833	85.0	92.0	88.3	492	.12
6	1900	50.5	54.5	52.3	501	.07
7	1905	53.5	55.2	54.2	501	.07
8	1907	54.5	55.0	54.8	502	.07
9	1910	55.0	55.0	55.0	485	.07
10	1918	55.0	59.0	57.5	482	.07
11	1923	51.5	56.0	48.0	508	.06
12	1928	50.0	56.2	53.9	497	.07
13	1933	48.5	51.5	50.5	492	.07
14	1938	50.5	56.2	53.5	402	.06
1	1951	69.5	75.0	73.0	439	.09
2	1956	68.5	71.0	69.5	484	.09
3	2001	67.5	68.0	67.7	495	.09
4	2006	64.0	65.2	64.7	507	.09
5	2011	63.5	66.0	64.8	506	.09
6	2016	62.5	67.0	64.8	481	.08
7	2021	64.0	68.0	66.3	456	.08
8	2026	63.0	64.5	63.8	503	.09
9	2031	62.3	63.0	62.8	501	.08
10	2036	58.7	62.5	61.1	502	.08
11	2041	57.0	63.0	60.7	512	.08
12	2046	59.0	62.0	60.3	500	.08
13	2051	60.0	63.5	61.7	494	.08
14	2056	63.0	67.0	65.5	473	.08
AVG		63.4	66.9	65.1	484	.08

WT. AVG (BASED ON 28 VALID READINGS) 64.9

GASEOUS EMISSION DATA: (GR/DSCF) .019

(LBS/HR) 2.19

(KG/HR) .99

CERTAIN-TEED SHAKOPEE,MINN TP-2 RUN NO 2 OUTLET 9/11/75
DATA AVERAGED DURING 5 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	ND	ND	ND	ND	365	ND
2	ND	ND	ND	ND	467	ND
3	1257	26.5	29.0	27.5	483	.04
4	1302	25.0	28.0	26.5	472	.03
5	1307	31.0	31.5	31.3	421	.04
6	1312	25.5	27.0	26.3	474	.03
7	1317	24.0	24.5	24.3	488	.03
8	1322	23.0	24.0	23.5	500	.03
9	1327	21.0	26.0	23.0	502	.03
10	1332	23.0	23.5	23.3	506	.03
11	1337	22.0	25.0	23.6	503	.03
12	1342	24.5	27.5	25.7	493	.03
13	1347	24.5	27.0	25.7	499	.03
14	ND	ND	ND	ND	470	ND
1	1423	30.5	32.0	31.5	415	.03
2	1428	27.0	30.0	28.2	452	.03
3	1433	26.0	28.5	27.2	466	.03
4	1438	22.5	25.0	23.8	478	.03
5	1443	21.5	23.5	22.5	479	.03
6	1448	21.0	22.5	22.0	490	.03
7	1453	21.0	24.0	22.5	488	.03
8	1458	23.5	27.0	25.3	486	.03
9	1503	23.0	25.0	24.2	497	.03
10	1508	23.0	24.0	23.5	509	.03
11	1513	21.0	22.0	21.7	519	.03
12	1518	23.5	26.0	24.3	510	.03
13	1523	27.0	28.5	27.5	500	.04
14	1528	25.5	29.5	27.2	478	.03
AVG		24.2	26.4	25.3	478	.03

WT. AVG (BASED ON 25 VALID READINGS) 25.2

GASEOUS EMISSION DATA: (GR/DSCF) .007

(LBS/HR) .84

(KG/HR) .38

CERTAIN-TEED SHAKOPEE,MINN TP-3 RUN NO 1 INLET 9/9/75
DATA AVERAGED DURING 3 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	ND	ND	ND	ND	159	ND
2	ND	ND	ND	ND	159	ND
3	ND	ND	ND	ND	171	ND
4	1823	265.0	285.0	277.0	171	.13
5	1826	255.0	258.0	266.0	167	.12
6	1829	260.0	265.0	262.0	167	.12
7	1832	260.0	262.0	261.0	159	.11
8	ND	ND	ND	ND	159	ND
9	ND	ND	ND	ND	150	ND
10	ND	ND	ND	ND	148	ND
11	ND	ND	ND	ND	160	ND
12	ND	ND	ND	ND	160	ND
13	ND	ND	ND	ND	155	ND
14	ND	ND	ND	ND	163	ND
15	ND	ND	ND	ND	174	ND
16	ND	ND	ND	ND	174	ND
17	ND	ND	ND	ND	178	ND
18	ND	ND	ND	ND	178	ND
19	ND	ND	ND	ND	167	ND
20	ND	ND	ND	ND	163	ND
21	ND	ND	ND	ND	173	ND
22	ND	ND	ND	ND	176	ND
23	ND	ND	ND	ND	176	ND
24	1944	102.0	124.0	112.0	183	.05
25	1947	128.0	130.0	129.0	183	.06
26	1950	130.0	132.0	131.0	172	.06
27	1953	130.0	132.0	131.0	167	.06
28	1956	132.0	135.0	134.0	159	.06
29	1959	135.0	135.0	135.0	151	.05
30	ND	ND	ND	ND	151	ND
31	ND	ND	ND	ND	159	ND
32	ND	ND	ND	ND	167	ND
33	ND	ND	ND	ND	160	ND
34	ND	ND	ND	ND	164	ND
35	ND	ND	ND	ND	164	ND
36	ND	ND	ND	ND	160	ND
37	ND	ND	ND	ND	156	ND
38	2023	102.0	122.0	113.0	139	.04
39	2026	120.0	130.0	125.0	139	.05
40	2029	130.0	135.0	133.0	139	.05
AVG		166.1	173.5	169.9	163	.07

WT. AVG (BASED ON 13 VALID READINGS) 171.2

GASEOUS EMISSION DATA: (GR/DSCF) .053

(LBS/HR) 2.77

(KG/HR) 1.26

CERTAIN-TEED SHAKOPEE,MINN TP-3 RUN NO 2 INLET 9/11/75
DATA AVERAGED DURING 3 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	ND	ND	ND	ND	164	ND
2	ND	ND	ND	ND	164	ND
3	ND	ND	ND	ND	170	ND
4	ND	ND	ND	ND	179	ND
5	ND	ND	ND	ND	176	ND
6	ND	ND	ND	ND	176	ND
7	1259	105.0	110.0	107.7	168	.05
8	1302	112.0	112.0	112.0	164	.05
9	1305	113.0	115.0	114.0	155	.05
10	1308	116.0	118.0	117.0	155	.05
11	1311	118.0	120.0	119.0	159	.05
12	1314	121.0	123.0	122.0	154	.05
13	1317	120.0	120.0	120.0	166	.05
14	1320	120.0	123.0	121.0	166	.05
15	ND	ND	ND	ND	177	ND
16	ND	ND	ND	ND	177	ND
17	ND	ND	ND	ND	181	ND
18	ND	ND	ND	ND	181	ND
19	ND	ND	ND	ND	174	ND
20	ND	ND	ND	ND	166	ND
21	ND	ND	ND	ND	181	ND
22	ND	ND	ND	ND	188	ND
23	ND	ND	ND	ND	184	ND
24	ND	ND	ND	ND	195	ND
25	ND	ND	ND	ND	191	ND
26	ND	ND	ND	ND	187	ND
27	ND	ND	ND	ND	176	ND
28	1503	108.0	110.0	109.3	171	.05
29	1506	108.0	110.0	108.7	158	.05
30	1509	84.0	108.0	95.5	162	.04
31	1512	80.0	100.0	90.0	168	.04
32	1515	102.0	108.0	105.3	167	.05
33	ND	ND	ND	ND	170	ND
34	ND	ND	ND	ND	170	ND
35	ND	ND	ND	ND	173	ND
36	ND	ND	ND	ND	173	ND
37	ND	ND	ND	ND	170	ND
38	ND	ND	ND	ND	166	ND
39	ND	ND	ND	ND	158	ND
40	ND	ND	ND	ND	158	ND
AVG		108.2	113.6	110.9	170	.05

WT. AVG (BASED ON 13 VALID READINGS) 110.8

GASEOUS EMISSION DATA: (GR/DSCF) .033

(LBS/HR) 1.87

(KG/HR) .85

CERTAIN-TEED SHAKOPEE,MINN TP-3 RUN NO 3 INLET 9/12/75
DATA AVERAGED DURING 3 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	ND	ND	ND	ND	164	ND
2	ND	ND	ND	ND	172	ND
3	ND	ND	ND	ND	166	ND
4	ND	ND	ND	ND	174	ND
5	ND	ND	ND	ND	174	ND
6	ND	ND	ND	ND	170	ND
7	ND	ND	ND	ND	166	ND
8	ND	ND	ND	ND	162	ND
9	ND	ND	ND	ND	178	ND
10	1618	112.0	115.0	113.3	178	.05
11	1621	120.0	120.0	120.0	178	.06
12	1624	123.0	124.0	123.3	177	.06
13	1627	114.0	122.0	118.0	177	.06
14	ND	ND	ND	ND	181	ND
15	ND	ND	ND	ND	188	ND
16	ND	ND	ND	ND	198	ND
17	ND	ND	ND	ND	195	ND
18	ND	ND	ND	ND	203	ND
19	ND	ND	ND	ND	197	ND
20	ND	ND	ND	ND	179	ND
21	ND	ND	ND	ND	182	ND
22	1754	95.0	100.0	98.3	189	.05
23	1757	100.0	104.0	102.0	196	.05
24	1800	105.0	108.0	107.0	195	.06
25	1803	108.0	110.0	109.0	191	.06
26	1806	110.0	110.0	110.0	185	.05
27	1809	110.0	110.0	110.0	177	.05
28	1812	110.0	110.0	110.0	177	.05
29	1815	110.0	110.0	110.0	166	.05
30	ND	ND	ND	ND	166	ND
31	ND	ND	ND	ND	170	ND
32	ND	ND	ND	ND	170	ND
33	ND	ND	ND	ND	170	ND
34	ND	ND	ND	ND	170	ND
35	ND	ND	ND	ND	173	ND
36	ND	ND	ND	ND	177	ND
37	ND	ND	ND	ND	173	ND
38	ND	ND	ND	ND	166	ND
39	ND	ND	ND	ND	149	ND
40	ND	ND	ND	ND	149	ND
AVG		109.8	111.9	110.9	176	.05

WT. AVG (BASED ON 12 VALID READINGS) 110.7

GASEOUS EMISSION DATA: (GR/DSCF) .033

(LBS/HR) 1.94

(KG/HR) .88

CERTAIN-TEED SHAKOPEE,MINN TP-4 RUN NO 1 OUTLET 9/9/75
DATA AVERAGED DURING 5 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	1815	81.6	85.5	83.7	373	.08
2	1820	82.0	83.5	83.0	405	.09
3	1825	80.5	85.0	82.6	440	.10
4	1830	81.0	87.0	84.0	459	.10
5	ND	ND	ND	ND	458	ND
6	1902	74.8	77.0	75.7	468	.09
7	1907	76.2	77.8	77.2	468	.10
8	1912	78.0	84.0	80.3	478	.10
9	1917	80.6	83.5	82.0	465	.10
10	1922	65.0	84.5	74.8	464	.09
11	1927	64.5	86.0	77.2	481	.10
12	1932	60.0	72.5	64.2	480	.08
13	1937	58.5	61.0	59.5	460	.07
14	1941	60.2	73.0	66.7	443	.08
15	2007	74.0	75.2	74.5	365	.07
16	2012	76.0	79.8	77.8	426	.09
17	2017	78.2	80.8	79.3	472	.10
18	2022	81.5	84.0	82.6	471	.10
19	2027	81.2	85.0	83.5	471	.10
20	2032	80.0	85.5	82.9	470	.10
21	2037	73.0	84.2	79.7	482	.10
22	2042	66.3	83.0	74.6	483	.10
23	2047	81.2	82.8	82.1	482	.11
24	2052	74.0	84.5	81.0	472	.10
25	2057	83.0	84.2	83.7	482	.11
26	2102	64.5	82.7	75.7	472	.10
27	2107	64.3	80.0	73.9	463	.09
28	2112	82.0	85.0	83.7	426	.10
AVG		74.2	81.4	78.0	456	.09

WT. AVG (BASED ON 27 VALID READINGS) 78.0

GASEOUS EMISSION DATA: (GR/DSCF) .024

(LBS/HR) 2.47

(KG/HR) 1.12

CERTAIN-TEED SHAKOPEE,MINN TP-4 RUN NO 2 OUTLET 9/11/75
DATA AVERAGED DURING 5 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	ND	ND	ND	ND	430	ND
2	ND	ND	ND	ND	447	ND
3	ND	ND	ND	ND	468	ND
4	1304	84.0	90.0	87.0	476	.11
5	1309	82.5	86.0	84.2	498	.11
6	1314	84.2	89.5	86.7	497	.11
7	1319	83.0	88.0	85.9	498	.11
8	1324	83.0	87.2	85.1	487	.11
9	1329	81.5	84.5	83.3	490	.11
10	1334	85.0	86.5	85.8	500	.11
11	1339	81.0	87.0	84.2	491	.11
12	1344	83.0	87.0	84.3	502	.11
13	1349	79.0	89.5	84.7	484	.11
14	ND	ND	ND	ND	466	ND
15	ND	ND	ND	ND	442	ND
16	1431	75.0	76.5	75.8	431	.09
17	1436	59.5	71.0	63.7	470	.08
18	1441	59.0	66.0	61.7	479	.08
19	1446	57.0	61.5	59.0	488	.08
20	1451	56.5	62.0	60.0	496	.08
21	1456	63.0	75.5	70.8	497	.09
22	1501	71.5	82.0	77.2	488	.10
23	1506	79.0	80.5	79.8	487	.10
24	1511	68.0	83.0	75.3	489	.10
25	1516	71.0	80.5	77.2	500	.10
26	1521	81.4	87.5	84.0	490	.11
27	1526	72.5	86.0	78.5	470	.10
28	1531	69.5	72.5	70.7	445	.08
AVG		74.3	80.9	77.6	478	.10

WT. AVG (BASED ON 23 VALID READINGS) 77.7

GASEOUS EMISSION DATA: (GR/DSCF) .023

(LBS/HR) 2.58

(KG/HR) 1.17

CERTAIN-TEED SHAKOPEE,MINN TP-4 RUN NO 3 OUTLET 9/12/75
DATA AVERAGED DURING 5 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	ND	ND	ND	ND	417	ND
2	1410	65.0	67.5	66.2	462	.08
3	1415	64.0	66.0	65.0	472	.08
4	1420	64.0	65.5	64.8	483	.08
5	ND	ND	ND	ND	492	ND
6	1616	66.0	68.0	67.0	471	.08
7	1621	68.5	72.0	69.8	385	.07
8	1626	61.0	65.0	63.3	460	.08
9	1731	65.0	69.5	67.3	470	.08
10	ND	ND	ND	ND	483	ND
11	ND	ND	ND	ND	483	ND
12	ND	ND	ND	ND	481	ND
13	ND	ND	ND	ND	487	ND
14	ND	ND	ND	ND	473	ND
AVG		64.8	67.6	66.2	465	.08

WT. AVG (BASED ON 7 VALID READINGS) 66.1

GASEOUS EMISSION DATA: (GR/DSCF) .020

(LBS/HR) 2.14

(KG/HR) .97

CERTAIN-TEED SHAKOPEE,MINN TP-5 RUN NO 2 STORAGE VENT 9/10/75
DATA AVERAGED DURING 15 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVD MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	1112	250.0	320.0	296.0	77	.06
2	1127	330.0	355.0	345.0	88	.08
3	1142	278.0	332.0	303.0	89	.07
4	1157	405.0	625.0	542.0	89	.13
1	1215	645.0	685.0	668.0	85	.15
2	1230	460.0	605.0	533.0	92	.13
3	1246	90.0	135.0	110.0	129	.04
4	1301	75.0	85.0	79.0	121	.03
AVG		316.6	392.8	359.5	96	.09

WT. AVG (BASED ON 8 VALID READINGS) 335.0

GASEOUS EMISSION DATA: (GR/DSCF) .099

(LBS/HR) .64

(KG/HR) .29

CERTAIN-TEED SHAKOPEE,MINN TP-5 RUN NO 3 STORAGE VENT 9/10/75
DATA AVERAGED DURING 15 MINUTE INTERVAL

SAMPLE POINT	MEAN TIME	HYDROCARBON, PPMVOL MIN	MAX	AVG	VOL DSCFM	HC LB/HR
1	ND	ND	ND	ND	83	ND
2	1538	403.0	450.0	427.0	96	.11
3	1553	455.0	505.0	479.0	98	.13
4	1618	515.0	550.0	531.0	96	.14
5	1625	280.0	520.0	414.0	94	.10
6	1641	480.0	570.0	540.0	99	.14
7	1656	275.0	412.0	334.0	108	.10
8	1711	235.0	258.0	244.0	109	.07
AVG		377.6	466.4	424.1	97	.11

WT. AVG (BASED ON 7 VALID READINGS) 419.9

GASEOUS EMISSION DATA: (GR/DSCF) .125

(LBS/HR) .81

(KG/HR) .37

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

Weighted average hydrocarbon concentrations were calculated for each run using the following procedure

$$\text{weighted average} = \overline{HC} = \frac{\sum_{i=1}^{n} (HC_{ave_i} \cdot Vol_i)}{\sum_{i=1}^{n} (Vol_i)}$$

where HC_{ave_i} = average hydrocarbon concentration at the i th sampling point.

In the above calculation volume flow data were involved for only those sampling points for which hydrocarbon data were available. Using the weighted average hydrocarbon value, the total mass of hydrocarbon emissions was calculated as follows:

$$\text{Total emissions (lb/hr)} = \overline{HC}\ (\text{ppm, dry}) \cdot Vol_{ave,\ dry}\ (ft^3/min) \cdot 2.4836 \cdot 10^{-6}\ \left(\frac{min \cdot lb}{ft^3\ hr}\right)$$

where $\overline{HC}$ ppm, dry = $\overline{HC}$ ppm · 1.018[a]

$\overline{HC}$ ppm = weighted average hydrocarbon concentration (as measured)

$Vol_{ave,\ dry}$ = arithmetic average volume flow (dscfm) for all sample

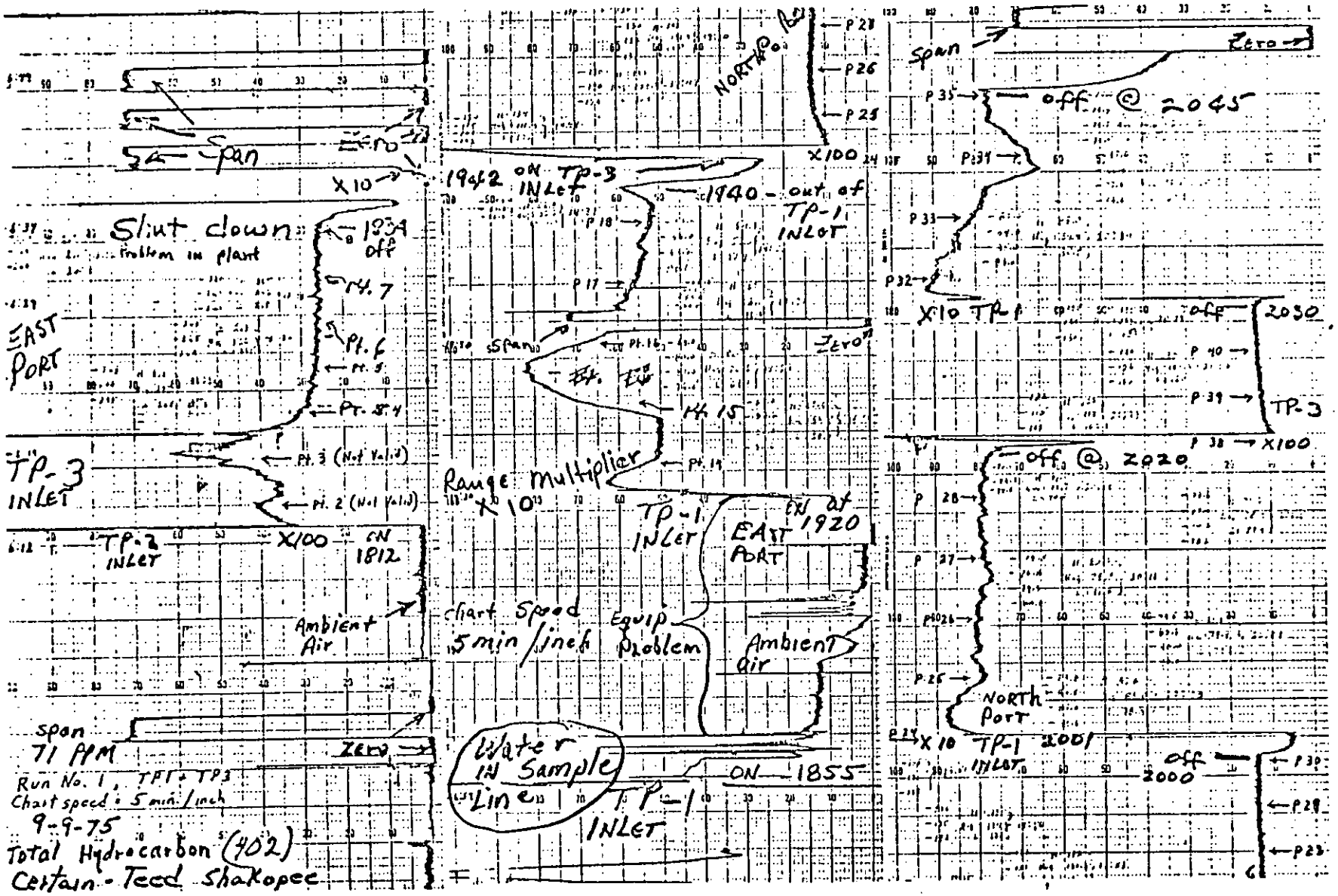
(a) The ratio of the specific volume of moist air (saturated at 15.5 C) to that of dry air is 1.018 (both of 21.1 C and 29.92 inches of mercury).

points times the number of sampling points (flow values for each segment are determined from pilot tube and thermocouple readings, stack moisture values from Method 5, and segment areas).

and $2.4836 \cdot 10^{-6}$ is derived from

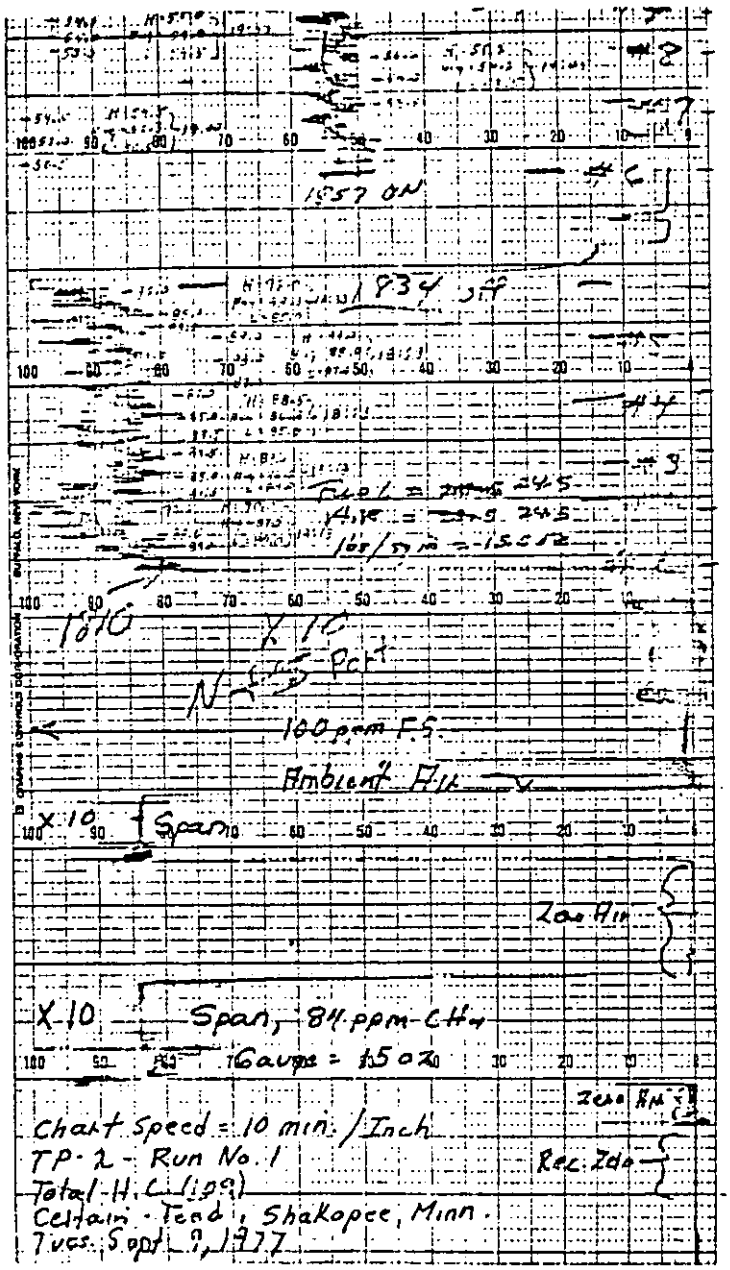
$$\frac{60\ (\text{min/hr}) \cdot 28.317\ (1/\text{ft}^3) \cdot 16\ (\text{g molecular weight of } CH_4)}{22.4\ (\text{l/gram molecular weight at } 0^\circ\text{C}) \cdot 453.59\ (\text{g/lb}) \cdot 10^6} \cdot \frac{273}{294.1}$$

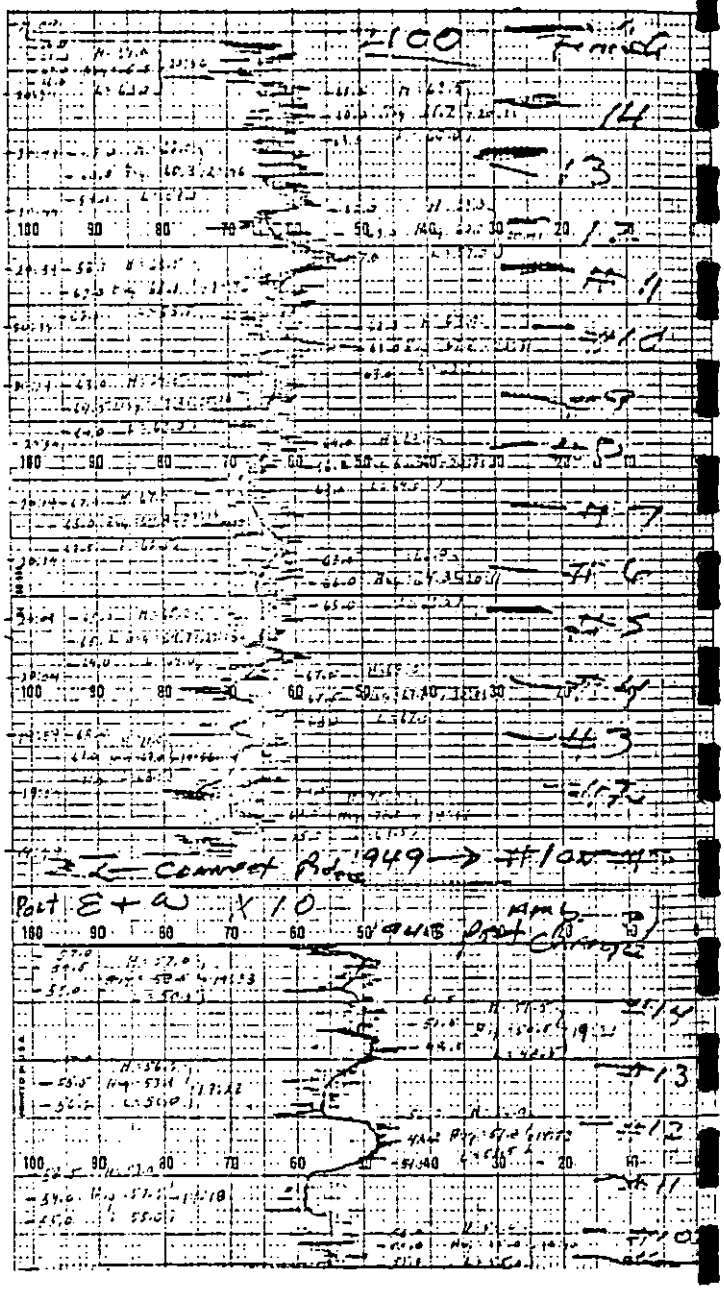
Hydrocarbon emissions at each sampling point (or segment) are calculated in the same manner except that average hydrocarbon concentrations and flow values for only that point are used.



FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

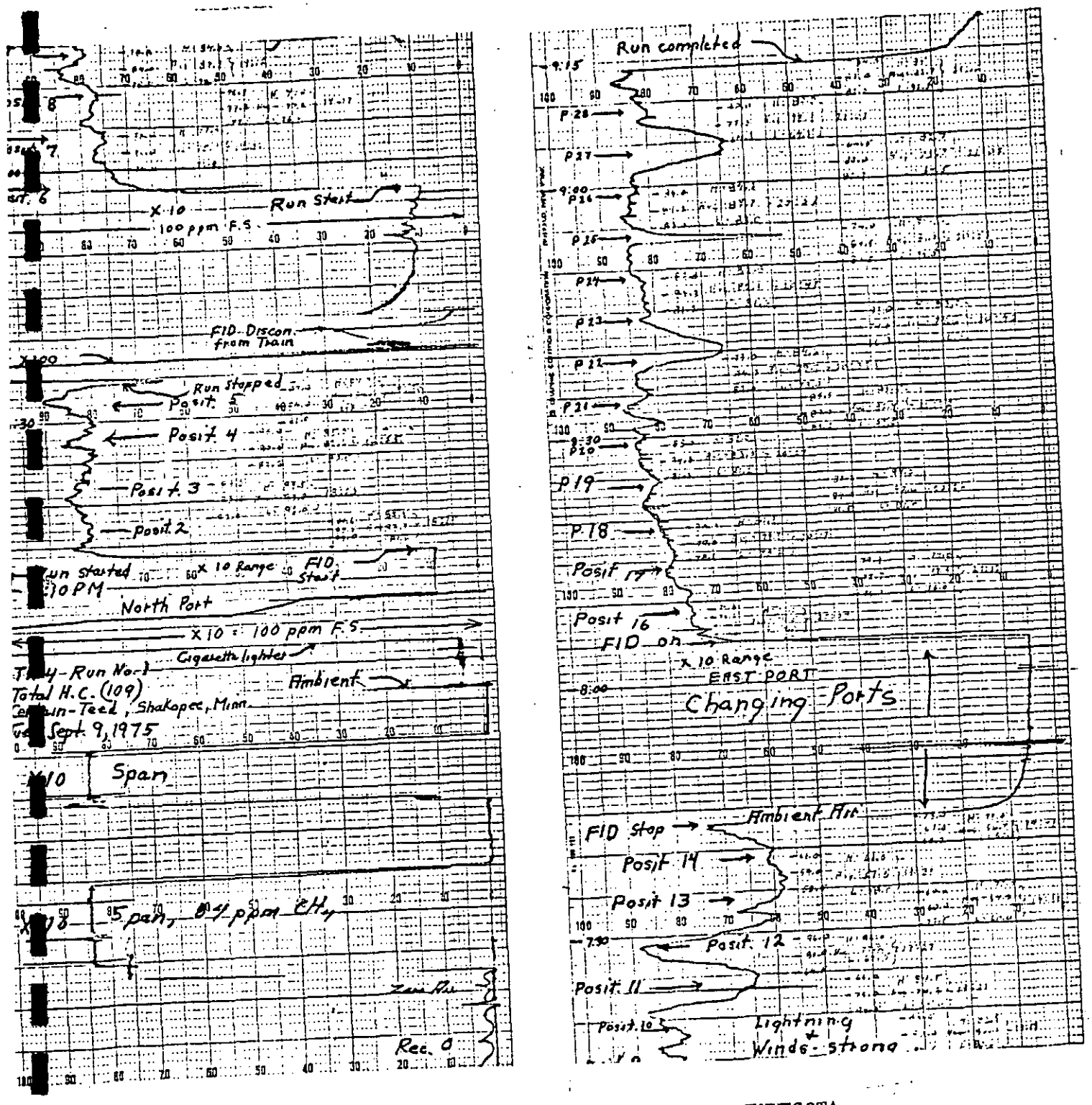
Run No. 1 - Inlets, TP1 and TP3





FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

Run No. 1 - Outlet, TP2



FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

Run No. 1 - Outlet, TP4

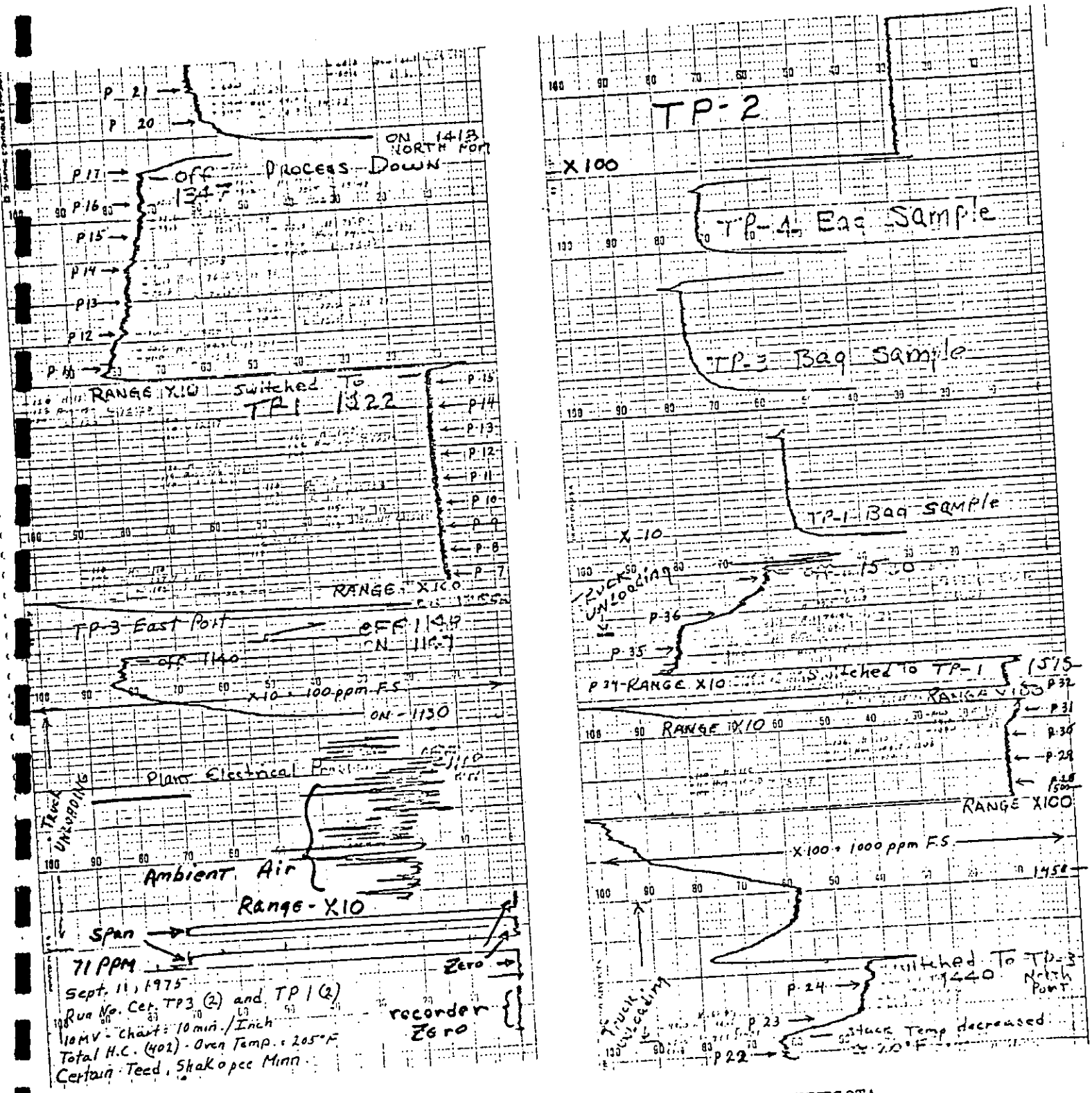
FID TABLE - CERTAIN TEED - SHAKOPEE

Run No. 1

TP 5

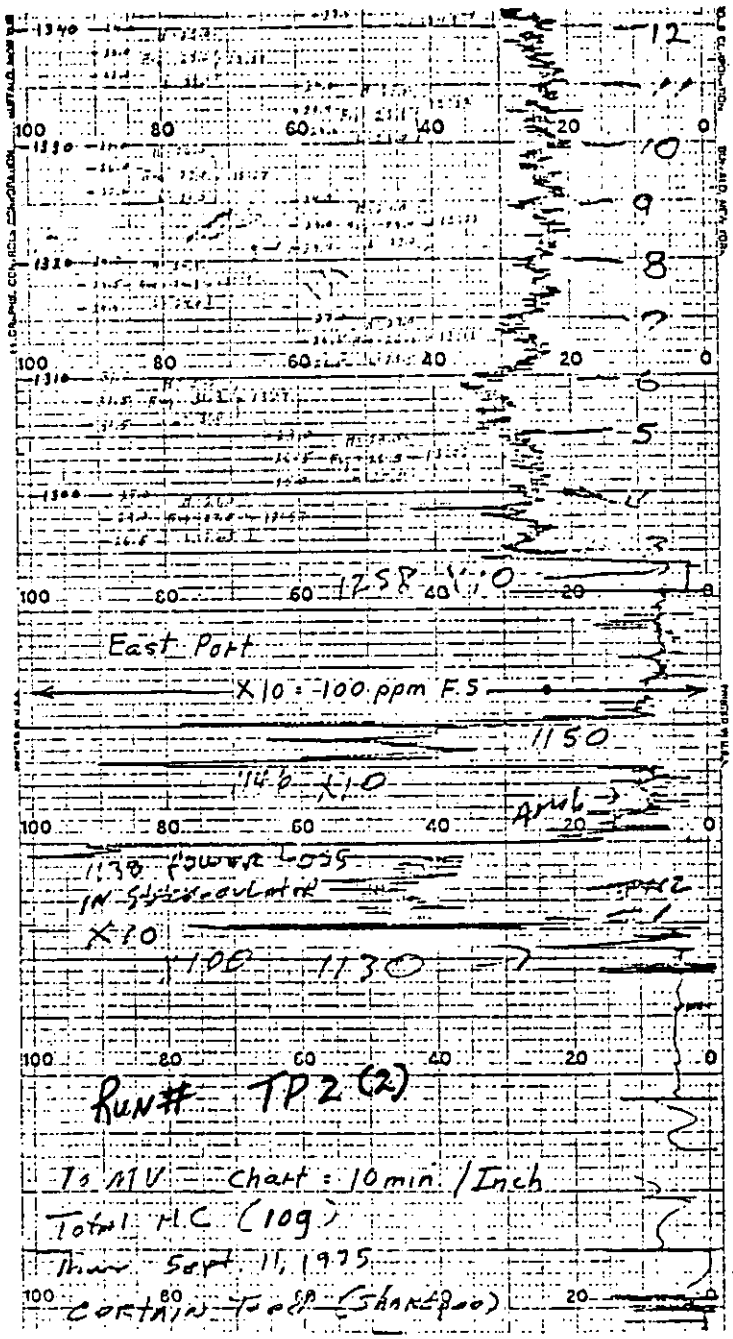
No Valid data this run

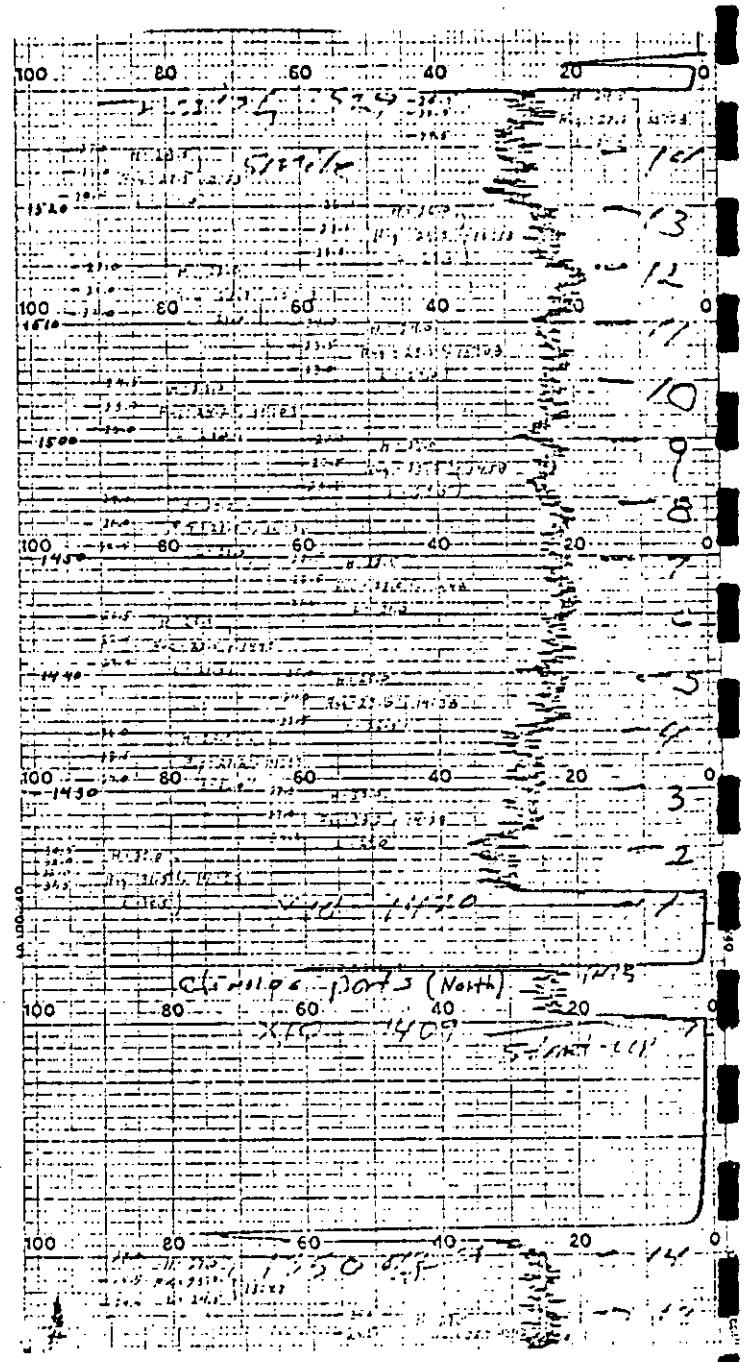
"O" Ring in 402 H.C. Analyzer filter assembly leaking



FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

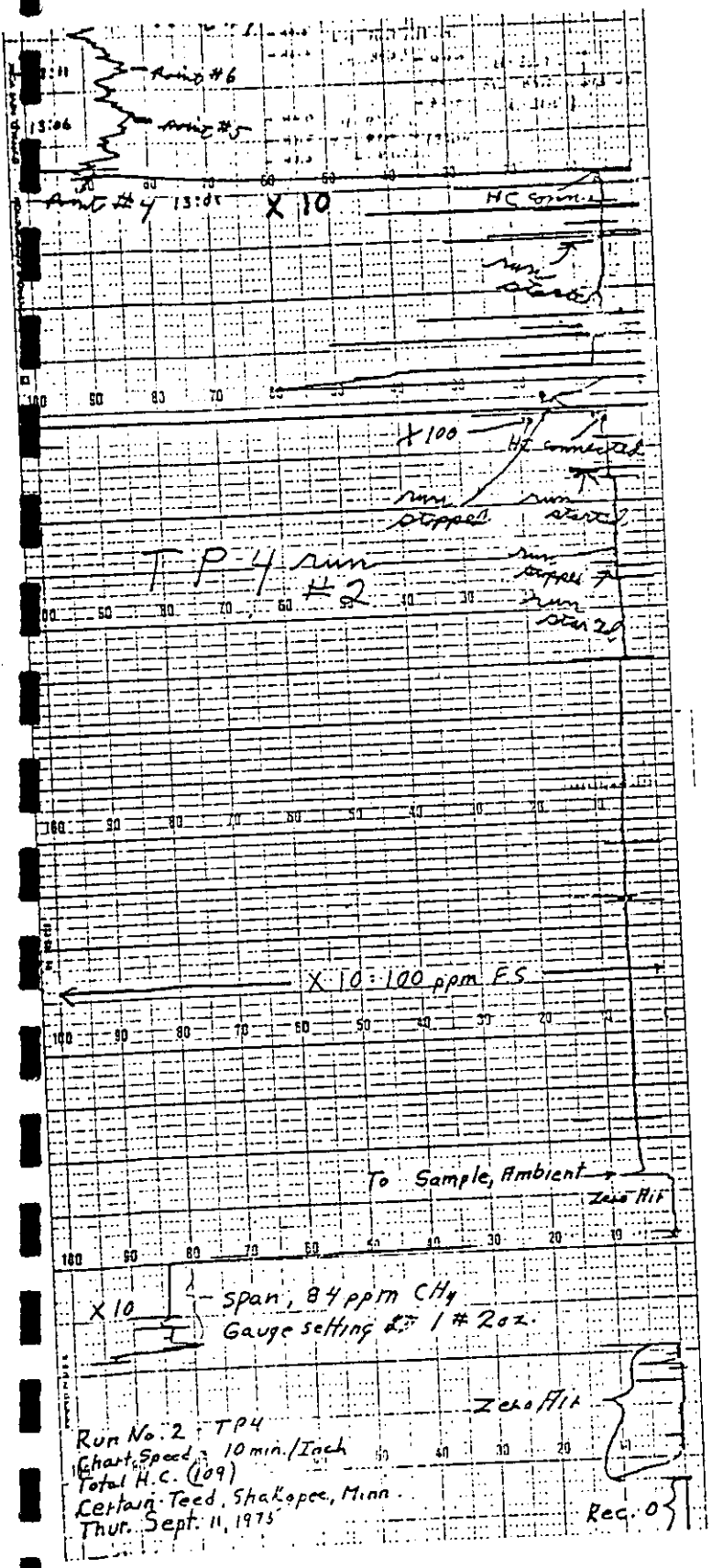
Run No. 2 - Inlets, TP1 and TP3

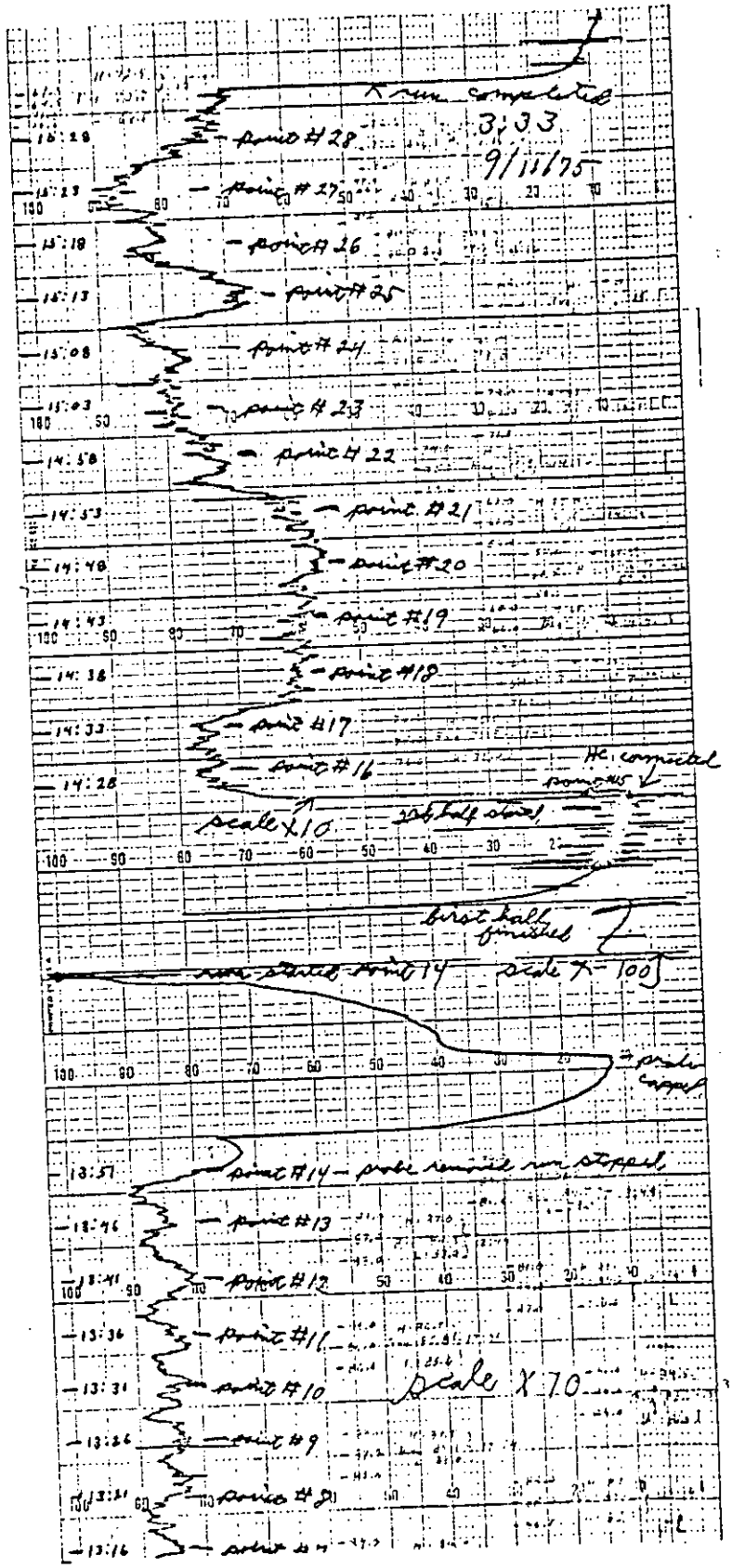




FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

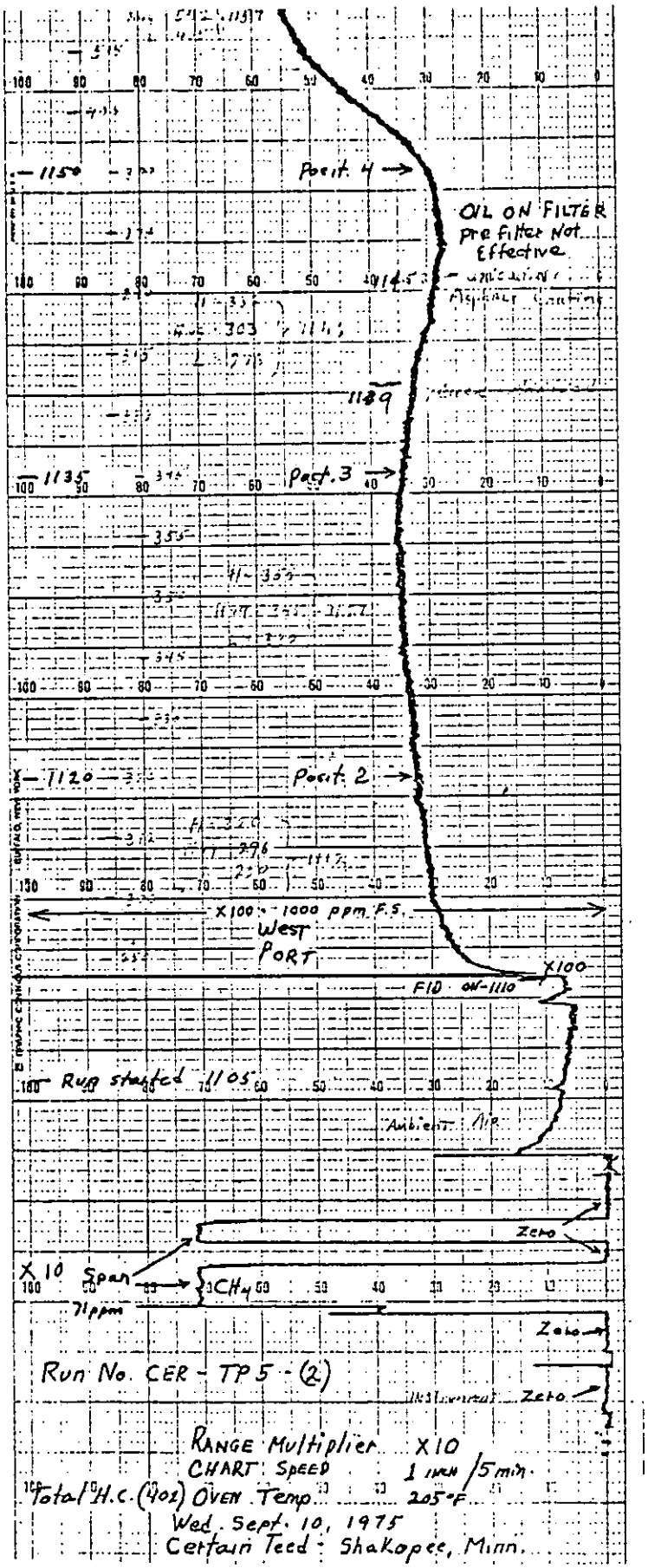
Run No. 2 - Outlet, TP2

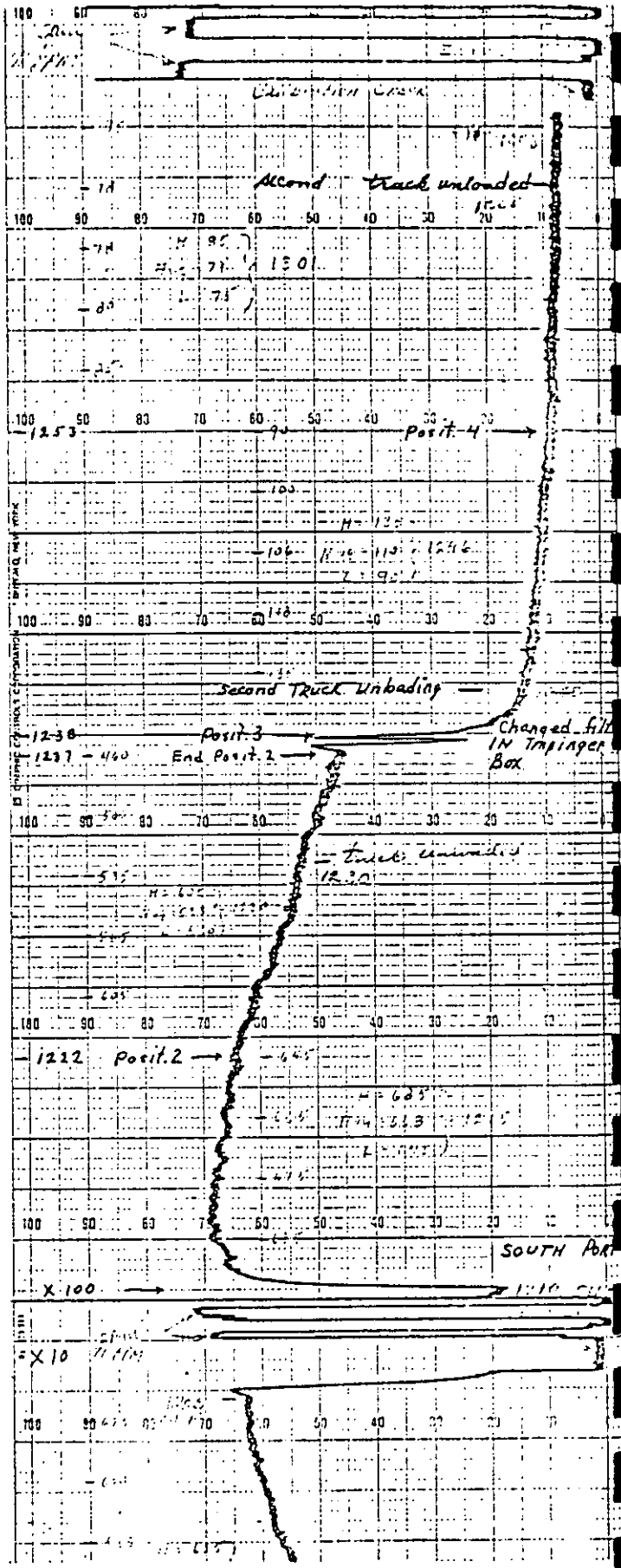




FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

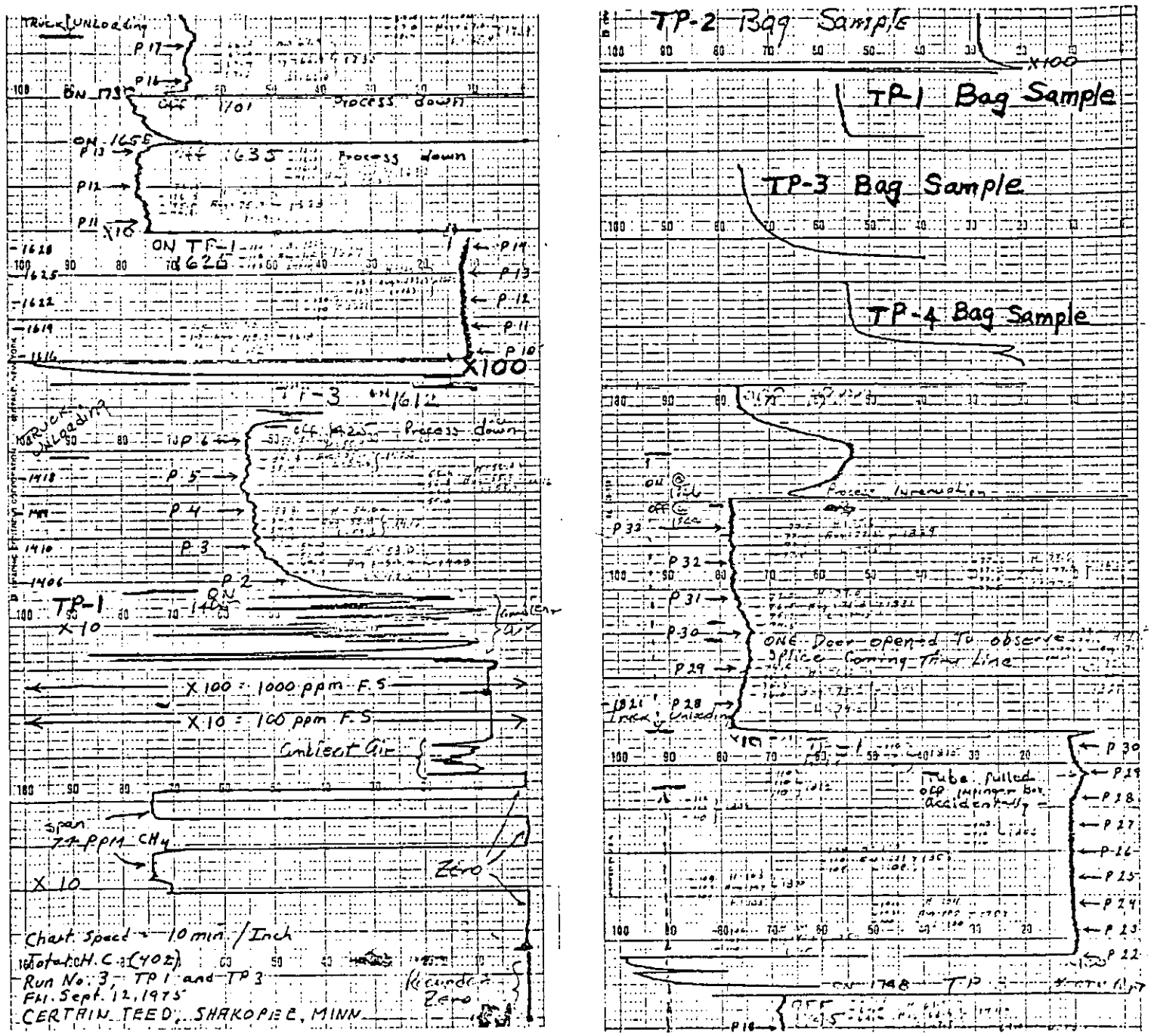
Run No. 2 - Outlet, TP4





FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

Run No. 2 - Storage Outlet, TP5



FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

Run No. 3 - Inlets, TP1 and TP3

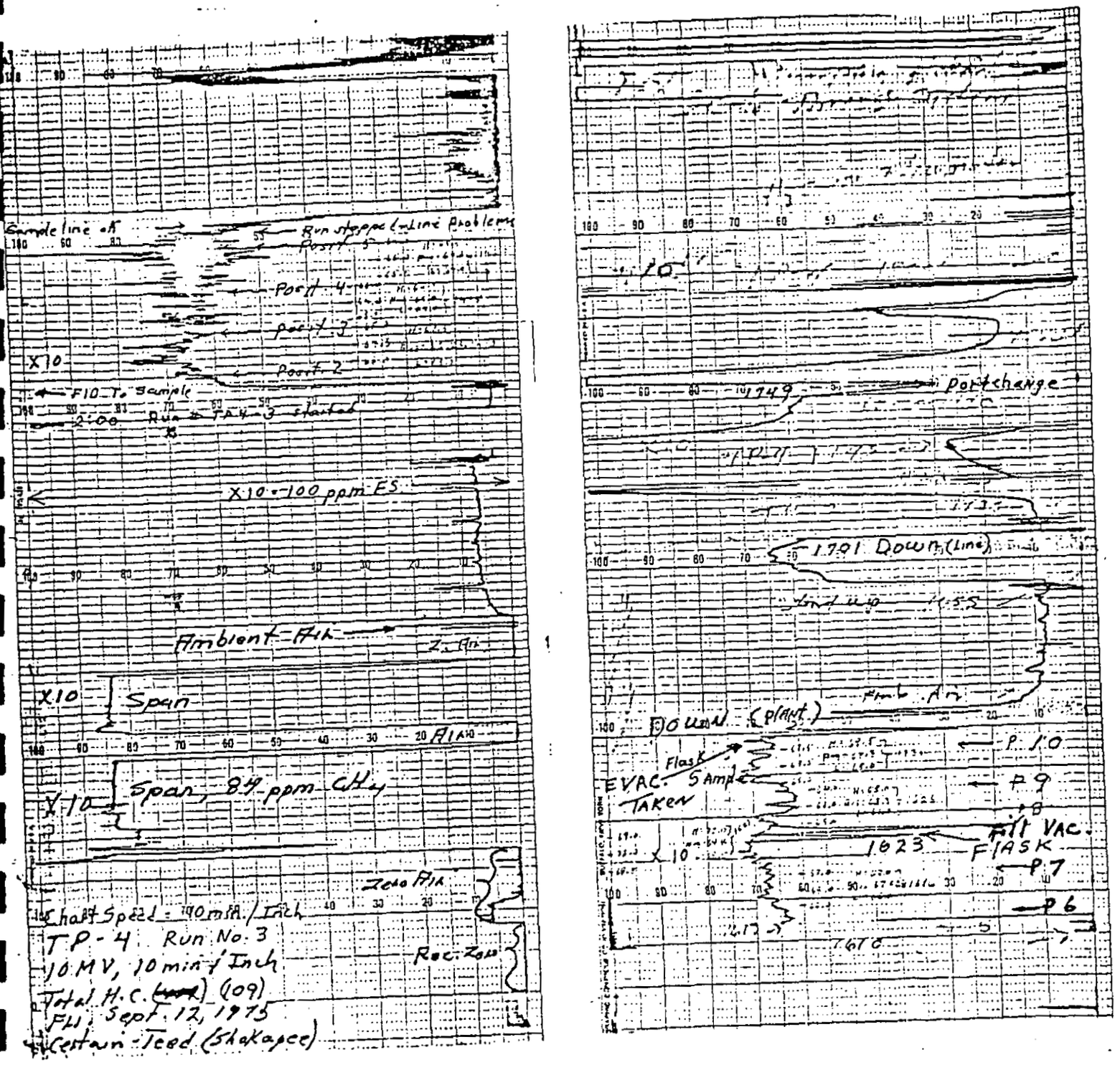
FID TABLE - CERTAIN TEED - SHAKOPEE

Run No. 3

TP 2

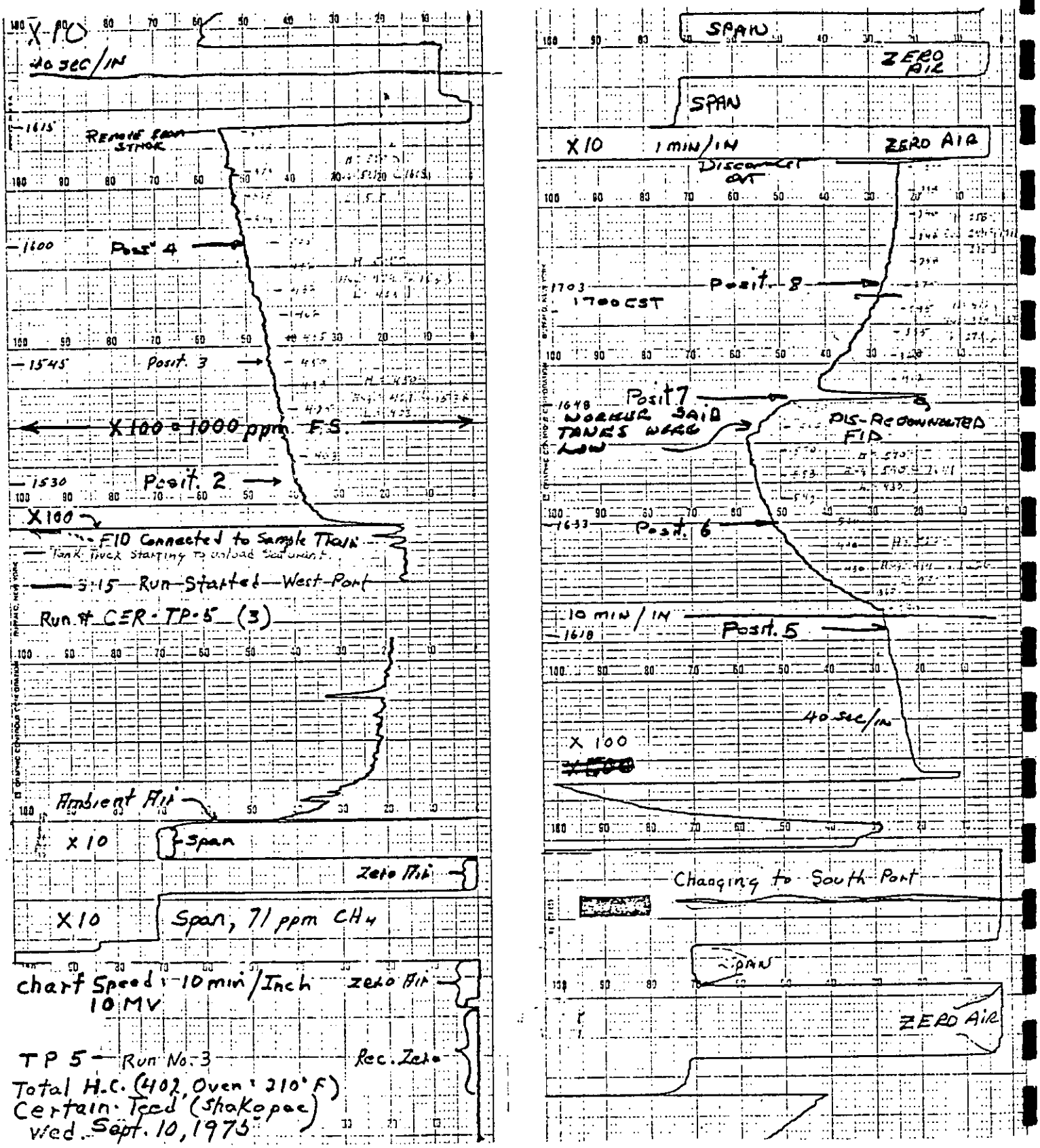
NO Valid Data for this Run

Pump in 109 H.C. Analyzer leaking



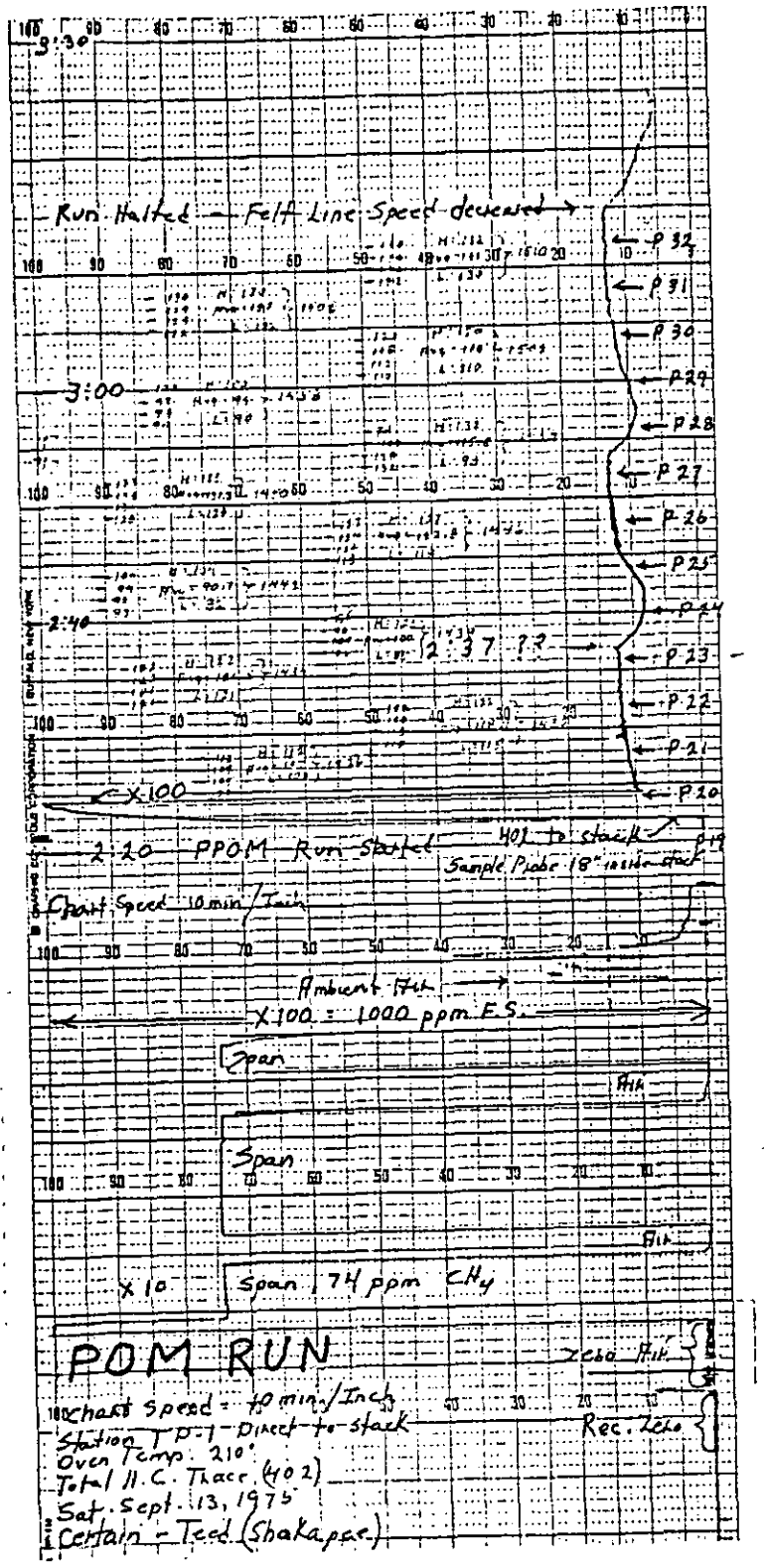
FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

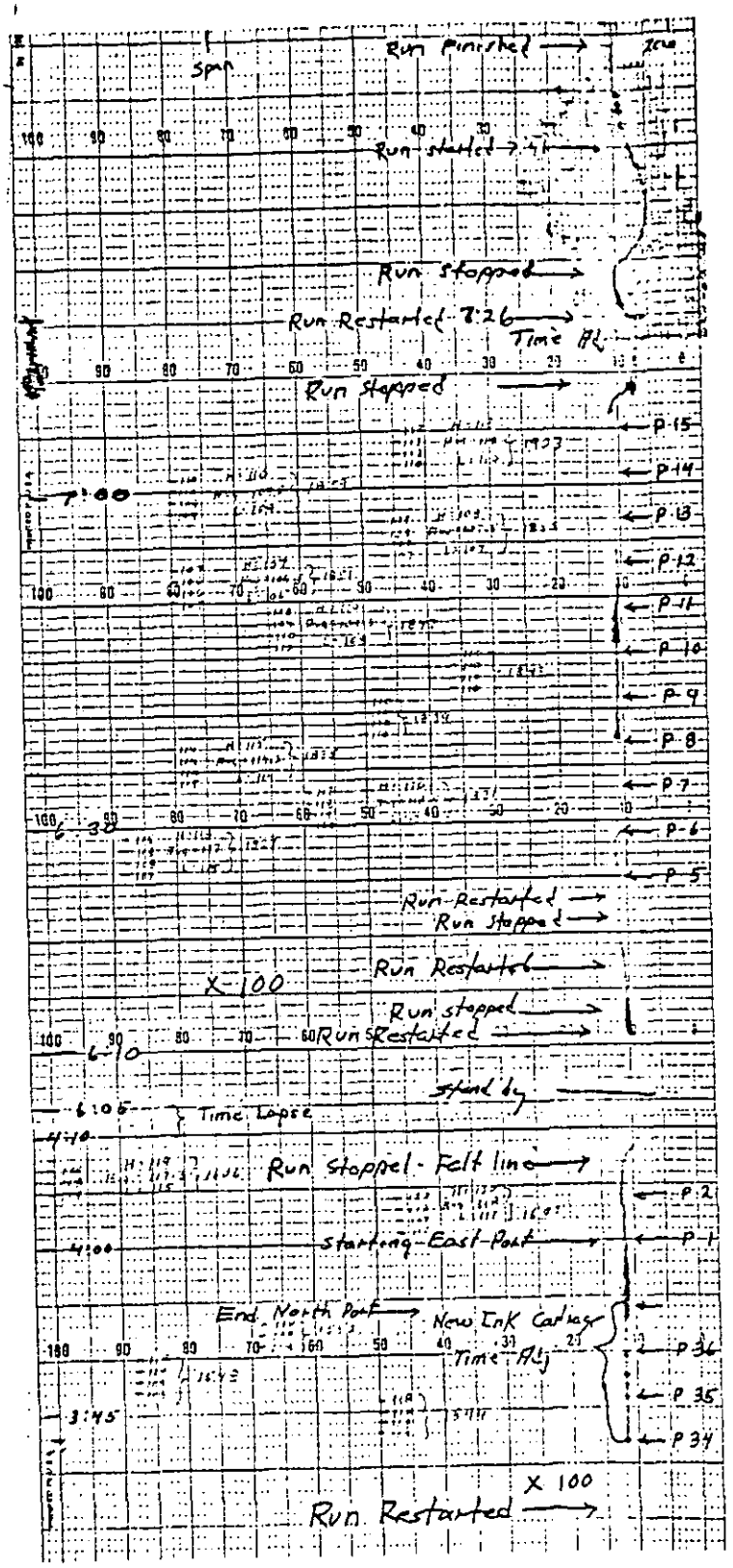
Run No. 3 - Outlet, TP4



FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

Run No. 3 - Storage Outlet, TP5





FID STRIP CHARTS - CERTAIN TEED - SHAKOPEE, MINNESOTA

POM Run - Direct from Stack at TP1

APPENDIX E

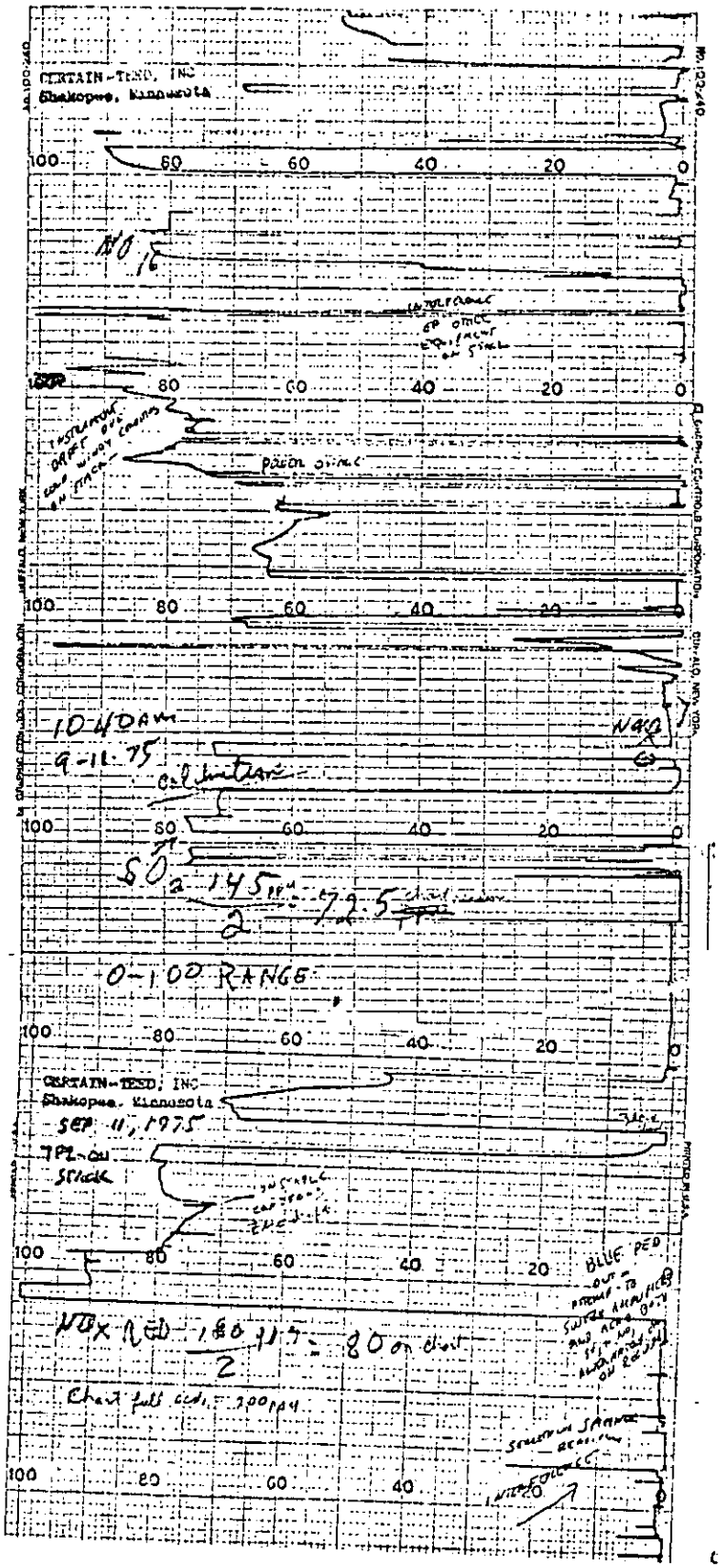
SO_2, NO_x, AND CO FIELD AND LABORATORY DATA

SO_2 and NO_x Strip Charts and Work-up Sheets E-1

Strip Charts and Work-up Sheets for Instrument Checkout at Battelle. E-11

CO Field Data E-16

SO_2 and NO_x Strip Charts and Work-up Sheets


CERTAIN-TEED, INC
Shakopee, Minnesota
100
80
60
40
20
0
NO 16
10 HOAM
9-11-75
NAO
0-100 RANGE
CERTAIN-TEED, INC
Shakopee, Minnesota
SEP 11, 1975
BLUE PEN
Chart full div. = 200 ppm
CER1-1

SULFUR DIOXIDE DATA SHEET NUMBER _____

CERTAIN-TEED, INC

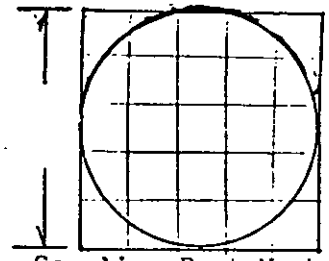
Plant Shakopee, Minnesota Location _____

Date SEPT. 11, 1975 Run Number TP 2 - OUTLET ON STACK

Operator PALITOS Instrument SN ENVIROMETRIC - NS300

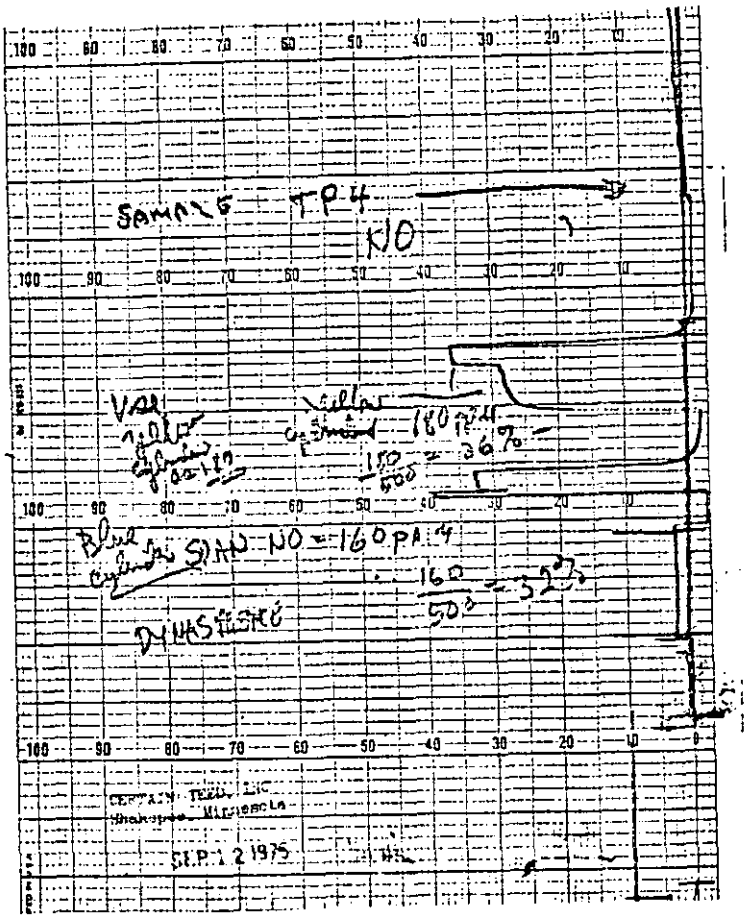
Project Number 92872-3514 Faristor SN _____ R

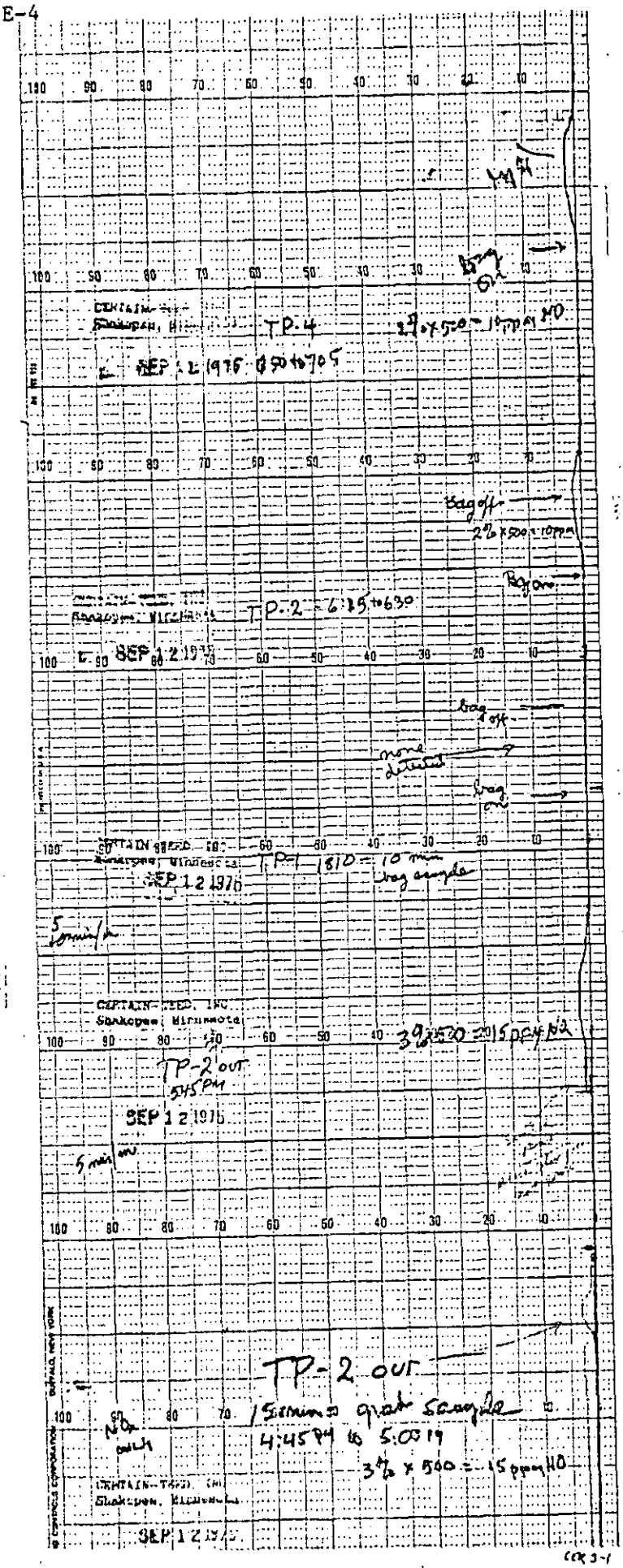
Barometric Pressure _____ "Hg Battelle Record Book No. _____



Sampling Port Numbers

Clock Time	Lapse Time	Sampl Port No.	Conc. of SO_2 in Calib. Gas PPM	Calibration Operation: Instr. Range Scale	Fac Tor	Full Scale PPM	Gas Flow Rate SCFH	Stack Gas Measurement: Instr. Range Scale	Meter Reading	Fac Tor	SO_2 Conc. PPM	Remarks & Observations
												Read for SO_x and NO_x simultaneously -
												Have analyzer on stack, cold winds affecting meter output, power out due to overloading of circuits -
	CALIBRATION											
	—	NO_x	160	100	2	200	3.2	100	80	2	160	
CALIBRATION ONLY												
1040		SO_x	145	100	2	200		100	72.5	2	145	Conditions on stack adversely affecting analyzer output - therefore decision made to transfer instrument to clean up and preparation van, so that integrated bag samples could be analyzed for SO_x + NO_x simultaneously -
NO STACK GAS MEASUREMENTS												
CONDITIONS UNSTABLE ON STACK												


SAMPLE TP4
NO
CERTAIN-TEED, INC
Shakopee, Minnesota
SEP 12 1975


TP-4
SEP 12 1975
Bag off
TP-2
SEP 12 1975
Bag off
Bag on
CERTAIN-TEED, INC
Shakopee, Minnesota
SEP 12 1975
TP-2 OUT
545PM
SEP 12 1975
TP-2 OUT
4:45PM to 5:00PM
CERTAIN-TEED, INC
Shakopee, Minnesota
SEP 12 1975

Since we were having problems in with constant supply of electricity, on the stack, decision was made, that the NO_x/SO_2 would be measured optical gas obtained by in a bag. This bag sample was collected over a 10 min. time period.

SULFUR DIOXIDE DATA SHEET NUMBER _____

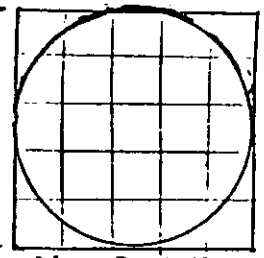
Plant CERTAIN-TEED, INC Shakopee, Minnesota Location _____

Date SEPT. 12, 1975 Run Number TP-1, TP-2, TP-4 - 3

Operator Boyle Instrument SN DYNA SCIENCE BELONGS TO EPA -

Project Number 92872-351V Faristor SN _____ NOTE SO_2

Barometric Pressure _____ "Hg Battelle Record Book No. SCRUBBER SOLUTION USED ON THIS SERIES

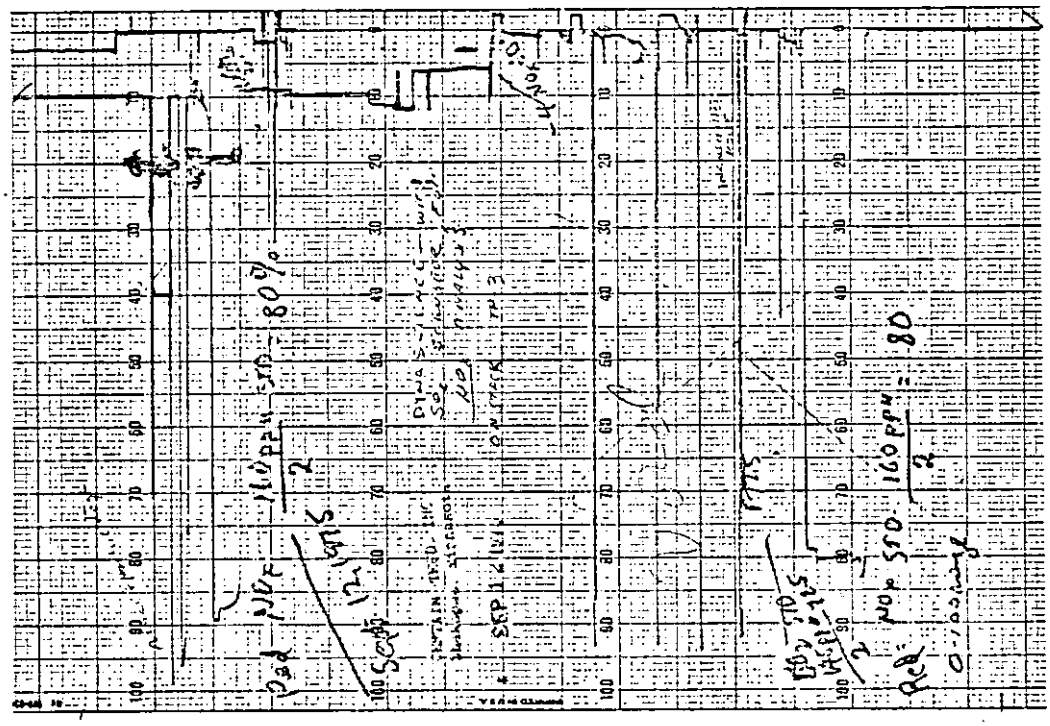


Sampling Port Numbers

Clock Time	Lapse Time	Sampl Port No.	CONC. OF SO_2 IN CALIB. GAS PPM	CALIBRATION OPERATION INSTR. RANGE SCALE	FACTOR	FULL SCALE PPM	GAS FLOW RATE SCFH	STACK GAS MEASUREMENT INSTR. RANGE SCALE	METER READING	FACTOR	SO_2 CONC. PPM	NO	Remarks & Observations
		Blue cylinder											Blue cylinder. Span gas -
CALIBRATION			160	0-500	5	500		0-50	32	5	160		CALIBRATION — USED BOTH 160 & 180 PPM NO span in N_2
		yellow cylinder	180	0-500	5	500		0-500	28	5	140		This reads low in comparison with the blue cylinder, decided to calibrate on yellow cylinder since this cylinder has been calibrated in Aug 1975
STACK		TP-4	OUTLET					0-500	4	5	20		- this may be an instrument drift - may another sample -
BAG SAMPLES	at 1645 - 1700	TP-2	OUTLET					0-500	3	5	15		Bag sample -
	1730 - 1745	TP-2	"						2		10		" "
	1815 - 1830	TP-2	"						2		10		" "
											avg.		12 PPM -
	1810 - 1820	TP-1	INLET						0	5	0		meter did not deflect + below detection limits of analyzer -
	1850 -	1905	TP-4 - OUTLET						0	2	10		

E-5

CIR 3 1



NITROGEN ~~SULFUR~~ DIOXIDES DATA SHEET NUMBER _____

CERTAIN-TEED, INC.

Plant Shakopee, Minnesota _____ Location _____

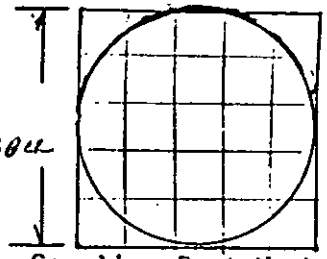
Date SEPT. 12, 1975 Run Number TP-3 INLET

DYNASCIENCE, WITH SO_2 SCRUBBER

Operator Baxter Instrument SN _____

Project Number 02872-3514 Faristor SN _____

Barometric Pressure _____ "Hg Battelle Record Book No. _____



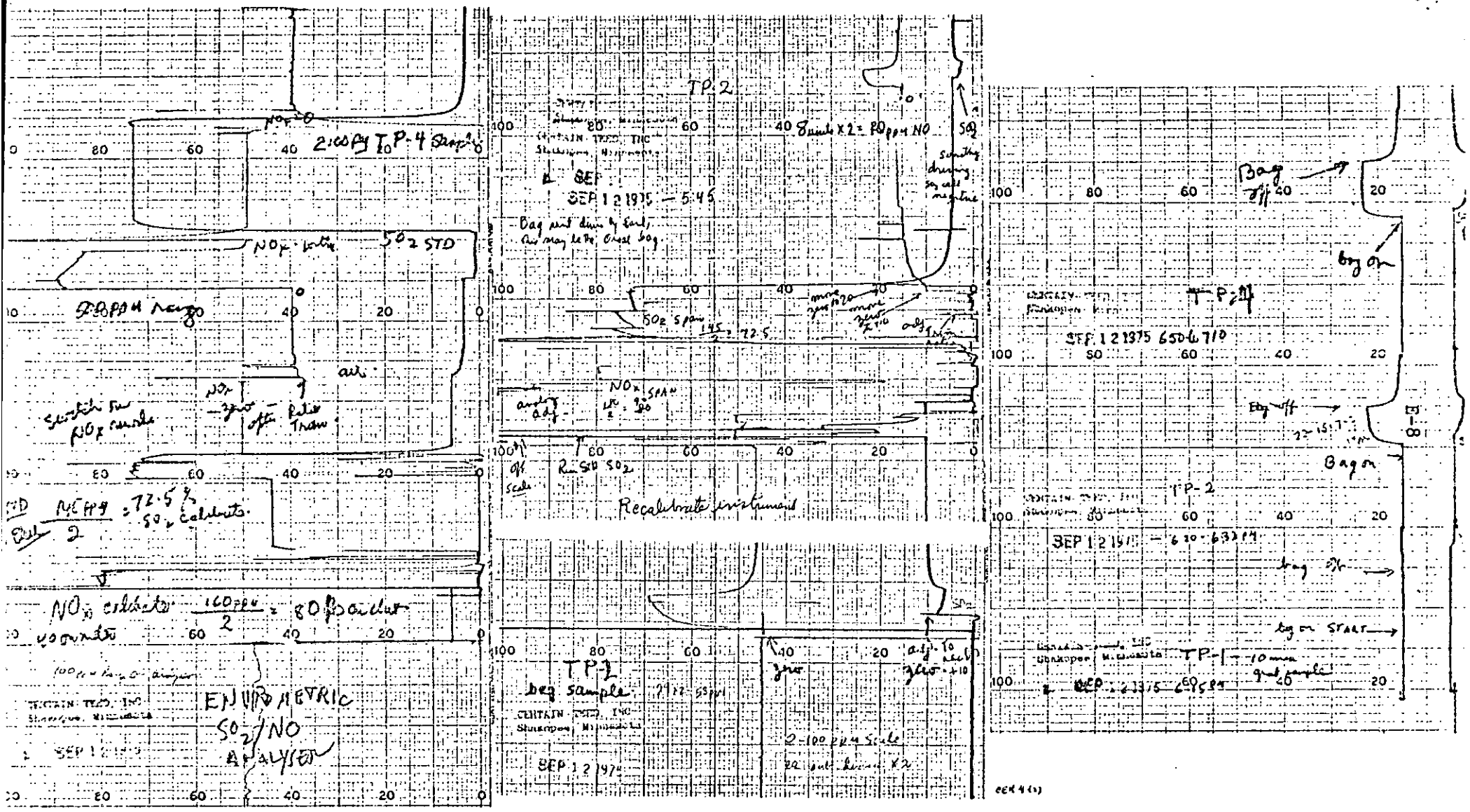
Sampling Port Numbers

Clock Time	Lapse Time	Sampl Port No.	Conc. of SO_2 in Calib. Gas PPM	Calibration Operation: Instr. Range Scale	Fac Tor	Full Scale PPM	Gas Flow Rate SCFH	Stack Gas Measurement: Instr. Range Scale	Meter Reading	Fac Tor	SO_2 Conc. PPM	Remarks & Observations
		use	blue cylinder									
		TP-3	160					0-100	90-10: 80	2	160	since baseline drifted below zero —, that zero was established on +10, ∴ subtract 10 from each reading.
AM-		TP-3	INLET					0-100	10-10: 0	2	0	NO is below detection limits of instrument

CALIBRATION ON STACK.

Time has not moved on chart.

note: Run STD SO_2 gas through scrubber to determine if the solution absorbs the SO_2 — Ans. Yes —


TP-2
SEP 12 1975 — 5:45
Recalibrate instrument
TP-4
SEP 12 1975 650-710
TP-2
TP-1
ENVIRONMETRIC
SO2/NO
ANALYSER

note: Due to adverse conditions on the stack, (windy, cold, abrupt temp change, electrical outage) we could not measure SO_2/NO_x continuously. Therefore to obtain meaningful data, the decision was made to measure the SO_2/NO_x from a 10 min. composited bag sample. These measurements were done on the analyzers located in the clean-up van, located on site. Measurements were made within 10 minutes of collection

CERTAIN-TEED, INC SULFUR DIOXIDE AND NITRIC OXIDE DATA SHEET

NUMBER _____

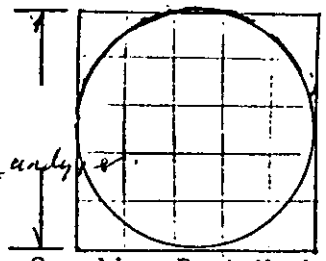
Plant Shakopee, Minnesota Location _____

Date SEPT. 12, 1975 Run Number TP1-3; TP2-3; TP4-3

Operator BAYLOS Instrument SN _____ ENVIRONMETRIC SN 300 SO_2/NO_x only

Project Number 12872-3514 Faristor SN _____

Barometric Pressure _____ "Hg Battelle Record Book No. _____



Sampling Port Numbers

Clock Time	Lapse Time	Sampl Port No.	Conc. of SO_2 in Calib. Gas PPM	Calibration Operation: Instr. Range Scale	Fac-tor	Full Scale PPM	Gas Flow Rate SCFH	Stack Gas Measurement: Instr. Range Scale	Meter Reading	Fac-tor	SO_2 Conc. PPM	Remarks & Observations
		blue cylinder	Nitric Oxide									
CALIBRATION			160		2	200	3.2	100	80	2	160	NO calibration, (on recalibration it is necessary to set zero on 40 on chart)
		SO_2 →	145		2	200	3.2	100	72.5	2	145	SO_2 calibration
VOIDED calibration off	1400	TP4-3	OUTLET			NO_x	3.2 →	100	40-40 0	2	0	integrated bag sample } no SO_2/NO_x detected
						SO_2	→	100	0	2	0	– SO_2 – } in this bag sample.
												← VOIDED, CALIBRATION OFF —
	1730–	1745	TP2-3	outlet			NO_x		29	2	58	– NO_x – NO_x zero drifted up scale –
							SO_2		–3	2	–6	– SO_2 went negative,
		yellow cylinders										calibration now on yellow cylinder
RE-CALIBRATION			180			NO_x		100	90	2	180	calibration off, attempted to correct –
			145			SO_2		1.	72.5	2	145	used trim ratio adjustment
	1790–	1745	TP2-3	OUTLET			NO_x		23-15 8	2	16	zero on NO_x = 15 ∴ ~~subtract chart reading~~ fig 14
							SO_2		–2	2	–4	SO_2 cells goes negative – ?
	1810–1820	TP1-3	INLET				NO_x		15-11 0		0	
							SO_2		0		0	

E-9

CEK-9(2)

CERTAIN-TEED, INC SULFUR DIOXIDE DATA SHEET NUMBER _____

Plant Shakopee, Minnesota Location _____

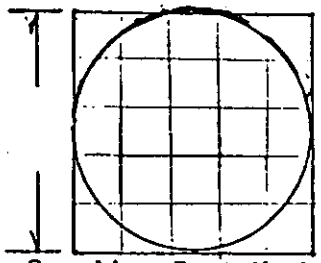
Date SEPT 12, 1975 Run Number _____

Operator Baxter Instrument SN _____

Project Number _____ Faristor SN _____

Barometric Pressure _____ "Hg Battelle Record Book No. _____

ENVIRONMETRICS N9300 SO_2/NO_x

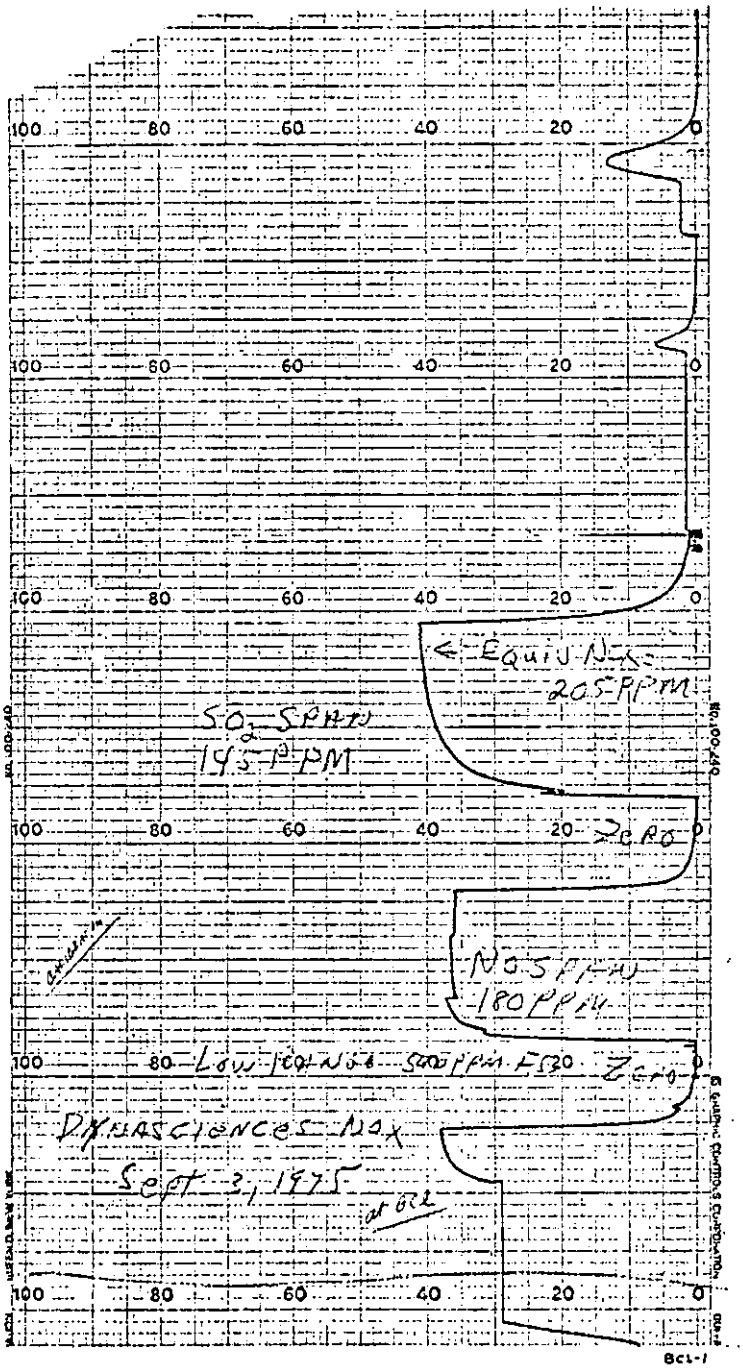


Sampling Port Numbers

	Clock Time	Lapse Time	Sampl Port No.	Conc. of SO_2 in Calib. Gas ppm	Calibration Operation: Instr Range Scale	Factor	Full Scale PPM	Gas Flow Rate SCFH	Stack Gas Measurement: Instr Range Scale	Meter Reading	Factor	SO_2 Conc. PPM	Remarks & Observations
Bag Sample	1820-	1832	TP2-3	OUTLET						22-15 7	2	14	NO_x -
										-4	2	-8	SO_2 drives negative - assumed to be zero
Bag Sample	1850-	1910	TP4-3	OUTLET				NO_x →		23-15 8	2	16	NO_x -
								SO_2 →		-3	2	-6	SO_2 drives negative - assumed to be zero

E-10

Strip Charts and Work-up Sheets
for Instrument Check at Battelle


100
80
60
40
20
0
← EQUIV NOx
205 PPM
SO2 SPIKE
145 PPM
ZERO
NOx SPIKE
180 PPM
LOW FCO NOx 500 PPM FS20
ZERO
DYNASCIENCES NOx
Sept 3, 1975
BC1-1

OBJECT OF THIS CALIBRATION IS TO DETERMINE WHAT INFLUENCE SO_2 HAS UPON THE DYNASCIENCE ANALYSER. —

CERTAIN-TEED, INC ~~SULFUR DIOXIDE~~ NITROGEN DATA SHEET NUMBER _____

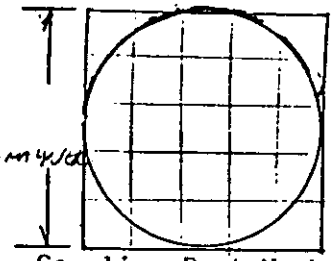
Plant Shakopee, Minnesota Location _____

Date SEPT. 3 1975 Run Number CHECK-OUT AT BCL -

Operator BAYNE / FAMILIU Instrument SN DYNASCIENCE, NO_x ANALYZER

Project Number _____ Faristor SN _____

Barometric Pressure _____ "Hg Battelle Record Book No. _____

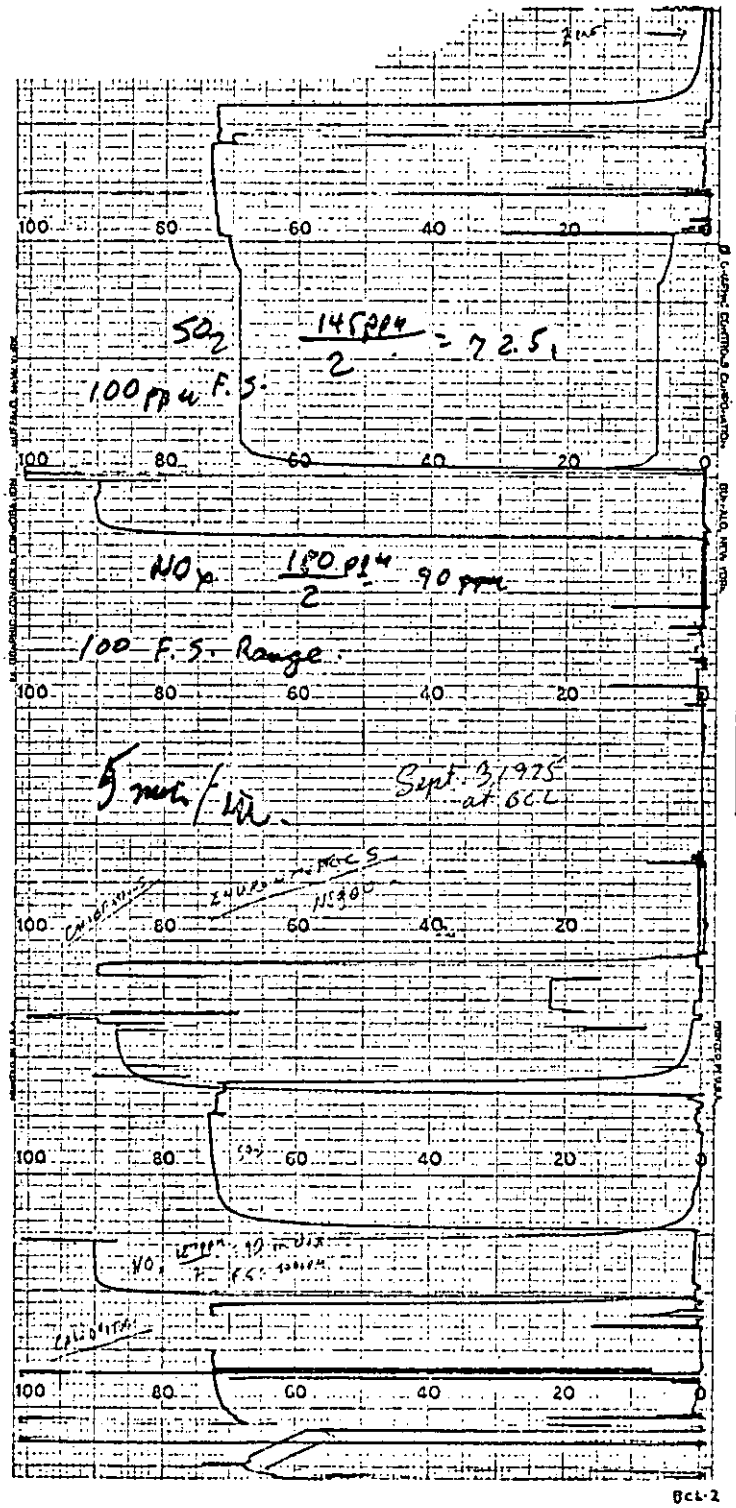


Sampling Port Numbers

Clock Time	Lapse Time	Sampl Port No.	CONC. OF SO_2 IN CALIB. GAS PPM	CALIBRATION OPERATION INSTR. RANGE SCALE	FACTOR	FULL SCALE PPM	GAS FLOW RATE SCFH	STACK GAS MEASUREMENT INSTR. RANGE SCALE	METER READING	FACTOR	SO_2 CONC. PPM	Remarks & Observations
			~~NO_x~~									
NO_x			180	0-500	5	100	—	500	36	5	180	— was yellow cylinder 180 ppm NO_x in Nitrogen — original assay was 160 ppm Nitric Oxide in Nitrogen. prepared by Matheson —
			~~SO_2~~									
SO_2			145	0-500	5	100		500	42	5	210	PASS 145 ppm SO_2 SPAN GAS THROUGH ANALYSER.
												$\frac{145}{210}$ = 0.69 x Chart reading = SO_2 conc. if SO_2 is the only gas in the flue stream —

E-13

BCL-1


100 80 60 40 20 0
SO_2 145 ppm / 2 = 72.5
100 ppm F.S.
NO_x 180 ppm / 2 = 90 ppm
100 F.S. Range
5 min/div
Sept. 3, 1975
at GCL
Bcl-2

INSTRUMENT CHECK-OUT

CERTAIN-TEED, INC. SULFUR DIOXIDE DATA SHEET NUMBER HT BATTELLE

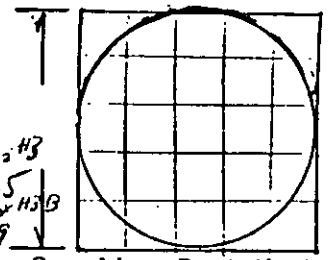
Plant Shakopee, Minnesota Location BCL

Date SEPT. 3, 1975 Run Number _____ ENVIROMETRICS

Operator BAYTOS/FANCILLI Instrument SN NS 300 TYPE SO_2 HS

Project Number 12872-3514 Faristor SN _____ SO_2 - SS 25 TYPE NO_x HSB

Barometric Pressure _____ "Hg Battelle Record Book No. _____ NO_x 8709



Sampling Port Numbers

Clock Time	Lapse Time	Sampl Port No.	CONC. OF SO_2 IN CALIB. GAS PPM	CALIBRATION OPERATION: INSTR. RANGE SCALE	FACTOR	FULL SCALE PPM	GAS FLOW RATE SCFH	STACK GAS MEASUREMENT: INSTR. RANGE SCALE	INSTR. READING	FACTOR	SO_2 CONC. PPM	Remarks & Observations
												attempt here is to read NO_x and SO_2 simultaneously.
NO_x	Calibration		180	100	2	200	3.2	100	90	2	180	used yellow cylinder, nitrous oxide 180 ppm - balance air
SO_2	CALIBRATION —		145	100	2	200	3.2	100	72.5	2	145	
												will NO_x with Trigon pot -
												call factory in Calif - ~~and~~ told us to
												ground meter - to case. This appears
												to give us more from pot range -

E-15

BCL - 2

CO Field Data

CERTAIN-TEED SHAKOPEE, MINNESOTA

CO Concentration, ppm
(Integrated Bag Sample)

Particulate Run No.	TP-1	TP-2	TP-3	TP-4	TP-5
1	10.0	290.0	20.0	440.0	270.0
2	12.0	250.0	20.0 20.0 * 18.0	350.0 360.0 * 355.0	145.0
3	10.0	265.0	12.0	300.0	240.0
PPOM	—	280.0	—	—	—

* Same bag measured 3 times

APPENDIX F

EPA DRAFT METHOD FOR DETERMINATION OF PARTICULATE AND TOTAL GASEOUS HYDROCARBON EMISSIONS FROM THE ASPHALT ROOFING INDUSTRY

DRAFT
DO NOT QUOTE OR CITE

5 MAY 1976

APPENDIX F

EPA DRAFT METHOD FOR DETERMINATION OF PARTICULATE AND TOTAL GASEOUS HYDROCARBON EMISSIONS FROM THE ASPHALT ROOFING INDUSTRY

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 F-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 F-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

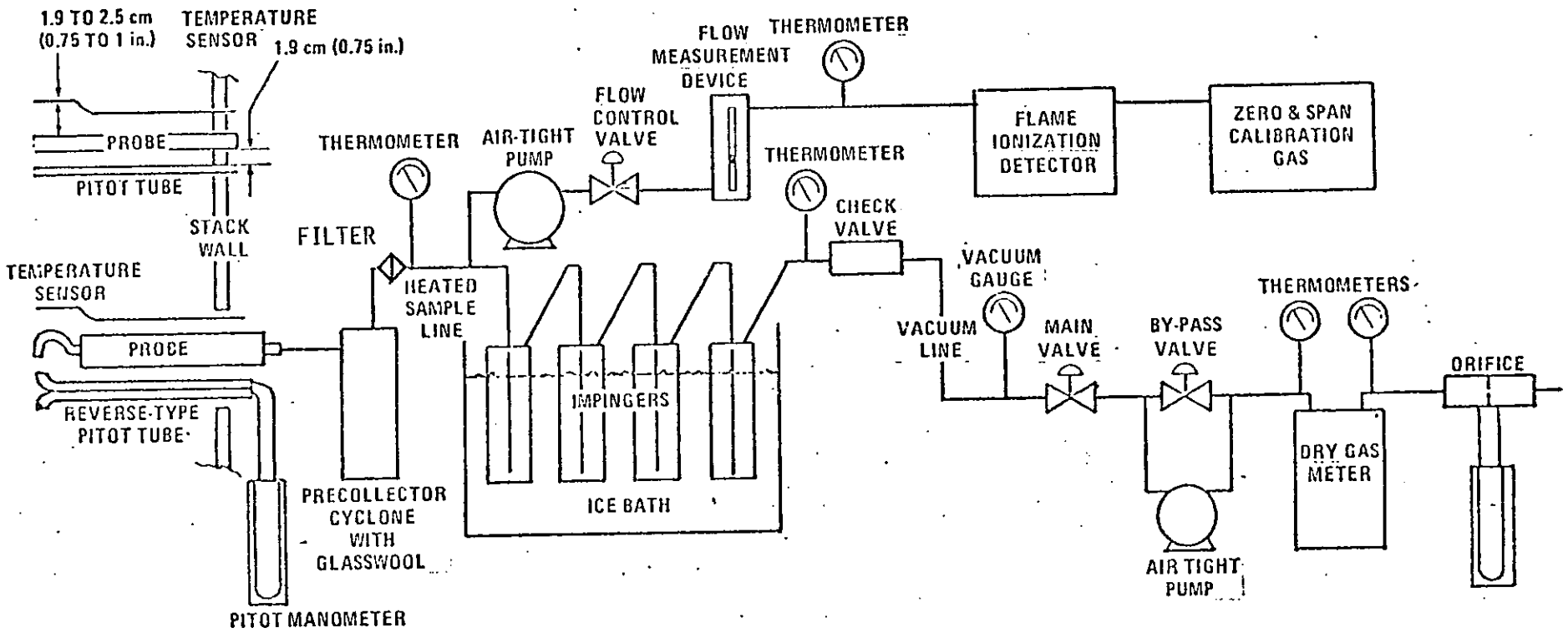


Figure F-1. Particulate and gaseous hydrocarbon sampling train.

DRAFT
DO NOT QUOTE OR CITE

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 F-1) contains a known weight of glass wool to trap the condensed oil and/or water. A 125 ml, or larger, Erlenmyer 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 F-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°C (68 + 10°F) and ambient pressure for at least 24 hours and weigh at 6 or more hour intervals to a constant weight, i.e., $\leq$ 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 (cylcone) 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 F-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 m^3/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 F-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 addtional 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 $\pm$ 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 psuedo 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 F-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 ± 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 F-3. Record the data and report span drift as a percentage of the instrument span, using a form similar to Figure F-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 F-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 F-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 inplace. 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, dessicated 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 loose 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. Transer 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.

5.1.5 Temperature gauges. Calibrate dial and liquid filled bulb thermometers and thermocouple-potentiometer systems against mercury-in-glass thermometers. Ice bath and boiling water (corrected for barometric pressure) are acceptable reference points. For other devices, check with the Administrator.

5.2 Calibration of Gaseous Hydrocarbon System. Prior to the conduct of the test, the hydrocarbon measurement system shall be calibrated according to the procedures described in this paragraph. The manufacturer's operation and calibration instructions are also to be followed as required.

5.2.1 The measurement system shall be put into operation and allowed to warm up until stable conditions are achieved. Zero gas, span gas, and a mid-scale gas mixture corresponding to approximately 50% of span shall be introduced into the analyzer. The response to these gases shall be used to establish a calibration curve or verify the manufacturer's calibration curve. The data obtained in these procedures shall be recorded on a form similar to Figure F-6. If the manufacturer's calibration curve, or the expected response curve cannot be attained at the mid-scale point with an accuracy of less than 2% of full scale, the calibration shall be considered invalid and corrective measures shall be taken. The calibration procedure shall be repeated using only zero gas and span gas at the conclusion of test to calculate the instrument zero and span drift.

5.2.2 Hydrocarbon (HC) calibration gas mixtures shall be certified accurate by the gas manufacturer to within $\pm$ 2% of

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 $Hgm^3/^oK$-mole (21.83 in. $Hg\text{-}ft^3/^oR$-lb-mole)

T_m = Absolute average dry gas meter temperature (see Figure F-2), ^oK (^oR)

T_h = Absolute temperature of hydrocarbon sample at flow meter, ^oK (^oR)

T_s = Absolute average stack gas temperature (see Figure F-2), ^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 silca gel (see Figure F-5, 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 by this method, m/sec (ft/sec)

W_a = Weight of residue in TCE wash, mg

ΔH = Average pressure differential across the orifice meter (see Figure F-2), mm H_2O (in. H_2O)

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 F-2).

6.2.2 Hydrocarbon Analyzer Sample Volume

$$V_h = (Q_h)\ (\Theta)\ \left(\frac{T_{std}}{T_h}\right)\left(\frac{P_{bar}}{P_{std}}\right)\ (1-B_{ws})$$

$$= Z\ \ (Q_h)(\Theta)\ \left(\frac{P_{bar}}{T_h}\right)\ (1-B_{ws})$$ *Equation F-1

where:

Z = .386 metric units

= 17.65 english units

*Note: Equation F-1. The term B_{ws} must be estimated. Use Equation F-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 F-1.

$$V_{m(std)} = V_m \left(\frac{T_{std}}{T_m}\right)\left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}}\right) + V_h$$

$$= K\ V_m \left(\frac{P_{bar} + \Delta H/13.6}{T_m}\right) + V_h$$ Equation F-2

where:

K = 0,3856 ^{o}K/mm Hg for metric units

= 17.65 ^{o}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 F-3-1

$$V_{wt(std)} = (V_{lc} + V_{fh}) \left(\frac{\rho_w}{M_w}\right) RT \quad \text{*Equation F-3-1}$$

where:

$K = 0.00134\ m^3/ml$ for metric units

$= 0.0472\ ft^3/ml$ for English units

*Note: Equation F-3-2 for use when there is water condensation in the particulate catch.

6.2.5 Moisture content.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + (V_{w(std)} - V_n)} \quad \text{Equation F-4-1}$$

$$B_{wt} = \frac{V_{wt(std)}}{V_{m(std)} + V_{wt}} \quad \text{*Equation F-4-2}$$

6.2.6 TCE blank concentration.

$$C_a = \frac{m_a}{V_a \rho_a} \quad \text{Equation F-5}$$

6.2.7 TCE wash blank.

$$W_a = (C_a)(V_{aw})(\rho_a) \quad \text{Equation F-6}$$

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 F-5).

6.2.9 Particulate concentration.

$$c_s = (0.001\ g/mg)\ (m_n/V_{m(std)}) \quad \text{Equation F-7}$$

*Note: Equation F-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	2.205×10^{-3}
g/ft^3	g/m^3	35.31

6.2.11 Isokinetic variation.

6.2.1.1 Calculations from raw data.

$$I = \frac{100 \; T_s \; [K \; V_{1c} + (V_m/T_m) \; (P_{bar} + \Delta H/13.6)]}{60 \; \Theta \; v_s \; P_s \; A_n}$$

Equation F-8

where:

$K = 0.00346$ mm Hg-m^3/ml-°K for metric units

$= 0.00267$ in. Hg-ft^3/ml-°R for English units

6.2.11.2 Calculations from intermediate values.

$$I = \frac{T_s \; V_{m(std)} \; P_{std} \; 100}{T_{std} \; v_s \; \Theta \; A_n \; P_s \; 60 \; (1-B_w)}$$

$$= K \; \frac{T_s \; V_{m(std)}}{P_s \; v_s \; A_n \; \Theta \; (1-B_w)}$$

Equation F-9

where:

$K = 4.323$ for metric units

$= 0.0944$ for English units

$B_w = B_{ws}$ or B_{wt}, as appropriate

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 F-8.

$$pmr = 0.67 \times 10^6 \ (\overline{ppm}_v) \ (v_s) \ (A_s) \qquad \text{Equation F-10}$$

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 1419, 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 _____
LOCATION _____
OPERATOR _____
DATE _____
RUN NO. _____
SAMPLE BOX NO. _____
METER BOX NO. _____
METER ΔH@ _____
F FACTOR _____
PITOT TUBE COEFFICIENT, Cp _____

SCHEMATIC OF STACK CROSS SECTION

AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE _____
ASSUMED MOISTURE, % _____
PROBE LENGTH, m (ft) _____
NOZZLE IDENTIFICATION NO. _____
AVERAGE CALIBRATED NOZZLE DIAMETER, cm (in.) _____
PROBE HEATER SETTING _____
LEAK RATE, m^3/min (cfm) _____
PROBE LINER MATERIAL _____

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE mm Hg (in. Hg)	STACK TEMPERATURE (T_S) °C (°F)	VELOCITY HEAD (ΔP_S), mm(in.)H_2O	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER mm H_2O (in. H_2O)	GAS SAMPLE VOLUME m^3 (ft^3)	GAS SAMPLE TEMPERATURE AT DRY GAS METER		FILTER GAS EXIT TEMPERATURE, °C (°F)	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER, °C (°F)	TOTAL GASEOUS HYDROCARBON ppm
							INLET °C (°F)	OUTLET °C (°F)			
							AVG.	AVG.			
TOTAL							AVG.				
AVERAGE											

Figure F-2. Particulate and gaseous hydrocarbon field 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 F-3.

DRAFT
DO NOT QUOTE OR CITE

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

Downscale
1 _____ seconds
2 _____ seconds
3 _____ seconds

Average downscale response _____ seconds

System response time = slower average time = _____ seconds.

Figure F-4.

DRAFT
DO NOT QUOTE OR CITE

Plant _____

Date _____

Run No. _____

Relative Humidity _____

Amount liquid lost during transport _____

blank volume, ml _____

wash volume, ml _____

blank concentration, mg/mg (equation F-5) _____

wash blank, mg (equation F-6) _____

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 F-5. Analytical data.

DRAFT
DO NOT QUOTE OR CITE

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 F-6.

DRAFT
DO NOT QUOTE OR CITE

APPENDIX G

POM FIELD DATA AND CALCULATED EMISSIONS

POM Sampling and Analyses Using the Special POM Sampling Train	G- 1
POM Field and Laboratory Data	G-14
Calculated Sampling Results for POM Runs	G-25

APPENDIX G

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 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 POM Sampling Train, as shown in Figure G-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.

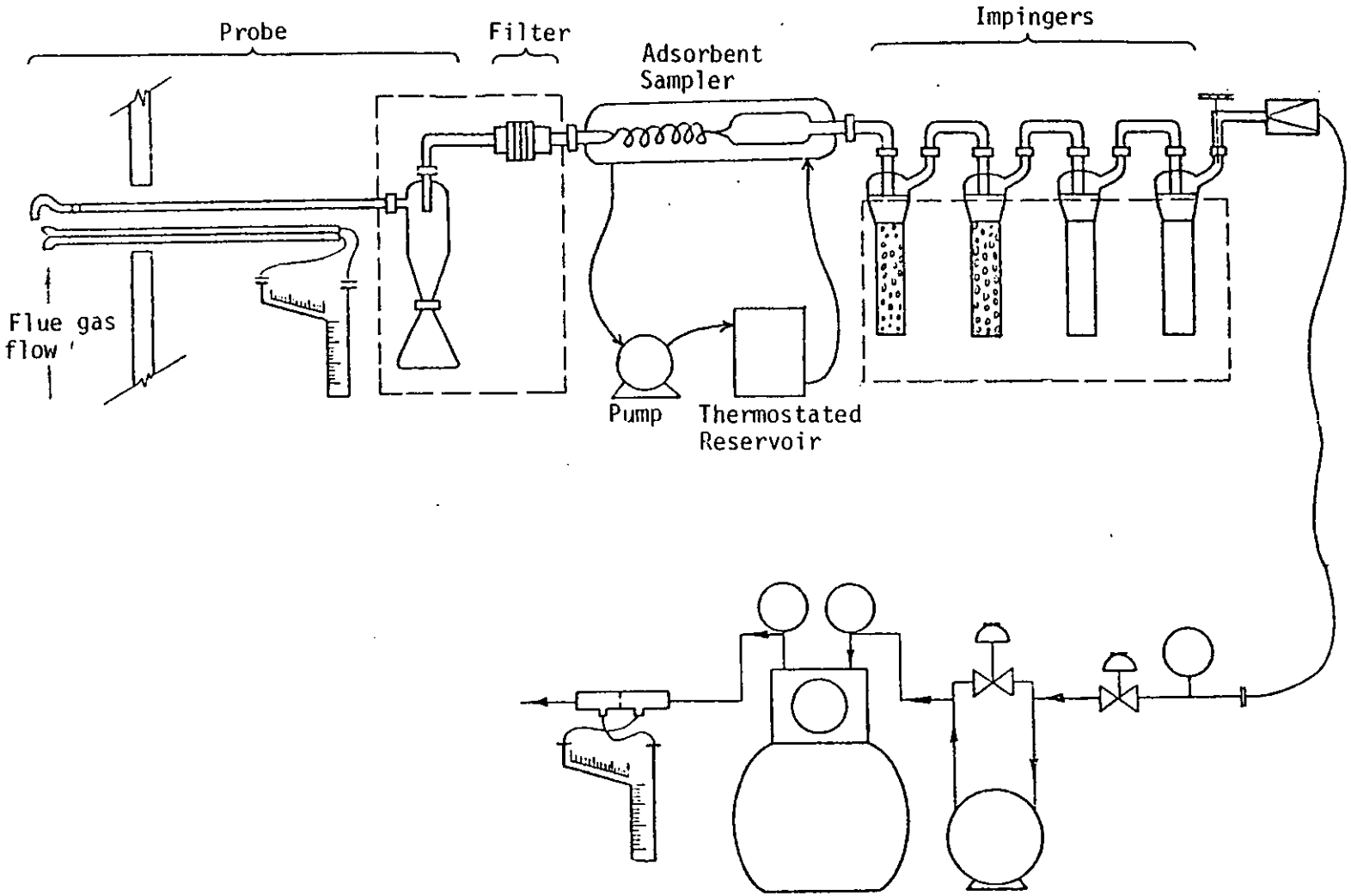


FIGURE G-1. BATTELLE POM SAMPLING TRAIN

Details of POM Absorber

A schematic representation of the adsorbent sampler is shown in Figure G-3. 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 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.

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 absorbent sampler from a 4-ℓ reservoir. An acquastat 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 Nm^3/min) to 0.75 scfm (0.021 Nm^3/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.

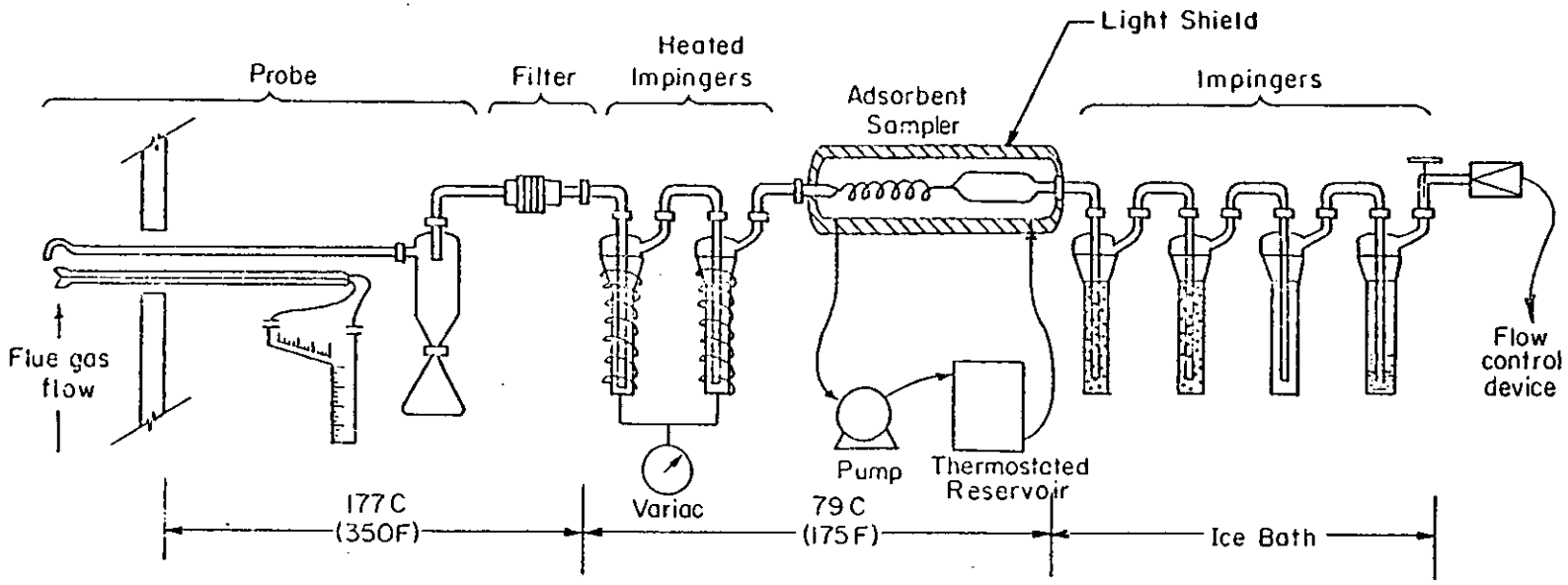


FIGURE G-2. POM SAMPLE TRAIN CONFIGURATION FOR ASPHALT BLOWING STILL PROCESS

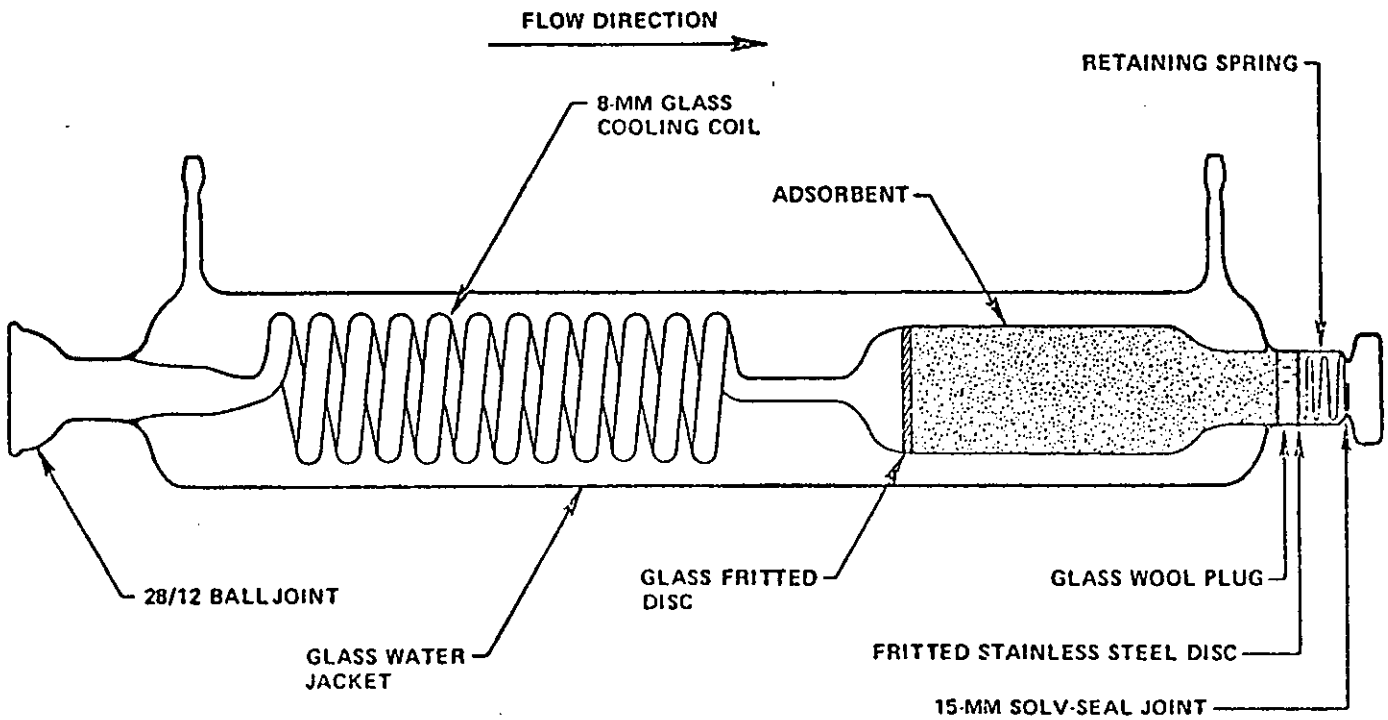


FIGURE G-3. ADSORBENT SAMPLING SYSTEM

Sampling

Sampling with the 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 prevents 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 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 (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 Soxhet 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 is it 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 G-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 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 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 Tenas 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.

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 separation[1] in order to isolate the POM fraction

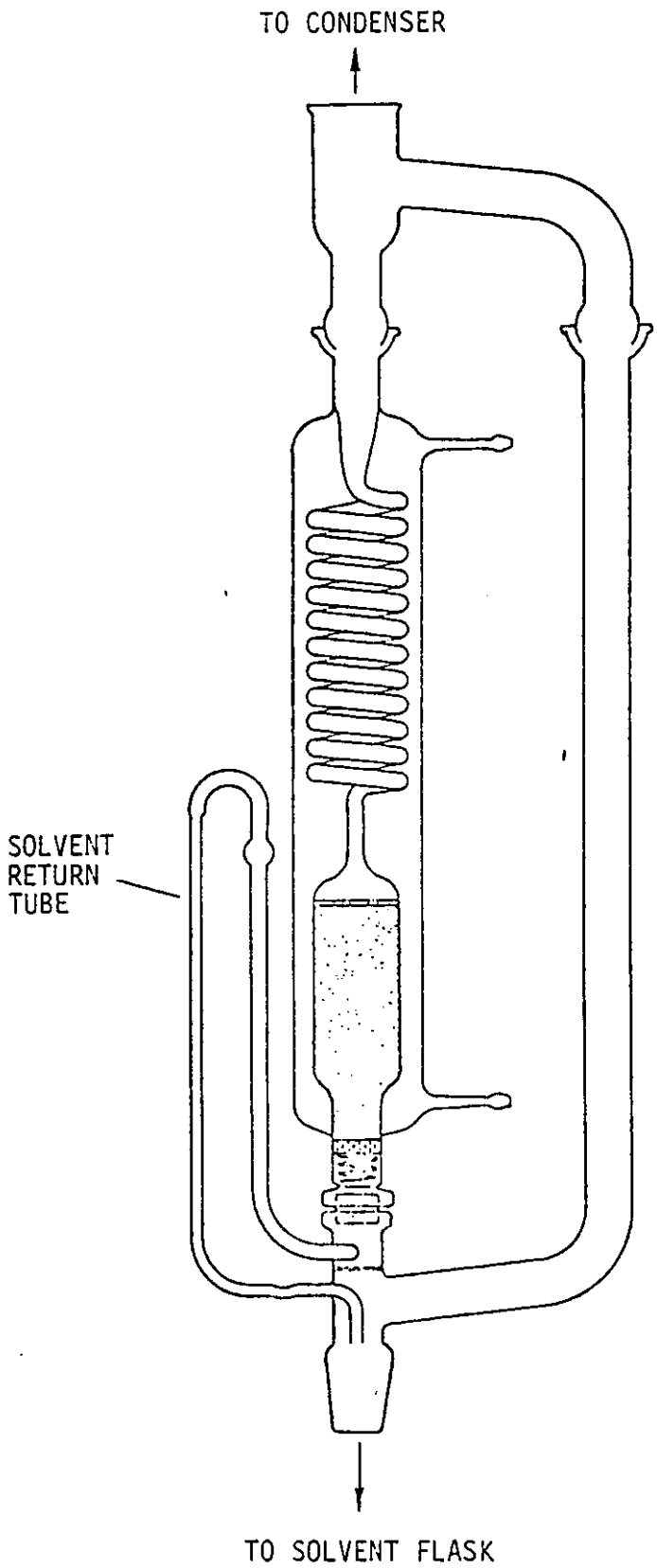


FIGURE G-4. CONTINUOUS EXTRACTION ASSEMBLY
FOR ABSORBENT SAMPLER

before carrying out gas chromatographic-mass spectrometric (GC-MS) analysis. Gas chromatographic separation is achieved using a 14-foot x 2-mm, 2½ 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'-Bix (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 ge adjusted at various stages during the analysis. This adjustment necessitated the incorproation 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

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.

Laboratory validation studies were performed on the absorbent 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.

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.

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 G-1.

TABLE G-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

As part of an EPRI-supported program[2], a further series of validation runs was conducted. Clean air was passed through a Pyrex chamber that was electrically heated to about 392 F (200 C). So_2, No_x, and water vapor were added to the air stream at each of several selected concentrations. Quantities of pyrene, chrysene, benzoic acid, terephthalic-acid, 1, 2, 3, 4-tetrachloronaphthalene (TCN), and 2, 2′, 5, 5′-tetrachlorobiphenyl were added to the air stream. The entire gas stream was passed through the sampler, which was operated at three temperatures: 131 F (55 C), 154 F (68 C), and 180 F (82 C), and the percent recovery of the spiking material was determined.

For the two POM compounds included in this study (pyrene and chrysene), the average percent recovery for all tests was 73 and 63, respectively. The range of individual values for percent recovery was 20 to 100 for pyrene and 18 to 337 for chrysene. For both compounds the average percent recovery decreased slightly, with increasing temperature of the adsorbent column as follows:

	Column Temperature		
	131 F (55 C)	154 F (68 C)	180 F (82 C)
Pyrene	77	73	69
Chrysene	69	65	61

Thus, results of this study showed that adsorbent column temperature did not have a significant effect on POM collection.

Field Calibration of Higher Adsorbent Column Temperature

Because the high moisture content of the exhaust stream from one asphalt roofing plant blowing still required that the adsorbent column be run at 175 F (79 C) to avoid condensation, a parallel run with two sampling trains was made on the exhaust stream from an asphalt roofing plant saturator. Comparing the results of the POM data from these parallel runs showed that the high-temperature column (175 F, 79 C) did not collect nearly as much POM as was collected in the low-temperature column (130 F, 54 C). The ratios of POM collected in the low-temperature column to that collected in the high-temperature column are:

Compound	Ratio
Anthracene/phenanthrene	57
Methyl anthracenes	585
Fluoranthene	160
Pyrene	60
Methyl pyrene/fluoranthene	59
Chrysene/benz(a)anthracene	25.4
Methyl chrysenes	2.34
Benzo fluoranthenes	0.94
Benz(a)pyrene	1.24
Benz(e)pyrene	0.95
Perylene	0.053

These data (from only one run) suggest column temperature is an important factor in POM sampling, and also that a higher-temperature column will retain heavier (higher molecular weight) POM compounds more effectively than light POM compounds.

References

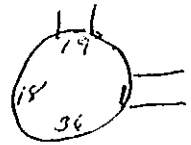
(1) Moore, G. G., Thomas, R. S., and Monkman, J. L., *J. Chromatog.*, **26**, 456 (1967).

(2) Neher, M. B., Jones, P. W., and Perry, P. J., "Validation of the Battelle Adsorbent Sampler", Draft Final Report from Battelle-Columbus to Electric-Power Research Institute, 1977.

POM FIELD AND LABORATORY DATA

PLANT Certain Teed.
DATE 9-13-75
SAMPLING LOCATION TPI - Inlet
SAMPLE TYPE P.O.M.
RUN NUMBER POM PPI
OPERATOR Turner
AMBIENT TEMPERATURE 70
BAROMETRIC PRESSURE 29.60
STATIC PRESSURE, (P_s) 1.0
FILTER NUMBER (s)

N ↑



PROBE LENGTH AND TYPE 4' Water Cooled
NOZZLE I.D. .270
ASSUMED MOISTURE, % 5%
SAMPLE BOX NUMBER 5
METER BOX NUMBER 3
METER $\Delta H_@$ 1.90
C FACTOR 1.1
PROBE HEATER SETTING N/A
HEATER BOX SETTING 250
REFERENCE Δp .38

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 4 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	POM	IMPINGER TEMPERATURE, °F	Eff.
			473.2											
18	0	14 12	475.8	.27	1.3	1.3	238	71	73		260	125	65	
17	4	14 23	478.0	.27	1.3	1.3	242	73	73	16	270	128	62	60
16	8	14 27	480.5	.31	1.5	1.5	241	75	72	17.5	269	130	64	61
15	12	14 31		.31	1.5	1.5	243	77	72	17.5	269	134	73	64
14	16	14 35	485.9	.29	1.4	1.4	243	78	72	18	266	132	78	68
13	20	14 39	488.5	.27	1.3	1.3	229	79	71	16	267	130	82	72
12	24	14 43	490.9	.25	1.25	1.25	234	80	71	15	272	129	82	75
11	28	14 47	493.2	.23	1.1	1.1	237	81	71	12.5	273	128	79	75
10	32	14 51	495.6	.22	1.05	1.05	237	79	70	12.	270	125	72	73
9	36	14 55	497.8	.25	1.2	1.2	231	80	72	11.5	248	125	68	67
8	40	14 59	500.1	.27	1.3	1.3	229	78	70	13.5	265	125	68	65
7	44	15 03	502.5	.28	1.35	1.35	230	80	72	14	265	125	67	61
6	48	15 07	505.0	.28	1.35	1.35	226	79	70	15	258	125	66	63
5	52	15 11	507.0	.28	1.35	1.35	234	79	71	15	272	125	65	60
		15 12		Pump	off			~~69~~	~~70~~		~~265~~	~~125~~	~~64~~	61
4	56	15 36	509.3	.30	1.4	1.4	223	69	70	15	265	125	64	~~64~~
3	60	15 40	509.6	.25	1.2	1.2	212	71	70	15	264	125	64	64
2	64	15 44	512.0	.20	.97	.97	208	73	70	15.5	269	125	65	60
1	68	15 48	514.4	.20	.97	.97	208	73	70		265	125	65	62
	72	15 52	516.6	Change	Ports.									62
36	72	16 04	518.7	.25	1.2	1.2	229	68	67	13	265	125	60	59
35	76	16 06	520.1	.25	1.2	1.2	233	68	67	13	272	125	60	59
~~34~~	~~80~~	~~16 08~~		Shut	Down									

COMMENTS:

EPA (Dur) 235
4 72

G-15

FIELD DATA

PLANT _____
DATE _____
SAMPLING LOCATION _____
SAMPLE TYPE _____
RUN NUMBER _____
OPERATOR _____
AMBIENT TEMPERATURE _____
BAROMETRIC PRESSURE _____
STATIC PRESSURE, (P_s) _____
FILTER NUMBER (s) _____

PROBE LENGTH AND TYPE _____
NOZZLE I.D. _____
ASSUMED MOISTURE, % _____
SAMPLE BOX NUMBER _____
METER BOX NUMBER _____
METER $\Delta H_@$ _____
C FACTOR _____
PROBE HEATER SETTING _____
HEATER BOX SETTING _____
REFERENCE Δp _____

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY _____ MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	PORT	IMPINGER TEMPERATURE, °F	
			520.1											
35	~~78~~	18 02	521.5	.28	1.35	1.35	174	64	65	14	267	125	63	58
	80	18 07		Shut Down				~~64~~	~~64~~					~~57~~
34	84	18 12	523.8	.25	1.2	1.2	191	64	64	13	274	124	60	58
33	88	18 17	524.3				191	66	65		278			60
	~~89~~	18 18	524.3	Shut Down										
	89	18 20	525.4	~~.28~~			~~201~~	~~66~~	~~64~~		~~272~~	~~124~~	~~63~~	~~60~~
32	92	18 23	527.8	.28	1.35	1.35	201	66	64	15.5	272	124	65	60
31	96	18 25	530.6	.28	1.35	1.35	199	70	64	15.5	268	124	63	62
30	100	18 29	533.7	.27	1.25	1.25	206	72	64	15.5	273	125	65	62
29	104	18 33	535.2	.28	1.35	1.35	208	74	65	16	272	125	65	63
28	108	18 37	537.7	.28	1.35	1.35	212	75	65	16	274	125	65	63
27	112	18 41	540.2	.27	1.25	1.25	216	77	66	15.5	277	125	65	63
26	116	18 51	542.7	.29	1.4	1.4	216	77	66	17	278	125	65	63
25	120	18 55	545.3	.29	1.4	1.4	219	79	67	17	282	125	65	65
24	124	18 59	547.9	.34	1.6	1.6	223	78	67	19	280	125	65	63
23	128	19 03	550.7	.32	1.5	1.5	219	76	66	19	282	125	65	62
22	132	19 07	553.6	.32	1.5	1.5	217	76	65		272	125	65	62
					Shut Down							~~125~~		~~60~~
21	132	19 24	556.1	.32	1.5	1.5	206	61	62	18	264	125	60	55
20	136	19 28	558.7				191	61	62		271			54
	137	19 29	556.7					~~57~~	~~60~~		~~274~~	~~125~~	~~59~~	~~53~~
19	140	19 38	558.9	.23	1.1	1.1	187	57	60	.13	274	125	59	53
18	144	19 43	561.5		Run	~~Complete~~		Complete						

COMMENTS:

88.3 ft^3 9.53 / .27 1.35 225 70

2.470 m^3

EPA (Dur) 235
4-72

FIELD DATA

PLANT Costom Steel Shakopee
DATE 9/13/75
SAMPLING LOCATION TP 2
SAMPLE TYPE POM 2-1
RUN NUMBER POM 2-1
OPERATOR [illegible] & R. Foster
AMBIENT TEMPERATURE 52
BAROMETRIC PRESSURE 29.60
STATIC PRESSURE, (P_s) 29.60
FILTER NUMBER (s)

1 of 2 sheets

POM 125F

PROBE LENGTH AND TYPE 15' Lined
NOZZLE I.D. 0.305
ASSUMED MOISTURE, % 3
SAMPLE BOX NUMBER 7
METER BOX NUMBER 5
METER $\Delta H_@$ 1.72
C FACTOR 1.00
PROBE HEATER SETTING 250
HEATER BOX SETTING 250
REFERENCE Δp 0.37

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	Probe Temp °F	POM Temp °F
	2:25	0	366.2											
WE 1	2:25	5	365.5	0.14	0.60	0.60	467	72	72	7	332	50	361	126
2	2:30	10	377.2	0.18	0.90	0.90	514	72	72	9	332	48	349	128
3	2:35	15	374.1	0.18	0.90	0.90	529	72	72	9	337	51	358	128
4	2:40	20	377.0	0.19	0.94	0.94	544	74	72	9	341	52	359	130
5	2:45	25	379.8	0.19	0.94	0.94	554	75	71	9	343	54	336	132
6	2:50	30	382.7	0.19	0.94	0.94	549	77	73	9	345	56	335	132
7	2:55	35	385.7	0.20	1.00	1.00	538	79	74	10	352	57	340	130
8	3:00	40	388.7	0.20	1.00	1.00	547	78	73	10	351	56	404	129
9	3:05	45	391.6	0.20	1.00	1.00	535	77	73	10	348	54	518	128
10	3:10	50	394.6	0.21	1.05	1.05	536	76	72	10	343	54	574	125
11	3:15 / 3:38	50 / 55	397.6	0.22	1.10	1.10	542	76	72	10	344	54	577	127
12	3:43	60	400.5	0.19	0.94	0.94	532	78	70	9	329	47	326	125
13	3:48	65	403.3	0.18	0.90	0.90	526	75	70	9	325	46	458	125
14	3:53	70	405.9	0.16	0.80	0.80	487	65	65	8	317	44	490	124
NS 1	3:55	75	408.3	0.14	0.60	0.60	458	67	64	7	296	47	348	124
2	4:00	80	411.0	0.17	0.85	0.85	501	65	65	8	295	47	316	125
3	4:05	80.3 / 85	411.2 / [illegible]	0.18	0.90	0.90	—	—	—	—	—	—	—	—
	Line plug out		[illegible]	0.22	1.10						324		354	126
3	6:28 / 6:28	85	413.5 / 416.2	0.17	0.85	0.85	516	61	58	7	300	44	363	126
4	6:33	90	418.9	0.18	0.90	0.90	529	62	58	8	304	42	321	125
5	6:38	95	421.8	0.19	0.94	0.94	538	63	58	8	318	43	308	125
6	6:43	100	424.7	0.20	1.00	1.00	544	63	59	9	321	44	341	126
7	6:48	105	427.6	0.19	0.94	0.94	542	63	59	8	326	45	324	127

COMMENTS:

EPA (Dur) 235
4-72

FIELD DATA

PLANT Centennial Shakopee
DATE 9/13/75
SAMPLING LOCATION TP 2
SAMPLE TYPE POM 1
RUN NUMBER POM-2-1
OPERATOR Eddie & P Sister
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 29.52
STATIC PRESSURE, (P_s) 29.52
FILTER NUMBER (s)

2 of 2 sheets

PROBE LENGTH AND TYPE 15' Inconel
NOZZLE I.D. 0.305
ASSUMED MOISTURE, % 3
SAMPLE BOX NUMBER 7
METER BOX NUMBER 5
METER $\Delta H_@$ 1.72
C FACTOR 1.00
PROBE HEATER SETTING 350
HEATER BOX SETTING 350
REFERENCE Δp 0.37

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F		
8	6 53	110	430.6	0.21	1.05	1.05	549	64	59	9	328	45	354	127
9	6 58	115	433.6	0.22	1.10	1.10	554	63	58	9	333	46	510	127
10	7 03	120	436.6	0.23	1.15	1.15	558	62	57	9	332	45	515	128
11	7 08	125	439.7	0.23	1.15	1.15	564	62	57	9	330	45	514	127
12	7 13	130	442.8	0.23	1.15	1.15	560	62	57	9	326	45	518	128
13	7 42	135	445.7	0.22	1.10	1.10	526	49	51	9	306	38	338	122
14	7 51	140	448.6	0.20	1.00	1.00	528	49	50	9	304	38	446	125
				0.19		0.96	531							
			80.0					66						

COMMENTS:

$80.4 \times \frac{29.52}{460 + 66} \times 17.2 \times 0.0283 = 2.249\ m^3$

EPA (Dur) 235
4 72

ANALYTICAL DATA

PLANT Cargill - Feed Shakopee Minn

DATE Sept 13 '75

SAMPLING LOCATION

SAMPLE TYPE EPA #5 w/ POM

RUN NUMBER POM-TP-1

SAMPLE BOX NUMBER Impo #5 Glass lot #7

CLEAN-UP MAN McN

COMMENTS:

1258

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER 5145 _____ — CONTAINER _____ _____ mg

tare 0.57680 g _____

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	321 ml	7.0 ml	4.2 ml	ml	ml	
INITIAL VOLUME	100.0 ml	0	0	5.0		
NET VOLUME	221 ml	7.0 ml	4.2 ml	4.1 ml	ml	ml

SILICA GEL			
FINAL WEIGHT	504.2 g	g	g
INITIAL WEIGHT	475.0 g	g	g
NET WEIGHT	29.2 g	g	g

29.2
7.0
4.2
40.4

TOTAL MOISTURE 31.6 g

EPA (Dur) 231
4/72

ANALYTICAL DATA

PLANT CERTAIN-TEED, INC Shakopee, Minnesota

DATE SEP 13 1975

SAMPLING LOCATION

SAMPLE TYPE

RUN NUMBER CER PO M-1 -TP-2

SAMPLE BOX NUMBER 7

CLEAN-UP MAN Baylor

COMMENTS:

FRONT HALF

LABORATORY RESULTS

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____ mg

FILTER NUMBER JUL-60 _____ _____ — CONTAINER _____ _____ mg

tare 0.38067 g _____

net _____ _____

washing from cyclone in filter jt body, however: washing at elbow still entered.

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 (1st spl)	2	3	4	5	6
FINAL VOLUME	118 ml	6 ml	2 ml	45.6 ml	5 ml	
INITIAL VOLUME	100 ml	0	0			
NET VOLUME	18 ml	6 ml	2 ml	ml	ml	ml

SILICA GEL			
FINAL WEIGHT	499.6 g	g	g
INITIAL WEIGHT	475 g	g	g
NET WEIGHT	24.6 g	g	g

TOTAL MOISTURE 56.2 g

EPA (Dur) 231
4/72

Polycyclic Organic Matter Analyses

We agreed with you and Pete that Item 2 of your October 31, 1975, correspondence is the best approach to analyzing the total number of polycyclic organic matter (POM) samples. However, due to emphasis needed in other areas of the sample analyses program, we have decided on the following POM analyses to be performed:

Item I. GC-MS for all POM compounds but reporting the sum of Benzo (a) pyrene (BaP) and Benzo (e) pyrene (BeP).

This analysis is to be conducted on the following POM samples:

✓ 575-006-497 1. One inlet POM sample from Celotex, Fairfield, Ala. (1-1) — (2-5)
✓ 575-006-341 2. One outlet POM sample from Certain-Teed, Shakopee, Minn. (1-2) - (1-5)
✓ 575-006-504 3. One outlet POM sample from Celotex, Fairfield, Ala. (1-3) - (2-5)
✓ 575-007-056 4. One outlet POM sample from Celotex, Los, Angeles, Calif. (1-4) - (1-7)
✓ 575-006-106 5. One outlet POM sample from Elk Roofing, Stephens, Ark. (1-5) - (1-6)
✓ 575-006-155 6. One blank POM sample from Elk Roofing, Stephens, Ark. —e—
✓ 575-007-096 7. One blank POM sample from Celotex, Los, Angeles, Calif. —e—

Cost of analysis for each sample is estimated to range between $550 to $600.

Item II. GC-MS for all POM compounds but reporting BaP and BeP as separate polynuclear aromatic hydrocarbons in addition to their sums.

This analysis is to be conducted on the following POM samples:

✓ 575-006-112 1. One inlet POM sample (POM-3) from Elk Roofing, Stephens, Ark. (2-1) - (1-6)
✓ 575-006-113 2. One inlet POM sample from Celotex, Los Angeles, Calif. (2-2) - (1-7)
✓ 575-007-055 3. One 125° inlet POM sample from Certain-Teed, Shakopee, Minn. (2-3) - (1-6)
✓ 575-006-335 4. One 175° inlet POM sample from Certain-Teed, Shakopee, Minn. (2-4) - (1-6)
✓ 575-006-489 5. One blank POM sample from Celotex, Fairfield, Ala. —e—

Cost of analysis for each sample is estimated to range between $650 to $700.

In summary twelve (12) runs will be analyzed for polycyclic organic matter at an approximate cost of $7200. Hopefully these data will support the project's needs, however as you have pointed out, it is possible that the BaP results may be below the detectable levels, but the carcinogenic POM levels may be high, thus validating the need for acquisition of additional data.

Continuous Data Analyses

I. Flame Ionization Detector (FID) Data

A. Record data from strip charts by sampling location, date, run, port, time, and traverse point. A numerical (N) average along with a maximum and minimum value shall be tabulated for each traverse point. Only data collected during the actual particulate run times shall be treated in this manner and reported in the Summary Section of the Report.

Example: Table FID
Sampling Location: Afterburner inlet

Quantification Notation	EPA Sample Number
I1	S75-006-497
I2	S75-006-341
I3	S75-006-504
I4	S75-007-056
I5	S75-006-106
I6	S75-006-155
I7	S75-007-096
* 2-1	S75-006-112 S75-006-113
2-2	S75-007-055
2-3	S75-006-329
2-4	S75-006-335
2-5	S75-006-489

* 1/64 of sample analyzed

ng = ~~mg~~ μg × 10^-3
= mg × 10^-6

POM QUANTIFICATION

Component	NAS Notation	ng	ng	ng	ng	ng	ng	ng
		T1	T2	T3	T4	T5	T6	T7
Anthracene/Phenanthrene		5200	13500	4500	12500	9900	450	1000
Methyl anthracenes		18500	16200	6400	17200	6900	400	700
Fluoranthene		1000	1500	1200	3500	400	100	100
Pyrene		9500	18500	300	900	900	100	1500
Methyl Pyrene/Fluoranthene		400	13000	2000	5900	1500	400	900
Benzo(c)phenanthrene	***	350				1000		
Chrysene/Benz(a)anthracene	*	8300	20500	700	2200	4000	400	350
Methyl chrysenes	*	6800	23100	350	3100	3500	400	150
Benzo fluoranthenes	**	5300	12500	350	1200	4700	400	450
Benz(a)pyrene	***	13500	9900	900	1900	4500	400	900
Benz(e)pyrene								
Perylene								
3-Methylcholanthrene	****							
Indeno(1,2,3,-cd)pyrene	*							
Benzo(ghi)perylene								
Dibenzo(a,h)anthracene	***							
Diebenzo(c,g)carbazole	***							
Dibenz(ai and ah)pyrenes	***							
Coronene								
TOTAL								

POM QUANTIFICATION

Component	NAS Notation	1/64 of Sample				
		ng 1-1	ng 2-2	ng 2-3	ng 2-4	ng 2-5
Anthracene/Phenanthrene		643	426	631	10 000	900
Methyl anthracenes		1952	1123	1357	2000	1200
Fluoranthene		30	24	8	150	50
Pyrene		44	83	60	850	100
Methyl Pyrene/Fluoranthene		689	211	185	2700	
Benzo(c)phenanthrene	***		20			
Chrysene/Benz(a)anthracene	*	188	43	35	1200	
Methyl chrysenes	*	615	121	13	4800	
Benzo fluoranthenes	**	18	1.50	1.9	1750	
Benz(a)pyrene	***	8	.33	1.0	900	
Benz(e)pyrene		14	.56	1.3	1200	
Perylene			4.57	0.1	1600	
3-Methylcholanthrene	****		6.02			
Indeno(1,2,3,-cd)pyrene	*					
Benzo(ghi)perylene						
Dibenzo(a,h)anthracene	***					
Dicbenzo(c,g)carbazole	***					
Dibenz(ai and ah)pyrenes	***					
Coronene						
TOTAL						

CALCULATED SAMPLING RESULTS FOR POM RUNS

POM Computer Test Results
Summary (English Units)

CERTAIN-TEED PROM RESULTS	TP-1 INLET	TP-2 OUTLET
Test Point	1	2
TEST DATE	9/13	9/13
VOLUME OF GAS SAMPLED, DSCF	87.6	79.9
PERCENT MOISTURE BY VOLUME	1.7	3.2
AVERAGE STACK TEMPERATURE, F	222	531
STACK VOLUMETRIC FLOW RATE, DSCFM	7557	13349
STACK VOLUMETRIC FLOW RATE, ACFM	10001	26021
PERCENT ISOKINETIC	99.7	105.9
PERCENT EXCESS AIR	37143	1143

Metric Units

CERTAIN-TEED PROM RESULTS	TP-1 INLET	TP-2 OUTLET
Test Point	1	2
TEST DATE	9/13	9/13
VOLUME OF GAS SAMPLED, NCM	2.49	2.26
PERCENT MOISTURE BY VOLUME	1.7	3.2
AVERAGE STACK TEMPERATURE, C	105	277
STACK VOLUMETRIC FLOW RATE, NCMM	213	376
STACK VOLUMETRIC FLOW RATE, CMM	282	734
PERCENT ISOKINETIC	99.7	105.9
PERCENT EXCESS AIR	37143	1143

POM Computer Test Results

CERTAIN-TEED PPOM RESULTS TP-1 INLET TP-2 OUTLET

	Test Point	1	2
	TEST DATE	9/13	9/13
	SAMPLING TIME, 24 HOUR CLOCK FROM	1419	1420
	TO	1942	1951
DN	SAMPLING NOZZLE DIAMETER, IN.	0.270	0.305
TT	NET TIME OF TEST, MIN.	144	140
PB	BAROMETRIC PRESSURE, IN. HG ABSOLUTE	29.60	29.60
PM	AVG. ORIFICE PRESSURE DROP, IN. H2O	1.35	0.96
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS, DCF	88.3	80.0
TM	AVG. GAS METER TEMPERATURE, F	70	66
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS, DSCF	87.6	79.9
VW	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML	31.6	56.2
VWGAS	VOLUME OF H2O VAPOR COLLECTED,SCF	1.5	2.7
%M	PERCENT MOISTURE IN STACK GAS BY VOLUME	1.68	3.23
MD	MOLECULAR FRACTION OF DRY GAS	0.98	0.97
% CO2	VOLUME PERCENT DRY	0.1	1.1
% O2	VOLUME PERCENT DRY	20.8	19.3
% CO	VOLUME PERCENT DRY	0.1	0.1
% N2	VOLUME PERCENT DRY	79.0	79.5
% EA	PERCENT EXCESS AIR	37143	1143
MWD	MOLECULAR WEIGHT OF STACK GAS, DRY BASIS	28.8	28.9
MW	MOLECULAR WEIGHT OF STACK GAS, WET BASIS	28.7	28.6
CP	PITOT TUBE COEFFICIENT	0.85	0.85
TS	AVG. STACK TEMPERATURE	222	531
NP	NET SAMPLING POINTS	36	28

POM Computer Test Results
(Continued)

CERTAIN-TEED PROM RESULTS TP-1 INLET TP-2 OUTLET

	Test Point	1	2
	TEST DATE	9/13	9/13
	SAMPLING TIME, 24 HOUR CLOCK FROM	1419	1420
	TO	1942	1951
PST	STATIC PRESSURE OF STACK GAS, IN. HG.	-0.07	.00
PS	STACK GAS PRESSURE, IN. HG ABS.	29.53	29.60
VS	STACK GAS VELOCITY AT STACK CONDITIONS, FPM	2029	2068
AS	STACK AREA, SQ. IN.	707	1809
QS	DRY STACK GAS VOLUMETRIC FLOW RATE AT STANDARD CONDITIONS, DSCFM	7557	13349
QA	STACK GAS VOLUMETRIC FLOW RATE AT STACK CONDITIONS, ACFM	10001	25021
% I	PERCENT ISOKINETIC	99.7	105.9

APPENDIX H

PARTICLE SIZE TESTING

Report of "Particle Size Sampling at Asphalt Roofing Plants" (The report reproduced in the first part of this appendix was prepared by the Monsanto Research Corporation under a separate EPA contract.) H- 1

Sampling Test Log H-48

Battelle Comments on Particle Size Results H-53

Particle Size Sampling at Asphalt Roofing Plants

EMB Projects Report No.
76-ARM-12

Plant Tested

Certain-Teed Corporation
(Shakopee), Minnesota

September 8, 9, 10, 11, and 12, 1975

Prepared for

Environmental Protection Agency
Office of Air Quality Planning and Standards
Emission Measurement Branch
Research Triangle Park
North Carolina 27711

by

Darrell L. Harris
W. R. Feairheller

Monsanto Research Corporation
Dayton Laboratory
Dayton, Ohio 45407

Report Reviewed by Clyde E. Riley

Contract No. 68-02-1404, Task No. 14

DRAFT

TABLE OF CONTENTS

		Page
I.	PARTICLE SIZE TESTING	1
	Sampling and Analytical Procedures	2
	Discussion	4

Appendix - Field Data Sheets

DRAFT

LIST OF TABLES

Table		Page
1	Dry Catch Run TP1-1	9
2	Dry Catch Run TP1-2	10
3	Dry Catch Run TP1-3	11
4	Dry Catch Run TP1-4	12
5	Dry Catch Run TP3-1	13
6	Dry Catch Run TP3-2	14
7	Dry Catch Run TP3-3	15
8	Dry Catch Run TP3-4	16
9	Dry Catch Run TP2-1	17
10	Total Catch Run TP1-1	18
11	Total Catch Run TP1-2	19
12	Total Catch Run TP1-3	20
13	Total Catch Run TP1-4	21
14	Total Catch Run TP3-1	22
15	Total Catch Run TP3-2	23
16	Total Catch Run TP3-3	24
17	Total Catch Run TP3-4	25
18	Total Catch Run TP2-1	26

DRAFT

SECTION I

PARTICLE SIZE TESTING

On September 8 through 12, 1975, particle size distribution tests were conducted at Certain-Teed Corporation, Shakapee, Minnesota. The tests were conducted by D. L. Harris of Monsanto Research Corporation to provide data for the Emission Standards and Engineering Division, Emission Measurements Branch of the EPA.

Particle size distribution tests employing a Brink® BMS-11 cascade impactor were conducted on the inlet and outlet of one control incinerator, and the inlet duct of a second control incinerator, which are used to control emissions from a shingle saturator and coater line. Four runs were conducted at the inlet duct of each incinerator and a single run was conducted at the outlet duct. The test points are identified as TP1 and TP3, both inlets, and TP2, an outlet. The run times ranged from fifteen to sixty minutes at the inlets and 130 minutes at the outlet. A summary of the test results is given in Tables 1 through 18.

It was recognized in the preparations for the test that the material to be sampled would most likely be an aerosol of organic material resembling a light motor oil. For this reason a number of aluminum foil cups were fabricated to fit the pans in the Brink® impactor. These aluminum cups were preweighed in the laboratory and shipped to the test site with the

DRAFT

sampling equipment. The exposed pans were then hand carried back to the laboratory after the test and reweighed. It is not known whether the organic material that was collected was stable enough to remain in the pan until reaching the laboratory to be weighed. It is probable that volatile materials were lost due to evaporation. As a result, the particle size distribution data may be invalid.

Sampling and Analytical Procedures

At all three 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 is selected by determining the average velocity of the duct from velocity traverse data and selecting a point in the duct where that average velocity occurs. This is referred to as "probe immersion depth" on the field data sheets in the Appendix of this report. Isokinetic sampling rates are established according to the instructions provided with the sampling device. This basically is done by selecting a nozzle size that will maintain the flow rate through the sampler at approximately .05 cubic feet per minute while the velocity through the nozzle is maintained at the velocity of the stream being sampled. The impactor itself is 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) is selected from the calibration curve.

Prior to the start of each sampling, the sampler is cleaned and assembled. The proper size nozzle is assembled on an appropriate probe length and the probe connected to the inlet of the glass cyclone. The outlet of the cyclone is connected

DRAFT

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

The sampling time is determined by experience and trial and error. The sampling time on the first run is estimated and when the run is finished the pans are observed for collected material. The sampling time for subsequent runs is then adjusted depending on the amount of material collected on the first run. If too little material is collected on the impactor pans the sampling time must be increased.

Clean-up and sample collection is 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 is then cleaned thoroughly with methylene chloride solvent. The final filter is removed and placed in its container for shipment. The nozzle, probe, cyclone, and cyclone catch bottle is thoroughly 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

DRAFT

cyclone and subsequent stages were evaporated in a tared container and the weight of residue was determined.

Discussion

The four runs conducted at TP1 were conducted on September 9 and 10, 1975. Run TP1-1 was fifteen minutes long. There appeared to be insufficient material collected on the substrates, and it was determined that the fifteen minute run time was too short. Runs TP1-2 and TP1-3 were extended to thirty minutes. On September 9, shingle material was being produced, however, on September 10, the process line was changed to the production of 9-inch starter roll roofing. The data shown on Run TP1-4 was obtained on September 10, while the line was producing the roll roofing material. Upon clean-up of this run it was noticed that the loading in the impactor pans appeared to be light, therefore, when the other inlet, TP3, was sampled the run designated TP3-1 was extended to 1 hour. In cleaning this run it was discovered that the loadings were also very light. Based on this physical observation, it was determined that if the inlets were loaded so lightly while roll roofing was being produced, that it might take several hours of running on the outlet to get sufficient data. The outlet was, therefore, not sampled while roll roofing was being produced. It was also noticed, in the two inlet runs, TP1-4 and TP3-1, that the bottom stages of the impactor appeared to be loaded more heavily than the upper stages and they also seemed to be loaded more heavily than prior runs. This generally indicates a higher loading of smaller particles.

On September 11, TP3-2, TP3-3, and TP3-4 were conducted. These runs were conducted while shingle material was being

DRAFT

produced on the line and each were a 30 minute duration run time. All impactor pans on each run appeared to have collected a weighable amount of material.

On September 12, Run TP2-1, on the outlet, was conducted. After starting the run, there were several shutdowns by the plant that caused long delays in the sampling. During one delay at thirty minutes into the sampling run, the impactor was cooled and inspected and there was absolutely no apparent collection on any of the impactor pans. At the conclusion of the 130 minute run, there were just very slight amounts of material observed on some of the pans. It was concluded at this point that an unreasonable amount of time would be required to collect sufficient material for analysis. No further sampling was, therefore, conducted at this outlet.

The analysis of the data illustrates some peculiarities. The weight of material collected from the aluminum pans from all runs are shown in Tables 1-9. The weights vary between 1 to 2.4 milligrams of material and the majority are in the 1.3 milligram range and appear to be quite uniform. The samples, however, were observed at the time of their collection by visual observation to vary to quite an extent. Strangely enough the highest loaded pans were from the run conducted on the outlet of the incinerator. This run, however, was the one that was observed in the field to be the least loaded. A conclusion that can be drawn from this observation is that material collected on the other runs and observed on the pans immediately after sampling could have been mostly light hydrocarbons or organic material that evaporated or was otherwise lost during the time between sampling and analysis and material collected from this run could have been less volatile. To further emphasize this hypothesis, note that the temperature of the stack on the outlet run was 540°F while the temperature of the gases at the inlets were 200-220°F. Obviously there

DRAFT

would have been fewer light hydrocarbons collected as particulate or aerosol at the outlet stream due to the higher temperature. Since higher boiling materials were collected at this sample point, less would have been lost in transit. As pointed out, these weights are higher than those of the collected material at the inlets. These factors enforce our belief that these data are not useful.

To further enforce the assumption that higher boiling liquids were collected at the outlet of the incinerator, the data from the methylene chloride evaporations can be compared. These data are added to the pan weights, included in the calculations, and illustrated in Tables 10-18. If the material passing through the impactor were volatile or low boiling, not a large quantity or percentage of the total catch would exist as condensate or be deposited on the walls and collected in the washings. If, however, high boiling liquids did exist in the high temperature stack, more material would be deposited as a liquid on the cooler impactor walls. The average percent of total catch that was washed from the walls of the impactor after Run TP2-1 was 62%. The overall average percent catch in the washings from the rest of the runs was 46%.

Unfortunately, the evaporation procedure that is used on the wash solvent is suspected to cause losses. The normal technique for particle mass determination in a solvent is to evaporate to dryness in a tared container and dessicate to a constant weight. This procedure was followed for these samples. While this process is good for nonsoluble, solid particles, it is not conducive to accurate results when dealing with liquid droplets of organic materials. A better method would be a chromatographic analysis of the liquids, however, this procedure would be extensive and time consuming.

DRAFT

The data from the tables also presents another indication as to the inconclusive nature of the particle size data. It was mentioned that the visible impressions of the loadings in the pans did not agree with the measured results and this may be due to the loss of volatile materials. However, if volatiles were lost, the higher boiling materials should remain and the amounts of these materials should vary with different running conditions and times. If the total dry catch and total catch including the dry catch and washes of all components are calculated, we can obtain the following information:

Run No.	Dry Catch (mg)	Total Catch (mg)	Run Time (min)	Sampler Temp. °F	Source Temp. °F
TP1-1	6.05	18.80	15	200	198
TP1-2	7.04	22.92	30	201	200
TP1-3	6.70	15.94	30	202	200
TP1-4	6.07	35.29	30	205	200
TP3-1	6.23	36.96	60	225	220
TP3-2	6.39	29.59	30	230	220
TP3-3	6.08	21.78	30	222	220
TP3-4	6.02	26.42	30	222	220
TP2-1	8.15	36.65	130	223	540

It is of interest to note that on all inlet runs (TP1 and TP3) the dry catch is about the same regardless of the sampling time, which varied from 15 to 60 minutes. Even if evaporation does occur during transit, different run times should deposit different quantities of materials and if only the less volatile materials remain, the results should reflect the different amounts of the materials. Run TP2 on the outlet shows an increase with run time, however, the material collected at the outlet is not the same as at the inlet.

DRAFT

The total catch weight for the inlet runs show another trend in that the weights, except for TP1-4 and TP3-1 are not too different. The weights for these two runs are almost identical even though TP1-4 was a 30 minute run and TP3-1 was a 60 minute run. Runs TP1-4 and TP3-1 were the only runs involved with the roll roofing production, and thus a different material could be emitted from the process and collected by the sampler.

Thus, based on both the dry catch collection and the total amount of material from both dry catch and washings, there is an indication that the amount of material collected and retained is a function of the type of material and sampling temperatures and not the sampling time. In the collection of size fractionated particulate, the amount of material collected is proportional to the running time and the largest portion of the material is collected on the pans rather than in the washings.

To summarize, there is convincing evidence to indicate that a process emitting organic material as an aerosol cannot be sampled with a cascade impactor system as currently used. The evidence indicates that the field results are not representative, and considerable loss of volatile material may occur during sampling, transit and sampling handling procedures. As a result, the data presented in this report is not representative of the particle size distribution of the gas streams.

DRAFT

Table 1. DRY CATCH RUN TP1-1

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-1

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	15.0
PRESSURE DROP	IN HG	1.30
STATIC PRESSURE	IN H2O	-1.15
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.64
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	200.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00095

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	0.000		0.00	0.00	100.00
1	1.180	4.92	1.23	19.50	100.00
2	1.250	2.91	1.30	20.66	80.50
3	1.170	1.99	1.22	19.34	59.83
4	1.190	1.05	1.24	19.67	40.50
5	1.260	0.66	1.31	20.83	20.83
FILTER	0.000		0.00	0.00	0.00

DRAFT

Table 2. DRY CATCH RUN TP1-2

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-2

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.30
STATIC PRESSURE	IN H2O	-1.15
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.64
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	201.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00095

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	0.000		0.00	0.00	100.00
1	1.260	4.92	0.65	15.29	100.00
2	1.240	2.91	0.64	15.05	84.71
3	1.240	1.99	0.64	15.05	69.66
4	1.450	1.05	0.75	17.60	54.61
5	1.850	0.66	0.96	22.45	37.01
FILTER	1.200		0.62	14.56	14.56

DRAFT

Table 3. DRY CATCH RUN TP1-3

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-3

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.30
STATIC PRESSURE	IN H2O	-1.10
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.64
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	202.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00095

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	0.000		0.00	0.00	100.00
1	1.300	4.92	0.67	19.40	100.00
2	1.240	2.91	0.64	18.51	80.60
3	1.180	1.99	0.61	17.61	62.09
4	1.390	1.05	0.72	20.75	44.48
5	1.590	0.66	0.83	23.73	23.73
FILTER	0.000		0.00	0.00	0.00

DRAFT

Table 4. DRY CATCH RUN TP1-4

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-4

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.30
STATIC PRESSURE	IN H2O	-1.16
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.30
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	205.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00094

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	0.000		0.00	0.00	100.00
1	1.190	4.90	0.61	19.29	100.00
2	1.290	2.90	0.66	20.91	80.71
3	1.210	1.98	0.62	19.61	59.81
4	1.160	1.04	0.60	18.80	40.19
5	1.220	0.65	0.63	19.77	21.39
FILTER	0.100		0.05	1.62	1.62

DRAFT

Table 5. DRY CATCH RUN TP3-1

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP3-1

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	60.0
PRESSURE DROP	IN HG	1.00
STATIC PRESSURE	IN H2O	-1.00
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.30
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	225.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00091

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	0.000		0.00	0.00	100.00
1	1.120	5.16	0.32	16.16	100.00
2	1.210	3.05	0.35	17.46	83.84
3	1.300	2.09	0.37	18.76	66.38
4	1.240	1.10	0.35	17.89	47.62
5	1.360	0.70	0.39	19.62	29.73
FILTER	0.700		0.20	10.10	10.10

DRAFT

Table 6. DRY CATCH RUN TP3-2

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP3-2

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.00
STATIC PRESSURE	IN H2O	-1.10
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.41
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	230.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00090

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	0.000		0.00	0.00	100.00
1	1.230	5.15	0.70	17.85	100.00
2	1.220	3.05	0.70	17.71	82.15
3	1.300	2.09	0.74	18.87	64.44
4	1.290	1.10	0.74	18.72	45.57
5	1.350	0.70	0.77	19.59	26.85
FILTER	0.500		0.28	7.26	7.26

DRAFT

Table 7. DRY CATCH RUN TP3-3

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP3-3

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.00
STATIC PRESSURE	IN H2O	-1.10
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.41
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	222.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00091

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	0.000		0.00	0.00	100.00
1	1.270	5.17	0.73	19.60	100.00
2	1.200	3.06	0.69	18.52	80.40
3	1.190	2.09	0.68	18.36	61.88
4	1.220	1.11	0.70	18.83	43.52
5	1.200	0.70	0.69	18.52	24.69
FILTER	0.400		0.23	6.17	6.17

DRAFT

Table 8. DRY CATCH RUN TP3-4

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP3-4

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.00
STATIC PRESSURE	IN H2O	-1.10
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.41
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	222.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00091

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	0.000		0.00	0.00	100.00
1	1.190	5.17	0.68	17.71	100.00
2	1.240	3.06	0.71	18.45	82.29
3	1.250	2.09	0.72	18.60	63.84
4	1.010	1.11	0.58	15.03	45.24
5	1.330	0.70	0.76	19.79	30.21
FILTER	0.700		0.40	10.42	10.42

DRAFT

Table 9. DRY CATCH RUN TP2-1

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP2-1

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	130.0
PRESSURE DROP	IN HG	0.70
STATIC PRESSURE	IN H2O	-0.25
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.54
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	223.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00091

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	0.000		0.00	0.00	100.00
1	1.240	5.61	0.19	15.21	100.00
2	1.280	3.32	0.20	15.71	84.79
3	2.460	2.28	0.38	30.18	69.08
4	1.920	1.21	0.30	23.56	38.90
5	1.250	0.77	0.19	15.34	15.34
FILTER	0.000		0.00	0.00	0.00

DRAFT

Table 10. TOTAL CATCH RUN TP1-1

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-1

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	15.0
PRESSURE DROP	IN HG	1.30
STATIC PRESSURE	IN H2O	-1.15
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.64
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	200.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00095

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	11.600		12.05	61.70	100.00
1	1.330	4.92	1.38	7.07	38.30
2	1.900	2.91	1.97	10.11	31.22
3	1.520	1.99	1.58	8.09	21.12
4	1.190	1.05	1.24	6.33	13.03
5	1.260	0.66	1.31	6.70	6.70
FILTER	0.000		0.00	0.00	0.00

DRAFT

Table 11. TOTAL CATCH RUN TP1-2

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-2

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.30
STATIC PRESSURE	IN H20	-1.15
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.64
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	201.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00095

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	12.230		6.35	53.36	100.00
1	2.110	4.92	1.10	9.21	46.64
2	1.990	2.91	1.03	8.68	37.43
3	1.690	1.99	0.88	7.37	28.75
4	1.600	1.05	0.83	6.98	21.38
5	2.100	0.66	1.09	9.16	14.40
FILTER	1.200		0.62	5.24	5.24

DRAFT

Table 12. TOTAL CATCH RUN TP1-3

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-3

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.30
STATIC PRESSURE	IN H2O	-1.10
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.64
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	202.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00095

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	9.240		4.79	57.97	100.00
1	1.300	4.92	0.67	8.16	42.03
2	1.240	2.91	0.64	7.78	33.88
3	1.180	1.99	0.61	7.40	26.10
4	1.390	1.05	0.72	8.72	18.70
5	1.590	0.66	0.83	9.97	9.97
FILTER	0.000		0.00	0.00	-0.00

DRAFT

Table 13. TOTAL CATCH RUN TP1-4

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP1-4

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.30
STATIC PRESSURE	IN H2O	-1.18
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.30
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	205.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00094

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	16.670		8.59	47.10	100.00
1	4.980	4.90	2.57	14.07	52.90
2	3.380	2.90	1.74	9.55	38.82
3	3.500	1.96	1.80	9.89	29.27
4	2.550	1.04	1.31	7.21	19.38
5	4.210	0.65	2.17	11.90	12.18
FILTER	0.100		0.05	0.28	0.28

DRAFT

Table 14. TOTAL CATCH RUN TP3-1

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP3-1

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	60.0
PRESSURE DROP	IN HG	1.00
STATIC PRESSURE	IN H2O	-1.00
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.30
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	225.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00091

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	19.100		5.45	51.68	100.00
1	2.710	5.16	0.77	7.33	48.32
2	4.100	3.05	1.17	11.09	40.99
3	2.750	2.09	0.78	7.44	29.90
4	4.090	1.10	1.17	11.07	22.46
5	3.510	0.70	1.00	9.50	11.39
FILTER	0.700		0.20	1.89	1.89

DRAFT

Table 15. TOTAL CATCH RUN TP3-2

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP3-2

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.00
STATIC PRESSURE	IN H2O	-1.10
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.41
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	230.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00090

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	18.500		10.54	62.52	100.00
1	1.700	5.15	0.97	5.75	37.48
2	2.280	3.05	1.30	7.71	31.73
3	2.270	2.09	1.29	7.67	24.03
4	2.360	1.10	1.34	7.98	16.36
5	1.980	0.70	1.13	6.69	8.38
FILTER	0.500		0.28	1.69	1.69

DRAFT

Table 16. TOTAL CATCH RUN TP3-3

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP3-3

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.00
STATIC PRESSURE	IN H2O	-1.10
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.41
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	222.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00091

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	11.300		6.47	51.88	100.00
1	1.270	5.17	0.73	5.83	48.12
2	1.900	3.06	1.09	8.72	42.29
3	2.390	2.09	1.37	10.97	33.56
4	1.920	1.11	1.10	8.82	22.59
5	2.600	0.70	1.49	11.94	13.77
FILTER	0.400		0.23	1.84	1.84

DRAFT

Table 17. TOTAL CATCH RUN TP3-4

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP3-4

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	30.0
PRESSURE DROP	IN HG	1.00
STATIC PRESSURE	IN H2O	-1.10
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.41
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	222.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00091

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	12.100		6.93	45.80	100.00
1	2.390	5.17	1.37	9.05	54.20
2	1.940	3.06	1.11	7.34	45.16
3	2.550	2.09	1.46	9.65	37.81
4	2.910	1.11	1.67	11.01	28.16
5	3.830	0.70	2.19	14.50	17.15
FILTER	0.700		0.40	2.65	2.65

DRAFT

Table 18. TOTAL CATCH RUN TP2-1

CERTAIN-TEED CORPORATION 21 JAN 1976

CASCADE IMPACTOR PARTICLE SIZE DISTRIBUTION FOR RUN TP2-1

INPUT VARIABLE	UNITS	INPUT DATA
SAMPLING TIME	MIN	130.0
PRESSURE DROP	IN HG	0.70
STATIC PRESSURE	IN H2O	-0.25
PARTICLE DENSITY	G/CC	0.90
BAROMETRIC PRESSURE	IN HG	29.54
GAS MOL WT		29.0
GAS TEMPERATURE	DEG F	223.0
GAS VISCOSITY	POISE	0.00022
GAS DENSITY	G/CC	0.00091

STATE	WT OF MATERIAL	DPC	MG/ACF	WT PCNT	CUM WT PCNT
CYCLONE	15.200		2.36	41.47	100.00
1	2.940	5.61	0.46	8.02	58.53
2	4.080	3.32	0.63	11.13	50.50
3	5.160	2.28	0.80	14.08	39.37
4	5.320	1.21	0.82	14.52	25.29
5	3.950	0.77	0.61	10.78	10.78
FILTER	0.000		0.00	0.00	0.00

DRAFT

Brink BMS-11 Calculations

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

Plant Westerinted (Alliance Co)

Data: avg Δp - velocity ~ .268

Duct press Pd ~2"H₂O -.015 "Hg Molecular Wt Md 29

Duct Temp Td 198 °F Vel head Δp .25 "H₂O point = 12" in

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

$$V_d \text{ (ft/sec)} = 85.48 (.85) \sqrt{\frac{(198 + 460)(.25)}{(.29)(29)}} = 32 \text{ ft/sec.}$$

BP ≈ 29

Probe nozzle selection for a flow rate of F_s = 0.064 ft³/m

Nozzle = 2 mm

Δpc from Calibration curve = 1.65 "Hg.

Sampling Δp calculation: (Est box temp = 210 °F)

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

$$\Delta p_s = (1.65)\, 0.6189 \frac{(29)(29)}{(460 + 210)} = \frac{1.25}{\text{avg } 1.3} \text{ "Hg}$$

Comments:

Stage	Pan	final #
1	59-1	111
2	59-2	
3	59-3	
4	59-4	
5	59-5	

Operator [illegible]

Brink Data Sheet 1.3" Hg

Date 9/4/25 Run# 1 Location TP-1 (inlet)

Plant Centralia Steel

Data: Stack gas molecular wt 29

Stack temp 198 °F, Stack static press -.20 "H_2O

Barometric Press 29.64 "Hg actual, Ambient Temp ~60 °F

Probe tip diameter 2 mm, Probe immersion 12 in total
5 1/2 in stack

Sample box temp:

Start-in 200 °F, out 200 °F; Stop - in 250-230 °F, out 202 °F

Impactor pressure drop (Δp_s)-calculated 1.3 "Hg Real 1.3 "Hg

Impactor static inlet pressure - Start 1.1 "H_2O, Stop 1.2 "H_2O

Start time 1050 End time 1409

Sample run time 15 min

Comments + sketches:

stopped at 1 min to fix probe (connection hose came off)

stopped at 2 min - Now 1055 - plant down

checked impactor - looking shut down - very small deposit on first stage

Started at 1340

" test 1350 temperature 200°F

Operator [illegible]

Brink BMS-11 Calculations

Date 7/9/95 Run # 2 Location TP-1 (inlet)

Plant Certain-teed (Albany Co)

Data:

Duct press Pd $-.08$ "H_2O Molecular Wt Md ~29

Duct Temp Td 200 °F Vel head Δp .25 "H_2O

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

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

Same as run #1

Probe nozzle selection for a flow rate of F_s = _____ ft^3/min

Nozzle = 2.0 mm

Δpc from Calibration curve = "Hg

Sampling Δp calculation: (Est box temp = 200 °F)

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

$$\Delta p_s = (\quad) 0.6189 \frac{(\quad)(\quad)}{(460 + \quad)} = 1.3 \text{ "Hg}$$

Comments:

Stage	Part #	final filter #
1	59-6	110
2	59-7	
3	59-8	
4	59-9	
5	59-10	

Operator [signature]

Brink Data Sheet

Date 9/9/75 Run# 2 Location TP-1

Plant Certain Teed

Data: Stack gas molecular wt assume air 29

Stack Temp 200 °F, Stack static press -.8 "H_2O inclined

Barometric Press 29.64 "Hg, Ambient Temp ~60°F

Probe tip diameter 2 mm, Probe immersion 8 1/2 in
12 total - 3 1/2

Sample box temp:

Start - in 230/250 °F, out 201 °F; Stop - in 225/250 °F, out 201 °F

Impactor pressure drop (Δp_s) calculated 1.3 "Hg Real 1.3 "Hg

Impactor static inlet pressure - Start 1.01 "H_2O, Stop 1.2 "H_2O

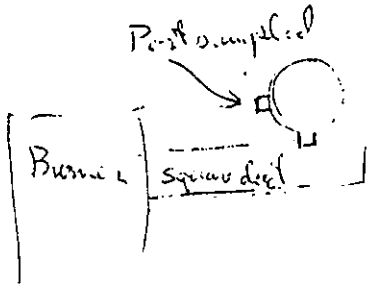
Start time 1606 End time 1636

Sample run time 30 min

Comments + sketches: no stoppage

Performed on same position run # 1

Top view



Operator _____

Brink BMS-11 Calculations

Date 9/9/75 Run # 3 Location TP-1

Plant Certain Teed Catalina Co

Data: Calculate the atmos assume it's at this location

Duct press Pd _____ "Hg Molecular Wt Md 29

Duct Temp Td _____ °F Vel head Δp .25 "H_2O

Cp .83 actual from Bell Method 5 Point #8

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

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

Probe nozzle selection for a flow rate of F_s = _____ ft^3/m

Nozzle = 2 mm

Δpc from Calibration curve = 1.3 "Hg

Sampling Δp calculation: (Est box temp = 200 °F)

$$\Delta ps = \Delta pc \times \frac{M_d}{29} \times \frac{P_d}{29.92} \times \frac{460 + 77}{460 + T_{box}} = \Delta pc\,(.6189)\,\frac{M_d\,P_d}{T_{box}}$$

$$\Delta ps = (\quad)\,.6189\,\frac{(\quad)(\quad)}{(460 + \quad)} = ____ \text{ "Hg}$$

Comments:

Stage	Pan #
1	59 - 11
2	59 - 12
3	59 - 13
4	59 - 14
5	59 - 15

final filter # 10

Operator [illegible]

Brink Data Sheet

Date 7/9/75 Run# 3 Location TP-1

Plant Certain Teed

Data: Stack gas molecular wt [illegible]

Stack temp ~200 °F, Stack static press -.8 "H_2O

Barometric Press 29.64 "Hg, Ambient Temp 55 °F

Probe tip diameter 2 mm, Probe immersion 6 2 in

Sample box temp:

Start - in 240/250 °F, out 200 °F; Stop - in 240/250 °F, out 204 °F

Impactor pressure drop (Δp_s) - calculated 1.3 "Hg Real 1.3 "Hg

Impactor Static inlet pressure - Start 1.1 "H_2O, Stop 1.1 "H_2O

Start time 2000 hrs End time 2030

Sample run time 30 min

Comments + sketches: [illegible] TP-1 #1 [illegible]

Operator [illegible]

Brink BMS-11 Calculations

Date 9/10/75 Run # 4 Location TP-1

Plant Certain Teed (Roofing) 9" starter rolls

BPa: 29.64

Data:

Duct press Pd _____ "Hg Molecular Wt Md 29

Duct Temp Td 200 °F Vel head Δp .25 "H_2O

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

$$V_d \text{ (ft/sec)} = 85.48 (.85) \sqrt{\frac{(200 + 460)(.25)}{(29)(29.6)}} = 32$$

Probe nozzle selection for a flow rate of F_s = .064 ft^3/min

Nozzle = 2.0 mm

Δpc from Calibration curve = 1.65 "Hg

Sampling Δp calculation: (Est box temp = 200 °F)

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

$$\Delta p_s = (1.65)\, 0.6189 \frac{(29)(29.6)}{(460 + 200)} = 1.3 \text{ "Hg}$$

Comments:

Stage Panel final filter # 112

1 59-16
2 59-17
3 59-18
4 59-19
5 59-20

Operator DJH

Brink Data Sheet

Date 9/10/75 Run# 4 Location TP-1

Plant Certain-teed

Data: Stack gas molecular wt 29

Stack Temp 200 °F, Stack static press -.6 "H_2O

Barometric Press 29.30 "Hg, Ambient Temp 60 °F

Probe tip diameter 2.0 mm, Probe immersion 8 1/2 in

Sample box temp:

Start - in 230/200 °F, out 205 °F; Stop - in 230/210 °F, out 205 °F

Impactor pressure drop (Δp_s) - calculated 1.3 "H_2O Real 1.3 "H_2O

Impactor static inlet pressure - Start 1.15 "H_2O, Stop 1.2 "H_2O

Start time 1018 End time 1048

Sample run time 30 min

Comments + sketches:

Operator EAH TS + CD

Brink BMS-11 Calculations

Date 9/10/75 Run # 1 Location TP-3

Plant Certain Teed (~~Roof Shingling~~) 36" dock shingles

Data: $\Delta P = -1"H_2O$ BP = 29.30 "Hg

Duct press Pd 29.23 "Hg Molecular Wt Md 29

Duct Temp Td 220 °F Vel head Δp .20 "H_2O

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

$$V_d\ (ft/sec) = 85.48\,(.85)\sqrt{\frac{(220+460)(.20)}{(29)(29.2)}} = \frac{29.118}{29}$$

Probe nozzle selection for a flow rate of F_s = .059 ft^3/min

Nozzle = 2.0 mm

Δpc from Calibration curve = 1.35 "Hg

Sampling Δp calculation: (Est box temp = 220 °F)

$$\Delta ps = \Delta pc \times \frac{M_d}{29} \times \frac{P_d}{29.92} \times \frac{460+77}{460+T_{box}} = \Delta pc\,(.6189)\,\frac{M_d P_d}{T_{box}}$$

$$\Delta ps = (1.35)\,0.6189\,\frac{(29)(29.2)}{(460+220)} = \frac{1.09}{1"}\ "Hg$$

Comments:

Stage	Pan, #
1	59-21
2	59-22
3	59-23
4	59-24
5	59-25

final filter # 11

Operator [illegible]

Brink Data Sheet

Date 7/10/75 Run# 1 Location TP-3

Plant CERTAIN TEED

Data: Stack gas molecular wt 29

Stack Temp 220 °F, Stack static press _____ "H_2O

Barometric Press 29.30 "Hg, Ambient Temp _____ °F

Probe tip diameter 2.0 mm, Probe Immersion 7½ in

Sample box temps:

Start - in ~240 °F, out ~225 °F; Stop - in ~230 °F, out ~225 °F

Impactor pressure drop (Δp_s) - calculated .09 "Hg Real 1.0 "Hg

Impactor Static inlet pressure - Start [illegible] "H_2O, Stop 1.0 "H_2O

Start time 1420 End time 1520

Sample run time 60 min

Comments + sketches:

final filter # 11

Operator [illegible]

Brink BMS-11 Calculations

Date 9/11/25 Run # 2 Location TP-3

Plant Contaminated (illegible)

Data: 29.41 − .5"H_2O / 13.6

Duct press Pd _____ "Hg Molecular Wt Md 29

Duct Temp Td 220 °F Vel head Δp .20 "H_2O

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

$$V_d\ (ft/sec) = 85.48\ (.85)\ \sqrt{\frac{(220 + 460)(.2)}{(29)(29.2)}} = 29$$

Probe nozzle selection for a flow rate of F_s = _____ ft^3/min

Nozzle = 2 mm

Δpc from Calibration curve = 1.35 "Hg

Sampling Δp calculation: (Est box temp = 220 °F)

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

$$\Delta p_s = (\quad)\,.6189\,\frac{(\quad)(\quad)}{(460 + \quad)} = 1.0 \text{ "Hg}$$

Comments:

Stage	part #
1	59-26
2	59-27
3	59-28
4	59-29
5	59-30

Final filter # 104

Operator [illegible]

Brink Data Sheet

Date 9/11/75 Run# 2 Location TP-3 outlet

Plant Ceslain Feed

Data: Stack gas molecular wt 29 assumed

Stack Temp 230 °F, Stack static press -.8 "H_2O

Barometric Press 29.41 "Hg actual, Ambient Temp ~60 °F

Probe tip diameter 2 mm, Probe immersion 7 1/2 in (point 8) North point

Sample box temp:

Start - in 230 °F, out 230 °F; Stop - in 226 °F, out 229 °F

Impactor pressure drop (Δp_s) - calculated 1.0 "H_2O Real 1.0 "Hg

Impactor Static inlet pressure - Start 1.1 "H_2O, Stop 1.1 "H_2O

Start time 1015 End time 1045

Sample run time 30 min

Comments + sketches:

Final filter #104

Operator [illegible]

Brink BMS-11 Calculations

Date 9/11/25 Run # 3 Location TP-3 inlet

Plant Certain Teed (Albany Co)

Data: CCC Amcast Bay 2 BP = 29.41

Duct press Pd _____ "Hg Molecular Wt Md _____

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

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

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

Probe nozzle selection for a flow rate of F_s = _____ ft^3/min

Nozzle = _____ mm

Δpc from Calibration curve = "Hg

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

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

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

Comments:

Stage	Pan #
1	60-1
2	60-2
3	60-3
4	60-4
5	60-5

final filter # 13

Operator [illegible]

Brink Data Sheet

Date 9/11/75 Run # 3 Location TP 3

Plant Certain Teed (Lim [illegible]) See other side

Data: Stack gas molecular wt. 27

Stack Temp ____ °F, Stack static press ____ "H_2O

Barometric Press 29.91 "Hg, Ambient Temp [illegible] °F

Probe tip diameter 2 mm, Probe immersion 7 1/2 in

Sample box temp:

Start - in [illegible] °F, out 220 °F; Stop - in [illegible] °F, out 224 °F

Impactor pressure drop (Aps) - calculated 1.0 "H_2O Real 1.0 "Hg

Impactor static inlet pressure - Start 1.1 "H_2O, Stop 1.1 "H_2O

Start time 1409 End time 1439

Sample run time 30 min

Comments + sketches: [illegible]

[illegible] filter # 13

Operator [illegible]

Brink BMS-11 Calculations

Date 9/11/95 Run #: 4 Location TP-3

Plant Certain Teed (Willingboro)

Data: [illegible] TP-3 run 3

Duct press P_d _____ "Hg Molecular Wt M_d _____

Duct Temp T_d _____ °F Vel head Δp _____ "H_2O

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

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

Probe nozzle selection for a flow rate of F_s = _____ ft^3/min

Nozzle = _____ mm

Δpc from Calibration curve = _____ "Hg

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

$$\Delta ps = \Delta pc \times \frac{M_d}{29} \times \frac{P_d}{29.92} \times \frac{460+77}{460+T_{box}} = \Delta pc\,(.6189)\,\frac{M_d P_d}{T_{box}}$$

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

Comments:

Stage	Part #
1	60-10
2	60-9
3	60-8
4	60-7
5	60-6

final # - 106

Backwards!

Operator [illegible]

Brink Data Sheet

Date 9/11/75 Run# 4 Location TP-3

Plant Certain Teed

Data: Stack gas molecular wt _____

Stack Temp 220 °F, Stack static press ___ "H_2O

Barometric Press _____ "Hg, Ambient Temp _____ °F

Probe tip diameter 2 mm, Probe immersion 12½ in

Sample box temp:

Start - in 240/290 °F, out 220 °F; Stop - in 240/240 °F, out 224 °F

Impactor pressure drop (Δp_s) - calculated 1.0 "H_2O Real 1.0 "Hg

Impactor static inlet pressure - Start 1.1 "H_2O, Stop 1.1 "H_2O

Start time 1630 End time 1700

Sample run time 30 min

Comments + sketches: Cut port

Operator [illegible]

Brink BMS-11 Calculations

Date 9/12/75 Run # 1 Location TP-2 (outlet)

Plant Ceramic Feed

Data: BP – 29.54

Duct press Pd 29.54 "Hg Molecular Wt Md 28.5 assumed

Duct Temp Td 540 °F avg Vel head Δp .20 "H_2O

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

$$V_d\ (ft/sec) = 85.48\,(.85)\sqrt{\frac{(540+460)(.2)}{(28.5)(29.54)}} = 36\ ft/sec$$

Probe nozzle selection for a flow rate of F_s = .072 ft^3/min

Nozzle = 20 mm $Q_I = Q_{II}\frac{T_I}{T_n} = .072\,\frac{460+540}{460+540} = .049$

Δpc from Calibration curve = .90 "Hg

Sampling Δp calculation: (Est box temp = 220 °F)

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

$$\Delta p_s = (.09)\,.6189\,\frac{(28.5)(29.5)}{(460+220)} = \frac{.687}{.07}\ \text{"Hg}$$

Comments:

Stage	Dram #
1	60-11
2	60-12
3	60-13
4	60-14
5	60-15

Final # 1 OK

Operator [illegible]

Brink Data Sheet

Date 9/17/75 Run# 1 Location TP-2

Plant Certain Teed (outlet)

Data: Stack gas molecular wt ~28.5

Stack temp 540 °F, Stack static press 0 "H_2O

Barometric Press 29.54 "Hg, Ambient Temp 46 °F

Probe tip diameter 2 mm, Probe immersion 4 3/4" in
+3 1/2 = 8 1/4" total

Sample box temp:

Start-in 240/290 °F, out 220 °F; Stop - in 240/290 °F, out 225 °F

Impactor pressure drop (Δps)-calculated .07 "H_2O Real ____ "Hg

Impactor static inlet pressure - Start .2 "H_2O, Stop .3 "H_2O

Start time 1736 End time 1746

Sample run time 1360 min

Comments + sketches:

Shutdown 1053 - opacity 16"20" [illegible]
restart 11 57 1/2 - outlet temp 225°F
Shutdown 1211 - 30 minute run → back impactor - recalibration - clean
restart 1401 -
stop 1423 - 52 min dirty down
restart 1542 - [illegible] running slow ~325 ft/sec at point
stop 1636 - 108 minute run - find back dirty
restart 1655
stop 1700 [illegible] - 1 hr 52 1/2 min
restart 1730

Operator DEH

Particle Size Sampling Test Log

Particle Size

SAMPLING TASK LOG

For

Particle Size

Plant Certain-Teed Corporation Plant Location Shakopee, Minnesota

Date 9-9-75 Recorded by D. L. Harris

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Hose reconnected	TP1-1	Inlet east side	Particle size	10:50	10:51	1	
Process down				10:54	10:55	1	
				13:56	14:09	13	
Run TP1-1 complete----------	----	----------	----------	----------	----	15	
9-9-75							
	TP1-2	Inlet east side	Particle size	16:06	16:36	30	
Run TP1-2 complete----------	----	----------	----------	----------	----	30	
9-9-75							
	TP1-3	Inlet east side	Particle size	20:00	20:30	30	
Run TP1-3 complete----------	----	----------	----------	----------	----	30	

Particle Size
SAMPLING TASK LOG

Plant Certain-Teed Corporation
Date 9-10-75

Plant Location Shakopee, Minnesota
Recorded by D. L. Harris

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Process running roll goods	TP1-4	Inlet east side	Particle size	10:18	10:48	30	
Run TP1-4 complete----------						30	
9-10-75							
Process running roll goods	TP3-1	Inlet north side	Particle size	14:20	15:20	60	
Run TP3-1 complete----------						60	

Particle Size
SAMPLING TASK LOG

Plant Certain-Teed Corporation
Date 9-11-75

Plant Location Shakopee, Minnesota
Recorded by D. L. Harris

Comments	Run	Sampling location (Port)	Pollutant	Clock Time Began	Clock Time Ended	Elapsed Time (min)	Sample Nos.
Plant running shingle goods	TP3-2	Inlet north side	Particle size	10:15	10:45	30	
Run TP3-2 complete----------	----	----------	----------	----------	----------	30	
9-11-75							
Plant running shingle goods	TP3-3	Inlet easth side	Particle size	14:09	14:39	30	
Run TP3-3 complete----------	----	----------	----------	----------	----------	30	
9-11-75							
	TP3-4	Inlet east side	Particle size	13:30	17:00	30	
Run TP3-4 complete----------	----	----------	----------	----------	----------	30	

PARTICLE SIZE

SAMPLING TASK LOG

Plant Certain-Teed Corporation

Date 9-12-75

Plant Location Shakopee, Minnesota

Recorded by D. L. Harris

Comments	Run	Sampling location (Port)	Pollutant	Clock Began	Time Ended	Elapsed Time (min)	Sample Nos.
	TP2-1	Outlet south side	Particle size	10:36	11:09	16	
				11:57	12:11	14	
				1401	14:23	22	
				15:40	16:36	56	
				16:55	17:01	6	
				17:30	17:46	16	
Run TP2-1 complete----------						130	

Battelle Comments on Particle Size Results

Mr. Gene Riley
Emission Measurement Branch
Office of Air Quality Planning
and Standards
U.S. Environmental Protection Agency
Research Triangle Park
North Carolina 27711

Dear Gene:

In reviewing the draft reports for the Celotex Plant at Fairfield, Alabama and Appendix H (supplied by Monsanto) for Certain-Teed Products at Shakopee, Minnesota, I find it difficult to comprehend the text relative to the particle-size measurements. Trying to explain possible erroneous data is extremely difficult with the limited amount of information available.

It is apparent in reviewing the particle size measurement results, Table 1 and Table 2, that at both asphalt plants, most of the mass was collected prior to the impactor (which presumably includes the nozzle, probe, and cyclone) and therefore could not be classified according to size. Accordingly, either the particulate being sampled for size classification was extremely large and/or the sample probe was relatively cold with respect to the stack temperature resulting in vapor condensation.

To further substantiate the vapor condensation theory, Table 3 shows comparison of mass concentration for the two sampling techniques, (particle size and Method 5). It is readily apparent, especially at the outlets, TP-2, that there is a significantly higher mass concentration for the particle size measurement runs, compared to Method 5 data, which may be attributable to vapor condensation. (A factor of 22.5 for the Celotex plant and 6.7 for Certain-Teed.) In addition to possible vapor condensation within the sample probe, it appears that condensation may also have occurred within the impactor.

For the following discussion it is assumed that the impactor walls did not equilibrate to stack temperature before sampling commenced. If one compares the dry catch and total catch data tabulated in Table 4, it is again apparent that the impactor stages show a significant increase in mass after adding the residue from the wash. (It is assumed that the total mass is the sum of the pan catch plus the wash residue.)

Mr. Gene Riley June 14, 1976

TABLE 1. CERTAIN-TEED PARTICLE SIZE MEASUREMENT RESULTS[a]

Run No.	Pan Catch (mg)	Total Catch (mg)	Run Time (min)	Sampler Temp. F	Stack Temp. F
TP1-1	6.05	18.80	15	200	198
TP1-2	7.04	22.92	30	201	200
TP1-3	6.70	15.94	30	202	200
TP1-4	6.07	35.29	30	205	200
TP3-1	6.23	36.96	60	225	220
TP3-2	6.39	29.59	30	230	220
TP3-3	6.08	21.78	30	222	220
TP3-4	6.02	26.42	30	222	220
TP2-1	8.15	36.65	130	223	540

TABLE 2. CELOTEX PARTICLE SIZE MEASUREMENT RESULTS[b]

Run No.	Pan Catch (mg)	Total Catch (mg)	Run Time (min)	Sampler Temp. F	Stack Temp. F
TP1-1	6.54	19.12	30	115	100
TP1-2	2.79	12.21	30	130	120
TP1-3	3.42	19.89	45	130	115
TP2-1	0.506	14.15	70	135	135
TP2-2	0.0	13.42	90	138	135
TP2-3	0.0	15.38	120	140	135

(a) Data are from page H-7 of Monsanto Research Corporation draft report to EPA.

(b) Data are from Celotex draft report, Table 14.

Mr. Gene Riley June 14, 1976

TABLE 3. COMPARISON OF PARTICULATE CONCENTRATION OF METHOD 5 AND PARTICLE SIZE MEASUREMENT DATA

Particle Size Measurements[a] Run No.	gr/acf	Method 5 Measurements Run No.	gr/acf
Celotex Plant, Fairfield, Alabama			
TP1-1	0.182		
TP1-2	0.115	TP1-1	0.067
TP1-3	0.125	TP1-2	0.054
Average	0.141	Average	0.061
TP2-1	0.057		
TP2-2	0.042	TP2-2	0.002
TP2-3	0.036		
Average	0.045	Average	0.002
Certain-Teed Products, Shakopee, Minnesota			
TP1-1	0.301		
TP1-2	0.183	TP1-1	0.185
TP1-3	0.127	TP1-2	0.114
TP1-4	0.281		
Average	0.223	Average	0.150
TP2-1	0.087	TP2-3	0.013
Average	0.087	Average	0.013
TP3-1	0.162		
TP3-2	0.260	TP3-2	0.130
TP3-3	0.192	TP3-3	0.268
TP3-4	0.233		
Average	0.212	Average	0.199

(a) Particle Size Measurements were made during but not necessarily concurrent with Method 5 runs.

TABLE 4. COMPARISON OF PAN CATCH AND TOTAL CATCH AS A FUNCTION OF SAMPLE TIME

Stage	Wt of Pan Catch, mg	Wt of Total Catch, mg	Percent of Total Mass Associated with Wash
		RUN TP1-1, SAMPLE TIME, 30 MINUTES	
Cyclone	0.000	10.800	100.0
1	0.940	1.660	43.4
2	0.000	0.020	100.0
3	0.970	0.990	2.0
4	1.990	3.010	33.9
5	2.340	2.340	0.0
Filter	0.300	0.300	0.0
Total	6.540	19.120	65.8
		RUN TP1-2, SAMPLE TIME, 30 MINUTES	
Cyclone	0.000	8.700	100.0
1	0.000	0.000	0.0
2	0.000	0.000	0.0
3	0.000	0.720	100.0
4	0.390	0.390	0.0
5	1.200	1.200	0.0
Filter	1.200	1.200	0.0
Total	2.790	12.210	77.2

TABLE 4. (Continued)

Stage	Wt of Pan Catch, mg	Wt of Total Catch, mg	Percent of Total Mass Associated with Wash
		RUN TP1-3, SAMPLE TIME, 45 MINUTES (Continued)	
Cyclone	0.000	11.730	100.0
1	0.015	1.140	98.7
2	0.011	0.700	98.4
3	0.008	1.100	99.3
4	0.704	1.720	59.1
5	1.683	2.500	32.7
Filter	1.000	1.000	0.0
Total	3.421	19.890	82.8
		RUN TP2-1, SAMPLE TIME, 70 MINUTES	
Cyclone	0.000	9.730	100.0
1	0.005	0.700	99.3
2	0.000	0.790	100.0
3	0.000	0.020	100.0
4	0.001	1.390	99.9
5	0.000	1.020	100.0
Filter	0.500	0.500	0.0
Total	0.506	14.150	96.4

TABLE 4. (Continued)

Stage	Wt of Pan Catch, mg	Wt of Total Catch, mg	Percent of Total Mass Associated with Wash
		RUN TP2-2, SAMPLE TIME, 90 MINUTES	
Cyclone	0.000	9.930	100.0
1	0.000	1.390	100.0
2	0.000	0.390	100.0
3	0.000	0.420	100.0
4	0.000	1.290	100.0
5	0.000	0.000	0.0
Filter	0.000	0.000	0.0
Total	0.000	13.420	100.0
		RUN TP2-3, SAMPLE TIME, 120 MINUTES	
Cyclone	0.000	10.800	100.0
1	0.000	0.930	100.0
2	0.000	0.570	100.0
3	0.000	1.070	100.0
4	0.000	1.270	100.0
5	0.007	0.740	99.1
Filter	0.000	0.000	0.0
Total	0.007	15.380	99.8

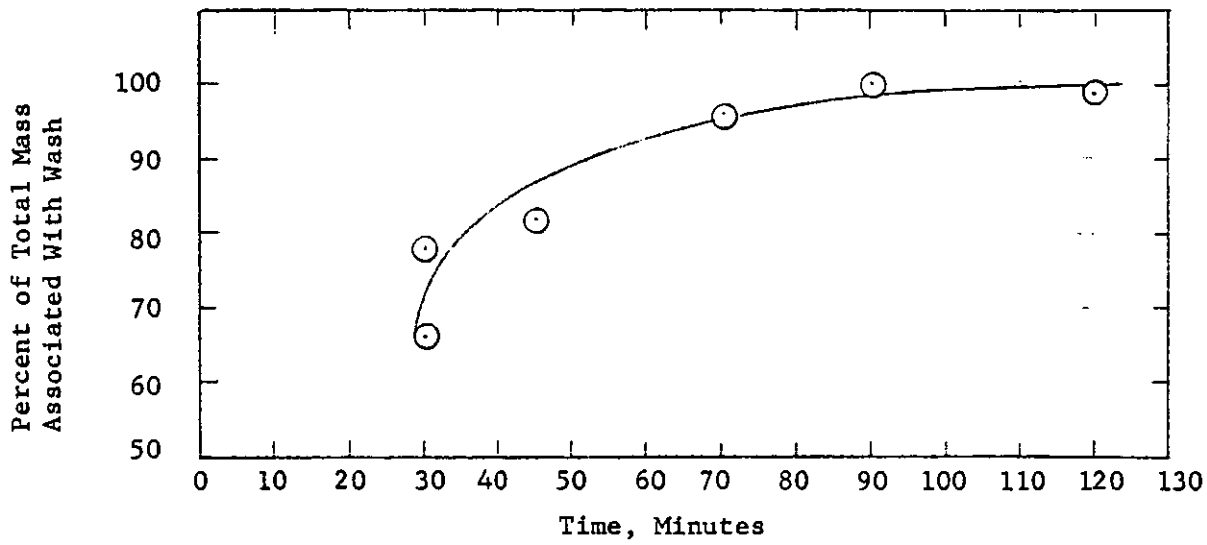


FIGURE 1. PERCENT OF TOTAL MASS ASSOCIATED WITH WALL WASH AS A FUNCTION OF TIME

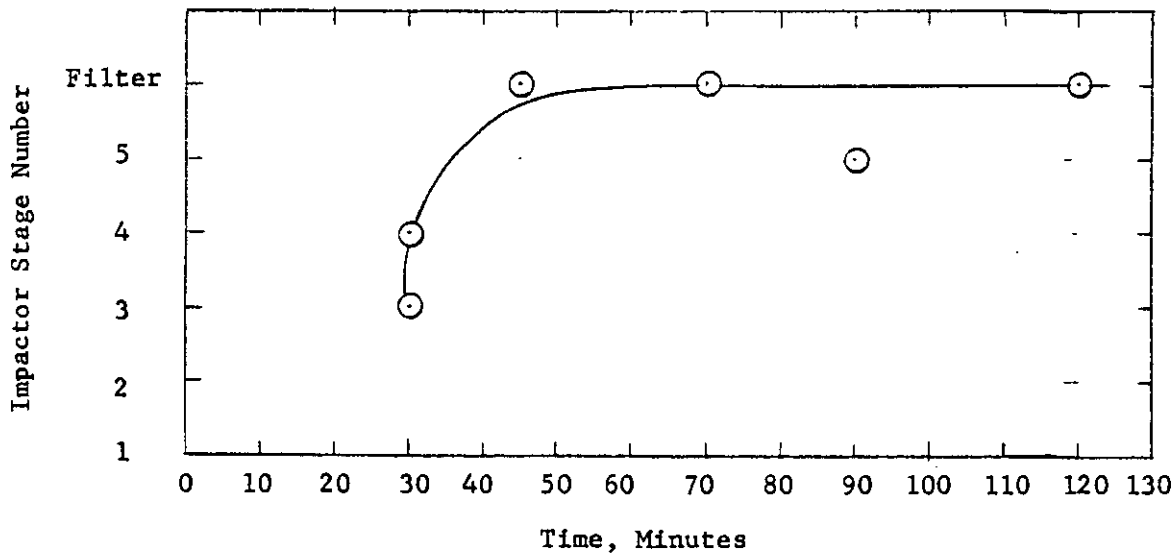


FIGURE 2. IMPACTOR STAGE WHERE CONDENSATION STOPS AS A FUNCTION OF TIME

Mr. Gene Riley June 14, 1976

In observing the data in Table 4, it became apparent that there was a possible relationship between run time and the amount of material washed from the walls relative to the total catch (percent of total in wash). Figure 1 is a graph showing this relationship. From the graph it appears as time increases the percent of material on the impactor walls increases. If one refers to Table 4, again, it is also apparent that as run time increases, that the pan and filter catches decrease.

It seems reasonable to assume that when the dry catch and total catch are equal, for an impactor stage, condensation has stopped at that point in the impactor. It is then apparent that as time increases, the point of condensation within the impactor propagates toward the filter. Figure 2 depicts the relationship between the point of condensation and time.

Conclusion

It has been hypothesized for interpretation of results that the impactor was not completely at stack temperature when sampling commenced. Consistent with this hypothesis are the indications that some vapor condensation on the impactor walls and some vapor condensation on the impactor or substrate pans occurred immediately when sampling 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 re-vaporized 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 of an attempt to measure size distribution if necessary.

Very truly yours,

Paul R. Webb
Combustion Systems Section

PRW:kb

cc: Tom Logan

APPENDIX I

ALDEHYDE EMISSIONS

Aldehyde Field Data. I-1

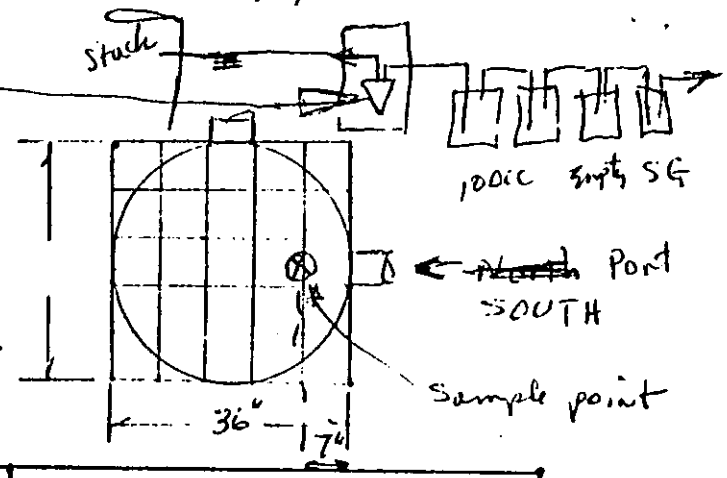
Aldehyde Analytical Data I-8

Aldehyde Emissions Sample Calculations I-11

Aldehyde Field Data

Used Method 5 train w/o filter paper

Cyclone packed with fibre glass



GAS SAMPLING FIELD DATA SHEET NUMBER 1

Plant Certain-Teed
Date 9/13/75
Ambient Temp. ____ F
Project Number G2872-3514
Operator Hebb

Location Shakopee, MINN
Run Number AL-TP-3-INLET
Barometric Pressure 29.60 "Hg
Battelle Record Book No. 32148

F = 0.98

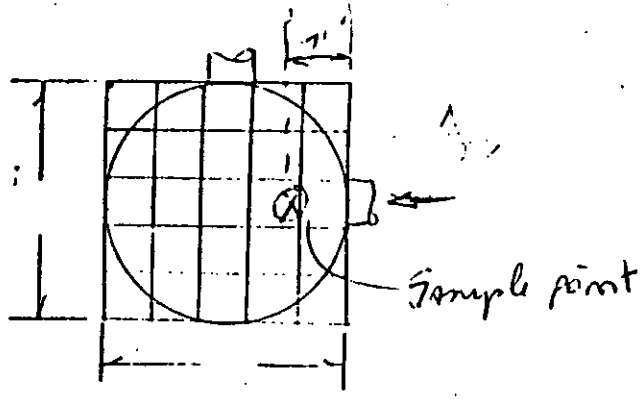
Clock Time	Lapse Time MIN	Sampl Port No.	Temperature Probe	Shell Coil	F Meter	Gas Meter ft³ Read'	Samp'	Rate	Gas STP B.P / 460+T	×17.7	NM³ .0283	Remarks & Observations	IMPINGER °F
1426	0	TP-3				752.4						Aldehydes	
1430	4	"			71	755.0			~~75~~				42
1435	9	"			75	760.4			~~75~~				50
1441	15	"			77	765.3							53
1445	19					768.0							
						15.30							
						cc xils							
							15.31	ft³			0.43		

I-2

GAS SAMPLING FIELD DATA SHEET NUMBER a

Plant Certain-Teed
Date 9/13/75
Ambient Temp. ____ F
Project Number G2872-3514
Operator Wehle

Location Shakopee Minn
Run Number AL-TP-3-2 INLET
Barometric Pressure 29.60 "Hg
Battelle Record Book No. 32148



Clock Time	Lapse Time	Sampl Port No.	Temperature F Probe	Shell Coil	Meter	Gas Meter ft³ Read'	Samp'	Rate	Gas STP (0.98) B.P / 460+T	×17.7	NM³ .0283	Remarks & Observations
1452	0	TP-3			75	768.0						Aldehydes
1459	7	"			75	774.5						
1507	15				75	781.0						
1510	18					784.1						
						16.	10 ft³					
						cont.						
							15.	77 ft³			0.45	

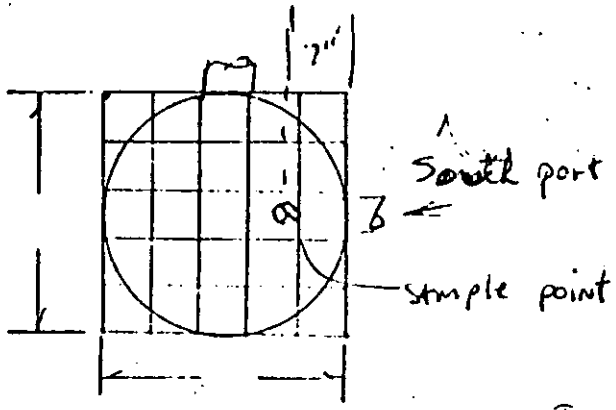
Impingers °F
62
68

I-3

GAS SAMPLING FIELD DATA SHEET NUMBER 3

Plant Catawba Iowa
Date 9/13/75
Ambient Temp. _____ F
Project Number CF 2872-3514
Operator Tilley, P

Location Shakopee, Minn.
Run Number HL-TP-3-3 INLET
Barometric Pressure 29.6 "Hg
Battelle Record Book No. 32148



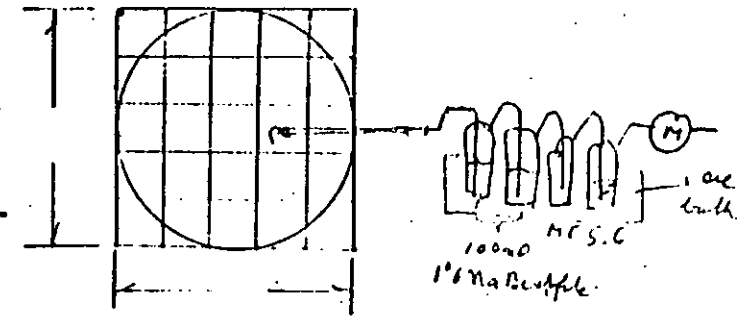
Clock Time	Lapse Time	Sampl Port No.	Temperature F Probe	Shell Coil	Meter	Gas Meter ft³ Read'	Samp'	Rate	Gas STP B.P/460+T (0.99)	×17.7	NM³ .0283	Remarks & Observations	Impinger °F
1538	0	TP-3			70	784.1						Aldehydes	
1543	5	"			71	784.0							69
1548	10	"			70	794.5							
1555	17					800.0							
						15.90 corrected							
							15.69 ft³				0.44		

method 5 transmissifier

GAS SAMPLING FIELD DATA SHEET NUMBER _____

Plant Certain-Teed
Date 9/13/75
Ambient Temp. 80° F
Project Number _____
Operator Leonard

Location TP4
Run Number AL-TP4-1
Barometric Pressure 29.60 "Hg
Battelle Record Book No. _____



F = 0.96

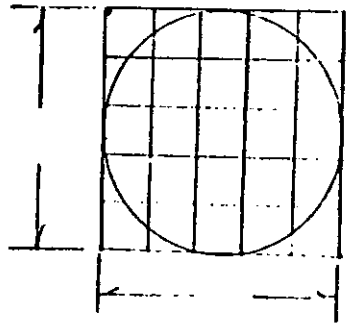
min	STACK	Clock Time	Lapse Time	Sampl Port No.	Temperature F Probe	~~Shell~~ Coil OVEN	Meter IN	Meter OUT	Gas Meter ft³ Read'	Samp'	Rate	Gas STP B.P / 460+T	~17.7	NM³ .0283	Remarks & Observations
2.5	624	2:26		TP4		104	94	80	777.642						
3.25	660	2:34		"	487	211	96	81	784.8						60°
3.25	662	2:36		"	571	219	97	82	786.6						62°
3.30	664	2:42			548	247	100	83	792.4						70°
		2:44 off							794.465						
							87.9								
									16.82 ft.						
									corrected						
										16.09 ft³				0.46	

I-5

GAS SAMPLING FIELD DATA SHEET NUMBER _____

Plant Citrus Reds
Date 9/13/75
Ambient Temp. 80° F
Project Number _____
Operator Leonard

Location TP4
Run Number AL-TP4-2
Barometric Pressure 29.60" Hg
Battelle Record Book No. _____



mor setting 3.3

0.93

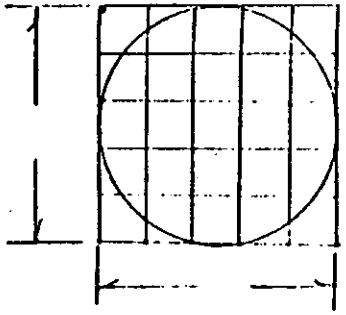
Stack	Clock Time	Lapse Time	Sampl Port No. TP4	Temperature F Probe	Shell ~~Coil~~ outlet	Meter IN	Meter OUT	Gas Meter ft³ Read'	Samp'	Rate	Gas STP B.P / 460+T	×17.7	NM³ .0283	Remarks & Observations
634	2:51					79	87	794.465						NMR
652	2:56			492	235	104	88	799.2						
646	3:01			537	235	106	89	804.2						
654	3:06			558	169	108	91	809.2						70°
	3:09	28	1			92.5		812.716						
								18.25						
								corrected						
								16.99					0.48	

1% Sodium Bisulfite

GAS SAMPLING FIELD DATA SHEET NUMBER _____

Plant Ontario Steel
Date 9/13/75
Ambient Temp. 80° F
Project Number _____
Operator Leonard

Location TP4 - (OUTLET)
Run Number AL-TP4-3
Barometric Pressure 29.10 "Hg
Battelle Record Book No. _____



Stack	Clock Time	Lapse Time	Sampl Port No. TP4	Temperature F Probe	Shell ~~Coil~~ OVEN	Meter IN	Meter OUT	Gas Meter ft³ Read'	Samp'	Rate	Gas STP (0.94) B.P / 460+T	×17.7	NM³ .0283	Remarks & Observations mg/
645	3:38			353	143	98	84	812.716						66
654	3:43			467	213	102	75	817.7						67
647	3:48			527	248	102	94	822.7						72
648	3:53			549	254	102	92	827.7						74
	3:55	off				97	4	829.645						
									16.93					
								corrected						
									15.91 ft³				0.45	

nor. setting 33

I-7

Aldehyde Analytical Data

Work Performed by:

Title or Purpose:

Project No. LAB 32148

Date of Work:

Continued from:

BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES

ANALYTICAL REPORT CARD

PROJECT G 2872-3518

DATE SUBMITTED SEPT. 26, 1975

SUBMITTED BY W. BAYDOS EXT. 2441 ROOM NO. 6001

DIVISION NO. 566

CARD NO. P 4777

TYPE OF ANALYSIS: CHEM ☒ OES ☐ XRF ☐ XRD ☐ EMP ☐ MS-7 ☐ GMS ☐ VF ☐ OM ☐ EM ☐ PCSI ☐ IMA ☐

APPROX. COMPOSITION

REMARKS ALDEHYDES, (LOS ANGELES METHOD)

CERTAIN-TEED INC.
SHAKOPEE, MINN.

DETERMINATIONS DESIRED (REPORT AS Total mg.

SAMPLE NO. (DO NOT FILL IN)	DESCRIPTION OF SAMPLE	HCHO			mg/m³		mg/m³
	INLET						
S40190	AL-TP3-1-IMP-1	1.2	>	4.6	.46		10.0
S40191	" -IMP-2	3.4					
S40192	AL-TP-3-2-IMP-1	3.4	>	4.5	0.48		9.4
S40193	" IMP. 2	1.1					
S40194	AL-TP3-3 IMP-1	2.6	>	6.0	0.45		13.3
S40195	IMP. 2	3.4					

ANALYST DLC

DATE REPORTED 10/20/75

WHITE -- REPORT COPY
YELLOW -- SUBDIVISION COPY
PINK -- DIVISION COPY

SYMBOLS ON REVERSE SIDE

REMARKS Results corrected for blk

QUALITATIVE ☐ SEMI-QUANT ☐ QUANT ☐

Performances of this work observed by:

Date:

Date:

Disclosed to and understood by me:

Date:

Date:

Continued to:

Entered by:

Performances of this work observed by:

Date:

Date:

Date:

Date:

Date:

Date:

Disclosed to and understood by me:

Continued to:

Work Performed by:

Title or Purpose:

Project No. LRS 32148

Date of Work:

Continued from:

BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES

ANALYTICAL REPORT CARD

PROJECT D 2872-3518

DATE SUBMITTED SEPT. 26, 1975

CARD NO. P 4777

SUBMITTED BY W. BAYTOS EXT. 2441 ROOM NO. 6001

DIVISION NO. 566

TYPE OF ANALYSIS: CHEM ☒ EMP ☐ OM ☐ OES ☐ MS-7 ☐ EM ☐ XRF ☐ GMS ☐ PCSI ☐ XRD ☐ VF ☐ IMA ☐

APPROX. COMPOSITION

CERTAIN-TEED INC.
SHAKOPEE, MINN.

REMARKS ALDEHYDES (LOS ANGELES METHOD)

SAMPLE NO. (DO NOT FILL IN)	DESCRIPTION OF SAMPLE	DETERMINATIONS DESIRED (REPORT AS ppm/m³)										
		HCHO										
	OUT LET											
	AL-TP4-1 IMP-1	6.8		7.7		0.43		17.9				
	" IMP. 2	1.1										
	ALTP4-2-IMP-1	7.0		9.6		0.45		21.3				
	" IMP-2	2.6										
	ALTP4-3-IMP-1	6.5		8.7		0.44		19.6				
	" IMP. 3	2.2										
	BLANK	0.1										

ANALYST DLC

DATE REPORTED 10/20/75

QUALITATIVE ☐ SEMI-QUANT ☐ QUANT ☐

WHITE -- REPORT COPY
YELLOW -- SUBDIVISION COPY
PINK -- DIVISION COPY

SYMBOLS ON REVERSE SIDE

REMARKS Results corrected for blk.

Aldehyde Emissions Sample Calculations

Sample Aldehyde Calculations

[Run, AL-TP3-1 (Inlet)]

1. Volume of dry gas sampled at standard conditions[a], Nm^3

$$V_{m,\ std} = V_m \times 17.7 \times \frac{P_b}{(T_m + 460)} \times 0.0283$$

$$= 15.60 \times 17.7 \times \frac{29.60}{(74 + 460)} \times 0.0283$$

$$= 0.433\ Nm^3 \quad .$$

2. Aldehyde emissions, kg/hr

$$HCHO = \frac{HCHO}{V_m} \frac{(mg)}{(Nm^3)} \times Q_s \left(\frac{Nm^3}{min}\right) \times 60 \left(\frac{min}{hr}\right) \times 10^{-6} \left(\frac{kg}{mg}\right)$$

$$= \frac{4.5}{0.433} \times 191^{(b)} \times 60 \times 10^{-6} = 0.119\ kg/hr \quad .$$

(a) Standard conditions at 70 F, 29,92 in. Hg.
(b) Flow rates were obtained from particulate emission runs.

APPENDIX J

LABORATORY RESULTS

Flask Lab Data	J-1
Process Sample Ultimate Analysis	J-2
Trace Metal Results	J-7

J-1

Project: #2872-3618 **ANALYTICAL REPORT Card** E-4

Date Submitted: 10-31-75

Submitted by - W. Baytas

Div. No. 569

Reported: 11-. -75

cc: W. Baytas
S. Miller
R. Bennett
R. Dainer (4)
E Schulz

Gaseous Constituents from Asphalt Shingle Plants

Re: Memo dated Aug 1, 1975, Iden to Miller & Analytical Report Card P 4997, EPA S75-006-034

EPA ID	S-75-006-030	S-75-007-091	S-75-006-464	S-75-006-348
Company	John Manville	Celotex	Celotex	SHAKPEE
Volume Percent				
Oxygen	20.8	20.9	21.0	19.3
Carbon dioxide	0.05	0.05	0.05	0.97
Carbon monoxide	<.0015	<.0015	<0.015	0.02
Argon	0.95	1.00	0.99	0.99
Nitrogen	78.1	78.0	77.9	78.6
Hydrogen	0.09	0.04	0.06	0.10
ppm by Volume				
Sulfur dioxide	<.02	<0.02	< 0.02	<0.3
Formaldehyde	<0.5	<0.5	<0.5	<0.5
Nitrogen Dioxide	<0.5	<0.5	<0.5	<0.5
Carbonyl Sulfide	<.02	0.06	.06	<0.3
Ethanol	<.1	<0.1	<0.1	<0.2
Methanol	0.3	0.09	0.1	0.4
Acetone	0.8	1.	1.	1
Benzene	0.1	0.06	.06	<0.1
Hexane	0.4	0.7	0.2	<0.2
Pentane	0.6	0.5	0.2	<0.2
Butane	0.2	5.4	0.2	0.2
Butene	0.01	2	0.1	2
Propane	0.5	2	1.	0.2
Propene	<0.1	<0.1	<.1	4
Ethane	0.4	2	1	17
Ethene	0.3	0.4	0.2	29
Methane	6	17	4	260
Acetylene	<0.1	<0.1	<0.1	0.5
Pentene	0.5	<0.1	<0.1	<0.5
Hydrogen sulfide	<0.02	.6	0.7	<0.1
Toluene	<.01	.06	.02	<0.01
Charge	#2872-3218	#2872-3618	#2872-3618	#2872-3618

Note: Typing and Xerox copies changed to #2872-3618, analysis changed to project shown above.

The NALIN LABORATORIES

2641 CLEVELAND AVENUE
AREA CODE 614
PHONE 263-3586

COLUMBUS, OHIO 43211

February 6, 1976

CONSULTING
TECHNICAL SERVICE
RESEARCH CHEMICAL ANALYSIS

LABORATORY
APPARATUS
INSTRUMENTS
CHEMICALS
GLASSWARE

FUEL TESTING LABORATORY

ESTABLISHED 1938

COAL ANALYSIS
WATER ANALYSIS
STANDARD SOLUTIONS FOR WATER ANALYSIS

CERTIFICATE OF ANALYSIS

LABORATORY NO. 44667 DATE February 6, 1976

SUBMITTED BY Battelle Memorial Institute, Attn: Mr. Bill Baytos
P. O. No. L-6056

IDENTIFICATION Flux (unblown asphalt) S75-006-301
Task No. 35
Certain-Teed, Shakope, Minn.

DATE RECEIVED AT LABORATORY October 31, 1975

ULTIMATE ANALYSIS

AIR-DRIED MOISTURE 0.00 %

		AS RECEIVED	DRY SAMPLE
TOTAL MOISTURE	%	0.03	----
VOLATILE MATTER	%	87.48	87.51
FIXED CARBON	%	12.21	12.21
ASH	%	0.28	0.28
TOTAL CARBON	%	78.38	78.40
NITROGEN, KJELDAHL	%	0.51	0.51
SULPHUR	%	3.54	3.54
HYDROGEN	%	5.44	5.44
B. T. U. PER LB.		18,642	18,648
OXYGEN	%	15.36	15.36

FREE SWELLING INDEX _____ M-ASH FREE 18,700

ASH FUSION TEMPERATURE _____ °F

INITIAL DEFORMATION _____ °F

FLUID TEMPERATURE _____ °F

Respectfully submitted,
THE NALIN LABORATORIES

PROFESSIONAL CHEMIST

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.

ORIGINAL REPORT OF ANALYSIS

The NALIN LABORATORIES

2541 CLEVELAND AVENUE
AREA CODE 614
PHONE 263-3588

COLUMBUS, OHIO 43211

February 7, 1976

CONSULTING
TECHNICAL SERVICE
RESEARCH CHEMICAL ANALYSIS

LABORATORY
APPARATUS
INSTRUMENTS
CHEMICALS
GLASSWARE

FUEL TESTING LABORATORY

ESTABLISHED 1938

COAL ANALYSIS
WATER ANALYSIS
STANDARD SOLUTIONS FOR WATER ANALYSIS

CERTIFICATE OF ANALYSIS

LABORATORY NO. 44668 DATE February 7, 1976

SUBMITTED BY Battelle Memorial Institute, Attn: Mr. Bill Baytos
P. O. No. L-6056

IDENTIFICATION Saturant Asphalt, S75-006-296
Task No. 35
Certain-Teed, Shakope, Minn.

DATE RECEIVED AT LABORATORY October 31, 1975

ULTIMATE ANALYSIS

AIR-DRIED MOISTURE 0.00 %

		AS RECEIVED	DRY SAMPLE
TOTAL MOISTURE	%	0.00	----
VOLATILE MATTER	%	85.14	85.14
FIXED CARBON	%	14.67	14.67
ASH	%	0.19	0.19
TOTAL CARBON	%	78.72	78.72
NITROGEN, KJELDAHL	%	0.98	0.98
SULPHUR	%	1.89	1.89
HYDROGEN	%	5.46	5.46
B. T. U. PER LB.		18,501	18,501
OXYGEN	%	14.65	14.65

FREE SWELLING INDEX _____ M-ASH FREE 18,536

ASH FUSION TEMPERATURE _____ °F

INITIAL DEFORMATION _____ °F

FLUID TEMPERATURE _____ °F

Respectfully submitted,
THE NALIN LABORATORIES

PROFESSIONAL CHEMIST

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.

ORIGINAL REPORT OF ANALYSIS

The NALIN LABORATORIES

2641 CLEVELAND AVENUE
AREA CODE 614
PHONE 263-3565

COLUMBUS, OHIO 43211

February 7, 1976

CONSULTING
TECHNICAL SERVICE
RESEARCH CHEMICAL ANALYSIS

LABORATORY
APPARATUS
INSTRUMENTS
CHEMICALS
GLASSWARE

FUEL TESTING LABORATORY

ESTABLISHED 1938

COAL ANALYSIS
WATER ANALYSIS
STANDARD SOLUTIONS FOR WATER ANALYSIS

CERTIFICATE OF ANALYSIS

LABORATORY NO. 44669 DATE February 7, 1976

SUBMITTED BY Battelle Memorial Institute, Attn: Mr. Bill Baytos
P. O. No. L-6056

IDENTIFICATION Coating Asphalt, S-75-006-303
Task No. 35
Certain-Teed, Shakope, Minn.

DATE RECEIVED AT LABORATORY October 31, 1975

ULTIMATE ANALYSIS

AIR-DRIED MOISTURE 0.00 %

		AS RECEIVED	DRY SAMPLE
TOTAL MOISTURE	%	0.00	----
VOLATILE MATTER	%	83.95	83.95
FIXED CARBON	%	15.63	15.63
ASH	%	0.42	0.42
TOTAL CARBON	%	78.64	78.64
NITROGEN, KJELDAHL	%	0.09	0.09
SULPHUR	%	2.86	2.86
HYDROGEN	%	5.45	5.45
B. T. U. PER LB.		18,068	18,068
OXYGEN	%	15.40	15.40

FREE SWELLING INDEX _____ MASH FREE 18,144

ASH FUSION TEMPERATURE _____ °F

INITIAL DEFORMATION _____ °F

FLUID TEMPERATURE _____ °F

Respectfully submitted,
THE NALIN LABORATORIES

PROFESSIONAL CHEMIST

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.

ORIGINAL REPORT OF ANALYSIS

The NALIN LABORATORIES

2641 CLEVELAND AVENUE
AREA CODE 614
PHONE 263-3586

COLUMBUS, OHIO 43211

February 6, 1976

CONSULTING
TECHNICAL SERVICE
RESEARCH CHEMICAL ANALYSIS

LABORATORY
APPARATUS
INSTRUMENTS
CHEMICALS
GLASSWARE

FUEL TESTING LABORATORY

ESTABLISHED 1938

COAL ANALYSIS
WATER ANALYSIS
STANDARD SOLUTIONS FOR WATER ANALYSIS

CERTIFICATE OF ANALYSIS

LABORATORY NO. 44666

DATE February 6, 1976

SUBMITTED BY Battelle Memorial Institute, Attn: Mr. Bill Baytos
P. O. No. L-6056

IDENTIFICATION Recovery Oil, TP3 Duct, S75-006-300
Task No. 35
Certain-Teed, Shakope, Minn.

DATE RECEIVED AT LABORATORY January 17, 1976

ULTIMATE ANALYSIS

AIR-DRIED MOISTURE 0.00 %

		AS RECEIVED	DRY SAMPLE
TOTAL MOISTURE	%	0.24	----
VOLATILE MATTER	%	88.61	88.82
FIXED CARBON	%	6.73	6.75
ASH	%	4.42	4.43
TOTAL CARBON	%	74.47	74.65
NITROGEN, KJELDAHL	%	0.23	0.23
SULPHUR	%	2.38	2.38
HYDROGEN	%	5.18	5.19
B. T. U. PER LB.		17,325	17,367
OXYGEN	%	15.46	15.50

FREE SWELLING INDEX _____ M-ASH FREE 18,172

ASH FUSION TEMPERATURE _____ °F

INITIAL DEFORMATION _____ °F

FLUID TEMPERATURE _____ °F

Respectfully submitted,
THE NALIN LABORATORIES

PROFESSIONAL CHEMIST

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.

ORIGINAL REPORT OF ANALYSIS

The NALIN LABORATORIES

2641 CLEVELAND AVENUE
AREA CODE 614
PHONE 263-3586

COLUMBUS, OHIO 43211

February 2, 1976

CONSULTING
TECHNICAL SERVICE
RESEARCH CHEMICAL ANALYSIS

LABORATORY
APPARATUS
INSTRUMENTS
CHEMICALS
GLASSWARE

FUEL TESTING LABORATORY

ESTABLISHED 1938

COAL ANALYSIS
WATER ANALYSIS
STANDARD SOLUTIONS FOR WATER ANALYSIS

CERTIFICATE OF ANALYSIS

LABORATORY NO. 44665 DATE February 2, 1976

SUBMITTED BY Battelle Memorial Institute, Attn: Mr. Bill Baytos
P. O. No. L-6056

IDENTIFICATION Recovery Oil, TP3 Afterburner S-75-006-299
Certain-Teed, Shakope, Minn.
Task No. 35

DATE RECEIVED AT LABORATORY October 31, 1975

ULTIMATE ANALYSIS

AIR-DRIED MOISTURE 0.02 %

		AS RECEIVED	DRY SAMPLE
TOTAL MOISTURE	%	0.79	----
VOLATILE MATTER	%	98.68	99.47
FIXED CARBON	%	0.45	0.45
ASH	%	0.08	0.08
TOTAL CARBON	%	76.77	77.38
NITROGEN, KJELDAHL	%	0.17	0.17
SULPHUR	%	1.75	1.76
HYDROGEN	%	5.33	5.37
B. T. U. PER LB.		18,999	19,150
OXYGEN	%	16.86	16.99

FREE SWELLING INDEX _____ M-ASH FREE 19,166

ASH FUSION TEMPERATURE _____ °F

INITIAL DEFORMATION _____ °F

FLUID TEMPERATURE _____ °F

Respectfully submitted,
THE NALIN LABORATORIES

PROFESSIONAL CHEMIST

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.

ORIGINAL REPORT OF ANALYSIS

Trace Metal Results

SOURCE SAMPLE REQUEST & REPORT
(MUST BE FILLED OUT FOR EACH TEST RUN)

SAMPLING DATE: 75 (YR) 9 (MO) 12 (DAY)

FIRST IDENT. NO. USED S75-006-231

LAST IDENT. NO. USED S75-006-236

TEST NO.

RUN NO. CER TP1-3

INDUSTRY Asphalt Roofing Shingle Mfg. (USE TABLE A)

UNIT PROCESS OPERATION Asphalt Saturators of a Felt Dip Tank

COMPANY Certain Teed Products

AIR POLLUTION CONTROL After Burner

ADDRESS Shakopee, Minnesota

FUEL USED Natural Gas

SAMPLING METHOD EPA Method 5 (Modified) TP-1 (3)

[X] INLET [ ] OUTLET

GAS VOLUME SAMPLED 112.7 (METER VOL IN FT^3)

IDENT NO S-75-006-	DESCRIPTION OF SAMPLE OR SAMPLE FRACTION	SAMPLE WT (SOLID) MG	SAMPLE VOL (LIQUID) ML	ANALYSIS REQUESTED - GENERAL COMMENTS (APPROX CONCENTRATIONS - POSSIBLE INTERFERENCES ETC) (INDICATE SPECIFIC ANALYSIS ON BACKSIDE)
-231	Tri Chloro Ethane (TCE) Rinse of Nozzle and Probe	325.5		
-231A	Acetone Rinse of Nozzle and Probe	7.2		
-236	TCE Rinse of Glass Wool Prefilter	792.9		
235	Fiber Glass Filter Jul 44	200.0		
-232	Impinger Catch, Water and Oil and Emulsion	5.0		
232A	TCE Extraction of Impinger Catch	56.2		
233	TCE Rinse of Back Half Glassware	77.5		
234	Acetone Rinse of Back Half Glassware	10.6		

COMMENTS:

SAMPLING CONTRACTOR Battelle Columbus Laboratories (IF APPLICABLE)

PROJECT OFFICER C. E. Riley

REQUEST REVIEWED BY

DATE OF REQUEST April 2, 1976

DATE ANALYSIS REQUESTED

DATE OF REQUEST (TO BE FILLED IN BY SSFAB)

EPA(DUR)245

REPORT OF ANALYSIS
TRACE ELEMENTS
ppm - for solid samples
ug/ml - for liquid samples

Mark (x) for specific analysis
Mark (x) in block to left of Ident. No. when requesting all analysis on that line

Ident No.	Hg	Be	Cd	As	V	Mn	Ni	Sb	Cr	Zn	Cu	Pb	Se	B	F	Li	Ag	Sn	Fe	Sr	Na	K	Ca	Si	Mg	Ba					Analyst's Initial
-231																															
-231A	—	<1	<1	<2	<1	8	60	<1	10	<10	2	<1	—	<35	—	5	<1	<1	<20	<1	<90	<40	<60	<120	<30	<2					
-236																															
-235	—	<1	<10	<10	<1	<5	<5	<5	<5	<25	20	<1	—	<50	—	<10	<1	25	<25	<5	*N.D.	*N.D.	*N.D.	—	<250	40					
-232																															
-232A	—	<1	<4	<13	<1	30	<13	<4	<4	75	40	10	—	270	—	40	<1	500	150	1	<670	<300	<4500	<9000	<335	90					
-233																															
-234																															

Analysis Method: 1-NAA, 2-SSMS, 3-OES, 4-AA, 5-ASV, 6-XRF, and 7-other

Comments: DETECTION LIMITS ARE VARIABLE BECAUSE OF VARIATION IN SAMPLE WEIGHT AND BLANK LEVELS.

*N.D. = NOT DETECTED GREATER THAN BLANK. — ALL SAMPLES HAVE BEEN CORRECTED FOR BLANK.

Other Analysis - Use Table B to fill analysis requested (above each column)

Mark (x) for specific analysis requested

Ident No.										
Analyst										
Method										

Comments:

SOURCE SAMPLE REQUEST & REPORT

(MUST BE FILLED OUT FOR EACH TEST RUN)

SAMPLING DATE: 75 (YR) 9 (MO) 12 (DAY)

FIRST IDENT. NO. USED: S75-006-249

LAST IDENT. NO. USED: S75-006-253

TEST NO.

RUN NO. CER TP2-3

INDUSTRY: Asphalt Roofing Shingle Mfg. (USE TABLE A)

UNIT PROCESS OPERATION: Asphalt Saturator of a Felt Dip Tank

COMPANY: Certain Teed Products

AIR POLLUTION CONTROL: After Burner

ADDRESS: Shakopee, Minnesota

FUEL USED: Natural Gas

SAMPLING METHOD: EPA Method 5, (Modified) TP-2(3)

☐ INLET ☒ OUTLET

GAS VOLUME SAMPLED (METER VOL IN FT^3): 107.9

IDENT NO S75-006-	DESCRIPTION OF SAMPLE OR SAMPLE FRACTION	SAMPLE WT (SOLID) MG	SAMPLE VOL (LIQUID) ML	ANALYSIS REQUESTED - GENERAL COMMENTS (APPROX CONCENTRATIONS - POSSIBLE INTERFERENCES ETC) (INDICATE SPECIFIC ANALYSIS ON BACKSIDE)
249	Tri Chloro Ethane (TCE) Rinse of Nozzle and Probe	85.4		
249A	Acetone Rinse of Nozzle and Probe	5.9		
254	TCE Rinse of Glass Wool Prefilter	72.3		
253	Fiber Glass Filter Jul 29	22.7		
250	Impinger Catch, Water and Oil and Emulsion	9.3		
250A	TCE Extraction of Impinger Catch	7.0		
251	TCE Rinse of Back Half Glassware	76.9		
252	Acetone Rinse of Back Half Glassware	2.5		

COMMENTS:

SAMPLING CONTRACTOR (IF APPLICABLE): Battelle Columbus Laboratories

PROJECT OFFICER: C. E. Riley

REQUEST REVIEWED BY:

DATE OF REQUEST: April 2, 1976

DATE ANALYSIS REQUESTED:

DATE OF REQUEST (TO BE FILLED IN BY SSFAB):

EPA/OUR/245

REPORT OF ANALYSIS
TRACE ELEMENTS
ppm - for solid samples
ug/ml - for liquid samples

Mark (x) for specific analysis
Mark (x) in block to left of Ident. No. when requesting all analysis on that line

Ident No.	Hg	Be	Cd	As	V	Mn	Ni	Sb	Cr	Zn	Cu	Pb	Se	B	F	Li	Ag	Sn	Fe	Sr	Na	K	Ca	Si	Mg	Ba					Analyst's Initial
-249																															
-249A	—	<1	5	<12	<1	40	920	<4	200	290	270	1	—	430	—	60	35	40	1000	<1	1000	<300	<4300	<4600	<250	410					
-254																															
-253	—	<1	<40	<40	<4	<40	<40	<40	<40	<220	<40	<4	—	<460	—	<40	<4	130	<220	410	* N.D.	* N.D.	* N.D.	—	<2200	90					
-250																															
-250A	—	<1	8	<20	<2	60	1470	<6	<5	40	50	2	—	<460	—	60	<1	40	380	8	<1000	<500	<7000	<4600	<840	40					
-251																															
-252																															

Analysis Method: 1-NAA, 2-SSMS, 3-OES, 4-AA, 5-ASV, 6-XRF, and 7-other

Comments: DETECTION LIMITS ARE VARIBLE BECAUSE OF VARIATION IN SAMPLE WEIGHT AND BLANK LEVELS.

* N.D. = NOT DETECTED GREATER THAN BLANK — ALL SAMPLES HAVE BEEN CORRECTED FOR BLANK

Other Analysis - Use Table B to fill analysis requested (above each column)

Mark (x) for specific analysis requested

Ident No.										
Analyst										
Method										

Comments:

SOURCE SAMPLE REQUEST & REPORT

(MUST BE FILLED OUT FOR EACH TEST RUN)

SAMPLING DATE 75 (YR) 9 (MO) 12 (DAY)

FIRST IDENT. NO. USED S75-006-267

LAST IDENT. NO. USED S75-006-272

TEST NO

RUN NO CER-TP3-3

INDUSTRY Asphalt Roofing Shingle Mfg. (USE TABLE A)

UNIT PROCESS OPERATION Asphalt Saturator of a Felt Dip Tank

COMPANY Certain Teed Products

AIR POLLUTION CONTROL After Burner

ADDRESS Shakopee, Minnesota

FUEL USED Natural Gas

SAMPLING METHOD EPA Method 5, (Modified) TP-3(3)

[X] INLET [ ] OUTLET

GAS VOLUME SAMPLED 95.8 (METER VOL IN FT^3)

IDENT NO S75-006-	DESCRIPTION OF SAMPLE OR SAMPLE FRACTION	SAMPLE WT (SOLID) MG	SAMPLE VOL (LIQUID) ML	ANALYSIS REQUESTED - GENERAL COMMENTS (APPROX CONCENTRATIONS - POSSIBLE INTERFERENCES ETC) (INDICATE SPECIFIC ANALYSIS ON BACKSIDE)
267	Tri Chloro Ethane (TCE) Rinse of Nozzle and Probe	335.2		
267A	Acetone Rinse of Nozzle and Probe	19.5		
272	TCE Rinse of Glass Wool Prefilter	879.9		
271	Fiber Glass Filter Jul 27	977.6		
268	Impinger Catch, Water and Oil and Emulsion	6.0		
268A	TCE Extraction of Impinger Catch	75.8		
269	TCE Rinse of Back Half Glassware	68.0		
270	Acetone Rinse of Back Half Glassware	24.3		

COMMENTS:

SAMPLING CONTRACTOR Battelle Columbus Laboratories (IF APPLICABLE)

PROJECT OFFICER C. E. Riley

REQUEST REVIEWED BY

DATE OF REQUEST April 2, 1976

DATE ANALYSIS REQUESTED

DATE OF REQUEST (TO BE FILLED IN BY SSFAB)

EPA(DUR)245

REPORT OF ANALYSIS
TRACE ELEMENTS
ppm - for solid samples
ug/ml - for liquid samples

Mark (x) for specific analysis
Mark (x) in block to left of Ident. No. when requesting all analysis on that line

Ident No.	Hg	Be	Cd	As	V	Mn	Ni	Sb	Cr	Zn	Cu	Pb	Se	B	F	Li	Ag	Sn	Fe	Sr	Na	K	Ca	Si	Mg	Ba					Analyst's Initial
-267																															
-267A	—	<1	4	<2	10	10	60	<1	10	40	10	15	—	<30	—	<3	<1	4	140	<1	<50	<40	<570	<1100	<25	<4					
-272																															
271	—	<1	<2	<2	<1	1	<1	<1	<1	<10	10	<1	—	<10	—	<2	<1	20	<5	1	X N.D.	X N.D.	X N.D.	—	<50	10					
-268																															
-268A	—	<1	<3	<10	<1	3	<10	<3	<3	570	10	20	—	700	—	10	<1	360	<100	<1	630	<290	<1100	<5000	<170	5					
-269																															
-270																															

Analysis Method: 1-NAA, 2-SSMS, 3-OES, 4-AA, 5-ASV, 6-XRF, and 7-other

Comments: DETECTION LIMITS ARE VARIABLE BECAUSE OF VARIATION IN SAMPLE WEIGHT AND BLANK LEVELS.

*N.D. = NOT DETECTED GREATER THAN BLANK — ALL SAMPLES HAVE BEEN CORRECTED FOR BLANK.

Other Analysis - Use Table B to fill analysis requested (above each column)

Mark (x) for specific analysis requested

Ident No.										
Analyst										
Method										

Comments:

SOURCE SAMPLE REQUEST & REPORT

(MUST BE FILLED OUT FOR EACH TEST RUN)

SAMPLING DATE 75 (YR) 9 (MO) 11 (DAY)

FIRST IDENT. NO. USED S75-006-279

LAST IDENT. NO. USED S75-006-283

TEST NO _____

RUN NO CER TP4-2

INDUSTRY Asphalt Roofing Shingle Mfg. (USE TABLE A)

UNIT PROCESS OPERATION Asphalt Saturator of a Felt Dip Tank

COMPANY Certain Teed Products

AIR POLLUTION CONTROL After Burner

ADDRESS Shakopee, Minnesota

FUEL USED Natural Gas

☐ INLET ☒ OUTLET

SAMPLING METHOD EPA Method 5, (Modified) TP-4(2)

GAS VOLUME SAMPLED 113.3 (METER VOL IN FT^3)

IDENT NO S75-006-	DESCRIPTION OF SAMPLE OR SAMPLE FRACTION	SAMPLE WT (SOLID) MG	SAMPLE VOL (LIQUID) ML	ANALYSIS REQUESTED - GENERAL COMMENTS (APPROX CONCENTRATIONS - POSSIBLE INTERFERENCES ETC) (INDICATE SPECIFIC ANALYSIS ON BACKSIDE)
279	Tri Chloro Ethane (TCE) Rinse of Nozzle and Probe	15.8		
279A	Acetone Rinse of Nozzle and Probe	19.6		
284	TCE Rinse of Glass Wool Prefilter	12.4		
283	Fiber Glass Filter Jul 30 and Jul 69	8.1		
280	Impinger Catch, Water and Oil and Emulsion	24.7		
280A	TCE Extraction of Impinger Catch	0		
281	TCE Rinse of Back Half Glassware	31.4		
282	Acetone Rinse of Back Half Glassware	3.5		

COMMENTS: _____

SAMPLING CONTRACTOR Battelle Columbus Laboratories (IF APPLICABLE)

PROJECT OFFICER C. E. Riley

REQUEST REVIEWED BY _____

DATE OF REQUEST April 2, 1976

DATE ANALYSIS REQUESTED _____

DATE OF REQUEST _____ (TO BE FILLED IN BY SSFAB)

EPA-DUP-245

REPORT OF ANALYSIS
TRACE ELEMENTS
ppm - for solid samples
ug/ml - for liquid samples

Mark (x) for specific analysis
Mark (x) in block to left of Ident. No. when requesting all analysis on that line

Ident No.	Hg	Be	Cd	As	V	Mn	Ni	Sb	Cr	Zn	Cu	Pb	Se	B	F	Li	Ag	Sn	Fe	Sr	Na	K	Ca	Si	Mg	Ba					Analyst's Initial
-279																															
-279A	—	<1	140	<40	<4	200	26,000	<10	3000	400	460	50	—	840	—	410	30	20	9800	<4	4000	<1000	<11,000	<18,000	<600	70					
-284																															
-283	—	<2	<250	<250	120	<120	1300	<120	1700	<660	1100	<25	—	<1200	—	<250	<25	<60	4000	<60	N.D.	N.D.	N.D.	—	<1200	370					
280																															
280A	—	<1	410	<30	70	150	800	<10	150	170	180	<3	—	<700	—	170	<2	<15	1400	15	600	<850	<11,000	<23,000	<500	85					
281																															
282																															

Analysis Method: 1-NAA, 2-SSMS, 3-OES, 4-AA, 5-ASV, 6-XRF, and 7-other

Comments: DETECTION LIMITS ARE VARIBLE BECAUSE OF VARIATION IN SAMPLE WEIGHT AND BLANK LEVELS

N.D. = NOT DETECTED GREATER THAN BLANK — ALL SAMPLES HAVE BEEN CORRECTED FOR BLANK.

Mark (x) for specific analysis requested

Other Analysis - Use Table B to fill analysis requested (above each column)

Ident No.										
Analyst										
Method										

Comments:

SOURCE SAMPLE REQUEST & REPORT

(MUST BE FILLED OUT FOR EACH TEST RUN)

SAMPLING DATE: 75 (YR) 9 (MO) 10 (DAY)

FIRST IDENT. NO. USED: S75-006-193

LAST IDENT. NO. USED: S75-006-198

TEST NO: _____

RUN NO: CER-TP5-3

INDUSTRY: Asphalt Roofing Shingle Mfg. (USE TABLE A)

UNIT PROCESS OPERATION: ~~Asphalt Saturator of a Felt Dip Tank~~

COMPANY: Certain Teed Products

AIR POLLUTION CONTROL: After Burner

ADDRESS: Shakopee, Minnesota

FUEL USED: Natural Gas

SAMPLING METHOD: EPA Method 5, (Modified) TP-5(3)

☒ INLET ☐ OUTLET

GAS VOLUME SAMPLED (METER VOL IN FT^3): 91.6

IDENT NO S75-006-	DESCRIPTION OF SAMPLE OR SAMPLE FRACTION	SAMPLE WT (SOLID) MG	SAMPLE VOL (LIQUID) ML	ANALYSIS REQUESTED - GENERAL COMMENTS (APPROX CONCENTRATIONS - POSSIBLE INTERFERENCES ETC) (INDICATE SPECIFIC ANALYSIS ON BACKSIDE)
-193	Tri Chloro Ethane (TCE) Rinse of Nozzle and Probe	218.0		
193A	Acetone Rinse of Nozzle and Probe	2.8		
198	TCE Rinse of Glass Wool Prefilter	2640.1		
197	Fiber Glass Filter Jul 31	85.0		
194	Impinger Catch, Water and Oil and Emulsion	0	—	
194A	TCE Extraction of Impinger Catch	398.7		
195	TCE Rinse of Back Half Glassware	64.2		
196	Acetone Rinse of Back Half Glassware	1.9		

COMMENTS: _____

SAMPLING CONTRACTOR: Battelle Columbus Laboratories (IF APPLICABLE)

PROJECT OFFICER: C. E. Riley

REQUEST REVIEWED BY: _____

DATE OF REQUEST: April 2, 1976

DATE ANALYSIS REQUESTED: _____

DATE OF REQUEST: _____ (TO BE FILLED IN BY SSFAB)

EPA(DUP)245

REPORT OF ANALYSIS
TRACE ELEMENTS
ppm - for solid samples
ug/ml - for liquid samples

Mark (x) for specific analysis
Mark (x) in block to left of Ident. No. when requesting all analysis on that line

Ident No.	Hg	Be	Cd	As	V	Mn	Ni	Sb	Cr	Zn	Cu	Pb	Se	B	F	Li	Ag	Sn	Fe	Sr	Na	K	Ca	Si	Mg	Ba					Analyst's Initial
153																															
193A	—	<1	<1	<1	1	3	10	<1	10	4	1	<1	—	20	—	2	3	<1	50	<1	40	<15	<250	<500	<10	<1					
198																															
197	—	<1	<10	<10	<1	20	<10	<10	<10	<50	<10	<1	—	<100	—	<40	<1	100	<50	<10	* N.D.	* N.D.	* N.D.	—	400	150					
194																															
194A	—	<1	<1	<4	<1	<1	<5	<1	<1	<20	<2	<1	—	<90	—	<6	<1	30	<40	<1	<200	<100	<1500	<3000	<10	<2					
195																															
196																															

Analysis Method: 1-NAA, 2-SSMS, 3-OES, 4-AA, 5-ASV, 6-XRF, and 7-other

Comments: DETECTION LIMITS ARE VARIBLE BECAUSE OF VARIATION IN SAMPLE WEIGHT AND BLANK LEVELS.

*N.D. = NOT DETECTED GREATER THAN BLANK — ALL SAMPLES HAVE BEEN CORRECTED FOR BLANK.

Other Analysis - Use Table B to fill analysis requested (above each column)

Mark (x) for specific analysis requested

Ident No.										
Analyst										
Method										

Comments:

SOURCE SAMPLE REQUEST & REPORT

(MUST BE FILLED OUT FOR EACH TEST RUN)

SAMPLING DATE: 75 (YR) 9 (MO) 12 (DAY)

FIRST IDENT. NO. USED: S75-006-351

LAST IDENT. NO. USED: S75-006-357

TEST NO. _____

RUN NO. Blanks

INDUSTRY: Asphalt Roofing Shingle Mfg. (USE TABLE A)

UNIT PROCESS OPERATION: Asphalt Saturators of a Felt Dip Tank

COMPANY: Certain Teed Products

AIR POLLUTION CONTROL: After Burner

ADDRESS: Shakopee, Minnesota

FUEL USED: Natural Gas

SAMPLING METHOD: Blanks for EPA Method 5 (Modified)

☐ INLET ☐ OUTLET

GAS VOLUME SAMPLED (METER VOL IN FT^3): _____

IDENT NO S75-006-	DESCRIPTION OF SAMPLE OR SAMPLE FRACTION	SAMPLE WT (SOLID) MG	SAMPLE VOL (LIQUID) ML	ANALYSIS REQUESTED - GENERAL COMMENTS (APPROX CONCENTRATIONS - POSSIBLE INTERFERENCES ETC) (INDICATE SPECIFIC ANALYSIS ON BACKSIDE)
352	Tri Chloro Ethane 100 ml Fisher Certified	1.4		
	Lot No. 742435			
353	Acetone 100 ml Burdic and Jackson Lot No. 7426	0.8		
354	TCE Rinse of Glass Wool Prefilter	68.1		[illegible]
357	Glass Fiber Filter, 3 ea., Jul 47, 51, 53	0		[illegible]
351	Demineralized, Double Distilled Water Prepared	1.0		
	by OSU Labs.			

COMMENTS: _____

SAMPLING CONTRACTOR (IF APPLICABLE): Battelle Columbus Laboratories

PROJECT OFFICER: C. E. Riley

REQUEST REVIEWED BY: _____

DATE OF REQUEST: April 2, 1976

DATE ANALYSIS REQUESTED: _____

DATE OF REQUEST: _____ (TO BE FILLED IN BY SSFAB)

EPA [redacted] 245

ASPHALT AND ROOFING SAMPL
RESULTS REPORTED AS PPMW,

75-,	Hg	Be	Cd	As	V	Mn	Ni	Sb	Cr	Zn	Cu	Pb
006-136	—	<0.002	<0.06	<0.06	10.	0.2	6.	<0.06	0.2	0.6	0.2	0.2
7-068	—	<0.002	<0.06	<0.06	60.	0.2	20.	<0.06	0.6	6.	0.6	40.
06-301	—	<0.002	<0.06	<0.06	60.	0.2	20.	<0.06	1.	0.4	0.6	2.

CENED SAMPLES

	B	F	Li	Ag	Sn	Fe	Sr	Na	K	Ca	Si	Mg	Ba
36	<0.02	—	<0.2	<0.005	0.06	10,	0.6	40.	1.	20.	4.	2.	0.4
068	<0.02	—	<0.2	<0.005	0.4	20.	0.6	80.	10.	60.	6.	4.	10.
01	0.02	—	<0.2	<0.005	0.06	20.	0.6	40.	20	40.	20.	4.	4.

APPENDIX K

FIELD DATA ON PROCESS PARAMETERS

APPENDIX K

Process Calculation Procedures

The estimate of shingle produced during these tests and the quantities of felt, saturant and coating asphalt used were calculated in a number of different ways. These were encoded as follows:

A. Production and usage calculations using shingle bundle counter readings
B. Production and usage calculations using average line speed during sampling period
C. Production and usage using felt footage counter readings
D. Asphalt usage calculations using asphalt deliveries and height changes of asphalt in storage tanks

The following formulae were used for these calculations:

A. Shingle bundle counter

Shingle Production Rate

$$\cdot \quad \frac{\text{Shingle bundles}}{\text{3 bundles/Square}} \times \frac{\text{235 \#/Sq}}{\text{Operating Period (min)}} \times \frac{\text{60 min/hour}}{\text{2000 \#/ton}}$$

Felt Usage Rate

. Shingle Production Rate (tons/hr) x .116

Saturant Asphalt Usage Rate

. Shingle Production Rate (tons/hr) x .198

Coating Asphalt Usage Rate

. Shingle Production Rate (tons/hr) x .172

Where:

1) Shingle bundles is bundle count for the test period, not excluding periods when sampling was not in progress

2) Operating period is the sampling time

3) 235# is the design weight of one square of the standard shingle (actual weights were not measured)

4) .116 is the design weight fraction of felt in shingle and corresponds to a weight of .455 pounds per linear foot of felt (actual weight as measured during the tests were somewhat higher, ranging from .476 to .50)

5) .198 is the design weight fraction of saturant in the finished shingle

6) .172 is the design weight fraction of unfilled coating asphalt in the finished shingle.

B. Line Speed

Shingle Production Rate

. $\frac{\text{Average Line Speed (ft/min)}}{\text{60 Ft/Square}} \times \frac{\text{235 \#/sq}}{\text{2000 \#/ton}} \times \text{60 min/hour}$

Felt Usage Rate

. Shingle Production Rate (tons/hr) x .116

Saturant Usage Rate

. Shingle Production Rate (tons/hr) x .198

Coating Asphalt Usage Rate

. Shingle Production Rate (tons/hr) x .172

Where:

60 feet is the length of 4 foot wide felt required to make one square (240 square feet) of shingle

C. Felt Counter

Shingle Production Rate

. $\frac{\text{Felt footage used (ft)}}{\text{60 ft/sq.}} \times \frac{\text{235 \#/sq}}{\text{Operating period (min)}} \times \frac{\text{60 min/hr}}{\text{2000 \#/ton}}$

Felt Usage Rate

. Shingle Production Rate (tons/hr) x .116

Saturant Usage Rate

. Shingle Production Rate (tons/hr) x .198

Coating Asphalt Usage Rate

. Shingle Production Rate (tons/hr) x .172

D. Asphalt Tank Levels and Deliveries

Saturant Usage Rate

$$\frac{[\Sigma\text{Reductions in tank asphalt levels (ft)} \times \text{846 gal/ft} \times \text{7.6 \#/gal} + \Sigma\text{Deliveries (\#)}]}{[\text{2000 \#/ton} \times \text{Sampling Period (hours)}]}$$

Coating Asphalt Usage Rate - same procedure

Where:

1) all in-process tanks are identical, with each foot of tank holding 846 gal.

2) Each gallon of asphalt (saturant or coating) is assumed to weigh 7.6# at storage temperatures (420 - 500°F).

TABLE K-1. PROCESS CONDITIONS FOR EMISSIONS TESTS CONDUCTED BETWEEN 9:30 a.m. AND 2:15 p.m. ON SEPTEMBER 9, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product throughput for run
9/9/75	9:35 AM	SM 66552	200	-	414	404	1,870	43,032	$\left[(3,650 - 1,870) \times \frac{78}{2,000}\right]$ tons
		(Started reading visible emissions from afterburner stacks)							
	9:45	SM 66552	380	-	414	404	-	-	= 69.42 tons from 9.30 to 12:30
	9:55	SM 66554							
	10:03	SM 66554	380	-	420	408	-	-	
	10:09	SM 66555							
	10:15	SM 66555	360	-	410	415	-	-	
	10:18	SM 66555	250 (problems with looper)						
	10:19	SM 66555	120 (problems with looper)						
	10:30	SM 66557	210	-	410	395	-	-	
	10:45	SM 66558	275	-	410	395	-	-	
	10:50	SM 66558	250	-	410	392	-	-	
		(Particle sizing run started at test point TP1).							
	10:55	Felt break		10:55-11:18					
		(Particle sizing run stopped, but continued reading visible emissions.)							
	11:20	SM 66558	315	-	412	402	-	-	
	11:23	SM 66560							
	11:30	Felt break		11:30-11:52					
	11:55	SM 66174	305						
	11:59	Felt break		11:59-12:20)					
	12:25 PM	SM 66174	260	-	417	400	-	-	
	12:30	SM 66175	350	-	416	400	3,650	84,130	
		(Completed visible emission reading run)							
	1:57	SM 66569	375	-	405	390	-	-	
		(Resumed particle sizing run)							
	2:03	SM 66574							
	2:13	SM 66574	380	-	405	400	-	-	
		(Completed particle sizing run)							

Note: Temperature of gases entering and leaving Afterburners I and II was measured by Battelle test team. The operating temperatures of Afterburner I was 1000°F and that of Afterburner II was 1200°F.

TABLE K-2. TANK LEVELS AND TEMPERATURES DURING SAMPLING AT TEST POINT TP5 ON SEPTEMBER 9, 1975

ASPHALT TYPE		COATING				SATURANT						SEALANT	
		Tank No. 1		Tank No. 2		Tank No. 3		Tank No. 4		Tank No. 5		Tank No. 6	
Date	Time	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)
9/9/75	12:45 PM	4 ft 0 in. (Started sampling at TP5)	470	18 ft 9 in.	490	19 ft 1 in.	490	10 ft 0 in.	420	Empty	-	12 ft 7 in.	285
	1:00		475		495		490		420		-		290
	1:15		475		495		485		415		-		290
	1:30		470		495		485		415		-		290
	1:45		470		500		480	8 ft 0 in.	410		-		290
	1:46	(Received truckload of saturant which was loaded to Tank No. 4. Tank level rose from 8 ft to 13 ft 6 in. 44,460 lb of saturant at 480°F were unloaded from the truck between 1:46 PM and 2:20 PM.)											
	2:15	4 ft 0 in.	470		495		480		415		-		290
	2:25	(Received truckload of coating which was loaded to Tank No. 1. Tank level rose from 4 ft to 9 ft. 45,424 lb of coating were unloaded from truck to tank.)											
	2:30		465		495		480		415		-		290
	2:45		490		500		480		-		-		290
	2:50	9 ft 0 in. (Completed sampling at TP5)	490	14 ft 5 in.	500	18 ft 8 in.	480	12 ft 0 in.	415	Empty	-	12 ft 7 in.	290

Note: 1 ft of asphalt in tank denotes 846 gal.

TABLE K-3. PROCESS CONDITIONS FOR EMISSIONS TESTS CONDUCTED BETWEEN 4:00 AND 9:15 p.m. ON SEPTEMBER 9, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product throughput for run
9/9/75	4:02 PM	SM 66581	370	-	420	398	1,026	20,610	
		(Started particle sizing run)							
	4:11	SM 66582							
	4:15	SM 66582	370	-	420	392	-	-	
		(Started visible emission readings)							
	4:25	SM 66556							
	4:28	(Door in front of hot looper was open for ~ 2 min to check splice of new roll.)							
	4:30	SM 66556	348	-	420	388	-	-	
		(Line speed was reduced since operator was not satisfied with the felt roll.)							
	4:42	SM 66588 (Dry looper door opened ~ 2 min to check splice of new roll.)							
	4:43	(Particle sizing run completed)							
	4:45	SM 66588	348	-	420	398	-	40,110	
	4:48	SM 66589 (Dry looper door opened ~ 2 min to check splice of new roll.)							
	5:00	SM 66589	348	-	420	398	-	-	
	5:15	SM 66590 (Dry looper door opened ~ 2 min to check new splice.)							
	5:15	SM 66590	348	-	420	388	-	-	
	5:20	SM 66590	-	-	-	-	2,373	-	
	5:30	SM 66590	348	-	420	388	-	-	
	5:31	SM 66591 (Dry looper door opened ~ 2 min to check new splice.)							
	5:45	SM 66591	348						
	5:46	SM 66592 (Dry looper door opened ~ 2 min to check new splice.)							
	5:50	SM 66592	250	-	420	400	-	-	
		(Line speed reduced since packers farther down the line could not handle output material.)							

TABLE K-3. (Continued)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/9/75 (cont'd.)	5:55 PM	SM 66592	340	-	420	400	-	-	
	6:00	SM 66592	355	-	422	400	-	-	
	6:08	SM 66593	-	-	-	-	3,220	65,351	
		(Sampling started at points 1, 2, 3 and 4 with 5 closed.)							
	6:11	SM 66593	360	-	422	400	-	-	
	6:23	SM 66594 (Dry looper door opened ~ 2 min to check new splice.)							
	6:30	SM 66594	375	-	422	400	-	-	
	6:33	Felt break		6:33-6:45			3,440	74,860	
		(Sampling stopped; hot looper door opened to correct breakage; coating tanks switched from one to the other.)							
	6:45	SM 66594	150	-	428	368	-	-	
	6:50	SM 66595							
	6:53	SM 66595	360	-	430	370	3,560	78,690	
		(Sampling resumed)							
	7:03	(Hot looper door closed.)							
	7:10	SM 66596 (Hot looper door opened to check new splice.)							
	7:10	SM 66596	372	-	430	398	-	-	
	7:15	(Different color granules used; hot looper door closed.)							
	7:25	SM 66597	372	-	430	392	-	-	
		(Hot looper door opened to check new splice.)							
	7:35	SM 66597	250	-	430	388	-	-	
		(Line speed reduced due to accumulation of product farther down the line.)							
	7:40	SM 66598							
	7:45	SM 66598	372	-	430	392	-	-	

TABLE K-3. (Continued)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product throughput for run
9/9/75 (cont'd)	8:00 PM	SM 66602	372	-	425	398	-	-	
	8:15	SM 66602	372	-	420	405	-	-	
	8:19	SM 66603	(Hot looper door opened for ~ 2 min)						
	8:30	SM 66603	372	-	416	410	-	-	
	8:35	SM 66604	(Hot looper door opened for ~ 2 min)						
	8:45	SM 66604	378	-	418	410	-	-	
	8:50	SM 66605	(Hot looper door opened for ~ 2 min)						
	8:58	SM 66605	378	-	418	410	-	-	
	9:00	SM 66605	250	-	418	402	-	-	
		(Line speed reduced since time was inadequate for product to be cooled in spray and looper section.)							
	9:06	SM 66605	375	-	418	410	6,158	127,566	
	8:12	(Hot looper door opened for ~ 1/2 min.)							
	9:15	SM 66605 (Sampling completed.)	375	-	418	410	6,256	131,141 Felt used from 6:08 PM to 9:15 PM excluding times not sampled was 61,960 ft or 15.2 tons. (61,160 ft x 0.49 lb/ft[a] x 1 ton/2,000 lb	113.7 tons (2,916 bundles x 78 lb/bundle[b] x 1 ton/2,000 lb) from 6:08 PM to 9:15 PM excluding times not sampled

a/ From data in Table K-4.
b/ From quality control personnel at plant.

TABLE K-4. CHARACTERISTICS OF FELT ROLLS USED DURING EMISSION TESTS ON SEPTEMBER 9, 1975

Felt characteristics	Roll numbers									
	SM 66552	SM 66554	SM 66555	SM 66557	SM 66558	SM 66560	SM 66174	SM 66175	SM 66569	SM 66574
Moisture content (%)	4.4	4.3	4.3	4.4	4.4	4.4	4.5	4.5	4.4	5.1
Kerosene value	172	169	169	170	170	174	172	172	175	178
Flexibility	17	17	17	19	19	16	17	18	15	15
Density	17	19	19	19	19	17	19	17	17	15
Tensile	42	43	45	39	39	41	40	38	41	40
Felt point by dry wt	54.5	55	55	53	53	53	52.5	52.5	53	56
Scale wt of roll (lb)	2,986	2,964	2,988	2,924	2,938	3,060	3,104	3,116	3,092	3,062
Length (ft)	6,350	6,340	6,340	6,210	6,210	6,170	6,411	6,409	6,400	6,250
Felt width (in.)	49	49	49	49	49	49	49	49	49	49
Felt grade	55	55	55	55	55	55	55	55	55	55

TABLE K-4. (Continued)

Felt characteristics	Roll numbers									
	SM 66581	SM 66582	SM 66556	SM 66588	SM 66589	SM 66590	SM 66591	SM 66592	SM 66593	SM 66594
Moisture Content (%)	5.2	5.2	4.3	6.5	5.8	5.1	5.1	5.0	4.4	4.4
Kerosene value	176	176	169	168	168	168	168	168	165	165
Flexibility	17	17	17	14	14	14	14	14	16	16
Density	15	15	19	20	20	21	21	21	18	18
Tensile	38	38	43	42	42	43	43	43	42	42
Felt point by drt wt	55	55	55	57	56	56	56	57.5	54	54
Scale wt of roll (lb)	3,162	3,154	3,072	3,208	3,210	3,196	3,202	3,182	3,142	3,162
Length (ft)	6,280	6,280	6,340	6,320	6,320	6,685	6,685	6,685	6,594	6,594
Felt width (in.)	49	49	49	49	49	49	49	49	49	49
Felt grade	55	55	55	55	55	55	55	55	55	55

TABLE K-4. (Concluded)

Felt characteristics	Roll numbers							
	SM 66595	SM 66596	SM 66597	SM 66598	SM 66602	SM 66603	SM 66604	SM 66605
Moisture content (%)	4.5	4.5	4.5	4.5	5.3	5.3	5.4	6.8
Kerosene value	165	171	171	171	168	168	168	169
Flexibility	16	19	19	19	19	19	19	18
Density	18	17	17	17	16	16	16	17
Tensile	42	38	38	38	40	40	40	40
Felt point by dry wt	53	52.5	52.5	52.5	53.5	53.5	52.5	55.5
Scale wt of roll (lb)	3,108	3,120	3,132	3,082	3,180	3,186	3,142	3,158
Length (ft)	6,594	6,452	6,452	6,452	6,400	6,400	6,400	6,370
Felt width (in.)	49	49	49	49	49	49	49	49
Felt grade	55	55	55	55	55	55	55	55

TABLE K-5. PROCESS CONDITIONS DURING PARTICLE SIZING TEST AT TEST POINT TP1 ON SEPTEMBER 10, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	No. of bundles at start/end	Felt footage at start/end	Product throughput for run
9/10/75	10:20 AM	SM 65898	250	-	422	410	Counter not in operation	39,110	
		(Start of particle sizing run at sampling point TP1)							
	10:30	SM 65898	200	-	430	400		-	1.23 tons of felt[a] from 10:20 AM to 10:50 AM
		(One of the saturator doors was opened for ~ 1 min.)							
	10:37	SM 66425			440	400		-	
	10:40	SM 66425	235	-	438	400		46,150	
	10:50	SM 66425	235	-					
		(Particle sizing run completed at TP1)							

a/ $(46{,}150 - 39{,}110)\ \text{ft} \times 0.35\ \frac{\text{lb}}{\text{ft}} \times \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = 1.23\ \text{tons}$

Roll SM 65898 weighs 2,242 lb and its length is 6,738 ft. Therefore, weight per linear foot is $\frac{2{,}242}{6{,}738}$ or 0.33 lb/ft. Similarly, for Roll SM 66425 it is 0.36 lb/ft. Therefore, the average is 0.35 lb/ft of felt.

Note: Product manufactured today was 36 in. wide mineral-surfaced rolls which are cut into 9" wide rolls called "9-inch starter" rolls.

TABLE K-6. TANK LEVELS AND TEMPERATURES DURING SAMPLING AT TEST POINT TP5 ON SEPTEMBER 10, 1975

ASPHALT TYPE		COATING				SATURANT						SEALANT	
		Tank No. 1		Tank No. 2		Tank No. 3		Tank No. 4		Tank No. 5		Tank No. 6	
Date	Time	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)
9/10/75	11:05 AM	1 ft 0 in. (Start of sampling at point TP5)	280	1 ft 0 in.	420	9 ft 10 in.	425	3 ft 6 in.	400	1 ft 0 in.	100	11 ft 5 in.	285
	11:20	- (Operator had problems pumping asphalt to line from Tank No. 3. Therefore, Tank No. 4 was used to supply asphalt to line. Pump No. 3 was reversed to remove plugged up matter, if any.)	280	-	425	-	425	-	400	-	100	-	285
	11:35	1 ft 0 in.	275	-	420	-	420	-	400	1 ft 0 in.	100	-	285
	11:45-12:20	(Truckload of coating asphalt was unloaded into Tank No. 2. The truck contained 45,440 lb at 450°F.)											
	11:50	1 ft 0 in.	275	-	455	-	420	-	400	-	100	-	285
	12:05 PM	1 ft 0 in.	275	-	455	-	420	-	415	1 ft 0 in.	95	-	285
	12:35-12:55	(Truckload of coating asphalt was unloaded into Tank No. 2. The truck contained 39,060 lb at 450°F.)											
	12:20	-	275	-	455	-	420	-	420	-	95	-	285
	12:40	-	275	-	455	-	420	-	405	-	95	-	285
	12:55	-	275	-	450	-	405	-	400	-	95	-	285
	1:10	1 ft 0 in. (Completed sampling at TP5)	275	11 ft 2 in.	435	4 ft 0 in.	380	4 ft 6 in.	405	1 ft 0 in.	95	11 ft 0 in.	285

TABLE K-7. PROCESS CONDITIONS DURING PARTICLE SIZING AT TEST POINT TP3 ON SEPTEMBER 10, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product throughput for run
9/10/75	2:20 PM	SM 61819	240	-	428	400	768	26,065	
		(Start of particle sizing run at sampling point TP3)							
	2:35	SM 64489	255	-	428	400	-	-	
	2:50	SM 64489	250	-	428	408	-	-	
	2:55	SM 61816 (Hot looper door opened ~ 8 min)							
	3:00	SM 61816	-	-	-	-	1,044[a]	31,210[a]	
	3:05	SM 61816	200	-	425	400	-	-	21.4 tons from 2:20-3:20 PM (i.e., 516 bundles x 83 lb/bundle[c] x 1 ton/2,000 lb
	3:20	SM 61816	200	-	420	-	240	6,230	
		(Completed particle sizing run at sampling point TP3)						Felt used from 2:20-3:20 PM was 2.2 tons (i.e., 11,375 ft x 0.385 lb/ft[b] x 1 ton/2,000 lb	

a/ At 3:00 PM the second shift zeroes the counters. Therefore, the number of bundles made during the run equals 516 (i.e., 1,044 - 768 + 240) Similarly, felt footage equals 11,375 ft.

b/ From data in Table K-9.

c/ The product is 36 in. lock shingle and weighs 83 lb/bundle according to plant personnel.

TABLE K-8. TANK LEVELS AND TEMPERATURES DURING SAMPLING AT TEST POINT TP5 ON SEPTEMBER 10, 1975

ASPHALT TYPE		COATING				SATURANT						SEALANT	
		Tank No. 1		Tank No. 2		Tank No. 3		Tank No. 4		Tank No. 5		Tank No. 6	
Date	Time	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)
9/10/75	3:15 PM	1 ft 0 in.	270	9 ft 0 in.	470	4 ft 0 in.	405	3 ft 6 in.	420	N.A.	405	11 ft 5 in.	290
		(Started sampling at TP5)											
	3:15-3:35	(Truckload of saturant unloaded into Tank No. 5. The truck contained 46,060 lb @ 460°F)											
	3:45	-	260	-	480	-	430	-	375	-	420	-	280
	3:55-4:40	(Truckload of coating asphalt unloaded into Tank No. 1. The truck contained 44,560 lb at 510°F.)											
	4:15	-	475	-	490	-	435	-	365	-	425	-	290
		(Asphalt was transferred from Tank No. 4 to Tank No. 3 so that Tank No. 4 can be cleaned.)											
	4:42-5:05	(Truckload of saturant unloaded into Tank No. 5. The truck contained 41,760 lb at 455°F.)											
	4:45	-	475	-	495	-	450	1 ft 0 in.	360	-	435	-	290
	5:15	8 ft 0 in.	475	6 ft 6 in.	500	6 ft 6 in.	450	1 ft 0 in.	350	17 ft 7 in.	435	11 ft 4 in.	290
		(Completed sampling at TP5)											

TABLE K-9. CHARACTERISTICS OF FELT ROLLS USED DURING EMISSIONS TESTS ON SEPTEMBER 10, 1975

	Roll numbers				
Felt characteristics	SM 65898	SM 66425	SM 61819	SM 64489	SM 61816
Moisture content (%)	5.6	4.6	5.0	4.5	6.6
Kerosene value	176	178	164	174	164
Flexibility	17	17	20	14	20
Density	21	15	20	14	20
Tensile	47	39	42	-	42
Felt point by dry wt	51	51.5	56	52	56.5
Scale wt of roll (lb)	2,242	2,028	2,252	1,990	2,342
Length (ft)	6,738	5,690	5,960	-	5,960
Felt width (in.)	36	36	36	36	36
Felt grade	50	50	55	55	55

TABLE K-10. PROCESS CONDITIONS DURING PARTICLE SIZING RUNS AT TEST POINT TP3 ON SEPTEMBER 11, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/11/75	10:15 AM	SM 66039	300	-	420	400	890	26,518	
		(Start of particle sizing run at test point TP3)							
	10:25	(Hot looper door opened to check roll which was suspected to have a crack in the felt. Line speed reduced to 110 ft/min momentarily.)							
	10:28	SM 66007							15.21 tons from 10:15 AM to 10:45 AM at 78 lb/bundle
	10:30	SM 66007	-	-	-	-	-	29,800	
	10:45	SM 66007	350	-	418	410	1,280	35,800	
		(Completed particle sizing run)							
		--------- X ---------- X ---------							
	2:09 PM	SM 66018	305	-	405	400	-	-	
		(Start of second particle sizing run at TP3)							
	2:20	SM 66018	360	-	402	398	-	-	
	2:22	SM 66020							
	2:30	SM 66020	360	-	402	405	-	-	
	2:34	SM 66026							
	2:39	SM 66026	-	-	405	400	-	-	
		(Completed particle sizing run)							

TABLE K-10. (Concluded)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product throughput for run
9/11/75	4:30 PM	SM 66029 (Start of third particle sizing run at TP3)	355	-	420	390	990	16,320	
	4:33	SM 66036 (Hot looper door open for ~ 2 min)							
	4:45	SM 66036	355	-	418	390	-	-	
	4:49	SM 66035							19.2 tons from 4:30 PM to 5:00 PM[c/]
	5:00	SM 66035	355	-	410	390	1,482	27,540 (Felt used from 4:30-5:00 PM was 2.7 tons)[a/]	

a/ $(27{,}540-16{,}320)\ \text{ft} \times 0.48\ \frac{\text{lb}^{b/}}{\text{ft}} \times \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = 2.7\ \text{tons}$

b/ From data in Table 15 for rolls used in this run

c/ $(492\ \text{bundles} \times 78\ \frac{\text{lb}^{d/}}{\text{bundle}} \times \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = 19.2\ \text{tons}$

d/ According to plant personnel.

TABLE K-11. PROCESS CONDITIONS DURING FIRST VISIBLE EMISSION RUN ON SEPTEMBER 11, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/11/75	9:35 AM	SM 66713	370	-	425	400	468	14,230	
		(Start of visible emission readings at afterburner stack)							
	9:36	Felt break		9:36-9:40					
	9:55	SM 65987 (Hot looper door open for ~ 5 min)							
	10:05	SM 65987	360	-	420	395	-	-	
	10:10	SM 66039							
	10:15	SM 66039	300	-	420	400	890	26,518	
	10:25	(Hot looper door opened to check roll. Speed reduced to 110.)							
	10:28	SM 66007							
	10:45	SM 66007	350	-	418	410	-	-	
	10:51	SM 65993 (Hot looper door was opened for 2 min.)							
	11:15	SM 66037	210	-	410	400	1,672	42,550	
	11:30	SM 66037	300	-	410	400	-	-	
	11:35	SM 66038							
	11:36	SM 66038	355	-	410	400	-	-	
	11:48	Line break	-	11:48-12:15	-	-	2,313	53,376	
	12:15 PM	SM 65988							
	12:20	SM 65988	350	-	415	422	-	-	
	12:35	SM 65988	350	-	415	422	2,450	59,445	
		(Completed visible emission readings)							

TABLE K-12. PROCESS CONDITIONS DURING SECOND VISIBLE EMISSION RUN ON STPTEMBER 11, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/11/75	1:30 PM	SM 66016	370	-	408	398	-	-	
		(Started visible emission readings on afterburner stack)							
	1:35	SM 66019							
	1:45	SM 66019	370	-	402	412	-	-	
	1:50	SM 66018	(Felt break--line down)	1:50-2:02	-	-	3,792	84,640	
	2:10	SM 66018	305	-	405	400	-	-	
	2:20	SM 66018	360	-	402	398	-	-	
	2:22	SM 66020							
	2:30	SM 66020	360	-	402	405	-	-	
	2:35	SM 66026							
	2:45	SM 66026	140	-	405	400	-	-	
		(line speed reduced due to "trouble" farther down the line.)							
	3:00	SM 66026	350	-	410	415	4,471 (Set to 0 by second shift)	100,940 (Set to 0 by second shift)	
	3:08	SM 66032							
	3:15	SM 66032	355	-	410	402	-	-	
	3:25	SM 66033	(Hot looper door opened for ~ 2 min)						
	3:30	SM 66033	250	-	410	400	-	-	
	3:40	Line down		3:40-3:55			696	8,509	
	4:30	SM 66029	355	-	420	390	990	16,320	
		(Completed visible emission readings)							

TABLE K-13. PROCESS CONDITIONS DURING SAMPLING AT TEST POINTS TP1 - 4 ON SEPTEMBER 11, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/11/75	11:15 AM	SM 66037	210	-	410	400	1,672	42,550	
		(Started sampling at points TP1, 2, 3 and 4 with TP5 open)							
	11:18	(Power to sampling instruments went off. It came back at 11:20 and went off again at 11:22 AM.)							
	11:30	SM 66037	300	-	410	400	-	-	
		(Sampling resumed)							
	11:35	SM 66038							
	11:36	SM 66038	355	-	410	400	-	-	
	11:48	Felt break/sampling power off		11:48-12:15			2,313	53,376	
	12:52 PM	SM 66011	180	-	410	408	2,757	63,776	
		(Sampling resumed)							
	12:57	SM 66011	350	-	412	402	-	-	
	1:00	SM 66013 (Hot looper door was opened for ~ 2 min.)							
	1:15	SM 66013	370	-	410	410	-	-	
	1:16	SM 66016							
	1:30	SM 66016	370	-	408	398	-	-	
	1:35	SM 66019							
	1:45	SM 66019	370	-	402	412	-	-	
	1:50	SM 66018 (Felt break)		1:50-2:02	-	-	3,792	84,640	
	2:10	SM 66018	305	-	405	400	-	-	
		(Sampling resumed)							
	2:20	SM 66018	360	-	402	398	-	-	
	2:22	SM 66020							
	2:30	SM 66020	360	-	402	405	-	-	

TABLE K-13. (Concluded)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product throughput for run
9/11/75 (cont'd)	2:35 PM	SM 66026							
	2:45	SM 66026	140	-	405	400	-	-	
		(Line speed reduced due to trouble farther down the line as a result of product accumulation.)							
	3:00	SM 66026	350	-	410	415	4,471 (Set to 0 by second shift)	100,940 (Set to 0 by second shift)	
	3:08	SM 66032							
	3:15	SM 66032	355	-	410	402	-	-	
	3:25	SM 66033 (Hot looper door was opened for ~ 2 min.)							
	3:30	SM 66033	250	-	410	400	-	-	136.3 tons[c/] from 11:15 AM to 3:40 PM excluding downtime
	3:40	Line down (Completed sampling)		3:40-3:55	-	-	696	8,509	
								Felt used from 11:15 AM to 3:40 PM excluding downtime was 15.89 tons[a/]	

a/ $66{,}899 \text{ ft} \times 0.476 \frac{\text{lb}^{b/}}{\text{ft}} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = 15.89 \text{ tons}$

b/ From data in Table A-15 for rolls used in this run.

c/ $3{,}495 \text{ bundles} \times 78 \frac{\text{lb}^{d/}}{\text{bundle}} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = 136.3 \text{ tons}$

d/ According to plant personnel.

TABLE K-14. TANK LEVELS AND TEMPERATURES ON SEPTEMBER 11, 1975

ASPHALT TYPE		SATURANT				COATING						SEALANT	
		Tank No. 1		Tank No. 2		Tank No. 3		Tank No. 4		Tank No. 5		Tank No. 6	
Date	Time	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)
9/11/75	9:35 AM	19 ft 8 in.	490	16 ft 7 in.	455	6 ft 6 in.	430	0 ft 5 in.	175	17 ft 10 in.	425	11 ft 3 in.	285
	10:20-10:50	(43,600 lb of coating asphalt unloaded from truck into Tank No. 2 at 495°C)											
	10:30	18 ft 2 in.	490	18 ft 7 in.	455	6 ft 6 in.	415	0 ft 5 in.	170	16 ft 6 in.	425	11 ft 2 in.	285
		(Coating from Tank No. 1 and saturant from Tank No. 5 are being used on the line)											
	11:00	17 ft 6 in.	495	23 ft 7 in.	455	6 ft 6 in.	425	0 ft 5 in.	160	16 ft 2 in.	425	11 ft 2 in.	285
	11:14-11:40	(45,780 lb of saturant unloaded into Tank No. 5 at 460°F)											
	11:30	17 ft 4 in.	500	23 ft 7 in.	455	6 ft 6 in.	425	0 ft 5 in.	160	18 ft 6 in.	420	11 ft 2 in.	285
	12 Noon	17 ft 2 in.	500	23 ft 7 in.	455	6 ft 6 in.	430	0 ft 5 in.	160	20 ft 6 in.	420	11 ft 2 in.	285
	12:20-12:45	(42,600 lb of coating unloaded into Tank No. 1 at 495°F)											
	12:45	-	495	-	455	-	410	-	155	-	415	-	280
	12:55-1:25	(45,580 lb of saturant unloaded into Tank No. 3 at 455°F)											
	1:00	20 ft 3 in.	490	23 ft 7 in.	455	11 ft 2 in.	420	0 ft 5 in.	155	19 ft 5 in.	415	11 ft 2 in.	285
	1:30	19 ft 0 in.	490	23 ft 6 in.	455	13 ft 1 in.	425	0 ft 5 in.	155	18 ft 0 in.	415	11 ft 2 in.	285
	2:00	18 ft 7 in.	490	23 ft 7 in.	455	13 ft 1 in.	425	0 ft 5 in.	150	17 ft 2 in.	410	11 ft 2 in.	280
	2:25-2:45	(45,020 lb of saturant unloaded into Tank No. 5 at 450°F)											
	2:30	17 ft 6 in.	500	23 ft 7 in.	455	13 ft 1 in.	430	0 ft 5 in.	150	18 ft 6 in.	410	11 ft 2 in.	285
	3:00	17 ft 0 in.	500	23 ft 7 in.	450	13 ft 1 in.	425	0 ft 5 in.	100	22 ft 4 in.	410	11 ft 2 in.	285
	3:30-3:45	(44,620 lb of coating unloaded into Tanks Nos. 1 and 2 at 495°F)											
	3:45	16 ft 0 in.	500	28 ft 2 in.	445	13 ft 1 in.	420	0 ft 5 in.	95	20 ft 9 in.	415	11 ft 3 in.	280
	3:50-4:20	(41,340 lb of saturant unloaded into Tank No. 5 at 450°F)											
	4:30	17 ft 7 in.	500	27 ft 6 in.	440	13 ft 2 in.	410	0 ft 5 in.	90	24 ft 1 in.	420	11 ft 2 in.	280

TABLE K-14. (Concluded)

ASPHALT TYPE		SATURANT				COATING						SEALANT	
		Tank No. 1		Tank No. 2		Tank No. 3		Tank No. 4		Tank No. 5		Tank No. 6	
Date	Time	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)
9/11/75 (cont'd)	4:43 PM	17 ft 7 in.	500	27 ft 6 in.	440	13 ft 2 in.	410	0 ft 5 in.	90	24 ft 1 in.	420	11 ft 2 in.	280
		(Started sampling at test point TP5)											
	5:00	17 ft 7 in.	500	26 ft 4 in.	450	13 ft 2 in.	405	0 ft 5 in.	85	24 ft 1 in.	420	11 ft 3 in.	280
	5:00-5:40	(45,060 lb of coating unloaded into Tank No. 1 at 495°F)											
	5:30	19 ft 7 in.	500	25 ft 5 in.	455	13 ft 2 in.	405	0 ft 5 in.	85	24 ft 2 in.	420	11 ft 3 in.	280
	6:00	24 ft 3 in.	490	23 ft 10 in.	460	13 ft 2 in.	405	0 ft 5 in.	85	22 ft 6 in.	420	10 ft 6 in.	280
	6:30	24 ft 3 in.	485	23 ft 4 in.	460	13 ft 2 in.	420	0 ft 5 in.	80	21 ft 7 in.	420	10 ft 6 in.	280
	6:44	24 ft 3 in.	485	23 ft 0 in.	465	13 ft 2 in.	420	0 ft 5 in.	80	21 ft 4 in.	420	10 ft 6 in.	280
		(Completed sampling at test point TP5)											

TABLE K-15. CHARACTERISTICS OF FELT ROLLS USED DURING EMISSIONS TESTS ON SEPTEMBER 11, 1975

Felt characteristics	Roll numbers										
	SM 66713	SM 65987	SM 66039	SM 66007	SM 65993	SM 66037	SM 66038	SM 65988	SM 66011	SM 66013	SM 66016
Moisture content (%)	6.6	4.4	6.2	7.3	5.0	6.1	6.2	5.4	4.5	4.5	6.0
Kerosene value	170	166	179	173	168	179	179	166	174	176	172
Flexibility	11	17	18	16	17	18	18	17	13	13	16
Density	22	19	17	20	19	17	17	19	16	18	20
Tensile	37	39	41	43	40	41	41	39	39	39	42
Felt point by dry wt	56.5	53.5	53	56.5	57	53.5	53	52.5	52.5	52.5	55
Scale wt of roll (lb)	3,320	3,058	2,992	3,084	3,162	2,926	2,940	3,078	3,072	3,104	3,084
Length (ft)	5,829	6,300	6,038	6,300	6,400	6,038	6,038	6,300	6,500	6,460	6,475
Felt width (in.)	49	49	49	49	49	49	49	49	49	49	49
Felt grade	55	55	55	55	55	55	55	55	55	55	55

TABLE K-15. (Concluded)

Felt characteristics	Roll numbers								
	SM 66019	SM 66018	SM 66020	SM 66026	SM 66032	SM 66033	SM 66029	SM 66036	SM 66035
Moisture content (%)	5.3	5.3	5.3	5.3	5.3	5.3	4.5	5.3	Specifications not available
Kerosene value	173	172	173	176	177	177	176	174	
Flexibility	14	16	14	15	14	14	15	14	
Density	18	20	18	18	18	18	18	18	
Tensile	39	40	39	39	39	39	40	41	
Felt point by dry wt	53	54	53	53	53	53	53	54	
Scale wt of roll (lb)	3,094	3,094	3,076	3,026	2,986	3,040	2,994	3,006	
Length (ft)	6,525	6,475	6,525	6,450	6,440	6,440	6,450	6,181	
Felt width (in.)	49	49	49	49	49	49	49	49	
Felt grade	55	55	55	55	55	55	55	55	

TABLE K-16. TANK LEVELS AND TEMPERATURES FROM 9:30 AM TO 2:00 PM ON SEPTEMBER 12, 1975

ASPHALT TYPE		SATURANT				COATING						SEALANT	
		Tank No. 1		Tank No. 2		Tank No. 3		Tank No. 4		Tank No. 5		Tank No. 6	
Date	Time	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)	Initial level (final level)	Temp. (°F)
9/12/75	9:30 AM	24 ft 0 in.	460	17 ft 4 in.	495	20 ft 6 in.	430	0 ft 5 in.	65	13 ft 11 in.	425	10 ft 7 in.	280
	10:00	24 ft 0 in.	460	16 ft 0 in.	500	20 ft 6 in.	455	0 ft 5 in.	70	12 ft 7 in.	425	10 ft 7 in.	280
	10:30	24 ft 0 in.	460	15 ft 5 in.	495	20 ft 6 in.	460	0 ft 5 in.	70	12 ft 7 in.	420	10 ft 7 in.	280
	10:45-11:00	(45,860 lb of saturant unloaded from truck to Tank No. 5 at 440°F)											
	11:00	24 ft 0 in.	460	14 ft 10 in.	490	20 ft 7 in.	460	0 ft 5 in.	70	15 ft 0 in.	415	10 ft 7 in.	280
	12 Noon	23 ft 11 in.	455	14 ft 2 in.	495	20 ft 7 in.	455	0 ft 5 in.	70	17 ft 9 in.	415	10 ft 7 in.	280
	12:05-12:35	(41,080 lb of coating unloaded from truck into Tank No. 2 at 485°F)											
	1:20-1:52	(46,120 lb of saturant unloaded from truck into Tank No. 5 at 450°F)											
	1:30	23 ft 11 in.	460	18 ft 6 in.	498	20 ft 9 in.	450	0 ft 5 in.	68	19 ft 0 in.	415	10 ft 7 in.	280
	2:00	23 ft 11 in.	460	17 ft 2 in.	498	20 ft 9 in.	450	0 ft 5 in.	68	21 ft 4 in.	415	10 ft 6 in.	280
		(Since valve at TP5 was closed at 2:00 PM, further readings of tank levels and temperatures were not recorded)											

Note: Coating to line was supplied from Tank No. 2 and saturant from Tank No. 5 during this time span

TABLE K-17. PROCESS CONDITIONS DURING PARTICLE SIZING RUNS ON SEPTEMBER 12, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/12/75	10:35 AM	SM 66790	355	-	415	395	2,870	58,053	
		(Started particle sizing run at test point TP2)							
	10:43	SM 65363							
	10:45	SM 65363	305	-	410	398	-	-	
	10:47	SM 65363	355	-	410	398	-	-	
	10:52	Felt break--Doors 1, 2 and 3 of saturator open. Particle sizing run stopped.							
				10:52-11:13					
	11:15	Felt break		11:15-11:46					
	11:52	SM 66894	340	-	415	400	-	71,850	
		(Particle sizing run resumed)							
	12:00 PM	SM 66896							
	12:05	SM 66896	350	-	-	-	-	-	
	12:10	Felt break. Particle sizing run stopped.							
	2:00	SM 65369	310	-	400	395	-	-	
	2:02	SM 65369	315	-	405	400	4,850	100,700	
		(Particle sizing run resumed)							
	2:04	SM 65369	335	-	405	402	-	-	
	2:08	SM 66788	335	-	-	-	-	-	
	2:15	SM 66788	335	-	402	408	-	-	
	2:21	SM 66620 (Hot looper door opened for ~ 2 min)							
	2:24	Felt break--Doors 1, 2, 5, 7 and 8 of saturator section opened.)							
				2:24-2:40					
	2:45	SM 66620	300	-	400	410	-	-	

TABLE K-17. (Concluded)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/12/75 (cont'd)	2:55 PM	SM 66627	230	-	405	412	-	-	
	2:57	SM 66627	265	-	402	410	-	-	
	3:00	SM 66627	-	-	-	-	5,465 (Set to 0 by second shift)	114,560 (Set to 0 by second shift)	
	3:03	SM 66627	270	-	-	418	-	-	
	3:15	SM 66627	330	-	405	410	-	-	
	3:20	SM 66626							
	3:26	SM 66626	150	-	412	410	-	-	
	3:43	SM 66628							
	3:45	SM 66628	325	-	418	410	-	-	
	4:00	SM 66613 (Hot looper door opened for ~ 2 min)	325	-	420	400	-	-	
	4:15	SM 66613	350	-	420	390	-	-	
	4:17	SM 66601 (Hot looper door opened for ~ 2 min)							
	4:30	SM 66601	352	-	418	400	-	-	
	4:32	SM 66561 (Hot looper door opened for ~ 2 min)							
	4:37	Felt break. Sampling stopped. 4:37-4:55					1,719	29,830	
	4:55	SM 66561	350	-	420	390	-	-	
	5:00	Felt break		5:00-5:11					
	5:15	Particle sizing run was abandoned due to insufficient sample even after almost 2 hr of sampling.							

TABLE K-18. PROCESS CONDITIONS DURING VISIBLE EMISSION RUNS ON SEPTEMBER 12, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/12/75	9:45 AM	SM 66885	350	-	410	405	2,390	47,580	
		(Started reading fugitive emissions from line)							
	9:50	SM 65568							
	10:00	SM 65568	355	-	410	405	-	-	
	10:03	Felt break--Doors 1, 2, 3 and 5 of saturator opened.							
				10:03-10:20					
	10:20	Doors closed							
	10:28	SM 66790	280	-	415	395	-	-	
		(Hot looper door opened for ~ 2 min and No. 2 saturator door opened for 1 min.)							
	10:30	No. 6 door opened for ~ 2 min							
	10:43	SM 65363							
	10:47	SM 65363	355	-	410	398	-	-	
	10:52	Felt break--Doors 1, 2 and 3 opened.							
				10:52-11:13					
	11:13	Line "on."							
	11:15	Felt break		11:15-11:46					
	11:46	Line "on."							
	11:52	SM 66894	340	-	415	400	-	71,850	
	12:00 PM	SM 66896							
	12:10	Felt break							
	2:00	SM 65369	310	-	400	395	-	-	
	2:02	SM 65369	315	-	405	400	4,850	100,700	
		(Fugitive emission readings resumed)							
	2:04	SM 65369	335	-	405	402	-	-	

TABLE K-18. (Continued)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/12/75 (cont'd)	2:08 PM	SM 66788	335						
	2:15	SM 66788	335	-	402	408	-	-	
	2:21	SM 66620 (Hot looper door opened for ~ 2 min)							
	2:24	Felt break--Doors 1, 2, 5, 7 and 8 of saturator were open.) 2:24-2:40							
	2:45	SM 66620	300	-	400	410	-	-	
	2:55	SM 66627	230	-	405	412	-	-	
	2:57	SM 66627	265	-	402	410	-	-	
	3:00	SM 66627	-	-	-	-	5,465	114.560	
	3:03	SM 66627	270	-	-	418	set to 0 by second shift	set to 9 by second shift	
	3:08	SM 66627 (Door 5 of saturator opened)	200	-	-	-	-	-	
	3:15	SM 66627	330	-	405	410	-	-	
	3:20	SM 66626							
	3:25	SM 66626	250	-	410	408	-	-	
	2:26	SM 66626	150	-	412	410	-	-	
	3:30	SM 66626	320	-	412	408	-	-	
	3:43	SM 66628							
	3:45	SM 66628	325	-	418	410	-	-	
	4:00	SM 66613 (Hot looper door opened for ~ 2 min)	325	-	420	400	-	-	
	4:07	SM 66613	350	-	418	400	-	-	
	4:10	SM 66613	350	-	420	400	-	-	

TABLE K-18. (Continued)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/12/75 (cont'd)	4:15 PM	SM 66613	350	-	420	390	-	-	
	4:17	SM 66601 (Hot looper door opened for ~ 2 min)							
	4:30	SM 66601	352	-	418	400	-	-	
	4:32	SM 66561 (Hot looper door opened for ~ 2 min)							
	4:37	Felt break		4:37-4:55			1,719	29,830	
	4:55	SM 66561	350	-	420	390	-	-	
	5:00	Felt break		5:00-5:11					
	5:22	SM 66561	325	-	425	395	-	-	
	5:34	SM 66925 (Hot looper door opened for ~ 3 min)							
	5:37	SM 66925	325	-	428	418	-	-	
	5:50	SM 66928 (Hot looper door opened)							
	5:50	SM 66928	322	-	422	398	-	-	
	5:53	SM 66928	350	-	425	400	-	-	
	6:05	SM 66929							
	6:10	SM 66929	350	-	420	400	-	-	
	6:25	SM 66930 (Hot looper door opened for 2 min)	350	-	415	400	-	-	
	6:30	SM 66930	365	-	415	400	-	-	
	6:42	SM 66927 (Hot looper door opened for ~ 2 min)	365	-	402	410	-	-	
	6:45	SM 66927 (Speed reduced due to felt getting stuck in looper)	185	-	400	410	-	-	

TABLE K-18. (Concluded)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/12/75 (cont'd)	6:51 PM	SM 66927	360	-	-	-	-	-	
	6:55	SM 66927	365	-	412	400	-	-	
	7:00	SM 66933							
	7:02	SM 66933	(Hot looper door opened for ~ 1 min)						
	7:10	SM 66933	365	-	415	400	3,840	75,860	
	7:14	SM 66926							
	7:15	SM 66926	(Hot looper door opened)						
	7:22	SM 66926	365	-	415	398	-	-	
	7:30	SM 66926	365	-	415	400	4,154	82,240	
		(Fugitive emission readings completed)							

TABLE K-19. PROCESS CONDITIONS DURING SAMPLING AT TEST POINTS TP1 - 4 ON SEPTEMBER 12, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/12/75	2:02 PM	SM 65369	315	-	405	400	4,850	100,700	
		(Started sampling at tests points TP1, 2, 3 and 4 with test point TP5 closed)							
	2:04	SM 65369	335	-	405	402	-	-	
	2:08	SM 66788	335						
	2:15	SM 66788	335	-	402	408	-	-	
	2:21	SM 66620 (Hot looper door opened for ~ 2 min)							
	2:24	Felt break--Doors 1, 2, 5, 7 and 8 of saturator were opened.) 2:24-2:40					5,290	109,070	
	2:45	SM 66620 (Sampling resumed)	300	-	400	410	-	-	
	2:55	SM 66627	230	-	405	412	-	-	
	3:00	SM 66627	-	-	-	-	5,465 (Set to 0 by second shift)	114,560 (Set to 9 by second shift)	
	3:03	SM 66627	270	-	-	418	-	-	
	3:08	SM 66627	200 (Door 5 of saturator opened)			-	-	-	
	3:15	SM 66627	330	-	405	410	-	-	
	3:20	SM 66626							
	3:25	SM 66626	250	-	410	408	-	-	
	3:26	SM 66626	150	-	412	410	-	-	
	3:30	SM 66626	320	-	412	408	-	-	
	3:43	SM 66628							
	3:45	SM 66628	325	-	418	410	-	-	

TABLE K-19. (Continued)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/12/75 (cont'd)	4:00 PM	SM 66613 (Hot looper door opened for ~ 2 min)	325	-	420	400	-	-	
	4:15	SM 66613	350	-	420	390	-	-	
	4:17	SM 66601 (Hot looper door opened for ~ 2 min)							
	4:30	SM 66601	352	-	418	400	-	-	
	4:32	SM 66561 (Hot looper door opened for ~ 2 min)							
	4:37	Felt break. Sampling stopped.		4:37-4:55	-	-	1,719	29,830	
	4:55	SM 66561 (Sampling resumed)	350	-	420	390	-	-	
	5:00	Felt break		5:00-5:11					
	5:22	SM 66561 (Sampling resumed)	325	-	425	395	-	-	
	5:34	SM 66925 (Hot looper door opened for ~ 3 min)							
	5:37	SM 66925	325	-	428	418	-	-	
	5:50	SM 66928 (Hot looper door opened)	322	-	422	398	-	-	
	5:53	SM 66928	350	-	425	400	-	-	
	6:05	SM 66929							
	6:10	SM 66929	350	-	420	400	-	-	
	6:25	SM 66930 (Hot looper door opened for 2 min)	350	-	415	400	-	-	
	6:30	SM 66930	365	-	415	400	-	-	

TABLE K-19 (Concluded)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product throughput for run
9/12/75 (cont'd)	6:42 PM	SM 66927 (Hot looper door opened for ~ 2 min)	365	-	402	410	-	-	
	6:45	SM 66927 (Speed reduced due to felt getting stuck in looper)	185	-	400	410	-	-	
	6:51	SM 66927	360	-	-	-	-	-	
	6:55	SM 66927	365	-	412	400	-	-	
	7:00	SM 66933 (Hot looper door opened for ~ 1 min)							
	7:02	SM 66933 (Sampling at TP1, 2, 3 and 4 completed)	365	-	415	400	3,840	75,860 (Felt used was 22.43 tons[a] from 2:02-7:10 PM excluding downtime)	4,455 bundles at 78 lb/bundle = 173.7 tons of product from 2:02 PM to 7:10 PM excluding downtime
	7:10								

a/ $89{,}720 \text{ ft} \times 0.5 \frac{\text{lb}^{b/}}{\text{ft}} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = 22.43 \text{ tons}$

b/ From data in Table K-20 for rolls used in this run.

TABLE K-20. CHARACTERISTICS OF FELT ROLLS USED DURING EMISSION TESTS ON SEPTEMBER 12, 1975

Felt characteristics	Roll numbers										
	SM 66885	SM 65568	SM 66790	SM 65363	SM 66894	SM 66896	SM 65369	SM 66788	SM 66620	SM 66627	SM 66626
Moisture content (%)	4.5	4.4	7.5	4.4	4.4	5.3	6.3	7.3	5.3	5.8	5.8
Kerosene value	177	171	179	170	177	177	174	179	164	169	169
Flexibility	15	20	17	18	17	17	21	17	11	11	11
Density	18	14	16	16	22	22	17	16	24	21	21
Tensile	39	47	41	44	39	39	41	41	39	40	40
Felt point by dry wt	52.5	54	55.5	53	54	54.5	53	56.5	54.5	57	57
Scale wt of roll (lb)	2,982	2,946	3,100	3,084	3,068	3,186	3,206	3,174	3,228	3,210	3,214
Length (ft)	6,380	6,260	6,245	6,690	6,440	6,440	6,400	6,245	6,630	6,500	6,500
Felt width (in.)	49	49	49	49	49	49	49	49	49	49	49
Felt grade	55	55	55	55	55	55	55	55	55	55	55

TABLE K-20. (Concluded)

Felt characteristics	Roll numbers										
	SM 66628	SM 66613	SM 66601	SM 66561	SM 66925	SM 66928	SM 66929	SM 66930	SM 66927	SM 66933	SM 66926
Moisture content (%)	6	5.3	6.8	4.4	4.4	5.3	5.3	4.5	4.5	Specifications not available	Specifications not available
Kerosene value	169	168	167	171	171	173	173	173	171		
Flexibility	11	19	16	16	14	14	14	14	14		
Density	21	19	19	17	24	22	22	23	24		
Tensile	40	39	39	41	45	42	42	42	45		
Felt point by dry wt	55	54	55.5	53	54	54	54	53	53		
Scale wt of roll (lb)	3,200	3,192	3,084	3,060	3,168	3,156	3,182	3,202	3,192		
Length (ft)	6,500	6,580	6,441	6,170	6,445	6,450	6,450	6,450	6,445		
Felt width (in.)	49	49	49	49	49	49	49	49	49		
Felt grade	55	55	55	55	55	55	55	55	55		

TABLE K-21. PROCESS CONDITIONS DURING SAMPLING AT TEST POINTS TP1 - 4 ON SEPTEMBER 13, 1975

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/13/75	2:20 PM	SM 67029	355	-	430	402	6,900	141,450	
		(Started sampling at test points TP1, 2, 3 and 4 with TP 5 closed)							
	2:30	SM 67029	355	-	430	408	-	-	
	2:33	SM 67040							
	2:37	SM 67040	160	-	-	-	-	-	
		(Line speed reduced due to accumulation of product)							
	2:43	SM 67040	305	-	-	-	-	-	
	2:45	SM 67040	355	-	430	405	-	-	
	2:51	SM 67041					-	151,895	
	2:55	SM 67041	195	-	430	402	-	-	
	3:00	SM 67041	305	-	430	-	7,506 (Set to 0 by second shift)	154,270 (Set to 0 by second shift)	
	3:03	SM 67041	330	-	-	-	-	-	
	3:12	SM 67042	332	-	-	410	-	-	
		(Hot looper door opened)							
	3:15	SM 67042	150	-	-	-	-	-	
	3:20	SM 67042 (Line stopped due to accumulation of product. Also, conveyor fuse went off.) 3:20-3:36					310	5,700	
	3:36	SM 67042	335	-	432	392	335	6,085	
		(Sampling resumed)							
	3:41	SM 67043	335 (Hot looper door opened for 2 min)						
	3:47	SM 67043 (Door No. 2 opened for 1 min for inspection)							
	3:55	SM 67043	335	-	430	388	-	-	

TABLE K-21. (Continued)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/13/75 (cont'd.)	3:59 PM	SM 67046							
	4:06	SM 67046	190 (Line speed reduced since defect was noticed on felt being used)						
	4:10	Felt break; saturator Doors 2, 4, and 5 were opened. 4:10-4:46					870	13,785	
	4:46	Line "on"							
	4:50	Felt break; Doors 1, 4, 5 and 6 were opened. 4:50-6:00					908	14,600	
	6:00	SM 67044 (Line "on")	140	-	-	-	-	-	
	6:08	SM 67044 (Sampling resumed)	350	-	420	392	-	-	
	6:14	SM 67045							
	6:20	SM 67045	350	-	420	408	-	-	
	6:28	Door No. 2 opened for inspection for ~ 1 min							
	6:30	SM 66995 (Hot looper door opened for ~ 2 min)	350	-	410	412	-	-	
	6:40	SM 66995	352	-	412	398	-	-	
	6:45	SM 66995	-	-	-	-	1,820	39,210	
	6:47	SM 66724 (Hot looper door opened for ~ 2 min)							
	6:55	SM 66724	350	-	410	410	-	-	
	7:03	SM 67059 (Hot looper door opened for ~ 1 min)							
	7:05	SM 67059	350	-	410	405	-	-	
	7:08	SM 67059 (Line speed reduced due to product accumulation. Sampling stopped.)	150	-	410	405	-	-	

TABLE K-21. (Concluded)

Date	Time	Roll number	Line speed (ft/min)	Downtime	Saturant temp. (°F)	Filled coating temp. (°F)	Bundle counter reading	Felt counter reading (ft)	Product through-put for run
9/13/75 (cont'd.)	7:10 PM	SM 67059	100	-	412	400	-	-	
	7:12	SM 67059 (Line stopped completely to enable product removal from line)							
	7:15	SM 67059	110	7:12-7:15	410	405	-	-	
	7:25	SM 67058 (Sampling resumed)	355	-	418	400	-	51,803	
	7:30	Felt break		7:30-7:36					
	7:36	SM 67058	150	-	-	-	-	-	
	7:38	SM 67058	-	-	-	-	2,496	-	
	7:41	SM 67058 (Sampling resumed)	310	-	-	-	-	-	
	7:43	SM 67058	325	-	-	408	-	-	3,226 bundles of shingles at 78 lb/bundle = 125.8 tons (2:20 PM to 7:51 PM) excluding downtime)
	7:45	SM 67058	350	-	420	410	2,570	55,200	
	7:51	SM 67058 (Completed sampling)	350	-	420	410	2,630	57,450	
								Felt used from 2:20-7:51 PM was 70,270 ft or 17.56 tons[a]	

a/ $70{,}270 \text{ ft} \times 0.50 \frac{\text{lb}}{\text{ft}}$[b] $\times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = 17.56$ tons

b/ From data in Table K-22 for rolls used in this run.

TABLE K-22. CHARACTERISTICS OF FELT ROLLS USED DURING EMISSIONS TESTS ON SEPTEMBER 13, 1975

Felt characteristics	Roll numbers											
	SM 67029	SM 67040	SM 67041	SM 67042	SM 67043	SM 67046	SM 67044	SM 67045	SM 66995	SM 66724	SM 67059	SM 67058
Moisture content (%)	4.4	5.3	5.3	5.3	5.2	6.5	5.2	5.1	4.4	5.3	5.1	5.1
Kerosene value	173	174	174	174	174	175	174	174	178	170	170	170
Flexibility	17	16	16	16	17	14	17	17	15	16	13	13
Density	17	21	21	21	19	19	19	19	20	27	20	20
Tensile	40	41	41	41	39	39	39	39	43	41	39	39
Felt point by dry wt	53	54	54	53	55	57	55	56	53	53.5	56	56
Scale wt of roll (lb)	3,186	3,316	3,352	3,402	3,240	3,150	3,254	3,282	3,028	3,256	3,192	3,184
Length (ft)	6,400	6,537	6,537	6,537	6,370	6,507	6,370	6,370	6,230	6,830	6,560	6,560
Felt width (in.)	49	49	49	49	49	49	49	49	49	49	49	49
Felt grade	55	55	55	55	55	55	55	55	55	55	55	55

TABLE K-23. CHARACTERISTICS OF ASPHALT USED DURING SEPTEMBER 9-13, 1975*

	Softening point (°F)	Penetration
Saturant	125,[a] 123[b]	-
Unfilled coating	228,[a] 229-231[b]	16.5,[a] 15[b]
% Saturation	157-183,[a] 157-178,[c] 164-186[d]	

* Data presented here were obtained from quality control personnel at plant. No additional data could be obtained.

a/ For September 11, 1975.

b/ For September 12, 1975.

c/ For September 10, 1975.

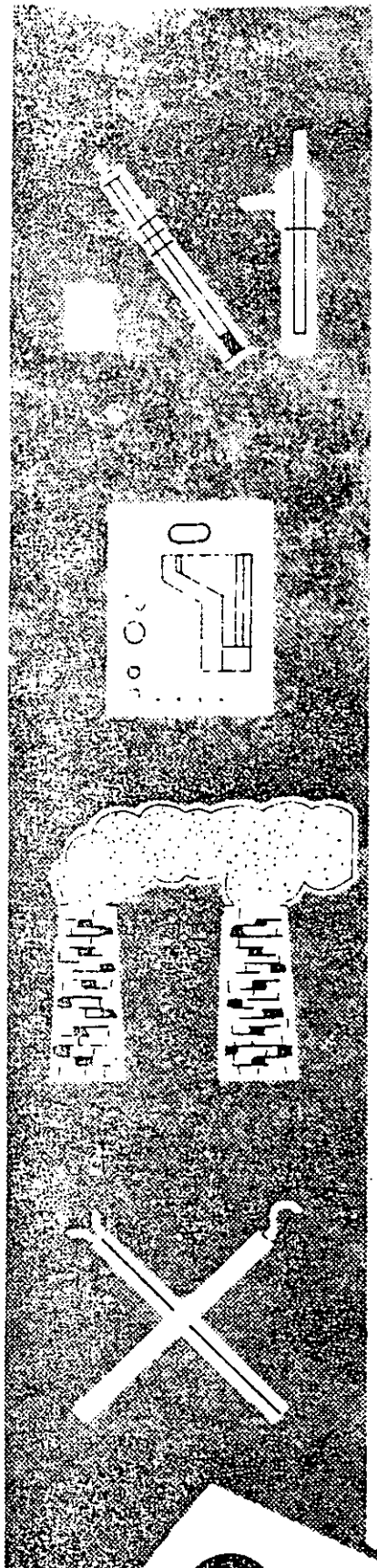
d/ For September 9, 1975.

APPENDIX L

VISIBLE EMISSION DATA

The report reproduced in this appendix was prepared by the Monsanto Research Corporation under a separate EPA contract.

Report No. 76-ARM-12



AIR POLLUTION EMISSION TEST

Visible Emissions
Certain-Teed Corp.
Shakopee, Minnesota

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

Visible Emission Measurement at Asphalt Roofing Plants

EMB Projects Report No.
76-ARM-12

Plant Tested

Certain-Teed Corporation
Shakopee, Minnesota

September 9, 10, 11, and 12

Prepared for

Environmental Protection Agency
Emission Measurement Branch
Research Triangle Park
North Carolina 27711

by

Mark T. Thalman and Francine A. Kulik

Monsanto Research Corporation
Dayton Laboratory
1515 Nicholas Road
Dayton, Ohio 45418

Report Reviewed by John W. Brown

Contract No. 68-02-1404, Task No. 14

TABLE OF CONTENTS

		Page
I.	Introduction	1
II.	Summary and Discussion of Results	3
Appendix	Field Data Sheets	

LIST OF TABLES

Table		Page
1	Summary of Visible Emission Data Certain-Teed, Shakopee, Minnesota	4

LIST OF FIGURES

Figure		Page
1	Physical layout of stacks TP4 and TP2 and reader locations	5
2	Location of observers at saturator - coater enclosure	6
3	Opacity for 12 hours reading time for Tuesday, September 9, 1975 and Thursday, September 11, 1975	7
4	Opacity readings from Observer #1 for Friday, September 11, 1975	8
5	Opacity readings from Observer #2 for Friday, September 11, 1975	9

SECTION I

INTRODUCTION

Under the Clean Air Act, as amended, the Environmental Protection Agency is charged with the establishment of performance standards for new installations or modifications of existing installations in stationary source categories which may contribute significantly to air pollution. A performance standard is a standard for emissions of air pollutants which reflects the best emission reduction systems that have been adequately demonstrated (taking into account economic considerations).

The development of realistic performance standards requires accurate data on pollutant emissions within the various source categories. This report presents the results of the testing which was performed at the Certain-Teed Corporation in Shakopee, Minnesota.

Monsanto Research Corporation as a contractor to the Environmental Protection Agency under the "Field Sampling of Atmospheric Emissions" program was requested to provide visible emission data from the Certain-Teed Corporation during the period of September 9-12, 1975. Visible emissions were tested at each of two after-burner outlet stacks which control shingle production line emissions and fugitive emissions from the saturator-coater enclosure.

The field testing program was under the direction of John W. Brown, Field Testing Section, Emission Measurement Branch, EPA. The visible emissions were observed and recorded by Charles F. Duncan, observer #1, and Tommy L. Stewart, observer #2, of Monsanto Research Corporation.

The visible emissions were determined as prescribed by EPA Method 9 as given in the Federal Register, Vol. 39, No. 219, November 12, 1974. This report presents a summary of the visible emission data and all field data sheets are included in the appendix. The measurements made at the indoor locations were not in exact compliance with the Federal Register, due to the fact that it does not make allowances for indoor reading.

During the same periods in which visible emission were being observed, personnel from Battelle Memorial Institute (Columbus, Ohio) were conducting sampling of the emissions of particulate (Method 5), gaseous hydrocarbons and polycyclic organic materials. This information will be presented in a separate report under the same EMB Project Report No. (76-ARM-12).

SECTION II

SUMMARY AND DISCUSSION OF RESULTS

The visible emission data was recorded for a total of more than twenty hours over a three day period, at the fifteen second intervals as specified by Method 9. Observer Tommy L. Stewart was certified at EPA Visible Emissions Course at Research Triangle Park, North Carolina on September 4, 1975. Observer Charles F. Duncan was recertified at the EPA Air Pollution Training Institute Visible Emissions Recertification course given in Kansas City, Missouri on August 4-6, 1975.

A summary of the time of observation, discharge area, pertinent distances, weather conditions and opacity is presented in Table 1. Figures 1 and 2 are diagrams of the stack and saturator-closure locations. The observer's locations are noted on Figure 1. The plots of the observed opacity against elapsed observation time are given in Figures 3, 4 and 5. These plots are of the six-minute averages of the opacity readings. The gaps in the graph are reading interruptions due to process delays or reader's needs.

The visible emissions of the after burner stacks were recorded at zero percent (0%) for the first two days or 12 hours of testing. It was necessary to move from Location B to Location A to complete the reading of TP2, in order to have the sun at the back of the readers. At Location B the background was the white brick wall, and at Location A the background was blue sky.

Table 1. SUMMARY OF VISIBLE EMISSION DATA
CERTAIN-TEED, SHAKAPEE, MINN.

Date	24 Hr. Clock Time	Observer	Discharge Area	Dist. to Source (ft.)	Direction From Source	Wind Direction	Wind Velocity mph	Weather	Background	
9-9-75	0935-1230	1	A	30	S	SE	8-15	Overcast Partly Cloudy	Gray Clouds and Light Blue Sky	175 ~~245~~ min - 0%
9-9-75	0935-1230	2	A	30	S	SE	8-15	Overcast Partly Cloudy	Gray Clouds and Light Blue Sky	175 ~~245~~ min - 0%
9-9-75	1425-1830	1	A	30	S	SE	5-15	NA	NA	245 ~~177~~ min - 0%
9-9-75	1425-1830	2	A	30	S	SE	5-15	NA	NA	245 ~~177~~ min - 0%
9-11-75	0935-1230	1	B	50	E	N-NW	8-15	Partly Cloudy	White Brick Building	150 min - 0%
9-11-75	0935-1230	2	B	50	E	N-NW	8-15	Partly Cloudy	White Brick Building	150 min - 0%
9-11-75	1330-1640	1	B	50	S	NW	10-20	Overcast Partly Cloudy	White, Gray Clouds, Blue Sky	190 ~~227~~ min - 0%
9-11-75	1330-1640	2	B	50-60	S	NW	10-20	Overcast Partly Cloudy	White, Gray Clouds, Blue Sky	190 ~~227~~ min - 0%
9-12-75	0900-1930	1	C	10-20	N	*	*	*	Green and White Doors and Hood	331 min 30 sec - 0% 8 min 15 sec - 5% 3 min 15 sec - 10% 4 min 45 sec - 15% 13 min 0 sec - 20% 6 min 0 sec - 25% 7 min 30 sec - 30% 1 min 0 sec - 35% 0 min 15 sec - 40%
9-12-75	0900-1930	2	C	10-20	N	*	*	*	Green and White Doors and Hood and Gray Machinery	339 min 0 sec - 0% 18 min 30 sec - 5% 9 min 0 sec - 10% 0 min 45 sec - 15% 5 min 0 sec - 20% 4 min 15 sec - 30%

Notes: * Indoors
NA Not Applicable
Discharge Area A - Test Point 4 (Outlet)
Discharge Area B - Test Point 2 (Outlet)
Discharge Area C - Saturator Hood, Hot Looper, Coater Section

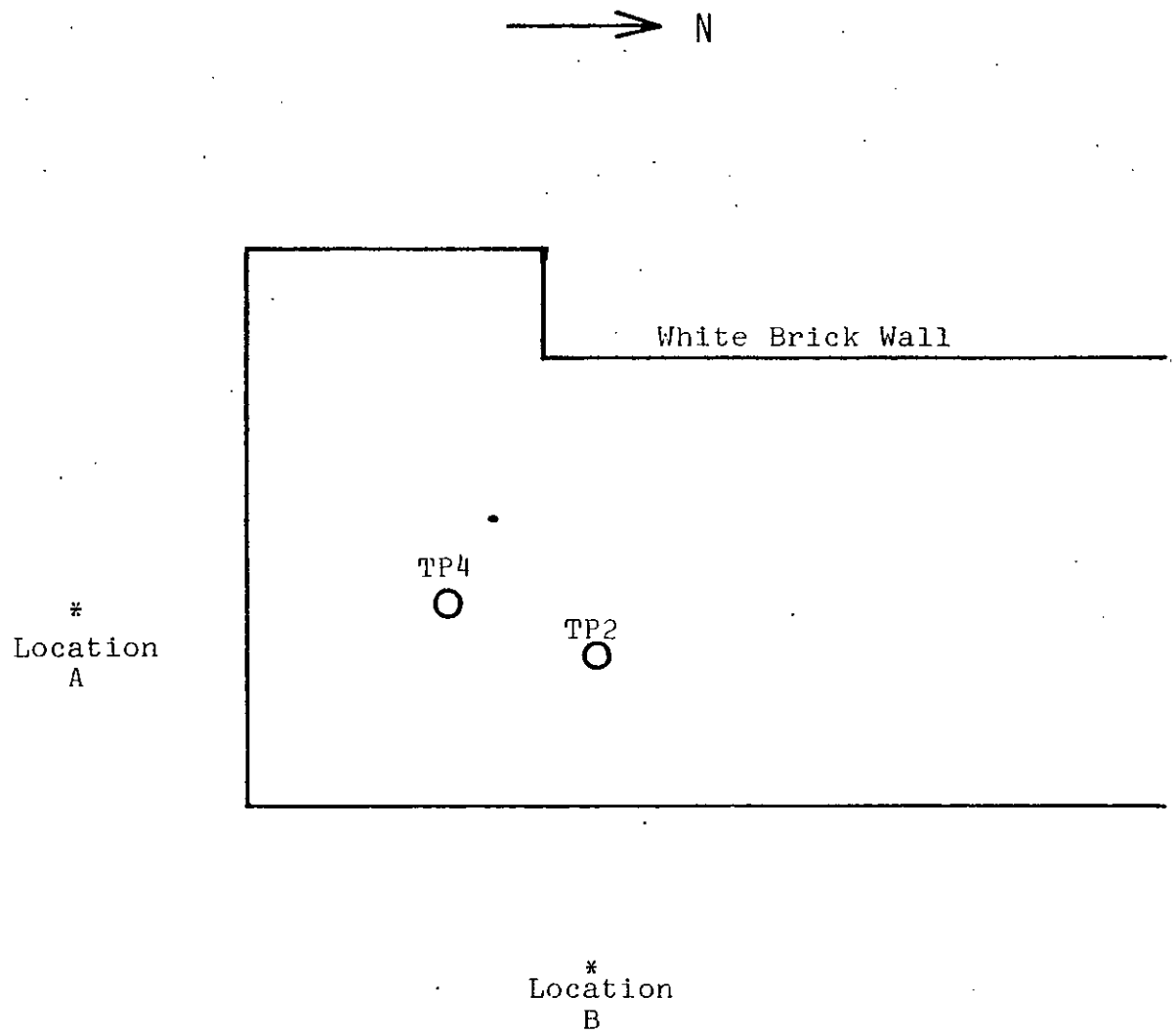


Figure 1. Physical layout of stacks TP4 and TP2 and reader locations.

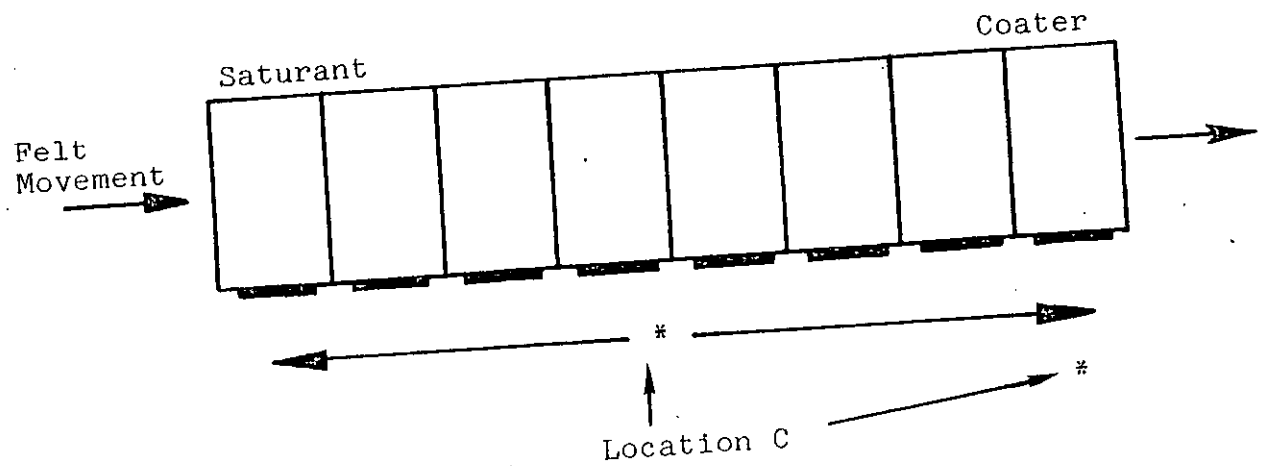


Figure 2. Location of observers at saturator - coater enclosure.

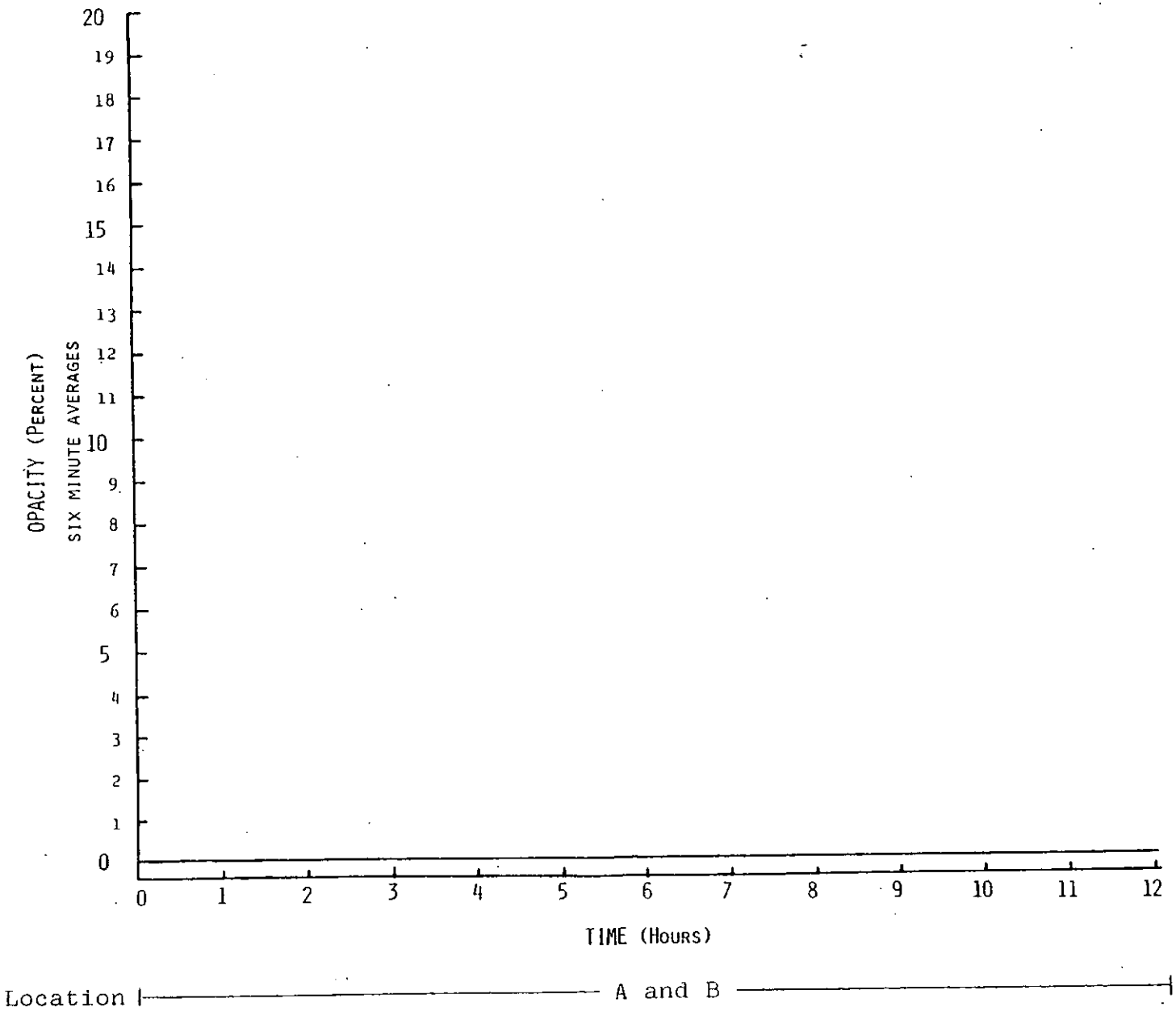


Figure 3. Opacity for 12 hours reading time by Observers 1 and 2 for Tuesday, September 9, 1975 and Thursday, September 11, 1975

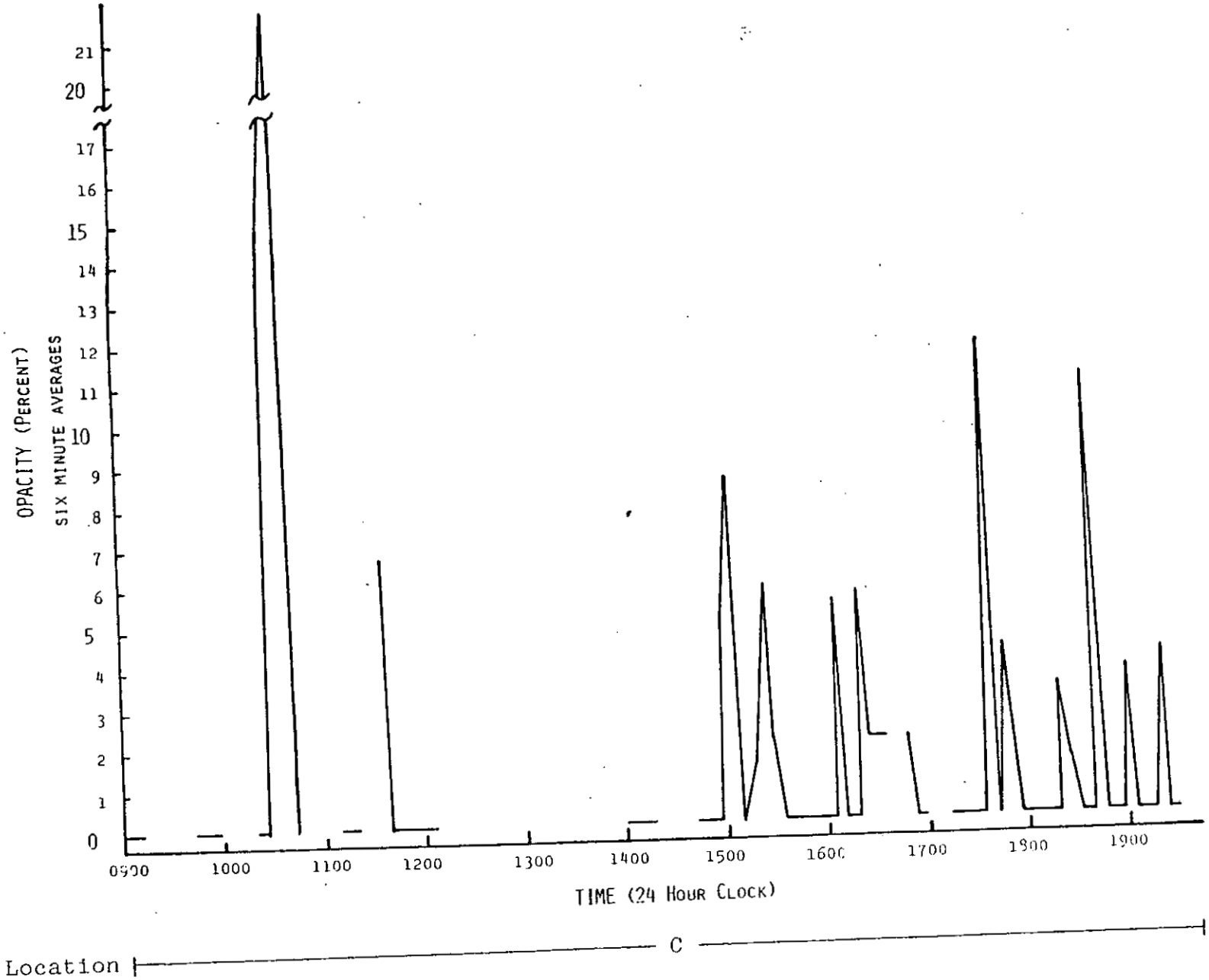


Figure 4. Opacity readings from Observer #1 for Friday, September 12, 1975

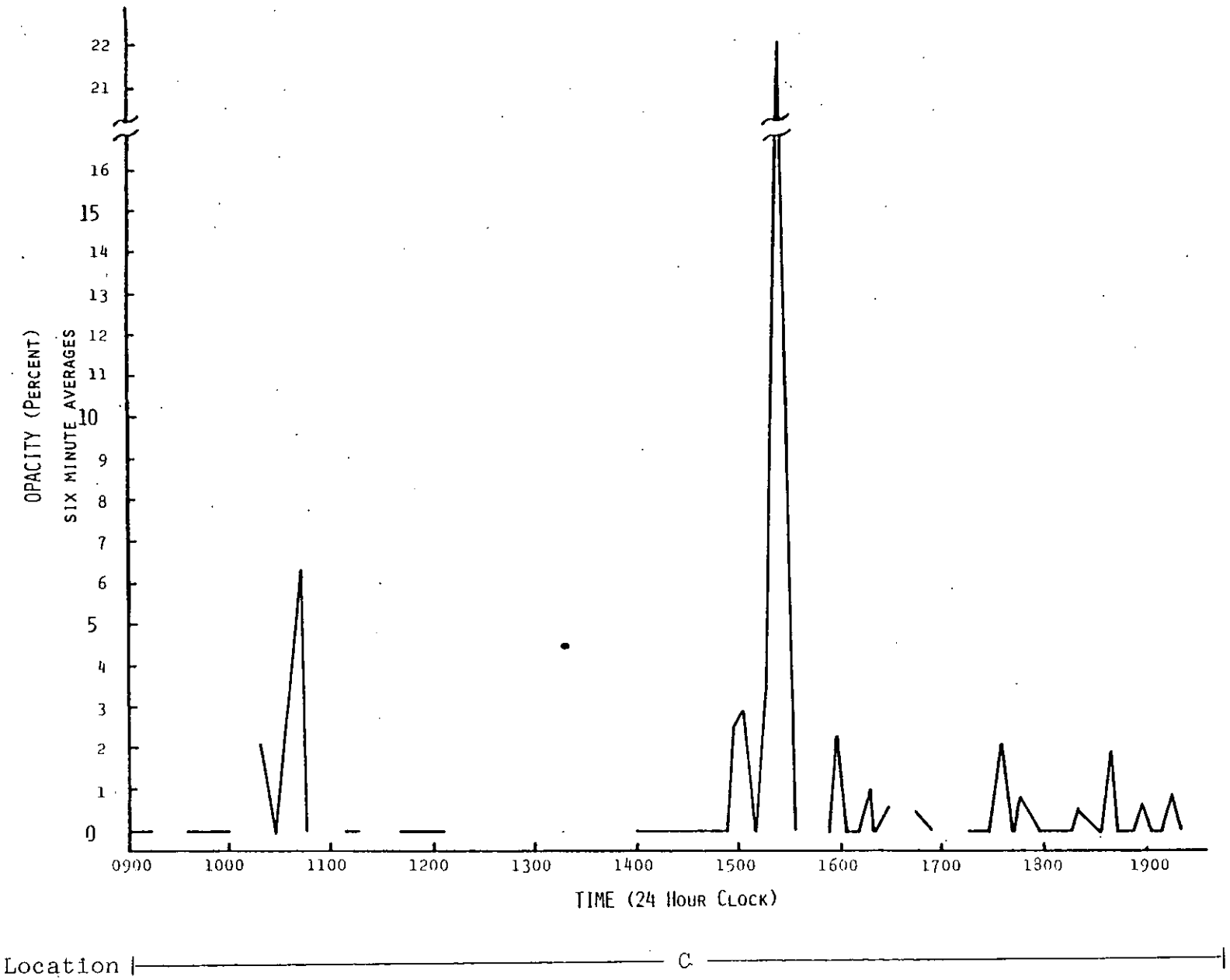


Figure 5. Opacity readings from Observer #2 for Friday, September 12, 1975

The saturator-coater enclosure readings are plotted in Figures 4 and 5. These measurements were made indoors and, therefore, are influenced by the lighting and air movements within the building. The saturator-coater enclosure contain a series of 8 doors and visible emissions were observed when more than one door was open and the felt line was moving. Door number eight was open all of the time to allow operator access and air movement into the enclosure. However, when any other door was opened in addition to number eight, the emissions were observed from one foot area at the top of the door. The opacity was 5-30% from this source and it dispersed in 1-5 feet from the source. Opacity data was recorded at door number eight and near any other door during the time that such door was open.

The building was illuminated with neon and mercury lamps approximately 35' above the floor. The lights were evenly distributed over the ceiling area and thus sufficient illumination was available for the smoke reader. However, the numerous sources of light made it impossible to have the light source at the reader's back, as in outdoor reading and effected the angle and direction of illumination between observer and fugitive emissions source. Both types of lamp provide light of different intensity and color than normal daylight and, therefore, the data can be higher or lower than those opacity readings taken under normal conditions employed for opacity training and qualification.

Sheet 1A
Run 1A

Date: SEPT 9, 1975

Type of Plant: ASPHALT COATING

Type of Discharge: STACK

Distance from Observer to Discharge Point: 70

Location of Discharge: TP4 - OUTLET

Height of Observation Point: 40'

Height of Point of Discharge: ~60 FT

Direction of Observer from Discharge Point: S

Description of Background: 30-100% GRAY CLOUDS & LIGHT BLUE SKY

Description of Sky: OVERCAST, PARTLY CLOUDY

Wind Direction: SE

Wind Velocity: 8-15

Color of Plume: NOT APPLICABLE

Detached Plume: NOT APPLICABLE

Duration of Observation: 0935 - 1230

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average	Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	0935	0941	0	0	21	1153	1159	0	0
2	0941	0947	0	0	22	1159	1205	0	0
3	0947	0953	0	0	23	1205	1211	0	0
4	0953	0959	0	0	24	1211	1217	0	0
5	0959	1005	0	0	25	1217	1223	0	0
6	1005	1011	0	0	26	1223	1229	0	0
7	1011	1017	0	0	27				
8	1017	1023	0	0	28				
9	1023	1029	0	0	29				
10	1029	1035	0	0	30				
11	1035	1041	0	0	31				
12	1041	1047	0	0	32				
13	1047	1053	0	0	33				
14	1053	1059	0	0	34				
15	1059	1105	0	0	35				
16	1105	1111	0	0	36				
17	1111	1117	0	0	37				
18	1117	1123	0	0	38				
19	1123	1129	0	0	39				
20	1147	1153	0	0	40				

Summary of Visible Emissions

Date: 9/9/75

Type of Plant: asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: 30'

Location of Discharge: TP-4 outlet

Height of Observation Point: 40'

Height of Point of Discharge: ~60'

Direction of Observer from Discharge Point: S

Description of Background: 30-100% gray, white clouds + blue sky

Description of Sky: Overcast + Partly Cloudy

Wind Direction: S.E.

Wind Velocity: 8-15 MPH

Color of Plume:

Detached Plume:

Duration of Observation: 0935-12.30

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average	Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	0935	0941	0	0	21	1149	1155	0	0
2	0941	0947	0	0	22	1155	1201	0	0
3	0947	0953	0	0	23	1201	1207	0	0
4	0953	0959	0	0	24	1207	1213	0	0
5	0959	1005	0	0	25	1213	1219	0	0
6	1005	1011	0	0	26	1219	1225	0	0
7	1011	1017	0	0	27				
8	1017	1023	0	0	28				
9	1023	1029	0	0	29				
10	1029	1035	0	0	30				
11	1035	1041	0	0	31				
12	1041	1047	0	0	32				
13	1047	1053	0	0	33				
14	1053	1059	0	0	34				
15	1059	1105	0	0	35				
16	1119	1125	0	0	36				
17	1125	1131	0	0	37				
18	1131	1137	0	0	38				
19	1137	1143	0	0	39				
20	1143	1149	0	0	40				

SH 11
Run # 1B

Date: SEPT 9, 1975

Type of Plant: ASPHALT COATING

Type of Discharge: STACK

Distance from Observer to Discharge Point: 30'

Location of Discharge: TRY OUTLET

Height of Observation Point: ~40 FT

Height of Point of Discharge: ~60 FT

Direction of Observer from Discharge Point: "S"

Description of Background:

Description of Sky:

Wind Direction: "SE"

Wind Velocity: 5-15 MPH

Color of Plume: NOT APPLICABLE

Detached Plume: NOT APPLICABLE

Duration of Observation: 1425 - 1830

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average	Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	1425	1431	0	0	21	1730	1736	0	0
2	1431	1437	0	0	22	1746	1752	0	0
3	1437	1443	0	0	23	1752	1758	0	0
4	1443	1449	0	0	24	1758	1804	0	0
5	1449	1455	0	0	25	1804	1810	0	0
6	1600	1606	0	0	26	1810	1816	0	0
7	1606	1612	0	0	27	1816	1822	0	0
8	1612	1618	0	0	28	1822	1828	0	0
9	1618	1624	0	0	29				
10	1424	1630	0	0	30				
11	1630	1636	0	0	31				
12	1636	1642	0	0	32				
13	1642	1648	0	0	33				
14	1648	1654	0	0	34				
15	1654	1700	0	0	35				
16	1700	1706	0	0	36				
17	1706	1712	0	0	37				
18	1712	1718	0	0	38				
19	1718	1724	0	0	39				
20	1724	1730	0	0	40				

Summary of Visible Emissions

Date: 9/9/75

Type of Plant: Asphalt Refinery

Type of Discharge: Stack

Distance from Observer to Discharge Point: ~30'

Location of Discharge: TP-4 outlet

Height of Observation Point: ~40'

Height of Point of Discharge: 60'

Direction of Observer from Discharge Point: S

Description of Background: 25-100% Cloudy

Description of Sky: SE

Wind Direction:

Wind Velocity: 5-15 mph/hr

Color of Plume:

Detached Plume: not applicable

Duration of Observation: 1425-1830

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average	Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	1425	1431	0	0	21	1730	1736	0	0
2	1431	1437	0	0	22	1736	1742	0	0
3	1432	1443	0	0	23	1742	1748	0	0
4	1443	1449	0	0	24	1748	1754	0	0
5	1449	1455	0	0	25	1754	1800	0	0
6	1600	1606	0	0	26	1800	1806	0	0
7	1606	1612	0	0	27	1806	1812	0	0
8	1612	1618	0	0	28	1812	1818	0	0
9	1618	1624	0	0	29	1818	1824	0	0
10	1624	1630	0	0	30	1824	1830	0	0
11	1630	1636	0	0	31				
12	1636	1642	0	0	32				
13	1642	1648	0	0	33				
14	1648	1654	0	0	34				
15	1654	1700	0	0	35				
16	1700	1706	0	0	36				
17	1706	1712	0	0	37				
18	1712	1718	0	0	38				
19	1718	1724	0	0	39				
20	1724	1730	0	0	40				

SH 1A
RUN 2A

Date: SEPT 11, 1975

Type of Plant: ASPHALT COATING

Type of Discharge: STACK

Distance from Observer to Discharge Point: ~50 FT

Location of Discharge: TR2 (OUTLET)

Height of Observation Point: ~40 FT

Height of Point of Discharge: ~60 FT

Direction of Observer from Discharge Point: "E"

Description of Background: WHITE BRICK BLDG

Description of Sky: PARTLY CLOUDY 40% - 70%

Wind Direction: "N" - "NW"

Wind Velocity: 8-15 MPH

Color of Plume: NOT APPLICABLE

Detached Plume: NOT APPLICABLE

Duration of Observation: 0935 - 1230

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average	Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	0935	0941	0	0	21	1135	1141	0	0
2	0941	0947	0	0	22	1141	1147	0	0
3	0947	0953	0	0	23	1147	1153	0	0
4	0953	0959	0	0	24	1153	1159	0	0
5	0959	1005	0	0	25	1217	1223	0	0
6	1005	1011	0	0	26	1223	1229	0	0
7	1011	1017	0	0	27				
8	1017	1023	0	0	28				
9	1023	1029	0	0	29				
10	1029	1035	0	0	30				
11	1035	1041	0	0	31				
12	1041	1047	0	0	32				
13	1047	1053	0	0	33				
14	1053	1059	0	0	34				
15	1059	1105	0	0	35				
16	1105	1111	0	0	36				
17	1111	1117	0	0	37				
18	1117	1123	0	0	38				
19	1123	1129	0	0	39				
20	1129	1135	0	0	40				

Summary of Visible Emissions

Date: 9/11/75 Run 2 A

Type of Plant: Asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: ~50'

Location of Discharge: TP-2 outlet

Height of Observation Point: ~40'

Height of Point of Discharge: ~60'

Direction of Observer from Discharge Point: E

Description of Background: white brick bldg.

Description of Sky: partly cloudy 40-70% cloudy

Wind Direction: N-NW

Wind Velocity: 8-15 mi/hr

Color of Plume:

Detached Plume:

Duration of Observation: 0935-1230

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average	Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	0935	0941	0	0	21	1200	1206	0	0
2	0941	0947	0	0	22	1206	1212	0	0
3	0947	0953	0	0	23	1212	1218	0	0
4	0953	0959	0	0	24	1218	1224	0	0
5	0959	1005	0	0	25	1224	1230	0	0
6	1005	1011	0	0	26				
7	1011	1017	0	0	27				
8	1017	1023	0	0	28				
9	1023	1029	0	0	29				
10	1029	1035	0	0	30				
11	1035	1041	0	0	31				
12	1041	1047	0	0	32				
13	1047	1053	0	0	33				
14	1053	1059	0	0	34				
15	1059	1105	0	0	35				
16	1105	1111	0	0	36				
17	1111	1117	0	0	37				
18	1117	1123	0	0	38				
19	1123	1129	0	0	39				
20	1129	1135	0	0	40				

7H 511
Run 2B

Date: SEPT 11, 1975

Type of Plant: ASPHALT COATING

Type of Discharge: STACK

Distance from Observer to Discharge Point: ~ 50 FT

Location of Discharge: TP2 (OUTLET)

Height of Observation Point: ~40 FT

Height of Point of Discharge: ~ 60 FT

Direction of Observer from Discharge Point: "S"

Description of Background: WHITE, GRAY CLOUDS, BLUE SKY

Description of Sky: PARTLY CLOUDY, OVERCAST

Wind Direction: "NW"

Wind Velocity: 10-20 MPH

Color of Plume: NOT APPLICABLE

Detached Plume: NOT APPLICABLE

Duration of Observation: 1330-1640

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	1330	1336	0	0
2	1336	1342	0	0
3	1342	1348	0	0
4	1348	1354	0	0
5	1354	1400	0	0
6	1400	1406	0	0
7	1406	1412	0	0
8	1412	1418	0	0
9	1418	1424	0	0
10	1424	1430	0	0
11	1430	1436	0	0
12	1436	1442	0	0
13	1442	1448	0	0
14	1448	1454	0	0
15	1454	1500	0	0
16	1500	1506	0	0
17	1526	1532	0	0
18	1532	1538	0	0
19	1538	1544	0	0
20	1544	1550	0	0

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	1550	1556	0	0
22	1556	1602	0	0
23	1602	1608	0	0
24	1608	1614	0	0
25	1614	1620	0	0
26	1620	1626	0	0
27	1626	1632	0	0
28	1632	1638	0	0
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Summary of Visible Emissions Run # 2B

Date: 9/11/75

Type of Plant: Asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: ~50'

Location of Discharge: TP-2 Outlet

Height of Observation Point: ~40'

Height of Point of Discharge: ~60'

Direction of Observer from Discharge Point: S

Description of Background: white, gray, clouds + blue sky

Description of Sky: partly cloudy + overcast

Wind Direction: NW

Wind Velocity: 10-20 mi/hr

Color of Plume:

Detached Plume:

Duration of Observation: 1330-1640

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	1330	1336	0	0
2	1336	1342	0	0
3	1342	1348	0	0
4	1348	1354	0	0
5	1400	1406	0	0
6	1406	1412	0	0
7	1412	1418	0	0
8	1418	1424	0	0
9	1424	1430	0	0
10	1430	1436	0	0
11	1436	1442	0	0
12	1442	1448	0	0
13	1448	1454	0	0
14	1454	1500	0	0
15	1500	1506	0	0
16	1506	1512	0	0
17	1512	1518	0	0
18	1518	1524	0	0
19	1524	1530	0	0
20	1550	1556	0	0

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	1556	1602	0	0
22	1602	1608	0	0
23	1608	1614	0	0
24	1614	1620	0	0
25	1620	1626	0	0
26	1626	1632	0	0
27	1632	1638	0	0
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

SH 117
RUN 3A

: SEPT 12, 1975

: f Plant: ASPHALT COATING

Distance from Observer to Discharge Point: 10-20 FT

e of Discharge: LEAKAGE

Height of Observation Point: GRD. LEVEL

ation of Discharge: SATURATOR HOOD INSIDE BLDG

Direction of Observer from Discharge Point: N

g of Point of Discharge: 6-7 FT

cription of Background: GREEN & WHITE PAINTED DOORS & HOOD

cription of Sky: NOT APPLICABLE

Wind Velocity: NOT APPLICABLE

d Direction: NOT APPLICABLE

Detached Plume: NO

lor of Plume: GRAY

ration of Observation: 0900 - 1500

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	0900	0906	0	0
2	0906	0912	0	0
3	0912	0918	0	0
4	0935	0941	0	0
5	0941	0947	0	0
6	0947	0953	0	0
7	0953	0959	0	0
8	0959	1005	0	0
9	1021	1027	0	0
10	1027	1033	380	15.8
11	1033	1039	520	21.7
12	1039	1045	160	6.7
13	1045	1051	0	0
14	1111	1117	0	0
15	1141	1147	160	6.7
16	1147	1153	0	0
17	1153	1159	0	0
18	1159	1205	0	0
19	1205	1211	0	0
20	1400	1406	0	0

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	1406	1412	0	0
22	1412	1418	0	0
23	1445	1451	0	0
24	1451	1457	0	0
25	1457	1503	120	5.0
26	1503	1509	205	8.5
27	1509	1515	0	0
28	1515	1521	20	0.8
29	1521	1527	140	5.8
30	1527	1533	35	1.5
31	1533	1539	0	0
32	1539	1545	0	0
33	1545	1551	0	0
34	1551	1557	0	0
35	1557	1603	130	5.4
36	1603	1609	0	0
37	1609	1615	0	0
38	1615	1621	135	5.6
39	1621	1627	35	1.5
40	1627	1633	35	1.5

SH 1B
Run 3A

Date:

Type of Plant:

Type of Discharge:

Distance from Observer to Discharge Point:

Location of Discharge:

Height of Observation Point:

Height of Point of Discharge:

Direction of Observer from Discharge Point:

Description of Background:

Description of Sky:

Wind Direction:

Wind Velocity:

Color of Plume:

Detached Plume:

Duration of Observation:

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
41	1646	1652	35	1.5
42	1652	1658	0	0
43	1715	1721	0	0
44	1721	1727	0	0
45	1727	1733	0	0
46	1733	1739	280	11.7
47	1739	1745	0	0
48	1745	1751	100	4.2
49	1751	1757	60	2.5
50	1757	1803	0	0
51	1803	1809	0	0
52	1809	1815	0	0
53	1815	1821	0	0
54	1821	1827	65	2.7
55	1827	1833	20	0.8
56	1833	1839	0	0
57	1839	1845	260	10.8
58	1845	1851	0	0
59	1851	1857	0	0
60	1857	1903	75	3.1

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
61	1903	1909	0	0
62	1909	1915	0	0
63	1915	1921	85	3.5
64	1921	1927	0	0
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Summary of Visible Emissions

Sh 1A
Run # 3 A

Date: 7/12/75

Type of Plant: Asphalt Roofing

Type of Discharge: Leakage

Distance from Observer to Discharge Point: 10'-20'

Location of Discharge: Saturator head inside bldg.

Height of Observation Point: ground level

Height of Point of Discharge: 6'-7'

Direction of Observer from Discharge Point: N.

Description of Background: Green, white door + gray machinery

Description of Sky:

Wind Direction:

Wind Velocity: NOT

Color of Plume: gray

Detached Plume: No,

Duration of Observation: 0900-1500

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	0900	0906	0	0
2	0906	0912	0	0
3	0912	0918	0	0
4	0935	0941	0	0
5	0941	0947	0	0
6	0947	0953	0	0
7	0953	0959	0	0
8	0959	1005	0	0
9	1021	1027	50	2.1
10	1027	1033	0	0
11	1033	1039	80	3.3
12	1039	1045	150	6.3
13	1045	1051	0	0
14	1111	1117	0	0
15	1141	1147	0	0
16	1147	1153	0	0
17	1153	1159	0	0
18	1159	1205	0	0
19	1205	1211	0	0
20	1400	1406	0	0

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	1406	1412	0	0
22	1412	1418	0	0
23	1445	1451	0	0
24	1451	1457	0	0
25	1457	1503	60	2.5
26	1503	1509	70	2.9
27	1509	1515	0	0
28	1515	1521	80	3.3
29	1521	1527	530	22.1
30	1527	1533	280	11.7
31	1533	1539	0	0
32	1539	1545	0	0
33	1545	1551	0	0
34	1551	1557	0	0
35	1557	1603	55	2.3
36	1603	1609	0	0
37	1609	1615	0	0
38	1615	1621	25	1.0
39	1621	1627	0	0
40	1627	1633	15	0.6

FACILITY

Summary of Visible Emissions

Run 3 A

Date: 9

Type of Plant:

Type of Discharge:

Distance from Observer to Discharge Point:

Location of Discharge:

Height of Observation Point:

Height of Point of Discharge:

Direction of Observer from Discharge Point:

Description of Background:

Description of Sky:

Wind Direction:

Wind Velocity:

Color of Plume:

Detached Plume:

Duration of Observation:

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average	Set Number	Time Start	Time End	Opacity Sum	Opacity Average
41	1646	1652	10	0.4	21 61	1903	1909	0	0
42	1652	1658	0	0	22 62	1909	1915	0	0
43	1715	1721	0	0	23 63	1915	1921	20	0.8
44	1721	1727	0	0	24 64	1921	1927	0	0
45	1727	1733	0	0	25				
46	1733	1739	50	2.1	26				
47	1739	1745	0	0	27				
48	1745	1751	20	0.8	28				
49	1751	1757	10	0.4	29				
50	1757	1803	0	0	30				
51	1803	1809	0	0	31				
52	1809	1815	0	0	32				
53	1815	1821	0	0	33				
54	1821	1827	10	0.4	34				
55	1827	1833	5	0.2	35				
56	1833	1839	0	0	36				
57	1839	1845	45	1.9	37				
58	1845	1851	0	0	38				
59	1851	1857	0	0	39				
60	1857	1903	15	0.6	40				

APPENDIX

This section includes the field data sheets for the three days of visible emissions observations. For each sampling period, the summary record of visible emission is followed by the record of visible emission data sheet.

SHEET 1 OF 7
Run # 1A

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant ASPHALT COATING

Date SEPT 9, 1975

Company Name CERTAIN TEED

Hours of Observation 0935 - 1230

Plant Address SHAMPEE

Observer E. DUNCAN

Type of Discharge STACK OTHER _____

Discharge Location TP4 - OUTLET

Height of Point of Discharge 60 FT

Observer's Location:

Distance to Discharge Point 30 FT

Height of Observation Point 40 FT

Direction from Discharge Point SOUTH

Background Description 30- 100% GRAY-BLUE CLOUDS, LIGHT BLUE SKY

Weather: Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction SE Wind Velocity 8-15 mi/hr

Plume Description: NOT APPLICABLE

Detached: Yes No

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
0	245 min. 0 sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

SHEET 2
Run #1A

RECORD OF VISIBLE EMISSIONS

Company Name CENTRAL TEED

Date 9-9-75

Plant Address SHREVEPORT, LOUISIANA

Observer C. DUNCAN

Stack Location TP4 - OUTLET

Observer's Location SAME AS SH 1

Weather Conditions SAME AS SH 1

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
	30					
	31					
	32					
	33					
	34					
9	35	0	0	0	0	GRAY BLUE CLOUDS AS BACKGROUND, HEAT WAVES VISIBLE
	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	

SHEET 8
RUN # 1A

RECORD OF VISIBLE EMISSIONS

Company Name [illegible]

Plant Address [illegible]

Stack Location T/4 OUTLET

Weather Conditions SAME AS SH 1

Date 9-9-75

Observer C [illegible]

Observer's Location SAME AS SH 1

HR	MIN	SECONDS 00	15	30	45	COMMENTS
10	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

SHEET 4
Run #1A

RECORD OF VISIBLE EMISSIONS

Company Name [illegible] Date 9-8-75

Plant Address [illegible] Observer C. Duncan

Stack Location [illegible] Observer's Location [illegible]

Weather Conditions [illegible]

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
10	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	

SHEET 5
RUN # 1A

RECORD OF VISIBLE EMISSIONS

Company Name [illegible]
Date 9-9-75
Plant Address [illegible]
Observer [illegible]
Stack Location T.P.U. - OUTLET
Observer's Location SAME AS SH. 1
Weather Conditions ~ 80% CLOUDS
SE 8-15 mph wind

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
11	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	LIGHT BLUE SKY AS BACKGROUND
	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	

SHEET 6
RUN # 1A

RECORD OF VISIBLE EMISSIONS

Company Name [illegible] Date 9-8-75

Plant Address [illegible] Observer C [illegible]

Stack Location [illegible] Observer's Location SAME AS SIDE 1

Weather Conditions ~60% CLOUDS SE 8-15 mph WIND

HR	MIN	SECONDS 00	15	30	45	COMMENTS
11	30	0	0	0	0	
	31	0	0	0	0	
	32					
	33					
	34					BREAK
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	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	

SHEET 2 OF 1
RUN # 1A FINAL

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-8-85

Plant Address SHAKOPEE, MINN

Observer C BRUNNER

Stack Location TPU - OUTLET

Observer's Location SAME AS #1

Weather Conditions ~30% CLOUDS
WIND 5-15 mph "SE" TO "NW"

HR	MIN	SECONDS 00	15	30	45	COMMENTS
P	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	SKY LIGHT BLUE CLOUD IN BACKGROUND
	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	

Run #1 – A 3hr

11

SUMMARY
RECORD OF VISIBLE EMISSIONS

Date 9/9/75

Type of Plant Asphalt Roofing

Hours of Observation 3hr

Company Name Certain Teed

Observer Y. Stewart

Plant Address

Type of Discharge STACK OTHER

Discharge Location TP4 outlet

Height of Point of Discharge ~60'

Observer's Location:

Distance to Discharge Point ~30'

Height of Observation Point ~40'

Direction from Discharge Point S

Background Description 30-100% Clouds, blue, grey clouds - light blue sky

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

Wind Direction S.E Wind Velocity 8-15 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other

Estimated Distance Plume Visible

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
0	245 min.	0 sec.	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 Citizens Fuel

Date 9/9/75

Plant Address Shakopee Minn.

Observer T. Stewart

Stack Location TPU outlet

Observer's Location Same as shot 1

Weather Conditions ~~Same as shot 1~~ Same as shot 1

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
	30					
	31					
	32					
	33					
	34					
09	35	0	0	0	0	gray, blue clouds as background
09	36	0	0	0	0	Heat waves visible
	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 VISIBLE EMISSIONS

Company Name: Certain Teed

Date: 9/9/75

Plant Address: Shakopee Minn

Observer: G. Sitterud

Stack Location: TP-4 Outlet

Observer's Location: Same as Shot 1

Weather Conditions: Same as Shot 1

HR	MIN	SECONDS 00	15	30	45	COMMENTS
10	00	0	0	0	0	Silent mine, visible
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

RECORD OF VISIBLE EMISSIONS

Company Name Clairton Tend

Date 9/9/75

Plant Address Shakopee Minn

Observer G. Stewart

Stack Location TP-4

Observer's Location Some on shelf

Weather Conditions Some on shelf

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
10	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 VISIBLE EMISSIONS

Company Name Certain Teed

Plant Address Shakopee Minn

Stack Location + P-4

Weather Conditions 70% Clouds
wind 5-15 MPH/hr

Date 9/9/75

Observer T. Stanton

Observer's Location Same as shot 1

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
11	00	0	0	0	0	Heat blower visible
	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	BREAK
	10	0				
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19	0	0	0	0	Blue sky as background
	20	0	0	0	0	Heat blower visible
	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 VISIBLE EMISSIONS

Company Name: Cargill Seed

Date: 9/9/75

Plant Address: Shrapnel Mine

Observer: G. Stierwalt

Stack Location: TP-4

Observer's Location: Some Rabbit!

Weather Conditions: 70% clouds winds E 5-15 mph/hr

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
11	30	0	0	0	0	blue sky as back ground
	31	0	0	0	0	heat waves visible
	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	

(7) (8)

RECORD OF VISIBLE EMISSIONS

Company Name Curtis Tent

Date 9/9/75

Plant Address Shakopee mine

Observer G. Stewart

Stack Location TP-4

Observer's Location Same as Ohd 1

Weather Conditions 30% clouds
wind 8-15 mph/hr S-E

TIME HR	MIN	SECONDS 00	15	30	45
12	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	0	0
	28	0	0	0	0
	29	0	0	0	0

COMMENTS

Scattered gray clouds in back ground
Heat waves visible

SHEET 1 OF 1
RUN #1B

SUMMARY
RECORD OF VISIBLE EMISSIONS

e of Plant ASPHALT COATING
pany Name CERTAIN TEED
n Address SHAKOPEE, MINN
pe of Discharge STACK OTHER
scharge Location TP 4 - OUTLET
ight of Point of Discharge 60 FT
server's Location:
Distance to Discharge Point 30 FT
Height of Observation Point 40 ft
Direction from Discharge Point "S"

Date SEPT 9, 1975
Hours of Observation 1425 - 1830
Observer C DUNCAN

ckground Description GRAY CLOUDS LIGHT BLUE SKY AND CLOUDS ; ~ 25% TO 100% CLOUDS

ea her: Clear Overcast Partly Cloudy Other Color

Wind Direction "SE" Wind Velocity 5-15 mi/hr

lume Description: NOT APPLICABLE

Detached: Yes No

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
0	179 min. 0 sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

SHEET 2
RUN # 1 B

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED Date 9-8-75

Plant Address SHAKOPEE, MINN Observer C Duncan

Stack Location Same as sh 1 (TP-4 a-7) Observer's Location SAME AS SHEET 1

Weather Conditions Same as sh 1

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
14	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					
14	25	0	0	0	0	HEAT WAVES VISIBLE, LIGHT BLUE SKY IN BACKGROUND
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

SHEET 3
RUN # 1 B

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED Date 7-9-75

Plant Address SHAKOPEE, MINN. Observer C. DUNCAN

Stack Location SAME AS SH 1 (TRAILER) Observer's Location SAME AS SH #1

Weather Conditions SAME AS SH 1

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
2/4	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	WHITE CLOUDS BY BACKGROUND HEAT WAVES VISIBLE
	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	

SHEET 4
Run # 1B

RECORD OF VISIBLE EMISSIONS

Company Name Costin Teed — Date 9-9-75

Plant Address Sparrows, Miami — Observer C Bonner

Stack Location Same As SH 1 (Top-Out) — Observer's Location Same As SH 1

Weather Conditions Same As SH 1

HR	MIN	SECONDS 00	15	30	45	COMMENTS
15	00	0	0	0	0	
	01	0	0	0	0	
	02	0	0	0	20	Dark Gray (not white) smoke
	03	20	20	20	15	
	04	20	20	20	15	
	05	15	20	15	15	
	06	10	0	0	0	Per Gene Rily this sheet
	07	0	0	0	0	is to be kept in report but not
	08	0	0	0	0	used as data (opacity) because burner
	09	0	0	0	0	went out.
	10	0	0	0	0	Problems with equipment, stopped readings.
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

SHEET 5
RUN # 1B

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-9-75

Plant Address SHAKOPEE, MINN

Observer C Donovan

Stack Location TP4 - OUTLET

Observer's Location Same as sh 1

Weather Conditions OVERCAST - WIND SE 8-15 mph

HR	MIN	TIME SECONDS 00	15	30	45
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
	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

HEAT WAVES VISIBLE
BLUE GRAY CLOUDS AS BACKGROUND

SHEET 5
Run # 10

RECORD OF VISIBLE EMISSIONS

Company Name CENTRAL TEXAS

Date 9-9-75

Plant Address SUGARLAND, TEXAS

Observer C. DUNCAN

Stack Location SAME AS SH 1 (illegible)

Observer's Location SAME AS SH 1

Weather Conditions OVERCAST 80% CLOUDS
WIND SE ~ 8-15 mph

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
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	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	HEAT WAVES STILL VISIBLE
	46	0	0	0	0	LIGHT BLUE SKY AND CLOUDS AS BACKGROUND
	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	WHITE CLOUD AS BACKGROUND
	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	

SHEET 2
RUN #10

RECORD OF VISIBLE EMISSIONS

Company Name CARGILL TECH
Date 9-8-75
Plant Address SHAKOPEE, MINN
Observer C. DOWNEY
Stack Location TAN - OUTLET
Observer's Location SAME AS SH 1
Weather Conditions ~50% CLOUDS
WIND 5-15 mph "SE" TO "NW"

HR	MIN	SECONDS 00	15	30	45	COMMENTS
17	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	BLUE SKY AS BACKGROUND; HEAT WAVES STILL VISIBLE
	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	

SHEET 8
RUN # 1/5

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-0-75

Plant Address SAN JOSE, MINN

Observer C. DONOHU

Stack Location TP4 - OUTLET

Observer's Location SAME AS SHEET 1

Weather Conditions ~60% CLOUDS
WIND "SE" 5-15 mph

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
17	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					BREAK
	40					
	41					
	42					
	43					
	44					
	45					
	46	0	0	0	0	
	47	0	0	0	0	
	48	0	0	0	0	WHITE CLOUDS AS BACKGROUND
	49	0	0	0	0	
	50	0	0	0	0	
	51	0	0	0	0	
	52	0	0	0	0	GRAY CLOUDS AS BACKGROUND
	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	

SHEET 9 OF 9, FINAL
RUN # 1 B

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-9-75

Plant Address SHAKOPEE, MINN

Observer C DUNCAN

Stack Location TP4 - OUTLET

Observer's Location SAME AS SH 1

Weather Conditions ~ 90% CLOUDS
WIND 8-15 mph "SE"

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
18	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	BLUE SKY AND WHITE CLOUDS AS BACKGROUND
	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	WHITE CLOUDS AS BACKGROUND
	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	

ek

(7)

Run #1 - B, after break

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt Roofing

Date 9/9/75

Company Name Certain-Teed

Hours of Observation

Plant Address Shakopee Minn.

Observer T. Stewart

Type of Discharge STACK OTHER

Discharge Location TP-4

Height of Point of Discharge ~60'

Observer's Location:

Distance to Discharge Point ~30'

Height of Observation Point ~40'

Direction from Discharge Point S

Background Description Partly cloudy, gray clouds, blue sky 25-100% clouds

Weather: Clear Overcast Partly Cloudy Other Color gray clouds

Wind Direction S.E Wind Velocity 5-15 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other

Estimated Distance Plume Visible

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	179 min. 0 sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

(2) (2)

RECORD OF VISIBLE EMISSIONS

Company Name Ontario Feed

Plant Address Blackfoot Idaho

Stack Location TP-6

Weather Conditions Same as sheet 1

Date 9/9/75

Observer G. Stewart

Observer's Location Same as sheet 1

HR	MIN	SECONDS 00	15	30	45	COMMENTS
	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					
14	25	0	0	0	0	Cloudy Sky as back ground
	26	0	0	0	0	Heat waves visible
	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

(3)

RECORD OF VISIBLE EMISSIONS

Company Name Certain-Teed

Date 9/9/75

Plant Address Shakopee minn

Observer T. Stewart

Stack Location TP-4 outlet

Observer's Location ~40' S. of stack

Weather Conditions cloudy

Spring data

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
14	30	0	0	0	0	1 minute cloudy sky as background
	31	0	0	0	0	heat waves visible
	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	

(B)(4)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Feed

Plant Address Shakopee Minn.

Stack Location TP-4 Outlet

Weather Conditions cloudy

Date 9/9/25

Observer T. Stewart

Observer's Location ~40' Soy stack

HR	MIN	SECONDS 00	15	30	45	COMMENTS
45	00	0	0	0	0	Partly cloudy gray clouds as background
	01	0	0	0	0	heat waves visible
*	02	0	0	0	20	black smoke visible
	03	20	20	20	20	
	04	20	20	20	20	
	05	20	20	20	20	
	06	10	0	0	0	Problem with equipment stopped
	07	0	0	0	0	reading (sheet to be kept with data, but
	08	0	0	0	0	void)
	09	0	0	0	0	
	10	0	0	0	0	Stopped problem in system -
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

(5) (6)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/9/75

Plant Address Shakopee Minn.

Observer T. Stewart

Stack Location ~~[illegible]~~ - B T P-4 outlet

Observer's Location ~ 40' S. of stack

Weather Conditions Cloudy

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
16	00	0	0	0	0	dark gray clouds as background
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

(6) (2) (7)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/9/75

Plant Address Shakopee

Observer T. Stimmel

Stack Location T P-4 outlet

Observer's Location ~40' S of stack

Weather Conditions Overcast 90% wind S-15 mi/hr S.E.

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
16	30	0	0	0	0	Dark gray Clouds as background
	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	

(7)

RECORD OF VISIBLE EMISSIONS

Company Name Certain-Teed

Date 9/9/75

Plant Address Shiloh mine

Observer T Stewart

Stack Location TP-4 outlet

Observer's Location ~40' S of stack

Weather Conditions pleasant 50% Clouds wind 5-15 mi/hr, S-E

HR	MIN	SECONDS 00	15	30	45	COMMENTS
17	00	0	0	0	0	Gray clouds in background heat never visible
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

(5) (8)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/9/75

Plant Address Shakopee Minn

Observer T. Stewart

Stack Location TP-4 outlet

Observer's Location ~40' S. of stack

Weather Conditions Cloudy 50%
wind SE 5-15 mi/hr

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
17	30	0	0	0	0	blue sky as background
	31	0	0	0	0	heat waves visible
	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	gray clouds in background
	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 VISIBLE EMISSIONS

Company Name Clinton Tank

Date 9/9/75

Plant Address Stockpile mine

Observer T. Stewart

Stack Location TP-4 outlet

Observer's Location ~40' S. of stack

Weather Conditions Cloudy 90%
wind 8-15 mi/hr SE.

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
18	00	0	0	0	0	Gray clouds as background
	01	0	0	0	0	heat waves visible
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

SHEET 1 OF 7
RUN 2A

SUMMARY
RECORD OF VISIBLE EMISSIONS

Plant ASPHALT COATING
any Name CERTAIN TEED
t Address SHAKOPEE, MINN
Discharge STACK OTHER
harge Location TP-2 (OUTLET)
jht of Point of Discharge ~ 60 FT
er's Location:
Distance to Discharge Point ~ 50 FT
ight of Observation Point ~ 40 FT
rection from Discharge Point EAST
kground Description WHITE BAKE BUILDING
ther: Clear Overcast Partly Cloudy Other 60% - 70% CLOUDS Color WHITE - BLUE
Wind Direction "NW" - "N" Wind Velocity 8-15 mi/hr
ume Description: NOT APPLICABLE
etached: Yes No
olor: Black White Other
Plume Dispersion Behavior: Looping Coning Fanning
Lofting Fumigating Other
stimated Distance Plume Visible
mary of Observations:

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

Sh 2
Run 2A

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED
Date 9-11-75
Plant Address SHAKOPEE, MINN
Observer C. DUNCAN
Stack Location TP-2
Observer's Location SEE SH 1
Weather Conditions SEE SH 1

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
	30					
	31					
	32					
	33					
	34					
09	35	0	0	0	0	HEAT WAVES VISIBLE
	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	

SH 3
RUN 2A

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-11-75

Plant Address SHAKOPEE, MINN

Observer C DUNCAN

Stack Location TP-2

Observer's Location SEE SH. 1

Weather Conditions ~40% CLOUDS
WIND "NW" TO "SE" 10-15 MPH

HR	MIN	TIME (FROM) SECONDS 00	15	30	45	COMMENTS
0	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

S11 4
RUN 2A

CERTAIN TEED RECORD OF VISIBLE EMISSIONS

Company Name ASPHALT COATING Date 9-11-75

Plant Address SHAKOPEE, MINN Observer C. DUNCAN

Stack Location TP-2 Observer's Location SEC SH 1

Weather Conditions ~40% CLOUDS
WIND "NW" 10-15 MPH

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
10	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	

Sh 5
Run 2A

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-11-75

Plant Address SHAKOPEE, MINN.

Observer C. DUNCAN

Stack Location TP-2

Observer's Location SEE SH 1

Weather Conditions ~60% CLOUDS
WIND "N" to "S" 10-15 MPH

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
11	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

Sh 6
Run 2A

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED ASPHALT COATING

Date 9-11-75

Plant Address SHAKOPEE, MINN

Observer C. DUNCAN

Stack Location TP-2

Observer's Location SEE SK 1

Weather Conditions ~50% CLOUDS
WIND NW 10-15 MPH

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
11	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	

Run 2A

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Plant Address SHAKOPEE, MINN

Stack Location TP-2

Weather Conditions ~40% CLOUDS
WIND "NW" 10-15 MPH

Date 9-11-75

Observer C. DUNCAN

Observer's Location SIDE STA 1

HR	MIN	SECONDS 00	15	30	45	COMMENTS
12	00	0	0	0	0	
	01	0	0	0	0	
	02					
	03					
	04					
	05					BREAK
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	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	

(1)

Run # 2-A

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant Asphalt

Date 9/11/75

Company Name Certain Teed

Hours of Observation 0935-1230

Plant Address Shakopee Minn

Observer T. Stewart

Type of Discharge STACK OTHER

Discharge Location TP-2 outlet

Height of Point of Discharge ~60'

Observer's Location:

Distance to Discharge Point ~50'

Height of Observation Point ~40'

Direction from Discharge Point E

Background Description white block bldg.

Weather: Clear Overcast Partly Cloudy 40% - 70% clouds Other Color blue sky fragmentary cloud

Wind Direction N-W - N Wind Velocity 8-15 mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other

Estimated Distance Plume Visible

Summary of Observations:

Opacity	Aggregate Time @ Opacity		Opacity	Aggregate Time @ Opacity
0	150 min.	0 sec.	55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

(2)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Feed

Date 9/24/75

Plant Address Shakopee Minn

Observer T. Stewart

Stack Location TP-2 Outlet

Observer's Location ~50' E. Off Stack

Weather Conditions partly cloudy

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
	30					
	31					
	32					
	33					
	34					
09	35	0	0	0	0	white bldg as back ground
	36	0	0	0	0	but water visible
	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 VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/11/75

Plant Address Shakopee

Observer G. Stewart

Stack Location PT-2

Observer's Location ~50' EOF stack

Weather Conditions Partly cloudy (was cloudy) wind 10-15 mi/hr NW

HR	MIN	SECONDS 00	15	30	45	COMMENTS
10	00	0	0	0	0	Heat waves visible
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

(4)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Feed

Date 9/11/75

Plant Address Shakopee Minn.

Observer T. Stewart

Stack Location PT-2

Observer's Location ~ 50' E of stack

Weather Conditions 60% Cloudy Partly Cloudy
Nw wind 10-15 mph

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
10	30	0	0	0	0	Heat waves visible
	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 VISIBLE EMISSIONS

Company Name Certain Teed

Date 8/11/75

Plant Address Shakopee Minn.

Observer T. Stewart

Stack Location PT-2

Observer's Location ~50' E of stack

Weather Conditions 60% Partly Cloudy N. wind 10-15 mph

HR	MIN	SECONDS 00	15	30	45	COMMENTS
11	00	0	0	0	0	Heat mass visible
	01	0	0	0	0	* Wind direction changed to the N.
	02	0	0	0	0	10-15 mph,
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

(6)

RECORD OF VISIBLE EMISSIONS

Company Name Cenex Feed

Date 9/11/75

Plant Address Shakopee Minn.

Observer T. Stewart

Stack Location PT-2

Observer's Location ~50' E of Stack

Weather Conditions Cloudy (50% clouds N. wind 10-15 MPH

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
11	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				Break
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50					
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					

(2)
(7)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/11/75

Plant Address Shakopee Minn.

Observer T. Stewart

Stack Location TP-2

Observer's Location ~50' E of stack

Weather Conditions cloudy (100% cloud) Wind 10-15 MPH

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
12	00	0	0	0	0	heat waves visible
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	stop - for lunch

SHEET 1 OF 8
RUN 2B

SUMMARY
RECORD OF VISIBLE EMISSIONS

Type of Plant ASPHALT COATING

Date SEPT 11, 1975

Company Name CERTAIN TEED

Hours of Observation 1330-1640

Plant Address SHAKOPEE, MINN

Observer C DUNCAN

Type of Discharge STACK OTHER _____

Discharge Location TP-2 (OUTLET)

Height of Point of Discharge ~60 FT

Observer's Location:

Distance to Discharge Point 50 FT

Height of Observation Point 40 FT

Direction from Discharge Point SOUTH

Background Description WHITE, GRAY ~~WHITE~~ CLOUDS, BLUE SKY

Weather: Clear Overcast Partly Cloudy Other _____ Color WHITE GRAY

Wind Direction NW Wind Velocity 10-20 mi/hr

Plume Description: 70% - 100% CLOUDS NOT APPLICABLE

Detached: Yes No

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
0	227 min. 0 sec.	55	
5		60	
10		65	
15		70	
20		75	
25		80	
30		85	
35		90	
40		95	
45		100	
50			

SH 2
RUN 2B

RECORD OF VISIBLE EMISSIONS

Company Name CESTRIAN TEED
Date 9-11-75
Plant Address SHAKOPEE, MINN
Observer C DUNCAN
Stack Location TP2
Observer's Location SEE SH 1
Weather Conditions ~ 80% CLOUDS
WIND NW 10-20 MPH

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
13	30	0	0	0	0	WHITE-GRAY CLOUD AS BACKGROUND HERE
	31	0	0	0	0	WALLS VISIBLE
	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	GRAY CLOUD AS BACKGROUND
	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	LIGHT BLUE SKY AS BACKGROUND
	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	

Run 2B

RECORD OF VISIBLE EMISSIONS

Company Name CENTRAL FEED

Date 9-11-75

Plant Address SHAKOPEE, MINN

Observer C DUNCAN

Stack Location TP-2

Observer's Location SEE SKT 1

Weather Conditions ~70% CLOUDS
WIND "NW" 10-15 MPH

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
14	00	0	0	0	0	GRAY CLOUDS AS BACKGROUND
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

SH 4
RUN 2B

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-11-75

Plant Address SHAKOPEE, MINN

Observer C. DUNCAN

Stack Location TP-2

Observer's Location SEE SH 1

Weather Conditions ~80% CLOUDS
WIND 10-20 MPH "NW" TO "SE"

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
14	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	DRAW GRAY CLOUDS AS BACKGROUND
	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	

Run 2B

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-11-75

Plant Address SHAKOPEE, MINN

Observer C. DUNCAN

Stack Location TP-2

Observer's Location SEE SH 1

Weather Conditions ~70% CLOUDS WIND NW" 10-15 MPH

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
15	00	0	0	0	0	WHITE CLOUDS AS BACKGROUND
	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				
	07					
	08					BREAK (DISCUSSION WITH RICK ON HOPPER READING AND TANK TRUCK READING)
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

SH 6
Run 2B

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED Date 9-11-75

Plant Address SHAKOPEE, MINN Observer C. DUNCAN

Stack Location TP-2 Observer's Location SEE SH 1

Weather Conditions ~ 70% CLOUDS
WIND NW 10-15 MPH

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
15	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	BLUE SKY AS BACKGROUND
	55	0	0	0	0	↓
	56	0	0	0	0	WHITE - GRAY CLOUDS AS BACKGROUND
	57	0	0	0	0	↓
	58	0	0	0	0	
	59	0	0	0	0	

Run 2B

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-11-75

Plant Address SUMMIT, MINN

Observer C. DUNCAN

Stack location TP-2

Observer's Location SEE SH 1

Weather Conditions ~50% CLOUDS

WIND MAX 10-15 MPH

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
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	
	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	

SHEET OF FINAL
Rev 2B

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-11-75

Plant Address SHAKOPEE, MINN

Observer C. DUNCAN

Stack Location TP-2

Observer's Location SEE SH 1

Weather Conditions ~50% CLOUDS
WIND "NW" 10-15 MPH

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
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	0	0	0	0	
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50					
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					

SUMMARY
RECORD OF VISIBLE EMISSIONS

Run # 2 - B

Type of Plant Asphalt Roofing

Date 9/11/75

Company Name Certain Teed

Hours of Observation 1330-1640

Plant Address Shakopee Minn.

Observer T. Stewart

Type of Discharge STACK OTHER

Discharge Location TP-2 Outlet

Height of Point of Discharge ~60'

Observer's Location:

Distance to Discharge Point ~50'-60

Height of Observation Point ~40'

Direction from Discharge Point S.

Background Description 70-90% Clouds white, gray - blue sky

Weather: Clear Overcast Partly Cloudy Other Color dark gray

Wind Direction N.W. Wind Velocity 10-20 mi/hr

Plume Description:

Detached: Yes No

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
0	227 min.	0 sec.	55	
5			60	
10			65	
15			70	
20			75	
25			80	
30			85	
35			90	
40			95	
45			100	
50				

(2)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/11/75

Plant Address Shakopee Minn

Observer T. Stewart

Stack Location TP-2

Observer's Location ~60' S-of stack

Weather Conditions Cloudy 80%
wind 10-20 MPH

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
13	30	0	0	0	0	dark gray clouds as background
	31	0	0	0	0	first minute visible
	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	blue sky as background
	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	

(3)

RECORD OF VISIBLE EMISSIONS

Company Name Certain-Teed

Date 9/11/75

Plant Address Kissimmee Minn.

Observer T Stewart

Stack Location TP-3

Observer's Location ~50' S. of stack

Weather Conditions Partly Cloudy 70°
wind NW 10-15 MPH

HR	MIN	SECONDS 00	15	30	45	COMMENTS
14	00	0	0	0	0	dark gray clouds as background
	01	0	0	0	0	heat waves were visible
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/11/75

Plant Address Shakopee Minn

Observer G. Stimson

Stack Location TP-2

Observer's Location ~60' S of stack

Weather Conditions Cloudy 80%
NW wind 10-20 mph

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
14	30	0	0	0	0	dark gray clouds in background
	31	0	0	0	0	heat waves visible
	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 VISIBLE EMISSIONS

Company Name Cotter Rock

Date 9/11/75

Plant Address Blackwell Minn.

Observer T. Stewart

Stack Location TP-2

Observer's Location ~60' S of Stack

Weather Conditions Cloudy 70°F
NW wind 10-15 mph

HR	MIN	SECONDS 00	15	30	45	COMMENTS
15	00	0	0	0	0	dark gray clouds as background
	01	0	0	0	0	brief cameo visible
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

(6)

RECORD OF VISIBLE EMISSIONS

Company Name: Certain-Teed

Date: 9/11/75

Plant Address: Shakopee Minn.

Observer: T. Stewart

Stack Location: TP-2

Observer's Location: ~60' S of stack

Weather Conditions: Cloudy 70%
WIND NW 10-15 MPH

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
15	30					Break
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48					
	49					
	50	0	0	0	0	dark gray clouds as background
	51	0	0	0	0	heat waves visible
	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 VISIBLE EMISSIONS

Company Name Centrim Kod

Date 9/11/75

Plant Address Blackfoot mine,

Observer T. Stewart

Stack Location TP-2

Observer's Location -60' S of stack

Weather Conditions Cloudy

HR	MIN	SECONDS 00	15	30	45	COMMENTS
16	00	0	0	0	0	dark clouds as background
	01	0	0	0	0	heat waves visible.
	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	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

(8)
(8)

RECORD OF VISIBLE EMISSIONS

Company Name Certain feed

Date 9/11/75

Plant Address Kinbapei Mill

Observer T. Stewart

Stack Location TP-2

Observer's Location ~60' South Stack

Weather Conditions Cloudy

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
14	30	0	0	0	0	dark gray cloudy background
	31	0	0	0	0	heat waves visible
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	Stop end of 6 hr run
	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					
	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 COATING

Date SEPT 12, 1975

Company Name CERTAIN TEED

Hours of Observation 0900 - 1500

Plant Address SHAKOPEE, MINN

Observer C DUNCAN

Type of Discharge STACK OTHER SATURATOR (LEAKAGE) / HOT LOADER / COATER HOOD (INDIRECT)

Discharge Location INSIDE BLDG - SAT HOOD

NOTE: YELLOW & NEON LIGHT SOURCES (YELLOW OVER HOOD AREA)

Height of Point of Discharge 6-7 FT

Observer's Location:

Distance to Discharge Point 10 - 20 FT

Height of Observation Point GRC (FLOOR LEVEL)

Direction from Discharge Point N

Background Description GREEN & WHITE PAINT ON DOORS & HOOD

Weather: Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction _____ Wind Velocity _____ mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other GRAY

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other BY DISPERSING

Estimated Distance Plume Visible 1-5 FT

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	331 min. 30 sec.	55	
5	8 min 15 sec	60	
10	3 min 15 sec	65	
15	4 min 45 sec	70	
20	13 min 0 sec	75	
25	6 min 0 sec	80	
30	7 min 30 sec	85	
35	1 min 0 sec	90	
40	0 min 15 sec	95	
45		100	
50			

SH 2
Run 3

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-12-75

Plant Address SUMMERVILLE

Observer C. DOWDEN

Stack Location SAT HOOD IN ROOF

Observer's Location SEE SH 1

Weather Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
9	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	LINE RUNNING, DOOR 8
	06	0	0	0	0	OPEN, NO EMISSIONS
	07	0	0	0	0	FROM HOOD
	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					LINE DOWN - PAPER (FELT) BROKE
	23					ALL SYSTEMS OFF. DOORS ALL
	24					OPEN, NO EMISSIONS
	25					
	26					
	27					
	28					
	29					

(4)
Run 3

RECORD OF VISIBLE EMISSIONS

Company Name: CATON TEED
Date: 9-12-75
Plant Address: SUMMERVILLE, MISSOURI
Observer: C. DUNCAN
Stack Location: SAT HOOD SECT.
Observer's Location: SEE SK 1
Weather Conditions:
OR COMMENTS

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
9	30					
	31					
	32					
	33					
	34					
	35	0	0	0	0	LINE ON DOOR 8 OPEN -
	36	0	0	0	0	NO EMISSIONS FROM HOOD AREA
	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	

Run 3

RECORD OF VISIBLE EMISSIONS

Company Name [illegible] Date [illegible]

Plant Address [illegible] Observer [illegible]

Stack Location [illegible] Observer's Location [illegible]

Weather Conditions _____

Comments

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
10	00	[illegible]	0	0	[illegible]	
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05					LINE STOP, FELT BREAKING, AS
	06					EXPECTED, ALL DOORS OPEN
	07					(SOMETIMES ~10% ESCAPES
	08					DOORS WHEN SHUTDOWN OCCURS
	09					BECAUSE ALL DOORS ARE OPENED
	10					AND HOOD CAN'T PULL ENOUGH
	11					AIR TO ACCOUNT FOR DOOR
	12					BREAKS)
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21	0	0	0	0	LINE RESTARTED - LET UP TO STEAM
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
	25	0	0	0	0	
	26	20	0	0	0	
	27	20	20	20	20	Door #2 open, leading down #9
	28	20	20	20	20	
	29	20	20	20	20	Door #2 closed, emission at #9 stopped

34 5
Run 3

RECORD OF VISIBLE EMISSIONS

Company Name CERTAINTEED
Date 1-12-75
Plant Address SHAKOPEE
Observer C. Dunn
~~Stack~~ Location SAT. HOOD SECTION
Observer's Location Sun sh. 1
~~Weather~~ Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
10	30	20	20	20	20	Door #6 open, reading emissions at #8
	31	30	30	0	0	Door #6 closed, emissions stopped at #8
	32	0	0	0	0	(Emissions now at top 1 foot of door)
	33	10	20	20	30	Door #6 open, reading at #8
	34	35	40	30	35	
	35	20	0	0	0	Door #6 closed, emissions stopped at #8
	36	20	0	30	30	Door #5 open, reading #8
	37	35	30	30	30	(Emissions at top 1 foot of door)
	38	35	25	20	10	Door #5 closed, emissions stopped at #8
	39	0	35	30	30	#6 open, reading #8 (Emissions to 1½ ft.)
	40	25	20	20	10	#6 closed, emissions stopped
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	
	44	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	BREAKAGE - Line stopped - door open
	53					
	54					
	55					
	56					
	57					
	58					
	59					

3/16
Run 7

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 7-12-75

Plant Address SHARPSBURG, MD

Observer C DUNCAN

~~Stack~~ Location HOT HOOD SECTION

Observer's Location SEE SKI OR COMMENTS

Weather Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
11	00					
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11	0	0	0	0	LINE RUNNING UP TO SPEED
	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	LINE DOWN, BREAKING, & ALL OFF
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

SH 7
Run 7

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED
Date 9-12-75
Plant Address SHAKOPEE, MINN
Observer C. DUNCAN
Stack Location SAT HOOD SECTION
Observer's Location SEE SH 1 OR COMMENTS
~~Weather Conditions~~

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
11	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41	0	0	0	0	LINE BURNING - NOT UP TO SPEED
	42	0	0	0	0	
	43	0	0	30	30	4 open, reading 0
→	44	30	30	30	10	4 closed, opacimeter stopped at 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	

SH 6
Run 3

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED
Date 9-12-75
Plant Address SHAKOPEE, MINN
Observer C DUNCAN
~~Stack~~ Location SAT HOOD SECTION
Observer's Location SEE SH 1 OF COMMENTS
~~Weather Conditions~~

HR	MIN	SECONDS 00	15	30	45	COMMENTS
12	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	LINE DOWN - BREAKAGE IN FELT
	13					
	14					BEGIN RUN IN - LOADING
	15					BAGHT
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 8-12-75

Plant Address SHAKOPEE, MINN

Observer C. Duncan

~~Stack~~ Location SAT. HOT SECTION

Observer's Location SEE SH 1 ON COMMENTS

Weather Conditions

HR	MIN	SECONDS 00	15	30	45	COMMENTS
19	00	0	0	0	0	Blue Rucker - up to speed
	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	20	30	30	30	Door 7 open, roof 8
	22	25	30	30	30	
	23	15				Ech broken, all Door open
	24					
	25					
	26					
	27					
	28					
	29					

SH 10

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-12-75

Plant Address SHREEPEED MILL

Observer C. DUNCAN

Stack Location SAT. HIGH SECTION

Observer's Location

~~Weather Conditions~~

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
14	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					LINE OFF
	41					
	42					
	43					
	44					
	45	0	0	0	0	~300 SW LINE SPEED, door #8 open
	46	0	0	0	0	no emissions.
	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	LINE SPEED ~250
	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	

SH 11
Run 3

RECORD OF VISIBLE EMISSIONS

Company Name: CERTAIN TEED
Date: 9-12-75
Plant Address: SHAKOPEE, MINN
Observer: C. Donovan
Stack Location: SAT: HOT SECTION
Observer's Location: SEE SH 1 for Comments
Weather Conditions:

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
15	00	20	15	20	15	Door #7 open, reading 8
	01	25	15	10	0	Door #7 closed, no emissions
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	10	15	Door #5 open, reading #8
7	05	20	20	20	25	
	06	15	0	0	0	Door 5 closed, 7 opened reading 8
	07	15	20	20	15	
	08	10	0	0	0	Door #7 closed, no emissions from #8
	09	0	0	0	0	
	10	0	0	0	0	
7	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	
7	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
	20	5	5	5	5	reading #7, #8 open
	21	5	5	5	5	
	22	5	5	5	5	
7	23	5	5	5	5	
	24	5	5	5	5	still reading #7, #8 open
	25	10	10	10	10	
	26	5	5	5	5	
	27	5	5	5	5	
	28	5	5	5	5	
7	29	10	5	0	0	7 closed.

#12
Run 3

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN-TEED

Date 9-12-75

Plant Address SPARROWS POINT

Observer C. Dawson

~~Stack~~ Location

Observer's Location See sk. 1 on Comments

Weather Conditions

	TIME					COMMENTS
HR	MIN	SECONDS 00	15	30	45	
15	30	0	0	0	0	line speed @ 325
	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	

SH 13
Run #3.

RECORD OF VISIBLE EMISSIONS

Company Name ~~SHAKOPEE~~ CERTAIN TEED

Date 9-12-75

Plant Address SHAKOPEE, MINN

Observer C. Duncan

~~Stack~~ Location Sat. Hole Section

Observer's Location See sh 1 on Comments

~~Weather Conditions~~

HR	MIN	SECONDS 00	15	30	45	COMMENTS
16	00	20	25	25	20	Dam. #7 open, read #8
	01	25	15	0	0	#7 closed emissions stopped in #8
	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	20	25	25	25	#7 open reading #8
	18	20	20	0	0	#7 closed, emissions stopped at #8
	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	15	20	#7 open reading #8
	27	20	15	0	0	#7 closed, emissions stopped in #8
	28	0	0	0	0	
	29	0	0	0	0	

SH 14
Rev 3

RECORD OF VISIBLE EMISSIONS

Company Name Contain Tool
Plant Address Shakopee, Minn
~~Stack~~ Location Sat Head Section
~~Weather Conditions~~

Date 9-12-75
Observer C. Donovan
Observer's Location See sk 1 on comments

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
16	30	0	0	0	0	
	31	0	0	0	0	
	32	0	0	0	0	
	33	0	0	15	15	#7 open, reading #8
	34	15	20	20	25	
	35	25	20	0	0	line down at #8 down. no
	36					emissions
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46	0	0	0	0	line on
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
	50	20	15	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	#7 open, read #8, #7 closed
	59	0	0	0	0	

SH 15
RUN 3

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-12-75

Plant Address SHAKOPEE, MINN

Observer C DUNCAN

~~Stack~~ Location SAT. HOOD SECTION

Observer's Location SEE SH 1 OR COMMENTS

~~Weather Conditions~~

HR	MIN	SECONDS 00	15	30	45	COMMENTS
17	00	0	0	0		LINE DOWN - FELT BREAKAGE
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					LINE ON
	12					
	13					
	14					
	15	0	0	0	0	LINE SPEED 325
	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	

SH 18
Row 3

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED

Date 9-12-75

Plant Address SHAKOPEE, MINN.

Observer C. Dowdell

~~Stack~~ Location SAT. HOOD SECT

Observer's Location SEE SKT / OR COMMENTS

~~Weather Conditions~~

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
18	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	20	
	42	20	25	25	25	#7 ~~closed~~ open, reading #8
	43	30	25	20	20	
	44	25	15	0	0	#7 closed, no emissions at #8
	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	

SA 17
Run 3

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED Date 9-12-75

Plant Address SHAKOPEE, MINN Observer C. DUNCAN

~~Stack~~ Location SEE HOOD SECTION Observer's Location SEE SA 1 ON COMMENTS

~~Weather Conditions~~

HR	MIN	SECONDS 00	15	30	45	COMMENTS
10	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	20	15	30	#7 open; read #8
	27	20	0	0	0	#7 closed, emissions stopped at #8
	28	0	0	0	0	
	29	0	0	0	0	

Sh 16
Run 3

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN-TEED
Date 9-12-75
Plant Address SHAMOKIN
Observer C. DUNCAN
~~Work~~ Location SAT. HOOD SECTION
Observer's Location SEE SH 1 OR COMMENTS
Weather Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
17	30	0	0	0	0	
	31	0	0	0	0	
	32	0	0	0	0	
	33	15	15	20	25	#7 open reading #8
	34	20	25	30	25	(emissions ~ 1½'d from top)
	35	20	30	25	30	#7 closed, emissions stopped
	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	20	20	30	30	#7 open, reading #8
	51	25	20	15	0	#7 closed, emissions stopped at #8
	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	

Sh 11 of FINAL
Run ~~Rep~~ 3

RECORD OF VISIBLE EMISSIONS

Company Name CERTAIN TEED Date 9-12-75

Plant Address SHAKOPEE, MINN Observer C. DUNCAN

Stack Location TIP-R SAT. HOOD Observer's Location SEE SH 1 OR COMMENTS

Weather Conditions ----

HR	MIN	SECONDS 00	15	30	45	COMMENTS
14	00	0	0	0	0	
	01	0	0	0	30	#7 open, read #8
	02	25	20	0	0	#7 closed, no emissions at #8
	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	10	20	30	#7 open, reading #8
	16	25	0	0	0	#7 closed, emissions observed at #8
	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	

Run # 3 inside saturator hood

(i)

SUMMARY
RECORD OF VISIBLE EMISSIONS

* white + yellow lights in ceiling for lighting purposes

Type of Plant Asphalt Roofing

Date 9/12/75

Company Name Certain-Teed

Hours of Observation 0900-1500

Plant Address Shakopee Minn.

Observer G. Stewart

Type of Discharge STACK OTHER Inside saturator (open line) (vent hood)

Discharge Location saturator hood

Height of Point of Discharge ~~[illegible]~~ floor level, 6-8'

Observer's Location:

Distance to Discharge Point ~10'-20'

Height of Observation Point floor level

Direction from Discharge Point N.

Background Description open + white hood doors + gray machinery

Weather: Clear Overcast Partly Cloudy Other _____ Color _____

Wind Direction _____ Wind Velocity _____ mi/hr

Plume Description:

Detached: Yes No

Color: Black White Other Gray, white

Plume Dispersion Behavior: Looping Coning Fanning

Lofting Fumigating Other dispersing

Estimated Distance Plume Visible 1-8'

Summary of Observations:

Opacity	Aggregate Time @ Opacity	Opacity	Aggregate Time @ Opacity
0	338 min. — 0 sec.	55	
5	18 min — 30 sec	60	
10	9 min — 0 sec	65	
15	0 min — 45 sec,	70	
20	5 min — 0 sec,	75	
25	~~[illegible]~~	80	
30	4 min — 15 sec;	85	
35		90	
40		95	
45		100	
50			

Shut 2
Run 3

(2)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/12/75

Plant Address Shelbyville Mun.

Observer T. Stewart

Stack Location Saturator Hood

Observer's Location Same as Sh. 1 ~~10 - 20 Not Saturator~~

Weather Conditions

HR	MIN	SECONDS 00	15	30	45	COMMENTS
09	00	0	0	0	0	No Emissions
	01	0	0	0	0	Door #8 was open at all times
	02	0	0	0	0	observer #A was only reading ~~from~~
	03	0	0	0	0	from #8 - observer B was reading from
	04	0	0	0	0	door #1 - ~~8~~ #7 which ever was open
	05	0	0	0	0	during normal operation.
	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	line down - door open no
	23	0	0	0	0	emission -
	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	

Run 3

(3)

RECORD OF VISIBLE EMISSIONS

Company Name Certain-Teed

Date 9/12/75

Plant Address Shelbyville Main.

Observer T. Stewart

Stack Location Extraction

Observer's Location Scope

~~10 20 yd. of Extraction~~

Weather Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
09	30	0	0	0	0	No visible emissions from extraction
	31	0	0	0	0	dust, line still off.
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	line on
	35	0	0	0		line on dust #8 open
	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	A constant ~~the~~ small cloud of dust
	51	0	0	0	0	particles, from over head.
	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	

Run 3

14.

RECORD OF VISIBLE EMISSIONS

Company Name Center Feed

Date 9/12/75

Plant Address Shakopee Minn.

Observer T. Stewart

Stack Location Saturator door

Observer's Location Same ~~10' - 20' N of saturator~~

Weather Conditions

HR	MIN	SECONDS 00	15	30	45	COMMENTS
10	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	line stop, overhaul in belt, no emission visible
	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	line on bringing up to speed.
9:24	21	0	0	0	0	
9	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
	25	10	10	10	10	door ~~2~~ open reading door ~~[illegible]~~
	26	10	0	0	0	door closed
	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

Run 3

RECORD OF VISIBLE EMISSIONS

Company Name [illegible] Steel

Plant Address [illegible]

Stack Location [illegible]

Weather Conditions

Date 9/12/75

Observer T. Stewart

Observer's Location ~10' - 20' from dip gates

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
10	30	0	0	0	0	door #7 open
	31	0	0	0	0	closed #7 door No emission
	32	0	0	0	0	
	33	5	5	5	5	door #4 open - next door also
	34	5	5	5	5	visible from saturator door
	35	0	0	0	0	door closed
	36	0	0	0	0	
	37	0	0	0	0	
	38	10	10	10	10	door #6 open (dip gate)
	39	20	20	20		door
	40	10	0	0	10	door #4 open saturator
	41	20	20	10	10	
	42	10	0	0	0	#4 door closed
	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	line stopped, break
	51	0	0	0	0	
	52	0	0	0	0	break in line - door open
	53					
	54					
	55					
	56					
	57					
	58					
	59					

Unit 6
Run 3

(6)

RECORD OF VISIBLE EMISSIONS

Company Name Cargill Feed
Date 9/12/75
Plant Address Shakopee
Observer T. Steward
Stack Location inside dehumidifier
Observer's Location ~10' - 20' from dehumidifier
Weather Conditions

HR	MIN	SECONDS 00	15	30	45	COMMENTS
11	00					
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11	0	0	0	0	line on - not up to speed -
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
	15	0	0	0	0	line stopped - broke
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	line stopped - broke
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

Spot 1 (1)

RECORD OF VISIBLE EMISSIONS Run 3

Company Name Certain Teed Date 9/13/75

Plant Address Shakopee Minn. Observer T. Stewart

Stack Location inside Intermator Observer's Location ~10' 20' from door

Weather Conditions

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
11	30					line down
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					line on - not up to full speed
	41	0	0	0	0	
	42	0	0	0	0	
	43	0	0	0	0	door #4 opens no emission
	44	0	0	0	0	#4 door closed
	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	

Sheet 8 (10)

Run #3

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/12/75

Plant Address Shakopee Minn.

Observer T. Stewart

Stack Location inside scrubber

Observer's Location ~10' - 20' from scrubber

Weather Conditions

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
12	00	0	0	0	0	line on - ~~no~~ all doors closed - no
	01	0	0	0	0	emission visible
	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	line off - breakage in line
	13	~~0~~	~~0~~	~~0~~	~~0~~	~~line off - broke~~
	14					went to lunch
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

Run # 3-B Stack 9 (41)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/12/75

Plant Address Shakopee Minn.

Observer G. Stewart

Stack Location inside saturator

Observer's Location ~10' – 20' from door

Weather Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
14	00	0	0	0	0	line on
	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	10	10	5	10	Door # 7 open
	21	10	10	10	5	
	22	5	5	0	0	* line broke - down all doors open
	23					
	24					
	25					
	26					
	27					
	28					
	29					

Start 10
Run 3

(10)

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed
Date 9/12/75
Plant Address Shakopee Minn.
Observer T. Stewart
Stack Location inside Saturator
Observer's Location ~10' - 20' from Hood.
Weather Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
14	30					line off
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
✓	45	0	0	0	0	line started - all doors closed
	46	0	0	0	0	no emission visible - line speed @ 310
	47	0	0	0	0	
	48	0	0	0	0	
	49	0	0	0	0	
	50	0	0	0	0	line speed reduced to 250
	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	

(11

RECORD OF VISIBLE EMISSIONS Run #3 Start 11

Company Name Chevron T.Corp. Date 9/12/75

Plant Address Stringfellow Mesa Observer T. Stewart

Stack Location Inside Detoxification Observer's Location ~10' – 20' from Hood

Weather Conditions

HR	MIN	SECONDS 00	15	30	45	COMMENTS
15	00	5	5	10	10	Door #7 open
	01	10	10	10	0	" Closed
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05	5	10	5	5	del gate #5 open
	06	5	0	10	10	door 7" open
	07	10	10	0	0	door closed
	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	20	20	20	20	door #7 open ~~[illegible]~~
	21	20	20	20	20	
	22	20	20	20	20	
	23	20	20	10	10	
	24	15	15	20	20	
	25	30	30	30	30	
	26	30	30	30	30	~~door #7 closed~~
	27	30	30	20	20	
	28	30	30	30	30	
	29	30	20	10	0	door #7 closed

Run 3 Sheet 12.

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/12/75

Plant Address Shakopee Minn.

Observer G. Stinstead

Stack Location inside saturator

Observer's Location ~10' - 20' from stack

Weather Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
15	30	0	0	0	0	door closed, no emission visible
	31	0	0	0	0	line speed 325
	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	

Run #3 Sheet 13

(13)

RECORD OF VISIBLE EMISSIONS

Company Name Clinton Food

Date 9/12/75

Plant Address Sinclair Mann

Observer T. Stewart

Stack Location inside Saturator

Observer's Location ~10' - 20' from Hood

Weather Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
16	00	5	5	5	10	door #7 open reading #7
	01	10	10	10	0	" #7 closed
	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	5	5	5	5	door #7 open reading #7
	17	5	0	0	0	door #7 closed
	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	5	5	5	0	door #7 open reading #7
	28	0	0	0	0	" " closed
	29	0	0	0	0	

Run #3 sheet 14

(14.

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/11/75

Plant Address Shakopee Minn.

Observer T. Stewart

Stack Location inside saturator

Observer's Location ~10'-20' from Hood

Weather Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
16	30	0	0	0	0	all doors closed
	31	0	0	0	0	
	32					
	33	5	5	5	5	door #7 open
	34	5	5	5	5	line broke ...
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46	0	0	0	0	line on
	47	0	0	0	0	
	48	0	0	0	0	~~line on~~
	49	0	0	0	0	
	50	5	5	0	0	line up to 350 - door #7 open
	51	0	0	0	0	reading #7. #7 door closed
	52	0	0	0	0	X
	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	

Run 3 Shed 15

(15

RECORD OF VISIBLE EMISSIONS

Company Name Cereal Food

Date 9/12/75

Plant Address Strickfaden Missouri

Observer F. Conrad

Stack Location

Observer's Location Second

Weather Conditions

HR	MIN	TIME SECONDS 00	15	30	45	COMMENTS
17	00	0	0	0	0	break - line down
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15	0	0	0	0	line on speed @ 325
	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	

Run : Sheet 16 (16)

RECORD OF VISIBLE EMISSIONS

Company Name Centrin Food Date 9/12/75

Plant Address Shelbyville Ind. Observer T. Stewart

Stack Location inside Dehydrator Observer's Location ~10'-20' from Hood

Weather Conditions

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
17	30	0	0	0	0	
	31	0	0	0	0	
	32	0	0	0	0	
	33	5	5	5	5	door #7 open
	34	5	5	5	5	
	35	5	5	0	0	door #7 closed
	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	5	5	5	5	door #7 open reading #?
	51	5	5	0	0	" " closed
	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	

Shut 17 Run #3

(17

RECORD OF VISIBLE EMISSIONS

Company Name Citizens Steel

Date 9/12/75

Plant Address Shapiro

Observer G. Stewart

Stack Location inside extension

Observer's Location 10' - 20' from Hood.

Weather Conditions

HR	MIN	SECONDS 00	15	30	45	COMMENTS
18	00	0	0	0	0	no emission visible
	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	5	5	door " 7 open
	27	5	0	0	0	" " closed
	28	0	0	0	0	
	29	0	0	0	0	

Run 3 Sheet 18

(18

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/12/75

Plant Address Shakopee Minn.

Observer J. Stewart

Stack Location inside Saturator

Observer's Location ~10' – 20' from Hood

Weather Conditions

TIME HR	MIN	SECONDS 00	15	30	45	COMMENTS
18	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	5	5	5	5	door # 7 open, reading # 7
	43	5	5	5	5	
	44	5	0	0	0	door # 7 closed
	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	

Run 3 sheet 19

RECORD OF VISIBLE EMISSIONS

Company Name Certain Teed

Date 9/12/75

Plant Address Kingsport Mining

Observer T. Stewart

Stack Location Inside Intake

Observer's Location ~10' - 20' from Head

Weather Conditions

HR	MIN	SECONDS 00	15	30	45	COMMENTS
19	00	0	0	0	0	
	01	5	5	5	0	clean # 7 open - clean # closed
	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	5	5	clean # 7 open
	16	5	5	0	0	" " - closed
	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	Stopped - end of run

APPENDIX M

BATTELLE SAMPLING CREW TEST LOG

APPENDIX M

BATTELLE SAMPLING CREW TEST LOG

Date (1975)	
September 7	Part of crew arrived; check and rearrange scaffolding.
September 8	Set up lab clean-up areas in back of rented trucks; rest of crew arrived. Place equipment on scaffolding. Run preliminary traverse and moisture determination.
September 9	Assigned crew responsibilities 0900 hrs. Began Method 5 clean-up evaluation. TP-5-1 started 1200 hrs. At 1800 hrs begin runs TP-1-1, TP-2-1, TP-3-1, TP-4-1. Continued sampling despite storm activity in area at 2000 hrs. Runs completed 2130 hrs. Closed shop at 2045 hrs. (Plant processing shingles.)
September 10	Plant processing rolls between 0800 and 1800 hrs, not shingles. Conduct sample Runs 2 and 3 at TP-5. Closed shop at 2010 hrs.
September 11	Arrived at site 0800 hrs. Run No. 2 started 1100 hrs at TP-1, TP-2, TP-3, TP-4. Complete Run No. 2 at 1600 hrs. Start Run No. 4 at TP-5 1700 hrs. Closed shop at 2010 hrs. (Plant processing shingles.)
September 12	Arrived at plant at 0800 hrs. Clean-up TP-3. EPA checking process. Begin Run 3 at TP-1, TP-2, TP-3, and TP-4 at 1400 hrs. Get bag samples for SO_2/NO_x. At 1900 hrs end Run 3 at TP-1, TP-2, TP-3, and TP-4. Get flask samples (Plant process problems; broken felt). Closed lab at 2130 hrs. Pack part of equipment for return to Columbus. Part of crew returns to Columbus.
September 13	Arrive site 0800 hrs. Conduct simultaneous POM runs at TP-1 and TP-2 from 1419-1942 hrs. Prepare for aldehyde samples at TP-3 and TP-4, simultaneously. End aldehyde samples at 1555 hrs. Disassemble and pack remaining equipment.
September 14	Part of crew returns to Columbus. Crew to sample at Waukegan, Illinois, leave by truck, car and plane.

APPENDIX N

PROJECT PARTICIPANTS

APPENDIX N

PROJECT PARTICIPANTS

Battelle Columbus Laboratories

R. E. Barrett, Associate Manager	Coordinator
P. R. Webb, Senior Technologist	Crew Chief
S. E. Miller	Gaseous Measurements
W. C. Baytos	Clean-up
J. McNulty	Clean-up
K. W. Turner	Particulate Measurements
T. C. Lyons	Particulate Measurements
P. R. Fritter	Particulate Measurements
H. G. Leonard	Particulate Measurements
F. L. Rice	Particulate Measurements
J. L. White	Particulate Measurements
E. J. Schulz	Particulate Measurements
D. Hupp	Particulate Measurements
R. Coleman	Particulate Measurements
J. A. Stetz	Gas Sample Collection
J. L. Harp	Gas Sample Collection
R. E. Robinson	Gas Sample Collection

Environmental Protection Agency

C. E. Riley	Project Officer-Project Coordinator
E. Noble	Project Officer-Process
T. Logan	Project Officer-Sampling & Analysis

Midwest Research Institute

K. Ananth	Process Monitor

Monsanto

C. Duncan	Visable Emissions
T. Stewart	Visable Emissions
D. L. Harris	Particle Size