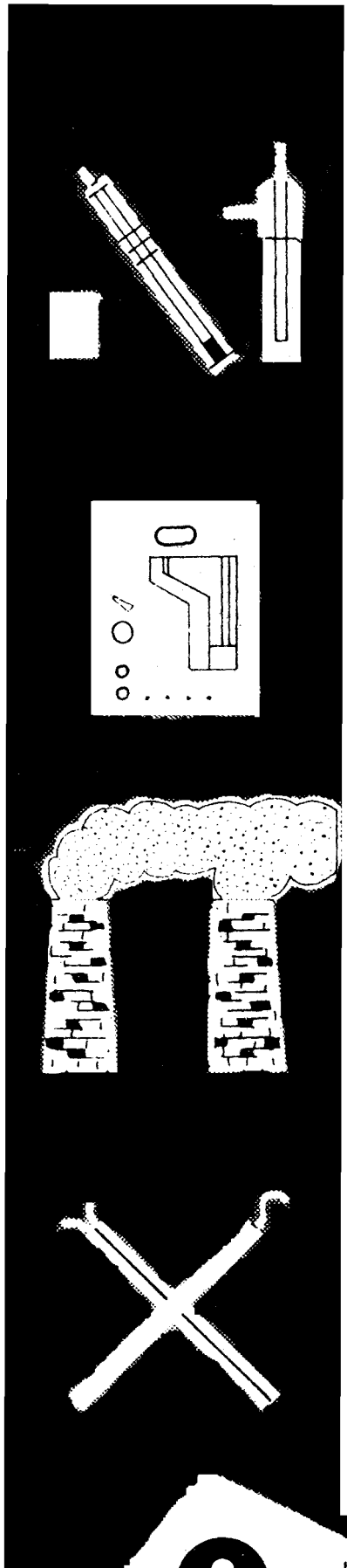
Project Report No. 75-ARM-2



AIR POLLUTION EMISSION TEST

Certain-Teed Corp.
Chicago Heights, Illinois

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.
75-ARM-2

Plant Tested

Certain-Teed Corporation
Chicago Heights, Illinois

July 22-23, 1975

Prepared for

Environmental Protection Agency
Emission Measurement Branch
Research Triangle Park
North Carolina 27711

by

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Contract No. 68-02-1404, Task No. 13

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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 Asphalt Roofing Plant in Chicago Heights, Illinois on July 22-23, 1975.

The field test work was directed by John W. Brown, Field Testing Section, Emission Measurement Branch. The visible emissions were recorded by John W. Brown of the EPA and Tommy L. Stewart of Monsanto Research Corporation. Process data was recorded by Dr. K. P. Ananth of Midwest Research Institute.

The opacity of the exhaust stack effluent from the mist eliminator controlling emissions from the seven storage tanks was observed. Of the seven storage tanks three contained bulk asphalt, three contained saturator working material and one contained coating material. Emissions were observed for a

total of twelve hours and included periods of normal operations, asphalt transfer and heating. The emission opacity was determined by using EPA Method 9 as given in the Federal Register Vol. 39, No. 219, November 12, 1974. During the testing period, observations were made from three locations, two using the sky as background and the other the dark colored coater work tank as background.

This report presents a summary of the visible emission data with the field observation and data sheets included in the appendix.

II. SUMMARY AND DISCUSSION OF RESULTS

The visible emission data was recorded for a total of twelve hours over a two day period, with readings being made every fifteen seconds as specified in Method 9. Observer John W. Brown (EPA), Observer No. 1, was certified at NERC, Research Triangle Park, N. C. on 3-5-75 and observer Tommy L. Stewart (MRC), Observer No. 2, was certified by the Ohio EPA, Columbus, Ohio on 3-27-75. In both cases certification is for a six month period and therefore were valid for the July 22-23 observation period.

During the period there was only one of the fifteen second readings (12:36:30 on 7-22) when the visible emission was observed to be above zero opacity. This reading was an opacity of 10, and was only recorded by one of the two observers due to the fact that the smoke seen was essentially an instantaneous puff, not judged by one observer to have occurred at the 15 second reading interval. For all practical purposes, therefore, no visible emissions were observed for the entire test period.

Neither the routine tank-to-tank asphalt transfers nor the periodic backflushing of the control device prefilter produced any outlet emissions that were visibly detectable.

On the first day the weather was good. Overcast skies prevailed and a very light rain fell for about one hour during the readings on the second day. The undesirable weather

conditions were not considered unacceptable as an alternate high contrast background was utilized for those readings taken in the rain.

The physical layout of the plant as far as the storage tanks and mist eliminator is concerned and the location of the observation points is shown in Figure 1. A summary of the time of observation, observation points, pertinent distances, weather conditions, and opacity is presented in Table 1. The opacity data for the entire twelve hours of reading time is shown graphically in Figure 2. The summaries of visible emissions for each sampling period and each observer are included in this section following Figure 2.

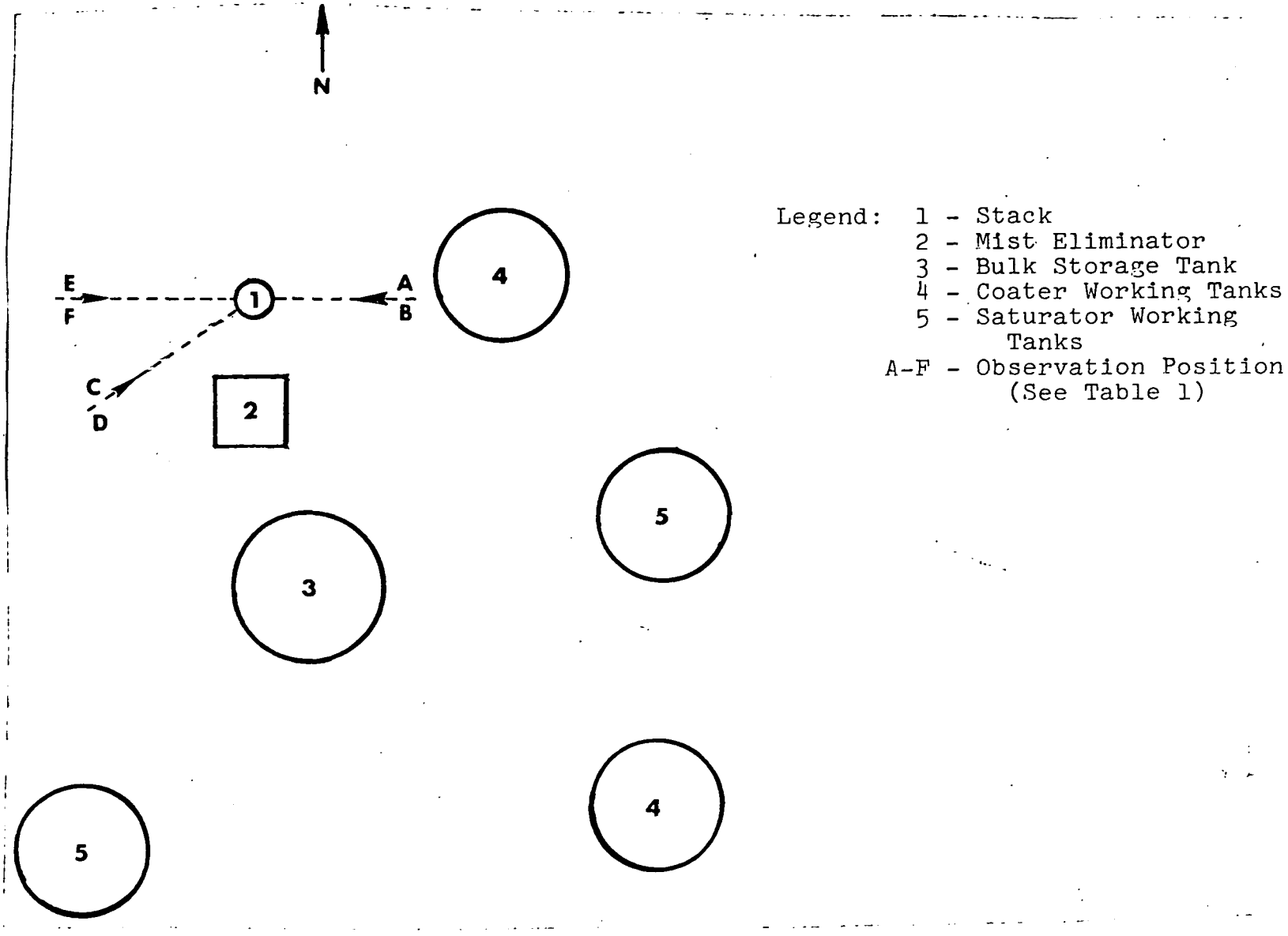

Figure 1. Layout of Storage Tanks, Mist Eliminator and Stack with Respect to Visible Emission Observators

Table 1. Summary of Visible Emission Data
Certain-Teed, Chicago Heights, Illinois

Date	24 Hr. Clock Time	Obs. Site	Dist. to Source (ft)	Direction from Source	Wind Direction	Wind Velocity MPH	Weather	Background	Time-Opacity
7-22	10:00-13:00	A	40	E	S.W.	2-5	Part Cloudy	Sky	179 min 45 sec-0 15 sec 10
7-22	10:00-13:00	B	40	E	S.W.	2-5	Part Cloudy	Sky	180 min - 0
7-22	14:00-17:00	C	50	S.W.	S.W.	2-15	Part Cloudy	Sky	180 min - 0
7-22	14:00-17:00	D	50	S.W.	S.W.	2-15	Part Cloudy	Sky	180 min - 0
7-23	8:00-11:00	A	40	E	S	2-5	Overcast	Sky	180 min - 0
7-23	8:00-11:00	B	40	E	S	2-5	Overcast	Sky	180 min - 0
7-23	11:00-14:00	E	50	W	S	2-10	Overcast Rain	Sky(11:00-11:30) Dark Tank (11:30-14:00)	180 min - 0
7-23	11:00-14:00	F	50	W	S	2-10	Part Cloudy Rain	Sky(11:00-11:30) Dark Tank (11:30-14:00)	180 min - 0

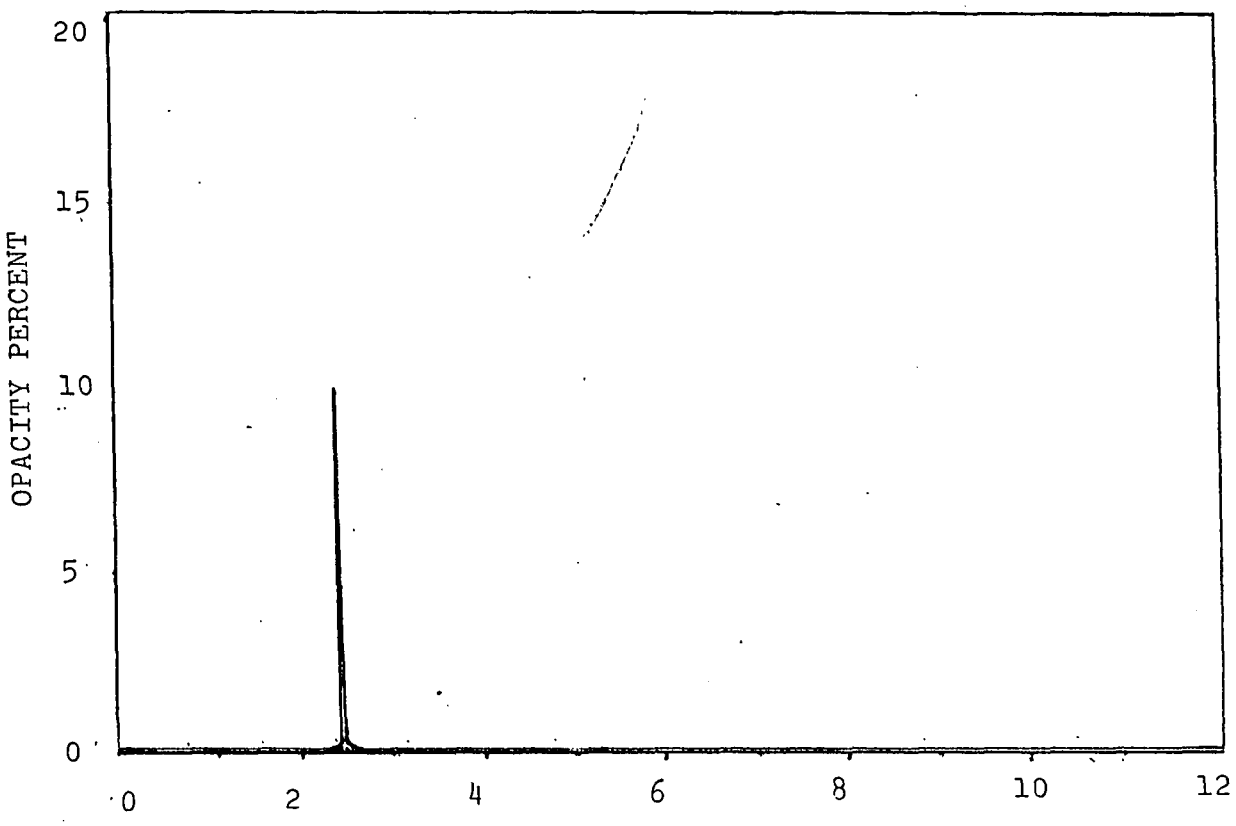

Figure 2. Opacity for 12 Hours Reading Time

FACILITY

Summary of Visible Emissions

(Observer No. 1)

Date: 7/22/75

Type of Plant: Asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: 40'

Location of Discharge: Mist eliminator outlet

Height of Observation Point: Ground Level

Height of Point of Discharge: 20'

Direction of Observer from Discharge Point: E

Description of Background: Sky

Description of Sky: partly cloudy

Wind Direction: S.W.

Wind Velocity: 2-5 mi/hr

Color of Plume: not visible

Detached Plume:

Duration of Observation: 3 hours

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	10:00	10:06	0	0
2	10:06	10:12	0	0
3	10:12	10:18	0	0
4	10:18	10:24	0	0
5	10:24	10:30	0	0
6	10:30	10:36	0	0
7	10:36	10:42	0	0
8	10:42	10:48	0	0
9	10:48	10:54	0	0
10	10:54	11:00	0	0
11	11:00	11:06	0	0
12	11:06	11:12	0	0
13	11:12	11:18	0	0
14	11:18	11:24	0	0
15	11:24	11:30	0	0
16	11:30	11:36	0	0
17	11:36	11:42	0	0
18	11:42	11:48	0	0
19	11:48	11:54	0	0
20	11:54	12:00	0	0

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	1200	12:06	0	0
22	12:06	12:12	0	0
23	12:12	12:18	0	0
24	12:18	12:24	0	0
25	12:24	12:30	0	0
26	12:30	12:36	10	0.417
27	12:36	12:42	0	0
28	12:42	12:48	0	0
29	12:48	12:54	0	0
30	12:54	13:00	0	0
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(1)

FACILITY

Summary of Visible Emissions
(Observer No. 2)

Date: 7/22/75

Type of Plant: Asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: 40'

Location of Discharge: Mist Elimination Outlet

Height of Observation Point: Ground level

Height of Point of Discharge: 20'

Direction of Observer from Discharge Point: E

Description of Background: Sky

Description of Sky: Partly Cloudy

Wind Direction: S-W.

Wind Velocity: 2-5 mi/hr

Color of Plume: Not Visible

Detached Plume:

Duration of Observation: 3 hrs.

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	10:00	10:06	0	0
2	10:06	10:12	"	"
3	10:12	10:18	"	"
4	10:18	10:24	"	"
5	10:24	10:30	"	"
6	10:30	10:36	"	"
7	10:36	10:42	"	"
8	10:42	10:48	"	"
9	10:48	10:54	"	"
10	10:54	11:00	"	"
11	11:00	11:06	"	"
12	11:06	11:12	"	"
13	11:12	11:18	"	"
14	11:18	11:24	"	"
15	11:24	11:30	"	"
16	11:30	11:36	"	"
17	11:36	11:42	"	"
18	11:42	11:48	"	"
19	11:48	11:54	"	"
20	11:54	12:00	"	"

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	12:00	12:06	0	0
22	12:06	12:12	"	"
23	12:12	12:18	"	"
24	12:18	12:24	"	"
25	12:24	12:30	"	"
26	12:30	12:36	"	"
27	12:36	12:42	"	"
28	12:42	12:48	"	"
29	12:48	12:54	"	"
30	12:54	13:00	"	"
31				
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38				
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(29)

FACILITY

Summary of Visible Emissions
(Observer No. 1)

Date: 7/22/75

Type of Plant: Asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: 50

Location of Discharge: Mist eliminator outlet

Height of Observation Point: Ground Level

Height of Point of Discharge: 20'

Direction of Observer from Discharge Point: S-i

Description of Background: Sky

Description of Sky: Partly cloudy

Wind Direction: S.W

Wind Velocity: 2-15

Color of Plume: Not visible

Detached Plume:

Duration of Observation: 3 hrs.

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	14:00	14:06	0	0
2	14:06	14:12	"	"
3	14:12	14:18	"	"
4	14:18	14:24	"	"
5	14:24	14:36	"	"
6	14:30	14:36	"	"
7	14:36	14:42	"	"
8	14:42	14:48	"	"
9	14:48	14:54	"	"
10	14:54	15:00	"	"
11	15:00	15:06	"	"
12	15:06	15:12	"	"
13	15:12	15:18	"	"
14	15:18	15:24	"	"
15	15:24	15:30	"	"
16	15:30	15:36	"	"
17	15:36	15:42	"	"
18	15:42	15:48	"	"
19	15:48	15:54	"	"
20	15:54	16:00	"	"

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	16:00	16:06	0	0
22	16:06	16:12	"	"
23	16:12	16:18	"	"
24	16:18	16:24	"	"
25	16:24	16:30	"	"
26	16:30	16:36	"	"
27	16:36	16:42	"	"
28	16:42	16:48	"	"
29	16:48	16:54	"	"
30	16:54	17:00	"	"
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38				
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FACILITY

Summary of Visible Emissions

(Observer No. 2)

Date: 7/22/75

Type of Plant: Asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: 50'

Location of Discharge: mist eliminator outlet

Height of Observation Point: ground level

Height of Point of Discharge: 20'

Direction of Observer from Discharge Point: SW

Description of Background: Sky

Description of Sky: partly cloudy

Wind Direction: S-W-

Wind Velocity: 2-15 mi/hr

Color of Plume: not visible

Detached Plume:

Duration of Observation: 3 hrs

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	14:00	14:06	0	0
2	14:06	14:12	"	"
3	14:12	14:18	"	"
4	14:18	14:24	"	"
5	14:24	14:30	"	"
6	14:30	14:36	"	"
7	14:36	14:42	"	"
8	14:42	14:48	"	"
9	14:48	14:54	"	"
10	14:54	15:00	"	"
11	15:00	15:06	"	"
12	15:06	15:12	"	"
13	15:12	15:18	"	"
14	15:18	15:24	"	"
15	15:24	15:30	"	"
16	15:30	15:36	"	"
17	15:36	15:42	"	"
18	15:42	15:48	"	"
19	15:48	15:54	"	"
20	15:54	16:00	"	"

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	16:00	16:06	0	0
22	16:06	16:12	"	"
23	16:12	16:18	"	"
24	16:18	16:24	"	"
25	16:24	16:30	"	"
26	16:30	16:36	"	"
27	16:36	16:42	"	"
28	16:42	16:48	"	"
29	16:48	16:54	"	"
30	16:54	17:00	"	"
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FACILITY

Summary of Visible Emissions

(Observer No. 1)

Date: 7/23/75

Type of Plant: Asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: 40

Location of Discharge: mist eliminator outlet

Height of Observation Point: Ground level

Height of Point of Discharge: 20'

Direction of Observer from Discharge Point: E

Description of Background: Sky

Description of Sky: Partly Cloudy

Wind Direction: S.

Wind Velocity: 2-5 mi/hr

Color of Plume: not visible

Detached Plume:

Duration of Observation: 3 hrs

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	8:00	8:06	0	0
2	8:06	8:12	"	"
3	8:12	8:18	"	"
4	8:18	8:24	"	"
5	8:24	8:30	"	"
6	8:30	8:36	"	"
7	8:36	8:42	"	"
8	8:42	8:48	"	"
9	8:48	8:54	"	"
10	8:54	9:00	"	"
11	9:00	9:06	"	"
12	9:06	9:12	"	"
13	9:12	9:18	"	"
14	9:18	9:24	"	"
15	9:24	9:30	"	"
16	9:30	9:36	"	"
17	9:36	9:42	"	"
18	9:48	9:48	"	"
19	9:48	9:54	"	"
20	9:54	10:00	"	"

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	10:00	10:06	0	0
22	10:06	10:12	"	"
23	10:12	10:18	"	"
24	10:18	10:24	"	"
25	10:24	10:30	"	"
26	10:30	10:36	"	"
27	10:36	10:42	"	"
28	10:42	10:48	"	"
29	10:48	10:54	"	"
30	10:54	11:00	"	"
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(3) 4

FACILITY

Summary of Visible Emissions

(Observer No. 2)

Date: 7/23/75

Type of Plant: asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: 40'

Location of Discharge: mist eliminator

Height of Observation Point: Ground level

Height of Point of Discharge: 20'

Direction of Observer from Discharge Point: E

Description of Background: Sky

Description of Sky: Overcast

Wind Direction: S.

Wind Velocity: 2-5 mi/hr.

Color of Plume: not visible

Detached Plume:

Duration of Observation: 3 hrs

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	8:00	8:06	0	0
2	8:06	8:12	"	"
3	8:12	8:18	"	"
4	8:18	8:24	"	"
5	8:24	8:30	"	"
6	8:30	8:36	"	"
7	8:36	8:42	"	"
8	8:42	8:48	"	"
9	8:48	8:54	"	"
10	8:54	9:00	"	"
11	9:00	9:06	"	"
12	9:06	9:12	"	"
13	9:12	9:18	"	"
14	9:18	9:24	"	"
15	9:24	9:30	"	"
16	9:30	9:36	"	"
17	9:36	9:42	"	"
18	9:42	9:48	"	"
19	9:48	9:54	"	"
20	9:54	10:00	"	"

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	10:00	10:06	0	0
22	10:06	10:12	"	"
23	10:12	10:18	"	"
24	10:18	10:24	"	"
25	10:24	10:30	"	"
26	10:30	10:36	"	"
27	10:36	10:42	"	"
28	10:42	10:48	"	"
29	10:48	10:54	"	"
30	10:54	11:00	"	"
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FACILITY

Summary of Visible Emissions

(Observer No. 1)

Date: 7/23/75

Type of Plant: Asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: 50'

Location of Discharge: mist eliminator

Height of Observation Point: Ground level

Height of Point of Discharge: 20'

Direction of Observer from Discharge Point: W.

Description of Background: Sky

Description of Sky: Partly cloudy

Wind Direction: S.

Wind Velocity: 2-10 mi/hr

Color of Plume: Not visible

Detached Plume:

Duration of Observation: 3 hrs

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	11:00	11:06	0	0
2	11:06	11:12	"	"
3	11:12	11:18	"	"
4	11:18	11:24	"	"
5	11:24	11:30	"	"
6	11:30	11:36	"	"
7	11:36	11:42	"	"
8	11:42	11:48	"	"
9	11:48	11:54	"	"
10	11:54	12:00	"	"
11	12:00	12:06	"	"
12	12:06	12:12	"	"
13	12:12	12:18	"	"
14	12:18	12:24	"	"
15	12:24	12:30	"	"
16	12:30	12:36	"	"
17	12:36	12:42	"	"
18	12:42	12:48	"	"
19	12:48	12:54	"	"
20	12:54	13:00	"	"

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	13:00	13:06	0	0
22	13:06	13:12	"	"
23	13:12	13:18	"	"
24	13:18	13:24	"	"
25	13:24	13:30	"	"
26	13:30	13:36	"	"
27	13:36	13:42	"	"
28	13:42	13:48	"	"
29	13:48	13:54	"	"
30	13:54	14:00	"	"
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(4)

FACILITY

Summary of Visible Emissions

(Observer No. 2)

Date: 7/23/75

Type of Plant: Asphalt Roofing

Type of Discharge: Stack

Distance from Observer to Discharge Point: 50

Location of Discharge: mist eliminator outlet

Height of Observation Point: Ground level

Height of Point of Discharge: 20'

Direction of Observer from Discharge Point: W.

Description of Background: Sky

Description of Sky: overcast

Wind Direction: S

Wind Velocity: 2-10 mi/hr,

Color of Plume: not visible

Detached Plume:

Duration of Observation: 3 hrs,

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
1	10:00	11:06	0	0
2	11:06	11:12	"	"
3	11:12	11:18	"	"
4	11:18	11:24	"	"
5	11:24	11:30	"	"
6	11:30	11:36	"	"
7	11:36	11:42	"	"
8	11:42	11:48	"	"
9	11:48	11:54	"	"
10	11:54	12:00	"	"
11	12:00	12:06	"	"
12	12:06	12:12	"	"
13	12:12	12:18	"	"
14	12:18	12:24	"	"
15	12:24	12:30	"	"
16	12:30	12:36	"	"
17	12:36	12:42	"	"
18	12:42	12:48	"	"
19	12:48	12:54	"	"
20	12:54	13:00	"	"

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start	Time End	Opacity Sum	Opacity Average
21	1300	13:06	0	0
22	13:06	13:12	"	"
23	13:12	13:18	"	"
24	13:18	13:24	"	"
25	13:24	13:30	"	"
26	13:30	13:36	"	"
27	13:36	13:42	"	"
28	13:42	13:48	"	"
29	13:48	13:54	"	"
30	13:54	14:0	"	"
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III. PROCESS DESCRIPTION AND OPERATIONS

Emission tests were conducted at Certain-Teed's asphalt roofing manufacturing plant at Chicago Heights to determine the opacity of stack emissions from the Brink® mist eliminator. The Brink® mist eliminator was used as the emission control system for the asphalt storage tanks at the plant. Descriptions of the process involving the tanks, the Brink® emission control system, and process operation are presented in the following sections.

Process Description

The physical layout of the tanks, including the blowing still, their dimensions, and the Brink® mist eliminator at the plant are shown schematically in Figure 3. Tank 4 was under repair during the tests and was empty.

Asphalt was transferred from the main storage tanks (S_I and S_{II} at about 260°F to the flux tank (i.e., Tank No. 5) where it was heated to about 475°F prior to being oxidized in the blowing still. The flux tank and the four work tanks were equipped with closed-loop heaters. Tank No. 4 and the flux tank each had separate heaters whereas Tanks 1, 2, and 3 shared two heaters. Figure 4 is a schematic of the asphalt flow system and tank-heater arrangement. Asphalt was pumped from the work tanks to the manufacturing lines as required. The level and temperature of asphalt in the tanks and the temperature of gases and particulates entering the Brink® control system were

monitored at half-hour intervals during the tests and these values are presented in Table 2.

Emission Control System

Emission sources that were controlled by the Brink® unit were the two main storage tanks, the flux tank and the four work tanks. Of the four work tanks, Tank No. 4 was under repair and valved off from the Brink® unit.

The Brink® mist eliminator basically consists of a vertical packed fiber bed retained between two concentric cylindrical screens. Gases containing mist and spray particles pass in a horizontal direction through the fiber bed. Clean gases emerge from the bed and rise upward to exit from the system. The liquid particulates (mist and spray) are collected on the fibers in the bed and coalesce into liquid films which are moved horizontally through the fiber bed by the drag of the gases and then downward by gravity.

The Brink® mist eliminator at the Certain-Teed plant is equipped with a prefilter made of stainless steel mesh. The prefilter knocks out water and oil sludge and is cleaned once a month. The packed fiber bed or the Brink® element itself is backflushed once every 8 hr with no observed difference in pressure drop which is usually about 13 in. H_2O. Details on the Brink® system, as provided by plant personnel, are shown below:

Manufacturer: Monsanto Enviro-Chem Systems, Inc.
St. Louis, Missouri

Size No.: 2496

Design Capacity: 1,000 cfm

Blower horsepower: 10

Process Operation

Emission tests were conducted when the process was apparently normal. The work tanks were operated at their normal operating capacity of 20,000 gal. and the flux tank at its operating capacity of 18,000 gal. The actual capacities of the work tanks and the flux tank are 25,000 gal. each.

The Brink® element was backflushed during emission test as per regular plant schedule and no variation was observed either in the pressure drop or in the opacity of stack emissions.

The quantity of oil collected from the Brink® and from the ducts leading to the Brink® was also monitored during the tests and is recorded in Table 1.

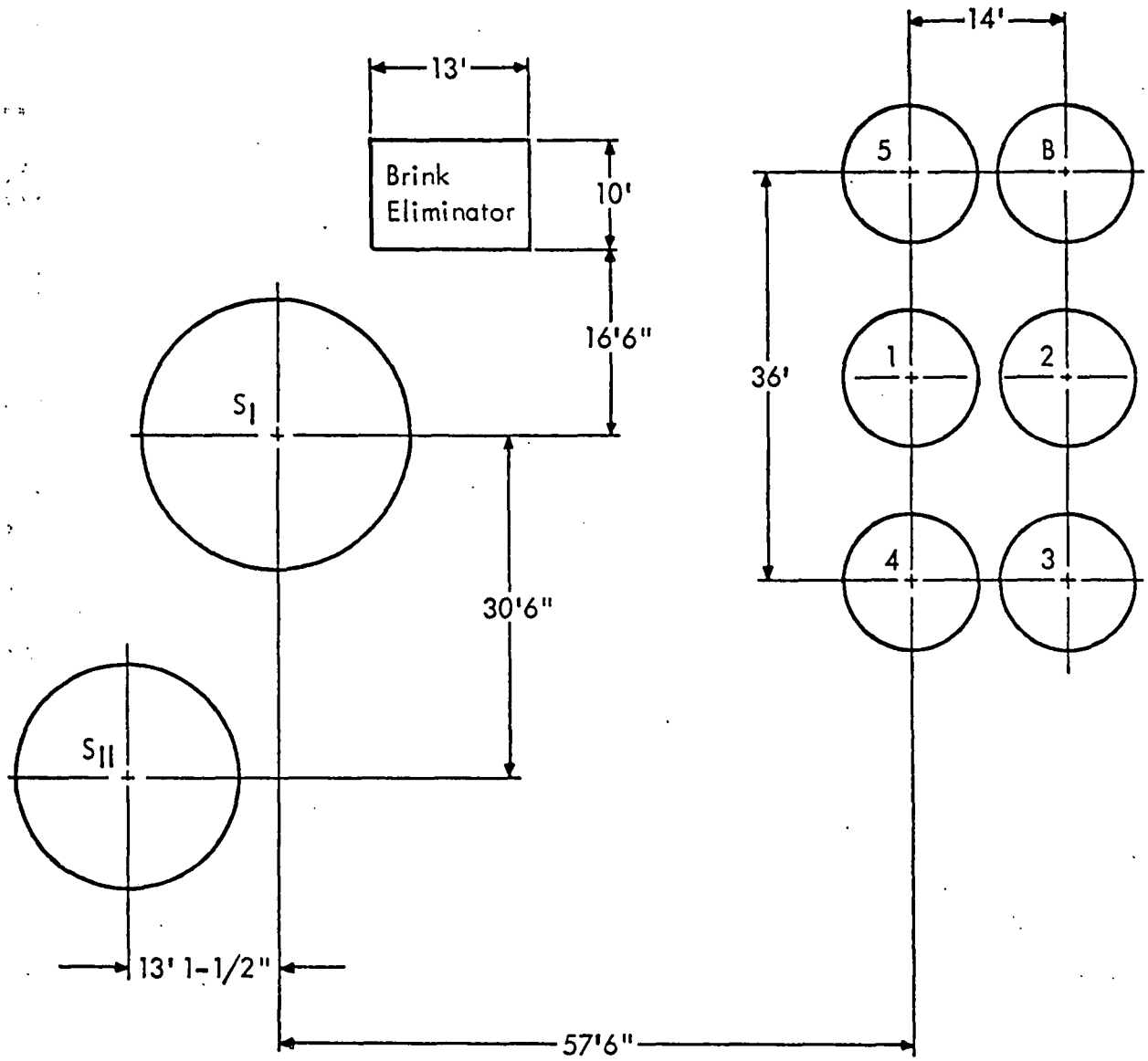
Even though the process was apparently normal, there were certain limitations in the method of operation and in the tests. These limitations are detailed below:

1. Methods to establish the quantity of asphalt in each tank and the temperature of gases entering Brink® are not precise. The amount of asphalt in each tank is estimated only from a visual observation of the float level.

2. The gas temperature range of 80 to 100°F at the Brink® inlet seems suspect in light of the fact that ambient temperatures were only ~1 to 5° below that of the gases. The temperature gauge was replaced with another one available at the plant, but it did not make a significant difference in the temperatures recorded.

3. There were no means of verifying the temperature of asphalt in the two main storage tanks. It was reported to be 260°F throughout the test by plant personnel but there were no temperature sensors and plant personnel could not even provide the pressure of steam used for heating the tanks.

4. The tests do not indicate the extent of control on gases (i.e., gaseous hydrocarbons). It would be reasonable to expect more gaseous matter than particulates to escape from hot asphalt storage tanks.



LEGEND

S_I - Main Storage Tank
100,000 gal cap, 25' high, 25' dia
S_{II} - Main Storage Tank
50,000 gal cap, 21' high, 20' dia
1 - Roll Saturant Tank
2 - Shingle Saturant Tank
3 - Shingle Saturant Tank
4 - Coating Tank
5 - Flux Tank
B - Blowing Still
Tanks 1-5, each have a capacity of 25,000 gal and are 30'6" high with 12'6" diameter

Figure 3. Layout of asphalt storage tanks, Blowing Still, and Brink Mist Eliminator at Certain-Teed's Chicago Heights plant

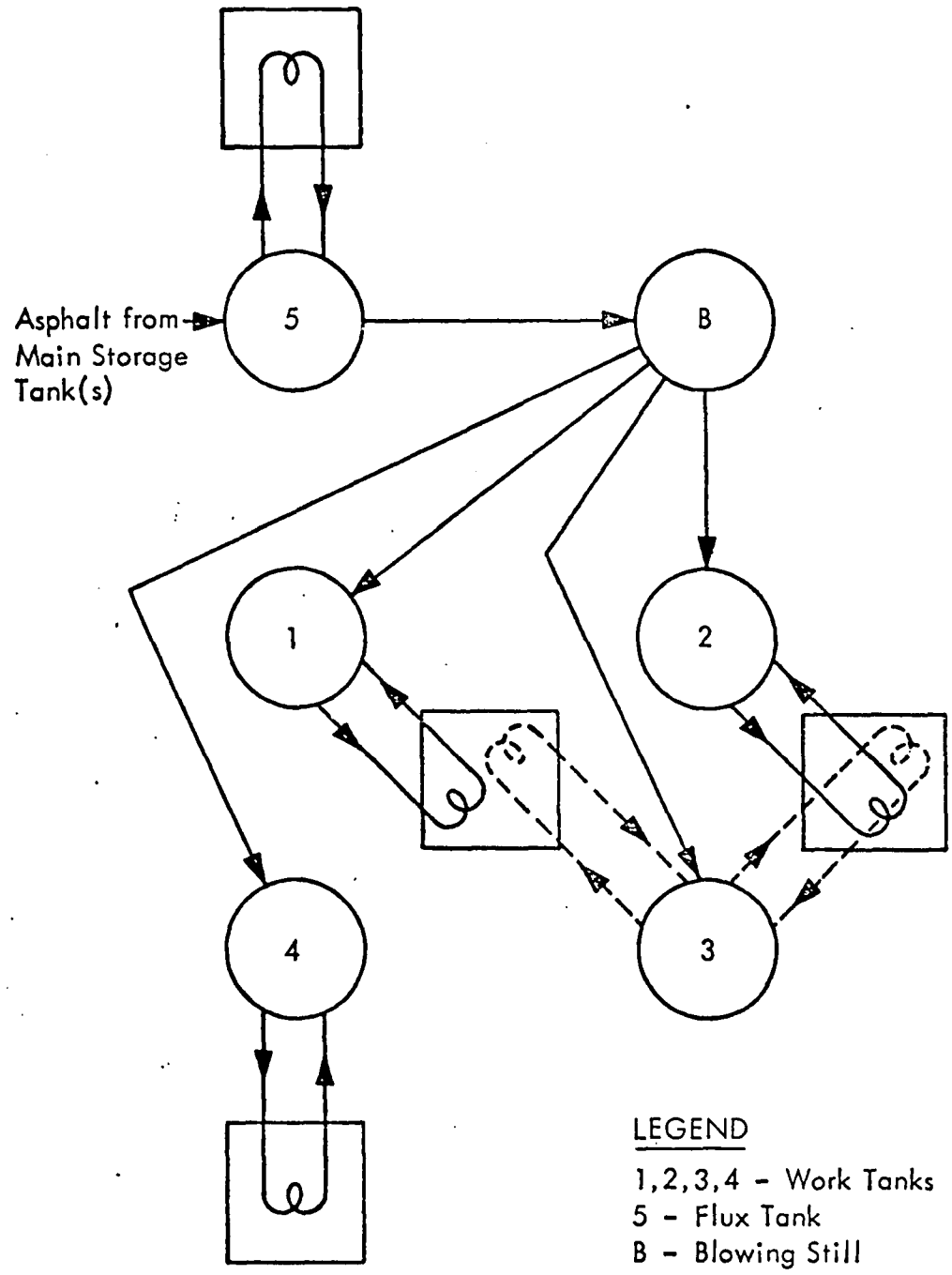


Figure 4. Schematic of Asphalt flow including flux tank-heater and Aspahlt work tank(s)-heater arrangement at Certain-Teed's Chicago Heights plant

Table 2 VALUES OF PARAMETERS MONITORED DURING VISIBLE EMISSION TESTS

Date	Time	Tank 1		Tank 2		Tank 3		Tank 4		Tank 5		Main storage tanks: 51		Main storage tanks: 511		Ambient temp. (°F)	Brink inlet temp. (°F)
		Temp. (°F)	Amount of asphalt (x 10^3 gal.)	Temp. (°F)	Amount of asphalt (x 10^3 gal.)	Temp. (°F)	Amount of asphalt (x 10^3 gal.)	Temp. (°F)	Amount of asphalt (x 10^3 gal.)	Temp. (°F)	Amount of asphalt (x 10^3 gal.)	Temp. (°F)	Amount of asphalt (x 10^3 gal.)	Temp. (°F)	Amount of asphalt (x 10^3 gal.)		
22 July 1975[a]	10:00 AM	500	17.0	390	2.0	450	13.0	Under repair/empty	Under repair/empty	470	18.0	269	30	260	6.0	83	96
	10:30 AM	495	17.25	385	2.25	450	11.25			470	8.0		30		6.0		
	11:00 AM	485	15.5	385	2.25	450	10.5			385	16.0		19		6.0		
	11:30 AM	470	15.5	490	8.75	450	11.0			395	18.0		20		12.5		
	12:00 PM	465	15.5	500	12.25	460	11.0			420	18.0		20		12.5	98	100
	12:30 PM	460	14.5	500	12.25	465	10.0			435	18.0		25		12.5		
	1:00 PM	455	13.75	495	12.25	460	9.25			460	9.0		32		12.5		
	2:00 PM	450	14.0	495	12.25	455	8.50			380	17.75		22		12.5		
	2:30 PM	445	12.5	495	12.25	460	7.0			420	17.75		25		12.5		
	3:00 PM	445	13.0	490	12.25	445	6.75			440	17.75		30		12.5	99	100
	3:30 PM	450	13.25	490	12.0	435	6.0			460	17.75		35		12.5		
	4:00 PM	450	17.75	490	12.0	435	5.0			670	13.5		40		12.5		
	4:30 PM[b]	455	17.5	490	12.0	480	4.5			430	17.75		38		12.5		
	5:00 PM	485	17.5	490	12.0	495	4.5			460	17.75		38		12.5	88	98
23 July 1975[c]	8:00 AM	475	15.5	455	Constant at	455	13.0			400	12.75		72		12.5	85	85
	8:30 AM	465	15.0	455	15.5	455	12.5			380	17.25		68		12.5		
	9:00 AM	455	14.25	455	(was not used)	455	12.5			430	17.75		68		12.5		
	9:30 AM	455	13.5	455		475	11.75			440	17.75		68		12.5		
	10:00 AM[d]	450	13.0	455		470	11.25			460	17.75		68		12.5	83	86
	10:30 AM	445	12.5	455		470	10.5			462	17.75		68		12.5		
	11:00 AM	440	12.0	455		460	9.75			468	17.75		68		12.5		
	11:30 AM[e]	440	11.25	455		455	9.0			470	17.75		68		12.5		
	12:00 PM	437	11.0	455		450	8.75			475	17.75		68		20.0	74	80
	12:30 PM	435	10.25	455		455	7.75			475	17.75		68		20.0		
	1:00 PM	432	10.0	455		442	7.0			475	17.75		68		26.5		
	1:30 PM	450	9.5	455		440	6.75			475	17.75		68		26.5		
	2:00 PM	430	9.25	455		445	5.25			475	17.75		72		26.5	80	85

a/ Quantity of oil collected from Brink ~ 2.75 gal. during 7-hr period. Asphalt as received from refinery (i.e., not blown) had a soft point of 112°F, penetration of 150°F and flash point of 590 to 610°F.

b/ Filter backwashed at 4:40 PM--no change in pressure drop observed--reading was 13 in. water.

c/ Quantity of oil collected from ducts leading to Brink ~ 3 gal. during 6-hr period. No significant amount was collected from Brink during this period.

d/ Brink inlet gas temperature gauge replaced.

e/ Filter backwashed at 11:15 AM.