AP42 Section:	12.2
Reference:	88
Title:	Report on Source Tests, Visible Emissions, and Plant Observations, Kaiser Steel Corporation, Fontana, California, Coke Oven Battery D, July 26-27, 1979, Engineering-Science, Arcadia, California, January 1979.

REPORT ON SOURCE TESTS, VISIBLE EMISSIONS, AND PLANT OBSERVATIONS

Facility Inspected

Kaiser Steel Corporation
Fontana, California

Coke Oven Battery "D"

Prepared For

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION IX
215 Fremont Street
San Francisco, California 94105

Task Order 50/TSA 2
Contract No. 68-01-4146

Dates of Inspections

November 27-28, 1978

January 1979

Submitted By

Engineering-Science
150 North Santa Anita Avenue
Arcadia, California 91006

OBSERVATIONS OF SOURCE TESTS
AT KAISER STEEL CORPORATION
FONTANA, CALIFORNIA

November 27-28, 1978

INTRODUCTION

Tests to determine particulate emissions from the baghouse serving Coke Oven Battery "D" were conducted on the above dates by technical personnel of Environmental Quality Control, Kaiser Steel Corporation. Visual emission observations of the discharge stack were made during the same period by representatives of the Southern California Air Quality Management District (SCAQMD) and Engineering-Science.

The tests and observations were conducted pursuant to Paragraph X of the Amended Consent Decree entered on September 30, 1977 at the U.S. District Court, Central District of California (Case No. CV76-0675MML).

The baghouse was installed at Coke Oven Battery "D" for control of particulate emissions in the exit gases from heating of the coke ovens. The control equipment was in operation since early November 1978. The remaining coke oven batteries (B, C, E, F, G) are in the process of having baghouses installed; battery "D" is the first to be tested to determine the efficiency of baghouse control of particulates originating from coke oven stacks.

PROCESS DESCRIPTION

Each of the seven batteries at Kaiser Steel consist of 45 individual vertical coke ovens. Each oven is charged with 13-1/2 tons of coal from an overhead larry car and heated for 16 to 17 hours to complete the coking process. At the end of this period the incandescent coke is horizontally pushed from the oven into a receiving ("hot") car for quenching and transfer to the blast furnaces. The pushing is accomplished with a ram which travels on the side of the ovens opposite to the hot car. Charging is done immediately after the expulsion of the coked product.

Each of the ovens is indirectly heated by what may be termed a "boot-strap" process. The gases emitted during the coking process are vented to the byproducts plant for removal of tarry materials and various organics. The gases then are returned to the coke batteries to serve as fuel to heat

the coke ovens. The brick work surrounding the ovens is used for regenerative heating of the combustion air being introduced, employing a reversal cycle every 30 minutes. According to information submitted by Kaiser Steel, about 4,000 scfh of 500 Btu/scf gas is required for each coke oven. (Approximately 100 x 10^6 scfd of coke oven gas can be generated by the 315 coke ovens at Kaiser Steel, or about 13,000 scfh per oven.)

Emissions from the combustion of the coke oven gas used to heat Battery "D" ovens are drawn through a baghouse by a 500 HP induced draft fan and discharged to atmosphere through a 225-foot stack. The baghouse, manufactured by American Air Filter (AAF), consists of six sections with a total of 1,080 "silicon-graphite" treated fiberglass bags of 49,760 ft^2 total area. (Design air/cloth ratio for 100,800 ACFM is about 2:1.) The baghouse is insulated to maintain operating temperature near 450°F. The baghouses being constructed for the other batteries appear to be similar to this one.

Although the coke oven gas fuel is fairly clean, material distilling from the coke oven charge can leak through cracks in the brick work into the combustion gases, introducing particulates into the coke oven stack gases, with consequent visible emissions that can vary from 10% to practically 100% at times. This variability is due to differences in the condition of the brick walls of ovens within a battery, and that the cracks, if present, will be sealed by fusion of the material some 5 to 10 minutes after charging, for any individual oven.

SAMPLING AND ANALYTICAL PROCEDURES

The sampling was conducted at the outlet duct of the baghouse at a point upstream of the induced draft fan and stack. The gases travel vertically downward with a 50-foot run prior to the sampling station (a 4 x 5 ft. rectangular cross-section of duct). Two sampling ports were used on the 4-ft side, sampling at six points along each traverse for a one-hour total sampling time for each test (see data sheets). Great care was used in the introduction and removal of the sampling probe and nozzle into and from the duct due to the high negative static pressure (16-17" H_2O).

The procedure followed EPA Method 5 equipment and procedures, also including the processing of "back-half" (impinger) collection to determine total particulate matter. This was necessary to determine compliance with applicable local regulations. (See Discussion of Data and Results.)

In addition to particulate sampling, samples of gas were aspirated from the duct at 5-minute intervals into a 2 cubic foot plastic bag, to obtain an integrated average gas sample for each one-hour test. The contents of each bag were analyzed at the laboratory using a Horiba MEXA/204 infrared analyzer for carbon dioxide and a Teledyne oxygen analyzer. Carbon monoxide was absent; nitrogen was determined by difference.

The technique used by KSC personnel during the sampling and sample processing (nozzle-probe, filter, impingers) appeared excellent to this observer. The personnel have many years experience in sampling for particulates; also the equipment was in excellent condition and showed careful maintenance. The weighing of the filters and determination of the impinger residue weights was not observed due not only to practical limitations, but also deemed unnecessary because of the competence demonstrated by the laboratory personnel.

DATA AND RESULTS

The test data, calculations, and results as submitted by Kaiser Steel Environmental Quality are included in the Appendix. The particulate matter concentration and emission rates were determined by three methods due to the different interpretations of particulate matter by (a) the former San Bernardino County APCD, and (b) the present SCAQMD rules. These are as follows:

I. Rule 52A: This rule was formerly in effect during the existence of the San Bernardino County APCD. Rule 52A, rather than Rule 404(a) of the SCAQMD (see below), apparently is part of the California SIP as submitted to EPA, hence is still considered effective for compliance determinations. Rule 52A requires all collected particulate matter, liquid or solid, to be included in concentration calculations; i.e., "front-half" plus total condensables in the "back-half" of the Method 5 sampling train. The KSC summary sheet shows the Rule 52A test results and maximum allowables.

II. Rule 404(a): This, the present particulate matter concentration rule of the SCAQMD, requires exclusion of all liquid sulfur compounds from the particulate matter weight. In practical terms, this excludes sulfuric acid which is known to exist as the dihydrate $(H_2SO_4 \cdot 2H_2O)$ when the impinger residue is evaporated to

dryness and desiccated. (The determination of H_2SO_4 is made by titration; this yields the most conservative value, as has been determined in analyses over many years by the Los Angeles County APCD laboratories.)

III. Rule 405(a): This, the present particulate matter mass flow rate rule of the SCAQMD, is limited to "solid particulate matter". Kaiser personnel interpreted this to mean only the "front-half" collection but SCAQMD interprets solid particulate matter to be the total collected, less sulfuric acid dihydrate (as per Rule 404a) unless the presence of other liquid particulate matter can be shown.

The recalculation of solid particulate matter by SCAQMD interpretation yields (as would be expected) somewhat higher emission rates than KSC. These are shown as the circled numbers under Rule 405(a) on the KSC Summary.

Other than the Rule 405a results, all of the KSC calculations were checked and found to be accurate.

PROCESS EQUIPMENT OBSERVATIONS

The following process equipment observations were obtained by the writer; Al Gubey, Engineer, SCAQMD; and Gerald R. Brown, Research Engineer, Kaiser Steel Corporation.

Test No.	Date & Time	No. of Pushes	No. of Charges	Coke Oven Heating Gas Reversal Times	Baghouse Press. Drop in. H_2O	Baghouse Temp. °F
1	11/27/78 (0945-1053)	4	5	0942 1012 1042	8.4	450
2	11/27/78 (1347-1450)	4	5	1342 1412 1442	8.5	460
3*	11/28/78 (1012-1115)	0	0	1015 1045 1115	9.0	465
4	11/28/78 (1348-1452)	5	5	1345 1415 1445	9.6	465

* Particulate sample lost (broken glass probe). Also breakdown in coal feed lines to oven during Test 3.

According to Kaiser personnel, the baghouse filter bags are cleaned by reverse air pressure when the pressure drop attains 10 inches of water. After about two weeks operation, this had not yet occurred, and very little material (extremely fine and fluffy) had accumulated in the baghouse hoppers.

VISIBLE EMISSION OBSERVATIONS

Mr. R. Bean, Engineering Inspector II, SCAQMD, was present to observe emissions from Battery D stack during Tests 1, 2 and 4 on November 27-28. Mr. T. A. Peters, Engineering-Science, was also present to observe emissions during and after Test 2, only. Their observations are included in the Appendix. (Rule 50A of the former San Bernardino APCD and 401 of the SCAQMD limit to 3 minutes in any hour visible emissions of 20% opacity or greater.)

APPENDIX

Summary - KSC Coke Plant Battery "D" Compliance Tests

Test 1
- Particulate Field Data
- Laboratory Analysis Data
- Calculations

Test 2
- Particulate Field Data
- Laboratory Analysis Data
- Calculations

Test 4
- Particulate Field Data
- Laboratory Analysis Data
- Calculations

Diagram of Method 5 Sampling Equipment Used by KSC-EQC

Visual Emission Observations
- Test 2 (T. A. Peters, Engineering-Science)
- Tests 1, 2 and 4 (R. Bean, SCAQMD)

SUMMARY-KSC COKE PLANT BATTERY "D" COMPLIANCE TESTS.

Test No.	Date Time	Sample Volume dscf	Sample Percent Isokinetic %	Part. Matter Conc. Rule 52A gr/dscf		Part. Matter Conc. Rule 404(a) gr/dscf $H_2SO_4.2H_2O$ Removed		Solid Part. Matter Rule 405(a)-lbs/hr.	
				Test Results gr/dscf	Max. Allowed	Test Results gr/dscf	Max. Allowed	Test Results*	Max. Allowe
1	11/27/78 0945-1053	35.5	98.9	0.0328	0.0515 gr/dscf @35,076 dscfm	0.0120	0.0495 gr/dscf @35,076 dscfm	=0.009 2.74 (3.60) 0.0120	15.9
2	11/27/78 1347-1450	35.2	99.3	0.0358	0.0518 gr/dscf @34,656 dscfm	0.0125	0.0497 gr/dscf @34,656 dscfm	2.97 (3.69) 0.0124	15.9
3	11/28/78 1012-1115	LOST SAMPLE - NO DATA.							
4	11/28/78 1348-1452	36.7	98.6	0.0219	0.0508gr/dscf @36,389 dscfm	0.0097	0.0488 gr/dscf @36,389 dscfm	2.40 (3.03) .0097	15.6

* CIRCLED VALUES CALC'D BY H.D. (See Text)

Standard Conditions - 60°F, 14.7 psia
12/4/78

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Plant KSC Coke Oven D	Test Start Time: 0945	Ambient Temp, °F 59
Run No. 1	Stop Time: 1053	Bar. Press. in. Hg. 28.98
Location D Baghouse Exit	Filter No. 3945-F	Assumed Moisture %
Date 11/27/78	Filter Tare Weight	Heater Box Setting, °F 250
Operator HJM & JAM	Orsat No. Not Used	Probe Tip Dia., In. 1/4
Sample Box No. 2	Date Rebuilt —	Probe Length 8'
Meter Box No. 2	Fyrite No. —	Probe Heater Setting 250°F
Meter $\Delta H_@$ 1.89	Date Rebuilt —	Avg. ΔP Avg. ΔH
C Factor	Nomograph ID. No.	Leak Rate @ ~~15"~~ 6.5 Hg 0 Post-Test .008 % 0

Point	Clock Time (min)	Dry Gas Meter CF	Pitot in H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg. Gauge	Box Temp. °F	Impinger Temp. °F	Stack Press. in. H_2O (~~Hg.~~)	Stack Temp. °F	Probe Temp °F (~~Fyrite % CO_2~~)
				Desired	Actual	Inlet	Outlet						
NE-6	0	332.0	0.60	1.32	1.9*	63	57	6.1	245	51	-16.2	402	257
NE-5	5	335.7	0.63	1.36		69	59	4.5	218	56		404	224
NE-4	10	338.9	0.58	1.25		71	59	4.4	219	56		403	250
NE-3	15	341.9	0.55	1.20		73	61	4.3	220	57		403	148
NE-2	20	344.9	0.54	1.19		74	63	4.2	260	58		401	100
NE-1	25	347.9	0.55	1.20		75	64	4.2	258	57		400	173
	30	350.9											
SE-6	0	351.5	0.56	1.23		74	65	4.5	258	58		399	266
SE-5	35	354.4	0.53	1.15		75	65	4.4	260	59		401	262
SE-4	40	357.4	0.50	1.10		77	66	4.2	265	59		400	243
SE-3	45	360.2	0.52	1.14		77	66	4.4	267	59		401	237
SE-2	50	363.1	0.62	1.36		79	68	5.0	269	59		402	253
SE-1	55	366.3	0.70	1.54		80	68	5.5	272	58	-16.2	403	236
	60	369.8											

Comments: * mis read orifice ΔH
Santa Ana blowing

Test Observers: Al Guber
H. Devorkin

LABORATORY ANALYSIS DATA
PARTICULATE SOURCE SAMPLE

Analysis Date (s) 11/30/78 ... Analytical Chemist J. Deutsch

Plant Sampled KSC Coke Ovs D Battery Location Coke Oven "D" Baghouse

Sampling location D Baghouse Exit Sampling Date 11/27/78

Sample Run No. 39459-1

Notes

Moisture Data:

1	Final Volume H_2O in Impingers	274	ml.
2	Initial Volume H_2O in Impingers	200	ml.
3	(1-2) Volume H_2O Condensed	74	ml.
4	Volume Wash H_2O	196	ml.
5	Final Weight Silica Gel	714.0	gm
6	Initial Weight Silica Gel	704.3	gm
	(5-6) Weight Gain	9.7	gm

Particulate Data:

Front Half:

7	Final Filter Weight	359.4	mg.
8	Initial Filter Weight	344.7	mg.
9	(7-8) Filter Particulate	14.7	mg.
10	Probe Particulate	6.3	mg.
11	(9+10) Total Particulate	21.0	mg.

Back Half:

12	Total Condensables	54.4	mg.
13	$H_2SO_4 \cdot 2H_2O$	47.8	mg.
14	(12-13) Net Condensables	6.6	mg.

Method 5 Particulate Test Calculation Form:

Location KSC Coke Oven D Baghouse Date: 11/27/78
Run No. 1

I Necessary Data
- A. No. of Traverse Points 12
- B. Total Test Time (θ) 60 minutes
- C Water Collected:
  1. Impinger H_2O 74 ml
  2. Silica Gel 97 gm
- D Particulate Weight:
  1. Front Half, M_f 0.0210 gm
  2. Back Half, M_b 0.0544 gm
  3. Back Half $H_2SO_4 \cdot 2H_2O$ 0.0478 gm
- E Volume Metered
  V_m = 37.2 CF × DGMCF (1.00) = 37.2 CF
- F Average $\sqrt{\Delta P}$ 0.76 $(in.H_2O)^{1/2}$
- G. Average ΔH 1.30 in. H_2O ÷ 13.6 = 0.096 in. Hg
- H. Average Meter Temperature, T_m 69 °F + 460 = 529 °R
- I Average Stack Temperature, T_s 402 °F + 460 = 862 °R
- J. Stack Absolute Pressure, P_s 27.79 in. Hg
- K. Stack Static Pressure −16.2 in. H_2O
- L Barometric Pressure, P_b 28.98 in. Hg
- M $\%CO_2$ 5.3 ; $\%O_2$ 12.6 ; $\%CO$ — ; $\%N_2$ 82.1
- N Area of Stack 20.0 ft^2
- O Area of Nozzle 0.000341 ft^2
- P Pitot Factor, C_p 0.85

II Calculations:
- A. Standard Volume Metered

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

$$V_{m(std)} = 17.380 \times \left(V_m \frac{37.2\ CF}{}\right)\left(\frac{P_b + \Delta H\ 29.08\ "Hg}{T_m\ 529\ °R}\right) = 35.5\ dscf$$

B. Moisture Content of Stack Gas

1. H_2O collected in impingers

$$V_{wc(std)} = K(V_f - V_i)$$

$$V_{wc(std)} = 0.04636\ ft^3/ml \times (\underline{74}\ ml) = \underline{3.43}\ scf$$

2. H_2O collected in silica gel

$$V_{wsg(std)} = K(W_f - W_i)$$

$$V_{wsg(std)} = 0.04644\ ft^3/gm\ (\underline{9.7}\ gm) = \underline{0.45}\ scf$$

3. Moister Content of Stack Gas, B_{ws}.

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws} = \frac{(\underline{3.43}\ scf) + (\underline{0.45}\ scf)}{(\underline{3.43}\ scf) + (\underline{0.45}\ scf) + (\underline{35.5}\ scf)} = \underline{0.099}$$

C. Molecular Weight of Stack Gas, 16/lb-mole

1. M_d (Dry Molecular Weight) $= \Sigma M_x B_x$

$$M_d = (0.44)\underline{5.3}\ \%CO_2 + (0.32)\underline{12.6}\ \%O_2 + (0.28)\underline{82.1}\ \%N_2 + \%CO$$

(0.282 more accurate)

$$= \underline{29.35}\ 16/lb\text{-mole}$$

2. M_s (Wet Molecular Weight) $= M_d(1 - B_{ws}) + 18 B_{ws}$

$$M_s = \underline{29.35}(1 - \underline{0.099}) + 18(\underline{0.099}) = \underline{28.23}\ 16/lb\text{-mole}.$$

D. Average Stack Gas Velocity

$$\bar{V}_s = K_p C_p \left[\frac{T_s}{P_s M_s}\right]^{\frac{1}{2}} \bar{\sqrt{\Delta P}}$$

$$\bar{V}_s = 85.48\ (\underline{0.85}) \left[\frac{(\underline{862})\ ^\circ R}{(\underline{27.79})\ "Hg\ (\underline{28.23})\ 16/lb\text{-mole}}\right]^{\frac{1}{2}} (\underline{0.76})\ "H_2O$$

$$= \underline{57.9}\ ft/sec$$

E. Average Stack Gas Volumetric Flow Rate

$$\bar{Q}_s = (3600\ sec/hr)\ \bar{V}_s\ A_s\ (1 - B_{ws})\ \frac{T_{std}}{P_{std}}\ \frac{P_s}{\bar{T}_s}$$

$$= 62566.8 \times (\underline{57.9}\ ft/sec)(\underline{20.0}\ ft^2)(1 - \underline{0.099})\ \frac{(\underline{27.79}\ "Hg)}{(\underline{862}\ °R)}$$

$$= \underline{2,104,547}\ dscfh \div 60\ \underline{35,076}\ dscfm$$

F. Pollutant Mass Rate (Front Half – Rule 405a)

$$PMR = \left[\frac{M_f}{V_{m(std)}}\right] \times \bar{Q}_s$$

Add 0.0066 gm for non-H_2SO_4 back-half partic[ulate]
= 0.0210 + 0.0066 = 0.0276 gm. (TD)

$$PMR = \frac{(\underline{0.0210}\ gm)}{(\underline{35.5}\ dscf)}\ (\underline{2104547}\ dscfh) \times \frac{1}{454\ gm/lb}$$

(0.0276 written above 0.0210)

$$= \underline{2.74}\ lb/hr$$ (3.60 lb/hr)

G. Particulate Concentration

1. Total Particulate

$$C_t = \frac{M_f + M_b}{V_{m(std)}} \times 15.43$$

$$C_t = \frac{(\underline{0.0210}\ gm) + (\underline{0.0544}\ gm)}{(\underline{35.5}\ dscf)} \times 15.43 = \underline{0.0328}\ gr/dscf$$

2. Net Particulate (Rule 404a)

$$C_n = \frac{M_f + M_b - (H_2SO_4 \cdot 2H_2O)}{V_{m(std)}} \times 15.43$$

$$C_n = \frac{(\underline{0.0210}\ gm) + (\underline{0.0544}\ gm) - (\underline{0.0478}\ gm)}{(\underline{35.5}\ dscf)} \times 15.43$$

$$= \underline{0.0120}\ gr/dscf$$

H. % Isokinetic Variation

$$\% I = \frac{T_s V_{m(std)} P_{std} \times 100}{\theta \bar{V}_s A_n P_s T_{std} (1 - B_{ws}) \times 60}$$

$$\% I = \frac{0.0959 \text{ (}862 \text{ °R)(}35.5 \text{ dscf)}}{\text{(}60 \text{ min.)(}57.9 \text{ ft/sec)(}0.000341 \text{ ft}^2\text{)(}27.79 \text{ "Hg)(}1 - 0.099\text{)}}$$

$$= 98.9$$

(Std. Conditions: 60°F, 29.92 "Hg.)

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Plant KSC Coke Ovens D
Run No. 2
Location D Baghouse Exit
Date 11/27/78
Operator HM & JAM
Sample Box No. 2
Meter Box No. 2
Meter $\Delta H_@$ 1.89
C Factor

Test Start Time: 1347
Stop Time: 1450
Filter No.
Filter Tare Weight
Orsat No. Not used
Date Rebuilt —
Fyrite No. Not used
Date Rebuilt —
Nomograph ID. No.

Ambient Temp. °F 59
Bar. Press. in.Hg. 28.96
Assumed Moisture %
Heater Box Setting, °F 250
Probe Tip Dia., In. 1/4
Probe Length 8'
Probe Heater Setting 250 °F
Avg. ΔP Avg. ΔH
Leak Rate @ ~~15~~ 14 Hg 0 Post-Test 0 6.7"Hg

Point	Clock Time (min)	Dry Gas Meter CF	Pitot in H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg. Gauge	Box Temp. °F	Impinger Temp. °F	Stack Press. in. Hg.	Stack Temp. °F	Probe Temp ~~Fyrite % CO~~ °F CO_2
NE-6	0	370.6	0.61	1.34		67	59	3.4	259	55	-15.8	400	256
" 5	5	373.8	0.57	1.25		70	60	3.2	249	55		401	260
" 4	10	376.9	0.58	1.28		73	62	3.5	249	55		401	269
" 3	15	380.0	0.55	1.21		74	63	3.3	263	56		400	267
" 2	20	383.0	0.54	1.19		76	64	3.4	268	55		399	252
" 1	25	386.0	0.54	1.19		76	65	3.4	266	55		400	256
	30	389.1										399	261
SE-6	0	389.1	0.61	1.34		74	66	3.6	255	55		400	265
" 5	35	392.6	0.54	1.19		77	67	3.5	256	56		401	254
" 4	40	395.6	0.47	1.03		78	67	3.1	257	57		401	242
" 3	45	398.4	0.52	1.14		77	67	3.4	255	56		401	247
" 2	50	401.4	0.58	1.28		78	68	3.6	253	56		401	247
" 1	55	404.6	0.60	1.32		79	68	3.6	255	57	-16.5	402	262
	60	407.8											

Comments:

Test Observers: A. Gubej
H. Devorkin

LABORATORY ANALYSIS DATA
PARTICULATE SOURCE SAMPLE

Analysis Date(s) 11/30/78 .. Analytical Chemist S. Deutsch

Plant Sampled KSC Coke Oven D Location Coke Oven "D" Stack Baghou

Sampling location D Baghouse Exit Sampling Date 11/27/78

Sample Run No. 39460-2

Moisture Data:

				Notes
1	Final Volume H_2O in Impingers	274.	ml.	
2	Initial Volume H_2O in Impingers	200	ml.	
3	(1-2) Volume H_2O Condensed	74	ml.	
4	Volume Wash H_2O	218	ml.	
5	Final Weight Silica Gel	743.5	gm	
6	Initial Weight Silica Gel	733.6	gm	
	(5-6) Weight Gain	9.9	gm	

Particulate Data:

Front Half:

7	Final Filter Weight	3444	mg.
8	Initial Filter Weight	331.6	mg.
9	(7-8) Filter Particulate	12.8	mg.
10	Probe Particulate	10.0	mg.
11	(9+10) Total Particulate	22.8	mg.

Back Half:

12	Total Condensables	58.9	mg.
13	$H_2SO_4 \cdot 2H_2O$	53.3	mg.
14	(12-13) Net Condensables	5.6	mg.

Method 5 Particulate Test Calculation Form:

Location KSC Coke Oven D Baghouse Date: 11/27/92
Run No. 2

I Necessary Data
- A. No. of Traverse Points 12
- B. Total Test Time (θ) 60 minutes
- C Water Collected:
  1. Impinger H_2O 74 ml
  2. Silica Gel 9.9 gm
- D Particulate Weight:
  1. Front Half, M_f 0.0228 gm
  2. Back Half, M_b 0.0589 gm
  3. Back Half $H_2SO_4 \cdot 2H_2O$ 0.0533 gm
- E Volume Metered
  V_m = 36.9 CF × DGM $\frac{1.00}{\text{CF}}$ = 36.9 CF
- F Average $\sqrt{\Delta P}$ 0.75 $(in.H_2O)^{\frac{1}{2}}$
- G. Average ΔH 1.23 in. H_2O ÷ 13.6 = 0.090 in. Hg
- H. Average Meter Temperature, T_m 70 °F + 460 = 530 °R
- I Average Stack Temperature, T_s 400 °F + 460 = 860 °R
- J. Stack Absolute Pressure, P_s 27.76 in. Hg
- K. Stack static Pressure −16.2 in. H_2O
- L Barometric Pressure, P_b 28.96 in. Hg
- M %CO_2 4.3 ; %O_2 12.9 ; %CO — ; %N_2 82.8
- N Area of Stack 20.0 ft^2
- O Area of Nozzle 0.000341 ft^2
- P Pitot Factor, C_p 0.85

II Calculations:
- A. Standard Volume Metered

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

$$V_{m(std)} = 17.380 \times \left(V_m \text{ } 36.9 \text{ CF}\right)\left(\frac{P_b + \Delta H \text{ } 29.05 \text{ "Hg}}{T_m \text{ } 530 \text{ °R}}\right) = 35.2 \text{ dscf}$$

B. Moisture Content of Stack Gas

1. H_2O collected in impingers

$$V_{wc(std)} = K(V_f - V_i)$$

$$V_{wc(std)} = 0.04636\ ft^3/ml \times (\underline{74}\ ml) = \underline{3.43}\ scf$$

2. H_2O collected in silica gel

$$V_{wsg(std)} = K(W_f - W_i)$$

$$V_{wsg(std)} = 0.04644\ ft^3/gm\ (\underline{9.9}\ gm) = \underline{0.46}\ scf$$

3. Moister Content of Stack Gas, B_{ws}.

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws} = \frac{(\underline{3.43}\ scf) + (\underline{0.46}\ scf)}{(\underline{3.43}\ scf) + (\underline{0.46}\ scf) + (\underline{35.2}\ scf)} = \underline{0.100}$$

C. Molecular Weight of Stack Gas, lb/lb-mole

1. M_d (Dry Molecular Weight) $= \Sigma M_x B_x$

(0.282 more accurate)

$$M_d = (0.44)\underline{4.3}\ \%CO_2 + (0.32)\underline{12.9}\ \%O_2 + (0.28)\underline{82.8}\ \%N_2 + \%CO$$

$$= \underline{29.20}\ lb/lb\text{-mole}$$

2. M_s (Wet Molecular Weight) $= M_d(1 - B_{ws}) + 18 B_{ws}$

$$M_s = \underline{29.20}(1 - \underline{0.100}) + 18(\underline{0.100}) = \underline{28.08}\ lb/lb\text{-mole}.$$

D. Average Stack Gas Velocity

$$\bar{V}_s = K_p C_p \left[\frac{T_s}{P_s M_s}\right]^{1/2} \sqrt{\Delta P}$$

$$\bar{V}_s = 85.48\ (\underline{0.85}) \left[\frac{(\underline{860})\ ^\circ R}{(27.76)\ "Hg\ (28.08)\ lb/lb\text{-mole}}\right]^{\frac{1}{2}} (\underline{0.75})\ "H_2O$$

$$= \underline{57.2}\ ft/sec\ \checkmark$$

E. Average Stack Gas Volumetric Flow Rate

$$\bar{Q}_s = (3600 \text{ sec/hr})\, \bar{V}_s\, A_s (1 - B_{ws}) \frac{T_{std}}{P_{std}} \frac{P_s}{T_s}$$

$$= 62566.8 \times (\underline{57.2} \text{ ft/sec})(\underline{20.0} \text{ ft}^2)(1 - \underline{0.100}) \frac{(\underline{27.76} \text{ "Hg})}{(\underline{860} \text{ °R})}$$

$$= \underline{2079378} \text{ dscfh} \div 60 = \underline{34656} \text{ dscfm}$$

F. Pollutant Mass Rate (Front Half – Rule 405a)

$$PMR = \left[\frac{M_f}{V_{m(std)}}\right] \times \bar{Q}_s$$

Add 0.0056 gm for non-H_2SO_4 back-half portion.

= 0.0228 + 0.0056 = 0.0284 gm. (NB)

$$PMR = \frac{(\underline{0.0284} \text{ gm})}{(\underline{0.0228} \text{ gm})} \frac{(\underline{35.2} \text{ dscf})}{(\underline{2079378} \text{ dscfh})} \times \frac{1}{454 \text{ gm/lb}}$$

$$= \underline{2.97} \text{ lb/hr} \quad (3.69 \text{ lb/hr})$$

G. Particulate Concentration

1. Total Particulate

$$C_t = \frac{M_f + M_b}{V_{m(std)}} \times 15.43$$

$$C_t = \frac{(\underline{0.0228} \text{ gm}) + (\underline{0.0589} \text{ gm})}{(\underline{35.2} \text{ dscf})} \times 15.43 = \underline{0.0358} \text{ gr/dscf}$$

2. Net Particulate (Rule 404a)

$$C_n = \frac{M_f + M_b - [H_2SO_4 \cdot 2H_2O]}{V_{m(std)}} \times 15.43$$

$$C_n = \frac{(\underline{0.0228} \text{ gm}) + (\underline{0.0589} \text{ gm}) - (\underline{0.0533} \text{ gm})}{(\underline{35.2} \text{ dscf})} \times 15.43$$

$$= \underline{0.0125} \text{ gr/dscf}$$

H. % Isokinetic Variation

$$\%\, I = \frac{T_s\, V_{m(std)}\, P_{std} \times 100}{\theta\, \bar{V}_s\, A_n\, P_s\, T_{std}\, (1 - E_{w.s}) \times 60}$$

$$\%\, I = \frac{0.0959\ (860\ ^\circ R)(35.2\ dscf)}{(60\ min.)(57.2\ ft/sec)(0.000341\ ft^2)(27.76\ "Hg)(1 - 0.100)}$$

$$= 99.3$$

(Std. Conditions: 60°F, 29.92 "Hg.)

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Plant KSC C&K Ovens D
Run No. 4
Location D Bighouse Exit
Date 11/28/78
Operator HJM & JAM
Sample Box No. 2
Meter Box No. 2
Meter $\Delta H_@$ 1.89
C Factor

Test Start Time: 1348
Stop Time: 1452
Filter No.
Filter Tare Weight
Orsat No.
Date Rebuilt
Fyrite No.
Date Rebuilt
Nomograph ID. No.

Ambient Temp. °F 63
Bar. Press. in.Hg. 29.06
Assumed Moisture %
Heater Box Setting, °F 250
Probe Tip Dia., In. 1/4
Probe Length 8'
Probe Heater Setting °F 250
Avg. ΔP Avg. ΔH
Leak Rate @ ~~15~~ 7.5 Hg 0.02 Post-Test 0.00 O.K. @ 4" Hg

Point	Clock Time (min)	Dry Gas Meter CF	Pitot in H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg. Gauge	Box Temp. °F	Impinger Temp. °F	Stack Press. in. Hg.	Stack Temp. °F	Probe Temp. ~~Fyrite~~ % CO_2 °F
				Desired	Actual	Inlet	Outlet						
NE-6	0	452.2	0.70	1.54		75	72	3.9	268	61	-17.7	414	248
" 5	5	455.6	0.66	1.45		81	72	3.6	280	58		415	257
" 4	10	459.0	0.64	1.41		85	71	3.6	266	58		413	237
" 3	15	462.3	0.64	1.41		89	75	3.6	258	59		414	228
" 2	20	465.6	0.60	1.32		89	74	3.5	249	57		414	254
" 1	25	468.8	0.59	1.30		89	75	3.5	249	57	-17.6	413	250
	30	472.0											
SE-6	0	472.3	0.60	1.32		85	77	3.5	259	57		412	247
" 5	35	475.5	0.60	1.32		90	78	3.5	258	59		412	265
" 4	40	478.7	0.55	1.21		94	78	3.4	263	61		413	258
" 3	45	481.8	0.56	1.23		96	82	3.4	267	61		416	242
" 2	50	484.9	0.60	1.32		96	81	3.5	267	60		415	256
" 1	55	488.1	0.71	1.56		94	81	4.0	242	57	-17.9	413	261
	60	491.7											

Comments:

Test Observers: Al Gubey
H. Devor Kim

LABORATORY ANALYSIS DATA
PARTICULATE SOURCE SAMPLE

Analysis Date (s) 11/30/78 Analytical Chemist J. Deutsch

Plant Sampled KSC Coke Ovens D Location Coke Oven 'D' Stack Baghouse

Sampling location D Baghouse Exit Sampling Date 11/28/78

Sample Run No. 39461-4

Notes

Moisture Data:

1	Final Volume H_2O in Impingers	270	ml.
2	Initial Volume H_2O in Impingers	200	ml.
3	(1-2) Volume H_2O Condensed	70	ml.
4	Volume Wash H_2O	170	ml.
5	Final Weight Silica Gel	756.0	gm
6	Initial Weight Silica Gel	743.5	gm
	(5-6) Weight Gain	12.5	gm

Particulate Data:

Front Half:

7	Final Filter Weight	348.6	mg.
8	Initial Filter Weight	336.8	mg.
9	(7-8) Filter Particulate	11.8	mg.
10	Probe Particulate	6.5	mg.
11	(9+10) Total Particulate	18.3	mg.

Back Half:

12	Total Condensables	33.7	mg.
13	$H_2SO_4 \cdot 2H_2O$	28.9	mg.
14	(12-13) Net Condensables	4.8	mg.

Method 5 Particulate Test Calculation Form:

Location KSC Coke Oven D Baghouse Date: 11/28/78
Run No. 4

I Necessary Data
- A. No. of Traverse Points 12
- B. Total Test Time (θ) 60 minutes
- C Water Collected:
  1. Impinger H_2O 70 ml
  2. Silica Gel 12.5 gm
- D Particulate Weight:
  1. Front Half, M_f 0.0193 gm
  2. Back Half, M_b 0.0337 gm
  3. Back Half $H_2SO_4 \cdot 2H_2O$ 0.0289 gm
- E Volume Metered
  V_m = 39.2 CF × DGMCF (1.00) = 39.2 CF
- F Average $\sqrt{\Delta P}$ 0.79 $(in.H_2O)^{1/2}$
- G. Average ΔH 1.37 in. H_2O ÷ 13.6 = 0.101 in. Hg
- H. Average Meter Temperature, T_m 82 °F + 460 = 542 °R
- I Average Stack Temperature, T_s 414 °F + 460 = 874 °R
- J. Stack Absolute Pressure, P_s 27.76 in. Hg
- K. Stack static Pressure −17.7 in. H_2O
- L Barometric Pressure, P_b 29.06 in. Hg
- M %CO_2 3.8 ; %O_2 14.4 ; %CO — ; %N_2 81.8
- N Area of Stack 20.0 ft^2
- O Area of Nozzle 0.000341 ft^2
- P Pitot Factor, C_p 0.85

II Calculations:
- A. Standard Volume Metered

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

$$V_{m(std)} = 17.380 \times \left(V_m\ 39.2\ CF\right)\left(\frac{P_b + \Delta H\ 29.16\ "Hg}{T_m\ 542\ °R}\right) = 36.7\ dscf$$

B. Moisture Content of Stack Gas

1. H_2O collected in impingers

$$V_{wc(std)} = K(V_f - V_i)$$

$$V_{wc(std)} = 0.04636\ ft^3/ml \times (\underline{70}\ ml) = \underline{3.25}\ scf$$

2. H_2O collected in silica gel

$$V_{wsg(std)} = K(W_f - W_i)$$

$$V_{wsg(std)} = 0.04644\ ft^3/gm\ (\underline{12.5}\ gm) = \underline{0.58}\ scf$$

3. Moister Content of Stack Gas, B_{ws}.

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws} = \frac{(\underline{3.25}\ scf) + (\underline{0.58}\ scf)}{(\underline{3.25}\ scf) + (\underline{0.58}\ scf) + (\underline{36.7}\ scf)} = \underline{0.095}$$

C. Molecular Weight of Stack Gas, lb/lb-mole

1. M_d (Dry Molecular Weight) = $\Sigma M_x B_x$

$$M_d = (0.44)\underline{3.8}\ \%CO_2 + (0.32)\underline{14.4}\ \%O_2 + (0.28)\underline{81.8}\ \%N_2 + \%C$$

(0.282 mole amount)

$$= \underline{29.18}\ lb/lb\text{-mole}$$

2. M_s (Wet Molecular Weight) = $M_d(1 - B_{ws}) + 18\,B_{ws}$

$$M_s = \underline{29.18}\ (1 - \underline{0.095}) + 18\,(\underline{0.095}) = \underline{28.12}\ lb/lb\text{-mole}.$$

D. Average Stack Gas Velocity

$$\bar{V}_s = K_p C_p \left[\frac{T_s}{P_s M_s}\right]^{\frac{1}{2}} \sqrt{\Delta P}$$

$$\bar{V}_s = 85.48\ (\underline{0.85})\left[\frac{(\underline{874})\,^\circ R}{(27.76)\,"Hg\ (28.12)\,lb/lb\text{-mole}}\right]^{\frac{1}{2}} (\underline{0.79})$$

$$= \underline{60.7}\ ft/sec\ \checkmark$$

E. Average Stack Gas Volumetric Flow Rate

$$\bar{Q}_s = (3600 \text{ sec/hr})\ \bar{V}_s\ A_s (1 - B_{ws}) \frac{T_{std}}{P_{std}} \frac{P_s}{T_s}$$

$$= 62566.8 \times (\underline{60.7} \text{ ft/sec})(\underline{20.0} \text{ ft}^2)(1 - \underline{0.095}) \frac{(\underline{27.76} \text{ "Hg})}{(\underline{874} \text{ °R})}$$

$$= \underline{2,183,329} \text{ dscfh} \div 60 = \underline{36,389} \text{ dscfm}$$

F. Pollutant Mass Rate (Front Half – Rule 405a)

$$PMR = \left[\frac{M_f}{V_{m(std)}}\right] \times \bar{Q}_s$$

Add 0.0048 gm for non-H_2SO_4 back-half partic.

= 0.0183 + 0.0048 = 0.0231 gm (MB)

$$PMR = \frac{(\underline{0.0231} \text{ gm})}{(\underline{36.7} \text{ dscf})} (\underline{2183329} \text{ dscfh}) \times \frac{1}{454 \text{ gm/lb}}$$

$$= \underline{2.40} \text{ lb/hr} \quad 3.03 \text{ lb/hr}$$

G. Particulate Concentration

1. Total Particulate

$$C_t = \frac{M_f + M_b}{V_{m(std)}} \times 15.43$$

$$C_t = \frac{(\underline{0.0183} \text{ gm}) + (\underline{0.0337} \text{ gm})}{(\underline{36.7} \text{ dscf})} \times 15.43 = \underline{0.0219} \text{ gr/dscf}$$

2. Net Particulate (Rule 404a)

$$C_n = \frac{M_f + M_b - [H_2SO_4 \cdot 2H_2O]}{V_{m(std)}} \times 15.43$$

$$C_n = \frac{(\underline{0.0183} \text{ gm}) + (\underline{0.0337} \text{ gm}) - (\underline{0.0289} \text{ gm})}{(\underline{36.7} \text{ dscf})} \times 15.43$$

$$= \underline{0.0097} \text{ gr/dscf}$$

H. % Isokinetic Variation

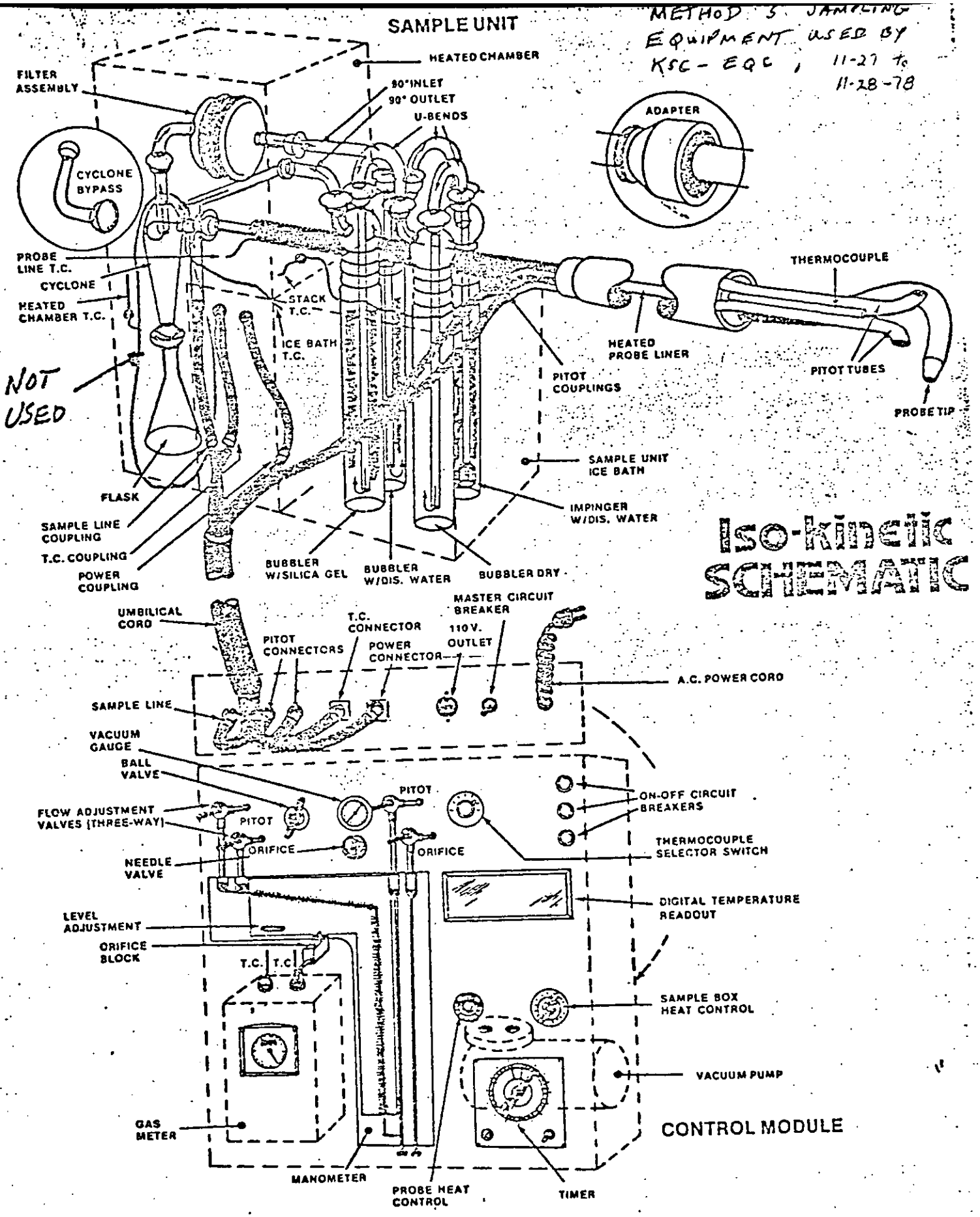
$$\% I = \frac{T_s V_{m(std)} P_{std} \times 100}{\theta \bar{V}_s A_n P_s T_{std} (1 - B_{ws}) \times 60}$$

$$\% I = \frac{0.0959 \ (\underline{874}\ ^\circ R)(\underline{36.7}\ dsc\text{f})}{(\underline{60}\ min.)(\underline{60.7}\ ft/sec)(\underline{0.00341}\ ft^2)(\underline{27.76}\ "Hg)(1 - \underline{0.095})}$$

$$= \underline{98.6}$$

(Std. Conditions: 60°F, 29.92 "Hg.)

METHOD 5 SAMPLING EQUIPMENT USED BY KSC-EQC, 11-27 to 11-28-78



GII ENTERPRISES, INC. P.O. BOX 3356 • CHERRY HILL, NJ 08034

VISIBLE EMISSION OBSERVATION RECORD

Company KAISER STEEL FONTANA, CA

Date 11/27/78 Time First Sighted Plume —

Time Start 1426 Time Stop 1451

Air Temperature 63 Relative Humidity 20

Wind Speed 10-15 G25 Wind Direction NNE

Sky Condition SCATTERED Background SKY

Plume Characteristics: Continuous: (✓) yes ( ) no

Color NONE. Dispersion Description CONING

Stack Height 200 (ft) Observer location: 200 (ft) WSW of stack

Sun location
- ( ) Back of Observer
- (X) Right Shoulder
- ( ) Left Shoulder
- ( ) Other

Emission Point COKE OVEN BATTERY D - BAGHOUSE

Min	0	15	30	45
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

Min	0	15	30	45
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				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Min	0	15	30	45
41	/			
42				
43	/			
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				

NOTES: STACK TEST IN Progress (Test 2, Started 1347)

STACK TEST ended 1450

STRONG SANTA ANA WINDS

Inspector J Peters T.A. PETERS Date 11/27/78

TSB-A-8 EPA-IX-FORM 298 ENFR. SCIENCE

VISIBLE EMISSION OBSERVATION RECORD

Company KAISER STEEL FONTANA CA

Date 11/27/78 Time First Sighted Plume _____

Time Start 1500 Time Stop 1512

Air Temperature 64 Relative Humidity 20

Wind Speed 10-15 G25 Wind Direction NNE

Sky Condition SCATTERED Background SKY

Plume Characteristics: Continuous: (4 yes ( ) no

Color None Dispersion Description CONING

Stack Height 200 (ft) Observer location: 200 (ft) WSW of stack

Sun location

( ) Back of Observer ( ) Left Shoulder

(X) Right Shoulder ( ) Other

Emission Point COKE OVEN BATTERY D- BAGHOUSE

Min	0	15	30	45
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				
14				
15				
16				
17				
18				
19				
20				

Min	0	15	30	45
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

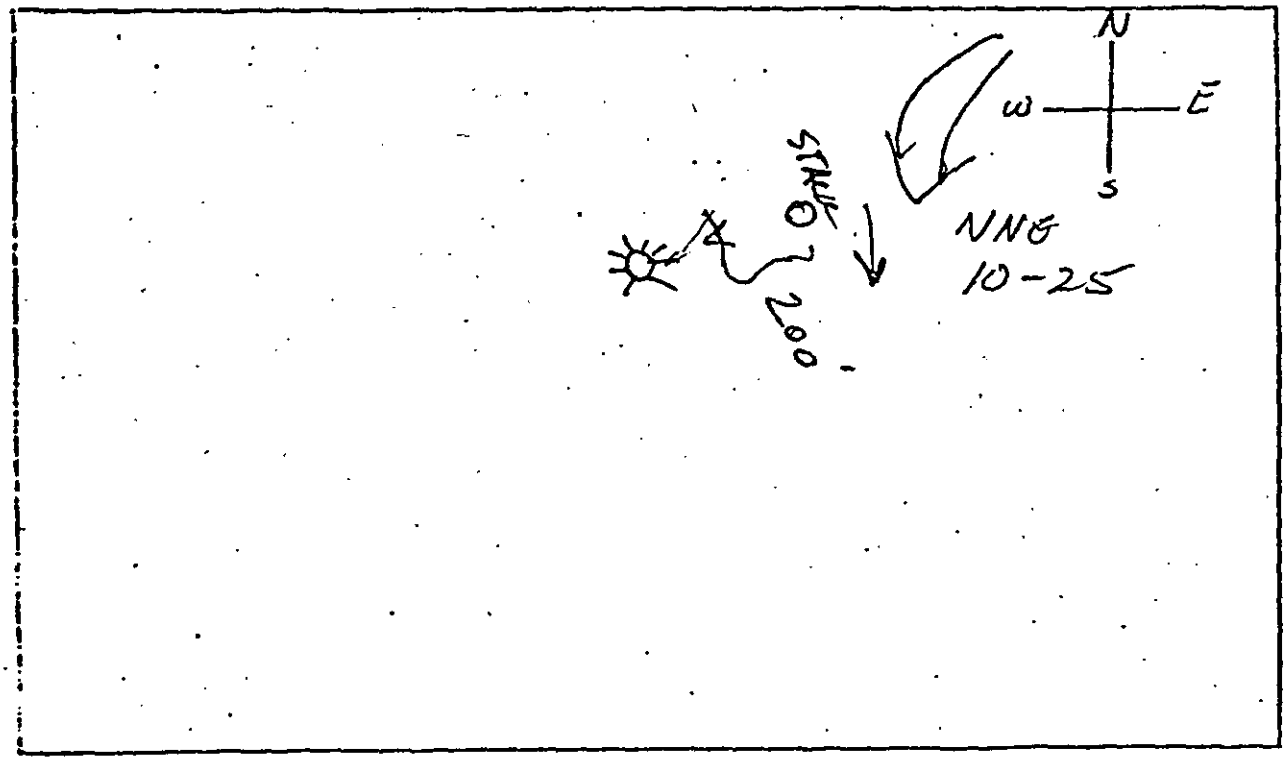
Min	0	15	30	45
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				

NOTES: STRONG SANTA ANA WINDS

NO STACK TEST IN Progress (Test 2 ended 1450)

Inspector [signature] Date 11/27/78

MAP



Symbols

Sun = ☼
Plume direction = ——›
Point where plume observed = ...
Observer = 4

Water Vapor Condensate _____

Photographs: S&A File ( ) Enclosed ( ) None (✓)

Comments _____

NO VISIBLE Emission Recorded

Signature J A Peters Date 11/27/78

BATTERY "D" STACK 11-27-78

WIND: 25-35 MPH NE

SKY: CLEAR

SUN: OVER SHOULDER

LOCATION: 400 YARDS SE OF STACK - AM (1035-1115)

250 YARDS S OF STACK - PM (1345-1415)

OBSERVATIONS (EQC + AQMD)

1030-1035 - NO EMISSIONS

1035-1040 - " "

1040-1045 - " "

1045-1050 - " "

1050-1055 - " " TEST 1 ENDED

1055-1100 - " "

1100-1105 - " "

1105-1110 - " "

1110-1115 - " "

1345-1350 - " " TEST 2 STARTED

1350-1355 - " "

1355-1400 - " "

1400-1405 - " "

1405-1410 - " "

1410-1415 - " "

1415-1420 - " "

1420-1425 - " " READINGS ENDED

R. BEAN AQMD ENG INSPECTOR II

28 NOVEMBER 1978

R BEAN - SCAQMD

'D' COKE STACK OBSERVATIONS

WIND SW CLEAR

0-3 MPH

	15	30	45	60	
1310	0	0	0	0	PRIOR TO TEST 4
1311	0	0	0	0	
1312	5%	5%	0	0	
1313	0	0	0	0	
1314	0	0	0	0	
1315	0	0	0	0	
1316	0	0	0	0	
1347	0	0	0	0	TEST 4 - START
1348	0	0	0	0	
1349	0	0	0	0	
1350	0	0	0	0	
1351	0	0	0	0	
1352	0	0	0	0	
1353	0	0	0	0	
1354	0	0	0	0	
1355	0	0	0	0	

28 NOV 14 18

	15	30	45	60
1356	0	0	0	0
1357	0	0	0	0
1358	0	0	0	0
1359	0	0	0	0
1400	0	0	0	0
1401	0	0	0	0
1402	0	0	0	0
1403	0	0	0	0
1404	0	0	0	0
1405	0	0	0	0
1406	0	0	0	0
1407	0	0	0	0
1408	0	0	0	0
1409	0	0	0	0
1410	0	0	0	0
1411	0	0	0	0
1412	0	0	0	0
1413	0	0	0	0
1414	0	0	0	0

READINGS ENDED

VISIBLE EMISSION OBSERVATION RECORD

any KAISER STEEL CORP

27 NOV 78 Time First Sighted Plume

Start 1030 Time Stop 1115

Temperature 58°F Relative Humidity 23%

Speed 25 - 35 MPH Wind Direction NE

Condition CLEAR Background SKY

e Characteristics: Continuous: ( ) yes (✓) no

lor NONE Dispersion Description

k Height 225 (ft) Observer location: 1200 (ft) SE of stack

location
( ) Back of Observer ( ) Left Shoulder
( ) Right Shoulder ( ) Other

sion Point D BATTERY STACK COKE OVENS
1030 — 1115

0	15	30	45
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Min	0	15	30	45
21				
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0
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

Min	0	15	30	45
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				
47				
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59				
60				

S: VISIBLE OBSERVATION ON D BATTERY STACK

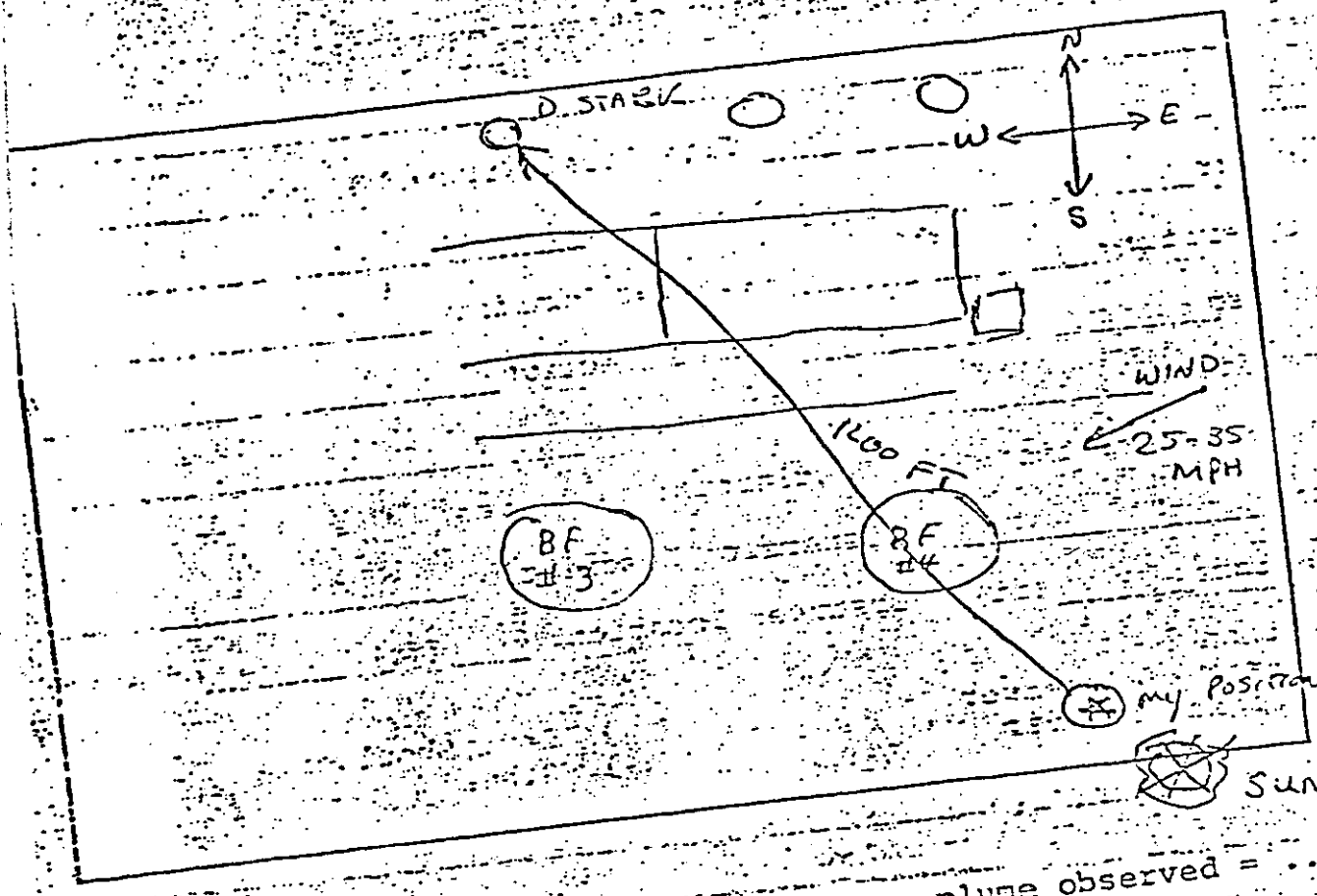
FOR VISIBLE EMISSIONS NONE OBSERVED

IN 45 MIN READING

ector Robert B BEAN Date 27 NOV 78

N-8 EPA-IN-FORM 298

MAP



Symbols

Sun = ☼
Plume direction = →
Point where plume observed = ····
Observer = ✕
Water Vapor Condensate

Photographs: S&A File ( ) Enclosed ( ) None ( )

Comments

Signature Robert B Beam Date 27 Nov 78

VISIBLE EMISSION OBSERVATION RECORD

mpany KAISER STEEL CORP

te 27 NOV 78 Time First Sighted Plume

e Start 1345 Time Stop 1425

Temperature 60°F Relative Humidity 20%

d Speed 25-35 MPH Wind Direction NE

Condition CLEAR Background SKY

me Characteristics: Continuous: ( ) yes ( ) no

olor Dispersion Description

ck Height 225 (ft) Observer location: 750 (ft) SOUTH of stack

location
(X) Back of Observer ( ) Left Shoulder
( ) Right Shoulder ( ) Other

ssion Point D BATTERY STACK COKE OVENS
1345-1425

0	15	30	45
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

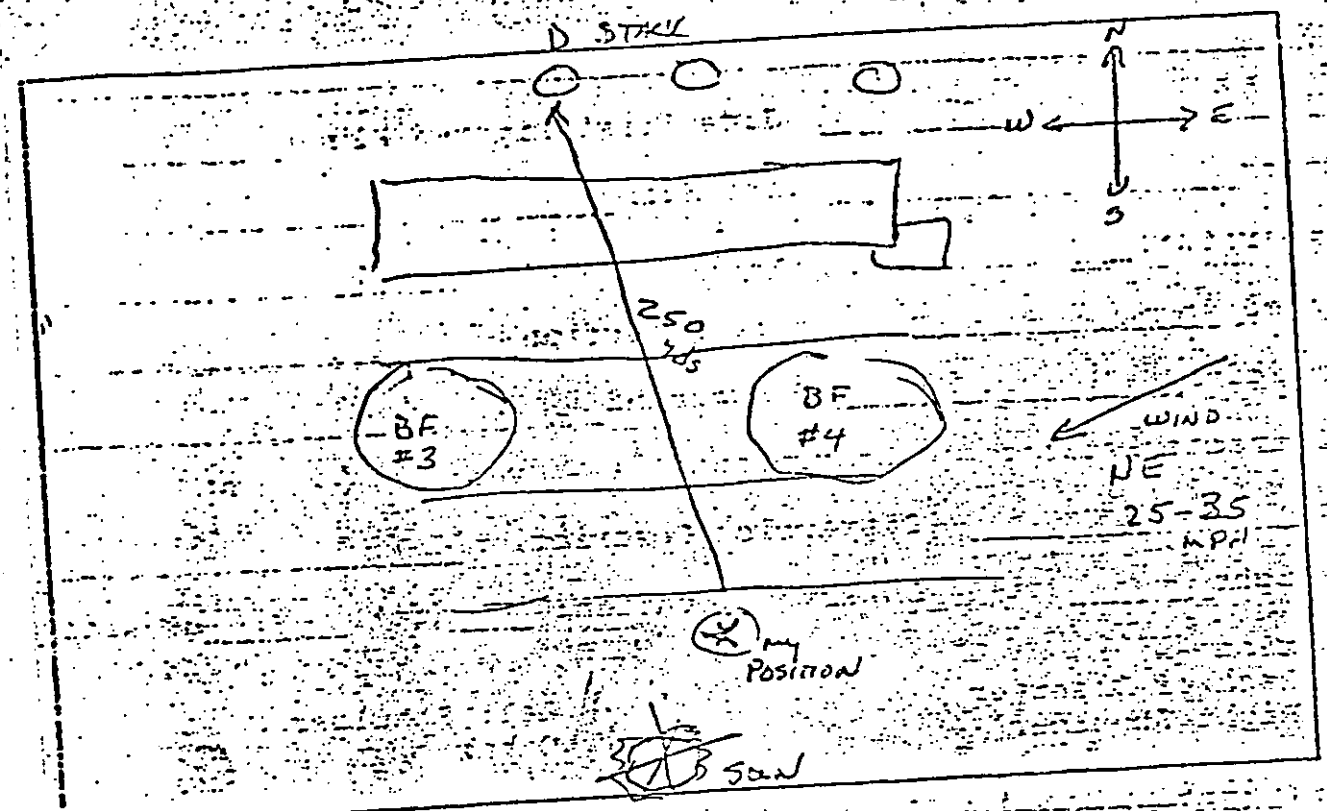
Min	0	15	30	45
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0

Min	0	15	30	45
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				

S: VISIBLE OBSERVATION ON D BATTERY STACK
FOR EMISSIONS NONE OBSERVED
IN 40 MIN OF READING

ctor ROBERT B BEHN Date 27 NOV 78

MAP



Symbols

Sun = ☼ Point where plume observed = ····

Plume direction = → Observer = ⊀

Water Vapor Condensate

Photographs: S&A File ( ) Enclosed ( ) None ( )

Comments

Signature Robert A Bean Date 27 NOV 78

VISIBLE EMISSION OBSERVATION RECORD

ompany KAISER STEEL CORP

ite 28 NOV 78 Time First Sighted Plume

me Start 1310 Time Stop 1414

r Temperature 62°F Relative Humidity 26.2%

nd Speed 0-3 MPH Wind Direction SW

y Condition CLEAR Background SKY

ume Characteristics: Continuous: ( ) yes ( ) no

Color Dispersion Description

ack Height 225 (ft) Observer location: 750 (ft) SOUTH of stack

n location
(X) Back of Observer
( ) Right Shoulder
( ) Left Shoulder
( ) Other

ission Point D BATTERY STACK COKE OVEN

1310 - 1414

n	0	15	30	45
	0	0	0	0
	0	0	0	0
	5	5	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0

Min	0	15	30	45
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0
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

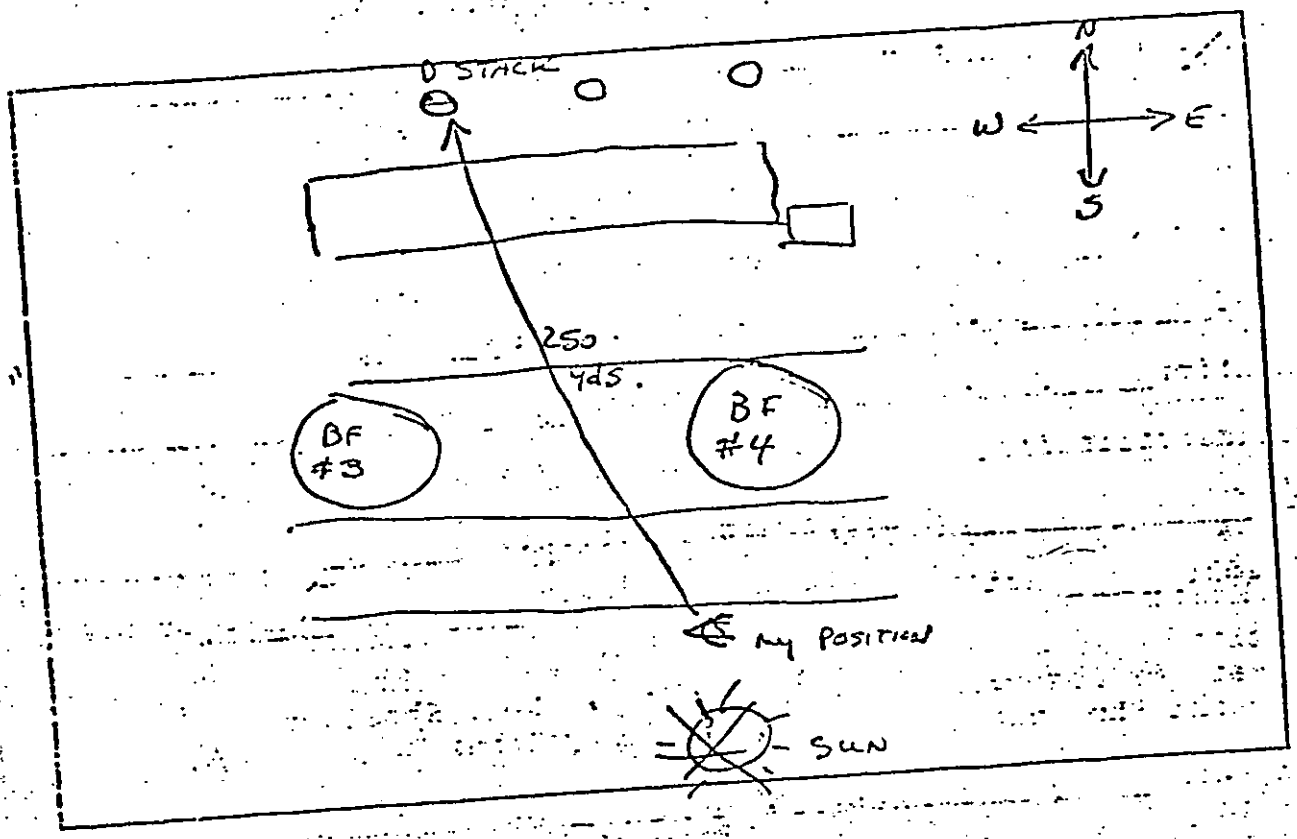
Min	0	15	30	45
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0
60	0	0	0	0
61	0	0	0	0
62	0	0	0	0
63	0	0	0	0
64	0	0	0	0

ES: OBSERVATIONS ON D BATTERY STACK

10 SECS OF VISIBLE EMISSIONS IN 64 MIN OBSERVATION

pector ROBERT B BEAN Date 28 NOV 78

MAP



Symbols

Sun = ☼
Plume direction = →
Point where plume observed = ...
Observer = 4

Water Vapor Condensate

Photographs: S&A File ( ) Enclosed ( ) None ( )

Comments

Signature Robert B Bean Date 28 Nov 72

7 BATTERIES

N
W + E
S

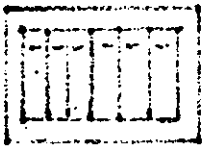
COKE PUSH SIDE — I RAM

"A"	B	C	D	E	F	G

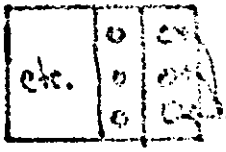
AERIAL VIEW

COKE SIDE

Each Battery = 45 coke ovens

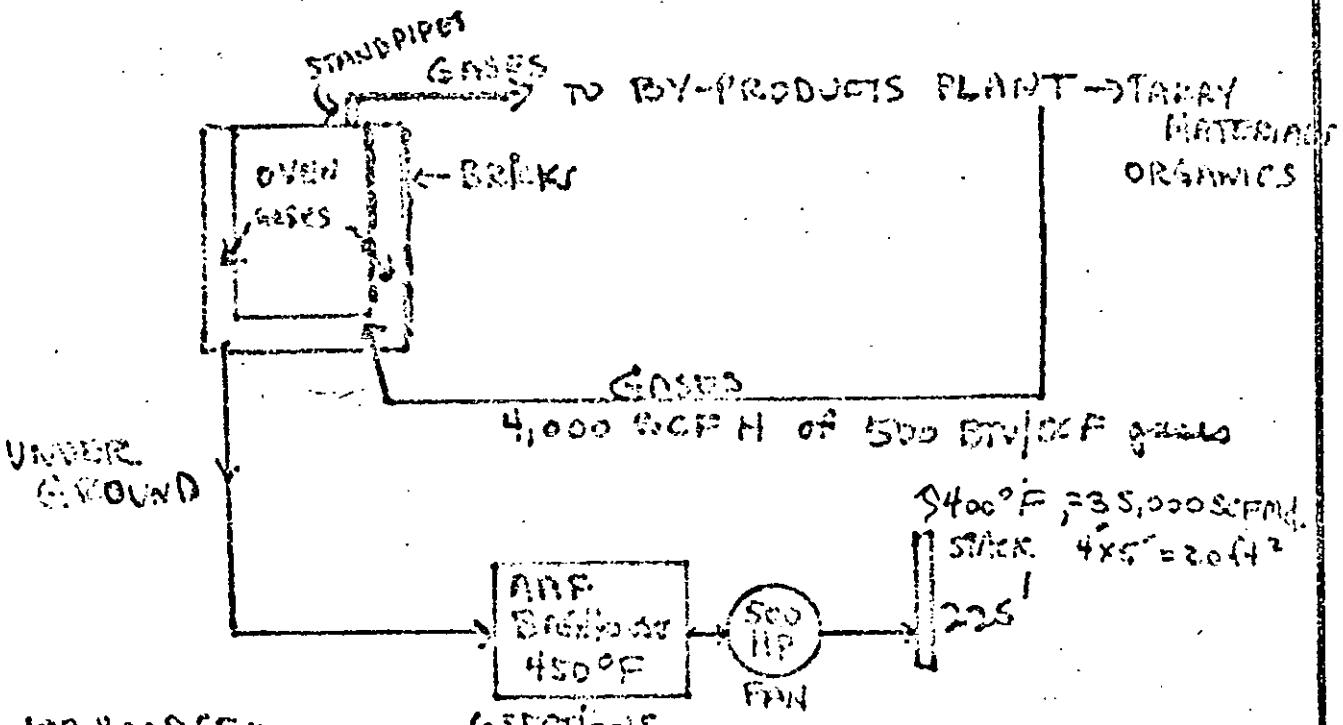


Side View



TOP SIDE

COAL CHARGE PORTS
13.5 Tons Charge From Larry Car
Heated 16-17 Hours



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY	Environmental Protection Agency Surveillance & Analysis Division Region IX San Francisco	KAISER STEEL CORP. FONTANA, CA BATTERY "D" - COKE OVENS
Adam Hawkins	1-29-79	Figure No. 1