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United States Steel Corporation

GENEVA WORKS

WESTERN STEEL DIVISION

GENEVA WORKS
P. O. BOX 510
PROVO, UTAH 84601

AP-42 Section 12.2
Reference
Report Sect. 4
Reference 107

March 27, 1981

Mr. Lance C. Vinson, Director
Enforcement Division
Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80295

Dear Mr. Vinson,

Please find enclosed a copy of the Compliance Test Report for the [redacted] Process data and continuous visible emission monitoring data have already been submitted to EPA and UDH. You will note that the gravimetric analysis exceeds the 0.04 GR/DSCF. However, excluding the sulfates and combined water, we are under the 0.03 GR/DSCF. U. S. Steel elects to demonstrate compliance by excluding the sulfates and combined water.

Yours very truly,

R. W. Pett
Chief Engineer
Geneva Works

Enclosure

cc: D. R. Cronin w/e
T. W. Goettge w/e
J. Hawthorne w/e
H. A. Huish wo/e

PROJECT NO. ____________

PLANT US Steel - Geneva I

CONFIDENTIAL
RELEASED ONLY BY
AUTHORIZED PERSONNEL

LAB NO. ____________

DATE 3/23/81

Particulate Compliance Testing

Coker Unit #3

U.S. Steel - Geneva

February, 1980

REPORT BY

Ed Wadington

ENERGY AND ENVIRONMENTAL
MEASUREMENT
CORPORATION

Phone 252-4450 ▪ 17 No. 32nd St. ▪ Billings, Montana 59101

INTRODUCTION

United States Steel Corporation (USS), Geneva Works at Provo, Utah, contracted with Energy and Environmental Measurement Corporation (EEMC) to conduct a series of EPA particulate compliance tests on the Geneva Works #3 Coker stack. Tests were conducted on 2/3, 4, 5/81. This is a report of the methods and results of this testing.

Test Chronolog

Date	Time Start	Time Finish	Run #
2/3/81	1158	1644	1 Pt.
2/4/81	0811	1309	2 Pt.
2/5/81	0752	1216	3 Pt.

METHODS - (PARTICULATES & OPACITY)

EPA Methods 1-5 & 9[1] were utilized for the test series. The following procedural comments apply:

1) A stainless steel probe liner was utilized.

2) The outer shell temperature of the probe liner was monitored.[2] The sensor (TC) was located approximately six-nine inches prior to connection within the collection box.

3) The filter air medium temperature was monitored (dial thermometer).

4) A mercury barometer was utilized for determination of absolute atmospheric pressures. This unit was supplied by USS-Geneva.[3]

5) Oxygen and carbon dioxide values were determined by integrated bag sampling utilizing a separate sample probe (attained during runs 1 & 2 to the pitobe assy. and during run 3 operated separately at a central sampling location in the stack). Upon completion of the particulate sampling, three orsat analyses were run on the integrated bag.[4]

   In addition to the integrated bag/orsat procedure, a Teledyne 320-A oxygen analyzer was utilized throughout the testing at the meter box orifice outlet. Also, integrated bag samples were verified with the Teledyne.

6) The resultant train capture was removed after each test. Samples were then bottled and returned to the contractors' laboratory for subsequent analysis.

7) A Dwyer micromanometer (0-0.25 "H_2O) was utilized for determination of Δ P.

8) Leak checks were performed on the particulate train prior to and after sampling at 15 "Hg. Leak checks were performed twice daily on the integrated bag sampling train.

9) Calibration procedures were as follows:
(Note appendix for calibration results.)

A) The meter box was calibrated with a wet test meter prior to and after the test series. The WTM was calibrated utilizing water displacement.

B) The nozzle(s) utilized were checked for dimensional features utilizing a Starrett expanding micrometer with micro-calipers.

C) The pitot (S-type) utilized was manufactured by the contractor and met EPA specifications (note appendix). It was mounted on the pitobe assy. so as to meet EPA placement (separation) requirements.

D) All temperature sensors were calibrated prior to and after the test series. Daily checks were made to ensure no obvious alterations had occurred in sensor(s) operation.

E) The opacity observer's Certification documentation is contained in the calibration section.

In general, the contractor followed procedures outlined in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III - Stationary Sources Specific Methods, EPA 600/4-77-027b, as revised.

10) Chain of Custody

The contractors' chain of custody was and is as follows:

Sample Route	Personnel	Location	Container
Sample procurement	E. Wadington R. Guillen	Sample site	Polypropylene bottle(s)
Sample storage in field during testing	E. Wadington	Travel Lodge Motel	Polypropylene bottle(s) in cardboard box
Sample return to contractors' laboratory	E. Wadington	Contractors' Aircraft	Polypropylene bottle(s) in cardboard box
Laboratory analysis and handling	R. Guillen	Billings Laboratory (17 N. 32nd St. Billings, MT)	Polypropylene bottle(s) in cardboard boc
Final Storage	R. Guillen	Billings Laboratory	Polypropylene bottle(s) in cardboard box

Ed Wadington

Rafael Guillen

11) Sample site location (note appendix).

12) Laboratory procedures were followed as per EPA specifications or as modified in the USS-Geneva-EPA stipulative agreement.[5] No deviations are noted.

13) Opacity results (data) and comments are contained in the appendix.

14) As per the request of the State of Utah,[6] impingers captured were retained and analyzed for gravimetric residue. Evaporations were conducted at 105°c, dessicated until constant weight was achieved and weighed. Results are included in the data summaries.

RESULTS

All pertinent results are contained in the Summary section of this report. Field and laboratory data and subsequent calculations are contained in the appendix as titled.

Process Data

Process operating data was provided to the EPA and State observers during the testing and in the test protocol (part of this report).

Comments on the Sampling Program at Geneva

The consultant makes the following observations because he feels that they are fundamental to the test program.

1) If it is the intent of the test program to procure isokinetic samples and the mass loss of particulate (via gas flow) then the use of the "approved" 0-.25 "H_2O micromanometer is not recommended. The errors involved in reading values encountered in the #3 Coke stack gas stream are easily ± 100% and are estimated at ± 200-300% for many individual ΔP "H_2O measurements. There are better ways to procure accurate and precise figures, and they should be employed if the parties are seeking reality and not just employing "agreed upon or standard procedure".

2) The temperature of the sampled gases should be taken within the probe and filter assemblies. The consultant feels that a minimum temperature should be utilized within the sample train stream. Any measure short of such an endeavor will avoid meaningful information.

3) During the testing the consultant was aborted from utilizing his own test gear in some instances due to activities by some of the primary parties. If instrumentation is brought in by one of the primary parties and is utilized to the exclusion of the contractor, then the contractor cannot be responsible for the resultant values. As a result, the contractor feels that the mercury barometer installed and utilized by EPA (owned by USS) was improperly placed on site (as mounted), and therefore generated questionable data. The contractor utilized its own aneroid barometer(s)-2, however, the "approved" data was included in this report.

4) The contractor was requested to utilize a pitobe located with the integrated gas sampling probe.[4] Upon analysis of the first bag sample, it was discovered that the integrated sample oxygen values were higher than the Teledyne data taken from the meter box during sampling. The consultant was not entirely surprised since the stack gases are negative (static) and infiltration was obvious as noted by the Teledyne meter box values. As a result, the integrated bag approach was abandoned upon approval. The resultant (run 3 Pt.) values appeared to be realistic. Run 1 Pt. (integrated) oxygen values do not appear to be representative. The consultant, however, was requested to utilize the integrated values so as to satisfy "procedure" even tho the "procedure" was modified in subsequent tests.

<u>REFERENCES</u>

(1) Federal Register, Vol. 36, No. 247, Thursday, December 23, 1971, and as further modified.
(2) Requested by John Floyd, 2/2/81, on test site.
(3) Supplied by USS-Geneva, mounted by John Floyd. All data was procured by EPA.
(4) Integrated sampling procedure required by State of Utah.
(5) Appendix 1.3, <u>General Particulate Emission Testing Procedures</u>.
(6) Dave Kopta, 2/2/81, at test site.

EEMC
ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION
Phone 252-4450 □ 17 No. 32nd St. □ Billings, Montana 59101

FIELD OBSERVATION CHECKLIST

PLANT NAME United States Steel - Geneva Works DATE 3/23/81

PLANT ADDRESS Provo, UT

SOURCE TESTED #3 Coker

PLANT CONTACT Jim Starley PHONE (801) 224-9220

		AFFILIATION
OBSERVERS	Jim Starley	U.S. Steel
	Art Holloman	"
	Dave Trozzo	"
	Norm Johnson	"
	Jerry Clark	EPA
	John Floyd	EPA
	Connally Mears	State of Utah
	Dave Kopta	
SUPERVISOR'S NAME	Ed Wadington	EEMC
OTHER MEMBERS	Rafael Guillen	EEMC
	Dave Wang	EEMC
	Ben Myren	EEMC

REPORT CERTIFICATION

THE SAMPLING AND ANALYSIS PERFORMED FOR THIS REPORT WAS CARRIED OUT UNDER MY DIRECTION AND SUPERVISION.

DATE 3/23/81 SIGNATURE

I HAVE REVIEWED ALL TESTING DETAILS AND RESULTS IN THIS TEST REPORT AND HEREBY CERTIFY THAT THE TEST REPORT IS AUTHENTIC AND ACCURATE.

DATE 3/23/81 SIGNATURE

ANALYSIS FORM 1038A

FI__

SEC.

DATE

SHEET NO.

Coker #3 Stack - Geneva - U.S. Steel @ Provo, UT

Particulate Tests
EPA #5

Date	Time	Run #	A gr/dscf	B PPh	C sdcfh x10^6	D awcfm	E % O_2	F % CO_2	G % H_2O	H Ts(°F)	J Opacity (%)	K Allowables	L gr/dscf	M PPh	N Add Impingers	O	P	R
2/3/81	1158	1	.049	15.7	2.232	86.244	10.0*	5.6	13.7	445.	7.4	**	.056	17.9				
2/4/81	0811	2	.063	21.1	2.345	91.562	9.4	7.3	14.5	445.	9.6	**	.067	22.3				
2/5/81	0752	3	.052	12.0	1.609	62.782	8.6	7.5	14.0	450.	6.0	**	.058	13.3				

*Oxygen content believed to be nonrepresentative. 10% figure directed to be utilized by John Floyd.

**0.04 gr/dscf - gravimetric analysis as is.

0.03 gr/dscf - exclusive of Sulfate and associated water.

**20% opacity (6 minute intervals)

ANALYSIS FORM 1038A

FILE

SEC.

DATE

SHEET NO.

Geneva - U.S. Steel @ Provo, UT - $SO_4^=$ & Combined Water Analysis

Particulate Tests
EPA #5

	Date	Time	Run #	A gr/dscf gravimetric	B gr/dscf - H_2O combined	C % of gr/dscf	D gr/dscf - H_2O - $SO_4^=$	E % of gr/dscf gravimetric	F	G	H	J	K	L	M	N	O	P	R
1																			
2	2/3/81	1158	1	.0491	.0485	12.2	.0280	42.9											
3																			
4	2/4/81	0811	2	.0629	.0565	10.2	.0386	38.6											
5																			
6	2/5/81	0752	3	.0520	.0453	12.9	.0203	61.0											
7																			
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UNITED STATES STEEL CORPORATION
Geneva Works
Particulate Compliance Testing

Location of Sampling Ports & Points

The sample ports are located (note drawing of stack dimension on next page) 49'4½ inches above the last gas stream interference. The diameter of the stack at this location is 16'3* inches. The number of diameter upstream and downstream of the sample ports are as follows:

Upstream:

$$\frac{49.38 \text{ ft.}}{16.25 \text{ ft.}} = 3.04$$

Downstream:

$$\frac{200.46 \text{ ft.}}{16.25 \text{ ft.}} = 12.34$$

The required number of 40 points was utilized. A total sampling time of six minutes per point was taken yielding a total sample time of 240 minutes per test. Data was taken at three minutes internally resulting in eighty (80) sets of data per test.

*As measured by USS-Geneva.

UNITED STATES STEEL CORPORATION
Geneva Works

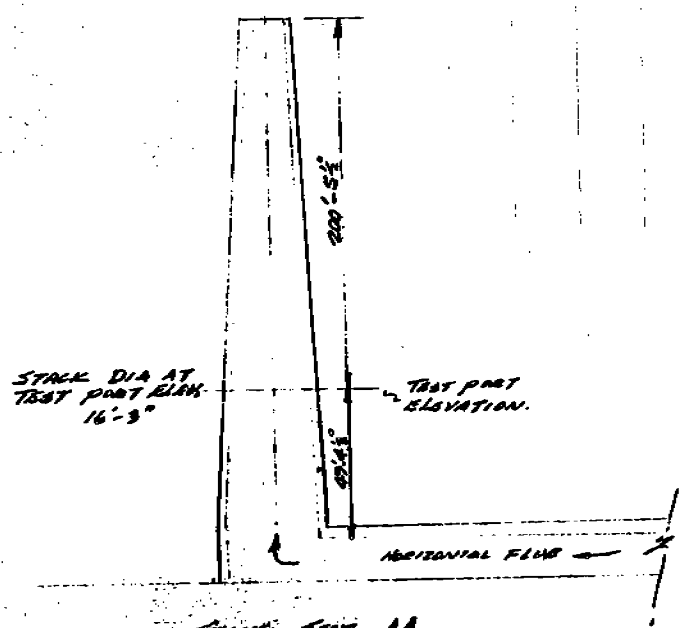
Location of Coker #3 Flue Gas Sampling Points

D = 15-7 7/8 [(1)] (187.8 inches)

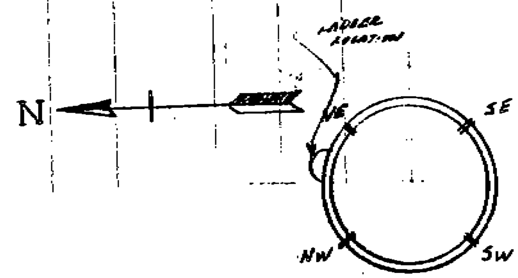
Sample points - 40

Point	% D Port Hole	Inches to Pt.
1	1.3	2.4
2	3.9	7.3
3	6.7	12.6
4	9.7	18.2
5	12.9	24.2
6	16.5	31.0
7	20.4	38.3
8	25.0	47.0
9	30.6	57.5
10	38.8	72.9

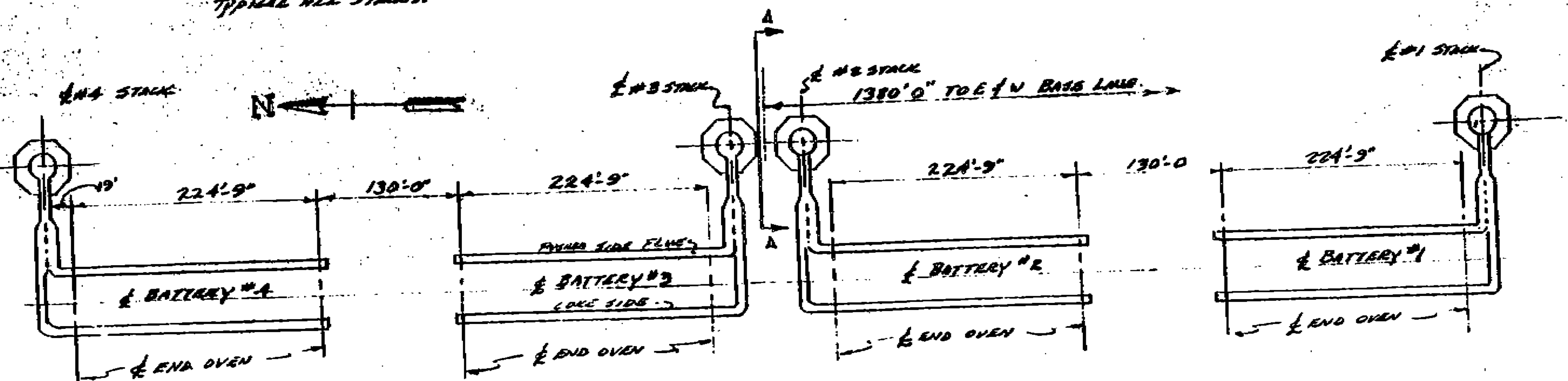
(1) Utilized stack dimensions were based on provided plant drawings. Subsequent measurements by USS-Geneva indicated an actual diameter of 16'3". It is not known by the consultant how accurate these measurements are. During the testing it was agreed by the company and EPA to complete the testing at the 15-7 7/8 value. All calculations are based on the 15-7 7/8 value.



STACK SECT. AA
TYPICAL ALL STACKS.

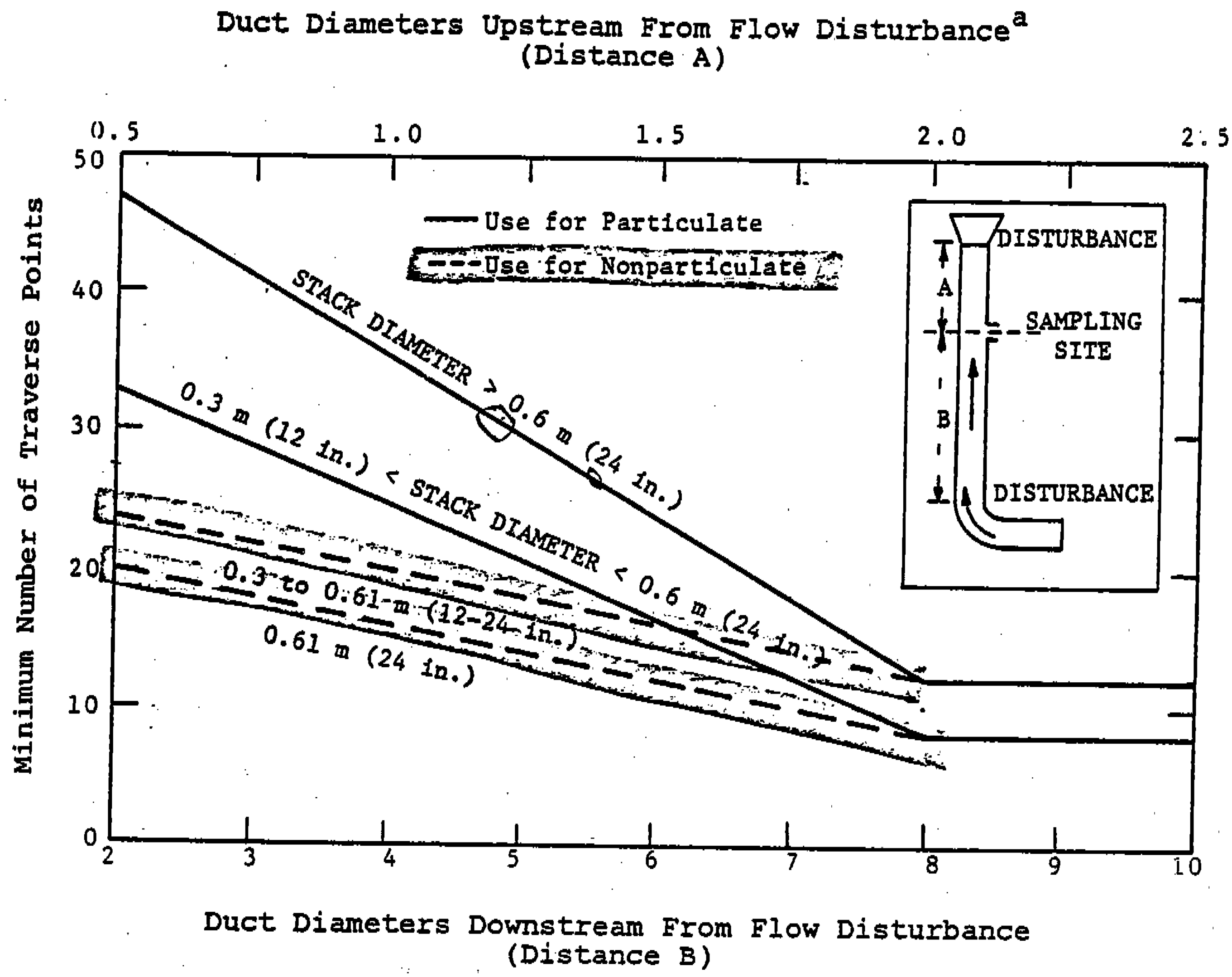


CROSS SECTION AT
TEST PORT ELEVATION.
TYPICAL ALL STACKS.



SCHEMATIC ℄ LOCATION DIAGRAM.
COKE BATTERY FLUES ¢ STACKS.

		TITLE	SCALE	DRAWING No.
GENEVA WORKS U.S. STEEL CORPORATION	DRAWN JRS 3/3/81 CHECKED DESIGN ENG. APPROVED	GENEVA COKE BATTERIES FLUES ¢ STACK ARRANGEMENT.	NONE.	Y-32219



[a]From point of any type of disturbance (bend, expansion, contraction, etc.).

Figure 1.4. Minimum number of traverse points for velocity (Particulate and nonparticulate) traverse.

The reference methods in this appendix are referred to in § 60.8 (Performance Tests) and § 60.11 (Compliance With Standards and Maintenance Requirements) of 40 CFR Part 60, Subpart A (General Provisions). Specific uses of these reference methods are described in the standards of performance contained in the subparts, beginning with Subpart D.

Within each standard of performance, a section titled "Test Methods and Procedures" is provided to (1) identify the test methods applicable to the facility subject to the respective standard and (2) identify any special instructions or conditions to be followed when applying a method to the respective facility. Such instructions (for example, establish sampling rates, volumes, or temperatures) are to be used either in addition to, or as a substitute for procedures in a reference method. Similarly, for sources subject to emission monitoring requirements, specific instructions pertaining to any use of a reference method are provided in the subpart or in Appendix B.

Inclusion of methods in this appendix is not intended as an endorsement or denial of their applicability to sources that are not subject to standards of performance. The methods are potentially applicable to other sources; however, applicability should be confirmed by careful and appropriate evaluation of the conditions prevalent at such sources.

The approach followed in the formulation of the reference methods involves specifications for equipment, procedures, and performance. In concept, a performance specification approach would be preferable in all methods because this allows the greatest flexibility to the user. In practice, however, this approach is impractical in most cases because performance specifications cannot be established. Most of the methods described herein, therefore, involve specific equipment specifications and procedures, and only a few methods in this appendix rely on performance criteria.

Minor changes in the reference methods should not necessarily affect the validity of the results and it is recognized that alternative and equivalent methods exist. Section 60.8 provides authority for the Administrator to specify or approve (1) equivalent methods, (2) alternative methods, and (3) minor changes in the methodology of the reference methods. It should be clearly understood that unless otherwise identified all such methods and changes must have prior approval of the Administrator. An owner employing such methods or deviations from the reference methods without obtaining prior approval does so at the risk of subsequent disapproval and retesting with approved methods.

Within the reference methods, certain specific equipment or procedures are recognized as being acceptable or potentially acceptable and are specifically identified in the methods. The items identified as acceptable options may be used without approval but must be identified in the test report. The potentially approvable options are cited as "subject to the approval of the Administrator" or as "or equivalent." Such potentially approvable techniques or alternatives may be used at the discretion of the owner without prior approval. However, detailed descriptions for applying these potentially approvable techniques or alternatives are not provided in the reference methods. Also, the potentially approvable options are not necessarily acceptable in all applications. Therefore, an owner electing to use such potentially approvable techniques or alternatives is responsible for: (1) assuring that the techniques or alternatives are in fact applicable and are properly executed; (2) including a written description of the alternative method in the test report (the written method must be clear and must be capable of being performed without additional instruction, and the degree of detail should be similar to the detail contained in the reference methods); and (3) providing any rationale or supporting data necessary to show the validity of the alternative in the particular application. Failure to meet these requirements can result in the Administrator's disapproval of the alternative.

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METHOD 1—SAMPLE AND VELOCITY TRAVERSES FOR STATIONARY SOURCES 69

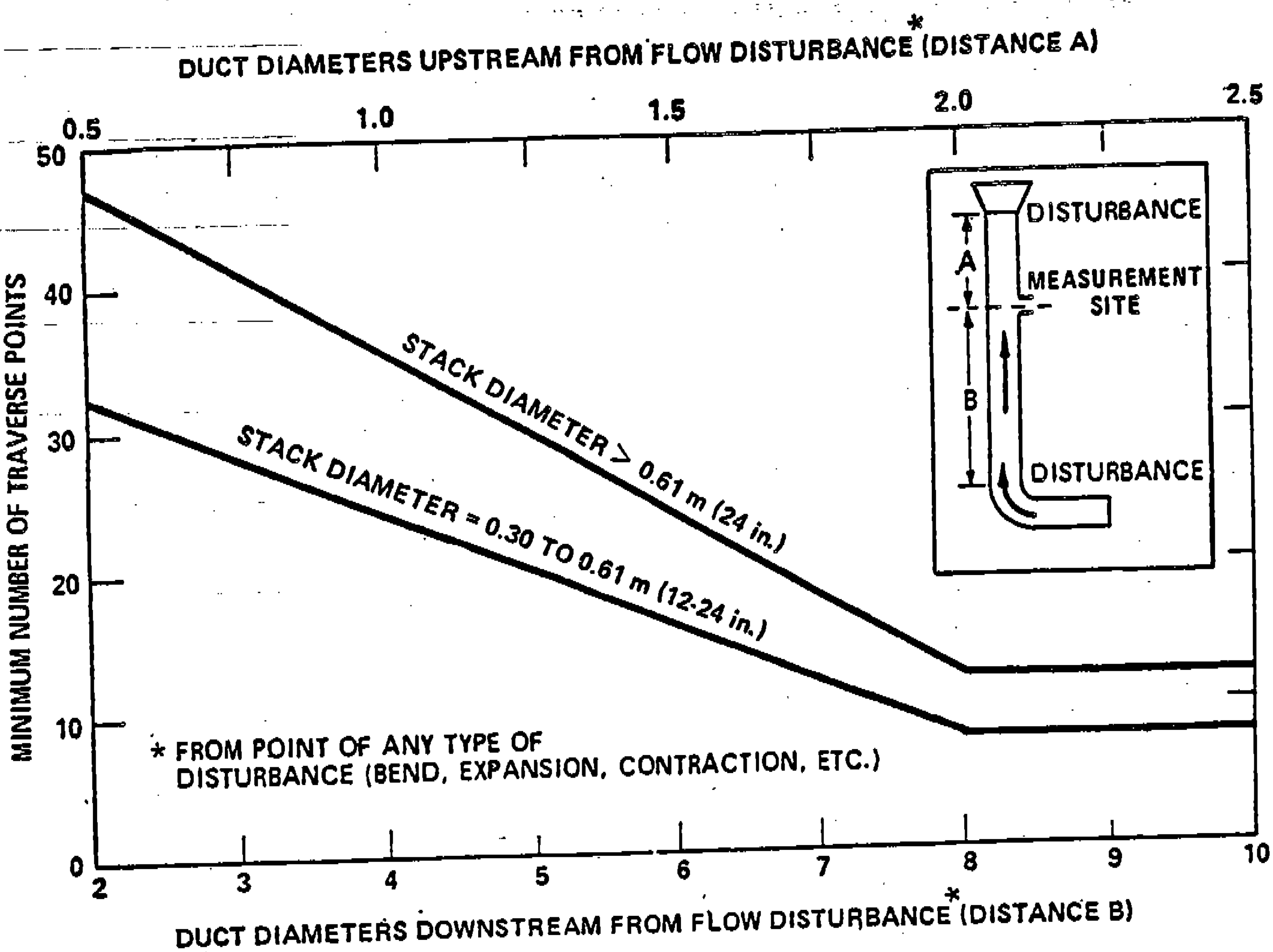


Figure 1-1. Minimum number of traverse points for particulate traverses.

#3 Coke Battery - [illegible]

Appendix 1.3

General Particulate Emission Testing Procedures

This Appendix specifies the Methods and procedures that shall be used in evaluating compliance of stacks (including baghouses) with the particulate emission standards set forth in this Decree. Particulate mass emission testing shall be performed as provided in this Appendix 1.3. No exceptions shall be made, except as approved by the EPA Administrator or as provided in other subparts of this Appendix 1. Provisions of this Appendix not addressed and replaced in other subparts of this Appendix 1 shall apply to all tests of stacks.

1. Any particulate mass emission test required by this Decree or its Appendices shall be performed pursuant to applicable EPA Reference Methods contained in 40 CFR, Part 60, Appendix A, as amended at the time of the test. All sampling and testing performed pursuant to this Decree or its Appendices shall be limited to the front half of the EPA train as described in EPA Reference Method 5, 40 CFR, Part 60, Appendix A as amended at the time of the test.

2. Compliance with the particulate mass emission limitations set forth in this Decree shall be determined by averaging three runs using the test procedures stated in this Appendix 1.3. The total sample time for each test run shall be as specified in the respective emission limitation set forth in this Decree, unless at least 100mg of total particulate mass is not expected to be collected, assuming that the emissions from the stack are at the allowable limit for the time of the test. If at least 100mg of particulate mass is not expected in the specified sample time, then the sample time shall be either

that time calculated to be necessary to provide 100mg of particulate mass or 240 minutes, whichever is the lesser sample time. If a sample time greater than 240 minutes is specified in a specific emission limitation set forth in this Decree, then no other sample time shall be used.

3. During each run of a stack test, the facility to be tested shall burn fuels, use raw materials, and maintain process conditions (as applicable) representative of normal operating conditions and under such other conditions as EPA may specify.

4. Prior to, during and after each stack test performed, U.S. Steel shall provide the EPA and UDH or their designated representatives, access to production data and other areas or parameters that are necessary for determining compliance and/or documenting the representativeness of process operating conditions during the tests.

5. During each stack test performed, simultaneous visible emission evaluations shall be conducted according to the methodology specified in Appendix 1.2 of this Decree. A copy of such raw data shall be included with the stack test report. The report should include actual sampling and observation clock times. If a continuous emission monitor for opacity is in operation as provided by this Decree, it shall be certified according to the procedures listed in Appendix 1.2 and in Performance Specification 1 of Appendix B, 40 CFR Part 60, and shall meet the provisions of Appendices 1.2, and/or 7, prior to the stack test. The continuous emission monitor shall be operated during all tests, and all measurements shall be documented fully in the stack test report. A plot of optical

density versus grain loading (gr/dscf) and mass emission rate (lb/hr) shall be made in the report separately for each series of runs on each stack tested.

6. Notification of tests and submission of reports shall be as set forth in paragraphs C.9. and C.10. unless specific requirements are set forth in the paragraphs of section D. applicable to the source being tested, or in this Appendix 1.

7. At least 60 days prior to the start of each stack test performance, U.S. Steel shall submit to UDH and EPA for their approval a test protocol. Such protocol shall address at least these topics: operation of the process during the test, test methodology, quality assurance and reporting procedures, and contractors and other personnel to be involved. At least 30 days prior to the start of the test, EPA and UDH shall comment on the test protocol and state approval or required changes. The protocol shall be consistent with this Decree, including Appendices, unless changes were agreed upon by U.S. Steel, EPA, and UDH no less than 21 days prior to the start of the test.

8. EPA and UDH shall judge the validity of test data and representativeness of the process operating conditions during each test consistent with the standards of this Decree and its Appendices, and may judge a test unacceptable. If any test is unacceptable, it must be repeated as soon as practicable, but in no event later than 60 days from the last day of testing of the previous test.

9. Each report of a stack test shall contain at least the following information:

Cover

1. Plant name and location

Need drawing Plant

2. Source samples and stack identification (including schematic and drawing of stack test location.)
3. Testing company or agency, name and address
4. Dates of tests and date of report
5. Names of test leader and other testers

Certification of Report Integrity

1. Certification by team leader (signature, title, and credentials)
2. Certification by reviewer (signature, title, and credentials)

Introduction {Results}

1. Test purpose
2. Test location, type of process
3. Test dates
4. Pollutants tested
5. Observers' names (industry and agencies)
6. Any other important background information
7. Methods applied, including revisions or modifications.
8. Quality assurance procedures applied

Summary of Results

1. Emissions results, in units of the standard
2. Process data to the extent available, as related to determination of compliance and representativeness of operating conditions and levels
3. Allowable emissions
4. Description of collected samples
5. Visible emissions summary and plot
6. Discussion of irregularities in the sampling procedures

7. Percent isokinetic sampling
8. Other statement(s) of data quality which may affect use of data

Source Operation

1. Description of process and control devices, including manufacturers name and model number, and important design parameters

2. Process and control equipment flow diagrams to show raw material and effluent flows, and the relationship between process components, air pollution control equipment and points of emission to the atmosphere to the extent this information has not already been provided to EPA and UDH, or has changed after prior submission

3. Process data and results, with example calculations, to document effect on emissions and representativeness of operating conditions and levels

4. Representativeness of raw materials, products and operating levels

5. Control equipment and operating parameter data

6. Any specially required operation demonstrated

Sampling and Analysis Procedures

1. Sampling port location and dimensioned cross section

2. Sampling port description, including labeling system

3. Sampling train description

4. Brief description of sampling procedures, with discussion of deviations from standard methods

5. Brief description of analytical procedures, with discussion of deviations from standard methods

6. Quality assurance

ee p/24

Appendix

1. Complete results with example calculations
2. Raw field data (original copy, not computer printouts, including visible emissions and quality assurance check results)
3. Laboratory report, and all raw data (lab)
4. Raw production and control equipment data, signed by plant official

P/24

5. Chronological record of test events
6. Calibration procedures and actual results
7. Project participants and titles
8. Related correspondence
9. Complete chain of custody of all samples (including signatures of participants) from the time of the initial tare and/or standardization (or set-up) of filters, reagents, etc. until final analyses of final results are recorded
10. Statement of where all samples are stored, as required, for 2 years following the test

5 4 who? by EPA QA coord.

10. Quality Assurance for General Test Procedures: For all tests conducted under this Decree, the tester shall follow all applicable and approved Quality Assurance (QA) procedures as specified in <u>Quality Assurance Handbook for Air Pollution Measurement Systems</u>, Volume III - Stationary Source Specific Methods, EPA 600/4-77-027b, as revised. If the tester can show EPA and UDH that s/he intends to apply alternate QA procedures which may not have been approved in the above document, but can be shown to be equivalent in assuring the collection of meaningful, accurate, and representative emission data, such alternate procedures may be used during tests.

Appendix 1.4

Procedure for determining particulate concentration of coke battery combustion stacks, including a correction for sulfate and combined water.

Stack testing procedures for determining compliance with standards set forth in paragraph B.2.(g)(1) shall be the methodology specified in 40 CFR, Part 60, Appendix A, Methods 1 through 5 and Appendix 1.3 of this Decree. These procedures shall be modified (as specified in this Appendix 1.4) to determine and delete the amount of sulfate ion and water combined with free sulfuric acid, if U.S. Steel elects to demonstrate compliance by excluding sulfates and combined water.

1. Applicability - This procedure is specifically designed to be used when determining only total non-sulfate particulate emissions from the combustion stacks of the U.S. Steel, Geneva Works Coke Batteries, in Provo, Utah. If EPA promulgates (nationally) a standard Reference Method which measures such particulates, minus sulfate and combined water, that new method will become applicable in place of the modified procedures specified in this Appendix. The analysis for, and exclusion of sulfate compounds, as described here, (or in any other promulgated method), are to be implemented only if U.S. Steel elects to demonstrate compliance by excluding sulfates and combined water.

2. Principal - A gas sample is extracted isokinetically from the stack and analyzed gravimetrically for particulate mass, using standard Method 5 sampling procedures, equipment and analysis. If certain sulfate compounds and

combined water are to be excluded as provided for in B.2.(g)(1), then an additional analysis may be performed (as specified below) on the entire front-half catch, which will quantify the amount of excludable sulfate compounds and combined water (soluble in water, reported as $SO_4^{=}$). These sulfate compounds will be determined using the barium-thorin method specified in Method 8 after pretreatment procedures through proper ion-exchange column. These procedures are specified in paragraph 9. below. The total front catch particulate portion (including sulfates and combined water) is determined gravimetrically. The analysis of the sulfate compounds in the following paragraphs for the front-half catch will be used to determine actual particulate mass less sulfate and combined water. Should any non-sulfate residue be found in the analysis of the water wash solution, this will be added to the gravimetric result.

3. The unused filters for the Method 5 tests should be dried at 105°C and desiccated to constant weight before their use. The soiled filters and acetone washings residue should be dried at 105°C and desiccated to constant weight following the tests. 2

4. After drying and equilibration of the glass-fiber filter and the acetone washings residue in accordance with Method 5, the filter and washings residue from each test run will be combined and extracted with a known volume of hot (80 degrees C) deionized water for a period of at least 30 minutes. The extract will be filtered into a clean tared beaker to separate insoluble solids and filter fibers. The beaker used to extract the filter and residue will be rinsed with three 10 ml aliquots of hot deionized water and each of

these aliquots will be filtered and combined with the original extracted solution.

5. Extract solutions from paragraph 4. above (one separate sample for each test run) will be evaporated (at 105°C) and desiccated and weighed to constant weight. This weight is the combined water, sulfate ion, and other soluble particulates.

6. The residues from paragraph 5. above will be redissolved in a known volume of deionized water and the resulting solution titrated to pH 7 with standardized NaOH solution. The normality and titrant volume of NaOH solution will be recorded. This neutralizes acids, so that the dried weight can be determined, without water.

7. The titrated solutions from paragraph 6. above will be evaporated at 105°C, desiccated and weighed to a constant weight. This weight is that of the sodium added in paragraph 6, sulfate, and other soluble particulate, but not with water.

2

8. The weighed residue from paragraph 7. above will again be dissolved in a suitable volume of deionized water and the resulting solution will be analyzed by the barium-thorin method after it has been pretreated in an ion-exchange column containing Rexyn 101-H or Dowex 50 resin, according to paragraph 9. below.

9. The following pre-treatment procedures shall be used, unless U.S. Steel, EPA, and UDH agree, based on previous experience, that valid data will be collected and reported without application of such procedure.

Pretreatment of samples to remove interfering ions shall be as follows: The filter extract and probe wash residue fractions may contain heavy metal ions (e.g., Fe, Ni, and V) which may cause an interference in the barium-thorin titration. Aliquots of these sample fractions must be passed through an ion exchange column in order to remove these ions prior to analysis.

(a) <u>Pretreatment Procedure</u> - The procedure for preparing and utilizing the resin column is as follows: a small amount of Rexyn 101-H (or Dowex-50), containing a strong acid type cationic exchange resin, is poured into a 250 ml beaker containing approximately 100 ml of 80% isopropanol and allowed to soak for approximately 20 minutes. This allows the resin to expand before being poured into the glass column. A 25 ml buret is plugged at the bottom end with a small portion of glass wool to prevent the resin particles from plugging the buret tip. The column is then filled approximately half full with 80% isopropanol, and the wetted resin is poured into the column until the level of resin reaches the 11 ml graduation mark. Care must be taken to maintain the 80% isopropanol level at least 1 inch above the resin level at all times. The buret is filled to the 0 ml graduation mark with 80% isopropanol, and the stopcock is opened to allow the isopropanol to pass through the column until the level reaches the 10 ml graduation mark. This rinsing process is repeated several times with the rinse being discarded. A column blank is then determined by placing a 125 ml erlenmeyer flask under the buret and passing three (3) 10 ml portions of 80% isopropanol through the column. Then 20 ml of 80% isopropanol are added to the flask (total volume = 50 ml); 1 to 2 drops of thorin indicator are added, and the blank is titrated with standard 0.01 N $Ba(ClO_4)_2$. If the sample requires more than 1 drop of titrant to cause the change from yellow to pink, the rinsing process must be repeated, followed by a second blank determination. Aliquots of each sample fraction are prepared for analysis by pipetting 10 ml of the sample into the column and then opening the stopcock to allow the sample to drip through the resin into a 125 ml erlenmeyer flask. When the level of the sample in the column reaches the 10 ml graduation mark, the stopcock is closed and the column is filled to the 0 ml graduation mark with 80% isopropanol and this is then passed through the column to rinse the sample through the resin. A second 10 ml rinse of 80% isopropanol is passed through the column and then 20 ml of 100% isopropanol is added directly to the flask and the sample is analyzed in the manner described in paragraph 9.(b) below. The capacity of resin columns of this size for removing cations is quite large as determined experimentally, however, a blank should be determined periodically when the column is in continuous use. The column can be regenerated by eluting the metal ions with 6 <u>N</u> HNO_3 (Note: the column must be rinsed thoroughly with distilled water before adding the 6 <u>N</u> HNO_3.)

(b) <u>Analysis of Individual Sample Fractions</u>

Filter and Probe Wash Residue - A 10 milliliter aliquot of the sample is passed through the ion exchange column into a 125 milliliter erlenmeyer flask, followed by 2-10 milliliter rinses of 80 percent isopropanol. 20 milliliter of 100 percent isopropanol are added directly to the flask followed by the addition of 1 to 2 drops of thorin indicator. Using a 10 milliliter buret (0.05 milliliter graduation), 0.01<u>N</u> $Ba(ClO_4)_2$ is added to the flask dropwise with swirling until the appearance of the first tinge of pink which persists for several minutes. Titration against a white background under fluorescent lighting aids in the detection of the endpoint. A second 10 milliliter aliquot is analyzed as above.

Calculation of Results

Results of analyses are reported for each individual sample fraction in terms of parts per million (ppm) H_2SO_4/SO_3 for the sample fraction, using the following formula:

$$C_{H_2SO_4/SO_3}\ (SO_2) = \frac{K \times N \times VT \times D}{VSTD}$$

where C = concentration of H_2SO_4/SO_3 or SO_2 in ppm (V/V)

$$K = \text{constant} = 1.08 \times 10^{-4} \frac{(lb)(l)}{(g)\ (ml)} \frac{(lb\ mole)}{98\ lb} \frac{(386.9\ scf)}{lb\ mole}$$

$$= 424.74 \text{ (for } H_2SO_4/SO_3)$$

$$= 7.05 \times 10^{-5} \frac{(lb)\ (l)}{(g)\ (ml)} \frac{(lb\ mole)}{64\ lb} \frac{(386.9\ scf)}{lb\ mole}$$

$$= 424.74 \text{ (for } SO_2)$$

N = Normality of std. $Ba(ClO_4)_2$

V_T = Volume of titrant, milliliters

D = Dilution factor

V_{STD} = Dry gas meter volume, corrected to STP, $ft.^3$ (at $68^{\circ}F$ and 29.92 inches of Hg)

10. Calculate the combined weight of SO_4 = ion, water, and soluble particulate in each sample from the net weight of the residue from paragraph 5. above.

11. Calculate the weight of Na+ ion used in the titration in paragraph 6. above.

12. Calculate the weight of water, combined with free sulfuric acid in the original Method 5 samples by subtracting

the weight of sodium from paragraph 11. above from the (NaOH titration) residue weight in paragraph 7. above and subtracting that difference (without the water) from the residue weight (including water) determined in paragraph 5. above, according to the equations in paragraph 9.(b) above.

13. Deduct the calculated weights of $SO_4^{=}$ ion and the weights of combined water from the original net gravimetric weights of the filters and acetone-washing residues. This corrected particulate weight is to be used to calculate the stack gas particulate mass loading where sulfate and combined water are being excluded.

SOURCE OPERATION

DESCRIPTION OF PROCESS OPERATION

Geneva Works has four coke batteries consisting of 63 ovens each. Batteries are designated 1, 2, 3, 4 each having its own flue system, controls and combustion stack. Each battery is a Koppers Becker underjet design equipped with automatic internal waste gas recirculation to provide uniform vertical heating. All four batteries are fired with coke oven gas.

Oven dimensions are as follows:

Width

Oven chamber - pusher side	13"
Oven chamber - coke side	15 1/2"
Oven chamber - average	14 1/4"
Center to center of ovens	3'-7 1/2"

Length

Inside of oven door lining	40'-10"
Face to face of brickwork	43'-2 1/2"
Inside of regenerators	41'- 4 1/2"

Height

Oven floor to oven roof	13'-0"
Oven roof to top of battery	3'-8 3/8"
Top of oven pad to oven floor	12'-1"
Top of oven pad to top of battery	28'-9 3/8"

Coke is produced in the slot-type ovens by destructive distillation of coal. The coking process begins when coal is charged into an oven by a Larry car. The gases which are driven out of the coal during the heating process flow into collecting mains. The gases in the collecting mains are drawn to the by-product plant by negative pressure for cleaning and processing. Part of these gases are used for fuel for heating the batteries.

After the coal has been transformed into coke, it is removed from the oven by the pusher machine. The machine pushes coke from the oven through the coke guide, located on the opposite side of the oven into the waiting quench car. The quench car transports the hot coke to a quenching tower to cool the coke with water. The coke is then screened and sent to the blast furnace to be used as a fuel and reducing agent for the production of iron.

Further details of the process are included in the Protocol prepared for this stack test. These include coal analysis, tonnages, temperature ranges, pressures, and oil usage.

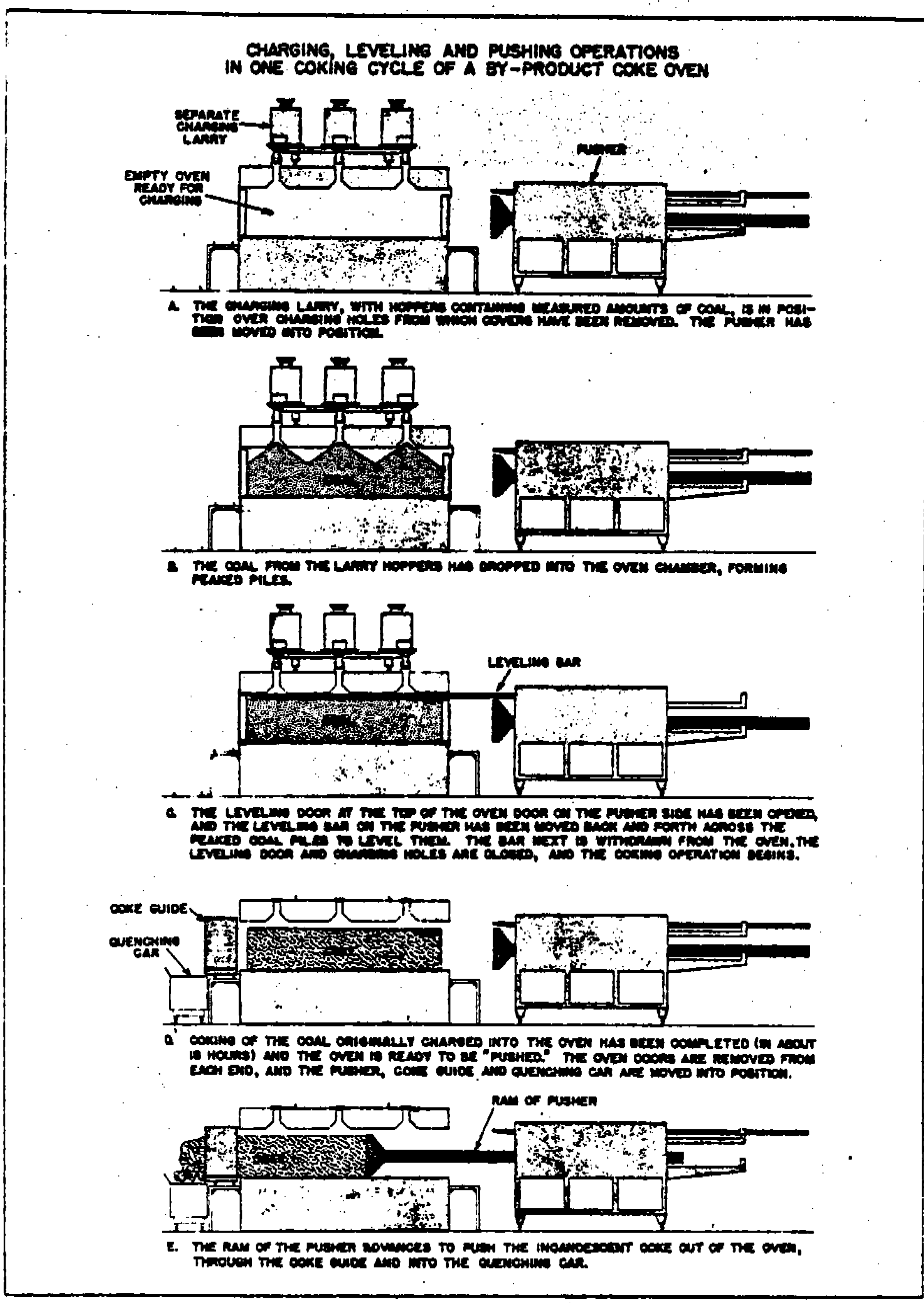


FIG. 4—3. Schematic representation of the sequence of operations involved in charging, leveling and pushing in one coking cycle of a by-product coke oven.

United States Steel Corporation
USS Engineering

Plant Engineering
Geneva Works
January 21, 1981

AGENDA

Coke Plant Combustion Stack No. 3 Pre-Test Meeting with EPA, UDH, U. S. Steel and Testing Contractor

Protocol Review

January 23, 1981, 1:00 p.m. Geneva Works

I. Introduction and list of personnel in attendance from EPA, UDH, U. S. Steel and testing contractor. Also location where personnel will be staying and telephone numbers.

II. Review of protocol submitted to EPA and UDH on December 15, 1980.

A. General Review

B. Specific Items

1. Clarify question on language on page 1 concerning agreement and signatures.
2. Determine number of tests per day. – 2 tests Tuesday
3. Where laboratory work by contractor will be done.
4. Process data needed.
5. Procedure for obtaining process data and contacts for observing process.
6. Safety, passes for entering plant, and restrictions of photographs.
7. Other miscellaneous.

United States Steel Corporation
USS Engineering

Plant Engineering
Geneva Works
Date________________

PLANT ENTRANCE REQUIREMENTS FOR NON-U.S. STEEL PERSONNEL

I. All persons entering the plant will previously sign in with the Receptionist at the Administration Building. Each entrance into the plant area will be cleared with Environmental Control Engineering.

II. Drivers of vehicles, which must enter the plant, will obtain a visitors pass from the Receptionist, with approval of Environmental Engineering.

III. All persons shall receive a safety orientation huddle, conducted by Environmental Control Engineering, prior to entering the plant. The safety huddle shall include but is not limited to the following:

A. Clothing and Safety Equipment

1. Safety glasses with side shields.
2. Non-Metallic hard hat.
3. Suitable footwear.
4. No finger rings.
5. Flame retardant clothing for areas of high temperature.
6. Safety belts and lanyard for unprotected areas of height.

B. In-Plant Traffic - Special alertness to local conditions.

1. Trains - remotely controlled.
2. Large mobile equipment.
3. Visibility problems in water vapor areas.
4. Observe all posted traffic regulations.
5. Park vehicles in specified areas only.
6. Pedestrians always have right-of-way in plant area.

C. Restricted Areas

1. Personnel are restricted to traveling from the plant gate directly to the previously designated work area.

2. When leaving the work area, personnel will go directly to the plant gate No. 2 for exit.

3. If it becomes necessary to leave the designated work area, it must first be cleared with Environmental Control Engineering.

D. Areas of Special Consideration in Work Area

1. Railroad crossings.
2. Mobile equipment movement.
3. Clearance between equipment and structures, etc.
4. Overhead cranes. Never go under a load carried by a crane.
5. Obstructions along walkways.
6. Foot traffic to stay in designated walkways except as cleared by Environmental Control Engineering.
7. Burn hazards near furnaces, ladles and other sources.
8. General alertness to all activities and stay in clear.

Plant Entrance Requirements for Non-U. S. Steel Personnel (Continued)

Reviewed by:	Date:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
1860 LINCOLN STREET
DENVER, COLORADO 80295

Ref: 8E-GE

JAN 16 1981

Mr. Ray Pett, Chief Engineer
U.S. Steel Geneva Works
P.O. Box 510
Provo, Utah 84601

Dear Mr. Pett:

Your letter of December 18, 1980 provides the proposed test protocol for the #3 combustion stack at the coke plant and proposes the test for the week of February 2, 1981. Your letter of January 8, 1981 to Mr. Bradford proposes changing the pretest date to January 23. I received the letters on December 23 and January 12 respectively, have reviewed them, and want to suggest changes as follows:

1. On page 1, the proposed language purports to bind the parties in all instances. The Agency cannot agree to this. We by no means intend to repudiate the importance of the development of a mutually acceptable test protocol. We consider such a protocol to be an essential precondition for any demonstration of compliance in that it prevents misunderstandings. In agreeing to a protocol, however, we cannot also agree to accept the results of the testing regardless of problems encountered in the implementation of the protocol. Unless an agreement or understanding can be worked out to include this concept EPA will not be able to sign such an agreement. If an agreement can be reached, I will sign for EPA.

2. Page 4, section III, and page 6, section VI, mention Method 9 observations during the mass tests, but fail to also mention the required operation of the continuous emission monitor for opacity. Paragraph 5 of Appendix 1.3 includes requirements for opacity monitors during mass testing.

3. Page 7, section VIII indicates that the quality assurance guidelines will be followed "as nearly as possible." While I realize that highly unusual circumstances could require a deviation from such guidelines, the Decree requires that they be followed fully. Any proposed deviation would have to be approved on a case by case basis.

4. Page 9, section IX should be clarified to show that the Utah Department of Health will also receive copies of the report(s).

RECEIVED
1981
ENGINEERING DEPT.
GENEVA WORKS

While the projected schedule anticipates only one test per day, the protocol holds open the option of two tests on one day. I would encourage two tests on one day, with the decision to be made jointly by the EPA, UDH, and U.S. Steel representatives in the field.

I presume the contractors laboratory work and analysis will be performed in their Montana offices. Please advise if that is not the case.

In order to resolve the above items, and assure that the testing contractor is fully aware of the testing requirements of the Decree, EPA representatives will attempt to attend the January 23 pretest meeting.

As of this date, we plan to have Mr. Connally Mears and Mr. Lam Nguyen observe the process operations during the test and Mr. John Floyd observe the testing operation. On February 2, in addition to the orientation meeting and preliminary testing activities, Mr. Mears and Mr. Nguyen would like to identify the nature of process data records and their location, review that data as gathered for past days, discuss with you the criteria used to determine when oven dusting and/or spraying is required, etc.

Finally, in a January 13 call to Mr. Mears, Mr. Erickson suggested that, while at Geneva Works for the coke plant test, we discuss the results of the EPA, UDH, and U.S. Steel attempts to chart the dates required by the Decree, as discussed in your letter of December 12 and my response of January 5. I agree that would be an opportune time to hold an informal discussion, but I would expect that any questions requiring legal interpretations would be discussed at a later date. I suggest those in the field find a convenient time to hold the proposed discussion.

Please contact Mr. Mears to arrange further discussion of these matters.

Sincerely yours,

Roger L. Frenette
for
Lance C. Vinson
Director of Enforcement

cc: Brent Bradford
Dave Kopta

GENEVA WORKS

United States Steel Corporation

WESTERN STEEL DIVISION

GENEVA WORKS
P. O. BOX 510
PROVO, UTAH 84601

December 18, 1980

Mr. Lance C. Vinson, Director
Enforcement Division
Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80295

Dear Mr. Vinson,

Your letter of November 19, 1980, has been reviewed and the additional information requested is enclosed. A test Protocol for No. 3 coke plant combustion stack is also enclosed. The guidelines and suggestions have been followed as closely as possible and we hope this information will be satisfactory for your approval. The Method 5 tests on this stack are planned to begin February 2, 1981. Since the Consent Decree stipulates the tests will be performed within 30 days after the date of entry and 60 days prior notification must also be given, it is hoped the date selected will conform to both requirements since the date of entry is still unknown.

If there are additional questions, please don't hesitate to call.

Yours very truly,

RWPett

R. W. Pett
Chief Engineer
Geneva Works

Enclosures

bc: D. R. Cronkn w/e
T. W. Goettge w/e
H. A. Huish wo/e

TEST PLAN

TITLE Particulate Emission Testing for Compliance - U. S. Steel Geneva Works
Provo, Utah

Coke Plant Combustion Stack No. 3

Approval Signatures

All parties hereby agree that the testing program, as specified in this plan, is acceptable, adequate, and a valid means of determining compliance. The below signatures by the responsible person for each party indicate their mutual acceptance and agreement on these planned procedures for this testing program.

USEPA, Region VIII, Connally Mears, /s/________________ ________ Date

Utah Bureau of Air Quality, Brent Bradford, /s/________________ ________ Date

U. S. Steel - Geneva Works, R. W. Pett /s/________________ ________ Date

U. S. Steel - QA Officer, Dave Trozzo, /s/________________ ________ Date

Contractor, EEMC, Ed Wadington, President /s/________________ ________ Date

I. Project Organization and Responsibility:

The following personnel and the testing contractor are presently anticipated to be involved in the testing program. EPA and UDH are invited to have their own personnel or contractor to observe all phases including the process.

Testing Contractor:

Energy and Environmental Measurement Corporation
17 N. 32nd Street
Billings, Montana, 59101
Ed Wadington, President

USSC Personnel:

Boyd C. Erickson, General Supervisor, Environmental Control Engineering
Jim R. Starley, Sr. Environmental Control Engineer - USSC Coordinator
Art Holloman, Environmental Control Engineer - USSC Coordinator
Dave Trozzo, USSC, QA Officer, USS Research

During these tests only USSC personnel listed above are authorized to answer or obtain answers to pertinent questions on the process conditions or the test protocol.

II. Test Schedule

It is planned to begin the tests on or about February 2, 1981, hoping that this date will meet both the stipulated requirements of not over 30 days after entry and the 60 day notification requirement before the tests. Since at this time the date of entry is unknown, it is suggested that this date be agreed to by all parties.

Date	Day	Time	Activity
Feb. 2, 1981	Monday	0800	Contractor, UDH, EPA and USS Representatives meet at Room 213, Geneva Administration Building, for orientation, safety and final test preparation and review meeting.
Feb. 2, 1981	Monday	0900	Personnel and equipment to set up on stack and in Geneva's Air Quality laboratory. Lab crews clean all probes and set up a complete set of equipment.
Feb. 2. 1981	Monday	1200	Begin preliminary tests for moisture, temperature and velocities. When complete secure equipment for next day's testing.
Feb. 3, 1981	Tuesday	0800	Pick up equipment and move to No. 3 stack.
Feb. 3, 1981	Tuesday	0900	Begin test run No. 1 on No. 3 combustion stack continue 4-hour test.
Feb. 3, 1981	Tuesday	14:30	End test No. 1 on No. 3 combustion stack, carry equipment to lab for cleaning and calculations.
Feb. 3, 1981	Tuesday	15:30	Lab begin reclaiming sample No. 1 on stack No. 3 and recharge the train.
Feb. 4, 1981	Wed.	0800	Pick up equipment and move to No. 3 combustion stack for test No. 2.
Feb. 4, 1981	Wed.	0900	Begin test run No. 2 on No. 3 combustion stack - continue 4-hour test.
Feb. 4, 1981	Wed.	14:30	End test No. 2 on No. 3 combustion stack, carry equipment to the lab for cleaning and calculation

IV. Test Procedures

Three particulate tests, four hours each, will be conducted. There will be one test run each of three days or two on one day and one the next depending on An agreement between EPA, UDH and U.S. Steel. ~~weather conditions.~~ Stack testing will be EPA Method 1 through 5 and as specified in 40 CFR, part 60, and appendix 1.3 of the consent decree. As stated in the decree, U. S. Steel reserves the option to elect to demonstrate compliance by excluding sulfates and combined wacer. This can be decided after the completion of the particulate test. However, the contract with the testing company calls for analyzing the front-half for sulfates and combined water according to the procedures in appendix 1.4 of the decree.

X Integrated — Separate pump ~~A single grab sample of the~~ flue gas will be taken during each test run and analyzed at the completion of the test with an orsat to determine the molecular weight of the effluent gas stream. The preparation and clean-up will be performed in the laboratory at Geneva Works Administration Building. The laboratory work and analyses will be done by the contractor as soon as possible after each test.

Contractor will have complete responsibility for all test work from gathering through analysis. U. S. Steel will make all necessary clearances for entering and leaving the plant. The contractor will be continuously monitored while testing by EPA, UDH and U. S. Steel representatives but no information will be given out or made available either verbally or in writing to any person or organization without first clearing with the U. S. Steel Co-ordinator in charge of the test.

V. Test Area

The test area shall include the No. 3 coke battery, stack and process control center for this battery. Also areas appropriate for visible observations outside the coke plant proper and the laboratory area for preparation, clean-up and laboratory activities located in the administration building at Geneva Works.

VI. The Visible Emissions Observation Program Method

Method 9 will be followed with a certified observer included with the testing contractor. Visible emissions using Method 9 will continue during each of the three 4-hour Method 5 particulate tests AS WELL AS OPERATING THE CONTINOUS EMISSION MONITOR FOR OPACITY.

VII. Process Operations

The process conditions that exist now, as proposed during the test and as can best be projected subsequent to the test, are as follows:

No. 3 Coke Plant Battery
Process Operating Conditions

	Now	Proposed During Test	Projected Following Test
Identity of ovens unavailable for use:	0	0	0
Identity of ovens partially charged	0	0	0
Ovens blanked off.	0	0	0
Length of the coking cycle in general, and for any ovens or special cycles.	15.8 hrs.	15.8 hrs.	15.8 hrs.
Charging sequence for the ovens.	-10 (21-31-41)	-10 (21-31-41)	-10 (21-31-41)
Amount of Coal charged and length of a charge in general, and for partially charged ovens.	13.7 T/O 2-2½ min.	13.7 T/O 2-2½ min.	13.7 T/O 2-2½ min.
Battery pressure, as measured at the Askania house.	6-6½ mm.	6-6½ mm	6-6½ mm
Oven patching practices adopted and the schedule followed for their implementation	See attached sheet*	See attached sheet	See attached sheet

	Now	Proposed During Test	Projected Following Test
Quality of coal charged as measured by an ultimate analysis.	See attached sheet **	See attached sheet	See attached sheet
Quantity and quality of oil sprayed on the coal prior to charging.	1-2 pts/ton #2 fuel oil	1-2 pts/ton #2 fuel oil	1-2 pts/ton #2 fuel oil
Oven temperature, including variations from oven to oven and/or through the coking cycle.	7th flue P.S.&C.S. Avg. Range 2230-2260	7th flue P.S.&C.S. Avg. Range 2230-2260	7th flue P.S.&C.S. Avg. Range 2230-2260
Frequency of change of gas flow direction through the checkers.	30 min.	30 min.	30 min.

VIII. Quality Assurance (General)

All testing and analysis in these tests will be conducted following the quality assurance guidelines given in EPA's Quality Assurance Handbook for Air Pollution Measurement Systems Volume III - Stationary Source Specific Methods, Sections 3.1, 3.2, 3.3, and 3.4. In general the following quality assurance control aspects are included:

1. Calibration and procurement of apparatus.
2. Pre-sampling - postsample operations.
3. On-site measurements - calculations.
4. Maintenance and auditing procedures.
5. Verification, tracability and data forms which includes sample custody.

The tests will follow these guidelines ~~as nearly as possible~~ FULLY to assure maximum accuracy of the results.

The specific quality assurance procedures will be carried out by:

1. Providing the contractor with copies of the above sections of the EPA Quality Assurance Handbook and require where applicable the procedures outline be followed.

2. Providing a quality assurance officer on test site at all times during the test and during washing and sample identification.
3. Following the protocol agreed to by all parties involved in the testing including contractor, U. S. Steel, UDH and EPA representatives.
4. Maintaining and verifying sample custody by the contractor project leader, QA officer for USSC, EPA, and UDH checking in each others presence the identification of filters before and after tests including washings and the sealing of samples with proper labels. The same procedure for custody will be followed with the samples to be analyzed for sulfates and combined water to assure quality assurance expected in EPA, QAMS - 005/80 guidelines.
5. Contractor will maintain a log of all calibrations - including meters, thermometers, probe heating system, etc., which will be made available for inspection upon request by USSC project coordinator or USSC QA officer.
6. All field data, notes and calculation sheets shall become a part of the report submitted to U. S. Steel. Field data and calculation sheets shall be made available for examination upon request by U. S. Steel project co-ordinator, QA officer and by UDH and EPA representatives during the test as part of the auditing procedures which will be randomly carried out which will include audits at the probe location as well as at the console data recording location. If deviations are noted during the tests by any individual, the USSC project co-ordinator or USSC QA officer shall be notified to take corrective action with the contractor during the sampling period. No other individual may direct the contractor in any practice change, additions or deletions during the tests.

It shall be the responsibility of the USSC co-ordinator or USSC QA officer to keep all members of the agencies informed of changes made with the contractor or in the test protocol.

IX. Reporting

Reports will be prepared by the testing contractor according to EPA Quality Assurance Guidelines and Appendix 1.3 of the Consent Decree. Complete copy of raw data, calculations, and summary of test will be included in reports. All process and production data will be supplied by USSC personnel. The contractor will furnish ten (10) copies of the test report to R. W. Pett, Chief Engineer, Geneva Works.

Distribution of test reports:

R. W. Pett, Chief Engineer - Geneva Works

Lance C. Vinson, EPA - Region VIII

John Hawthorne, USS Research

D. R. Cronin, USS Pittsburgh Environmental Control

Constance K. Lundberg, Attorney for USSC

T. W. Goettge, Division Supt. Coke Plant - Geneva Works

B.C. BRADFORD, BUREAU OF AIR QUALITY, UDH

X. Distribution of this Protocol:

Dave Trozzo - USS Research

John Hawthorne - USS Research

Ed Wadington - Testing Contraccor

D. R. Cronin - USS Pittsburgh E/C

Connally Mears - EPA - Region VIII

Lance C. Vinson - EPA - Region VIII

Brent Bradford - UDH

ATTACHMENT

* Oven patching practices adopted and the schedule followed for their implementation.

Daily routine patching of tie-in joints, roofs and charging holes. Oven areas are sprayed on a rotating basis according to battery needs. Conventional wet-slurry guns are utilized as well as ram mounted wet-slurry guns on the pusher. Oven dusting is performed as required.

** Quality of coal charged, as measured by an ultimate analysis.

	Range in Percent
Carbon	76.70 - 79.61
Hydrogen	4.41 - 6.13
Nitrogen	1.68 - 1.82
Ash	6.10 - 7.20
Sulphur	.62 - .67
Oxygen	6.10 - 9.04
Fixed H_2O	5.947 - 6.890

Other process data that is recorded and will be available is gas consumption to the ovens and gas pressure.

FIGURE 9-1
RECORD OF VISUAL DETERMINATION OF OPACITY

COMPANY U.S. Steel
LOCATION Provo Utah
TEST NUMBER 1
DATE 2/3/81
TYPE FACILITY Coke Stack # 3
CONTROL DEVICE

HOURS OF OBSERVATION 1205mst – 1703 mst
OBSERVER ATM
OBSERVER CERTIFICATION DATE
OBSERVER AFFILIATION EEMC
POINT OF EMISSIONS Coke Plant Stack #3
HEIGHT OF DISCHARGE POINT

Diagram of observation point on back of this sheet.
No pictures taken.

	1 Initial	2	3	4 Final	5
CLOCK TIME					
OBSERVER LOCATION Distance to Discharge	750	→	→	→	→
Direction from Discharge	SW	→	→	→	→
Height of Observation Point	GRND	→	→	→	→
BACKGROUND DESCRIPTION (Blue sky)	Blue sky scat Cirrus	→		Clear Blue →	→
WEATHER CONDITIONS Wind Direction	Var.	→	→	→	→
Wind Speed (Lt)	1-5	→	→	→	→
Ambient Temperature	29-32½	32½-34	33½-34	33½-34	33-32
SKY CONDITIONS (clear, overcast, % clouds, etc.)	Clear w/ scat Clouds	→	→	Clear Blue →	→
PLUME DESCRIPTION Color	White	→	→	→	→
Distance Visible	0-150 yds	→	→	→	→
OTHER INFORMATION	Detached	Steam	Plume	→	→

21

Blends in w/ # 2 & General Plant Plume.

choice was blue sky w/ scat cirrus clouds or mountains covered w/ snow. Because it was a white-whitish brn plume - observer picked blue sky for greatest contrast

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start--End	Opacity Sum	Opacity Average
Page	2	1445	204
	3	1985	226
	4	1100	223
	5	1335	144
	6 Not Part of Test	5865	797
	Aug. = 7.359	—	

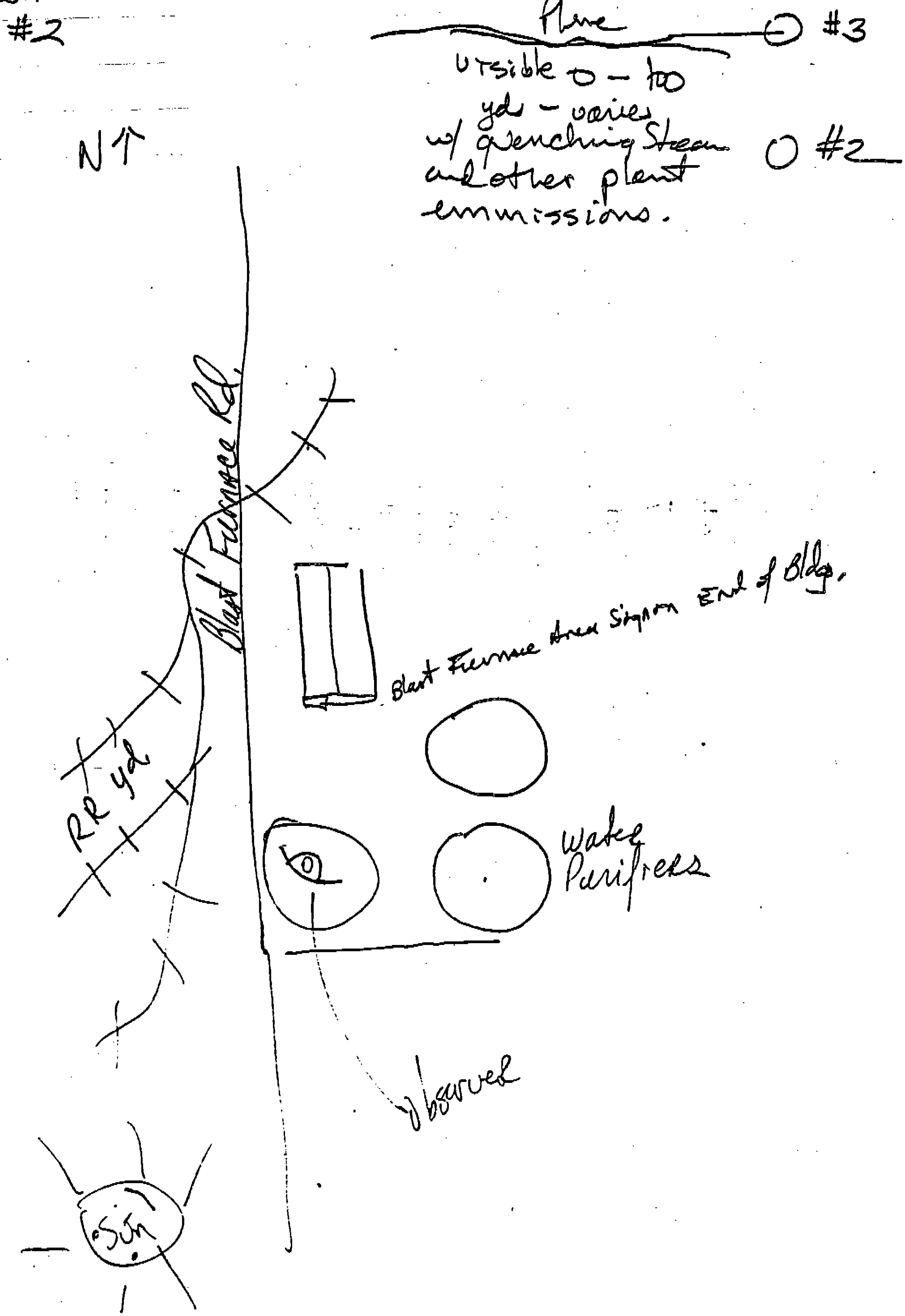
Readings ranged from 0 to 65 % opacity

The source was/was not in compliance with 20% at the time evaluation was made.

Page 2 col. 2

Page 3 6 min Avg. 24.375

Observation point #2



ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION

17 N. 32nd St., BILLINGS, MT. 59101

2 of 6

Page (1) Test 1

1st Freeze

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel

ADDRESS Provo, Utah

BUSINESS

DESCRIPTION OF SOURCE Coke Plant Stack #3

TYPE OF FUEL

STACK HEIGHT STACK DIAMETER

DISTANCE FROM STACK 750 ft

DIRECTION FROM STACK SSE

GENERAL PLUME CHARACTERISTICS (COLOR, ETC.) white - whitish brown

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Sun hi Cirrus / Blue

AIR TEMP. 29°F EST. WIND SPEED 3-5 DIRECTION NNW EST. AMBI... EST. RELATIVE HUMIDI...

DATE 2/3/1981

START TIME 1205 MST

STOP TIME 1304 MST

OBSERVER AM

OBSERVATION POINT #2 (See Map)

wet 32°F.

Dry 30°F

135 MST

emmomle ≥31°F

1205

29°F NNW

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK,~~ IN OPACITY ~~IF ANY OTHER COLOR~~

MIN \ SEC	0	15	30	45	REMARKS	MIN \ SEC	0	15	30	45	REMARKS
0	[illegible]	—	10	10	*2	30	5	5	0	0	
1	15	15	5	10		31	5	0	5	5	
2	10	5	10	5		32	5	5	0	5	
3	10	5	10	10		33	5	0	5	0	W
4	5	5	15	15	*1	34	0	5	5	5	32°F
5	5	—	10	10		2 35	0	5	—	—	*1
6	15	10	10	10		36	10	15	10	5	
7	10	10	5	5		37	10	10	10	5	
8	5	—	10	10	*305/36	38	0	0	0	0	*1 160/35
9	0	0	0	10	detached	3 39	—	—	5	—	
10	10	10	5	0		2 40	—	—	5	5	*
11	0	0	0	5		41	0	5	5	5	
12	5	15	5	5	Steam	42	5	5	0	10	
13	5	10	5	5		1 43	20	40	—	35	*1
14	5	10	10	10		2 44	30	20	—	—	*1
15	10	10	15	10	plume	4 45	—	—	—	—	*1
16	15	15	10	5		1 46	—	15	10	15	*1
17	5	0	5	5		47	15	10	10	15	
18	5	5	5	15		2 48	10	10	—	—	*1 305/24
19	10	10	10	5	290/40	4 49	—	—	—	—	
20	10	5	5	0		3 50	—	—	—	5	*1
21	5	0	5	5		51	5	0	5	5	
22	5	5	5	10		51	0	0	5	10	
23	10	10	5	5		53	20	25	30	25	
24	0	5	5	10		3 54	20	—	—	—	*1 W
25	0	0	5	0		2 55	—	—	10	10	32.5°F
26	0	5	0	0		56	5	5	5	5	
	5	0	5	5		57	0	0	0	5	
28	5	0	0	0		58	5	5	5	5	125/29
29	5	5	5	5	160/40 755/116	3 59	5	—	—	—	690/88

OTHER REMARKS *1 Quenching Steam obscured plume &/or stack observations of ground emissions began at 1205. Test started 1158 MST. Visual observer not immediately notified of test commencement. However observer was in place and observing emissions from stack. All that can be said is that emissions for 7 minute period were n...

AVERAGE PLUME DENSITY OPACITY 7.0833

RINGELMANN

1445/204

different that those of 1st ~~[illegible]~~ 5-6 minutes of actual observations,
i.e., observer believes 1st 7 minutes of test had similar opacities as
those of minutes 8 – 13.

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION

17 N. 32nd St., BILLINGS, MT. 59101

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Page # (2) Test - 1

Spot #2

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel
DATE 2/3/86

ADDRESS Provo, Utah
START TIME 1305 mst

BUSINESS
STOP TIME 1404 mst

DESCRIPTION OF SOURCE Coke Stack #3
OBSERVER [illegible]

OBSERVATION POINT #2 (See MAP)

TYPE OF FUEL

STACK HEIGHT STACK DIAMETER

DISTANCE FROM STACK ≅ 750

DIRECTION FROM STACK SW

GENERAL PLUME CHARACTERISTICS (COLOR, ETC.) wht - whtish brn.

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Scat Hi Cirrus / Blue EST. AMBI

AIR TEMP. 33°F EST. WIND SPEED 3-5 mph DIRECTION W EST. RELATIVE HUMIDI

wind direction

Temp

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK~~, IN OPACITY IF ~~ANY OTHER COLOR~~

	MIN \ SEC	0	15	30	45	REMARKS
33°F W	0	10	—	10	5	detached steam plume
	1	5	10	10	25	W
	2	25	20	20	15	
	3	15	15	5	5	
	4	10	15 5	5	5	
	5	5	0	5	5	
	6	5	5	5	5	
	7	5	5	5	5	
	8	5	10	10	10	
	9	5	5	5	5	330/39'
	10	5	0	15	35	12.3
	11	35	35	35	15	
32.5°F	12	15	15	10	5	
	13	—	5	5	5	
WSW	14	5	0	5	5	WSW
	15	0	5	0	0	
	16	5	5	0	5	
	17	—	—	5	0	*'
	18	—	0	5	5	*' 310/36'
	19	5	5	5	10	
	20	20	30	35	30	
W	21	25	20	15	—	*' W
	22	—	—	15	5	*' 10.4
	23	5	0	5	5	
	24	0	5	5	5	
	25	5	10	10	5	
	26	5	10	5	5	
33°F		5	5	10	10	465/37'
	28	5	10	15	20	W
W	29	30	30	25	20	1105/112

34°F

W 33°F

wind shift NE

33.5°F calm

MIN \ SEC	0	15	30	45	REMARKS
30	20	20	10	10	
31	10	10	10	10	142
32	15	10	10	10	24.325
33	5	5	15	5	
34	10	10	10	10	
35	30	50	65	50	34.6
36	50	40	45	35	
37	25	25	20	20	1340 mst
38	15	15	15	15	
39	15	10	5	0	1750/40
40	5	0	0	0	
41	0	0	5	0	
42	0	5	0	5	
43	0	0	5	0	
44	0	0	5	5	
45	0	0	0	0	
46	0	5	0	5	shadow
47	0	0	0	—	straight
48	—	—	—	5	up to 60°
49	0	0	5	5	stack
50	5	5	5	5	1352 mst
51	5	0	5	0	
51	5	0	0	0	
53	0	0	0	0	
54	0	0	5	0	
55	0	—	—	0	*'
56	0	0	0	0	
57	0	0	0	0	calm
58	5	5	5	5	70/36
59	0	0	~~5~~	0	1880/114

OTHER REMARKS *' = Scratched Reading due to Steam plume obscuring Stack Pipe Plume

AVERAGE PLUME DENSITY OPACITY 8.783

1985 / 226

4 of 6

Page (3) Test 1
Spot #2

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION
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VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel
ADDRESS Provo, Utah
BUSINESS
DESCRIPTION OF SOURCE Coke Plant Stack #3

DATE 2/3/81
START TIME 1405 MST
STOP TIME 1504 MST
OBSERVER [illegible]
OBSERVATION POINT #2

TYPE OF FUEL
STACK HEIGHT STACK DIAMETER
DISTANCE FROM STACK 5750 ft
DIRECTION FROM STACK SW
GENERAL PLUME CHARACTERISTICS (COLOR, ETC.)
Wht - Whitish brown
GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Scat H. Cirrus - Blue EST. AMBI
AIR TEMP. 33.5 EST. WIND SPEED Lt. Calm DIRECTION Vari EST. RELATIVE HUMIDI

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLA~~CK, IN OPACITY ~~IF ANY OTHER COLOR~~

MIN \ SEC	0	15	30	45	REMARKS
0	5	0	5	10	calm
1	5	0	0	5	
2	0	0	0	0	detached
3	0	0	5	5	steam
4	0	5	0	5	plume.
5	5	0	0	5	
6	0	0	5	5	
7	5	5	10	5	
8	15	10	10	5	140/49
9	5	0	0	0	
10	0	5	0	0	
11	5	0	5	5	
12	5	5	0	0	
13	—	—	5	0	*2
14	0	0	0	0	
15	0	0	5	5	
16	5	5	5	0	
17	5	0	0	0	
18	0	0	0	0	calm 70/38
19	0	0	5	0	
20	5	0	5	0	V.H.
21	5	0	0	0	SW
22	0	0	0	5	
23	0	0	0	0	
24	5	5	5	0	W
25	0	0	0	0	
26	5	5	5	0	
	0	0	0	0	140
28	5	5	0	0	
29	5	5	5	5	290/118

33.5°F calm

34°F calm

34°F W

34°F W

34°F W

MIN \ SEC	0	15	30	45	REMARKS
30	5	5	0	5	W
31	10	30	30	30	
32	35	25	25	25	
33	20	15	15	10	17.5
34	15	10	15	15	
35	10	15	15	10	
36	15	10	10	10	
37	5	5	0	5	
38	5	5	0	0	965/40
39	0	0	0	0	
40	5	0	0	—	
41	20	30	25	20	#4
42	20	20	20	—	Plume
43	—	—	—	5	behind
44	—	0	0	—	#3
45	—	0	0	0	
46	0	0	0	0	
47	0	0	5	5	
48	0	0	0	5	200/32
49	5	5	5	5	
50	—	—	—	5	
51	5	5	5	0	
51	5	5	0	5	
53	20	15	15	—	
54	20	15	10	5	
55	5	0	0	0	Steam
56	—	5	0	—	Plume
57	—	0	0	0	
58	0	0	0	0	145/33
59	0	0	0	0	810/105

OTHER REMARKS *2 Train Exhaust

AVERAGE PLUME DENSITY OPACITY 4.933

1100/223

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION
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Vagesoyso
Run 1 Sht 4

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel
DATE 2/3/81
ADDRESS Provo Utah
START TIME 1505 MST
BUSINESS
STOP TIME 1604 MST
DESCRIPTION OF SOURCE Coke plant stack #3
OBSERVER KTM
OBSERVATION POINT #2
TYPE OF FUEL
STACK HEIGHT STACK DIAMETER
DISTANCE FROM STACK 750
DIRECTION FROM STACK SW
GENERAL PLUME CHARACTERISTICS (COLOR, ETC.)
white Whitish brn - Black
GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Blue - clear
EST. AMBI
AIR TEMP. 33.5°F EST. WIND SPEED 4- 1-3 DIRECTION W EST. RELATIVE HUMIDI

Air Temp, Wind Direction

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK~~, IN OPACITY ~~IF ANY OTHER COLOR~~

MIN \ SEC	0	15	30	45	REMARKS		MIN \ SEC	0	15	30	45	REMARKS
0	—	5	0	0	white steam plume	W 15°	30	10	10	5	5	END OF TEST
1	5	20	20	20			31	5	5	0	0	
2	15	20	20	15			32	0	0	0	0	
3	15	15	20	15		33 1/2	33	0	0	0	0	
4	15	15	15	15			34	0	0	0	0	
5	10	15	15	10			35	0	0	0	0	puff
6	10	10	25	15			36	0	5	0	0	
7	15	10	10	—	Plume in way		37	0	0	0	0	
8	15	15	10	15		1544	38	0	0	0	0	45/36
9	5	5	10	25	500/38		39	0	0	0	0	
10	25	25	25	25			40	0	0	0	0	
11	20	20	20	20		34° W	41	0	0	0	0	Showers
12	15	15	15	15			42	0	0	0	0	
13	15	15	10	15	Plume in way		43	0	0	0	0	
14	10	—	—	—			44	0	0	0	0	
15	10	15	25	35			45	0	0	0	0	
16	30	30	25	25			46	0	0	0	0	
17	20	20	15	15	600/33		47	0	0	0	0	
18	10	10	5	5			48	0	0	0	0	0/40
19	—	—	—	—	Plume in way W		49	0	0	0	0	
20	10	5	—	0			50	0	0	0	0	
21	0	0	0	0			51	0	0	0	0	
22	0	0	0	0		33 1/2	51	0	0	0	0	
23	0	0	0	0			53	0	0	0	0	
24	0	0	0	0			54	0	0	0	0	
25	—	—	0	0	Plume in way		55	0	0	0	0	
26	0	0	0	0		SW	56	0	0	0	0	
	0	0	15	20	190/37		57	0	0	0	0	0/40
28	20	20	10	20			58	0	0	0	0	
29	20	15	15	10	1290/108		59	0	0	0	0	45/36

Left margin: 33 1/2 F W (row 0); W 33 1/2 (rows 14–15); SW (row 20); 34° W (row 25)

OTHER REMARKS

AVERAGE PLUME DENSITY OPACITY 9.270 [redacted]

1335/144

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION

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Page 5 of 6 Test 1

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel

ADDRESS Provo Utah

BUSINESS

DESCRIPTION OF SOURCE Coke Stack #3

DATE 2/3/8

START TIME 1604 MST

STOP TIME 1703 MST

OBSERVER AM

OBSERVATION POINT #2

TYPE OF FUEL

STACK HEIGHT STACK DIAMETER

DISTANCE FROM STACK 750

DIRECTION FROM STACK SW

GENERAL PLUME CHARACTERISTICS (COLOR, ETC.)

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR clear - blue EST. A[illegible]

AIR TEMP. 33°F EST. WIND SPEED 4-13- DIRECTION SW EST. RELATIVE HUMI[illegible]

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK~~, IN OPACITY ~~IF ANY OTHER COLOR~~

MIN \ SEC	0	15	30	45	REMARKS
0	0	0	0	0	SW-33°F
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	detached
4	0	0	0	0	steam
5	0	0	0	0	plume.
6	0	0	0	0	
7	0	0	0	5	
8	5	0	0	0	
9	0	0	0	0	10/40
10	0	0	0	0	
11	0	0	0	0	SW-34.5°F
12	0	0	0	0	
13	0	0	0	0	
14	0	5	5	0	
15	0	0	0	0	
16	0	5	0	5	
17	5	0	0	0	
18	0	0	0	10	55/40
19	10	10	0	0	Plume from
20	10	—	—	—	Plant
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	SW
24	0	0	0	0	32°F
25	0	0	0	0	
26	0	0	0	0	25/36
	5	5	5	5	Plume from
28	5	—	—	0	Plant
29	0	0	0	0	90/P/15

MIN \ SEC	0	15	30	45	REMAR[KS]
30	0	0	5	—	Plume
31	10	5	5	0	from
32	5	0	0	5	Plant
33	5	5	5	0	SW
34	5	5	5	0	
35	0	5	0	0	
36	5	5	5	—	Quench
37	—	5	—	0	Steam
38	0	0	0	0	
39	5	0	5	5	5 10%
40	0	0	0	—	
41	—	0	0	0	Quench
42	—	5	—	—	Steam
43	—	0	5	0	32°F
44	0	0	0	0	
45	0	0	5	0	
46	0	0	0	0	Quench
47	—	0	—	15	STEAM
48	—	5	5	—	46/29
49	0	—	—	0	
50	5	0	0	5	
51	5	0	0	0	
51	0	0	0	0	
53	0	—	0	0	
54	0	0	0	0	
55	0	0	—	—	55
56	—	0	0	10	33°F
57	—	—	5	—	40/30
58	0	0	0	5	
59					199/95

OTHER REMARKS

6140

AVERAGE PLUME DENSITY ~~[illegible]~~ OPACITY 1.3084

Total Readings 1091

280/214

6140 ÷ 1091 = 5.627

FIGURE 9-1
RECORD OF VISUAL DETERMINATION OF OPACITY

COMPANY U.S. Steel
LOCATION Provo, Utah
TEST NUMBER 2
DATE 2/4/81
TYPE FACILITY Coke Plant Stack #3
CONTROL DEVICE ______

HOURS OF OBSERVATION 0811 MST - 1310 MST
OBSERVER ATM
OBSERVER CERTIFICATION DATE ______
OBSERVER AFFILIATION EEMC
POINT OF EMISSIONS Coke plant Stack #3
HEIGHT OF DISCHARGE POINT ______

CLOCK TIME	Initial 0811 MST			~~Final~~	Final 1310 MST
OBSERVER LOCATION Distance to Discharge 750	[illegible]				
Direction from Discharge	SE				
Height of Observation Point	GRND				
BACKGROUND DESCRIPTION	Sky Gray				
WEATHER CONDITIONS Wind Direction	N NE-NE	NE	E-Var	CALM N	S SSE
Wind Speed	0-4 mph				
Ambient Temperature °F	19-20½	20½-24	25½-26	24½/26½	28-29
SKY CONDITIONS (clear, overcast, % clouds, etc.)	Clear w/ Smelling Fog Haze plumes	Clear w/ haze plumes	Clear w/ hazel plumes	Clear w/ hazel plumes	
PLUME DESCRIPTION Color	Blk				
Distance Visible TO Stack	0 - 50 ft				
OTHER INFORMATION					

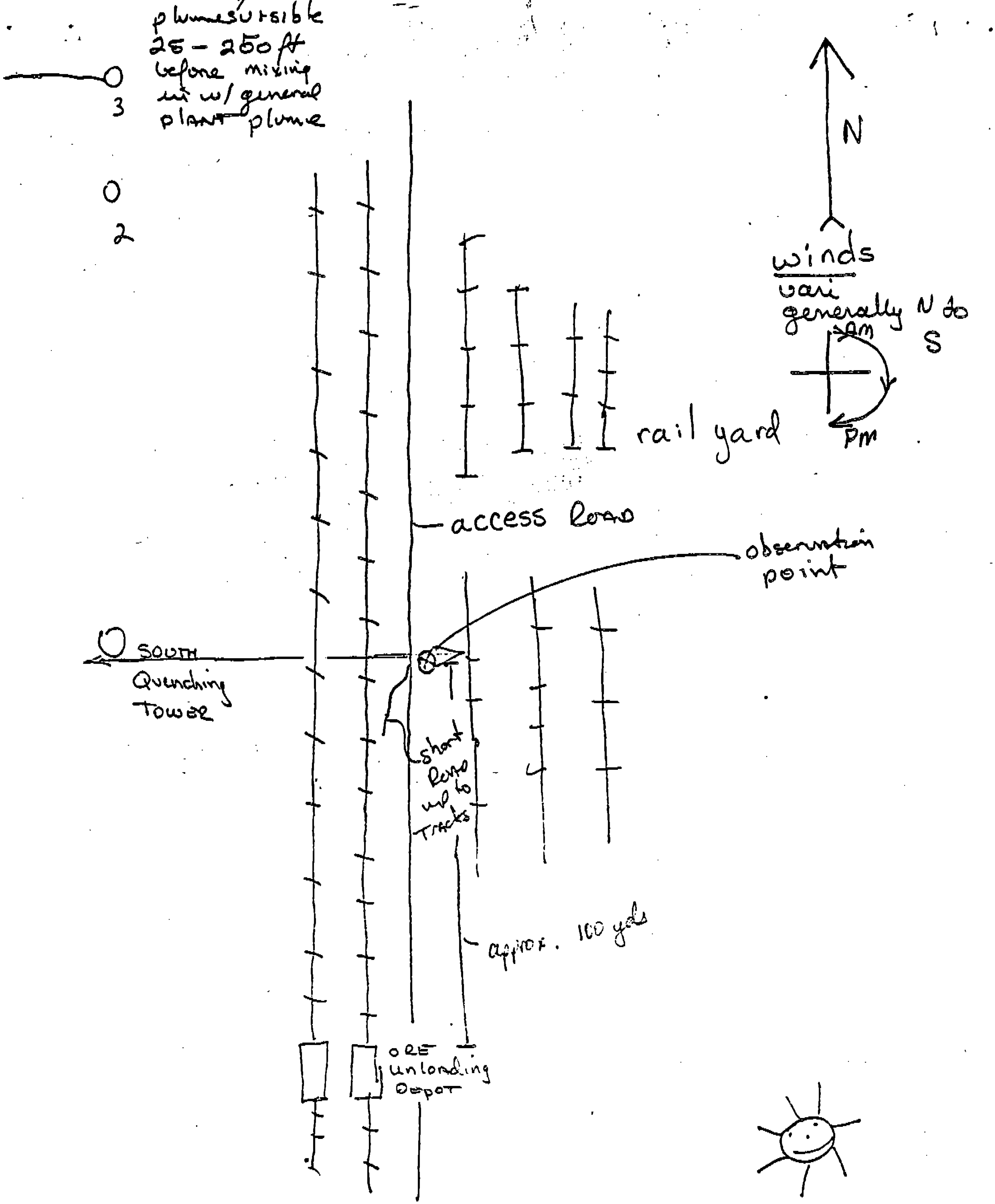
SUMMARY OF AVERAGE OPACITY

Set Number	Time Start--End	Opacity Sum	Opacity Average
Page	2	1440	145
	3	1690	141
	4	1400	215
	5	2260	228
		2425	229
		9215	957
	$\bar{X}$	9,6290	

Readings ranged from ____ to ____ % opacity

The source was/~~was not~~ in compliance with ____ at the time evaluation was made.

21


plume visible
25 - 250 ft
before mixing
in w/ general
plant plume
3
2
N
winds
vari
generally N to S
AM
PM
rail yard
access road
observation point
SOUTH
Quenching
Tower
short ramp up to tracks
approx. 100 yds
ORE
Unloading
Depot

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION
17 N. 32nd St., BILLINGS, MT. 59101

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel, Geneva Plant
DATE 2/4/81
ADDRESS Provo, Utah
START TIME 0811 mst
BUSINESS
STOP TIME 0910 mst
DESCRIPTION OF SOURCE Coke plant Stack #3
OBSERVER ATM
OBSERVATION POINT #1 - Re map see back of page 1
TYPE OF FUEL
STACK HEIGHT
STACK DIAMETER
DISTANCE FROM STACK ≅ 750 ft.
DIRECTION FROM STACK SE
GENERAL PLUME CHARACTERISTICS (COLOR, ETC.) Lt. black - black w/detached Steam plume
GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Blue-grey w/ haze & plumes.
EST. AMBI[ENT] AIR TEMP.
EST. WIND SPEED
DIRECTION
EST. RELATIVE HUMIDI[TY]
Sun not up above mtns to East at start of the Test

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK,~~ IN OPACITY ~~IF ANY OTHER COLOR~~

0811 mst

MIN \ SEC	0	15	30	45	REMARKS	MIN \ SEC	0	15	30	45	REMARKS
0	+	+	+	+	+, calm - v.lt. from NE 19°F	30	—	—	5	5	*,
1	—	—	—	—	*,	31	15	15	15	15	
2	15	—	—	—	*, Steam plume attached very difficult to read	32	15	—	20	20	
3	—	15	—	—	*,	33	15	15	—	15	*,
4	—	—	—	—	*,	34	10	15	10	15	
5	15	—	—	—	*,	35	15	10	—	—	*, V. Lt
6	—	15	—	15	*,	36	—	—	5	10	*, NNE
7	10	—	—	—	*,	37	—	5	—	5	*, 20°F
8	25	20	15	20		38	10	10	5	5	
9	—	—	15	15	*,	39	5	5	5	10	
10	—	—	—	15	*,	40	—	—	5	—	*,
11	10	—	5	5	*,	41	—	—?	15	10	*, -+,
12	5	—	—	5	*, - Sun up Here	42	10	15	10	5	
13	10	5	5	5	← ENE - 16° Lt,	43	5	10	15	—	*,
14	5	5	5	0		44	10	—	5	5	
15	5	5	5	5	←	45	5	10	5	5	
16	5	5	—	0	*, Steam plume detached	46	—	10	10	—	*,
17	5	5	5	5		47	—?	—?	—?	—	*, -+,
18	0	5	5	5		48	10	—	5	—	*,
19	5	5	—	5	*, ≅	49	—	5	10	10	Lt
20	5	5	5	5	20-30 ft. - Here	50	—	10	5	5	*, NE
21	—	5	5	5		51	—	30	—	50	*, 20.5°F
22	5	10	5	10		51	—	—	45	—	*,
23	5	5	10	5		53	30	—	—	25	*,
24	5	10	—	5	*, NNE - Lt. 18.5°F	54	25	—	—	—	*,
25	5	5	0	5		55	—	30	—	20	*,
26	10	10	5	10		56	—	—	20	—	*,
	—	—	—	10	*,	57	—	—	—	—	*,
28	—	10	10	10	*, 580/77	58	15	—	—	—	*,
29	5	5	10	—		59	—	—	—	10	*, 860/6[illegible]

OTHER REMARKS *, steam plume from By Products PLANT in way;
+, Plume looping down on itself - no readings

AVERAGE PLUME DENSITY
OPACITY 9.93
RINGELMANN

1440/145

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION
17 N. 32nd St., BILLINGS, MT. 59101

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel - Geneva Plant
ADDRESS Provo, Utah
BUSINESS
DESCRIPTION OF SOURCE Coke plant Stack #3
TYPE OF FUEL
STACK HEIGHT ______ STACK DIAMETER ______
DISTANCE FROM STACK 750 ft.
DIRECTION FROM STACK SE
GENERAL PLUME CHARACTERISTICS (COLOR, ETC.)
Lt. Black - Black w/ detached Steam plume

DATE 2/4/81
START TIME 0911 mst
STOP TIME 1010 mst
OBSERVER ATM
OBSERVATION POINT
#1 - For map see back of page 1.

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Clear Blue w/ background haze s/or steam plumes EST. AMBI
AIR TEMP. ______ EST. WIND SPEED ______ DIRECTION ______ EST. RELATIVE HUMIDI

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK,~~ IN OPACITY ~~IF ANY OTHER COLOR~~

	MIN \ SEC	0	15	30	45	REMARKS
0911 3	0	10	—	—	—	*,
2	1	15	—	—	10	*,
3	2	20	—	—	—	*,
2	3	—	30	—	15	*,
2	4	10	—	10	—	*,
	5	10	10	5	10	
2	6	—	10	10	—	*,
	7	10	10	5	15	
2	8	15	15	—	—	*, V.Lt.
1	9	15	10	10	—	*, E 20.5°F
3	10	—	—	20	—	*,
1	11	5	10	10	—	*,
	12	10	5	5	10	
	13	10	10	10	10	
1	14	10	10	15	—	*,
1	15	—	5	5	5	*,
	16	10	5	5	10	
2	17	—	—	10	5	*, calm 3 - V.Lt.
1	18	—	10	15	60	*, NE, 22°F
3	19	—	—	80	—	*,
1	20	60	65	60	—	*,
1	21	—	40	40	35	*,
	22	35	25	25	25	
1	23	25	—	25	30	*, 26.0
1	24	25	25	30	—	*,
1	25	—	25	25	25	*,
	26	20	20	15	15	
4	.	—	—	—	—	*, calm - VLt
	28	15	10	10	10	
1	29	10	10	—	10	*, NE 24°F

1420/51

	MIN \ SEC	0	15	30	45	REMARKS
1	30	10	5	—	10	*,
2	31	5	/	—	5	*,
	32	10	5	5	5	
2	33	5	—	10	—	*,
2	34	10	—	—	5	*,
1	35	10	5	—	10	*,
3	36	0	—	—	—	*,
2	37	—	—	15	25	*,
3	38	25	—	—	—	*,
1	39	20	—	15	15	*, VLt
2	40	—	10	10	—	*, NE
3	41	—	—	—	5	*, 28°F
3	42	5	—	—	—	*, Bench
3	43	—	—	—	5	*,
	44	0	0	5	0	
3	45	—	—	—	0	*,
4	46	—	—	—	—	*,
4	47	—	—	—	—	*,
2	48	0	0	—	—	*,
	49	0	—	—	—	*,
2	50	0	—	—	0	*,
1	51	—	0	0	0	*,
3	51	—	—	—	0	*,
2	53	—	0	—	0	*, Lt
	54	—	0	0	—	*, NE
1	55	0	0	0	—	*, 24°F
2	56	—	0	—	0	*,
1	57	0	0	—	0	*,
	58	0	0	0	0	
1	59	0	0	—	0	*, 270/60

OTHER REMARKS *, Plume blocked by Steam plume from by product plant

AVERAGE PLUME DENSITY OPACITY 11.99
RINGELMANN

1690/141

. ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION

17 N. 32nd St., BILLINGS, MT. 59101

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel – Geneva Plant DATE 2/4/81

ADDRESS Provo, Utah. START TIME ~~[illegible]~~ 1011 mst

BUSINESS STOP TIME 1110 mst

DESCRIPTION OF SOURCE Coke Plant Stack # 3 OBSERVER AM

OBSERVATION POINT # 1

TYPE OF FUEL

STACK HEIGHT STACK DIAMETER

DISTANCE FROM STACK 750 ft.

DIRECTION FROM STACK SE

GENERAL PLUME CHARACTERISTICS (COLOR, ETC.)

Lt Blk – Blk w/ detached Steam Plume

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Blue sky w/ haze // Steam plumes EST. AMBI

AIR TEMP. EST. WIND SPEED DIRECTION EST. RELATIVE HUMIDIT

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK~~, IN OPACITY ~~IF ANY OTHER COLOR~~

~~1011~~ 1011 mst

MIN	0	15	30	45	REMARKS	MIN	0	15	30	45	REMARKS
0 1	0	0	0	—	*,	30	0	5	0	0	
1 2	—	0	—	0	*,	31 3	5	—	—	—	*,
2	0	0	0	0		32 3	0	—	—	—	*,
3 1	0	0	0	—	*,	33	0	0	0	0	
4	0	0	0	0		34	0	0	0	0	
5	0	0	0	0		35	0	0	0	0	V.Lt. – E,
6	0	0	0	0		36	0	0	0	0	26°F
7	0	0	0	10		37	0	0	0	5	
8	5	5	5	5		38	10	5	0	0	calm
9	5	0	0	0		39	0	0	5	5	
10	5	0	0	0	E – Lt,	40	0	0	0	0	
11	0	0	0	0	25.5°F	41	0	0	5	0	
12	0	0	0	5		42	0	0	0	5	
13	0	5	5	5		43	5	0	0	0	
14	10	0	15	55	23.3 V	44	5	10	15	20	
15 2	80	80	—	—	*,	45	20	15	15	10	V.Lt. E,
16	55	40	30	15	my	46	5	0	5	0	25°F
17	15	20	20	15	shadow	47	0	0	0	0	* wind shift
18	15	15	15	15	← directly	48 1	5	—	0	0	* out of W
19	10	15	10	15	towards	49	0	0	0	0	Lost sun
20 1	10	—	10	10	*, Stack –	50	0	0	0	0	on plume shift back
21 1	10	15	—	10	*, Haze	51	5	0	0	0	to E
22	10	10	10	5		51 1	0	0	0	—	*,
23	5	10	5	5		53	5	20	60	60	16.9
24	5	0	5	5	E – Lt,	54 1	60	55	50	—	*
25	5	0	0	5	25.5°F	55 2	40	—	15	—	*, vari winds
26	5	10	5	5		56 3	—	—	—	10	
.	5	0	0	0		57 2	10	—	10	—	*, 25.5°F
28	0	0	0	0		58 1	5	0	—	5	
29	0	0	0	0	500/112	59	5	5	0	0	600/103

OTHER REMARKS * Steam plume from byproducts plant obscuring Stack # 3's plume.

AVERAGE PLUME DENSITY OPACITY 6.51

RINGELMANN

1400/215

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION
17 N. 32nd St., BILLINGS, MT. 59101

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel - Geneva Plant
ADDRESS Provo, Utah
BUSINESS
DESCRIPTION OF SOURCE Coke Plant - Stack #3

DATE 2/4/81
START TIME 1111 MST
STOP TIME 1210 MST
OBSERVER ATM
OBSERVATION POINT #1

TYPE OF FUEL
STACK HEIGHT ____ STACK DIAMETER
DISTANCE FROM STACK 750 ft.
DIRECTION FROM STACK SE
GENERAL PLUME CHARACTERISTICS (COLOR, ETC.) Lt. Black - Black w/ detached Steam plume
EST. AMBI
GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Blue w/ general haze & ore steam plumes
EST. RELATIVE HUMIDI
AIR TEMP. ____ EST. WIND SPEED ____ DIRECTION

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK~~, IN OPACITY ~~IF ANY OTHER COLOR~~

MIN \ SEC	0	15	30	45	REMARKS	MIN \ SEC	0	15	30	45	REMARKS
1111 MST 0	0	5	5	0		30	5	0	0	0	Lt. N.
1	0	0	0	0		31	0	0	0	0	24.8°F
2	0	0	0	0		32	0	0	0	0	
3 /	5	15	15	—	*1	33	0	0	0	0	
4	15	15	10	15		34	0	0	0	0	
5 2	10	10	*	—	*1	35 /	0	0	—	0	*1
6	0	0	0	5		36 /	0	0	—	0	*1
7	5	0	5	5		37	0	0	10	15	
8	0	0	0	0		38	15	15	10	10	
9	0	5	0	0		39	15	15	15	10	calm
10	0	0	0	0	calm	40	15	15	10	10	25.5°F
11	0	0	10	15	26.5°F	41 /	—	15	10	10	*1
12	15	15	15	15		42 /	10	10	—	10	*1
13	10	10	5	5		43	10	10	15	10	
14	5	0	0	0		44	10	15	15	15	
15	0	0	0	0		45 /	—	15	35	65	*1
16	0	0	0	0		46	40	25	25	30	
17	0	0	0	0		47	20	15	10	10	
18	0	0	0	0		48	10	10	10	5	
19	0	0	0	5		49	10	10	10	10	calm
20	25	35	30	20	calm - V. Lt. N	50	10	5	10	15	26°F
21	50	30	30	25	24.5°F	51 /	10	10	10	—	*1
22	25	20	25	15		51 /	—	10	10	10	*1
23	10	10	10	10	18.5	53	5	10	5	5	
24 /	5	10	—	5	*1	54	5	15	15	20	
25	5	5	10	15		55	20	20	25	25	
26	25	20	20	20		56	30	30	25	25	
	20	15	15	15		57	20	20	20	15	
28	15	15	15	15		58	15	15	15	15	
29	10	15	10	5	950/116	59 /	15	—	15	20	*1 1280/112

OTHER REMARKS *1 steam plume from by producers plant obscuring plume from Stack #3

AVERAGE PLUME DENSITY OPACITY 9.91
RINGELMANN

2260/228

AND ENVIRONMENTAL MEASUREMENT CORPORATION

2nd St., BILLINGS, MT. 59101

VISIBLE EMISSIONS FIELD DOCUMENTATION

NAME U.S. Steel Geneva Plant

DATE 2/4/81

ADDRESS Provo, Utah.

START TIME 1211 MST

BUSINESS

STOP TIME 1310 MST (1309 MST)

DESCRIPTION OF SOURCE Coke Plant Stack # 3

OBSERVER AM

OBSERVATION POINT #1

TYPE OF FUEL

STACK HEIGHT STACK DIAMETER

DISTANCE FROM STACK ≅ 750 ft

DIRECTION FROM STACK SE

GENERAL PLUME CHARACTERISTICS (COLOR, ETC.) Lt Blk. - Blk. w/ detached Steam Plume

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Blue w/ gray haze &/or steam plumes EST. AMBI

AIR TEMP. EST. WIND SPEED DIRECTION EST. RELATIVE HUMIDI

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK,~~ IN OPACITY ~~IF ANY OTHER COLOR~~

	MIN \ SEC	0	15	30	45	REMARKS
1211 am	0	35	45	55	50	Lt. S. 28.5°F
	1	50	45	45	40	
	2	35	30	25	20	
	3	15	20	15	15	27.92 ✓
	4	15	15	20	15	6 min.
	5	15	15	10	15	VIOLATION
	6	15	15	15	15	
	7	5	5	20	15	
	8	15	10	5	5	
	9	10	5	5	5	
	10	0	5	5	5	
	11	5	10	5	5	
	12	5	5	5	5	
	13	10	10	5	5	V.Lt.S, 29°F
	14	10	5	10	10	
	15	10	10	10	5	
	16	5	10	5	10	
	17	5	5	0	5	
	18	5	10	10	5	
	19	5	5	5	5	
	20	5	5	5	5	
	21	5	5	5	10	
	22	10	10	5	15	
	23	5	5	5	5	SSE, V.Lt. 28.5°F
	24	5	5	10	10	
	25 1	10	5	10	—	*3
	26 1	—	5	10	5	*3
		5	5	5	5	
	28	5	5	5	10	
	29	10	5	5	5	1230/118

MIN \ SEC	0	15	30	45	REMARKS
30	5	5	5	10	S Lt 28°F
31	5	5	10	10	
32	5	5	5	5	
33	10	5	5	10	
34	5	10	10	10	
35	5	5	5	5	
36	5	10	10	10	
37	5	5	10	15	
38	10	5	15	5	
39	5	5	10	5	
40	5	5	5	5	
41	5	5	5	5	
42	10	5	5	5	
43	0	0	5	5	
44	5	5	5	5	
45 1	—	10	10	0	*4 S.Lt.
46	0	10	35	55	28°F
47	45	60	55	55	
48	35	25	25	20	
49	15	20	15	15	23.3 ✓
50	15	10	5	10	
51 1	5	10	5	—	*4
51 1	—	5	5	5	*4
53	5	5	5	10	
54	15	15	10	10	
55	5	10	5	0	
56 1	5	5	5	—	*4
57 2	—	—	0	0	*4
58 1	0	5	0	0	S.Lt.
59 4					28°F 1095/

OTHER REMARKS *3 Plume from Stack 2 Crossing in front of #3
*4 Overriding Steam obscuring Stack #3's Plume

AVERAGE PLUME DENSITY OPACITY 10.64
RINGELMANN

2425 / 228

/957

FIGURE 9-1
RECORD OF VISUAL DETERMINATION OF OPACITY

COMPANY U.S. Steel - Geneva Plant
LOCATION Provo, Utah
TEST NUMBER #3
DATE 2/5/81
TYPE FACILITY Coke Plant Stack #3
CONTROL DEVICE ____

HOURS OF OBSERVATION 0752 MST - 1215 MST
OBSERVER ATM
OBSERVER CERTIFICATION DATE ____
OBSERVER AFFILIATION EEMC
POINT OF EMISSIONS Coke Stack #3
HEIGHT OF DISCHARGE POINT ____

map of observation point on back of Page 1

	Page 1	2	3	4	5
CLOCK TIME	Initial 0752			Final	1215
OBSERVER LOCATION Distance to Discharge	≃750 ft				
Direction from Discharge	SE				
Height of Observation Point	Grnd				
BACKGROUND DESCRIPTION	Blue sky w/ scat cirrus + gray haze	occ. steam plume			
WEATHER CONDITIONS Wind Direction	SE-SW	E-NE	SE-SSE	S-E	E
Wind Speed	Lt 1-3	Lt 1-3	Lt. 1-5	Lt. 1-3	Lt. 1-3
Ambient Temperature	16.5-19°F	20-21.5°F	24-26°F	25.5-27°F	28-32°F
SKY CONDITIONS (clear, overcast, % clouds, etc.)	Clear Blue w/ scat hi Cirrus + gray plant haze + occ. Steam plume				
PLUME DESCRIPTION Color	Lt black	blk			
Distance Visible	0-200 ft				

Untill blends into General plant plume

OTHER INFORMATION
VO-USS. Dennis Phister on 2/4 & 2/5 Jerry Clark on 2/3

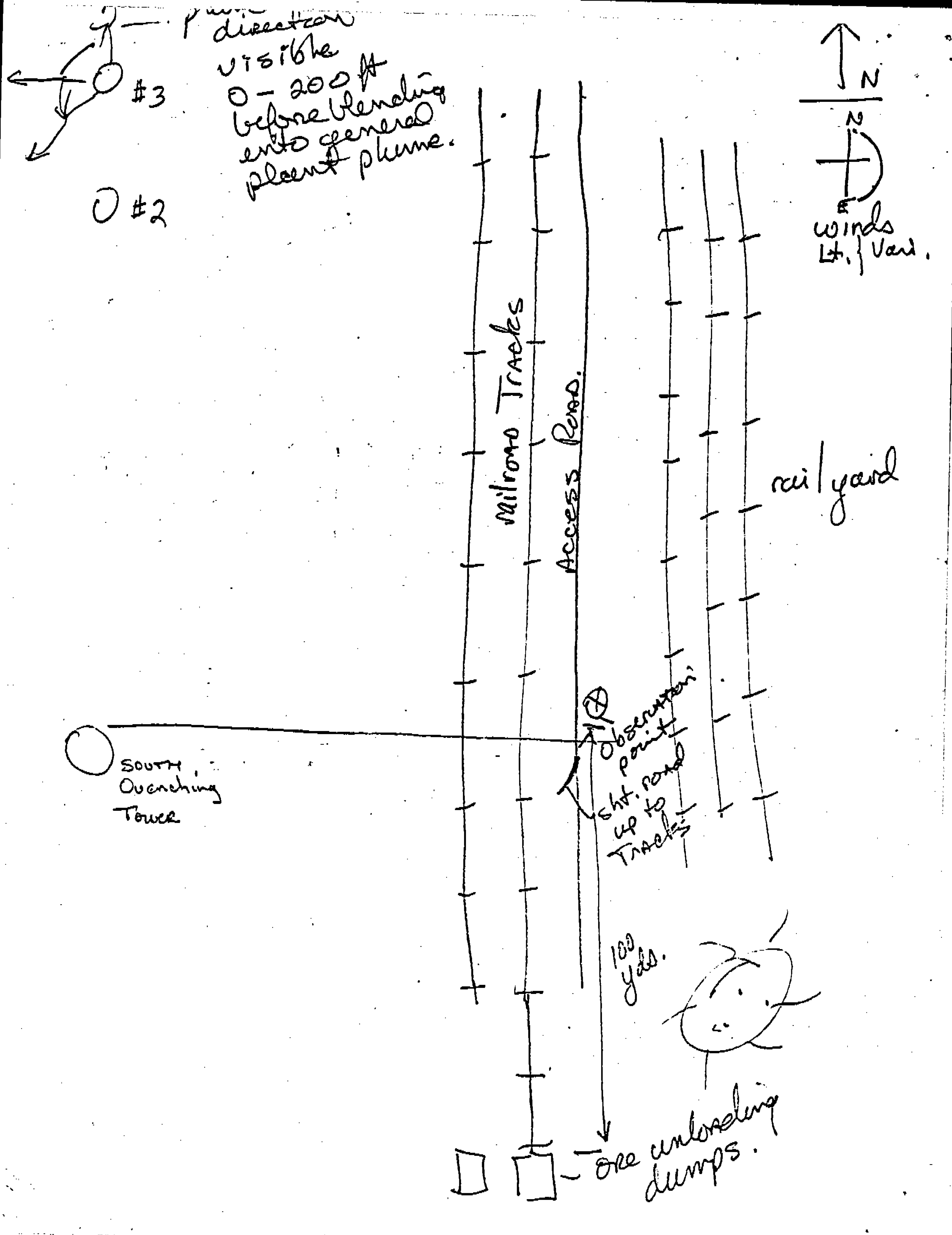
SUMMARY OF AVERAGE OPACITY

Set Number	Time Start--End	Opacity Sum	Opacity Average
Page	2	1110	214
	3	1150	77
	4	825	240
	5	1110	238
	6	790	94
		5015	863
	$\bar{X}$ = 5.99860		
	$\bar{X}$ = 5.20768		

Readings ranged from ____ to ____ % opacity

The source was/was not in compliance with ____ at the time evaluation was made.

21


direction
visible
0 – 200 ft
before blending
into general
plant plume.
#3
#2
N
N
E
winds
Lt. & Var.
Railroad Tracks
Access Road.
rail yard
Observation
point
sht. road
up to
Tracks
South
Quenching
Tower
100
yds.
ore unloading
dumps.

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION

17 N. 32nd St., BILLINGS, MT. 59101

Test 3 Page 2 of 6

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel - Geneva Plant
ADDRESS Provo Utah
BUSINESS
DESCRIPTION OF SOURCE Coke plant Stack #3

DATE 2/5/81
START TIME 0752 MST
STOP TIME 0851 MST
OBSERVER ATM
OBSERVATION POINT #1
See back of page 1 for map

TYPE OF FUEL
STACK HEIGHT STACK DIAMETER
DISTANCE FROM STACK ≅ 750 ft.
DIRECTION FROM STACK SE
GENERAL PLUME CHARACTERISTICS (COLOR, ETC.)
Grey-brown (no sun on it) occ steam plumes
EST. AMB
GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Blue w/scat clds + haze 1/10
EST. RELATIVE HUMID
AIR TEMP. EST. WIND SPEED DIRECTION
Sun not up at the start of the test.

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK~~, IN OPACITY ~~IF ANY OTHER COLOR~~

0752 MST
Start of test

Drive? jump up [illegible]

MIN \ SEC	0	15	30	45	*1 REMARKS
0	5	—	—	—	SE, Lt, 19°F
1	5	5	15	10	detached
2	5	5	5	5	steam
3	5	15	10	10	plume
4	15	15	15	15	≅25-80 ft.
5	15	15	15	15	
6	15	15	15	15	
7	16	15	15	10	
8	15	15	16	10	
9	15	10	10	10	
10	15	15	10	15	
11	10	10	15	10	SE, Lt. 18°F
12	15	10	10	5	
13	15	10	10	10	← Sun starting up
14	10	10	5	15	over mtn
15	16	15	15	10	here
16	—	—	—	10	*2
17	10	10	10	10	
18	10	10	—	—	*2
19	—	—	10	10	
20	—	—	10	10	*2
21	5	5	5	0	
22	5	5	0	0	
23	5	5	0	5	SSE. Lt. 18°F
24	0	0	0	0	
25	5	0	0	0	
26	0	0	0	0	
[illegible]	0	0	0	0	
28	0	0	0	0	
29	0	5	0	—	*3 SSO/10?

MIN \ SEC	0	15	30	45	REMARKS
30	—	0	0	0	*3
31	0	—	—	5	*3
32	0	0	5	0	
33	5	0	5	0	~~calm~~ Lt. SSE
34	0	0	0	5	
35	5	0	0	0	
36	0	0	0	5	19°F
37	0	0	0	5	
38	0	5	0	0	
39	5	5	5	5	
40	0	0	5	0	
41	0	0	5	0	
42	0	0	0	5	Lt. SW 19°F
43	0	0	5	0	
44	5	0	5	0	* 0836 ? on cement dome
45	0	5	0	0	
46	0	0	0	0	
47	0	0	0	5	* 7 min - ? on ave reading [illegible]
48	0	0	0	5	
49	5	5	0	5	
50	5	5	5	5	
51	5	5	5	5	calm 18.5°F
51	5	5	5	5	
53	5	—	0	—	*4
54	—	5	—	0	*4
55	0	—	—	5	*4
56	0	0	5	0	
57	5	0	—	5	*4
58	5	5	5	—	*4, 230/10
59	0	0	—	—	*4

OTHER REMARKS *1 Not Notified until 1 minute into test
*2 Plume looping behind itself. - Can't read it.
*3 Plume from #2 behind #3 ~~in front of stack #3's plume.~~
*4 Steam from byproducts plant

AVERAGE PLUME DENSITY OPACITY
RINGELMANN

1110/214

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION

17 N. 32nd St., BILLINGS, MT. 59101

Test 3 Page 3 of 6

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel - Geneva Plant

DATE 5/FEB/81

ADDRESS Provo, Utah

START TIME 0852 MST

BUSINESS

STOP TIME 0952 MST

DESCRIPTION OF SOURCE Coke plant stack #3

OBSERVER ATM

OBSERVATION POINT # 1

TYPE OF FUEL

STACK HEIGHT STACK DIAMETER

DISTANCE FROM STACK ≈ 750 ft.

DIRECTION FROM STACK

GENERAL PLUME CHARACTERISTICS (COLOR, ETC.)

Lt blk → blk, w/ detached steam plume. ; haze / occ steam plum

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Blue w/scat hi cirrus + EST. AM

AIR TEMP. EST. WIND SPEED DIRECTION EST. RELATIVE HUMI

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK~~, IN OPACITY ~~IF ANY OTHER COLOR~~

0852

MIN \ SEC	0	15	30	45	REMARKS
0	—	—	0	—	*,
1	—	0	0	0	*,
2	—	—	—	0	*,
3	—	—	—	—	*,
4	—	0	—	—	*,
5	—	—	—	—	*,
6	—	—	—	—	*,
7	0	0	0	0	
8	0	—	—	—	*,
9	—	—	0	15	*,
10	—	55	—	—	*,
11	—	80	25	15	*,
12	15	10	10	10	
13	10	—	—	5	*,
14	5	5	5	5	20°F, calm
15	5	0	0	5	
16	—	5	5	—	*,
17	5	5	—	5	*,
18	0	—	—	5	*,
19	—	15	—	75	*,
20	—	—	25	—	*, Lt. E, 20.5°F
21	—	20	20	—	*,
22	20	—	10	15	*,
23	15	—	10	10	*,
24	5	—	5	5	*,
25	5	5	10	5	
26	5	0	5	0	
27	0	0	—	0	*,
28	0	—	—	0	*,
29	0	5	5	0	560/69

MIN \ SEC	0	15	30	45	REMARKS
30	—	15	40	40	*, NE L
31	30	30	25	25	
32	20	15	10	10	
33	10	10	5	—	21.5°F
34	10	10	0	5	*,
35	5	5	0	5	
36	5	5	0	0	
37	5	0	5	5	
38	5	5	5	5	
39	5	5	5	0	
40	5	—	0	0	*,
41	0	0	0	5	NE Lt,
42	5	0	0	0	21.5°F
43	5	0	5	0	
44	5	5	5	5	
45	0	0	5	0	
46	5	0	0	0	
47	0	0	0	0	
48	0	0	0	—	*,
49	0	0	5	5	
50	10	15	—	5	*,
51	15	20	15	—	*, Lt ENE
52	—	0	—	5	*,
53	—	0	0	0	21.5°
54	0	0	0	0	? to:
55	0	0	0	5	North
56	0	0	0	0	90k
57	0	—	—	0	Windows
58	5	5	0	15	
59	25	25	—	5	*, 620/1

OTHER REMARKS *, Steam plume from by-products plant obscuring stack #3 / or plu

AVERAGE PLUME DENSITY OPACITY ~~RINGELMANN~~

1100/177

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION

17 N. 32nd St., BILLINGS, MT. 59101

?

Test 3 Page 4 of 6

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S Steel Geneva Plant

ADDRESS Provo Utah

BUSINESS

DESCRIPTION OF SOURCE Coke plant Stack #3

TYPE OF FUEL

STACK HEIGHT STACK DIAMETER

DISTANCE FROM STACK ≈ 750 ft.

DIRECTION FROM STACK SE

GENERAL PLUME CHARACTERISTICS (COLOR, ETC.)

LtBlk → Blk.

DATE 5 FEB 1981

START TIME 0952 mst

STOP TIME 1051 mst

OBSERVER ATM

OBSERVATION POINT

#1

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Blue w/occasional hi cirrus thin haze/ice steam plumes EST. AMT

AIR TEMP. EST. WIND SPEED DIRECTION EST. RELATIVE HUMIDITY

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK~~, IN OPACITY ~~IF ANY OTHER COLOR~~

	MIN \ SEC	0	15	30	45	REMARKS
0952 mst	0	5	10	5	5	SE. Lt, 1-3 mph.
	1	5	5	5	5	
	2	0	0	0	0	
	3	0	5	5	0	
	4	0	0	5	0	
	5	0	0	0	0	24.5°F
	6	5	0	0	5	3 mph
	7	5	0	0	0	
	8	0	0	0	0	
	9	0	5	5	0	
	10	0	0	0	5	
	11	5	5	0	5	
	12	5	0	0	0	
	13	0	0	0	10	
	14	30	40	35	30	
	15	20	20	15	10	
	16	5	5	5	5	3-5 mph SSE
	17	5	5	5	5	25°F
	18	5	0	0	0	
	19	5	0	5	0	
	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	5	0	0	
	24	0	0	5	5	
	25	5	5	0	5	
	26	0	0	0	5	
	27	0	0	5	0	
	28	5	5	0	5	
	29	5	5	5	5	450/120

MIN \ SEC	0	15	30	45	REMARKS
30	5	5	0	5	SSE Lt
31	5	5	5	5	my
32	0	5	0	0	shadow
33	5	0	0	5	directly
34	0	0	5	5	downwind Stack
35	5	5	0	0	
36	0	0	0	0	25°F Lt.
37	0	5	0	0	SE
38	5	0	0	0	
39	0	0	0	0	
40	0	5	0	0	
41	0	0	0	0	
42	0	0	5	0	
43	0	0	5	0	
44	5	5	5	0	
45	0	0	5	10	
46	5	0	0	0	
47	0	5	5	0	
48	5	5	5	0	
49	0	0	0	0	
50	0	0	0	0	
51	5	0	0	0	
52	0	0	0	0	
53	10	25	30	35	
54	25	15	15	10	
55	5	0	0	0	26°F
56	0	0	0	5	SE
57	0	0	5	5	
58	5	0	5	5	375/120
59	5	5	5	5	

OTHER REMARKS

AVERAGE PLUME DENSITY OPACITY RINGELMANN

825/240

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION

17 N. 32nd St., BILLINGS, MT. 59101

Test # 3 . Page 5 of 6

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel - Geneva plant. DATE 5 FEB 1981

ADDRESS Provo, Utah START TIME ~~0?0~~ 1052 mST

BUSINESS STOP TIME 1151 MST

DESCRIPTION OF SOURCE Coke plant stack # 3 OBSERVER ATM

OBSERVATION POINT # 1

TYPE OF FUEL

STACK HEIGHT STACK DIAMETER

DISTANCE FROM STACK ≅ 750 ft.

DIRECTION FROM STACK SE

GENERAL PLUME CHARACTERISTICS (COLOR, ETC.) Clear - Lt. blk - blk.

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Blue w/ gray haze and/or occ. SC or cirrus occ steam plumes EST. AM

AIR TEMP. EST. WIND SPEED DIRECTION EST. RELATIVE HUMI

PLUME DENSITY READINGS: ~~IN RINGELMANN IF BLACK~~, IN OPACITY ~~IF ANY OTHER COLOR~~

1052 mST

MIN \ SEC	0	15	30	45	REMARKS
0	5	0	0	0	
1	0	0	0	0	
2	0	5	0	0	
3	0	5	5	0	Lt. SE.
4	0	5	5	0	← 25.5°F
5	5	5	10	40	
6	30	35	25	20	
7	15	15	10	5	S. Lt.
8	0	0	0	5	
9	0	0	0	0	
10	5	0	0	0	
11	0	0	0	0	
12	5	0	0	0	
13	0	5	0	0	
14	0	5	5	5	
15	0	0	0	0	
16	0	0	0	0	S. Lt.
17	0	0	0	0	← 27°F
18	0	0	0	0	
19	0	0	5	5	
20	0	0	5	0	
21	5	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	5	0	0	0	
26	0	0	0	0	calm
	5	0	0	0	27°F
28	0	0	0	0	
29	0	0	0	0	310/120

MIN \ SEC	0	15	30	45	REMARKS
30	0	0	0	0	
31	0	0	0	0	W. Lt. E.
32	0	0	0	0	
33	5	0	0	0	
34	5	0	5	0	
35	0	5	5	5	
36	0	5	0	0	
37	5	0	0	5	11.7
38	5	0	0	0	
39	15	35	40	35	
40	25	25	20	15	E. Lt.
41	15	15	10	5	27°F
42	5	5	0	0	
43	0	0	0	0	
44	0	0	0	0	
45	0	0	0	5	
46	0	0	0	5	
47	0	0	0	0	
48	0	0	5	0	
49	0	15	20	20	E. Lt.
50	20	15	5	0	
51	0	10	10	—	*1 27°F
51	0	0	0	0	
53	0	5	0	0	
54	0	0	0	—	*1
55	0	0	10	20	
56	25	30	35	35	
57	25	25	20	15	
58	15	15	15	15	calm
59	15	15	15	10	300/1

CO No cut 1/4 [illegible]

② check in time — Just into part #4

OTHER REMARKS *1 Steam plumes from by-products plant obscuring plume from #3.

AVERAGE PLUME DENSITY OPACITY ~~RINGELMANN~~

1110/238

ENERGY AND ENVIRONMENTAL MEASUREMENT CORPORATION

17 N. 32nd St., BILLINGS, MT. 59101

Test 3 Page 6 of 6

VISIBLE EMISSIONS FIELD DOCUMENTATION

FIRM NAME U.S. Steel, Geneva Plant

ADDRESS Provo, Utah

BUSINESS

DESCRIPTION OF SOURCE Coke Plant Stack #3

DATE 2/5/81

START TIME 1152 mst

STOP TIME 1215 MST

OBSERVER ATM

OBSERVATION POINT #1

TYPE OF FUEL

STACK HEIGHT STACK DIAMETER

DISTANCE FROM STACK 3750 ft.

DIRECTION FROM STACK SE

GENERAL PLUME CHARACTERISTICS (COLOR, ETC.) clear-Lt Black- Black w/ detached steam plume

GENERAL METEOROLOGY: SKY CONDITIONS AND COLOR Blue w/ scat cirrus + grey haze / see steam plume EST. AM

EST. RELATIVE HUMI

AIR TEMP. EST. WIND SPEED DIRECTION

PLUME DENSITY READINGS: IN RINGELMANN IF BLACK, IN OPACITY IF ANY OTHER COLOR

	MIN \ SEC	0	15	30	45	REMARKS
1152 mst	0	10	10	5	0	E. Lt.
	1	10	10	10	10	28°F
	2	5	5	5	5	
	3	5	5	5	5	
	4	5	5	0	5	
	5	—	0	0	0	*1
	6	15	25	25	15	
	7	—	0	0	0	*1
1200 mst	8	0	0	0	0	
	9	0	0	0	0	
	10	0	0	0	0	
	11	0	0	0	0	E. Lt.
	12	0	10	50	70	
	13	65	55	50	40	24.2
	14	35	35	30	25	
	15	20	20	20	15	
	16	15	10	5	5	
	17	5	0	0	10	32°F
	18	0	0	0	0	
	19	0	0	0	0	
	20	0	0	0	0	
	21	10	0	0	0	
	22	0	0	0	0	E. Lt. 29°F
1215 mst	23	0	0	0	0	790/94
	24					
	25					
	26					
	28					
	29					

MIN \ SEC	0	15	30	45	REMARKS
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
51					
53					
54					
55					
56					
57					
58					
59					

OTHER REMARKS steam plume from by-products plant obscuring stack #3 & its plume.

AVERAGE PLUME DENSITY OPACITY

RINGELMANN

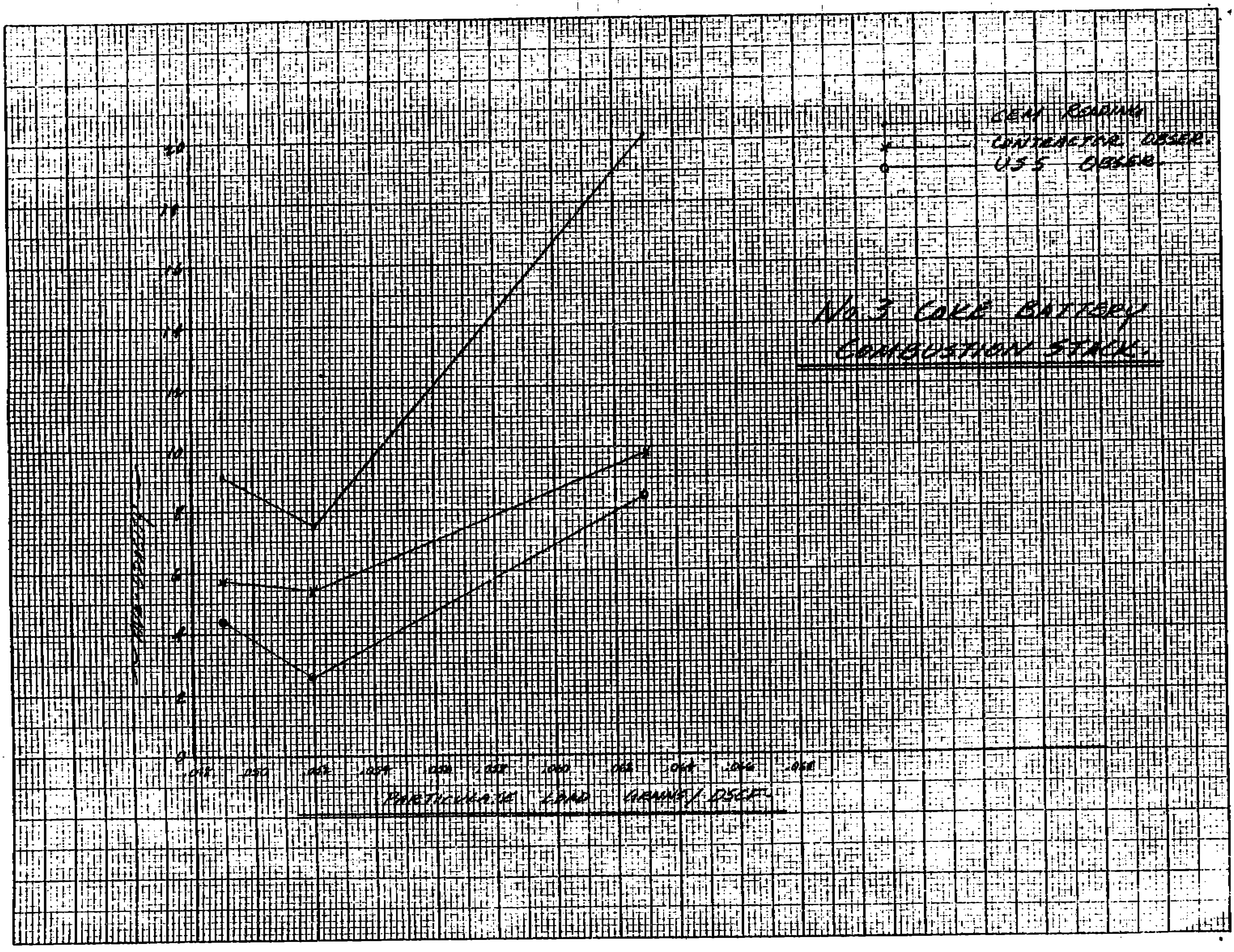
Dennis Phisker

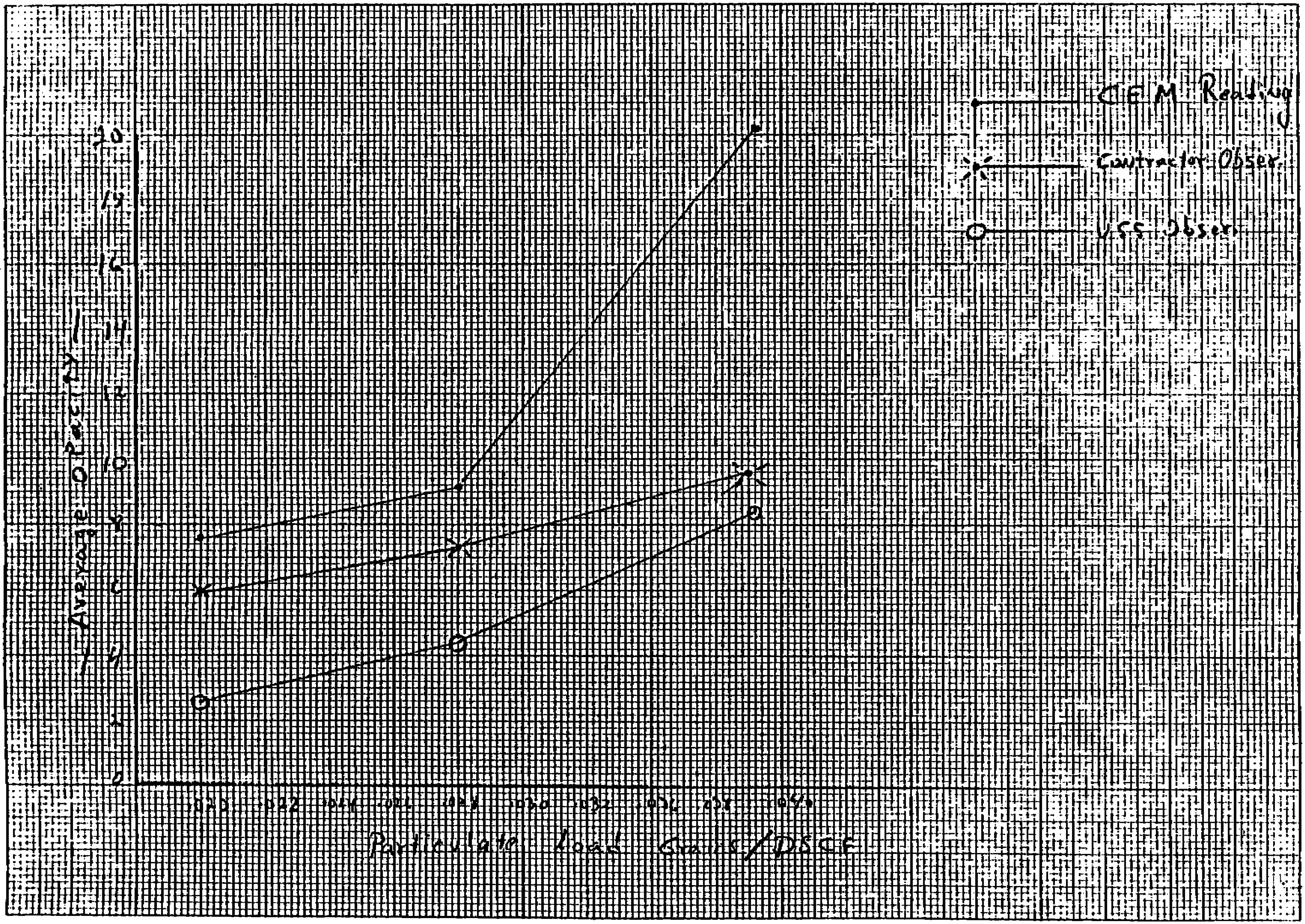
Jerry Clark

General comments;

① USS UB observer watched almost all (if not all) ~~SF~~ Emissions on 2/4/81 thru windshield of car.

② on 2/5/81 he WATCHED almost 75% inside car.


No. 3 COKE BATTERY
COMBUSTION STACK
CEM READING
CONTRACTOR OBSER.
U.S.S. OBSER.
PARTICULATE LOAD GRAINS/DSCF
0
2
4
6
8
10
12
14
16
18
20



CROSS SECTION - 20 SQUARES TO INCH

AEMC Pox 4-5@1.01 SOURCE Coker #3 STK @ Geneva DATE 2/3/81 LAB#

TEST # I-P1 LEAK CHECK ✓ BOX LEVEL ✓ MANOMETERS ZERO ✓ TEST TIME θ 2 1/4

initial @ 7 10" Hg post LC .0075 cfm @ 4" 19.8 13.1

TEST SPECIES (Pts) P_B 25.73 P_S SE Port P_M CO 2.1 2.3 CO_2 4.4 4.5 O_2 13.1 $\%H_2O$

START TIME 1158

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) in. H2O	$\sqrt{\Delta P}$	STACK GAS VELOCITY fpm	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_{in} °F		OUTLET t_o °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	TP
1-A	3	?ble.	459	.015	.122		.39		761.207	70	61	64	210	40	Nil	117
-B	6	9.29%O2	461	.011	.105		.29			74	70	65	250	40	"	170
2-A	9		462	.011	.105		.29			76	81/71	66	250	40	"	171
B	12		467	.011	.105		.29			77	72	66	252	38	"	180
3-A	15		468	.010	.100		.26			78	72	66	251	38	"	188
-B	18	6.59%O2	494	.007	.084		.18			80	74	68	251	38	"	[illegible]
4-A	21		460	.007	.084		.18			81	75	68	250	38	"	[illegible]
-B	24		458	.005	.071		.13			81	76	70	250	38	"	[illegible]
5-A	27		459	.005	.071		.13			81	76	71	250	38	"	[illegible]
-B	30	6.8%O2	461	.005	.071		.13			82	77	72	250	37	"	[illegible]
6-A	33		464	.005	.071		.13			84	78	72	250	37	"	[illegible]
-B	36		466	.005	.071		.13			84	79	73	248	37	"	21?
7-A	39		457	.003	.055		.08			85	80	74	248	37	"	213
-B	42	7.5%O2	439	.003	.055		.08			85	80	75	248	36	"	[illegible]
8-A	45		435	.004	.063		.10			85	81	76	248	36	"	[illegible]
-B	48	Pb 25.77	452	.002	.045		.05			86	81	76	249	36	"	201
9-A	51		403	.003	.055		.08			86	83	77	248	36	"	19?
-B	54	9.27%O2	249	.002	.045		.07			86	82	78	—	—	"	197
10-A	57		[illegible]	.008	.089		.28			87	83	78	—	—	"	191
-B	60		121	.008	.089		.28		776.487	87	83	78	—	—	"	17?
									A = 15.277							
		X	420°F		.078		.18			77		78°F	250			11
			460		.0061						46	0				
			880°A							537	538	°A				

JRF 4 of 4

finish @ 1258

GEMCO

SOURCE Coker #3 stack Geneva DATE 2/3/81 LAB# ____

TEST # 1-P1 LEAK CHECK Train wet / [illegible] BOX LEVEL ✓ MANOMETERS ZERO ✓ TEST TIME θ 2/10

TEST SPECIES Otr. P_B 25.91 P_S (N/F Port) P_M ____ CO_2 ____ O_2 ____ $\%H_2O$ ____

START TIME 1311

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) in. H2O	($\sqrt{\Delta P}$)	STACK GAS VELOCITY V_s	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_{m_i} °F	OUTLET t_{m_o} °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	TC
1 A	3		453	.030	.173		.80			86 83	79	240	34	Nil	141
B	6		467	.030	.173		.80			89 84	80	240	36	"	15[illegible]
2 A	9	6.7900	468	.030	.173		.76			89 85	80	235	36	"	17[illegible]
B	12		415	.030	.173		.76			91 86	80	255	36		185
3 A	15		474	.027	.164		.69			92 87	81	255	36	"	20[illegible]
B	18		484	.023	.152		.59			93 89	82	230	37	"	22[illegible]
4 A	21	6.2860	486	.023	.152		.58			92 87	82	250	37	"	23[illegible]
B	24		490	.025	.158		.63			93 88	82	250	37	"	23[illegible]
5 A	27		492	.016	.126		.40			93 88	82	247	38	"	22[illegible]
B	30		461	.025	.158		.63			93 88	82	248	38	"	21[illegible]
6 A	33	6.8350	467	.027	.164		.68			93 88	82	248	38	"	21[illegible]
B	36	25.67	468	.026	.161		.65			93 88	83	250	39	"	21[illegible]
7 A	39	[illegible]	497	.026	.161		.61			94 89	83	245	40	"	20[illegible]
B	42		475	.020	.141		.50			94 89	83	245	40	"	20[illegible]
8 A	45	6.1990	472	.020	.141		.56			95 90	84	245	40	"	20[illegible]
B	48		482	.023	.152		.58			95 90	84	245	40	"	21[illegible]
9 A	51		452	.013	.114		.33			96 91	85	254	41	"	22[illegible]
B	54		453	.013	.114		.33			96 91	85	254	41	"	22[illegible]
* 10 A	57		331	.008	.089		.14			95 90	85	—	—	"	22[illegible]
B	60		310	.008	.089		.24			95 90	85	—	—	"	2[illegible]
									3.833						
* av			458°F		(.146)²		.57			88	84°F	248			20[illegible]
			460		.11		= Δ		= 27.348	460					
			918°A		.0213					544°A					
										548					

JPF 3064

4.6
17.6
17.5

SOURCE [illegible] DATE [illegible] LAB# ____

TEST # 1-Pt LEAK CHECK ✓ BOX LEVEL ✓ MANOMETERS ZERO ✓ TEST TIME θ 240

TEST SPECIES Pts. P_B 25.67 P_S ____ P_M ____ CO_2 ____ O_2 ____ $\%H_2O$ ____

(NW Port)

START TIME 1431

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) in. H2O	($\sqrt{\Delta P}$)	STACK GAS VELOCITY fps	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_{in} °F		OUTLET t_o °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	T_p °F
1-A	3		469	.015	.122		.45			89	88	86	250	38	Nil	170
B	6		478	.015	.122		.45			89	88	86	25[illegible]	39	"	192
2-A	9		480	.013	.114		.39			90	89	87	255	39	"	206
B	12		483	.013	.114		.39			90	89	87	250	38	"	224
3-A	15		484	.010	.100		.31			91	89	87	250	38	"	228
B	18		460	.010	.100		.31			92	91	87	250	39	"	242
4-A	[illegible]		460	.005	.071		.16			92	91	87	248	38	"	241.
B	[illegible]		463	.005	.071		.16			92	91	87	250	39	"	241.
[illegible] A	[illegible]		470	.005	.071		.16			93	87	85	245	38	"	234.
B	30		472	.005	.071		.16			93	87	85	245	37	"	234
[illegible] A	33		475	.005	.071		.16			93	90	86	245	37	"	231
B	[illegible]		480	.005	.071		.16			94	90	86	248	37	"	22[illegible]
[illegible] A	[illegible]	2.1% O_2	479	.004	.063		.12			93	90	87	250	38	"	224
B	[illegible]		480	.002	.045		.06			93	90	87	250	38	"	220
[illegible]	45		455	.005	.071		.16			93	90	87	250	38	"	22[illegible]
[illegible]	48		457	.005	.071		.16			94	91	87	245	38	"	22[illegible]
[illegible] A	51		430	.001	.032		.03			96	92	87	255	40	"	219
B	54		412	.000	.00		.00			—	—	—	—	—	—	—
10 A	57		—	.000	.00		.00			—	—	—	—	—	—	—
B	60		—	.000	.00		.00			—	—	—	—	—	—	—
			466°F	$(.069)^2$			.190		18.085	90°F			241			x22[illegible]
			460							460						
			926°A	.0048						550°A						

$T_{s} = (.091)^2$

"

.0066

JPF 2034

TEST # 1-P[illegible]

SOURCE Coke [illegible] @ [illegible] DATE [illegible] LAB# ____

LEAK CHECK [illegible] BOX LEVEL ____ MANOMETERS ZERO ____ TEST TIME θ 240-18=222

TEST SPECIES [illegible] P_B 25.66 P_S ____ P_M ____ CO_2 ____ O_2 ____ $\%H_2O$ ____

START TIME [illegible]

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) in. H2O	$(\sqrt{\Delta P})$	STACK GAS VELOCITY fpm	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET °F	OUTLET °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	
1-A	[illegible]	-1.2"H2O	[illegible]	[illegible]	.032		.03			[illegible] 91	86	[illegible]	[illegible]		[illegible]
-B	[illegible]		[illegible]	[illegible]	.032		.03			[illegible] 91	[illegible]	252	50	[illegible]	[illegible]
2-A	[illegible]	Pb	475	.005	.071		.16			90 89	87	250	50	11	
-B	1[illegible]	25.66	458	.003	.055		.10			93 90	87	250	50	"	22
3-A	1[illegible]	"Hg	461	.003	.055		.10			93 90	87	249	51	"	23
-B	1[illegible]	759.0	461	.003	.055		.10			93 90	87	249	51	11	2[illegible]
4-A	21		469	.003	.055		.10			93 90	87	250	52	"	2[illegible]
-B	[illegible]		493	.001	.032		.03			94 91	88	251	52	"	2[illegible]
5-A	[illegible]		495	.001	.032		.03			94 92	89	250	46	11	22
-B	[illegible]	25.66	484	.001	.032		.03			94 92	87	250	46	11	2[illegible]
[illegible]	33	"Hg	487	.001	.032		.03			94 92	89	251	46	"	22
[illegible]	36		490	.001	.032		.03			94 92	89	250	42	"	22
1-[illegible]	39		462	.001	.032		.03			94 92	89	250	42	"	22
[illegible]	42		461	.001	.032		.03			94 92	89	249	40	"	21
[illegible]	45		449	.003	.055		.09			95 92	89	249	40	"	21
[illegible]	48		42[illegible]	.001	.032		.03			94 92	90	250	40	"	21
[illegible]	51		214	.001	.032		.03			94 92	89	250	40	"	21
[illegible]	54		395	.001	.032		.04			94 92	89	250	40	"	21
[illegible]	57		395	.001	.032		.04			94 92	89	250	40	"	21
	60		339	.001	.032		.04			94 92	89	250	40	11	21
			434°F	(.0397)²			.06		1028.612	91.0°F		x̄ [illegible]			
			460		.0016					460					
			894°R							551°R					
				.0085	[illegible]										
SV			90[illegible]	.0089	[illegible]		.25		61.365	1.86°F		Pb 25.76			

1:46

[illegible signature]

Borometric Pres

Date	Time	Value	Initials
2/3	0815	~~25.37~~	JRF AH
	0815	25.74	JRF AH
	1135	25.73	AH
	1220	25.72	JRF
	1300	25.71	JRF
	1355	25.67	AH
	1515	25.67	JRF
	1600	25.66	JRF

$\overline{X} =$

Run 1 25.69" Hg

EEMC

TEST # 1 LAB # ______

@ Genova Provo

SET 3

TEST DATE 2-3-81

SOURCE USS Stack 3

WEIGHED BY DW APPROVED BY ______

MOISTURE DETERMINATION

Balance level ✓ Balance zeroed ✓

GRAMS

WATER WEIGHT GAIN, GRAMS

IMPINGER # 1

Final Weight 730.7

Initial Weight 587.8

Increase 142.9 ✓

Impinger # 1 ______

IMPINGER # 2

Final Weight 647.9

Initial Weight 616.7

Increase 31.2 ✓

Impinger # 2 ______

IMPINGER # 3

455.8

Final Weight 461.9

Initial Weight 3.9 ✓

Increase ______

Impinger # 3 ______

SILICA GEL IMPINGER

Final Weight 942.4

Initial Weight 829.8

Increase ~~1[illegible].6~~ 12.6

Silica Gel ______

TOTAL MASS OF WATER CAPTURED ~~232.6~~ 190.6 GRAMS

NOTES

Run No. 1 Lab. No. ______

Geneva Stack#3 Date 2-6-81

PARTICULATE CATCH

			Color & Solution volume, ml	
BEAKER 025	A. Probe wash	105.1337 / 105.0920 / 0.0417 g.	Clear Black solid 175ml	Filter Catch: Filter No. 330; Final Wt. .4925; Tare Wt. .3986; .0939
Beaker D26	B. Probe Wash	106.8816 / 106.8373 / 0.0443 g.	Clear Black Solid 200ml	NOTES:
Beaker ______	C. ______	______ g.	______	
Beaker 037	D. IMP	106.9048 / 106.8906 / 0.0142 g.	clear	
Beaker 038	E. IMP	108.3533 / 108.3416 / 0.0117 g.	clear	
Beaker ______	F. ~~BLANK~~	______ g.	______	

Probe and Cyclone Residue .0860 g. - (.0001) 2 g. blank = .0858 g.

Impinger Residue .0259 g. - .0003 g. blank = .0256 g.

EPA METHOD Filter, Probe & Cyclone Residue .1797 g.

TOTAL PARTICULATE WEIGHT

Filter, Probe, Cyclone and Impinger Residues .2053 g.

BALANCE CALIBRATION

Setup ______ Beakers ______ Filters ______

DATE 2/3/82 PARTICULATE CALCULATIONS TEST 1 Pt.

LAB NO. ________ @ Geneva-Coke #3

EPA FORMAT - METHODS 1-5

1. Gas Volume sampled - Dry Standard Conditions

$$V_m(std) = V_m K_1 Y \frac{Pbar + \Delta H/13.6}{Tm}$$

$$= (67.365 \text{ cf})(17.65)(1.01) \frac{(25.69" + \frac{.25"}{13.6})}{(546\ ^\circ A)}$$ 547 EQN 5-1

= 56.543 dscf 56.440

2. Volume of Water Vapor

$$V_w(std) = K_2 V_{1c}$$ EQN 5-2

$$= 0.04707\ (190.6 \text{ ml.}) = 8.972 \text{ scf}$$

3. Moisture Content

$$Bws = Vw(std)/(Vm(std) + Vw(std))$$ EQN 5-3

$$= \frac{(8.972)}{(56.543+8.972)} = .137 \text{ Moisture Content } x$$

56.44

$$x\ 100 = 13.7\ \%\ H_2O$$

4. Actual Stack Gas Sampled

$$Vm(actual) = \frac{V_m}{\left(\frac{100 - \%\ H_2O}{100}\right)} \times \frac{T_s\ ^\circ A}{T_m\ ^\circ A} \times \frac{P_m\ "Hg}{P_s\ "Hg}$$

$$Vm(actual) = \frac{(\quad)}{(\quad)} \times \frac{(\quad)}{(\quad)} \times \frac{(\quad)}{(\quad)} = \_\_\_\_ \text{ awcf}$$

5. Dry Stack Gas Molecular Weight

$$Md = 0.44(\%\ CO_2) + 0.32(\%\ O_2) + 0.28(\%\ N_2 + \%\ CO)$$ EQN 3-2

$$= 0.44(5.6) + 0.32(10 -) + 0.28(84.4) =$$

per John Floyd. = 29.296 lb./lb. mole

6. Wet Stack Gas Molecular Weight

$$Ms = Md(1 - Bws) + 18\ Bws$$ EQN 2-5

$$= (29.296)(1 - .137) + (18 \times .137) =$$

.863 = 27.748 lb./lb. mole

7. Cross Sectional Stack Area

$$A = \pi r^2 = (3.1416)(7.829 \text{ ft.})^2 = 192.541 \text{ ft.}^2$$

$$A = (h)(w) = (\_\_\_\_ \text{ ft.})(\_\_\_\_ \text{ ft.}) = \_\_\_\_ \text{ ft.}^2$$

for rectangular type stacks

8. Average Stack Gas Velocity

$$Vs = KpCp\left(\sqrt{\Delta P}\ Ave.\right)\sqrt{\frac{Ts\ Avg.}{Ps\ Ms}}$$ EQN 2-9

$$= (85.49)(\underline{.84})\left(\sqrt{\frac{.0085\ "H_2O}{.0089 (Ico)}}\right)\sqrt{\frac{904\ °A}{25.602"\ Hg\ 27.748}} = \underline{7.642}\ ft./sec. - Ico$$

7.473
7.469 fps - STV
7.447

9. Average Stack Gas Dry Volumetric Flow Rate

$$Qsd = 3600(1 - Bws)\ VsA\left(\frac{Tstd}{Ts\ avg.}\right)\left(\frac{Ps}{Pstd}\right)$$ EQN 2-10

$$= 3600(1 - \underline{.137})(\underline{7.469}\ ft./sec.)(\underline{112.54}\ ft.^2)\left(\frac{528\ °A}{904\ °A}\right)\left(\frac{25.602\ Hg}{29.92"\ Hg}\right) =$$

7.472
905

.863

= 2,233,008 dscf/hr. 37217 SdcfM
2,231,874 37,195

10. Actual (Wet) Cubic Feet per Minute

$$AWCFM = \frac{\left(\frac{Ts}{528}\right)\left(\frac{29.92}{Ps}\right)\left(\frac{100}{100 - \%\ H_2O}\right)(Qsd)}{60}$$

$$= \frac{\left(\frac{904}{528}\right)\left(\frac{29.92}{25.602}\right)\left(\frac{100}{100 - 13.7}\right)\ \underline{2,231,874}\ dscf/hr.}{60}$$

(86.3)

= 86,244 AWCFM

11. Particulate Concentration

$$Cs = \frac{(grams\ particulate)(15.43)}{Vm(std)}$$

EPA-5 = .1797
5+I = .2053

$$= \frac{\underline{.2053}\ g\ (15.43)}{\underline{56.440}\ dscf} = \underline{\qquad}\ gr/dscf$$

.0491 EPA #5
.0561 #5 + I

$$C_A = \frac{(grams\ particulate)(15.43)}{AWCF}$$

$$AWCF = Vm(std)\left(\frac{Ts}{528}\right)\left(\frac{29.92}{Ps}\right)\left(\frac{100}{100 - \%\ H_2O}\right)$$

$$= \frac{\underline{\qquad}\ g\ (15.43)}{\underline{\qquad}\ awcf} = \underline{\qquad}\ gr/awcf$$

12. Emissions lbs./10^6 BTU's

$$\text{lbs.}/10^6 \text{ BTU's} = (Cd)(Fd)\ \frac{20.9}{20.9 - \%\ O_2}$$

(a) % O_2 = Average Dry % O_2

(b) Cd = lbs./dscf = Cs/7000 = $\frac{\text{grams particuate sample}}{\frac{\text{Vm(std)}}{452}}$

(c) Fd = BTU Factor for specific fuel:

Anthracite	@	10,140
Bituminous	@	9,820
Lignite	@	9,900
Oil	@	9,220
Natural Gas	@	8,740
Wood	@	9,280
Bark	@	9,640

lbs./10^6 BTU = $\frac{(\_\_\_\_\_\_\text{gr/dscf})}{7000}$(______Fd) $\frac{20.9}{20.9 - \_\_\_\_\_\_}$

= ______ $\frac{\text{lbs.}}{10^6 \text{ BTU}}$

13. Particulate Emissions

ME = $\frac{(Cs)(Qsd)}{7000}$

#5 = .0491

#5 + I = .0561

= $\frac{(\_\_\_\_\_\_\text{gr/dscf})(223,874\text{ scf/hr.})}{7000}$ = 15.7 - #5

17.9 - #5 + I lbs./hr.

ME_A = $\frac{(C_a)(\text{avcfm})(60)}{7000}$ = ______ lbs./hr.

= $\frac{(\_\_\_\_\_\_\text{gr/swcf})(\_\_\_\_\_\_\text{avcfm})(60)}{7000}$ = ______ lbs./hr.

14. Isokinetic Sampling Rate

$$I = \frac{K_4\ T_s\ Vm(std)}{PsVsAn\theta(L - Bws)}$$

$$= \frac{(0.0945)(904\ ^\circ R)(56.543\text{ dscf})}{(25.60\text{ in Hg})(7.642\text{ ft./sec.})(.00136\text{ ft.}^2)(231\text{ min})(1 - .137)}$$

.863

= 91.1 % Isokinetic

Box 4(F) SOURCE Coking #3 @ Geneva DATE 2/4/81 LABR

O_2 = 11.4 - 12.2

TEST # Pitt 2 LEAK CHECK ✓ BOX LEVEL ✓ MANOMETERS ZERO ✓ TEST TIME θ 249

-1.20" wg

(#1215.7) (#1 15.4) Big (mg) 9.3 (TD)

TEST SPECIES Pt P_B ____ P_S 21.60 P_M ____ CO_2 7.2 → 7.4 O_2 9.7 8.3 %H_2O ____

SW Port

CO 0

START TIME	TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) in. H2O	($\sqrt{\Delta P}$)	STACK GAS VELOCITY fpm	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_{m_i} °F		OUTLET t_{m_o} °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	
0810	1-A	[illegible]		444	.007	.084		.21	.26	40.011	79	78	76	250	32	Nil	186
0811	-B	1	25 (a)	462	.007	.084		.21	.26	—	82	79	76	252	32	//	20?
JRF	2-A	9	(Hg)	462	.005	.075		.26	.35	—	84	80	76	254	31	//	210
	-B	12	Tel	463	.007	.084		.21	.24	43.870	82	77	76	255	31	//	225
	3-A	15	O_2: 7.1	466	.007	.084		.21	.26	—	83	80	77	245	32	//	231
	-B	18	Tel	469	.007	.084		.21	.26	—	84	81	77	245	32	//	24?
	4-A	21	7.9%	472	.007	.084		.21	.26	—	86	82	77	245	33	//	24?
	-B	24		476	.007	.084		.21	.26	47.400	87	84	77	250	32	//	247
	5-A	27		478	.007	.084		.21	.26	—	87	82	77	250	32	//	234
	-B	30		482	.005	.071		.15	.20	—	89	84	79	250	32	//	22?
	6-A	33	Tel	484	.005	.071		.15	.20	—	89	85	80	250	32	//	22?
	-B	[illegible]	6.8%	487	.005	.071		.15	.20	—	90	81	79	250	32	//	239
	7-A	[illegible]		490	.005	.071		.15	.20	—	90	81	79	250	32	//	244
	-B	[illegible]		452	.006	.077	JRF	.22	.24	52.495	90	81	80	250	32	//	251
	8-A	[illegible]	Tel	455	.006	.077		.22	.24	—	90	81	80	250	32	//	254
	-B	[illegible]	15%	428	.006	.077		.22	.24	—	90	85	80	250	36	//	254
	9-A	[illegible]		405	.006	.077		.22	.24	—	90	86	81	250	36	//	253
	-B	[illegible]		405	.006	.077		.22	.24	56.010	90	86	81	250	38	//	250
	10-A	[illegible]		299	.005	.071	(23)	.18	.19	—	90	86	81	250	38	//	250
	-B	60		276	.005	.071	(23)	.23	←	57.761	91	86	81	250	39	//	249
0911				1443°F	.0772												
				460						Δ=17.756			83°F				
				903°R	.006			.24					460				
			one change JRF										543°R				
one of 4 JRF					Leak check			.002 (1 minute)									

SOURCE 's Coker @ Geneva DATE 2/4/81 LAB# ____

TEST # 2-Pt. LEAK CHECK ____ BOX LEVEL ✓ MANOMETERS ZERO ✓ TEST TIME θ 240

TEST SPECIES Pt. P_B ____ P_S ____ P_M ____ (NW Port) CO_2 ____ O_2 ____ $\%H_2O$ ____

START TIME 0920

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) in. H2O	$\sqrt{\Delta P}$	STACK GAS VELOCITY fpm	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_{m_i} °F		OUTLET t_{m_o} °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	Tpor
1-A	3	-1.2	448	.003	.055		.11	.12	57.767	85	83	81	255	36	Nil	202
-B	6	30/29.79	459	.003	.055		.11	.12	—	86	84	81	255	36	"	233
2-A	[illegible]		466 446	.010	.100		.37	.39	—	88	85	81	256	36	"	233
-B	12	[illegible]	468	.010	.100		.37	.39	—	89	86	82	250	36	"	240
3-A	15	"	471	.013	.114		.48	.51	—	90	86	82	250	34	"	240
-B	18	29.9	473	.013	.114		.48	.51	—	90	86	82	250	34	"	236
4-A	21		480	.013	.114		.48	.51	—	91	87	82	260	34	"	237
-B	21		479	.013	.114		.48	.51	—	91	87	82	250	34	"	221
5-A	27		475	.013	.114		.48	.51	—	91	87	82	250	34	"	223
-B	30		457	.013	.114		.48	.51	—	91	87	82	250	34	"	228
6-A	[illegible]		459	.013	.114		.48	.51	—	92	87	82	256	34	"	223
-B	36	29.9	463	.013	.114		.48	.51	—	92	87	82	250	34	"	245
7-A	39		467	.013	.114		.48	.51	—	92	87	82	250	34	"	250
-B	[illegible]		472	.013	.114		.48	.51	73.920	92	87	82	250	34	"	251
8-A	[illegible]		457	.015	.122		.55	.58	—	93	88	83	250	34	"	251
-B	[illegible]	/	466	.015	.122		.55	.58	—	93	88	83	250	34	"	250
9-A	51		490	.008	.089		.29	.32	—	94	89	84	—	—	"	250
-B	54		436	.008	.089		.27	.32	—	94	89	84	—	—	"	240
10-A	57		384	.008	.089		.25	.32	—	94	89	84	—	—	"	241
-B	60		236	.008	.089		.39	—	80.899	94	89	84	—	—	"	245
			444 °F	$(.103)^2$			.41	Δ=	23.132		87 °F		250			235
			460	"							460					
			0.072%	.011			.45				547 °R					
			Tim Wagner JRF													

two of 4
JRF

SOURCE W.S. Coke, St. @ Gen... DATE 2/4/81 LAB#

TEST # 2-pt LEAK CHECK ___ BOX LEVEL ___ MANOMETERS ZERO ___ TEST TIME θ 240

TEST SPECIES O... P_B ___ P_S -1.2 (NE Port) P_M ___ CO_2 ___ O_2 ___ $\%H_2O$ ___

START TIME	TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) in. H2O	($\sqrt{\Delta P}$)	STACK GAS VELOCITY fps	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_{d_i} °F	OUTLET t_{d_o} °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	T Probe
1027	1-A	3	TC2	461	.013	.114		.48	.50	80.859	91	88	94	240	37	~1.0	193
* lost leak check .0075 cfm @ ...	-B	6	1.6/410	479	.015	.122		.54	.60	—	93	87	91	240	37	~1.0	202
	2-A	9		478	.015	.122		.54	.60	—	94	90	85	251	39	~4.0	209
1040	-B	11	(Pb=25.71)	482	.015	.122		.54	.60	86.376	94	90	85	leak check		~14.0	stop
Stop	3-A	15	Tele	479	.020	.141	.72	.77	start	87.364	94	90	85	248	32	~1.5	15[illegible]
Start @ 1110	-B	18	7.19	490	.020	.141	.77	.77		—	94	90	85	254	32	~1.75	200
	4-A	21		472	.020	.141		.72	.77	—	95	91	86	254	32	~1.75	208
	-B	[illegible]		468	.020	.141		.77	.77	—	96	91	86	250	33	~1.75	220
	5-A	[illegible]		471	.020	.141		.72	.76	—	96	91	86	252	33	~1.75	230
	-B	[illegible]		476	.020	.141		.72	.76	—	97	92	86	250	33	~1.75	24[illegible]
	6-A	[illegible]		474	.020	.141		.72	.76	—	97	91	94	255	34	~1.75	250
	-B		Pb	478	.020	.141		.72	.76	—	97	92	86	255	34	~2.0	259
	7-A	39	25.71	479	.020	.141		.72	.76	—	97	92	86	255	34	~2.0	260
	-B	42	TC "	480	.020	.141		.72	.76	—	97	92	86	255	34	~2.0	259
	[illegible]	45	/89	485	.020	.141		.72	.76	—	96	91	86	255	34	~3.0	259
	-B	[illegible]		487	.020	.141		.72	.76	—	96	91	86	255	34	~3.0	257
	[illegible]	[illegible]		453	.025	.158		.90	.94	—	97	92	86	256	35	~4.0	245
	-B	[illegible]		410	.020	.141		.72	.76	—	98	92	86	256	35	~3.0	240
	[illegible]	[illegible]		360	.020	.141		.72	.76	—	98	92	86	250	35	~3.0	230
port out 1158	-B	[illegible]		252	.025	.141		.95	—	112.620	97	92	86	250	35	~4.0	237
JRF											91°F						
						(.133)				Δ=31.721	1.462						
						.17		.75		volume - ... for leak check							
3 of 4 JRF				JRF no changes				filter changed @ 1040 JRF									
* leak check @ 15" 0.0075 cfm																	

SOURCE Coke #3 @ Geneva DATE 1/4/81 LAB#

TEST # Pt 2 LEAK CHECK —— BOX LEVEL ✓ MANOMETERS ZERO ✓ TEST TIME θ 240

TEST SPECIES Pt pr 0.005 cfm @ 5" P_B —— P_S —— SE Port P_M —— CO_2 —— O_2 —— $\%H_2O$ ——

START TIME	TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s, °F	VELOCITY HEAD (ΔP) in. H2O	($\sqrt{\Delta P}$)	STACK GAS VELOCITY fps	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_{in}, °F	OUTLET t_{out}, °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	
1209	1 A	[illegible]	-1.2	452	.013	.114		.48	.48	1126.2	88 86	84	240	37		
	B	[illegible]		474	.005	.069		.36	.30	——	90 88	86	245	38	Nil	171
	2 A	[illegible]		464	.005	.071		.3	.3	——	90 88	86	245	3[illegible]	"	177
	B	[illegible]		455	.005	.071		.19	.19	——	91 88	85	250	37	"	186
	3 A	[illegible]	1125	457	.003	.055		.11	.11	——	91 88	84	238	38	"	191
	B	[illegible]		461	.003	.055		.11	.11	——	92 88	84	239	38	"	202
	4 A	[illegible]		467	.003	.055		.11	.11	——	91 88	84	240	38	"	210
	B	[illegible]		470	.005	[illegible]		.11	.11	——	91 88	84	252	3[illegible]	"	213
	5 A	[illegible]	26.0[illegible]	468	.02	[illegible]	2[illegible]	.04	.04	——	91 88	84	255	3[illegible]	"	218
	B	[illegible]	1770	474	.001	[illegible]		.04	.04	——	91 88	85	255	3[illegible]	"	222
	6 A	[illegible]		475	[illegible]	[illegible]		.04	.04	——	91 88	94	255	39	"	223
	B	[illegible]		475	[illegible]	[illegible]		.04	.04	1123.[illegible]	91 88	85	255	39	"	224
	7 A	[illegible]		412	.001	[illegible]		.04	.04	——	91 88	85	255	39	"	22[illegible]
	B	[illegible]		413	[illegible]	[illegible]		.04	.04	——	91 88	85	250	36	"	231
	8 A	[illegible]		433	[illegible]	[illegible]		.04	.04	——	91 88	85	250	36	"	233
1305	B	[illegible]		397	[illegible]	.031		.04	.04	——	91 88	85	250	36	"	237
	9 A	[illegible]		386	.001	.031		.04	.04	——	91 88	85	250	37	"	235
	B	[illegible]		356	.001	.031	.032	.04	.04	——	91 89	86	250	38	"	235
	10 A	[illegible]	26.68	390	.001	.032		.05	.05	——	91 89	86	——	——	"	236
1309 end	B	[illegible]		401	.001	.032		.05	.05	——	91 89	86	——	——	"	236
										1231.09			[illegible]			
				430.9		.0418		.11		Δ=130.[illegible]		88 °F				21[illegible]
				[illegible]						85.696		41.0				
				[illegible]			.0623			.988		54.6[illegible]				
4 of 4				[illegible]												
									net Δ =	84.916						
												5[illegible]				
		[illegible]		[illegible]		.0096		.37								
											X Pb =	29.[illegible]				

EEMC

TEST # 2

@ ____________

set 3.

LAB # ____________

TEST DATE 2-4-81

SOURCE USS. Stack 3

WEIGHED BY [illegible] APPROVED BY ____________

MOISTURE DETERMINATION

Balance level ✓ Balance zeroed ✓

GRAMS

IMPINGER # 1

Final Weight 802.1

Initial Weight 595.7

Increase +206.4

IMPINGER # 2

Final Weight 636.2

Initial Weight 605.7

Increase +30.5

IMPINGER # 3

Final Weight 515.2

Initial Weight 511.7

Increase + 3.5

SILICA GEL IMPINGER

Final Weight 756.5

Initial Weight 742.1

Increase +14.4

WATER WEIGHT GAIN, GRAMS

Impinger # 1 ____________

Impinger # 2 ____________

Impinger # 3 ____________

Silica Gel ____________

TOTAL MASS OF WATER CAPTURED +256.80 GRAMS

NOTES

DATE 2/4/81

LAB NO. ______

PARTICULATE CALCULATIONS

TEST # 2 Pt

@ Geneva @ Coke, #3

EPA FORMAT - METHODS 1-5

1. Gas Volume sampled - Dry Standard Conditions

$V_m(std) = V_m K_1 Y \frac{Pbar + \Delta H/13.6}{Tm}$

$= (84.710 \text{ cf})(17.65)(1.01) \frac{(25.64" + \frac{.37"}{13.6})}{(541. \,^\circ A)}$ 25.67 70.777 = 70.839 dscf EQN 5-1

2. Volume of Water Vapor

$Vw(std) = K_2 V_{lc}$

$= 0.04707 \,(254.8 \text{ ml.}) = 11.993$ scf EQN 5-2

3. Moisture Content

$Bws = Vw(std)/(Vm(std) + Vw(std))$

$= \frac{(11.993)}{(70.839 + 11.993)} = .145$ Moisture Content x EQN 5-3

x 100 = 14.5 % H_2O

4. Actual Stack Gas Sampled

$Vm(actual) = \frac{V_m}{\left(\frac{100 - \% H_2O}{100}\right)} \times \frac{T_s \;\; ^\circ A}{T_m \;\; ^\circ A} \times \frac{P_m \;\; "Hg}{P_s \;\; "Hg}$

$Vm(actual) = \frac{(\quad)}{(\quad)} \times \frac{(\quad)}{(\quad)} \times \frac{(\quad)}{(\quad)} =$ ______ awcf

5. Dry Stack Gas Molecular Weight

$Md = 0.44(\% CO_2) + 0.32(\% O_2) + 0.28(\% N_2 + \% CO)$

$= 0.44(7.3) + 0.32(9.4) + 0.28(83.3) =$ EQN 3-2

$= 29.54$ lb./lb. mole

6. Wet Stack Gas Molecular Weight

$Ms = Md(1 - Bws) + 18 Bws$

$= (29.54)(1 - .145) + (18 \times .145) =$ EQN 2-5

.855 = 27.867 lb./lb. mole

7. Cross Sectional Stack Area

$A = \pi r^2 = (3.1416)(7.829 \text{ ft.})^2 = 192.559 \text{ ft.}^2$

$A = (h)(w) =$ (______ ft.)(______ ft.) = ______ ft.^2

for rectangular type stacks

8. Average Stack Gas Velocity

$$V_s = K_pC_p\left(\sqrt{\Delta P}\ \text{Ave.}\right)\sqrt{\frac{T_s\ \text{Avg.}}{P_s\ M_s}} \qquad \text{EQN 2-9}$$

$$= (85.49)(.84)\left(\sqrt{.0096\ ''H_2O}\right)\sqrt{\frac{905\ ^\circ A}{25.55\ ''Hg\ \ 27.867}} = 7.933\ \text{ft./sec.}$$

7.925

9. Average Stack Gas Dry Volumetric Flow Rate

$$Q_{sd} = 3600(1 - B_{ws})\ V_sA\left(\frac{T_{std}}{T_s\ \text{avg.}}\right)\left(\frac{P_s}{P_{std}}\right) \qquad \text{EQN 2-10}$$

$$= 3600(1 - .145)\ 7.925\ \text{ft./sec.})(192.559\ \text{ft.}^2)\left(\frac{528.\ ^\circ A}{905\ ^\circ A}\right)\left(\frac{25.60\ Hg}{29.92''\ Hg}\right)$$

.855

$= 2.344743 \times 10^6$ dscf/hr.

10. Actual (Wet) Cubic Feet per Minute

$$AWCFM = \frac{\left(\frac{T_s}{528}\right)\left(\frac{29.92}{P_s}\right)\left(\frac{100}{100 - \%\ H_2O}\right)(Q_{sd})}{60}$$

$$= \frac{\left(\frac{905.}{528}\right)\left(\frac{29.92}{25.60}\right)\left(\frac{100}{100 - 14.5}\right)\ 2.344743 \times 10^6\ \text{dscf/hr.}}{60}$$

85.5

$= 91,562.$ AWCFM

11. Particulate Concentration

$$C_s = \frac{(\text{grams particulate})(15.43)}{V_{m(std)}}$$

#5 - .2896

#5 + I - $\frac{.3061\ g\ (15.43)}{10.991\ dscf}$ = .0629 - #5

= .0665 gr/dscf - #5 + I

$$C_A = \frac{(\text{grams particulate})(15.43)}{AWCF}$$

$$AWCF = V_{m(std)}\left(\frac{T_s}{528}\right)\left(\frac{29.92}{P_s}\right)\left(\frac{100}{100 - \%\ H_2O}\right)$$

$$= \frac{\_\_\_\_\ g\ (15.43)}{\_\_\_\_\ awcf} = \_\_\_\_\ gr/awcf$$

12. Emissions lbs./10^6 BTU's

lbs./10^6 BTU's = (Cd)(Fd) $\frac{20.9}{20.9 - \% O_2}$

(a) % O_2 = Average Dry % O_2

(b) Cd = lbs./dscf = Cs/7000 = $\frac{\text{grams particulate sample}}{\frac{Vm(std)}{452}}$

(c) Fd = BTU Factor for specific fuel

Anthracite	@	10,140
Bituminous	@	9,820
Lignite	@	9,900
Oil	@	9,220
Natural Gas	@	8,740
Wood	@	9,280
Bark	@	9,640

lbs./10^6 BTU = $\frac{(\_\_\_\_\text{gr/dscf})}{7000}$(____Fd) $\frac{20.9}{20.9 - \_\_\_\_}$

= ____ $\frac{\text{lbs.}}{10^6 \text{ BTU}}$

13. Particulate Emissions

ME = $\frac{(Cs)(Qsd)}{7000}$

#5 - .0629
#5 + I - .0665

= $\frac{(\_\_\_\_\text{gr/dscf})(2.24744 \times 10^6 \text{ dscf/hr.})}{7000}$ = ____ lbs./hr

#5 - 21.1
#5 + I - 22.3

ME_A = $\frac{(C_a)(\text{avcfm})(60)}{7000}$ = ____ lbs./hr.

= $\frac{(\_\_\_\_\text{gr/svcf})(\_\_\_\_\text{avcfm})(60)}{7000}$ = ____ lbs./hr.

14. Isokinetic Sampling Rate

I = $\frac{K_4 \, T_s \, Vm(std)}{PsVsAn\theta(1 - Bws)}$

= $\frac{(0.0945)(905 \text{ °A})(70.257 \text{ dscf})}{(25.55 \text{ "Hg})(7.933 \text{ ft./sec.})(.00154 \text{ ft.}^2)(240 \text{ min})(1 - .145)}$

7.7..

1.8551

= 94.6 % Isokinetic

Lab. No. ______

Run No. 2 Date 2-6-81

Stack # 1

Geneva

PARTICULATE CATCH

		Weights	Color & Solution volume, ml
BEAKER 027	A. Probe wash	99.5819 / 99.5564 / 0.0255 g.	clear/black solid 200
Beaker 028	B. Probe wash	94.9443 / 94.9175 / 0.0268 g.	clear/black solid 200
Beaker 029	C. Probewash	101.5562 / 101.5130 / 0.0432 g.	clear/black solid 300
Beaker 030	D. Probewash	90.5724 / 90.5550 / 0.0174 g.	clear/black solid 200
Beaker 031	E. Probe wash	104.0109 / 103.9852 / 0.0257 g.	clear/black solid 79.3
Beaker 039	F. ~~Blank~~ IMP (refilled)	103.4666 / 103.4498 / 0.0168 g.	

First half

Filter Catch

Filter No. 331

Final Wt. .4727

Tare Wt. .3977

.0750

NOTES:

Second half

filter #332

Final wt.	.4773
Tare wt.	.4008
	.0765

$\Sigma_{F_i} =$ .1515 g

Probe and Cyclone Residue .1386 g. - (.0005) g. blank = .1381 g.

Impinger Residue .0168 g. - .0003 g. blank = .0165 g.

EPA METHOD

Filter, Probe & Cyclone Residue .2896 g.

TOTAL PARTICULATE WEIGHT

Filter, Probe, Cyclone and Impinger Residues .3061 g.

BALANCE CALIBRATION

Setup ______ Beakers ______ Filters ______

Barometric Pressure

Date	Time	Value	Initials
2/4	0720	25.68 JRF	JRF
	0800	25.67	JRF
	0915	25.69	JRF
	1040	25.71	JRF
	1130	25.70	JRF
	1240	25.69	JRF
	1315	25.68	JRF

test avg = 25.69 JRF

Run 2

JRF

1984 SOURCE [illegible] @ Genesee [illegible] DATE 2/5/81 LAB# [illegible]

TEST # 3-[illegible] LEAK CHECK ✓ BOX LEVEL ✓ MANOMETERS ZERO ✓ TEST, TIME θ 240

CO - 16.4-16.1 = 0.3% orsat 7.6 orsat 8.6
16.2-15.9 = 0.3% 7.8 15.9 8.5

TEST SPECIES [illegible] P_B ____ P_S ____ (SE Port) P_M ____ CO_2 ____ O_2 ____ $\%H_2O$ ____

START TIME 0752

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s, °F	VELOCITY HEAD (ΔP) in. H2O	$\sqrt{\Delta P}$	STACK GAS VELOCITY fpm	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_{in}, °F	OUTLET t_{out}, °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	Tr
1-A	[illegible]	3	[illegible]	.018	.134		.66	.69	141.084	83 78	76	250	33	22	216
-C	[illegible]	6	478	.018	.134		.66	.69		81 77	76	250	32	2	22
2-A	[illegible]	(25.1	482	.018	.134		.66	.69		85 [illegible]	76	250	32	1	23
[illegible]	[illegible]	in Hg)	[illegible]	.018	.134		.66	.69		86 81	76	250	32	1	23
[illegible]	[illegible]		486	.007	.084		.28	.27		86 81	76	250	32	1	23
[illegible]	[illegible]	Tot	487	.005	.071			.19		86 81	76	253	32	1	24
[illegible]	[illegible]	72961	[illegible]	.003	.055			.10		86 83	77	250	31	"	24
[illegible]	[illegible]	/	[illegible]	.001	.032		.04	.04		86 82	77	253	31	"	24
[illegible]	77		464	.001	.032		.04	.04		87 82	77	251	31	"	24
-B	[illegible]		466	[illegible]	.032		.04	.04		85 82	78	251	32	"	25
6-A	[illegible]		470	[illegible]	.032		.04	.04		85 82	78	251	31	"	25
-C	[illegible]		[illegible]	[illegible]	.032		.04	.04		85 83	79	251	[illegible]	"	26
[illegible]	[illegible]		470	[illegible]	.032		.04	.04		86 83	78	250	32	"	26
-C	[illegible]		[illegible]	[illegible]	.032		.04	.04		86 83	79	250	31	"	25
8-A	[illegible]	(	[illegible]	[illegible]	.032		.04	.04		86 83	79	250	31	"	24
-C	[illegible]		[illegible]	[illegible]	.032		.04	.04		86 83	79	250	31	"	24
9-A	[illegible]		[illegible]	[illegible]	.032		.04	.04		86 83	80	250	31	"	23
-C	[illegible]		[illegible]	[illegible]	.032		.04	.04		86 83	80	250	31	"	23
10-[illegible]	[illegible]		[illegible]	[illegible]	.032		.05	.05		86 83	80	250	31	"	22
-C	[illegible]		[illegible]	[illegible]	.032		.05	.05	156.417	86 83	80	250	31	"	22
			[illegible]	[illegible]	(.058)^2			(.19)	(A15.333)	82		(252)			(240)
										460					
			[illegible]		(.0034)					542	61.575				

1084 dst

No Opacity In Flue & Fine

0852

ELMC 2104 SOURCE Colm H3 @ [illegible] DATE [illegible] LAB#

TEST # 3 R4 LEAK CHECK — BOX LEVEL — MANOMETERS ZERO — TEST TIME θ [illegible]

TEST SPECIES R4 P_B P_S P_M CO_2 O_2 $\%H_2O$

(Port N E)

START TIME

0856

2064 JRT

No break

756

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (In. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) In. H2O	($\sqrt{\Delta P}$)	STACK GAS VELOCITY fpm	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) In. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_{m_i} °F	OUTLET t_{m_o} °F		SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM In. Hg GAGE	
1 A	3		487	.003	.055		.11		1564.11	85	83	81				170
B	6	.06	490	.003	.055		.11			86	84	82	250	31	Nil	182
2 A	9	[illegible]	489	.010	.100		.37			87	85	81	250	32	"	180
C	13		489	.010	.100		.37			89	85	83	260	32	"	187
3 A	15	0.02571	490	.005	.071		.18			88	85	82	260	33	"	190
C	18		480	.015	.122		.55			89	85	82	267	34	"	211
4 A	[illegible]		476	.015	.122		.55			88	85	83	260	34	"	215
C	[illegible]		477	.015	.122		.55			88	85	81	269	36	"	225
5 A	[illegible]		479	.015	.122		.55			92	88	83	250	37	"	240
C	[illegible]		487	.015	.122		.55			94	89	83	248	36	"	252
6 A	[illegible]	[illegible]	483	.015	.122		.55			94	89	82	252	[illegible]	"	252
C	[illegible]		[illegible]	.015	.122		.55			93	89	84	250	37	"	248
7 A	[illegible]		484	.015	.122		.55			93	88	82	250	36	Nil	251
C	[illegible]		485	.015	.122		.55			93	88	83	250	37	Nil	253
8 A	[illegible]		465	.010	.100		.37			94	89	84	251	36	Nil	254
C	48		461	.001	.032		.04		1753.1	94	89	84	250	36	Nil	241
9 A	51		465	.001	.032		.04			91	90	84	251	36	Nil	235
C	54		462	.001	.032		.04			91	88	84	250	36	Nil	232
10 A	57		464	.001	.032		.04		1787.91	92	88	84	250	36	"	233
C	60		465	.001	.032		.04			92	88	84	250	36	"	230
																230
			448 / 460 / 9004.60		(.087)^2		(.33)		21.454	87			(252)			(226)
					=					460 / 547						
					(.0076)					30.875 / [illegible]						

[illegible] 3 of 4 JRT

SOURCE Coke #3 @ ______ DATE 2/5/81 LAB# ______

TEST #3 Pt LEAK CHECK ____ BOX LEVEL ✓ MANOMETERS ZERO ✓ TEST TIME θ 240

TEST SPECIES Pt P_B ____ P_S ____ P_M ____ CO_2 ____ O_2 ____ $\%H_2O$ ____

START TIME	TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) in. H2O	($\sqrt{\Delta P}$)	STACK GAS VELOCITY fps	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_i °F	OUTLET t_o °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	
1009	1 A	3	[illegible]	[illegible]	.005	.071		.18		179.891	86 84	82	253	33	Nil	193
	B	7	[illegible]	463	.005	.071	[illegible]	.18	18		87 85	82	252	33	"	19[illegible]
	2 A	9		463	.005	.071		.18			87 85	82	250	35	"	198
	B	12		[illegible]	.005	.071		.18			87 85	82	250	36	"	21[illegible]
	3 A	15	Ps=[illegible]	463	.005	.071		.18			87 85	82	251	36	"	22[illegible]
	B	18		413	.005	.071		.18			88 85	82	250	37	"	23[illegible]
	4 A	21		418	.005	.071		.18		184.600	88 85	82	250	37	"	26[illegible]
3 of 4	B	[illegible]		[illegible]	.003	.055		.11			86 86	82	[illegible]	38	"	26[illegible]
	5 A	[illegible]		[illegible]	.005	.071		.18			88 85	82	[illegible]	[illegible]	"	26[illegible]
JRT	B	[illegible]		[illegible]	.005	.071		.18			88 85	82	251	[illegible]	"	266
	6 A	[illegible]		[illegible]	.005	.071		.18			88 85	82	257	[illegible]	"	26[illegible]
	B	[illegible]		458	.005	.071		.18			88 85	82	250	39	"	258
	7 A	[illegible]		459	.005	.071		.18			88 85	82	252	39	"	255
	B	[illegible]		463	.001	.032		.04			85 84	82	250	39	"	249
	8 A	[illegible]		462	.001	.032		.04			87 85	83	250	40	"	249
	B	[illegible]		440	.001	.032		.04			86 84	82	250	40	"	240
	9 A	51		460	.001	.032		.04			86 84	82	250	40	"	241
	B	[illegible]		[illegible]	.001	.032		.04			86 84	82	[illegible]	40	"	242
1109	10 A	[illegible]		276	.001	.032		.04			86 84	82	251	40	"	22[illegible]
	B	60		229	.001	.032		.04		182.025	86 84	82	250	40	"	226
				[illegible] 4411		.057		.13		[illegible]	85		252			237
				440		"					460					
				401°A		.0032					545 84.5 JRT					

494

SOURCE Colu #3 @ [illegible] DATE 2/5/81 LAB# ______

TEST # Pt 3 LEAK CHECK ______ BOX LEVEL ______ MANOMETERS ZERO ______ TEST TIME θ 240

TEST SPECIES Pt P_B ______ P_S (Port SW) P_N ______ CO_2 ______ O_2 ______ $\%H_2O$ ______

START TIME	TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) in. H2O	($\sqrt{\Delta P}$)	STACK GAS VELOCITY fps	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_i °F	OUTLET t_o °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE	
1116	1-A	3		437	.010	.100		.37		182.025	85	83 81	246	40	W	180
	B	6		453	.010	.100		.37			87	85 81	242	41		181
	2-A	9		411	.012	.110		.44			88	84 80	250	40	"	183
	B	12		446	.012	.110		.44			88	85 82	250	40	"	183
	3 A	15		473	.010	.100		.37			89	86 82	250	40	"	19[illegible]
	B	18	[illegible]	478	.007	.084		.26			90	86 82	250	40	"	194
	4 A	21		481	.005	.071		.18			90	86 82	250	38	"	20[illegible]
	B	[illegible]		481	.005	.071		[illegible]			90	86 82	250	38	"	21[illegible]
	5 A	27		490	.005	.071		.18			91	87 82	250	38	"	22[illegible]
	B	30		473	[illegible]	.071		.18			91	87 82	25[illegible]	3[illegible]	"	23[illegible]
	6 A	[illegible]		465	.001	.032		.04			91	87 83	252	38	"	23[illegible]
	B	[illegible]		467	.001	.032		.04			91	87 83	252	38	"	2[illegible]
	7 A	3[illegible]	Tel	465	.001	.032		.04			91	87 83	252	38	"	2[illegible]
	B	[illegible]	759	471	.001	.032		.04			92	88 84	252	38	"	24[illegible]
	8 A	[illegible]		452	.001	.032		.04			92	88 84	252	38	"	2[illegible]
	B	[illegible]	[illegible] 1560	460	.001	.032		.04			93	89 84	252	38	"	2[illegible]
	9 A	[illegible]		450	.001	.032 JRT		.04			90	87 84	252	38	"	2[illegible]
1216	B	[illegible]		455	.001	.032		.04			89	87 84	252	38	"	24[illegible]
	10 A	[illegible]		361	.001	.032		.04			90	88 85	251	37	"	24[illegible]
	B	[illegible]		348	.00	.032 JRT		.04		202.996	86	87 84	253	37	"	23[illegible]
								.05		15.840	89	87 84	252	39	"	23[illegible]
-1.2 / 13.6	+2	5.10 = 25.612		455 / 460 / 915		.060 / .0034		.17		201.996 / 104	87	3[illegible]	250			224
										15.361	87 / 517		Leak rate = [illegible]			
				450°F / 460									P_b = 25.710			
				[illegible]		.0045		.21		66.5020	[illegible]		217[illegible]		3.20	

4 of 4 JRT

Barometric Pressure

Date	Time	Value	Initials
2/5	0800	25.70	JRF
2/5	0905	25.71	JRF
2/5	~~1015~~	~~25.73~~	~~JRF~~
	1055	25.72	JRF
	1130	25.70	JRF
	1210	25.68	JRF

avg = ~~25.705~~
25.71 JRF

Run No. 3

Geneva stack #3

Lab. No. ___

Date 2-6-81

PARTICULATE CATCH

			Color & Solution volume, ml
	BEAKER 032	104.5191 104.4843 0.0348 g.	
A.	Probe Wash		clear/~~Black~~ solid 200
	Beaker 033	95.7700 95.7415 0.0285 g.	
B.	probe Wash		clear/Black solid 200
	Beaker 034	105.5247 105.4999 0.0248 g.	
C.	probe wash		clear/Black solid 70.6
	Beaker 021	98.9420 98.9324 0.0096 g.	
D.	Imp		
	Beaker 022	101.1135 101.1042 .0093 g.	
E.	Imp		
	Beaker 023	94.9320 94.9288 0.0032 g.	
F.	~~Blank~~ Imp		

Filter Catch

Filter No. 333

Final Wt. .5027

Tare Wt. .4020

.1007

NOTES:

Probe and Cyclone Residue .0881 g. (-.0001)3 g. blank = .0878 g

Impinger Residue .0221 g. (.0003)3 g. blank = .0212 g

EPA METHOD Filter, Probe & Cyclone Residue .1885 g.

TOTAL PARTICULATE WEIGHT

Filter, Probe, Cyclone and Impinger Residues .2097 g.

BALANCE CALIBRATION

Setup ___ Beakers ___ Filters ___

Run No. Blanks

Lab. No. [illegible]

Date (Geneva)

200 ml.

PARTICULATE CATCH

Color & Solution volume, ml

BEAKER 035 — 107.1582 / 107.1580 / + 0.0002 g.

A. acetone

Beaker 036 — 105.8124 / 105.8125 / − 0.0001 g.

B. acetone

Beaker 024 — 100.0206 / 100.0203 / +0.0003 g.

C. H_2O

Beaker ______ ______ g.

D. ______

Beaker ______ ______ g.

E. ______

Beaker ______ ______ g.

F. BLANK-

Filter Catch

Filter No. 337

Final Wt. .4030

Tare Wt. .4030

g

NOTES:

$\overline{X}$ Acetone = +.0001

Probe and Cyclone Residue ______ g. − acetone −.0001 g. blank = ______ g.

Impinger Residue ______ g. − H_2O −.0003 g. blank = ______ g.

EPA METHOD Filter, Probe & Cyclone Residue ______ g.

TOTAL PARTICULATE WEIGHT

Filter, Probe, Cyclone and Impinger Residues ______ g.

BALANCE CALIBRATION

Setup ______ Beakers ______ Filters ______

EEMC

TEST # 3

@

set 5

MOISTURE DETERMINATION

Balance level ✓ Balance zeroed ✓

LAB #

TEST DATE 2-4-81

SOURCE USS Stack 3

WEIGHED BY 2/11 APPROVED BY

	GRAMS
IMPINGER # 1	
Final Weight	754.9
Initial Weight	593.2
Increase	161.7
IMPINGER # 2	
Final Weight	641.6
Initial Weight	621.5
Increase	20.1
IMPINGER # 3	
Final Weight	464.3
Initial Weight	462.7
Increase	1.6
SILICA GEL IMPINGER	
Final Weight	850.0
Initial Weight	838.8
Increase	11.2

WATER WEIGHT GAIN, GRAMS

Impinger # 1

Impinger # 2

Impinger # 3

Silica Gel

TOTAL MASS OF WATER CAPTURED 194.6 GRAMS

NOTES

DATE 2/5/81 PARTICULATE CALCULATIONS TEST # 3 - Pt
@ Geneva Collect #3

JOB NO.

EPA FORMAT - METHODS 1-5

1. Gas Volume sampled - Dry Standard Conditions

$$Vm(std) = V_m K_1 Y \frac{Pbar + \Delta H/13.6}{Tm}$$ EQN 5-1

$$= (66.802 cf)(17.65)(1.01)\frac{(25.71" + \frac{.21"}{13.6})}{(543\ ^{o}A)} = 56.211\ dscf$$

2. Volume of Water Vapor

$$Vw(std) = K_2 V_{1c}$$ EQN 5-2

$$= 0.04707\ (194.6\ ml.) = 9.160\ scf$$

3. Moisture Content

$$Bws = Vw(std)/(Vm(std) + Vw(std))$$ EQN 5-3

$$= \frac{(9.160)}{(56.211 + 9.160)} = .140$$ Moisture Content x

$$x\ 100 = 14.0\ \%\ H_2O$$

4. Actual Stack Gas Sampled

$$Vm(actual) = \frac{V_m}{\left(\frac{100 - \%\ H_2O}{100}\right)} \times \frac{T_s\ ^{o}A}{T_m\ ^{o}A} \times \frac{P_m\ "Hg}{P_s\ "Hg}$$

$$Vm(actual) = \frac{(\quad)}{\frac{(100 - 14.0)}{100}} \times \frac{(\quad)}{(\quad)} \times \frac{(\quad)}{(\quad)} = \_\_\_\_\ acf$$

.860

5. Dry Stack Gas Molecular Weight

8.6% 7.5% 0.3%

$$Md = 0.44(\%\ CO_2) + 0.32(\%\ O_2) + 0.28(\%\ N_2 + \%\ CO)$$ EQN 3-2

$$= 0.44(7.5) + 0.32(8.6) + 0.28(83.9) = 29.544\ lb./lb.\ mole$$

6. Wet Stack Gas Molecular Weight

$$Ms = Md(1 - Bws) + 18\ Bws$$ EQN 2-5

$$= (29.544)(1 - .140) + (18 \times .140) = 27.928\ lb./lb.\ mole$$

.860

7. Cross Sectional Stack Area

$$A = \pi r^2 = (3.1416)(7.829\ ft.)^2 = 192.559\ ft.^2$$

$$A = (h)(w) = (\text{—}\ ft.)(\text{—}\ ft.) = \text{—}\ ft.^2$$

for rectangular type stacks

8. Average Stack Gas Velocity

$$V_s = K_p C_p \left(\sqrt{\Delta p \text{ Avg.}}\right) \sqrt{\frac{T_s \text{ Avg.}}{P_s M_s}} \qquad \text{EQN 2-9}$$

$$= (85.49)(.84)\left(\sqrt{.0045 \text{ " } H_2O}\right) \sqrt{\frac{910.\ ^\circ A}{25.612 \text{" Hg } 27.928}} = 5.434 \text{ ft./sec}$$

9. Average Stack Gas Dry Volumetric Flow Rate

$$Q_{sd} = 3600(1 - B_{ws})\ V_s A \left(\frac{T_{std}}{T_s \text{ avg.}}\right)\left(\frac{P_s}{P_{std}}\right) \qquad \text{EQN 2-10}$$

$$= 3600(1 - .140)(5.434 \text{ ft./sec.})(192.559 \text{ ft.}^2)\left(\frac{528\ ^\circ A}{910.\ ^\circ A}\right)\left(\frac{25.612 \text{ " Hg}}{29.92 \text{ " Hg}}\right)$$

.860

$= 1.609010 \times 10^6$ dscf/hr. $/60 = 26,817$

10. Actual (Wet) Cubic Feet per Minute

$$AWCFM = \frac{\left(\frac{T_s}{528}\right)\left(\frac{29.92}{P_s}\right)\left(\frac{100}{100 - \%\ H_2O}\right)(Q_{sd})}{60} =$$

$$= \frac{\left(\frac{910.}{528}\right)\left(\frac{29.92}{25.612}\right)\left(\frac{100}{100 - 14.0}\right) 1.609010 \times 10^6 \text{ dscf/hr.}}{60}$$

86.

$= 62,782$ AWCFM

11. Particulate Concentration

$$C_s = \frac{(\text{grams particulate})(15.43)}{V_m(\text{std})}$$

#5 = .1885

#5 + I = .2097

$$= \frac{.2097 \text{ g } (15.43)}{56.211 \text{ dscf}} = \text{gr/dscf}$$

.052 #5

.058 #5 + I

$$C_A = \frac{(\text{grams particulate})(15.43)}{AWCF}$$

$$AWCF = V_m(\text{std})\left(\frac{T_s}{528}\right)\left(\frac{29.92}{P_s}\right)\left(\frac{100}{100 - \%\ H_2O}\right)$$

$$= \frac{\_\_\_\_ \text{ g } (15.43)}{\_\_\_\_ \text{ awcf}} = \_\_\_\_ \text{ gr/awcf}$$

12. Emissions lbs./10^6 BTU's

$$\text{lbs./}10^6\text{ BTU's} = (Cd)(Fd)\frac{20.9}{20.9 - \%\ O_2}$$

(a) $\%\ O_2$ = Average Dry $\%\ O_2$

(b) Cd = lbs./dscf = Cs/7000 = $\dfrac{\text{grams particulate sample}}{\frac{Vm(std)}{452}}$

(c) Fd = BTU Factor for specific fuel:

Anthracite	@	10,140
Bituminous	@	9,820
Lignite	@	9,900
Oil	@	9,220
Natural Gas	@	8,740
Wood	@	9,280
Bark	@	9,640

$$\text{lbs./}10^6\text{ BTU} = \frac{(\_\_\_\_\_\_\text{ gr/dscf})}{7000}(\_\_\_\_\_\_\text{ Fd})\frac{20.9}{20.9 - \_\_\_\_\_\_}$$

$$= \frac{\_\_\_\_\_\_\text{ lbs.}}{10^6\text{ BTU}}$$

13. Particulate Emissions

$$ME = \frac{(Cs)(Qsd)}{7000}$$

#5 - .052

#5+I .058

1.6901 x 10^6

$$= \frac{(\_\_\_\_\_\_\text{ gr/dscf})(\_\_\_\_\_\_\text{ dscf/hr.})}{7000} = \_\_\_\_\_\_\text{ lbs./hr.}$$

12.0 #5

13.3 #5+I

$$ME_A = \frac{(C_a)(awcfm)(60)}{7000} = \_\_\_\_\_\_\text{ lbs./hr.}$$

$$= \frac{(\_\_\_\_\_\_\text{ gr/awcf})(\_\_\_\_\_\_\text{ awcfm})(60)}{7000} = \_\_\_\_\_\_\text{ lbs./hr.}$$

14. Isokinetic Sampling Rate

$$I = \frac{K_4\ T_s\ Vm(std)}{PsVsAn\theta(1 - Bws)}$$

$$= \frac{(0.0945)(910\ °R)(56.211\text{ dscf})}{(25.61\text{ "Hg})(5.434\text{ ft./sec.})(.00154\text{ ft.}^2)(240\text{ min})(1 - .140)}$$

.860

= 109.3 % Isokinetic

SOURCE Coma ... 3 @ Geneva DATE 2/4/81 LAB#

TEST # OY1 fice LEAK CHECK post .001 cfm @ 4" BOX LEVEL MANOMETERS ZERO TEST TIME θ 15

TEST SPECIES Cal. CHIC P_B 25.68 P_S N/A P_M 25.73 CO_2 O_2 $\%H_2O$

START TIME 1432

TRAVERSE POINT NUMBER	SAMPLING TIME θ, min	STACK GAGE PRESSURE (in. H2O)	STACK TEMPERATURE t_s °F	VELOCITY HEAD (ΔP) (√ΔP) in. H2O	STACK GAS VELOCITY fpm	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET t_i °F		OUTLET t_o °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg GAGE
1	1	N/A	N/A	N/A										
2	2					.69		133.310	76	74	70	N/A	N/A	16.50
3	3					.69			78	74	70			"
4	4					.68			79	75	70			"
5	5					.66			80	75	70			"
6	6					.69			80	75	70			
7	7					.69			80	75	70			
8	8					.69			81	76	70			
9	9					.69			82	77	71			
10	10					.68			83	77	71			
11	11					.68			84	78	72			
12	12					.68			85	79	72			
13	13					.68			85	79	72			
14	14					.68			85	79	73			
15	15					.69			86	80	72			
						.68		146.721	86	80	72			"
						.69	Δ=1.411			77				
					ΔH@ =	1.0[illegible]				460	= 537			
						=	(1.01)(1.411)		=	1.4[illegible]				

JRT

Provo Utah
Coker #3

Run No. 1

Lab. No. ______

Date 2-25-81

After extraction & filtration

PARTICULATE CATCH

BEAKER 015	102.5782 102.4608 0.1174 g.	Color & Solution volume, ml	Filter Catch	
A. Probe wash & filter		Very pale yellowish color 200ml Oily residue black	Filter No. ______	
			Final Wt.	
			Tare Wt. ______	
Beaker ______	______ g.			
B. ______		______	NOTES:	
Beaker ______	______ g.			
C. ______		______		
Beaker ______	______ g.			
D. ______		______		
Beaker ______	______ g.			
E. ______		______		
Beaker ______	______ g.			
F. BLANK ______		______		

Probe and Cyclone Residue ______ g. - ______ g. blank = ______ g.

Impinger Residue ______ g. - ______ g. blank = ______ g.

EPA METHOD

Filter, Probe & Cyclone Residue ______ g.

TOTAL PARTICULATE WEIGHT

Filter, Probe, Cyclone and Impinger Residues ______ g.

BALANCE CALIBRATION

Setup ______ Beakers ______ Filters ______

Run No. 2
Provo Utah Coker # 3

LAB. NO. ____

Date 2-25-81

after extraction & filtration

PARTICULATE CATCH

BEAKER 02S

	104.4536 104.2935 0.1601 g.	Color & Solution volume, ml	Filter Catch
A. Probe & filter residue		very pale yellowish color 200 ml oily residue black	Filter No. ____ Final Wt. ____ Tare Wt. ____
Beaker ____	____ g.		
B. ____		____	NOTES:
Beaker ____	____ g.		
C. ____		____	
Beaker ____	____ g.		
D. ____		____	
Beaker ____	____ g.		
E. ____		____	
Beaker ____	____ g.		
F. BLANK- ____		____	

Probe and Cyclone Residue ____ g. - ____ g. blank = ____ g.

Impinger Residue ____ g. - ____ g. blank = ____ g.

EPA METHOD Filter, Probe & Cyclone Residue ____ g.

TOTAL PARTICULATE WEIGHT

Filter, Probe, Cyclone and Impinger Residues ____ g.

BALANCE CALIBRATION

Setup ____ Beakers ____ Filters ____

U.S. Steel
Provo Utah

Run No. 3

Lab. No. ______

Date ______

After extraction & filtration

PARTICULATE CATCH

	BEAKER 038	94.9802 94.8408 0.1394 g.	Color & Solution volume, ml	
A.	Probe & filter residue		Pale yellowish color - 200ml oily residue black	
	Beaker ______	______ g.		
B.	______		______	
	Beaker ______	______ g.		
C.	______		______	
	Beaker ______	______ g.		
D.	______		______	
	Beaker ______	______ g.		
E.	______		______	
	Beaker ______	______ g.		
F.	BLANK ______		______	

Filter Catch
Filter No. ______
Final Wt.
Tare Wt. ______

NOTES:

Probe and Cyclone Residue ______ g. - ______ g. blank = ______ g

Impinger Residue ______ g. - ______ g. blank = ______ g

EPA METHOD

Filter, Probe & Cyclone Residue ______ g

TOTAL PARTICULATE WEIGHT

Filter, Probe, Cyclone and Impinger Residues ______ g.

BALANCE CALIBRATION

Setup ______ Beakers ______ Filters ______

Run No. coker #7 1 Lab. No. ______

Date 2-26-81

PARTICULATE CATCH

after ~~titration~~ with NaOH

BEAKER 045 102.2164 102.0816 0.1348 g. Color & Solution volume, ml

A. ______ ______

Beaker ______ ______ g.

B. ______ ______

Beaker ______ ______ g.

C. ______ ______

Beaker ______ ______ g.

D. ______ ______

Beaker ______ ______ g.

E. ______ ______

Beaker ______ ______ g.

F. BLANK ______ ______

Filter Catch

Filter No. ______

Final Wt.

Tare Wt. ______

NOTES:

Probe and Cyclone Residue ______ g. - ______ g. blank = ______ g.

Impinger Residue ______ g. - ______ g. blank = ______ g.

EPA METHOD

Filter, Probe & Cyclone Residue ______ g.

TOTAL PARTICULATE WEIGHT

Filter, Probe, Cyclone and Impinger Residues ______ g.

BALANCE CALIBRATION

Setup ______ Beakers ______ Filters ______

Genever [illegible] Cohen #3

Run No. 2

after titration with NaOH

Lab No.

Date 2-26-81

PARTICULATE CATCH

			Color & Solution volume, ml
	BEAKER OCS	84.2335 84.0631 .1704 g.	
A.			
	Beaker	g.	
B.			
	Beaker	g.	
C.			
	Beaker	g.	
D.			
	Beaker	g.	
E.			
	Beaker	g.	
F.	BLANK		

Filter Catch

Filter No.

Final Wt.

Tare Wt.

NOTES:

Probe and Cyclone Residue ______ g. - ______ g. blank = ______ g.

Impinger Residue ______ g. - ______ g. blank = ______ g.

EPA METHOD

Filter, Probe & Cyclone Residue ______ g.

TOTAL PARTICULATE WEIGHT

Filter, Probe, Cyclone and Impinger Residues ______ g.

BALANCE CALIBRATION

Setup ______ Beakers ______ Filters ______

Georgia U.S. Steel [illegible]

Run No. 3

after titration with NaOH

Lab. No. ____
Date 2-26-81

PARTICULATE CATCH

	BEAKER		Color & Solution volume, ml
	655	86.8999 86.7487 0.1512 g.	
A.			
	Beaker	g.	
B.			
	Beaker	g.	
C.			
	Beaker	g.	
D.			
	Beaker	g.	
E.			
	Beaker	g.	
F.	BLANK-		

Filter Catch

Filter No. ____

Final Wt.

Tare Wt. ____

NOTES:

Probe and Cyclone Residue ____ g. - ____ g. blank = ____ g.

Impinger Residue ____ g. - ____ g. blank = ____ g.

EPA METHOD

Filter, Probe & Cyclone Residue ____ g.

TOTAL PARTICULATE WEIGHT

Filter, Probe, Cyclone and Impinger Residues ____ g.

BALANCE CALIBRATION

Setup ____ Beakers ____ Filters ____

LOCATION Billings lab

DATE 2-26-81

TEST Combined Water NO.

COMPANY Geneva, U.S. Steel, Provo, Utah, coker #3

~~$Ba(ClO_4)_2$~~ NaOH = 0.100 N N.

R-1 TOTAL VOLUME 200ml

DILUTION

ALIQUOT (ml.)	~~Ba^{++}~~ Na^+ (ml.)	BLANK (ml.)	TOTAL TITRATION
total sample 200ml	8.65	—	8.65 ml

NOTES

R-2 TOTAL VOLUME 200ml

DILUTION

ALIQUOT (ml.)	~~Ba^{++}~~ Na^+ (ml.)	BLANK (ml.)	TOTAL TITRATION
total sample 200ml	17.44	—	17.44

NOTES

R-3 TOTAL VOLUME 200ml

DILUTION

ALIQUOT (ml.)	~~Ba^{++}~~ Na^+ (ml.)	BLANK (ml.)	TOTAL TITRATION
total sample 200ml	15.36	—	15.36

NOTES

TOTAL VOLUME

DILUTION

ALIQUOT (ml.)	Ba^{++} (ml.)	BLANK (ml.)	TOTAL TITRATION

LOCATION Billings lab 1 DATE 2-27-81

TEST SO_2 NO. ______ COMPANY Geneva U.S. Steel

$Ba(ClO_4)_2$ = 0.0101 N. Coke #3

Blank TOTAL VOLUME ______

DILUTION ______

ALIQUOT (ml.)	Ba^{++} (ml.)	BLANK (ml.)	TOTAL TITRATION
50.0	0		
50.0	0		

NOTES ______

R-1 TOTAL VOLUME 100 ml

DILUTION ______

ALIQUOT (ml.)	Ba^{++} (ml.)	BLANK (ml.)	TOTAL TITRATION
10.0	15.09	0	150.9
10.0	15.13		151.3 $\bar{X}$ 151.1

NOTES ______

R-2 TOTAL VOLUME 100 ml

DILUTION ______

ALIQUOT (ml.)	Ba^{++} (ml.)	BLANK (ml.)	TOTAL TITRATION
10.0	16.56	0	165.6 $\bar{X}$ 165.6
10.0	16.56		165.6

NOTES ______

R-3 TOTAL VOLUME 100 ml

DILUTION ______

ALIQUOT (ml.)	Ba^{++} (ml.)	BLANK (ml.)	TOTAL TITRATION
10.0	18.39		183.9
10.0	18.39	0	183.9 $\bar{X}$ 183.9

R-1 Geneva U.S. Steel at Provo Utah
$SO_4^=$ & Combined water Analysis

$$C_{SO_4^=/SO_3} = \frac{(424.74)(0.0101)(151.10)(1)}{56.44} = 11.5 PPM$$

$= 11.5$ PPM

0.1174 g of $SO_4^=$, combined H_2O, Soluble Particulates (S.P.)
8.65 ml of 0.1N Na^+ used
0.1348 g Residue of $SO_4^=$ + Soluble Particulates

$$\left(\frac{8.65\ ml}{1000\ ml/l}\right)\left(0.1\ eq/l\right) = 8.65 \times 10^{-4}\ eq\ (23\ g/eq) = 0.0199\ g\ Na$$

$(0.1348\ g\ SO_4 + S.P.) - (.0199\ g\ Na^+) = 0.1149\ g.\ SO_4^= + S.P.$

$(0.1174\ g\ SO_4^=, H_2O, S.P.) - (.0.1149\ g\ SO_4^= + S.P.) = 0.0025\ g$ combine water

$$Wt_{SO_4^=/SO_3} = (1.08 \times 10^{-4})(.0101)(151.10)(454)$$

$= 0.0748\ g\ SO_4^=$

0.0748	g. $SO_4^=$
0.0025	g. combine H_2O
0.0773	g. SO_4^+ + combined H_2O

R-2 Geneva U.S. Steel at Provo Ut.
$SO_4^=$ & Combined water Analysis

$$C_{SO_4^=/SO_3} = \frac{(424.74)(.0101)(165.6)(1)}{70.997} = 10.00 PPM$$

0.1601 g. of $SO_4^=$, Combined H_2O, Soluble Particulates (S.P.)
17.44 ml of 0.1N Na^+ Soln used
0.1704 g. Residue of $SO_4^=$ + S.P.

$$\left(\frac{17.44 \text{ ml}}{1000 \text{ ml/l}}\right)(0.1 \text{ eq/l}) = (0.0017 \text{ eq})(23 \text{ g/eq}) = 0.0401 \text{ g. } Na^+$$

$$(0.1704 \text{ g. } SO_4^= + S.P.) - (.0401 \text{ g. } Na^+) = 0.1303 \text{ g. } SO_4^= + S.P.$$

$$(0.1601 \text{ g. } SO_4^=, H_2O, S.P.) - (0.1303 \text{ g } SO_4^= + S.P.) = 0.0298 \text{ g Combined water}$$

$$Wt\ SO_4^=/SO_3 = (1.08 \times 10^{-4})(.0101)(165.60)(454)$$

$$= 0.0820 \text{ g } SO_4^=$$

0.0820 g. $SO_4^=$
0.0298 g H_2O
0.1118 SO_4 & Combined H_2O

R-3 Geneva U.S. Steel at Provo UT.
$SO_4^=$ & Combined water Analysis

$$C_{SO_4^=/SO_3} = \frac{(424.74)(.0101)(183.90)(1)}{56.211}$$

$$= 14.04 \text{ PPM}$$

0.1394 g. of $SO_4^=$, combined water, soluble particulates (S.P.)
15.36 ml of 0.1N Na^+ Soln. used
0.1512 g. Residue of $SO_4^=$ + S.P.

$$\left(\frac{15.36 \text{ ml}}{1000 \text{ ml/l}}\right)(0.1 \text{ eq/l}) = (.00154 \text{ eq.})(23 \text{ g/eq } Na^+) = .0353 \text{ g } Na^+$$

$$(0.1512 \text{ g } SO_4 + S.P.) - (.0353 \text{ g. } SO_4^= + S.P.) = 0.1159 \text{ g. } SO_4^= + S.P.$$

$$(0.1394 \text{ g. } SO_4^=, H_2O, S.P.) - (0.1159 \text{ g. } SO_4^= + S.P.) = 0.0235 \text{ g combined water}$$

$$Wt_{SO_4^=/SO_3} = (1.08 \times 10^{-4})(.0101)(183.90)(454)$$

$$= 0.0911 \text{ g } SO_4^=$$

0.0911	g. SO_4
0.0235	g. H_2O
0.1146	g. Combined H_2O + $SO_4^=$

DATE 1-28-81 BOX NO. 4

CALIBRATION BY [illegible] DRY GAS METER NO. F

Barometric Pressure, P_b = 26.57 in. Hg								H01
Orifice Manometer Setting, ΔH, in. H_2O		.5	1.0	2.0	3.0	4.0	5.0	H02
Gas Volume Wet Test Meter V_w, ft.^{3}		5	5	10	10 10.311			H03
Gas Volume Dry Gas Meter V_d, ft.^{3}	M_{final}	5.036	5.049	10.195	939.811			H04
	$M_{initial}$	913.236 908.200	918.653 913.604	929.195 919.000	929.500			H05
Temperature	Wet Test Meter t_w, °F	68	68	68	68			H06
	Dry Gas Meter-Outlet t_{do}, °F	84	83	85	88			H07
	Dry Gas Meter-Inlet t_{di}, °F							H08
Time seconds		714	514	736	640			H09
Results $y = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$		1.02	1.016	1.007	.998			P11
$\Delta H @ = \frac{.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w} \right]^2$								P12
$K_o = \frac{V_w}{\theta, \text{min.}} \left[\frac{P_m \times MW}{(T_{mo}, °A)(\Delta H_o)} \right]^{1/2}$								P13

Averages:

y = 1.01

$\Delta H @$ = ______

K_o = ______

K_o = Factor for HP-65; T_{mo} = Outlet temp.

$P_m = P_b + \frac{\Delta H}{13.6}$

MW = molecular weight of air = 28.97

y = Ratio of accuracy of wet test meter to ~~dry test~~ meter. Tolerance = ± 0.01

$\Delta H @$ = Orifice pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H_2). Tolerance ± 0.15.

DATE 2/7/81 BOX NO. 4

CALIBRATION BY GEW DRY GAS METER NO. F

Barometric Pressure, P_b = 26.50 in. Hg							H01
Orifice Manometer Setting, ΔH, in. H_2O	~~.5~~ .1	~~1.0~~ .5	~~2.0~~	~~3.0~~	~~4.0~~	5.0	H02
Gas Volume Wet Test Meter V_w, ft.^{3}	5.0	5.0					H03
Gas Volume Dry Gas Meter V_d, ft.^{3} — M_{final}	212.400	217.719					H04
Gas Volume Dry Gas Meter V_d, ft.^{3} — $M_{initial}$	207.375 / 5.025	212.682 / 5.037					H05
Temperature — Wet Test Meter t_w, °F	70	70					H06
Temperature — Dry Gas Meter-Outlet t_{do}, °F	80	80					H07
Temperature — Dry Gas Meter-Inlet t_{di}, °F							H08
Time seconds	1587	709					H09
Results $y = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	1.014	1.010					P11
$\Delta H@ = \frac{.0317 \Delta H}{Pb\ (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w}\right]^2$							P12
$K_o = \frac{V_w}{\theta,\ min.} \left[\frac{P_m \times MW}{(T_{mo},\ ^oA)(\Delta H_o)}\right]^{1/2}$							P13

Averages:

y = 1.01

$\Delta H@$ =

K_o =

K_o = Factor for HP-65; T_{mo} = Outlet temp.

$P_m = P_b + \frac{\Delta H}{13.6}$

MW ≐ molecular weight of air = 28.97

y = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

$\Delta H@$ = Orifice pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in. H2). Tolerance ± 0.15.

Water Displacement

WET TEST METER CALIBRATION LOG

Wet test meter serial number AA455 Date 12-15-80

Range of wet test meter flow rate 0.01 - 0.83 CFM

Volume of test flask V_s = 2 ℓ

Satisfactory leak check? ✓

Ambient temperature of equilibrate liquid in wet test meter and reservoir 72 °F

073

Test number	Manometer reading,[a] mm H_2O	Final volume (V_f), ℓ	Initial volume (V_i), ℓ	Total volume (V_m)[b], ℓ	Flask volume (V_s), ℓ	Percent error,[c] %
1	0.35	7.943.0	0	7.9430	7,983	0.50
2	0.35	7.9804	0	7.9804	8,0417	0.77
3	0.35	7.9835	0	7.9835	8.0532	0.87

a Must be less than 10 mm (0.4 in.) H_2O.

Calculations:

b $V_m = V_f - V_i$.

c % error = $100 (V_m - V_s)/V_s$ = $\bar{X}$ .71% (±1%).

K. Guillen Signature of calibration person

\# 006

TYPE S PITOT TUBE INSPECTION DATA FORM

used geneva

Pitot tube assembly level? ✓ yes ______ no

Pitot tube openings damaged? ______ yes (explain below) ✓ no

α_1 = 5 ° (<10°), α_2 = 6 ° (<10°), β_1 = 1½ ° (<5°),

β_2 = 2 ° (<5°)

γ = 1 °, θ = ½ °, A = .964 cm (in.)

$z = A \sin \gamma$ = .017 cm (in.); <0.32 cm (<1/8 in.),

$w = A \sin \theta$ = .008 cm (in.); <.08 cm (<1/32 in.)

P_A .482 cm (in.) P_b 482. cm (in.)

D_t = .313 cm (in.)

Comments: ______________________________

Calibration required? ______ yes ✓ no

NOZZLE CALIBRATION

Nozzle I.D. Number	Nominal Size, Inches	Measured	Average	Date
01	1"	.998 .997 .997	.997	1-7-81
02	1/2	.500 .500 .501	.500	"
03	1/2	.499 .531 .501 .532 .500 .53 .531 .531	.500-RUN 1 .531-RUN 2+3	"
04	3/8	.375 .375 .374	.375	"
05	3/8	.374 .374 .375	.374	"
06	3/8	.373 .373 .374	.373	"
07	3/8	.374 .375 .374	.374	"
08	5/16	310 310 309	.310	"

Nozzles measured by Precise Starrett expanding micrometer and micro-calipers.

PRETEST SAMPLING CHECKS
(Method 7, Figure 3.1)

Date 1-26-81 Calibrated by

Flask Volume

Flask volumes measured with valves? ____yes ____no

Volume measured within ±10 ml of actual volume? _____yes _____no

Temperature Gauge

Was a pretest temperature correction used? ___yes ___no

If yes, temperature correction _____ (within ±1°C (2°F) of reference values for calibration and within ±2°C (4°F) of reference values for calibration check)

Vacuum Gauge

Was gauge calibrated against a U-tube mercury manometer (If it was a mechanical gauge)? ___yes ___no _____not applicable?

Barometer

Was the pretest field barometer reading within ±2.5 mm (0.1 in.) Hg of the mercury-in-glass barometer? ✓ yes ___no

#001 Cal. 1-26-81 (No change)

#002 Cal. 1-26-81 (No change)

* Most significant items/parameters to be checked.

Date: 1-29-81 Thermocouple No.: C

Ambient Temperature: 68 °C Barometric pressure: ________ " Hg

Calibrator: [illegible] Reference: Mercury-in-glass: 61027-[illegible]

Other: ________

Reference point No.[a]	Source[b] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, °F ~~°C~~	Difference,[c] %
50	water	50	50	0
100	"	100	100	0
150	"	150	149	.6%
200	"	206	204	1.0
250	oil	250	248	.8%
300	oil	300	298	.7
Post Ganes (GEW)		2/7/81		
		°F	°F	
ambient	water	76	76	0.0
Boiling water	"	206	206	0.0

[a] Every 30°C (50°F) for each reference point

[b] Type of Calibration system used

[c] $\frac{(\text{Ref. temp: °C} + 273) - (\text{Test therm. temp. °C} + 273)}{\text{Ref. temp. °C} + 273} \times 100 \leq 1.5\%$

Stack Temperature Sensor Calibration Data Sheet

Date: 1-29-71 Thermocouple No.: 1

Ambient Temperature: 68 °C Barometric pressure: ______ " Hg

Calibrator: [illegible] Reference: Mercury-in-glass: 6100

Other: ______

Reference point No.[a]	Source[b] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Difference,[c] %
50	water	50	50	0
100	"	100	100	~~0~~
150	"	150	151	.7 %
206	"	206	207	.5 %
250	oil	250	252	.8 %
300	oil	300	302	.7 %
Post GenerA (6EW)			2/17/31	
		°F	°F	
ambient	water	76	75 (A=1)	-.7 %
Boiling water @ Billings	"	206	206	0

a Every 30°C (50°F) for each reference point

b Type of Calibration system used

c $\frac{(\text{Ref. temp: °C} + 273) - (\text{Test therm. temp. °C} + 273)}{\text{Ref. temp. °C} + 273} \times 100 \leq 1.5\%$

Stack Temperature Sensor Calibration Data Sheet

Department of Health and Environmental Sciences
STATE OF MONTANA HELENA, MONTANA 59601

A. C. Knight, M.D., F.C.C.P.
Director

AIR QUALITY BUREAU
Cogswell Building
(406) 449-3454

October 16, 1980

Mr. Ben Myren
Myren Air Monitoring
323 E. Beckwith
Missoula, MT 59801

Dear Ben:

This letter serves as formal notice that you have successfully completed the Visible Emission Evaluation Course held in Helena, Montana, on October 8 and 9, 1980. You are considered a qualified smoke reader by virtue of making 50 consecutive observations of 25 black and 25 white plumes with no reading in error by more than 15 percent and having maintained an average deviation of less than 7.5 percent.

This qualification shall expire April 9, 1981.

Sincerely,

Bob Raisch

Bob Raisch, Supervisor
Enforcement Section

Filters

Conditioned 3hours @ 250° F

330	.3986
331	.3977
332	.4008
333	.4020
334	.4013
335	.3984
336	.3973
337	.4030

1-29-81

EJ Wang